ABSTRACTS

RESUMEN

RESUMOS

RÉSUMÉS

HOW TO USE THIS BOOK

Abstracts are arranged in alphanumeric order based on the OP/PP (oral presentation/poster presentation) numbers displayed in the RITA2020 Program. If you're looking for a specific abstract, please search on the OP/PP number.

CÓMO USAR ESTE LIBRO

Los resúmenes están dispuestos en orden alfanumérico basado en los números que aparecen en el Programa RITA2020 OP/PP (presentación oral/presentación del cartel). Si usted está buscando un resumen específico, por favor buscar en el número OP/PP.

COMO USAR ESTE LIVRO

Os resumos são dispostos em ordem alfanumérica com base no OP/PP (apresentação oral/poster) números exibidos no Programa RITA2020. Se você está procurando um resumo específico, por favor, procure no número OP/PP.

COMMENT UTILISER CE LIVRE

Les résumés sont classés par ordre alphanumérique en fonction des numéros OP / PP (présentation orale / présentation par affiche) affichés dans le programme RITA2020. Si vous recherchez un résumé spécifique, veuillez rechercher le numéro OP / PP.

Name: Charles Rupprecht

OP02

Email: charleserupprechtii@gmail.com

Session: Keynote Address: Human Rabies & Prophylaxis

Country: United States

Title: Rabies in the age of COVID: a complex global tableau in a positive, non-vacuum on current matters arising towards musing productively, collaborating ingeniously & communicating frankly…

Authors: Charles E Rupprecht

Affiliations: Lyssa LLC, Lawrenceville, Georgia, USA

Abstract: Unlike selected other viral diseases, such as smallpox, riderpest, polio, measles, etc., rabies is not a candidate for true eradication. Nevertheless, the global elimination of human rabies caused via dogs (GEHRD) by the year 2030 (ZBT) is accomplishable within our lifetime and is one of the most ambitious plans of this decade. As exemplified by Mexico and most other countries in the Americas, as a regional model, the GEHRD is a feasible plan. Unfortunately, the COVID19 pandemic has affected substantially everyone's professional and personal lives. While the actual objective, trans-disciplinary impacts upon all NTDs (including rabies) remain to be quantified, already several less than ideal attributes are obvious subjectively, related to time, talent, and treasure. Severe limitations on travel and social distancing requirements have affected the ability to engage directly (e.g., this RITA conference and many others; hands-on laboratory training; community educational outreach; etc.), staff priorities (e.g., zoonoses surveillance; diagnostic testing; canine vaccination; etc.) and policy outlays (e.g., Gavi arrangements for GEHRD; focal biologics production, supplies and distributions; financial support for PAHO/WHO; etc.). Yet, so-called emerging infectious diseases are a force of nature, just like rabies. Rising to this occasion is a clarion call to our collective inventiveness for evidence-based solutions. For example, positively viewed, political ruminations on current implicit disease causation has caused some to question seriously the sense of wildlife markets and the sensibility of dogs for human consumption. Moreover, at least in theory, situational awareness and spatial/temporal separation may lead to a temporary decrease in environmental exposures to rabid animals as well as animal translocations. Rather than isolate, novel health communications can bridge the gap to the ignored, as offered remotely by talk radio, broadcast public service announcements, brochures, loudspeakers, cell phones, social media outlets, etc., will still reach certain populations at risk. Even laboratory 'wet labs' could occur on-line, in near real-time or in an archived format (e.g., JoVE). As demonstrated by wildlife biologists and others, decentralized, point-of-care testing can contribute to case detection and program goals. Local canine immunizations should ever more be meticulously planned for the vaccinators and the care givers to their vaccinee, as PPE is now de rigueur. Routine utilization of a proper risk assessment should result in preservation of critical biologics, regardless of a health emergency. Consideration of dose-sparing routes and schedules will stretch vaccine availability. Thorough wound care, triaging and local infiltration of rabies immune globulin/monoclonal antibodies do promote patient survivorship. Beyond academic research, actualization of remote, needless delivery of rabies vaccines, for humans, domestic animals, and wildlife, needs to come to our table today. Coat-tails adaptation of any relevant anti-viral drugs or health care interventions for the severely ill can be re-purposed for the considered therapy of the rabies patient. Any predicted temporary drawbacks to the GEHRD might require a re-evaluation of priorities in both the short and long term, but not abandoned in toto. Decision makers need reminding that epidemiologically, the R0 for rabies is lower than COVID19, whereas predictably, the case fatality is substantially higher. Now more than ever, in this pessimistic perception of the worst of times, the rabies community writ large needs to do what it has always done in a true One Health context, demonstrate to the world that such posed challenges may actually be the best of times using the occasion, expertise and resources in a cost-effective manner to accomplish even more with less towards the task at hand.

Name: Huy-Binh Nguyen *(presented by Nicholas Hobart-Porter)*

OP03

Email: hb.nguyen@kedrion.com

Session: Human Rabies & Prophylaxis

Country: United States

Title: Safety and efficacy of rabies post-exposure prophylaxis with human rabies immunoglobulin (HRIG150; KEDRAB) and active vaccination in pediatric patients with suspected or confirmed rabies virus exposure: A Phase 4 Open-label Single-Arm Clinical Trial

Authors: Nicholas Hobart-Porter, Michal Stein, Naveh Toh, Novinyo Amega, Huy-Binh Nguyen, James Linakis

Affiliations: Kedrion Biopharma Inc., Fort Lee, New Jersey, USA

Abstract: Rabies is a deadly viral zoonosis with a global disease burden. Following exposure to a rabid animal, post-exposure prophylaxis (PEP) that includes human rabies immunoglobulin has become the standard of care for unvaccinated persons, based on evidence in adults that it prevents death when given appropriately. Despite the large proportion of pediatric cases, limited safety and efficacy data from clinical trials currently exist for use in pediatric patients. We report here the safety, efficacy, and immunogenicity results of a phase 4, prospective, two-center, open-label, single-arm clinical trial evaluating the use of a human rabies immunoglobulin (HRIG150; KEDRAB 150 IU/ml) as part of PEP in pediatric patients under 17 years of age with suspected or confirmed rabies exposure, in whom PEP was indicated following exposure to a suspected rabid animal. Thirty participants received 20 IU/kg HRIG150 infiltrated into detectable wound site(s), with any remainder injected intramuscularly, concomitantly with the first of a 4-dose (days 0, 3, 7, 14) rabies vaccine series. Rabies virus neutralizing antibody titers and tolerability were assessed on day 14 following administration, and participants were followed for safety up to 84 days in total. Efficacy in preventing rabies disease was 100%, with no (0%) participants developing rabies disease at any time during the study period. No serious adverse events or deaths were recorded. Twenty-one (70.0%) participants experienced 57 treatment-emergent adverse events (TEAEs) within 14 days following administration of HRIG150. Twelve (40.0%) participants experienced 12 study treatment-related adverse events, all of which were mild in severity. On day 14, 28 of 30 (93.3%) participants had RVNA levels of ≥0.5 IU/ml (mean ± SD: 18.89 ± 31.61). This study is the first to investigate pediatric safety and efficacy of any rabies immunoglobulin available in the United States, and the data establish safety and efficacy profiles for the pediatric population studied.

Name: Gabriela Koike

OP04

Email: gabi.koike@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Comparing the glycosylation patterns of IgG1 antibodies induced after pre-exposure rabies prophylaxis

Authors: Gabriela Koike, Iana Suly santos Kayz, Elaine Raniero Fernandes, Fernanda Guedes, Sandriana dos Ramos Silva

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: Rabies lyssavirus (RABV) neutralizing IgG antibodies confer protection after rabies vaccination, although how the RABV-specific antibodies neutralize the virus is still unknown. As changes in the antibody`s carbohydrate chain can interfere with its effector functions, we compared the glycosylation patterns of both neutralizing and non-neutralizing IgG1 induced by pre-exposure prophylaxis to human rabies and analyzed their influence on in vitro antibody neutralizing activities. Specific IgG1 were purified from human serum using affinity chromatography. Purity and avidity were analyzed by SDS-PAGE and indirect ELISA using NH4SCN respectively. The N-linked oligosaccharide chain of the purified IgG antibody was evaluated using a lectin-based ELISA assay with a panel of seven lectins. Neutralizing activity of purified IgG1 and neutralizing IgG1 deglycosylated by PNGase F enzyme were analyzed using the rapid fluorescent focus inhibition test. The purified IgG1 showed an electrophoretic pattern compatible with human IgG. All of the antibodies recognized RABV, although neutralizing IgG1 had a higher avidity (RAI =80%) than non-neutralizing IgG1 (RAI=30%). The neutralizing IgG1 also showed higher binding to WFA, ECA, WGA, and ConA lectins, indicating possible different N-acetylgalactosamine, galactose, N-acetylglucosamine, and mannose contents, respectively. Non-neutralizing IgG1, on the other hand, showed strong binding at UEA-1 and SNA, which bind to fucose and sialic acid residues, respectively. Different glycosylation profiles were also observed in Fab and Fc fragments from neutralizing and non-neutralizing IgG1, although the deglycosylated IgG1 lost its neutralizing activity. Our results suggest that antibody glycosylation is important for neutralizing RABV in vitro, since neutralizing IgG1 has a different glycosylation profile than non-neutralizing IgG1. Further research will be needed to better evaluate the differential glycosylation patterns between IgG1 antibodies following vaccination.

Name: Emmanuel Messias Vilar

OP05

Email: messiashp@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: City without rabies: didactic resource for health education actions

Authors: Emmanuel Messias Vilar, Agnes Alessandra Sekijima Takeda, Cássia Lima Costa, Giovanna Manga Guimarães, Juliana Paiva

Affiliations: Federal University of Paraíba, Mammals Laboratory, João Pessoa, Brazil

Abstract: In Brazil, the epidemiological cycle of rabies is didactically divided into four parts: aerial wild, terrestrial, urban and rural. Bats interact in all epidemiological cycles of transmission. The latest cases of human rabies that occurred in Brazil, in which cats were involved, the viral variant was bat-specific, demonstrating an interaction between felines and chiropterans. Understanding this interaction phenomenon is not easy, since it is necessary to understand, above all, the ecological dynamics between the reservoirs and the transmission dynamics. Therefore, we present an open project of a didactic resource capable of facilitating the understanding of the epidemiological scenarios of rabies in Brazil in a dynamic and practical way. This resource has two primary forms of use: 1. It can be used to assemble epidemiological cycles with the freedom to build several scenarios of interaction between taxonomic groups, showing the possible routes of transmission of the rabies virus; 2. It can be used as an evaluative game in the training of health professionals or at the end of lectures on health education actions. The schematic design of the epidemiological cycle of Rabies present in the technical manuals of national circulation was used as the basis for making the resource. The cycle scheme was composed using the Inkscape 0.92 software with vector images obtained in licensed image banks. With the vectors, we build cutting files that can be used for printing and cutting with scissors on paper or laser cutters/engravers on different materials. All files used in the construction of the resource are available in a free repository on Github. We believe that health education actions are essential for 0effective epidemiological surveillance, especially when educational resources used in the process facilitate the understanding of the target audience on the topic.

Name: Sergio Recuenco-Cabrera

OP06

Email: sergio.recuenco@gmail.com

Session: Human Rabies & Prophylaxis

Country: Peru

Title: Emerging scenarios for VBR response in the Amazon Basin due to the COVID-19 pandemic: challenges and opportunities

Authors: Sergio E Recuenco

Affiliations: National University of San Marcos, Lima, Peru

Abstract: Globally most human activities are impacted by the COVID-19 pandemic. While the final impact of the ongoing pandemic is yet to be seen, after 6 months of its introduction in Peru, the country became one of the most affected places in the world, with the highest mortality per million population. The remote and isolated populations of the Peruvian Amazon Basin where vampire bat rabies (VBR) is endemic and pre-exposure immunization campaign is ongoing failed to be remain free of the pandemic and now that are affected an intense emergency response activity was triggered among native communities and populations in Amazonia. Current public health activities prioritize pandemic response and all rabies prevention activities are halted or minimized. While the pandemic is reshaping the population demographics in the small riverside populations in Amazonia, the public health system was forced to redesigning strategies to outreach affected populations and mobilize critical patients, and start planning an eventual national immunization campaign, when a COVID-19 vaccine became available, creating a unique opportunity for sustained outreach for Amazon Basin populations without precedent. The scenario during pandemic is examined for Amazonia updating changes for VBR risk and an integrative interventions for outreach the include rabies prevention is proposed for the emerging scenarios, when a major effort occurs to deliver a COVID-19 vaccine in Amazonia the middle of year 2021 as is being scheduled.

Name: Nathalie Mendes Estima

OP07

Email: nathalie.estima@saude.gov.br

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Human rabies prevention: epidemiological situation of post-exposure prophylaxis assistances in Brazil, 2014-2019

Authors: Nathalie Mendes Estima, Marcelo Yoshito Wada, Silene Manrique Rocha, José Manoel Marques, Deborah Sicchierolli Moraes, Dalva Maria de Assis

Affiliations: Ministério da Saúde (MS), Secretaria de Vigilância em Saúde (SVS), Departamento de Saúde Ambiental, do Trabalhador e das Emergências em Saúde Pública (DSASTE), Coordenação-Geral de Emergências em Saúde Pública (CGEMSP), Programa de Treinamento em Epidemiologia Aplicada aos Serviços do Sistema Único de Saúde - Nível Avançado (EpiSUS-Avançado)

Abstract: Introduction: The main form of prevention of human rabies is anti-rabies prophylaxis, using vaccine and serum. The processing, analysis and dissemination of data referring to post-exposure human anti-rabies prophylaxis allow monitoring, evaluation and improvement of health surveillance actions. This study aimed to describe the epidemiological profile of post-exposure human anti-rabies prophylaxis services in Brazil, between 2014 and 2019. Method: Retrospective descriptive study referring to post-exposure human anti-rabies prophylaxis services notified in the Notifiable Diseases Information System in Brazil, from 2014 to 2019. Data analysis was performed using descriptive statistical measures. For the purposes of data processing and analysis, the Excel 2013® and QGIS 2.14.1 'Essen' programs were used. Results: 4,033,098 post-exposure human anti-rabies prophylaxis visits were reported, with an average of 672,181 notifications per year, and an increase of 11.0% in the period studied, 2014 and 2019. The states of Roraima northern region and Sergipe, northeast region had incidence rates per 1,000/inhabitants equal to 38.5 and 11.2, respectively. Males represented 52.4%, under 19 years old (35.3%), urban residents (88.1%), assaulted by dogs (81.5%) and wild animals (1.4%), bite means (81.9%), on hands and feet (35.3 %) and whose treatment indicated was animal observation + vaccine (44.2%).Conclusion: The epidemiological profile described, corroborates the profile expected for South America, in countries with rabies under control. Due to the high lethality, the search for anti-rabies prophylaxis is necessary, even in mild aggressions, especially those caused by wild animals. However small the aggression, people should be guided to seek prophylaxis, avoiding sporadic cases and outbreaks of human rabies caused by bats. It is important that health authorities continue to focus efforts on prevention, control and elimination of rabies in order to achieve the World Health Organization's 2030 goal: no deaths from human rabies.

Introdução: A principal forma de prevenção da raiva humana é a profilaxia antirrábica, com utilização de vacina e soro. O processamento, análise e divulgação dos dados referentes aos atendimentos de profilaxia antirrábica humana pós-exposição possibilitam monitoramento, avaliação e aprimoramento das ações de vigilância em saúde. Este estudo objetivou descrever o perfil epidemiológico dos atendimentos de profilaxia antirrábica humana pós-exposição no Brasil, entre 2014 e 2019. Método: Estudo descritivo retrospectivo referente aos atendimentos de profilaxia antirrábica humana pós-exposição notificados no Sistema de Informação de Agravos de Notificação no Brasil, de 2014 a 2019. Foi realizada análises de dados utilizando medidas de estatística descritiva. Para fins de processamento e análise de dados utilizou-se os programas Excel 2013® e QGIS 2.14.1 'Essen'. Resultados: Foram notificados 4.033.098 atendimentos de profilaxia antirrábica humana pós-exposição, com média de 672.181 notificações ao ano, e aumento de 11,0% no período estudado. Os estados de Roraima e Sergipe apresentaram taxas de incidências por 1.000/habitantes iguais a 38,5 e 11,2 respectivamente. O sexo masculino representou 52,4%, em menores de 19 anos (35,3%), residentes urbanos (88,1%), agredidos por cães (81,5%) e animais silvestres (1,4%), por meio de mordedura (81,9%), em mãos e pés (35,3%) e cujo tratamento indicado foi observação+vacina (44,2%). Conclusão: O perfil epidemiológico descrito, corrobora com o

esperado para a América do Sul, em países com a raiva sob controle. Em virtude da alta letalidade, a busca da profilaxia antirrábica é necessária, mesmo em agressões leves, principalmente as provocadas por animais silvestres. Por menor que seja a agressão, as pessoas devem ser orientadas a buscar a profilaxia, evitando casos e surtos esporádicos de raiva humana provocados por morcegos. É importante que autoridades de saúde permaneçam concentrando esforços para prevenção, controle e eliminação da raiva, afim de alcançar o objetivo da Organização Mundial de Saúde para 2030: nenhuma morte por raiva humana.

Name: Ryan Wallace

OP08

Email: euk5@cdc.gov

Session: Keynote Address: Progress Towards the Goal of Zero by 2030

Country: United States

Title: Recognizing milestones on the arduous journey to rabies freedom

Authors: Ryan M Wallace

Affiliations: Centers for Disease Control and Prevention, Poxvirus and Rabies Branch, Atlanta, Georgia, USA

Abstract: Until recently, international organizations recognized only one rabies status: absolute freedom from the rabies virus at the national level. This status is virtually impossible in countries with non-terrestrial rabies virus variants, and does not recognize the tremendous achievement of eliminating the canine rabies virus variant which is responsible for over 98% of all human and livestock deaths, globally. Achieving rabies-free status can take decades and the final recognition of rabies freedom is often met with lackluster acknowledgement. In 2015 the WHO, OIE, and FAO declared the goal "Elimination of Dog-Mediated Human Rabies Deaths by 2030". To advance this goal, international agencies have created new recognition, to promote milestone achievements. In 2017, the World Health Organization (WHO) updated the Rabies Technical Review Series to recognize two new rabies statuses: Validation and Verification. Validation reflects that a country has eliminated dog-mediated human rabies deaths, but the virus may still be present in certain reservoir species. Following Validation, countries can now achieve recognition for freedom from a specified reservoir animal species; this status is referred to as Verification. Guidelines for determining if these statuses have been met are available from the WHO. In 2019 the World Organisation for Animal Health (OIE) unveiled the "OIE endorsed official control programme for dog-mediated rabies", which allows for OIE member countries to receive endorsement once certain criteria for dog vaccination and rabies surveillance have been met. Recognition of true Rabies Freedom remains a self-declared status administered by OIE. These new statuses offer countries progressing towards rabies elimination an opportunity for recognition of milestone achievements. However, the global community must understand the meaning of these new statuses and the process by which they are bestowed so that rabies risks are correctly interpreted and progress towards the elimination of dog-mediated human rabies deaths by 2030 is appropriately recognized.

Name: Emily Mudoga

OP09

Email: EmilyMudoga@worldanimalprotection.org

Session: Progress Towards the Goal of Zero by 2030

Country: Kenya

Title: Kenyan National Rabies Elimination, Makueni County Pilot Project

Authors: Emily K Mudoga, Melania Gamboa, Jenny Roy

Affiliations: World Animal Protection, London, United Kingdom

Abstract: Background: Animal rabies was first reported in Kenya in 1912. Although mass dog vaccination campaigns in the 1950's resulted in near elimination of the disease by the early 1980', a resurgence led to an estimated 2,000 human deaths annually which highlighted the need for the development of a national rabies elimination plan. The achievement of rabies elimination in many countries informed the Kenyan Government's development of a Strategic Plan for the Elimination of Human Rabies in Kenya 2014 – 2030. Some plan approaches are: elimination of rabies in dogs; prevention in humans; strengthening outbreak surveillance and response; advocacy, communication, social mobilization; enhancing partnerships and coordination. Objective: Showcase lessons learned from Integrated Humane Dog Population Management (HDPM) actions within a One Health Rabies Elimination Program. Method: The County Government of Makueni, in partnership with World Animal Protection, and in collaboration with Washington State University, Kenyan National Government/Zoonotic Disease Unit, Kenya Medical Research Institutes CDC unit and World Organisation for Animal Health (OIE) undertook a 5 year pilot integrating MDV, dog bite management, Education and responsible dog ownership as facets of HDPM. Results: County government and community successfully bought into the project. Comprehensive background information on dog ecology, community KAPs on dogs resulted in effective planning. Training of teachers to educate school children successfully disseminated information on rabies control, compliance, and dog welfare to the wider community. Improved coordination of the county one health team meant better surveillance, MDV and treatment. Conclusion: Overall, the Makueni Rabies Elimination Pilot Project met its objectives: creating rabies awareness, training change agents and delivering MDV campaigns in three consecutive years (2016 to 2018). Success of the project was also attributed to close collaboration between national government and county one health departments, donors, non-state actors and the local community.

Name: Sarah Bonaparte

OP10

Email: sarahcbonaparte@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: United States

Title: Popping the rabies bubble: examination of economic, environmental, political, social, and health indictors' associations with the global canine rabies burden and projecting 2030 trends in disease burden

Authors: Sarah Bonaparte[1], Janae Moodie, Eduardo Undurraga, Yasmeen Ross, Gabriella Veytsel, Ryan M Wallace[1]

Affiliations: [1]Centers for Disease Control and Prevention, Poxvirus and Rabies Branch, Atlanta, Georgia, USA

Abstract: Rabies remains endemic in many countries throughout the world and The WHO has set an international goal of eliminating dog-mediated human rabies deaths by 2030. In this study, we modelled economic, environmental, political, social, and health determinants to identify standard global indicators that are associated with a country's rabies burden. Linear regression was used to assess bivariate and multivariate associations between 22 determinants and country rabies burden, defined as the equally weighted sum of proportions of a country's dog vaccination coverage, availability of post-exposure prophylaxis, and human rabies deaths per capita. Backwards elimination was used in multivariate analysis to create a final adjusted model of the most predictive determinants of rabies burden. These (Sociocultural, Technical, Organizational, Political, and Resource) determinants were used to create a 'STOP-R Index' from the resulting final adjusted model equation, which was calculated on the country and UN-designated sub-regional level. Sub-regional STOP-R Indices were projected to the year 2030 based on trends in the determinants used to comprise this novel index and the final adjusted model equation and correlating projected 2030 human death rates from rabies were calculated. Five determinants remained significant in the final multivariate model, showing that a higher rabies burden was associated with countries that have higher rates of urbanization, higher rates of infant mortality, lesser access to electricity, lesser political stability, and higher rates of natural hazards. Comparison of the current sub-regional STOP-R Indices with projected 2030 STOP-R indices indicated that rabies burden will decrease by 2030 in 13 of the 14 sub-regions. Results from this analysis suggest that factors external to rabies programs are associated with progress towards rabies elimination. Utilizing an index comprised of widely recognized indicators allows for annual re-evaluation of country-specific estimated rabies burden.

Name: Mamoona Arshad

OP11

Email: mamoona.arshadnagra@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Pakistan

Title: Impact of awareness activities and online courses of rabies among students in primary schools of Pakistan

Authors: Mamoona Arshad, Saima Arif, Abdul Haseeb, Muhammad Faiq, Wafa Yousaf, Waqas Ahmad

Affiliations: Save Pakistan from Rabies (SPR), University of Veterinary and Animal Sciences-Lahore, College of Veterinary and Animal Sciences, Jhang, Pakistan

Abstract: Rabies is one of the most ignored tropical neglected diseases which affect the greater part of poor people and children in Asia and Africa. Annually, more than 59,000 deaths occur mainly in Asia and Africa. Rabies is a highly underestimated disease in Pakistan and therefore, thousands of dog-bite cases occur every year especially in teenagers and children. Save Pakistan from Rabies (SPR) is a volunteer society equipped with trained students who are doing various activities like anti-rabies awareness programs using the available education material from Global Alliance for Rabies Control in order to promote responsible pet ownership. Our team visits primary and secondary schools as well as colleges in the premises of our university campus to educate and train those students with the help of practical activities and games. We designed a simple multiple-choice question proforma to evaluate the knowledge and mentalities towards rabies and dogs among school teachers and students before and after the delivery of lessons and awareness sessions. We noticed that there was a huge difference in the results and the participants began to learn basic prevention techniques and tips to behave with the unowned dogs. They were also more excited to get the online certification of the courses and educate other people in their communities. We are also taking volunteers on board from different other colleges and universities to work with us in this mindfulness program and hold hands to fight against rabies in Pakistan.

Name: Fernanda Melo Jucá

OP12

Email: fernandavet@edu.unifor.br

Session: Progress Towards the Goal of Zero by 2030

Country: Brazil

Title: The control of rabies through health education on the prevention of aggressions by dogs and cats, Ceará, Brazil

Authors: Fernanda Melo Jucá, Davi Renan Moreira Carvalho Melo, Camila Nascimento Dias, Isabelle Barroso Bezerra, Bianca Ferreira Gomes da Silva, Vanessa Lopes da Cunha, Naylê Francelino Holanda Duarte

Affiliations: Associação de Educação Ambiental Humanitária de Bem-Estar Animal, Guarda Responsável e Animais Silvestres – BEAGUARAS, Fortaleza, Ceará, Brasil

Abstract: The aggressions committed by mammals, either wild or domesticated, are a problem in the fields of public health because of the risks in the matters of zoonosis contagion, especially regarding rabies. In Brazil, from 2009 to 2018, registers point the occurrence of 38 cases of rabies, being 36.84% of the results reportedly caused by cats and dogs. In the state of Ceará, data collected from 2013 to 2016 points that dogs were responsible for 89.555 (67,7%) out of the 132.283 incidents of hostility listed by the System of Information and Notification of Grievances - SINAN. In those incidents, kids and teenagers represent the majority of the victims; the justification to this fact comes from the combination between the proximity to animals and lack of knowledge about ideal behaviorism that juvenile individuals present. Therefore, this work intends to explain the need for educational measures on the prevention of aggression by domestic animals and rabies in the state of Ceará. Informative campaigns displayed educative contents in open parks, zoos, and schools in Fortaleza, from May 2018, by using interactive methodologies, such as theatrical plays with costumes and representation, children's videos, and drawing workshops, with an emphasis on animal welfare and responsible guarding, teaching youngsters to understand and respect the natural behavior of animals. The events also stressed the importance of annual vaccination against rabies, identification of visible symptoms of the illness in cats and dogs, and the recommended procedure in case of aggression. Concerning the commitment of the population to the welfare of animals, the expectations are that the society must improve its health care to avoid exposure to the rabies' virus (caused by the attacks from dogs and cats) and allow the facilitated medical care in the cases of contamination. Therefore, this study emphasizes that medical education, combined with other actions, presents a vital role in the promotion of the population's health. In addition, recognizing that children are more vulnerable to diseases and empowering them to become educational multipliers will minimize the risk of aggression and the transmission of rabies by domestic and wild mammals in Ceará.

As agressões por mamíferos, domésticos ou selvagens, é constituído um problema de saúde pública em decorrência do risco de transmissão de zoonoses, em especial a raiva. No Brasil, de 2009 a 2018, foram registrados 38 casos de raiva humana, 36,84% foram transmitidos por cães e gatos. No Ceará, das 132.283 agressões registradas no Sistema de Informação e Notificação de Agravos - SINAN, 2013 a 2016, os cães foram responsáveis por 89.555 (67,7%) dos casos. Sendo a maioria das vítimas, crianças e adolescentes, fato justificável devido à proximidade destes com os animais e por falta de conhecimento básico de como se comportar perante os mesmos. Portanto, este trabalho objetiva descrever as ações educativas, sobre a prevenção de agressões por animais domésticos e raiva no Ceará. Foram realizadas ações educativas em parques abertos, zoológicos e escolas de Fortaleza, a partir de maio de 2018, através de metodologias interativas, como: teatro dos bichanos, vídeos infantis e oficina de desenhos, com ênfase no bem-estar animal e guarda responsável. Ensinando-as a compreender e respeitar o comportamento dos animais. Foi ressaltado a importância da vacinação antirrábica de cães e gatos anualmente, sinais sugestivos de raiva nos cães e gatos, procedimento em caso de agressões. Espera-se uma mudança na postura da população em relação ao compromisso com o bem-estar de seus animais, o cuidado para evitar exposição ao vírus da raiva, em consequência do ataque por cães e gatos e, atitude de buscar atendimento em tempo hábil e oportuno. Diante disso, ressaltamos que a educação em saúde, somada com outras

ações são de grande importância para a promoção da saúde da população. Tendo em vista que as crianças são mais vulneráveis às doenças. Capacitando-as para tornarem-se multiplicadores e minimizar o risco de agressões e a transmissão da raiva por mamíferos domésticos e silvestre no Ceará.

Name: Manar Khalifa

OP13

Email: m.khalifa@lancaster.ac.uk

Session: Vaccines & Antivirals

Country: United Kingdom

Title: Structural insights into the complex entry mechanics of the rabies virus

Authors: Manar E Khalifa, Muhammad Munir

Affiliations: Lancaster University, Faculty of Health and Medicine, Division of Biomedical and Life Sciences, Lancaster, UK

Abstract: Rabies sets a typical model for zoonotic viral diseases spill-over from multiple animal hosts to human and pose significant public health burden. Understanding the success of rabies virus (RV) in switching hosts require critical analysis of viral evolution and hosts interactions. To understand the global colonization of RV, we constructed phylogenetic trees using 283 sequences of glycoproteins (G) of RV using Bayesian, maximum likelihood and neighbor joining algorithms. Our analysis revealed a host-specific speciation and distribution of RV across the globe. In conjunction, we investigated the interaction of RV with pre-known host receptors; integrin beta 1 (ITGB1), metabotropic glutamate receptor 2 (mGluR2), nicotinic acetylcholine receptor (nAChR) and neural cell adhesion molecule (NCAM). We focused on elucidating the structural analysis and sequence alignment of those receptors among different RV-susceptible species including human, dog and black fruit bats. One of the major findings in our study was the absence of integrin plexin domain in ITGB1 of black fruit bat. Interestingly, sequence alignment of ITGB1, mGluR2 and NCAM showed different residues within protein domains among different species. However, the nAChR interaction site with RV G protein was conserved among different species. Subsequent studying of the interaction dynamics between RV G protein and the RV receptors, required the construction of 3D structures for RV receptors and G protein of Egyptian strain using homology modelling. Implying protein-protein docking between RV G protein and receptors using GRAMMX and PDBsum servers, highlighted the variability of interacting residues between different species of RV receptors. Overall, this study expand the diversity of RV G protein and plausible in silico interaction models. This would allow the foundation of future in-vitro host viral interaction studies to underpin the importance of receptor-mediated spill over events in RV infections.

Name: Matthias Schnell

OP14

Email: Matthias.schnell@jefferson.edu

Session: Vaccines & Antivirals

Country: United States

Title: Lyssavirus vaccine with a novel chimeric glycoprotein protects across phylogroups

Authors: Christine R. Fisher[1], David Lowe[2], Todd G. Smith[2], Yong Yang[2], Christina L. Hutson[2], Christoph Wirblich[1], Gino Cingolani[3], Matthias J. Schnell[1,4]

Affiliations: [1]Department of Microbiology and Immunology, Sidney Kimmel Medical College at Thomas Jefferson University, Philadelphia, Pennsylvania 19107, USA; [2]National Center for Emerging and Zoonotic Infectious Diseases, Division of High-Consequence Pathogens and Pathology, Poxvirus and Rabies Branch, Centers for Disease Control and Prevention (CDC), Atlanta, Georgia 30333, USA; [3]Department of Biochemistry and Molecular Biology, Thomas Jefferson University, Philadelphia, Pennsylvania 19107, USA; [4]Jefferson Vaccine Center, Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, Pennsylvania 19107, USA

Abstract: Rabies is nearly 100% lethal in the absence of treatment, killing an estimated 59,000 people annually. When vaccines are properly administered, they are highly efficacious, making them one of the most economically high-impact interventions among infectious diseases. Fifteen rabies-related viruses (lyssaviruses) are similarly lethal, but some are divergent enough to evade protection from current vaccines and biologics, which are based only on the classical rabies virus (RABV). Here we present the development and characterization of LyssaVax, a vaccine featuring a structurally-designed, functional chimeric glycoprotein (G) containing immunologically important domains from both RABV G and the highly divergent Mokola virus (MOKV) G. LyssaVax elicited high titers of antibodies specific to both RABV and MOKV Gs in mice. Immune sera also neutralized a range of wildtype lyssaviruses across the major phylogroups. LyssaVax-immunized mice were protected against challenge with recombinant RABV and MOVK. Altogether, we put forth LyssaVax as a pan-lyssavirus vaccine candidate.

Name: Jesse Bonwitt

OP15

Email: lyn5@cdc.gov

Session: Vaccines & Antivirals

Country: United States

Title: Country classification system to inform rabies vaccine recommendations for international travelers and dog importation regulations

Authors: Jesse Bonwitt, Ryan M Wallace, David E Lowe, Sarah Bonaparte, Jesse Blanton

Affiliations: Centers for Disease Control and Prevention, Poxvirus and Rabies Branch, Atlanta, Georgia, USA

Abstract: In the course of a year, an estimated 93 million Americans take international trips and more than one million dogs are imported into the United States. Such considerable human and animal movements necessitate evidence-based, country-specific data to inform risk assessments for pre- (PrEP) and post-exposure rabies prophylaxis (PEP), and determine dog importation regulations. To this end, the US CDC conducts an annual review of publicly available data, publications, and information provided by national and international rabies experts. PrEP and PEP recommendations for international travelers are based on a weighted point system that considers the presence of canine and wildlife (terrestrial and bat) lyssaviruses, and accessibility to high-quality PEP (rabies immunoglobulin and vaccine). Final recommendations are given as high risk, medium risk, and low risk. Risk of importing canine rabies variant is determined based on a weighted point system that considers presence of canine rabies, and existence of a robust surveillance and canine rabies control measures. Results for 240 countries, territories, and dependencies (CTD) are available at https://www.cdc.gov/rabies/resources/countries-risk.html. One hundred and twenty-three (51%) CTDs were classified as canine rabies free, 69 (29%) as rabies virus free, and 31 (13%) as lyssavirus free. RIG availability was assessed as available within 48 hours in 171 (82%) CTDs, and vaccine availability was assessed as available within 48 hours for 229 (95%) CTDs. Fifty-two (22%) CDTs were assessed to have robust rabies surveillance, with 106 (44%) having an unknown status. Forty-six (19%) countries were assessed to have adequate control measures and canine rabies limited to focal areas, with 106 (44%) countries with unknown status. Publication of international rabies status provides open-access information to explain CDC policy when conducting public health risk assessments and mitigate the risk of introducing canine rabies variant into the United States.

Name: Paola Puebla-Rodríguez

OP17

Email: pueblapao@gmail.com

Session: Wildlife Rabies & Control

Country: Mexico

Title: Characterization of two rabies virus variants in white-nosed coatis (Nasua narica) from Yucatan and Quintana Roo (2007-2020): Are coatis emergent reservoirs of rabies virus in Mexico?

Authors: Paola Puebla-Rodríguez[1], Cenia Almazán-Marín, Mauricio Gómez-Sierra, Susana Chávez-López, Albert Sandoval-Borja, David Martínez-Solís, Beatriz Escamilla-Ríos, Isaias Sauri-González, Adriana Beatriz Alonzo-Góngora, Susana Mendoza-Elvira, Irma López-Martínez, Nidia Aréchiga-Ceballos

Affiliations: [1]Rabies Laboratory, Department of Virology, Institute of Diagnostics and Epidemiological Reference (InDRE), Mexico City, Mexico

Abstract: In 2019, Mexico was recognized by WHO /PAHO as a human rabies -free country transmitted by dogs. Rabies remains as public health problem due to its great mammal biodiversity. Nowadays, the challenge is to control rabies virus (RV) transmitted by wildlife to humans and domestic animals. The white-nosed coati (Nasua narica) is a carnivore that belongs to the Procyonidae family. Rabies cases in this species have been poorly investigated. Since 2007, there have been seven reported cases of rabies occurred in coatis in the states of Yucatan (YUC) and Quintana Roo (ROO). The first molecular characterization of rabies in coatis was recorded in 2008, after an outbreak in ROO in which a new rabies virus variant (RVV) called "V9-Coati"related to the insectivorous bat Tadarida brasiliensis was described. Objective: The aim of this study was to characterize antigenically and genetically the registered cases of rabies in coatis in YUC and ROO to determine if these cases correspond to a single or multiple RVV. Materials and methods: A total of seven samples of coatis (2007-2020) from YUC (n=4) and ROO (n=3) were antigenically characterized with the Monoclonal Antibodies panels (CDC). The genomic characterization of the coati RV samples was performed by amplifying a fragment of nucleoprotein gene (≈ 900bp) using RT-PCR and sequenced by the Sanger method. Phylogenetic reconstruction was based on a dataset of RV partial nucleoprotein sequences belonging to RVV of the Americas. The Bayesian analysis was carried out using the Beast 10 software by the evolutionary model Kimura 2P+G. Results: The four samples from YUC were RVV atypical and were phylogenetically clustered in the lineage that has been previously designated as "Yucatan Silvatyc" associated with the terrestrial RV cycle. This RVV atypical have been responsible for the last rabies cases in domestic animals in YUC, in which skunks seem to be the active transmitters. However, the natural reservoir of this RVV remains undetermined. The three samples from ROO were RVV9 and were phylogenetic clustered in the lineage "V9-coati" pertaining to aerial cycle. We found out that this coati variant was present in ROO at least one year before it was described, since the virus included in this analysis came from 2007. Conclusion: In YUC and ROO, two independent RVV were detected in coatis. There is no evidence of overlapping between them; each one seems to have a restricted distribution. Due to the presence of an outbreak in ROO, one year before being described in 2008, RVV9 of coati we hypothesized this is a host switching from insectivorous bats to coatis. Nevertheless, the origin of this virus has not yet been determined since the natural distribution of T. brasiliensis in Mexico does not include these states, therefore we consider bats in the Molossidae family might be the most probable origin. So far, coatis have not been considered important RV reservoirs; our results suggest that a new lineage has been established in coatis of ROO, therefore surveillance in coatis should be relevant in the control of rabies in Mexico.

Name: Richard Chipman

OP18

Email: richard.b.chipman@usda.gov

Session: Keynote Address: Wildlife Rabies & Control

Country: United States

Title: Trials, tribulations and triumphs of managing raccoon rabies in North America

Authors: Richard B Chipman[1], Kathleen M Nelson[1], Jordona D. Kirby[1], Amy T Gilbert[2], Ad Vos[3], Charles E Rupprecht[4]

Affiliations: [1]United States Department of Agriculture (USDA), Wildlife Services (WS), National Rabies Management Program, Concord, New Hampshire, USA; [2]USDA, WS, National Wildlife Research Center, Fort Collins, Colorado, USA; [3]Ceva Innovation Center GmbH, Dessau-Rosslau, Germany; [4]LYSSA LLC, Atlanta, Georgia, USA

Abstract: Oral rabies vaccination (ORV) has revolutionized wildlife rabies management. The successful management and near elimination of rabies virus from wild red fox (Vulpes vulpes) populations in European Union countries underscores the effectiveness of coordinated ORV programs strategically distributed at the landscape scale. However, other competent reservoirs including the raccoon dog (Nyctereutes procyonoides), golden jackal (Canis aureus) and raccoon (Procyon lotor) are expanding in geographic range, potentially jeopardizing progress in wildlife rabies control. In some countries, meeting the 2030 goal of elimination of canine mediated human rabies may require ORV programs targeting free roaming dogs to supplement sustained mass parenteral vaccination campaigns. In North America, ORV programs to stop the spread of and eventually eliminate the raccoon rabies virus variant (RRVV) in wild carnivore populations have proven particularly challenging but have also been integral to realizing objectives at the local and regional level. Raccoons are ecological generalists who can thrive at high densities in urban habitats, where delivery of oral rabies vaccine is challenging. In the US, more than 8 million doses of oral rabies vaccine are distributed annually targeting raccoons across broad landscapes in 17 states to prevent RRVV spread and circulation. The USDA National Rabies Management Program (NRMP) model for wildlife rabies control focuses on seven key activities: program coordination; communication; enhanced rabies surveillance; management with ORV; program monitoring; applied research and emergency contingency actions as required. This model relies heavily on communication and cooperation at the local, state and Federal levels and emphasizes an adaptive management approach with strategic and complimentary applied research. Future success demands continued innovation and integration of coordinated wildlife management programs and research to enhance efficiency and effectiveness in controlling RRVV at the landscape scale. This paper discusses adaptive management strategies and lessons learned that could serve as a model for wildlife rabies management in similarly difficult species.

Name: Shylo Johnson

OP19

Email: shylo.r.johnson@usda.gov

Session: Wildlife Rabies & Control

Country: United States

Title: Home range behavior of Virginia opossums (Didelphis virginianus) in relation to oral rabies vaccination targeting raccoons in suburban and urban habitats of northern Vermont

Authors: Shylo R Johnson[1], Kathleen M Nelson[2], Fred E Pogmore[3], Richard B Chipman[2], Amy T Gilbert[1]

Affiliations: [1]United States Department of Agriculture (USDA), Wildlife Services (WS), National Wildlife Research Center, Fort Collins, Colorado, USA; [2]USDA, WS, National Rabies Management Program, Concord, New Hampshire, USA; [3]USDA, WS, New Hampshire/Vermont Program, Berlin, Vermont, USA

Abstract: The Virginia opossum (Didelphis virginianus) is the only native marsupial in the United States. While taxonomically unique, opossums show similarities in their diet and habitat preferences when compared to meso-carnivores such as raccoons (Procyon lotor) and striped skunks (Mephitis mephitis). Meso-carnivores are the focus of rabies management using oral rabies vaccination (ORV), whereas opossums are considered a non-target species. As non-target competitor for baits, opossums may be impacting the success of ORV. Using GPS/VHF radio collars, we tracked opossums in suburban and urban habitats of northern Vermont around the time of ORV baiting (August) to document their home range movements. We estimated home ranges during the month of August around the time of ORV for 18 opossums (17 F, 1 M) collared in 2018 and for 22 opossums (19 F, 3 M) collared in 2019. Female core and overall home ranges were 9.2 ha (±1.1 ha SE) and 46.9 ha (±5.5 ha SE), respectively, while male core and overall home ranges were 10.2 ha (±0.5 ha SE) and 95.5 ha (±23.2 ha SE), respectively. Females from high development areas had smaller core and overall home ranges (5.6 ha ±0.9 ha SE and 27.1 ha ±3.8 ha SE, respectively) than females from low development areas (12.7 ha ±1.7 ha SE and 66.6 ha ±8.1 ha SE, respectively). These home ranges are generally smaller than, but overlap considerably with, previously collared meso-carnivores in the study area suggesting that opossums may be a key bait competitor in developed landscapes of northern Vermont.

Name: Nidia Arechiga-Ceballos

OP20

Email: nhyxbiogirl@gmail.com

Session: Wildlife Rabies & Control

Country: Mexico

Title: Seroepidemiological analyses of rabies virus in white-nosed coatis (*Nasua narica*) and raccoons (*Procyon lotor*) in the ecoturistic park Museo La Venta in Villahermosa, Tabasco, Mexico and possible implications of virus dynamic in wildlife populations

Authors: Nidia Aréchiga-Ceballos, Emilio Rendón-Franco, Anahí García-Baltazar, Claudia I Muñoz-García, Claudia Villanueva-García, Lilia María Gama-Campillo, Gerardo Suzán, Alvaro Aguilar-Setién

Affiliations: Rabies Laboratory, Department of Virology, Institute of Diagnostics and Epidemiological Reference (InDRE), Mexico City, Mexico

Abstract: Mesocarnivores play a key role in the maintenance of rabies virus (RV) in the wild. Rabies virus-neutralizing antibodies are used to detect the response to vaccination in humans and animals, but has also been detected in populations of several mammal species without vaccination suggesting non-fatal exposure. Mexico is free of the raccoon (Procyon lotor) rabies virus variant (RVV) that circulates in North America and reports in the country are scarce with only one laboratory confirmed in 1991 in Chiapas State. By contrast, a rabies outbreak in white-nosed coatis (Nasua narica) took place in an ecological park in 2008 in Quintana Roo (Mexico) where a new RVV related to Tadarida brasiliensis was described. In this study, we made a four year serological survey in order to follow up the dynamics of rabies neutralizing antibodies in N. narica and P. lotor without vaccination history in the "Parque Museo La Venta", located in Villahermosa City, in the Western Central part of Tabasco State, Mexico. A total of 74 raccoons and 239 coatis sera samples were collected from 2009 to 2012. The overall prevalence was 19.4% (CI 95% 15.3-24.1) and the median IU/ml was 0.81 (±0.13) for both species. Variations in the prevalence were detected, with two peaks in 2009 and 2011 and antibodies titers for each species ranged from 0.24 to 0.90 IU for coatis and from 0.12 to 5.70 IU for raccoons. The antibodies dynamic prevalence showed by these animals in both species could represent natural immunity to RV. Although further control and experimental studies are needed, this study suggests that procyonids may represent RV reservoirs in the Neotropics.

Name: Amy Gilbert

OP21

Email: amy.t.gilbert@usda.gov

Session: Wildlife Rabies & Control

Country: United States

Title: Simulating animal movement in human-developed landscapes to optimize vaccination strategies for raccoon rabies control

Authors: Katherine M McClure[1,2], Guillaume Bastille-Rousseau[1,3], Amy J Davis[1], Carolyn A Stengel[4], Kathleen M Nelson[5], Richard B Chipman[5], George Wittemyer[6], Zaid Abdo[2], Amy T Gilbert[1], Kim M Pepin[1]

Affiliations: [1]United States Department of Agriculture (USDA), Wildlife Services (WS), National Wildlife Research Center, Fort Collins, Colorado, USA; [2]Colorado State University (CSU), Department of Microbiology, Immunology, and Pathology, Fort Collins, Colorado, USA; [3]Southern Illinois University, Cooperative Wildlife Research Laboratory, Carbondale, Illinois, USA; [4]USDA, WS, New Hampshire/Vermont Program, Concord, New Hampshire, USA; [5]USDA, WS, National Rabies Management Program, Concord, New Hampshire, USA; [6]CSU, Fish, Wildlife, and Conservation Biology, Fort Collins, Colorado, USA

Abstract: Oral baiting is used to deliver vaccines to control and eliminate wildlife rabies virus in North America, with a key challenge being how to optimally distribute baits to maximize target wildlife encounter and uptake from the environment. Refinement of ORV control strategies to favor target population local habitat use should increase uptake, but impacts for rabies antibody seroconversion are incompletely understood, particularly for targets like raccoons (Procyon lotor). We explore the effect of simulated movement behavior and conspecific density on oral rabies vaccination (ORV) baiting effectiveness in the context of an urban-suburban ORV zone in greater Burlington, Vermont. We modeled individual- and population-level resource selection patterns estimated from radio-collared raccoons trapped in the ORV treatment area and examined how home range and habitat selection influence antibody seroprevalence under simulated baiting strategies, including habitat-based baiting, random baiting across habitats, to compare with the operational distribution of ORV baits in greater Burlington. A resource selection informed baiting design increased seroprevalence among raccoon populations displaying strong but not weak habitat selection. Predicted gains in seroprevalence were highest when baits were applied across the full landscape compared to bait delivery along roads. Predicted seroprevalence decreased 31% on average when bait density was halved, suggesting substantial gains in seroprevalence at higher bait densities in areas with moderate to high target meso-carnivore densities (5-30 animals/km^2), and a non-linear relationship between bait density and seroprevalence. We report that the effectiveness of habitat-based baiting targeting urban and suburban raccoons in northern Vermont is influenced by both resource selection strength and landscape context. Our results suggest that the benefits of RSF-based baiting for raccoon rabies control in urban and suburban areas may depend on the interaction of a host's habitat selection strength and the landscape composition and structure.

Name: Enio Mori

OP22

Email: enio@usp.br

Session: Wildlife Rabies & Control

Country: Brazil

Title: Rabies in free-ranging capybaras (Hydrochoerus hydrochaeris) on Anchieta Island, Ubatuba, Brazil

Authors: Enio Mori, Maria Eduarda Rodrigues Chierato, Vitoria Bueno Vilela Silveira, Debora Fernanda Pedrozo Pavani, Tamires Santos de Arruda, Karen Miyuki Asano, Keila Iamamoto, Willian de Oliveira Fahl, Helena Beatriz de Carvalho Rutner Batista, Joana Pedro Gonçalves, Bianca Davico Canatto, Karin Correa Scheffer

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: The only rabid capybara case reported in Brazil was in 1980. It is well known that vampire bats (Desmodus rotundus) have an important role in rabies transmission between medium-sized terrestrial mammals such as capybaras. However, the case reported did not perform the variant characterization of the rabies virus (RABV). The present report registers the first RABV infection in free-ranging capybaras by using current laboratory diagnosis techniques and molecular characterization. Since December 2019, three capybaras (IP99/20; IP463/20; IP464/20) presented neurological signs and were later found dead at Anchieta Island. They were sent to the Pasteur Institute of Sao Paulo for rabies diagnosis and variant characterization. All three capybaras were positive by direct fluorescent antibody test, but only two were positive by rabies tissue culture infection test (RTCIT) and mouse inoculation test (MIT). Sample IP99/20 was negative by confirmatory tests (RTCIT and MIT) due to severe tissue autolysis. RT-PCR amplification followed by partial sequencing of the N gene was performed, and it confirmed a high degree of identity (close to 100%) among the capybaras samples and those of the vampire bat Desmodus rotundus strain. Viral RNA was also properly amplified by RT-qPCR designed to identify the variant compatible with the vampire bat Desmodus rotundus strain. Capybaras do not have a role in RABV transmission or maintenance, and they could behave as sentinels for rabies in endemic areas. The detection of rabies in capybaras showed exceptional spillover or dead-end hosts of RABV infection from a vampire bat reservoir, and it appears to be related to the incidence of rabies in D. rotundus.

Name: Maria Eduarda Rodrigues Chierato

OP23

Email: mchierato1@gmail.com

Session: Diagnostics

Country: Brazil

Title: Evaluation of RT-qPCR LN34 Pan-Lyssavirus assay for the detection of different genetic lineages of RABV using Brazilian samples: partial results

Authors: Maria Eduarda Rodrigues Chierato, Vitoria Bueno Vilela Silveira, Debora Fernanda Pedrozo Pavani, Keila Iamamoto, Karen Miyuki Asano, Willian de Oliveira Fahl, Helena Beatriz de Carvalho Ruthner Batista, Karin Correa Scheffer, Enio Mori

Affiliations: University of São Paulo, Faculty of Veterinary Medicine and Animal Science, São Paulo, Brazil

Abstract: The direct fluorescent antibody test (dFAT) is considered the gold standard for rabies diagnosis by WHO and OIE due to its high sensitivity and specificity. However, it may have varying results because the virus does not infect CNS structures uniformly. Furthermore, the test accuracy depends on the appropriate material (fluorescence microscope, high-quality anti-rabies conjugate), skilled technicians, low viral title and sample conservation. The RT-qPCR LN34 assay is a combination of degenerate primers and probes and a promising alternative as a confirmatory test due to the facility of detecting the diversity of RABV variants or genetic lineages and different Lyssavirus species. This assay amplifies and detects the initial region of the 3' portion of the genome, considered the most conserved among the Lyssavirus species, compound by the leader region and part of the nucleoprotein gene. This study aims to implement an assay that is highly sensitive and specific and shows robustness, quickness and ease of manipulation as a confirmatory test for dFAT. To date, 107 RABV samples from different RABV lineages have been tested. Most of the samples tested (87.8%), including those with genetic lineages compatible with domestic dogs and hematophagous bats, were detected by the LN34 assay. Only 13 samples from insectivore bats compatible with lineages Histiotus spp. (n=4), Myotis spp. (n=2), Eptesicus spp. (n=3), Nyctinomops spp. (n=1) and Lasiurus spp. (n=2) and from marmosets compatible with lineage Callithrix jacchus (n=1) were negative. It may be inferred that some RABV lineages can present high molecular variability that hampers detection using the RT-qPCR LN34 assay. Further study will be needed, such as nucleotide sequencing of the samples, to demonstrate the molecular diversity in silico.

Name: Amy Gilbert

OP24

Email: amy.t.gilbert@usda.gov

Session: Wildlife Rabies & Control

Country: United States

Title: Update on the blue ribbon panel on serology in support of oral vaccination: progress of the US national subcommittee

Authors: Amy T Gilbert[1], Kathleen M Nelson[2], Richard B Chipman[2]

Affiliations: [1]United States Department of Agriculture (USDA), Wildlife Services (WS), National Wildlife Research Center, Fort Collins, Colorado, USA; [2]USDA, WS, National Rabies Management Program, Concord, New Hampshire, USA

Abstract: [*This was an extremely last minute and invited replacement for the previous OP24 so no abstract was required/submitted.*]

Name: Débora Fernanda Pedrozo Pavani

OP25

Email: deborapedrozo.vet@gmail.com

Session: Diagnostics

Country: Brazil

Title: Development of RT-qPCR for characterization of different genetic lineages of the rabies virus

Authors: Débora Fernanda Pedrozo Pavani, Maria Eduarda Rodrigues Chierato, Keila Iamamoto, Karen Miyuki Asano, Willian de Oliveira Fahl, Helena Beatriz de Carvalho Ruthner Batista, Enio Mori, Karin Correa Scheffer Ferreira

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: Studies for the detection and differentiation of lyssavirus species by RT-qPCR have been done world widely. In Brazil, there is just Rabies lyssavirus (RABV) and genetic lineages (GL) are related to the main reservoirs: canids (wild and domestic), bats (of different eating habits) and marmosets (Callithrix jacchus) with approximately 12 distinct genetic lineages. The aim of this work was to develop RT-qPCR assays to characterize samples of domestic dogs from Bolivia (GL_V1) and C. jacchus (GL_Cj). From sequences of different RABV genetic lineages obtained from Genbank, primers and probes were designed in silico specifically for both strains: RABV1 (for GL_V1) and RABV_Cj (for GL_Cj). For the tests, were used RABV1 samples compatible with GL_V1 (n = 6); wild canids GL_V2 (n = 4); hematophagous bats GL_V3 (n = 5); insectivorous bats (n = 14) and GL_Cj (n = 10). All samples of GL_V1 were positive, while the others were negative. The RABV_Cj assay were also tested with samples of genetic lineages compatible with GL_Cj (n = 14); insectivorous bats (n = 12); domestic canids (n = 10); wild canids (n = 5) and hematophagous bats (n = 9). 26 samples of GL_Cj and insectivorous bats were positive, while the others tested negative. Although more tests are needed, the results demonstrate that the RABV1 probe is specific for the detection of samples compatible with GL_V1 and can be used as a detection and characterization tool with RT-qPCR. The RABV_Cj probe detected samples of GL_Cj and GL from insectivorous bats, and did not detect the other lineages. Studies indicates that the GL_Cj and the GL of insectivorous bats in Brazil have a common ancestor, which may have led to the observation of such results. Although further studies are needed, the RT-qPCR assay with the RABV_Cj probe has potential to detect different lineages of insectivorous bats and the specific lineage of C. jacchus.

Name: Israel Nicolás Reyes

OP26

Email: israel.nicolas@senasica.gob.mx

Session: Diagnostics

Country: Mexico

Title: Aptitude assay for the diagnosis of rabies by immunofluorescence in the Americas

Authors: I Nicolás Reyes, R Estrada Rodríguez, MG Robles Pesina

Affiliations: National Service of Agrifood Health, Safety and Quality (SENASICA), National Center for Diagnostic Services in Animal Health (CENASA), Mexico City, Mexico

Abstract: Proficiency tests (AE) are an essential element in supporting quality assurance in diagnostic processes, these tests are a fundamental tool for the standardization and harmonization of rabies diagnosis, their purpose is to evaluate the performance of laboratories that carry out detection of the absence or presence of the rabies virus, as well as identify possible problems within the laboratories and initiate the corresponding actions to improve and strengthen the Quality Management Systems, thereby ensuring the issuance of results fast, reliable and truthful in support of the control and elimination of this disease in the countries of America. A conclusive diagnosis of rabies can only be achieved through appropriate laboratory tests, the fluorescent antibody test (DFA) for the detection of the virus antigen is still the gold standard, which is why the CENASA in the last two years developed According to the NMX-17043-IMNC-2010 standard, the aptitude tests between the laboratories of the national network and with 12 countries in North, Central and South America. Participants were able to detect the absence and presence of the rabies virus in known brain samples. The panel included lyophilized brain tissue samples of mouse origin, to evaluate the different stages in the detection process by the DFA test. The percentage of sensitivity, specificity and concordance are evaluated by means of sample comparison matrices using descriptive statistics. The AE performed and the analysis described in the final report, supports the standardization of DFA in laboratories, for strengthening epidemiological surveillance in the countries, since a good diagnosis in suspected animals is important to assess the distribution and prevalence of this disease.

Los ensayos de aptitud (EA) son un elemento esencial en el apoyo al aseguramiento de la calidad en los procesos de diagnóstico, estos ensayos son una herramienta fundamental para la estandarización y armonización del diagnóstico de rabia, su finalidad es evaluar el desempeño de los laboratorios que realizan detección de la ausencia o presencia del virus de la rabia, así como identificar las posibles problemáticas dentro de los laboratorios e iniciar las acciones correspondientes para la mejora y fortalecimiento de los Sistemas de Gestión de la Calidad, asegurando con ello la emisión de resultados rápidos, confiables y veraces en apoyo al control y eliminación de esta enfermedad en los países de América. Un diagnóstico de rabia concluyente solo se puede lograr mediante las pruebas de laboratorio adecuadas, la prueba de anticuerpos fluorescentes (DFA) para la detección del antígeno del virus sigue siendo el estándar de oro, es por ello que el CENASA en los dos últimos años desarrolló de acuerdo a la norma NMX-17043-IMNC-2010 los ensayos de aptitud entre los laboratorios de la red nacional y con 12 países de Norte, Centro y Sur América. Los participantes fueron capaces de detectar la ausencia y presencia del virus de la rabia en las muestras de encéfalo conocidas. El panel incluyó muestras de tejido encefálico liofilizadas de origen ratón, para evaluar las diferentes etapas en el proceso de detección por la prueba DFA. El porcentaje de sensibilidad, especificidad y concordancia, se evalúan mediante matrices de comparación de muestras mediante estadística descriptiva. Los EA realizados y el análisis descrito en informe final, apoya la estandarización de la DFA en los laboratorios, para el fortaleciendo de la vigilancia epidemiológica en los países, ya que un buen diagnóstico en los animales sospechosos es importante para evaluar la distribución y prevalencia de esta enfermedad.

Name: Luke Gamble

OP27

Email: luke@missionrabies.com

Session: Keynote Address: Canine Rabies & Control

Country: United Kingdom

Title: Mission Rabies – madness, mayhem... and the simple art of vaccination?!

Authors: Luke Gamble

Affiliations: Mission Rabies, Cranborne, United Kingdom

Abstract: Can we win? What's the point? How do I even start? These are the common questions organisations working in the field of canine transmitted rabies get asked all the time. Global strategies are great – but they are often challenging to translate into practical programmes - especially those run by well-meaning NGO's or local Governments operating with under resourced local infrastructure and minimal budget. With over 99% of all human rabies cases being transmitted through dog bites and the number of child deaths still significantly under reported and misdiagnosed in countries where rabies is endemic, the need for direct and practical action has never been greater. This presentation will showcase the universally accessible toolkit developed by Mission Rabies, CDC, MSD Animal Health and the University of Edinburgh which has helped vaccinate over 1.3million street dogs and rabies educated over 3m children in the last five years. Operating rabies programmes in 9 different countries with 13 project sites in Africa and Asia, this talk will outline the principles adopted by Mission Rabies in strategically implementing an effective rabies programme from scratch. From counting dogs, planning and delivering a pilot vaccination campaign, through to epidemiologically evaluating an economically scalable programme – the challenge can be immense – but the results are definitely worth it.

Name: Brinkley Raynor

OP28

Email: bhraynor@vet.upenn.edu

Session: Canine Rabies & Control

Country: United States

Title: The impact of SARS-CoV-2 pandemic on dog rabies in Latin America

Authors: Brinkley Raynor, Elvis W Díaz, Julianna Shinnick, Edith Zegarra, Ynes Monroy, Claudia Mena, Ricardo Castillo-Neyra

Affiliations: University of Pennsylvania, Philadelphia, Pennsylvania, USA

Abstract: Canine rabies elimination programs centered around strong surveillance for rabid dogs and yearly mass dog vaccination campaigns have been enormously successful to control canine rabies in Latin America. However, the COVID-19 pandemic has created challenges to continuing to do vital rabies control activities; these disruptions have the potential to jeopardize the progress the region has made towards eliminating dog-mediated human rabies. Movement restrictions to prevent the spread of COVID-19 and public health funding shifted towards COVID-19 relief has led to decreased rabies surveillance and disrupted yearly vaccination campaigns. In order to explore the impacts of these control activity disruptions, we built a deterministic model of dog rabies dynamics parameterized for conditions found in the dog rabies epidemic in Arequipa, Peru. Our aims were to assess the effects of interrupting canine rabies surveillance and mass dog vaccination campaigns on rabies trends in Latin America, using our epidemiological model parameterized for Arequipa as a representative case. To investigate how decreased surveillance affected rabies dynamics, we examined the effect of an increased survival time of rabid dogs due to lack of reporting and subsequent removal. To investigate disruptions to the yearly vaccination campaigns, we analyzed three different scenarios: a vaccination campaign reaching optimal coverage, one reaching mediocre coverage, and a complete cancellation. We found that both a decreased surveillance and a cancelled vaccination campaign could lead to a sharp rise in canine rabies within months. Furthermore, we examined these scenarios over a range of plausible values for R0 (1.36-2.0) and found that the increasing trends in rabies cases remain the same though the magnitude differs. COVID-19 is straining public health departments world-wide; we recommend exploring innovative strategies to ensure that progress towards eliminating human-mediated canine rabies is not lost despite these trying times.

Name: Silene Manrique Rocha

OP29

Email: silene.rocha@saude.gov.br

Session: Canine Rabies & Control

Country: Brazil

Title: Vaccination campaign against rabies in dogs and cats 2019: Brazil's support in execution in Bolivian municipalities that do border with Brazil

Authors: Silene Manrique Rocha[1], Alexander Vargas[1], Deborah Sicchierolli Moraes[1], Marcelo Yoshito Wada[1], Nathalie Mendes Estima[1], José da Conceição Guimarães[2], Itamar Costa de Assis[3], Luís Armando Wertheimer[4], Carlos Eduardo Ribas Guedes[5], Rafael Oliveira[6], Viviane Amettla[7], Walkiria Arruda[7], Fabio[8], Ana Nazaré Nascimento[9], Daniela Holanda Calixto[10], Luís Martins Soares[11], Josdemar Moraes[12], Varlei Nascimento[12], Tatiana Helena Belmonte[12], Javier Rivas[13]

Affiliations: [1]Ministério da Saúde (MS), Secretaria de Vigilância em Saúde (SVS); [2]Secretaria de Vigilância em Saúde SES/A; [3]Secretaria Municipal de Brasileia/AC; [4]Secretaria Municipal de Saúde de Epitaciolândia/AC; [5]Cônsul do Brasil em Cobija; [6]Secretaria de Vigilância em Saúde SES/MS; [7]Secretaria Municipal de Brasileia/AC; [8]Departamento de zoonoses Porto Soares-BO; [9]Secretaria de Vigilância em Saúde SES/RO; [10]Secretaria Municipal de Guajará-mirim/RO; [11]Vice Cônsul do Brasil em Guyara; [12]Secretaria de Vigilância em Saúde SES/MT; [13]Gerente Regional de Saúde San Matias/BO

Abstract: Massive campaigns help with rabies prevention strategies. In Brazil, they reduced canine rabies by AgV1 and AgV2 variants. However, in 2015, in the border region of Brazil-Bolivia, in the state of Mato Grosso do Sul, the last human case for canine variant was recorded, in addition to 61 canine cases, demonstrating the need to strengthen vaccination at the border. Thus, after an International Health Cooperation Agreement at the Border between the Ministry of Health of Brazil and Bolivia, the objective was to identify, assess and resolve health problems on the Brazil-Bolivia border to eliminate canine rabies. As a result, the agreement allowed “in loco” support for canine vaccination in Bolivian territory (BO), in the municipalities bordering Puerto Soares / Quijaro (BO) / Corumbá / MS (BRA), San Matías / (BO), Cáceres / MT (BRA), Guayaramerim (BO) / Guajará-mirim / RO (BRA), Cobija (BO) / Brasiléia / AC (BRA) totaling 3,400 km of border. In 2019, between August 24 and 25, vaccination was carried out in Bolivian territory, the goal was to vaccinate 80% of the 34,500 canine population. Brazil contributed with the donation of canine rabies vaccines and the participation of 50 vaccinators from the states and municipalities involved. 32,138 animals, 26,828 dogs and 5,410 cats were vaccinated, with vaccination coverage of 78%. The municipalities of Puerto Soares / Puerto Quijaro exceeded the target set by 10%, while the municipality of San Matias was 70%, lower among the participants. The action at the border resulted in the control and decrease of cases of canine rabies AgV1 in the municipalities of Ladário and Corumbá, going from 71 cases in 2015 to zero cases until August 2020. The work showed that the expansion of anti-rabies campaigns on the Brazil-Bolivia border were essential for the control of canine rabies in Brazilian municipalities. It is essential to invest in international agreements on a continuous basis with the purpose of controlling and eliminating AgV1 canine rabies in the region.

As campanhas massivas auxiliam nas estratégias de prevenção da raiva. No Brasil, elas reduziram a raiva canina por variantes AgV1 e AgV2. No entanto, em 2015, na região de fronteira de Brasil-Bolívia, no estado do Mato grosso do Sul, foi registrado o último caso humano por variante canina, além de 61 casos caninos, demonstrando a necessidade de fortalecimento de vacinação na fronteira. Assim, após acordo Internacional de Cooperação em Saúde na Fronteira entre os Ministério da Saúde do Brasil e Bolívia objetivou-se identificar, avaliar e resolver problemáticas em saúde na fronteira Brasil-Bolívia para eliminação da raiva canina. Como resultado o acordo permitiu apoio “in loco” da vacinação canina em território Boliviano (BO), nos municípios limítrofes Puerto Soares/Quijaro(BO)/Corumbá/MS(BRA), San Matías/(BO), Cáceres/MT(BRA), Guayaramerim(BO)/Guajará-mirim/RO(BRA), Cobija(BO) /Brasiléia/AC(BRA) totalizando 3.400 km de fronteira. Em 2019, entre os dias 24 e 25 de agosto, a vacinação foi realizada no território boliviano, a meta foi vacinar 80% da população canina 34.500. O Brasil contribuiu com doação de vacinas antirrábicas caninas e participação de 50

vacinadores dos estados e municípios envolvidos. Foram vacinados 32.138 animais, 26.828 cães e 5.410 gatos, com cobertura vacinal de 78%. Os municípios de Puerto Soares/ Puerto Quijaro superaram a meta estipulada em 10%, já o município de San Matias foi de 70%, menor dentre os participantes. A ação na fronteira resultou no controle e arrefecimento dos casos de raiva canina AgV1 nos municípios de Ladário e Corumbá, passando de 71 casos em 2015 para zero casos até agosto de 2020. O trabalho mostrou que as ampliações das campanhas antirrábicas na fronteira Brasil-Bolívia foram essenciais para o controle de raiva canina nos municípios brasileiros. É fundamental investir em acordos internacionais de forma continuada com a finalidade de controle e eliminação de raiva canina AgV1 na região.

Name: Vilaiporn Wongphruksasoong

OP30

Email: lhin_001@hotmail.com

Session: Canine Rabies & Control

Country: Thailand

Title: Piloting of oral rabies vaccination in stray dog population in Thailand

Authors: Vilaiporn Wongphruksasoong[1], Ornpawee Sakaraseranee, Karoon Chanachai, Suwicha Kasemsuwan, Ratanaporn Tangwangvivat, Porathip Trinuson, Paisin Lekcharoen, Ad Vos

Affiliations: [1]Department of Livestock Development, Bangkok, Thailand

Abstract: Rabies in domestic animals is mainly caused by low vaccination coverage especially in the stray dog population. Managing the stray dog population needs tremendous effort to understand human behavior, manage and regulate malpractices. The success of dog population control programs is limited in most of the countries and it needs longer term implementation strategies. Oral rabies vaccination demonstrated its achievement to control and prevent rabies in the wild animal population in Europe. Following bait acceptance and serological study of oral rabies vaccine, the Department of Livestock Development, Kasetsart University, the Department of Disease Control, Thailand and Ceva Santé Animale, France are piloting oral rabies vaccination in the stray dog population. We aimed to demonstrate feasibility of oral rabies vaccination in the stray dog population. The pilot study had been done in 4 local municipalities in Thailand during March-August 2020. Oral vaccination team members were from community, municipality, local livestock and study team staff. We used SPBN GASGAS oral vaccine filled in sachet and covered with either egg-flavor or pig intestine bait. The team delivered vaccines to stray dogs using a hand-out and retrieve method. Data of individual dogs and groups of stray dogs had been recorded using standard questionnaire and Epicollect5 Software, respectively. Success of the oral vaccination, vaccination coverage, timing and labor cost have been recorded and analyzed. We described and analyzed success, benefit, constraint and challenges of oral vaccination. We deployed more than 2,000 doses of oral vaccine to these 4 municipalities. The result demonstrated the benefit of oral vaccination to improve vaccination coverage in the stray dog population and it can be applied in supplementary with parenteral vaccination.

Name: Mariana Olímpia Köhler Marra Pinto

OP31

Email: marykohler@gmail.com

Session: Canine Rabies & Control

Country: Brazil

Title: Study of the antirabic vaccination coverage of the Brazilian campaigns in dogs, from 2012 to 2017

Authors: Mariana Olímpia Köhler Marra Pinto, Gustavo Canesso Bicalho, Marcelo Teixeira Paiva, Elena Maria Hurtado, Tiago Mendonça de Oliveira, Danielle Ferreira de Magalhães Soares, Rafael Romero Nicolino, Camila Stefanie Fonseca de Oliveira

Affiliations: Federal University of Minas Gerais, Belo Horizonte, Brazil

Abstract: Since 1984, the feline and canine vaccination advocated by the National Rabies Prophylaxis Program has become part of the Ministry of Health's National Immunization Program (PNI), with the aim of immunizing - at least - 80% of these populations, since for the World Health Organization (WHO), the transmission of the disease can only be interrupted from the minimum vaccination of 80% of the canine population in endemic areas. The present work was a longitudinal, retrospective and ecological study, which used secondary data referring to the rabies vaccination campaigns of dogs carried out in Brazil from 2012 to 2017 collected on the PNI portal. The database contained information on the vaccination targets for dogs and the number of doses performed in all 5,570 Brazilian municipalities. Subsequently, data on the cases of canine and feline rabies that occurred in the period from 2015 to 2017 were obtained from the SINAN online portal. The historical series demonstrated that the canine vaccine coverage did not reach the target in most years, and this objective was achieved only in 2017, when the coverage reached 80.1% of vaccinated dogs. It was possible to verify that some municipalities that presented cases of rabies in dogs and / or cats in Brazil in the historical series from 2015 to 2017 had their vaccination coverage rates higher than or equal to the expected target. Other municipalities with positive cases presented rates lower than the minimum 80% vaccination target for dogs and cats. These contradictory results, as in the cases of municipalities that met or exceeded the target and still presented cases of the disease in dogs and cats, may indicate insufficiency in the registration of the information about vaccination or even failures in estimating the populations of dogs and cats in these municipalities.

Name: Daniel Streicker

OP32

Email: daniel.streicker@glasgow.ac.uk

Session: Keynote Address: Bat Rabies & Control

Country: United Kingdom

Title: Towards prevention of vampire bat rabies: from outbreak forecasting to transmissible vaccines

Authors: Daniel G. Streicker

Affiliations: University of Glasgow, Glasgow, UK

Abstract: Rabies transmitted by vampire bats affects human health and livestock production across Latin America. Vaccines for humans and domestic animals are safe and effective but are not currently used at sufficient scale to prevent major economic losses in the livestock sector and sporadic human rabies outbreaks. Moreover, since these vaccines target 'dead-end' hosts which do not contribute to long term viral perpetuation, they will need to be applied indefinitely, at ever increasing cost. Reducing or eliminating viral circulation from the primary reservoir host, Desmodus rotundus, is in principle the more desirable approach, but faces numerous obstacles. Existing efforts that rely on bat population reduction beneficially reduce bites, but not necessarily rabies incidence in bats or other species. An alternative, oral vaccines that spread among bats via social contacts, protect bats in laboratory settings, but whether they can immunize sufficient numbers of wild bats to meaningfully reduce rabies risk is unclear. I will present proof-of-concept findings from field experiments and epidemiological modelling which are assessing the potential utility virally-vectored, self-spreading vaccines to control rabies within its reservoir host. Existing vaccines which have deliberately constrained capacity to spread among bats are predicted to outperform analogous efforts using culling. Efficacy could be further enhanced by using knowledge of the spatiotemporal dynamics of rabies inferred from viral phylogeography or passive surveillance data to guide deployment strategies. Vaccines with less constrained bat-to-bat spread are in earlier the development pipeline, but if proven safe and effective, could open prospects for elimination.

Name: Andrea Tatiana Medina Rodríguez *(presented by Juan Pablo Vásquez)*

OP33

Email: andrea.medina@upra.gov.co

Session: Bat Rabies & Control

Country: Colombia

Title: Estimation of livestock health risk for bovine rabies of wild origin in Colombia, 2013-2018

Authors: Andrea Tatiana Medina Rodríguez, Juan Pablo Vásquez Álvarez, César Andrés Cortés Bello, Jaime Andrés Unriza Vargas, Felipe Fonseca Fino, Daniel Alberto Aguilar Corrales, Andres Felipe Rodríguez Vásquez

Affiliations: Unidad de Planificación Rural Agropecuaria - UPRA

Abstract: UPRA is leading the Information System for Agricultural Risk Management - SIGRA and for the livestock health component, the spatial estimation of the risk for bovine rabies of wild origin for the year 2019 in Colombia was carried out, based on the product between the threat parameters and vulnerability. The estimation of the threat parameter was carried out using an ecological niche model with the MaxEnt® software, based on historical data on the presence of rabies in Colombia for the years 2013 to 2018, together with biotic and climatic variables associated with the dynamics of the disease and whose objective is to calculate the spatial probability of finding the appropriate conditions for the establishment of the vampire bat (Desmodus rotundus) and thus the possible existence of colonies infected with rabies and thus the possible presence or appearance of foci of the disease in the country. The vulnerability parameter, defined as the predisposition of the system to be negatively affected by the assessed threat, was calculated from information from the official vaccination for rabies and the municipal cattle inventory for Colombia in 2018. The results indicate that the methodology can be replicated for any year of study, with use for decision-making in vaccination cycles and areas. In particular, the areas with the greatest risks are in the north of Colombia, mainly, the Atlantic Coast and César, which corresponds adequately with the outbreaks reported in 2019. Finally, for the threat parameter, there are areas in which, despite being scarce or null, reports of the disease may be probable areas for the presence of new rabies foci and whose level of risk may be affected by low coverage vaccination of the country, which makes it more vulnerable.

La UPRA se encuentra liderando el Sistema de Información para la Gestión del Riesgo Agropecuario – SIGRA y para el componente sanitario pecuario, se realizó la estimación espacial del riesgo para rabia bovina de origen silvestre para el año 2019 en Colombia, a partir de del producto entre los parámetros de amenaza y la vulnerabilidad. La estimación del parámetro amenaza se realizó usando un modelo de nicho ecológico con el software MaxEnt®, fundamentado en datos históricos de presencia de rabia en Colombia para los años 2013 a 2018, junto con variables bióticas y climáticas asociadas a la dinámica de la enfermedad y cuyo objetivo es calcular la probabilidad espacial de encontrar las condiciones apropiadas para el establecimiento del murciélago vampiro (Desmodus rotundus) y así la posible existencia de colonias infectadas con rabia y de esta manera la posible presencia o aparición de focos de la enfermedad en el país.El parámetro vulnerabilidad definido como la predisposición del sistema a ser afectado negativamente por la amenaza evaluada, fue calculada a partir de información de la vacunación oficial para la rabia y el inventario de bovinos municipal para Colombia en 2018. Los resultados indican que la metodología puede ser replicable para cualquier año de estudio, con uso para toma de decisiones en ciclos y zonas de vacunación. Particularmente, las zonas con mayores riesgos se presentan en el norte de Colombia, principalmente, Costa Atlántica y César, que corresponde adecuadamente con los focos reportados en 2019. Finalmente, para el parámetro amenaza se evidencian zonas en las que a pesar de ser escasos o nulos los reportes de la enfermedad pueden ser zonas probables para la presencia de nuevos focos de rabia y cuyo nivel de riesgo se puede ver afectado por la baja cobertura vacunal del país, lo que lo hace más vulnerable.

Name: Jose Alejandro Jimenez Ramirez

OP34

Email: alexrabia@gmail.com

Session: Bat Rabies & Control

Country: Mexico

Title: Progress of a mobile application for the identification of risks of rabies transmitted by vampire bats in Mexico

Authors: José Alejandro Jiménez Ramírez[1], Luis Armando Lecuona Olivares[2]

Affiliations: [1]Control de Vampiros, México; [2]USDA/APHIS/International Services, México

Abstract: Technological advances and the ease of accessing applications and social networks represent a great advantage in being able to evaluate, analyze, receive and send information more quickly. The challenge for the personnel working in public health and animal health is to combine actions for "One Health". The development of methodologies that allow epidemiological analyzes and geographic maps to be carried out in a matter of minutes is essential. In Mexico, rabies transmitted by hematophagous bat (Desmodus rotundus) is frequent and this makes it necessary to improve the tools that facilitate decision-making from the place where rabies cases occur. For this reason, a spreadsheet was developed that analyzes and identifies places of interest, places at a precise distance in several kilometers around each case of rabies, as well as human and animal populations, which are in risk areas or communities where they can prevent or take care of this phenomenon. Progress is also being made in creating a mobile application that, by entering geographic coordinates, executes the analysis of the distance of communities, rabies cases, captures in pens or shelters, location of shelters, or cattle populations. All this requires permanently updated, accurate databases and records from previous years. With this we can know the real situation of the case and the series of recommendations for its prevention or control. This contributes to improving the management of resources for immediate attention and avoiding economic losses due to the death of animals and possible public health risks. With this work, the advances available in the application for mobile phone, tablet or computer are presented, which show the updated information and the actions to follow, with the simple fact of entering geographic coordinates of the site where a report of rabies transmitted by vampire bats is being presented.

Los avances tecnológicos y la facilidad de acceder a aplicaciones y redes sociales, representa una gran ventaja para poder de evaluar, analizar, recibir y enviar información de manera más rápida. El reto del personal que labora en salud pública y salud animal es conjuntar acciones para "Una sola Salud". El desarrollo de metodologías que permitan realizar análisis epidemiológicos y mapas geográficos en cuestión de minutos es primordial. En México la rabia transmitida por murciélago hematófago (Desmodus rotundus), es frecuente y ello hace necesario mejorar las herramientas que faciliten la toma de decisiones desde el lugar donde ocurren los casos de rabia. Por ello se desarrolló una hoja de cálculo que analiza e identifica sitios de interés, lugares en distancia precisa en varios kilómetros a la redonda de cada caso de rabia, así como poblaciones humanas y animales, que se encuentran en zona de riesgo o comunidades donde puede prevenirse o atenderse ante este fenómeno. También se avanza en crear una aplicación móvil que al ingresar coordenadas geográficas, ejecute el análisis de distancia de comunidades, casos de rabia, capturas en corral o refugios, ubicación de refugios, o poblaciones ganaderas. Todo esto requiere de bases de datos permanentemente actualizadas, precisas y registros de años previos. Con esto podemos conocer la situación real del caso y la serie de recomendaciones para su prevención o control. Esto contribuye a mejorar el manejo de recursos para la atención inmediata y evitar pérdidas económicas por muerte de animales y posibles riesgos de salud pública. Con este trabajo se presentan los avances disponibles en la aplicación para teléfono móvil, tableta o computadora, que muestran la información actualizada y las acciones a seguir, con el simple hecho de ingresar coordenadas geográficas del sitio donde se está presentando un reporte de rabia transmitida por murciélagos vampiro.

Name: Megan Griffiths

OP35

Email: m.griffiths.1@research.gla.ac.uk

Session: Bat Rabies & Control

Country: United Kingdom

Title: Infection biology of a novel vampire bat herpesvirus reveals a promising vector for transmissible rabies vaccines

Authors: Megan Griffiths, Laura Bergner, Alice Broos, Diana Meza, Ana da Silva Filipe, Andrew Davison, Daniel G Streicker

Affiliations: MRC–University of Glasgow Centre for Virus Research, Glasgow, United Kingdom

Abstract: Vampire bat (Desmodus rotundus) rabies causes significant health and economic burdens across Latin America despite decades of efforts to control the disease by the culling of bats and vaccination of humans and domestic animals. Reservoir-targeted transmissible vaccines that autonomously spread through host populations would open prospects to eliminate zoonotic pathogens from inaccessible wildlife reservoirs. Such transmissible vaccines can be laboratory-generated by engineering natural virus "vectors" to stimulate immune responses against pathogens. However, numerous pitfalls undermine the real-world suitability of vectors, including safety requirements such as low pathogenicity and host specificity. They must also be capable of invading and spreading to high prevalence in populations that may already sustain a competing wild-type version of the viral vector. Here, by carrying out field and genomic studies, we show that a newly discovered betaherpesvirus of vampire bats (DrBHV) is an ideal candidate for further study as a viral vector of transmissible rabies vaccines. Across 22 sites in Peru, prevalence was universally high, from 80-100% with little variation by sex or age. Sequencing and phylogenetic reconstruction reveal high host specificity within the Phyllostomidae family of neotropical bats, limiting risks to non-target species. Finally, metagenomic sequencing of saliva from individual bats allowed us to reconstruct >99% of the viral genome and importantly, illustrated capacity for superinfection, suggesting that vaccine strains could invade despite a highly prevalent wild type. In light of the biology of betaherpesviruses, these results suggest DrBHV as a promising candidate for a lifelong, self-boosting, host-specific transmissible vaccine which could eventually transform the management of vampire bat rabies. More generally, we illustrate the first stages of a pipeline to generate transmissible vaccines from naturally-occurring, harmless viruses discovered through metagenomic sequencing.

Name: Paola de Benedictis

OP36

Email: pdebenedictis@izsvenezie.it

Session: Bat Rabies & Control

Country: Italy

Title: First detection of West Caucasian Bat Lyssavirus infection in a domestic cat, Italy, 2020

Authors: Stefania Leopardi, Maria Teresa Scicluna, Calogero Terregino, Paola De Benedictis, The Emergency Task Force for WCBL

Affiliations: Experimental Zooprophylactic Institute of the Venezie (IZSVe), National Reference Centre/FAO Reference Centre for Rabies, Legnaro (PD), Italy

Abstract: In June 2020, a two-year old neutered female domestic cat living in Arezzo (Tuscany) displayed neurological signs strongly suggestive of a rabies infection, namely fever, aggressiveness, respiratory distress, hypersalivation and hydrophobia. The cat had no history of travelling abroad; neither had it ever been in open countryside with the owners. Before developing neurological signs, the pet used to wander outdoors during the day while she was always kept indoors at night. Due to the highly suspect signs, the carcass was sent to the local veterinary authorities to rule out a rabies infection. A preliminary diagnosis was performed at the local diagnostic laboratory, timely confirmed by the national reference centre for rabies. Further typing indicated West Caucasian Bat Lyssavirus (WCBV) as responsible for the infection. Before this case, Italy had experienced several epidemic waves of rabies in red foxes (Vulpes vulpes), with the last case dating back to February 2011. Since then, no further episodes have been observed in wildlife nor in domestic animals. Prior to this case, WCBV had been detected only once worldwide in a Schreibersii's bat (Miniopterus schreibersii) in Russia in 2002. No evidence of spillover has been registered for such a Lyssavirus species. Schreibersii's bat represents the most suspected reservoir host for WCBV. It is a near threatened species (IUCN status) and a protected species in Italy where it aggregates in large caves in summer, often co-roosting with horseshoe bats (Rhinolophus spp.) and mouse-eared bats (Myotis spp.) with individuals flying hundreds of kilometers between hibernating sites and maternal roosts. Here we describe the case and the viral characterization, as well as the emergency surveillance as it has been enforced following the index case, with the objectives of (i) confirming/identifying the reservoir species, (ii) investigating the interaction between bats and domestic carnivores, and (iii) ruling out the occurrence of further spillovers.

Name: Felipe Rocha

OP37

Email: rochafe@paho.org

Session: Bat Rabies & Control

Country: Brazil

Title: A regional perspective upon domestic herbivore rabies mediated by hematophagous bat (D. rotundus) in the Americas

Authors: Felipe Rocha, Marco AN Vigilato, Larissa C Zanette, Baldomero Molina-Flores, Julio C Pompei, Ottorino Cosivi

Affiliations: Pan American Center for Foot-and-Mouth Disease and Veterinary Public Health – Pan American Health Organization/World Health Organization (PANAFTOSA-PAHO/WHO)

Abstract: In the Americas, over 500 million of domestic herbivores are at risk of hematophagous bat-mediated rabies, estimating an annual mortality of more than 100,000 animals, a direct annual loss of U$ 97 million and for each reported case, there are 09 not reported to the veterinary services. In 2016, 7,272 outbreaks were investigated, from which 1,877 were confirmed and reported to PANAFTOSA-PAHO/WHO, indicating an underreporting scenario in the countries. The hematophagous bat is present and endemic in 22 countries from the American Continent, from those, legislation to control domestic herbivores rabies mediated by D. rotundus was found in 12 countries – and only 07 have an established national program. These 12 legislations have common aspects and measures to address the issue, such as mandatory notification of suspicious cases, farms quarantine with positive cases, vaccination campaigns in areas with a disease history and control of hematophagous bats populations; but most of them emphasizing on the outbreak occurrence as the trigger event to execute actions, resulting in programs based on measures to mitigate outbreaks instead of preventive actions. Over the past years, new knowledge has been built upon the disease and ecological relations between the hematophagous bats, their preys, and the environment, which could be applied in the creation and update of domestic herbivores rabies control programs from the Americas. Also, a regional program to harmonize action and strategies to control rabies in domestic herbivores and to promote the exchange of information between countries should be created, gathering the vision and problematics seen by directors of national programs, experts on the subject and international technical cooperation organizations.

Name: Christine Fehlner-Gardiner

OP38

Email: christine.fehlner-gardiner@canada.ca

Session: Regional Update (invited)

Country: Canada

Title: The changing landscape of rabies in Canada – 2014-2020

Authors: Christine Fehlner-Gardiner

Affiliations: Canadian Food Inspection Agency, Ottawa, Ontario, Canada

Abstract: Although Canada has been free of dog-mediated rabies for over 50 years, rabies in wildlife presents important risks to human and animal health. Rabies is enzootic in bats, skunks and foxes, and eastern Canada has experienced multiple raccoon rabies epizootics, with two new incursions since 2014. This year has added significance as it marked the introduction of a decentralized approach for animal rabies case investigation, sample submission and post-exposure management. Since this time Canada has seen many changes in the way rabies is managed in this large, geographically diverse country, with the largest one being the requirement for all provinces and territories to develop programming to address these new activities. Whereas laboratory testing for samples with direct public health implications continues to be carried out in two federal laboratories, the availability of new diagnostic tests has enhanced the capacity for wildlife surveillance testing now conducted in multiple labs across the country. Linked to this change is the development of a national rabies database, that when completed will be a repository for all rabies data, regardless of the testing laboratory or reason for testing. On the human rabies side, the National Advisory Committee on Immunization is currently reviewing the guidelines for post-exposure prophylaxis in light of the latest recommendations from the World Health Organization. Regrettably, 2019 saw a case of bat-mediated human rabies in the province of British Columbia, demonstrating the need to renew efforts for public education about risks of rabies from wildlife. This presentation will provide an overview of rabies epizootiology in Canada over the last 6 years, highlighting a number of important changes and events that have impacted rabies surveillance, prevention and control during this time.

Name: Xiaoyue Ma

OP39

Email: hjv4@cdc.gov

Session: Regional Update (invited)

Country: United States

Title: Rabies surveillance in the United States during 2019

Authors: Xiaoyue Ma[1], Ben P Monroe[1], Lillian A Orciari[1], Crystal Gigante[1], Jordona D Kirby[2], Richard B Chipman[2], Jesse Bonwitt[1], Ryan Wallace[1], Brett W Petersen[1], Mary Reynolds[1], Victoria Olson[1]

Affiliations: [1]Centers for Disease Control and Prevention, Poxvirus and Rabies Branch, Atlanta, Georgia, USA; [2]United States Department of Agriculture, Wildlife Services, National Rabies Management Program, Concord, New Hampshire, USA

Abstract: Human and animal rabies have been nationally notifiable conditions in the United States since 1944. National rabies surveillance is a primarily passive laboratory-based system that consists of 125 state public health, agriculture, and university pathology laboratories. These laboratories perform the standard direct fluorescent antibody test. In addition, as a component of a large-scale oral rabies vaccination program, the USDA Wildlife Services tests animals collected through active surveillance in selected geographic regions with the direct rapid immunohistochemical test. The CDC national rabies surveillance program requests annual rabies testing data from 54 reporting jurisdictions including 50 states, District of Columbia, New York City, Puerto Rico and the USDA Wildlife Services. These reporting jurisdictions provide information pertaining to species, county, date of testing or specimen collection, and test results for all animals submitted for rabies testing. Information on vaccination status of domestic animals and results of rabies virus variant typing are also provided when available. The present report summarizes and analyzes 2019 rabies data submitted by the 54 reporting jurisdictions to provide information on the spatial and temporal occurrence of animal rabies in reservoir and spillover hosts. Reported cases of rabies by location will be portrayed with distribution figures for bats, raccoons, skunks, foxes, dogs, and cats. Rabies virus variants identified in domestic and wild animals will also be described with detailed information, in addition to a 20-years summary of human rabies cases during January 2001–September 2020. These results will facilitate national rabies management decisions, vaccination recommendations, and public outreach.

Name: Verónica Gutiérrez Cedillo

OP40

Email: veronica.gutierrez@salud.gob.mx

Session: Regional Update (invited)

Country: Mexico

Title: Current situation of Rabies in Mexico

Authors: Verónica Gutiérrez-Cedillo, Ignacio A Chávez-Flores, José R Fernández-Colin, Ruy López-Ridaura

Affiliations: Secretaría de Salud, CENAPRECE, Subdirección de Rabia y otras Zoonosis

Abstract: Background: The National Program for the Prevention and Control of Human Rabies was initiated in the last century with the Regulations for the Anti-rabies Campaign (1938-1950) and the National Health Plans (1974-1976 and 1977-1983). This was an effort with the aim to reduce the 1,200 human deaths from dog-transmitted rabies, registered in the period from 1970 to 1989; having as its main strategy the World Health Organization (WHO) recommendation on canine rabies vaccination, with additional medical-rabies care in people, using biologicals in cell culture. During the following years, this strategy continued to be applied with the proper adjustments made for massive, intensive and free anti-rabies vaccination of dogs, (National Canine Vaccination Weeks), using the biological whose quality had been tested and authorized for use by the Ministry of Health. Laboratory surveillance was also a priority, being a support in the preventive care against rabies of people at risk, which allows assessing the quality of National Canine Vaccination Weeks, it has been reinforced by the incorporation of molecular studies on viruses isolated from people and animals who dead by rabies. Development: The National Canine and Feline Rabies Vaccination Weeks in Mexico represent a historical impact on rabies in the world, considering the “vaccination” strategy; from 2013-2018, 105.7 million doses of canine and feline rabies vaccine were delivered, an average per year of 18 million, achieving a significant decrease in cases of human rabies, translated to zero deaths since 2006 and three years without registration in dogs by V1 dog, which are genetically associated with wildlife. The country is kept in zero cases of human rabies transmitted by dogs, compared to those caused by wild animals, accumulating five deaths, one in 2015 (Chihuahua by skunk); two in 2016 (Guerrero and Tamaulipas by bat); two in 2018 (one in Guerrero by bat and another in Durango by fox) and 1 in 2020 in Veracruz transmitted by bat, a joint approach with the Directorate of Animal Health of the Ministry of Agriculture in Mexico. Conclusion: These massive and continuous actions have allowed Mexico to receive the Recognition granted by the WHO as a country that has eliminated human rabies transmitted by dogs as a public health problem.

Name: Marcelo Yoshito Wada

OP41

Email: marcelo.wada@saude.gov.br

Session: Regional Update (invited)

Country: Brazil

Title: Epidemiological situation of rabies in Brazil

Authors: Marcelo Yoshito Wada, Silene Manrique Rocha, Deborah Siccierolli Moraes, Francisco Edilson Ferreira de Lima Júnior

Affiliations: Brazilian Ministry of Health, Brasilia, Brazil

Abstract: In the last ten years, 37 human rabies cases (HR) were confirmed in Brazil: 24% (09/37) were transmitted by dogs and 51% (19/37) by bats, the last case of canine variant (AgV1/AgV2) was reported in 2015. In addition to accidental cases transmitted by non-hematophagous bats, outbreaks by hematophagous bats occurred in the Amazonic region, which motivated the implementation of the "Pilot Vaccination Project Pre Exposure Prophylaxis" in 2019, with the objective to prevent outbreaks in vulnerable populations spoliation by vampire-bats, where 411 residences were visited on the banks of the Pacajá River in Pará State and the vaccination strategy was based on WHO recommendations. In urban areas, 04 HR were reported due secondary transmission (AgV3-domestic cats), showing the importance to be alert by this cycle of transmission. The annual average of postexpoure prophylaxis (PEP) was 676,000. In 2018, there was an increase of 10% in PEP. Some measures were taken to avoid waste, including reducing vaccine doses in PEP. The highest record of PEP was due to exposure to dogs 414,568 (79.3%) cases, followed by cats 88,824 (16.9%). Adults aged 20 to 49 correspond to 40% of the exposures and 52% were men and 85% lived in urban areas. The reduction of rabies in dogs by the AgV1 and AgV2 variants, justified by continuous surveillance work, in particular massive canine rabies vaccination campaigns, in addition to contingency plans in areas bordering Bolivia and in the Maranhão State, where there was circulation of canine variants. Currently the records of dogs and cats have rabies variants from bats (AgV3) and from wild canids (AgV Cerdocyon thous). In 2019, of 14 cases of rabies in dogs, 43% were due to AgV Cerdocyon thous and 29.5% AgV3. In felines, of 10 cases of rabies registered in 2019, 80% occurred due to the variant of bats.

Name: Natalia Casas

OP42

Email: ncasasvet@gmail.com

Session: Regional Update (invited)

Country: Argentina

Title: Argentina: Situation update on rabies

Authors: Natalia Casas, Carlos Palacios, Celeste Castillo Pascual, Emilio Faro, Eugenio Mirkin, Daniel Cisterna

Affiliations: Ministry of Health of the Nation, Buenos Aires, Argentina

Abstract: The rabies is a fatal zoonotic disease that causes serious public health problems in Argentina. From the National Health Surveillance System bases, between 2013 and 2020 (epidemiological week 28), 778 cases of animal rabies were reported. Where 82% were insectivorous bats; 12% cows and horses; 5% dogs; 2% cats, and other wild animals (fox, coati) in a lower percentage. In the northwestern and northeastern regions circulate rabies in dogs (virus variants V1 and V2), in the whole country rabies virus circulates in insectivorous bats (V4, V6, and other variants), and in the northwestern, northeastern, and central regions circulates V3 (rabies in vampire bats). The latest cases of V1 and V2 canine rabies occurred in 2018, with six cases of V1 canine rabies in the city of Salvador Mazza, province of Salta, in the north bordering Bolivia, and in 2019, with two cases of V2 canine rabies in the city of Villa Dos Trece in the province of Formosa. The last case of human rabies occurred in 2008 in Jujuy. The Ministry of Health supports rabies vaccination campaigns of dogs and cats in areas with circulation of V1 and V2; also distributes human and veterinary vaccines to all jurisdictions. Argentina has the future objective to certify as a country free of canine-mediated human rabies. Additionally, biologics for rabies vaccination and diagnostics are under development, executed by public and private national institutions, and some of them in a review phase by the respective regulatory offices. For the control of this disease is essential the interdisciplinary and intersectoral work, requiring strategic planning on the concept of “One Health”, which involves the Public and Private Systems with community empowerment.

Name: Marco Vigilato

OP43

Email: vigilato@paho.org

Session: Regional Update (invited)

Country: El Salvador

Title: Actions taken by national public health programs on the fight against dog mediated rabies during struggles and difficulties faced by COVID-19 pandemic

Authors: Felipe Rocha, Marco AN Vigilato, Larissa C Zanette, Baldomero Molina-Flores, Julio CA Pompei, Ottorino Cosivi

Affiliations: Pan American Center for Foot-and-Mouth Disease and Veterinary Public Health – Pan American Health Organization / World Health Organization (PANAFTOSA-PAHO/WHO)

Abstract: COVID-19 came as a force of nature, infecting millions of people and taking hundreds of thousand lives around the world, causing damage to society and health services, showing itself as a great challenge for public health services. Over the past 30 years, the Americas had decreased 95% in the incidence of human rabies mediated by dog, and now, the challenges imposed to the national public health programs brings concern over the continuity in the fight against rabies. From the four pillars of the dog-mediated rabies national programs, the surveillance and the execution of canine mass vaccination where the two most affected. Surveillance systems had been affected due to the decrease in number of samples collected and decrease in diagnostic capacities – cause by initial difficult in the supplies procurement and the reschedule in healthcare force. The canine mass vaccination in the Americas, in most of the countries, is based on the "vaccination points" strategy, which nowadays represent a risk of COVID-19 dissemination, and now is changing to the "door-to-door" strategy. Public health services has adapted its operational capabilities to maintain control of rabies, by the development of technical documents and change in protocols, aiming the standardization of guidelines for health professionals according to the epidemiological scenarios of COVID-19 in the region, taking into consideration the protection measures for biosafety of health workers and the community involved. On June 18th of 2020, PANAFTOSA-PAHO/WHO gathered the directors of rabies programs of the Americas, regional rabies experts and public health authorities to promote the exchange of experiences and knowledge on the situation of rabies in the countries of the Americas and how to maintain activities for the prevention and control of rabies, as well as the development of annual vaccination campaigns for the canine population, in the context of the COVID-19 pandemic.

Name: Ana Beatriz da Cruz Favaro Garcia

PP001

Email: anabeatrizbotto@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Rabies in bats (Chiroptera, Mammalia) in Brazil: prevalence and potential risk factors

Authors: Ana Beatriz da Cruz Favaro Garcia[1], Cristiano de Carvalho[2], Daiene Karina Azevedo Casagrande[1], Mirelle Andréa de Carvalho Picinato[3], Wagner André Pedro[2], Márcia Marinho[2], Luzia Helena Queiroz[2]

Affiliations: [1]São Paulo State University (UNESP) - School of Veterinary Medicine, Post-graduation Program on Animal Health, Araçatuba, São Paulo, Brazil; [2]São Paulo State University (UNESP) - School of Veterinary Medicine, Department of Support, Production and Animal Health, Araçatuba, São Paulo, Brazil; [3]São Paulo State University (UNESP) - School of Veterinary Medicine, Department of Preventive Veterinary Medicine and Animal Reproduction, Jaboticabal, São Paulo, Brazil

Abstract: In Brazil, the number of rabies cases transmitted by bats has been surpassing the transmission by dogs, representing a new epidemiological scenario for this zoonosis. The objective of this study was to analyze the prevalence of rabies in bats according to the food habits, taxonomic classification, sex and season of the year to identify possible risk factors for rabies occurrence in bats. A retrospective analysis of bat samples submitted to rabies diagnosis and taxonomic identification was carried out at the Rabies Diagnostic and Chiroptera Laboratories of Unesp Araçatuba, São Paulo, Brazil, from 1998 to 2017, consisting of 6,389 samples from different municipalities in the state of São Paulo. A total of 76 (1.1%) positive cases of rabies were detected in bats of 10 species belonging to seven genera of three families. The family with the largest number of specimens examined was Molossidae (74.4%). However, the family Vespertilionidae had the highest prevalence (48.7%), mainly Myotis nigricans (25%) and Eptesicus furinalis (21%). The dry season (between May and September) showed a significant association with positivity for rabies, as well as Bats with frugivorous eating habits. However, the variable "sex" had no association. It is recommended that rabies surveillance and control strategies be carried out mainly during the dry season, with special attention to the species of the family Vespertilionidae and other species with frugivorous eating habits.

Name: André Alberto Witt

PP002

Email: andrewitt15@gmail.com

Session: Session

Country: Brazil

Title: Marking of insectivorous bats in urban areas in Rio Grande do Sul, Brazil

Authors: André Alberto Witt

Affiliations: Secretary of Health, State of Rio Grande do Sul, Brazil

Abstract: Tadarida brasiliensis (I. Geoffroy, 1824) (Molosidae, Chiroptera) is one of the most common and abundant bat species in urban areas in Rio Grande do Sul (RS), where it shelters on roofs of houses, forming colonies that range from hundreds thousands of individuals. Among the species of bats found positive for rabies in the cities of RS is, without a doubt, the largest number of cases presents, causing concern of public health authorities. However, little is known about the use and occupation of shelters in the cities by T. brasiliensis, except that in the autumn and winter periods the colonies disappear or are reduced in large part, leading to the belief that they may migrate to other regions. In 2012, the State Health Surveillance Center, through the Rabies Surveillance Program, with the objective of improving knowledge about the role of insectivorous bats in the rabies cycle in urban centers, started a work to mark bats belonging to families Vespertilionidae and Molossidae, with an emphasis on T. brasiliensis. Aluminum and flap washers (Capri model) were used, made with a sequential number and with initials SES / RS / Brazil (SES-State Health Secretariat). So far, the following municipalities have been visited: Alegrete, Arroio Grande, São Lourenço do Sul, São Gabriel, Tavares, Charqueadas, Nova Petrópolis, Bom Jesus, Tupanciretã, Caçapava do Sul, Caiçara, Derrubadas, Ijuí, Maquiné, Palmares do Sul , Pelotas, São Francisco de Paula, Capão do Leão, Santa Cruz do Sul and Montenegro. In total, 1,776 bats of the following species were banded: T. brasiliensis (n = 1,506), Molossus sp. (n = 36), Eptesicus sp. (n = 183), Histiotus montanus (n = 6), Histiotus velatus (n = 16) and Myotis sp. (n = 12). It is expected over the years to obtain information on the use and occupation of refuges in cities, in order to propose strategies and measures to prevent rabies caused by insectivorous bats in urban areas.

Name: Angel Neftali Osorio Rodriguez

PP003

Email: neftali.eptesicusfuscus@gmail.com

Session: Bat Rabies & Control

Country: Mexico

Title: Distribution, abundance, control and records of cases of vampire bats (Desmodus rotundus) infected with rabies in livestock environments of Guerrero, Mexico

Authors: Angel Neftali Osorio-Rodríguez[1], César Eduardo Romero-Barrera[2], Rolando Cosme Santiago[2], Edelmiro Martinez Perez[2], Luis Alvin Garzón López[3]

Affiliations: [1]Institute for the Management and Conservation of Biodiversity; [2]State Committee for the Promotion and Protection of Livestock of Guerrero, Chilpancingo de los Bravo, Guerrero, Mexico; [3]Higher School of Natural Sciences, Petaquillas, Guerrero, Mexico

Abstract: The vampire bat (Desmodus rotundus) is the main vector of bovine paralytic rabies, with wide distribution in Mexico. Given the expansion of livestock activities in Guerrero, Mexico; the role of this species in the transmission of paralytic rabies is unknown. Then, to know the distribution, abundance of the vampire bat in livestock environments and analyze the importance of population control and record the number of vampire bats positive for the rabies virus in the state of Guerrero, Mexico; were captured 2,620 organisms in 178 localities, belonging to 29 municipalities in the period 2013-2017. The 30% abundance data were classified into the sparse category. 2,482 (95%) organisms were treated with Warfarin, in 2017 the largest number of treatments was performed (n = 1,038). Samples were sent 136 to the laboratory, of which four (3%) were positive for the rabies virus. To date, the bovine paralytic rabies campaign is an effective strategy, considering that no other strategies have been generated to mitigate the problems that arise between these blood-sucking species and livestock activities. It is also important to include awareness campaigns to raise awareness of the importance of vaccination of livestock and the ecological role of other bat species.

El murciélago vampiro Desmodus rotundus (È. Geoffroy Saint-Hilaire) es el principal vector de la rabia paralítica bovina, con amplia distribución en México. Ante la expansión de las actividades ganaderas en Guerrero, México; se desconoce el papel que podría jugar esta especie en la transmisión de la rabia paralítica. Por lo que con la finalidad de conocer la distribución, abundancia del murciélago vampiro (D. rotundus) en los ambientes pecuarios y analizar la importancia del control poblacional y registrar el número de murciélagos vampiro (D. rotundus) positivos al virus de la rabia en el estado de Guerrero, México; se capturaron 2,620 organismos, en 178 localidades, pertenecientes a 29 municipios en el periodo 2013-2017. El 30 % los datos de abundancia se clasificaron dentro de la categoría de escaso. Se trataron con Warfarina 2,482 (95%) organismos, en 2017 se realizó el mayor número de tratamientos (n = 1,038). Se enviaron 136 especímenes a laboratorio, de los cuales cuatro (3 %) fueron positivos al virus rábico. Hasta la fecha la campaña de rabia paralítica bovina es una estrategia efectiva, considerando que no se han generado algunas otras estrategias para mitigar la problemática que se genera entre esta especie hematófaga y las actividades pecuarias. Así mismo es importante incluir campañas de concientización con la finalidad de dar a conocer la importancia de la vacunación del ganado y la función ecológica de las demás especies de murciélagos.

Name: Bilal Haider

PP004

Email: dochaider1998@gmail.com

Session: Bat Rabies & Control

Country: Pakistan

Title: Rabies Awareness

Authors: Bilal Haider, Muhammad Asif

Affiliations: Global Alliance for Rabies Control (GARC), Manhattan, Kansas, USA

Abstract: I am Bilal Haider student of Dvm 4th year in UVAS. I am president of Umbrella of One Health. My other team members include Muhammad Asif, Muhammad Munawar, Kainat Zulfiqar, and Sana Shahid. Our mentor Dr. Waqas Ahmad Phn in epidemiology asked us to work on this highly fatal disease
Objective of this abstract is to aware you about our sincere work on Rabies elimination. I have decided to work on Rabies awareness among people when I came to know that most of the people do not know about the dog bites and about this highly fatal disease (Rabies) on survey. So I made a team and started working on awareness. For this purpose we went to different schools, colleges and villages and we have arranged seminars on its impacts and especially on its handling and treatment. I have shared my work with GARC (Global Alliance for Rabies Control) and One Health Commission. They appreciated our work sincerely. GARC has shown our work on world social media. After hard and sincere work for the humanity i.e. Rabies awareness we have performed survey by using printed form. We became very happy to know that most people given positive response and they knew about rabies, its causes, effects and treatment. Results of our surveys were very impressive. So the conclusion is that Rabies awareness can only prevent the dog bite cases and can save human lives also. Through awareness people also know about healthy dog practices and healthy behavior and importance of vaccine. I hope you will also appreciate us by giving project on rabies and or providing sessions and training.

Name: Débora Nunes de Souza

PP005

Email: deborarhcp@hotmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Rabies in bats and its relationship with rabies in domestic animals in the State of São Paulo, Brazil

Authors: DN de Souza[1], SM Achkar[1], CI Macedo[1], GMM Caporale[1], RN Oliveira[1], RMN Macusso[2], AC Rodrigues[1], JG Castilho[1]

Affiliations: [1]Pasteur Institute, São Paulo, Brazil; [2]Emilio Ribas Institute of Infectology, São Paulo, Brazil

Abstract: Rabies in the State of São Paulo mainly affects production animals and bats, with 90% of cases occurring in bats in urban areas. In light of this problem, the objective of this study was to perform an analysis of the positivity rates for the rabies virus in samples of hematophagous bats (HB) Desmodus rotundus and non-hematophagous bats (NHB) in the State of São Paulo during the period from 2002 to 2016 and related to the transmission of RABV to domestic animals. Of the total of 41,381 HB and NHB samples analyzed between 2002 and 2016 for the diagnosis of rabies, 40,733 (98.40%) were negative, while 648 (1.56%) were positive. The positivity for HB and NHB bats was 1.95% and 1.55%, respectively. This study evidenced that most of the municipalities that presented cases of rabies in HB also presented cases of rabies in herbivores in the same period. In addition, we observed that the number of NHB samples sent for diagnosis is much higher than that of HB samples. It is worth noting that the cities of Ribeirão Preto and Campinas were responsible for 49% of the positive cases of rabies in NHB, totaling respectively 187/626 and 120/626. The two municipalities were the ones that sent the most NHB samples for diagnosis, totaling 45.6% of the samples analyzed during the study period. In addition, these two cities had cases of rabies in dogs and cats caused by bat strains during the analyzed period. Therefore, understanding the importance of bats in the transmission of rabies is essential for continuous surveillance of rabies in these animals and consequently in domestic animals and humans.

Name: Érica Munhoz de Mello

PP006

Email: ericabiologia@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Number of cases, behavior and profile of positive-rabies bats recovered from the urban area of Belo Horizonte, Brazil southeast

Authors: EM Mello

Affiliations: Zoonosis Control Center from Belo Horizonte

Abstract: Following the Brazilian Rabies Surveillance Guidelines, the Zoonosis Control Center from Belo Horizonte (CCZ-BH), Brazil southeast, recovers bats showing atypical behavior to Lyssavirus diagnose. The positive-rabies bats records were compiled from January2004 to December 2018. The CCZ-BH recovered 4201 bats, with 160 positive-rabies specimens. The percentage of positivity ranged annually from 1.73% to 5.67% (mean 3.89%). Of the positive-rabies bats, 103 (64.38%) were found dead, 41(25.63%) were still alive during catch, and 16 (10%) records have no information. Regarding the places where sick animals were found, 78 (48.75%) bats were collected in domiciles, 47 (29.38%) in the street, 29 (18.13%) in public educational or health institutions, 2 (1.25%) in a commercial market and 4 (2.50%) records did not present this information. Most of the positive-rabies bats (98.12%) were found fallen on the ground and for some of these specimens other atypical behaviors were reported before the bat fall, such as daytime and uncoordinated flight. Sixteen bats species were identified with the virus, being 5 species of Phyllostomidae, 5 species of Molossidae and 6 species of Vespertilionidae. The species with the highest positivity for rabies was the frugivorous bat Artibeus lituratus (78.75%), being the only species found infected all years. Among the insectivorous bats, Nyctinomops laticaudatus was the most infected species (5.63%). Two antigenic variants of the virus were identified: antigenic variant 3 (AgV-3) (71.9%) and antigenic variant 4 (AgV-4) (1,3%). Among insectivorous, AgV-4 was found in two adult males of M. nigricans and AgV-3 in an adult female of Tadarida brasiliensis. Among frugivorous, AgV-3was found in one Artibeus fimbriatus, in 108 A. liturarus, in two Artibeus planirostris and in three Artibeus sp.

Name: Fabiola Rodriguez

PP007

Email: fabiola.rodriguez@ica.gov.co

Session: Bat Rabies & Control

Country: Colombia

Title: Rabies in Herbivores in Colombia: current situation

Authors: Fabiola Rodriguez Arevalo

Affiliations: Colombian Agricultural and Livestock Institute (ICA), Colombia

Abstract: In Colombian herbivores rabies is an endemic disease primarily concentrated in the bio-regions of Orinoco, Caribe and the north of the Andean Region. However, some sporadic outbreaks of endemic rabies can occur in other bio-regions. In the bio-regions where rabies is endemic, the main transmitters of the disease are hematophagous bats. Hematophagous bats get infected by rabies in nature and then transmit the disease to population of herbivores of economic importance such as cattle and equines. The Colombian Agricultural Institute ICA has developed a Disease Control Program specific for rabies. The rabies control program carries out strategic vaccinations of bovines since 2018 and equines located in risk areas and population control of hematophagous bats. The implementation of the ICA rabies disease control program, done together with Departmental Health offices, has resulted in a decrease in annual outbreaks of rabies in the endemic bio-regions of the disease.

Name: Gabrielle Thaís Miodutzki

PP008

Email: gabriellemiodutzki@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Rabies diagnosis in bats found in urban areas of Santa Catarina, Brazil

Authors: Gabrielle Thaís Miodutzki, Thiago Tourinho Pereira, Bruna Letícia Devidé Ribeiro, Clóvis Reynaldo Silva Fonseca, Vanessa Cristina Pelícia, Wanderson Sirley Reis Teixeira, Benedito Donizete Menozzi, Jane Megid, Deolinda Maria Vieira Filha Carneiro

Affiliations: Universidade Estadual Paulista "Júlio de Mesquita Filho"

Abstract: Rabies is a zoonosis that causes acute encephalitis and has a high mortality rate. Bats are one of the main reservoirs of the disease and show the symptomatology through behavioral changes, resulting in death. Monitoring the presence of the virus in bats is essential in the current epidemiological picture of urban rabies, where domestic animals can be infected by rabies through bats due to their synanthropic behavior and, secondarily, also humans. Therefore, viral monitoring in bats captured in urban areas makes possible to know the epidemiological status of the disease and, consequently, reduces the risks to public health caused by false evidence of the absence of viral circulation. This surveillance procedure is actually really important in Santa Catarina state, Brazil, a controlled area for urban rabies since 1981, where the diagnosis of all suspicious bats collected in urban areas is used as the main surveillance method. In this context, 81 bats (non-hematophagous) collected from January to December 2017 by passive surveillance in urban areas of Santa Catarina, were analyzed by RT-qPCR. Of all the 81 bats, 4.93% (4/81) of the samples were identified as positive, distributed throughout northern, southern and Itajaí valley regions, attesting viral circulation. One of the positive bats, had contact with a person, who was bitten by an Myotis nigricans, an insectivorous bat, commonly found in urban areas. It should be noted that epidemiological surveillance should accredits the increase in resources designed to disease control and, besides that, the constant sending of samples for diagnosis can act as a positive feedback by highlighting the need for greater investments in sector. Rabies epidemiology in bats should receive increasing attention from government institutions and researchers in order to provide effective control and prophylaxis strategies, avoiding cases of the disease in animals, and especially in humans.

Name: Gabrielle Thaís Miodutzki

PP009

Email: gabriellemiodutzki@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Bats in urban areas of Botucatu, SP (Brazil): importance of rabies surveillance and the one health approach

Authors: Gabrielle Thaís Miodutzki, Evelyn Cristine da Silva, Dayane da Silva Zanini, Caroline Munhoz Cunha, Karine Bott Mantovan, Benedito Donizete Menozzi, Helio Langoni

Affiliations: Universidade Estadual Paulista "Júlio de Mesquita Filho"

Abstract: Bats are one the most studied mammals nowadays since they have the ability to host a lot of pathogens, including the rabies virus. These animals tend to refuge in urban areas due the availability of food and shelters, but this proximity can expose humans and domestic animals to the rabies virus, causing several impacts on public health. In this context, the data of 410 bats collected in urban areas of Botucatu city (São Paulo State, Brazil) by passive surveillance sent for rabies diagnosis on 2019 to the Zoonosis Diagnostic Laboratory of the São Paulo State University were analyzed. All of the bats were non-hematophagous and the most found species was Molossus molossus, an insectivorous bat commonly found in urban areas. Taking in consideration the report written on the files, 122 (29.75%) bats had direct contact with humans (10.65%) or domestic animals (dogs and cats) (89.34%). Off all bats, 6 (1.46%) were positive by Fluorescent Antibody Test and the results were confirmed by Mouse Inoculation Test. One of the positive bats (Artibeus lituratus) had direct contact with a dog and a person was bitten by a Molossus molossus that ended up negative in both tests. These events show the importance of rabies surveillance in its wild cycle and also the need of make pre and post exposure measures available in time to the population. In addition, we can emphasize the need for health education to avoid direct contact with bats and people and also to keep vaccination in domestic animals up to date once the interaction between bats, cats and dogs can happen.

Name: Gustavo Martínez

PP010

Email: zoonosisurbanas@gmail.com

Session: Bat Rabies & Control

Country: Argentina

Title: Rabies spillover detected in a cat, Province of Buenos Aires, Argentina

Authors: D Ceballos Tulián[1], C Vitaliti[1], M Fazio[1], G Piccirilli[2], L Vico[2], S de la Vega[1], C Moreira[1], M Zabalza[3], L Novaro[3], S Russo[3], GH Martinez[2]

Affiliations: [1]Residencia veterinaria en Zoonosis y Salud Pública, Ministerio de Salud de la Provincia de Buenos Aires, Argentina; [2]Departamento Zoonosis Urbanas, Ministerio de Salud de la Provincia de Buenos Aires, Argentina; [3]Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), Ministerio de Agricultura, Ganadería y Pesca de la Nación Argentina

Abstract: Introduction: In Argentina, the rabies virus presents epidemiological cycles and reservoirs defined according to each variant, with variant 4 of the aerial-urban cycle being the most prevalent in the Province of Buenos Aires, whose natural hosts are the Chiropterans of the genus Tadarida brasiliensis, although also others circulate, associated with the species Myotis spp., Eptesicus spp. and Histiotus montanus. The epidemiological analysis of the outbreaks includes the investigation of the viral variant involved and the host that has produced the case, which may be in a different species from the natural host ("spillover" phenomenon), so it is of vital importance to be able to take appropriate preventive actions. Materials and methods: In June 2020, a sample was received from a feline from a rural area of Balcarce, province of Buenos Aires that had bitten one (1) person and had contact with five (5) unvaccinated feral felines. He had neurological signs before his death and tested positive for both the DIF and the biological test (Webster's test). The sample was referred to SENASA discarding variant 1 and 2 by monoclonal antibodies and subsequently to the Department of Virology of the INEI-ANLIS "Dr. C. Malbrán" giving Eptesicus variant, the molecular characterization. Conclusions: Knowing the viral variants allows determining the reservoir that originated the outbreak, detecting spillover phenomena in a timely manner, which provides the necessary tools for active surveillance and the consequent adaptation of local actions by effector zoonoses services, controlling the foci as in this case through adequate human prophylaxis, increasing rabies vaccination coverage in companion animals and the search / elimination of suspicious animals without control, in order to control this virus, which is one of the most lethal known.

Name: Igor Massahiro de Souza Suguiura

PP011

Email: igor.suguiura@sesa.pr.gov.br

Session: Bat Rabies & Control

Country: Brazil

Title: How to enhance bat species identification prior to rabies testing, an experience of the 17th Regional de Saúde, Londrina, Paraná, Brazil

Authors: Igor Massahiro de Souza Suguiura, Vivien Rissato Santos

Affiliations: 17th Health Regional, Londrina, Paraná State Department of Health

Abstract: Bat species identification is very important in order to monitor the occurrence of rabies in the local bat population. In Paraná state, a state in southern Brazil, the bat rabies diagnosis process starts in the municipality, in a zoonosis control center or health surveillance unit, that sends frozen dead bats to the regional specimen reception facility that concentrates samples from several municipalities for shipping to the central public health laboratory. The taxonomy identification relies on trained staff and usually takes place, in our state, in a zoonosis control center. However, if the region does not have such a facility and the taxonomy is not performed in an official lab designed for rabies diagnosis, this information is lost somehow. To overcome this issue our health district, 17th Regional de Saúde, started to identify the bats species in our specimen reception facility prior to being sent for rabies testing. Regional specimen reception facilities could begin to implement this procedure when taxonomy identification is not performed anywhere else. Our proposal produced a reliable identification key for local bat species to promote as accurate identification as possible with minimal handling. The key was based on external characters and in the majority of the species their identification was performed with ease and quickly by our trained staff. It may seem simple but it was an important measure to provide a better monitoring of the occurrence of rabies in our bat population, in a place without any zoonosis control facilities. Such initiatives may be implemented by local surveillance units in the same manner as ours in order to optimize the monitoring of rabies in Chiroptera.

Name: Isabel Bárcenas Reyes

PP012

Email: ibr.mvz@hotmail.com

Session: Bat Rabies & Control

Country: México

Title: Spatial-molecular analysis of paralytic rabies in central Mexico

Authors: Isabel Bárcenas-Reyes[1], Elizabeth Loza-Rubio[2], Germinal Jorge Cantó-Alarcón[1], Jesús Luna-Cozar[1], José Quintín Cuador GIL[3], Marina Durán Aguilar[1], Feliciano Milián-Suazo[1]

Affiliations: [1]Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro, Mexico; [2]CENID–M–INIFAP, Mexico; [3]Universidad de Pinar del Río, Cuba.

Abstract: In central Mexico, in the states of Guanajuato, Querétaro and San Luis Potosí, the number of cases of paralytic rabies in cattle transmitted D. rotundus has been increasing, even reported in traditionally free areas. The influence that environmental variables have in the presentation of cases of rabies has originated the need to study in more detail the phenomenon according to environmental conditions and other factors that directly affect the habitat of D. rotundus or its main host, the bovine. In Mexico, the use of geographic information systems has been based on notified focuses to know the dispersion of the bat and the distribution of the disease, however the patterns of dissemination and potential risk areas associated to climatic factors that impact the occurrence of the number of cases in the region have not been completely determined. The molecular study of rabies virus associated to vampires has been based, mostly, on the phylogenetic analysis of partial sequences of the genome (genes N, G and P) to explain the circulation of the virus in endemic areas of Mexico and to know that the disease remains in marginal focus in subpopulations of vampires and that its gradual propagation is by the sporadic movement of bats due to natural ecological or geographical stress. The use of the complete RV genome provides better differentiation of strains present in a geographic region (Nadin-Davis et al., 2017). The purpose of this study was to determine the geospatial distribution of RP cases transmitted by D. rotundus in the states of Guanajuato, Queretaro and San Luis Potosi, besides characterizing the complete genomic sequence of four VR strains from cattle in the central region of Mexico.

Name: Jaíne Gonçalves Garcia

PP013

Email: jaineggarcia@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: In vitro characterization of different genetic lines of rabies virus isolated from non hematophagous bats

Authors: Jaíne Gonçalves Garcia, Camila Mosca Barboza, Marcélia Emanuele Sad Fernandes, Raphaela Mello Zamudio, Ana Lee Francisco, Karin Corrêa Scheffer, Helena Beatriz de Carvalho Ruthner Batista

Affiliations: Federal University of ABC, Santo André, Brazil

Abstract: Despite advances in research on rabies virus (RABV), there are still gaps to fill, mainly on the biology of RABV and its mechanisms of adaptation to hosts. This work aimed to elucidate aspects about the adaptation and maintenance of RABV in different species of non hematophagous bats. Six RABV isolates were selected. Initially, such RABV samples were subjected to genetic characterization, through RNA extraction, reverse transcription followed by the polymerase chain reaction (RT-PCR) targeting nucleoprotein, genetic sequencing and phylogenetic analysis. Bat species were genetically identified through DNA extraction, PCR targeting cytochrome oxidase I (COI) from mitochondrial DNA (DNAmt) and subsequent sequencing and phylogenetic analysis. After selection and characterization, the samples were subjected to intracerebral inoculation in Swiss albino mice and later adapted to in vitro growth in human embryonic kidney cells (HEK 293T). Each serial passage in the cells was subjected to the Direct Immunofluorescence Antibody test (DFAT). The following RABV genetic lineages were identified: frugivorous bat Artibeus lituratus, insectivorous bats Eptesicus furinalis and Tadarida brasiliensis. With the genetic identification of species, it was possible to identify that each genetic lineage of RABV was maintained by the respective species of bat. Ten successive passages of the samples were performed in HEK 293 cell line and all six samples could be adapted to the cell culture. For the kinetics tests, were performed viral penetration test and viral growth curve and the results showed significant differences from the samples in the viral penetration phase. However, the samples did not obtain significant differences in the phase of viral growth. With the knowledge acquired from each RABV genetic strain in this study, it is possible to propose improvements in the diagnosis of rabies as well as in surveillance to control the disease specifically in these species.

Name: Jarier de Oliveira Moreno

PP014

Email: jarier_vet@msn.com

Session: Bat Rabies & Control

Country: Brazil

Title: Livestock rabies outbreaks in Ceará, Brazil: prevention of human rabies in rural environment

Authors: Jarier de Oliveira Moreno[1,3], Francisco Roger Aguiar Cavalcante[1,2], Kellyn Kessiene de Sousa Cavalcante[1,2], Reagan Nzundu Boigny[1], Carlos Henrique Alencar[1]

Affiliations: [1]Universidade Federal do Ceará, Faculdade de Medicina, Programa de Pós-Graduação em Saúde Pública, Fortaleza, CE, Brasil; [2]Secretaria de Saúde do estado do Ceará – SESA; [3]Agência de Defesa Agropecuária do estado do Ceará – ADAGRI

Abstract: Introduction: The study described characteristics and factors associated with rabies outbreaks in Livestock Ceará, Brazil, from 2015 to 2019. Methods: Cross-sectional descriptive and analytical study was carried out using records from state's livestock authority (Adagri), regarding investigations on rural properties. Prevalence ratios and their 95% confidence intervals were calculated, as well as Person's chi-square or Fisher's exact tests, with an error of 5%. Results: 244 farms and 304 animals were inquired, 41.4% (n = 101) properties and 35.9% (n = 109) animals were positive for rabies. The year 2015 registered prevalence 3.5 times higher than 2019 (PR = 3.5; 95% CI: 1.76 to 6.93). Properties in direct contact of suspect animals with humans had 40% higher prevalence (PR = 1.4; 95% CI: 1.01 to 2.06). Properties with vaccinated animals were 50% less prevalent (PR = 0.5; 95% CI: 0.34 to 0.81). Main surveillance actions were isolation of animals (n = 67; 62%) and monitoring of hematophagous bat (n = 47; 67.1%). Northwest of the state was 2.8 more prevalent than the central region (PR = 2.8; 95% CI: 1.28 to 6.32). 47.2% (n = 85) of cattle were positive and animals used for milk production were 2.4 more prevalent than those used at transport work (PR = 2.4; 95% CI: 1.36 to 4.38). 46.9% (n = 32) of animals with clinical changes in posture / locomotion were positive. Properties close to hematophagous bat were 2.7 times more prevalent (PR = 2.7; 95% CI: 1.71 to 4.13). Conclusions: Livestock rabies is endemic in state, associated with higher risk regions and direct contact with rural producers, in addition to proximity to hematophagous bat. Species, age and livestock farming were risk factors the occurrence of cases in the rural environment.

Name: Jimena Vidal

PP015

Email: zoonosispasteur@gmail.com

Session: Bat Rabies & Control

Country: Argentina

Title: Monitoring of canines and felines exposed to rabies by contact with insectivorous bats, January 2017-July 2020, Autonomous City of Buenos Aires

Authors: Laura Gramajo, Jimena Vidal, Adriana Faigenbaum, Diego Brambati

Affiliations: Luis Pasteur Institute of Zoonosis, Buenos Aires, Argentina

Abstract: The epidemiological situation of rabies in the City of Buenos Aires is characterized by the absence of viral circulation in canines and felines, maintaining an enzootic cycle mainly in colonies of the chiropter Tadarida brasiliensis, with the potential risk of the passage from the air cycle to the terrestrial (spill over). The Luis Pasteur Zoonosis Institute (IZLP) develops actions related to the diagnosis, surveillance, prevention and control of rabies in domestic and synanthropic reservoirs. The annual incidence of rabies in CABA bats referred to the IZLP is approximately 5%. The control actions in canines and felines with exposure to positive bats or without the possibility of analysis, are developed according to protocols adapted from the National Guide for the Prevention, Surveillance and Control of Rabies. The current epidemiological scenario allows the control of exposed animals without a history of rabies vaccination to be carried out for 4 months in strict isolation conditions under the supervision of IZLP veterinarians, as well as the home monitoring of animals with a current or expired vaccine at the time of the exposure. In the latter case, the measurement of rabies antibodies post-exposure (1st sample) and after 5-7 days (2nd sample) is indicated. All animals are vaccinated after challenge regardless of their vaccination status. From January 2017 to July 2020, 68 canines and 132 felines with exposure to chiroptera were followed, during a period of 45 days to 4 months depending on the validity of the vaccine, post-exposure revaccination date, and anti-rabies antibody titer. 113 animals presented a titer equal to or greater than 0.5 IU / ML in the 1st or 2nd sample. Isolation conditions and the appearance of signs compatible with rabies were evaluated. Two felines and one canine died during follow-up with a negative rabies diagnosis. No animals developed the disease.

Name: Jorge Miret

PP016

Email: jorgemiret@gmail.com

Session: Bat Rabies & Control

Country: Paraguay

Title: Interventions for rabies control outbreaks by the national program of zoonoses control and rabies national center in Paraguay (2019-2020)

Authors: Ramón Recalde[1], Luz Marina Delgado[1], Juan Trinidad[1], Guzmán Sienra[1], Mirtha Colmán[2], Gladys Riquelme[2], Antonio Rodríguez[3], Aurelio Fiori[1], Maycol Argüello[1], Lorena Jara[1], Jorge Miret[4]

Affiliations: [1]Programa Nacional de Control de Zoonosis y Centro Antirrábico Nacional (PNCZyCAN), Ministerio de Salud Pública y Bienestar Social, San Lorenzo, Paraguay; [2]Servicio Nacional de Calidad y Salud Animal (SENACSA), San Lorenzo, Paraguay; [3]Laboratorio de Diagnóstico Veterinario (CEDIVEP), San Lorenzo, Paraguay; [4]Servicio Nacional de Erradicación de Enfermedades Transmitidas por Vectores (SENEPA), Asunción, Paraguay

Abstract: Rabies is a zoonotic disease, causes by a virus from the Lyssavirus genus of the Rhabdoviridae family, which infects mammals and causes fatal encephalitis. The Paraguayan Program for Rabies Control in herbivores aims to prevent the disease in cattle by focusing on the control of vampire bats (Desmodus rotundus), strategic vaccination and epidemiological surveillance of animal's rabies outbreaks cases based in the vaccination of human, dogs and cats exposed to the virus. Veterinary immunization is mostly provided by the Public Veterinary Services in coordination with the local municipalities; private veterinary services also provide vaccination. The last case of human rabies in Paraguay was in 2004. The aim of this study was to show the interventions for rabies control outbreaks occurred from 2019 to July of 2020 in Paraguay. There were notified by the National Service of Quality and Animal Health (SENACSA), the National Program of Zoonoses Control and Rabies National Center and the Veterinary Diagnostic Laboratory (CEDIVEP), 110 cases of animal's rabies (99 cattle, 1 dog, 4 horses, 1 sheep, 1 goat and 4 vampire bat) from all the 17th departments of the country. There were vaccinated with Verorab® Sanofis®, France, vaccine against rabies in humans, 359 persons that were exposed to the virus (farmers, animal's owners), and 3268 dogs and cats living in a ratio of 5 kilometers around the animals rabies case were immunized with the Rai-vet®, Biovet®, Brazil veterinary vaccine against rabies. Implementation of control measures for rabies we recommend. Aggressive interventions that include regular animal's vaccination campaigns for farmers and dogs and cat's owners, improvement in vaccines provision for humans and animals, accompanied by regular campaigns of education in communities and sanitary professionals in public health centers for appropriate prevention and control strategies against rabies were carried out.

Name: Juan Carlos Camacho Martinez

PP017

Email: camacho-66@hotmail.com

Session: Bat Rabies & Control

Country: Mexico

Title: Bovine rabies in the State of San Luis Potosí (Mexico): an analysis from the perspective of the laboratory 1992-2019

Authors: Juan Carlos Camacho Martinez

Affiliations: Zoonosis Laboratory, San Luis Potosí, Mexico

Abstract: [No English abstract submission; English from Google Translate]
In the state of San Luis Potosí, the diagnosis of this zoonosis is carried out by the Zoonosis laboratory dependent on the LESP, which has the recognition of technical competence and has released the diagnosis by IFD, since 2013. Activities began in June 1991; The first cases began in 1992. Until 1999, 30 samples of bovine were analyzed, obtaining 17 positive, affecting 11 municipalities, with 8 cases in the capital and neighboring municipalities and 3 in the Huasteca area, in this period the Antigenic Characterization was not available in Mexico, it is inferred that these 8 cases were caused by dogs, since in those years there were an average of 40 annual cases of rabies in dogs and cats, controlled in 1996. The 3 cases of the Huasteca are suspected of hematophagous bat. Increasing, to a total in the state of 44 municipalities affected from 1992 to 2019. From 2000-2019, 1,443 samples were processed with 879 positives, 700 of them characterized. Variable V11 predominates by 98%. This work tries to show the progress of bovine cases in the state, indicating the municipalities affected by periods: 1992-1999, 2000-2005, 2006-2010, 2011-2015 and 2016-2019, in the state of San Luis Potosí. Through maps and tables. This due to Desmodus Rotundus; According to the variable found, affecting animals of Economic interest such as Equine, Caprine, sheep and Wild fauna: mustelids, there is a latency of transmission to humans.
Decreasing samples in 2019 due to the fact that from now on they are only received with contact with someone, this has lowered those of positive diagnoses.

En el estado de San Luis Potosí el diagnóstico de esta zoonosis se realiza laboratorio de Zoonosis dependiente del LESP, El cual cuenta con el reconocimiento a la competencia técnica y tiene liberado el diagnóstico por IFD, desde 2013. Se inició actividades en Junio de 1991; los primeros casos comenzaron en 1992. hasta 1999 se analizaron 30 muestras de bovino obteniéndose 17 positivas afectando a 11 municipios, con 8 casos en la capital y municipios aledaños y 3 de la zona huasteca, en este periodo no estaba disponible en México la Caracterización Antigénica, se infiere que estos 8 casos fueron causados por perro, ya que en esos años se tenía en promedio 40 casos anuales de rabia en perros y gatos, controlada en 1996. Los 3 casos de la huasteca se sospecha por murciélago hematófago. Incrementándose, hasta un total en el estado de 44 municipios afectados desde 1992 a 2019. De 2000-2019 se procesaron 1443 muestras con 879 positivas caracterizándose 700 de ellas. Predominando en un 98 % la variable V11. El presente trabajo trata de mostrar el avance de los casos de bovino en el estado señalando los municipios afectados por periodos: 1992-1999, 2000-2005, 2006-2010, 2011-2015 y 2016-2019, en el estado de San Luis Potosí. Mediante mapas y tablas. Esto debido al Desmodus Rotundus; según la variable encontrada, afectando animales de interés Económico como Equino, Caprino, ovino y fauna Silvestre: mustélidos, existiendo la latencia de la transmisión a humanos. Disminuyendo muestras en 2019 debido a que a partir de aquí solo se reciben con contacto con alguna persona, esto ha bajado los de diagnósticos positivos.

Name: Juliana Arena Galhardo

PP018

Email: juliana.galhardo@ufms.br

Session: Bat Rabies & Control

Country: Brazil

Title: Identification of bats and antigenic variants of rabies virus in the urban area of Campo Grande, Mato Grosso do Sul, Brazil

Authors: Juliana Arena Galhardo, Sallene da Silva Maciel, Julia Vasconcelos Rossin Andrade do Nascimento, Guilherme Douglas Piel Dornelles, Danielle Ahad das Neves, Mariana Pereira Alexandre

Affiliations: Federal University of Mato Grosso do Sul, Brazil

Abstract: Rabies is a viral zoonotic encephalomyelitis, with lethality close to 100%. With greater control of urban rabies transmitted by dogs and cats through vaccination in Brazil, rabies transmitted by bats becomes an important mechanism for the perpetuation of the disease. The objective of this research was to identify bats and antigenic variants of the rabies virus circulating in the municipality of Campo Grande-MS from samples processed between March and July 2018 by the Animal Disease Diagnosis Laboratory of the State Agency for Animal and Plant Health Defense (IAGRO). Positive samples by direct immunofluorescence and mouse inoculation test were subjected to molecular analysis (RT-PCR), sequencing and phylogenetic analysis. In the period, 167 samples were analyzed, from several urban buildings in the municipality. Of these, four were positive for rabies virus. Two bats belonged to Nyctinomops laticaudatus and Myotis albescens species, and two belonged to Family Molossidae, all insectivorous and male bats. RT-PCR amplified only one of the samples. Phylogenetic analysis showed homology with Brazilian isolates obtained from other insectivorous bats, especially N. laticaudatus. The results of this research demonstrate that the transmission of rabies by insectivorous bats in the urban area of Campo Grande is possible and imminent. The virus was isolated from bats in the central area and in the eastern and northern regions, showing heterogeneity in the distribution and possible maintenance of the virus in several regions of the city. The phylogenetically analyzed sample showed homology with other Brazilian insectivorous bat isolates, suggesting the existence of a variant of RABV not classified by the CDC panel. Further studies are needed to define the complexity of rabies virus interactions with bats in the urban area of Campo Grande in order to mitigate the risks of transmission to people and animals and ensure the preservation of bats, promoting one health approach.

Name: Juliana Galera Castilho Kawai

PP019

Email: juliana.castilho@uol.com.br

Session: Bat Rabies & Control

Country: Brazil

Title: An investigation of rabies virus study genetic lineages specific to the bats Desmodus rotundus and Artibeus spp. using the sequencing by ILLUMINA MISEQ platform

Authors: JG Castilho[1], DN de Souza[1], PF Asprino[2], F Bettoni[2], CI Macedo[1], SM Achkar[1], WO Fahl[1], PE Brandão[3], RN Oliveira[1]

Affiliations: [1]Pasteur Institute, São Paulo, SP, Brazil; [2]Centro de Oncologia Molecular, Hospital Sírio-Libanês, São Paulo, SP, Brazil; [3]Departaments of Preventive Veterinary Medicine and Animal Health, School of Veterinary Medicine and Animal Science, University of São Paulo, São Paulo, SP, Brazil

Abstract: In South and Southern Brazil, dog and cat rabies caused by the canine lineage, corresponding antigenic variant 2 (AgV2), is under control. However, these animals are sporadically found infected with bat lineages of RABV, mainly the Desmodus rotundus/Artibeus spp. lineage (AgV3). Until now, researches based on the N and G genes, demonstrate the possibility of phylogenetic differentiation of these lineage (D.rotundu/Artibeus spp.) between Artibeus spp lineage and D. rotundus lineage, however, further studies proved necessary to confirm this association. To this end, this study analyzed 90 rabies virus isolates (46 related to D. rotundus and 44 to Artibeus spp), all from São Paulo State. These strains were submitted to random ds-cDNA synthesis and deep sequencing in Illumina MiSeq™ and genomes assemble were then used to genomic and gene phylogenies. In this study were obtained 70 almost complete genomes sequences which were used for the construction of maximum likelihood phylogenetic trees in the software Mega 7 using each gene separately and all genes concatenated. In all phylogenetic trees, the samples grouped in the same four clusters, two clusters D. rotundus and two clusters Artibeus ssp. It is worth lightning that preliminary results demonstrate that probably different D. rotundus lineages are the ancestors of the two strains of Artibeus spp., which suggests that the two lineages of Artibeus spp. are not related to each other and are the result of independent differentiation events from different common ancestors. This data help to find the source of infection in domestic animals and consequently collaborate with epidemiological surveillance actions. Financial Support: FAPESP – 18/16000-3

Name: Karina Gatti de Abreu

PP020

Email: karinagattiabreu@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Environmental education on ecological importance of bats and rabies control in urban spaces, Fortaleza, Ceará, Brazil

Authors: Karina Gatti de Abreu[1], Raphael William Ponte Neres[1], Tatiane de Aguiar Sousa[1], Israeli Gomes de Souza[1], Camila Nascimento Dias[1], Verônica Moraes Campelo[2], Naylê Francelino Holanda Duarte[3]

Affiliations: [1]Humanitarian Environmental Education Association for Animal Welfare, Responsible Guard and Wild Animals – BEAGUARAS, Fortaleza, Ceará, Brazil; [2]State University of Ceará, Veterinary Medicine School, Fortaleza, Ceará, Brazil; [3]Federal University of Ceará, Medical School, Fortaleza, Ceará, Brazil

Abstract: Bats are fundamental to the health of ecosystems, being considered natural reforesters, agricultural pests predators and disease vectors. However, due to human interference, these animals seek refuge in urban centers, causing greater interaction with the population. Bats play an important role in the transmission of rabies, being considered the main reservoirs of the virus and being responsible for the last human case that occurred in Ceará, in 2016. Because they are not aware of the danger, children end up exposing themselves to more risk, becoming more vulnerable to zoonoses. This highlights the importance of developing environmental and health education activities on rabies, elucidating the ways of preventing aggressions and post-exposure care. Therefore, this work aims to describe the actions taken on ecology and the bats' role in rabies transmission in Fortaleza, Ceará. The study is descriptive, based on the actions carried out in parks, schools and zoos in Fortaleza. Instruments and tactics were used to mobilize in children a parallel between emotion and reason, using playful methodologies through interactive games, puzzles, plays and facial paintings. In addition, an oral presentation by veterinarians showed properly preserved specimens. Information about myths and beliefs, demystification, prevention of aggressions, post-exposure care, as well as the role of bats in the transmission of rabies were passed on. A positive feedback is observed, as the public is able to answer questions and interact dynamically, demonstrating that they have acquired knowledge about this subject. Environmental and health education is extremely important for children, as they are an audience whose cognition is under development. In addition, they have a greater capacity to adapt to new intellectual and behavioral skills in the social context, making them disseminators of information on conservation and prevention of rabies transmitted by bats.

Os morcegos desempenham papel fundamental para a saúde dos ecossistemas, sendo considerados reflorestadores naturais, predadores de pragas agrícolas e vetores de doenças. Porém, devido às interferências humanas, esses animais buscam refúgio nos polos urbanos, causando maior interação com a população. Os morcegos desempenham importante papel na transmissão da raiva, sendo considerados os principais reservatórios do vírus e transmissores do último caso humano ocorrido no Ceará, em 2016. Por não ter a percepção do perigo, as crianças acabam se expondo mais ao risco, tornando-se mais vulneráveis às zoonoses. Evidenciando desta forma a importância de se desenvolver atividades de educação ambiental e sanitária sobre raiva, elucidando as formas de prevenção de agressões e os cuidados pós exposição. Portanto, este trabalho objetiva descrever as ações realizadas sobre ecologia e o papel dos morcegos na transmissão da raiva em Fortaleza, Ceará. O estudo é do tipo descritivo, tendo como base as ações realizadas em parques, escolas e zoológicos de Fortaleza. Foram utilizados instrumentos e táticas para mobilizar no público infantil a emoção em paralelo à razão, com metodologias lúdicas através de jogos interativos, quebra-cabeças, peças teatrais e pinturas faciais, além de uma apresentação oral com espécimes devidamente conservados, manipulados por eterinários. Foram repassadas informações sobre mitos e crenças, desmistificação, prevenção de agressões, cuidados pós exposição, assim como o papel dos morcegos na transmissão da raiva. Percebe-se um retorno positivo, pois o público consegue responder aos

questionamentos e interagir de forma dinâmica, demonstrando que adquiriram conhecimentos, sobre o que foi repassado. A educação ambiental e sanitária é de extrema importância para crianças, pois trata-se de um público cuja cognição encontra-se em desenvolvimento, além de possuírem maior capacidade de adaptação às novas competências intelectuais e comportamentais no contexto social, tornando-os disseminadores de informações sobre conservação e prevenção da raiva transmitida por morcegos.

Name: Karine Bott Mantovan

PP021

Email: karine.bott@unesp.br

Session: Bat Rabies & Control

Country: Brazil

Title: Geographic distribution of Desmodus rotundus: the implications in cases of rabies in cattle and phylogenetic analysis of viral isolates in the Midwest region of the state of São Paulo

Authors: Karine Bott Mantovan, Benedito Donizete Menozzi, Lais Moraes Paiz, Ana Carolina Yamakawa, Mariana Guimarães Nilsson, Evelyn Cristine da Silva, Gabrielle Thaís Miodutzki, Anaiá da Paixão Sevá, Paulo Eduardo Brandrão, Helio Langoni

Affiliations: UNESP-Sao Paulo State University, Faculty of Veterinary Medicine and Animal Science, Botucatu, Brasil

Abstract: In Brazil, rabies in cattle transmitted by the hematophagous bat (Desmodus rotundus), economic burden of 15 million dollars annually. Anthropogenic changes in the environment are responsible for the increase in the number of this species of chiropteran, expanding the disease in cattle. Some regions of the country, such as the state of São Paulo, have annuals outbreaks. From 2016 to 2018, 269 bovine brain materials were received in the Zoonosis Diagnostic Service (SDZ) - UNESP / Botucatu for the diagnosis of rabies by fluorescence antibody and mouse inoculation test. All 104 positive samples, of 25 municipalities in the Midwest region of the state of São Paulo, were georeferenced and statistically analyzed, in addition to molecular and phylogenetic analysis. The spatial analysis shows that there is a relationship between the location of the properties, where the disease occurs, with the previously registered D. rotundus colonies, and that the annual outbreaks are mainly related to maternity colonies (42.63%) and males (44, 88%). Artificial shelters correspond to 85.19%, revealing a predilection for the choice of shelters close to the food source. The introduction and disorderly removal of cattle in a previously controlled area are indicative of virus dispersion, corroborated by the statistical analysis of rabies cases in the studied period. In the phylogenetic analysis, 4 important subclusters were formed, indicative of the genetic diversity of the virus and a possible viral regionalization. In addition to the direct risk with D. rotundus, indirect exposure to the virus through contact with suspected herbivores occurred in 84 people, showing a serious public health problem. Rigorous control measures must be considered by the competent authorities. A review of the current policy of vaccination of rabies in herbivores, which isn't compulsory, even in endemic areas, and investment in epidemiological surveillance of rabies in herbivores, with health education activities.

Name: Marcélia Emanuele Sad Fernandes

PP022

Email: marceliaemanuele@hotmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Antigenic and molecular characterization of the phosphoprotein of the non-hematophagous isolated rabies virus Eptesicus furinalis

Authors: Marcélia Emanuele Sad Fernandes, Paulo Vitor Marques Simas, Camila Mosca Barboza, Jaíne Gonçalves Garcia, Willian de Oliveira Fahl, Adriana Candido Nasraui, Juliana Galera Castilho Kawai, Rafael de Novaes Oliveira, Pedro Carnieli Junior, Samuel Paulo Cibulski, Lívia de Moraes Bomediano Camillo, Sergio Sasaki, Paulo Michel Roehe, Helena Beatriz de Carvalho Ruthner Batista

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: Rabies is a zoonosis caused by rabies virus (RABV), an RNA virus member of the Rhabdoviridae family, Lyssavirus genus. The main reservoirs of the disease belong to the Carnivora and Chiroptera orders. With the control of rabies in dogs and cats, bats have become predominant in the epidemiology of rabies. RABV can be identified in different species of bats, and the maintenance of the disease in these animals currently represents a challenge in public health. The study described below sought to contribute to the understanding of rabies dynamics in these bats given the importance of these animals in maintaining and spreading rabies. Sample IP964/06 of RABV isolated from the non-haematophagous bat Eptesicus furinalis was analysed after 10 successive passages in mice. This study evaluated the antigenic and genetic stability of the phosphoprotein of RABV, performed sequencing of the complete genome of RABV and characterized the three-dimensional (3D) structure of the RABV phosphoprotein. In the antigenic analysis, all successive passages were submitted to indirect immunofluorescence with a panel of monoclonal antibodies (Mabs) raised specific against the phosphoprotein of RABV, and no alterations in antigenic profile were identified. Genetic analysis revealed that the non-synonymous change in the amino acid 222 initially identified by Batista et al. (2015) occurred after three successive passages of the virus. The first and fifth passages were still submitted to sequencing of the complete genome; however, other alterations in the genome were not identified, with only the non-synonymous mutation at amino acid 222. In the analysis of the 3D structure of the original and mutated phosphoproteins, the results showed that the mutation can change the flexibility and interaction where it occurs, but it does not seem capable of drastically affecting the function of the protein. The mutation can happen by chance; however, maintenance indicates that it can benefit the adaptation of the virus to this species of bat. Studies on the adaptation of RABV to a specific species are still scarce, which reinforces the importance of this study. Our results highlight the need for further studies on the adaptation of RABV to different species, deepening the understanding of the adaptive and evolutionary aspects of RABV in non-haematophagous bats to complement the identification of different genetic lineages of RABV.

Name: Ornela Chávez Inagaki

PP023

Email: ornela.chavez@upch.pe

Session: Bat Rabies & Control

Country: Peru

Title: Epizootic of wild rabies on domestic animals in the North region of Peru

Authors: O Chávez, J Arévalo, M Arrieta, JL Bustamante

Affiliations: Ministry of Health, Peru

Abstract: In Peru, the circulation of urban rabies is focused on the southern region of the country (departments of Puno and Arequipa). Wild rabies persists in the Amazon and Andean region. However, since October 2019, an epidemic has originated in the Northwest region, in the Olleros town, located in Ayabaca province, on the western of the Andes chain (highest area of the Piura department), 20 km from the border with Ecuador and south-east of Cajamarca department where also cases of wild rabies were registered. The main economic activity in Ayabaca is husbandry. This area had no background of rabies, for this reason, farmers thought their animals died from other diseases. To date, more than 80 ruminants, a horse and a donkey have been found dead on suspicion of rabies transmited by bats and due to mandatory immobilization by the COVID-19 pandemic, it was difficult to transport samples for laboratory diagnosis in the national territory. The dead cattle were between six months and one year old. From May to July 2020, there were eight samples of animals positive for rabies in other localities of Ayabaca, which would indicate that the outbreak continues. Through epidemiological investigation, the circulation of wild rabies transmitted by bats was confirmed, the death of numerous animals and more than 30 contact persons were identified and started rabies vaccination. So far, a total of 4,308 ruminants have been vaccinated in the area, the training of people at risk has been strengthened, human and susceptible animal vaccination, disposal of dead animals, the search for caves and places where bats inhabit, the mapping of focus areas and risk for other outbreaks continues. The authorities of Peru and Ecuador, with the support of Non-Governmental Organizations are coordinating the rabies prevention and control activities in the area.

En el Perú, existe la circulación de rabia urbana focalizada en la región Sur de país (departamentos de Puno y Arequipa). La rabia silvestre persiste en la región Amazónica y Andina. Sin embargo, desde octubre de 2019, se ha originado una epidemia en la en la región Noroeste, en la localidad de Olleros, ubicado en la provincia de Ayabaca, sobre la cadena occidental de los Andes (zona más alta del departamento de Piura), a 20 Km de la frontera con Ecuador, donde hubo casos de rabia silvestre; al Sur limita con las provincias de Morropón y Huancabamba; por el Oeste con las provincias de Piura y Sullana. La principal actividad económica en Ayabaca es la agricultura. Esta zona no tenía antecedentes de rabia. Hasta la fecha, se ha identificado más de 80 rumiantes, un caballo y un burro muertos bajo sospecha de rabia y debido a la inmovilización obligatoria por la pandemia por COVID-19, era difícil transportar muestras para el diagnóstico de laboratorio. De mayo a julio de 2020, hubo 8 muestras de animales positivas a rabia en otras localidades de Ayabaca, lo que indicaría que el brote continúa. Mediante investigación epidemiológica, se confirmó la circulación de rabia silvestre transmitida por murciélagos, se identificó la muerte de numerosos animales y más de 30 personas contacto que iniciaron vacunación antirrábica. Hasta el momento, se ha vacunado un total de 4,308 rumiantes en la zona, se ha fortalecido la capacitación de personas en riesgo, continúa la vacunación humana y en animales susceptibles, la búsqueda de cuevas y lugares donde habitan los murciélagos, el mapeo de zonas de foco y de riesgo para otros brotes. Las autoridades de Perú y Ecuador con el apoyo de ORAS-CONHU, OPS Y PANAFTOSA, viene coordinando las actividades de prevención y control de la rabia en la zona.

Name: Paula Costa Lis

PP024

Email: paulalis22@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Importance of a zoonoses surveillance department in monitoring the urban bats rabies virus

Authors: Paula Costa Lis, Luis Eduardo da Silveira Delgado

Affiliations: Municipal Surveillance of Zoonoses

Abstract: The monitoring of the circulation of the rabies virus in chiropterans in urban areas in Brazil is based on passive surveillance, a function developed by the Unified Health System (SUS). Cascavel is a Brazilian municipality, with an estimated population of 328,454 inhabitants, founded in 1961, located in the western region of the state of Paraná, in the southern region of the country. The city has records in the public health system, for the collection and analysis of chiropterans, suspected of rabies in the urban area since 2010, with the following data (number of positive samples for the rabies virus / number of samples collected): 0/2 in 2010, 0/1 in 2011, 0/2 in 2012, 0/1 in 2013, 0/6 in 2014, 0/8 in 2015, 2/22 in 2016, 0/138 in 2017 and 1*/99 in 2018, 0/70 in 2019 and 2/37 until august 2020. The analysis are performed by the Central State Laboratory (LACEN). Although the collection of suspicious bats has existed in the municipality's health service since 2010, the significant increase in the number of samples was observed from the year 2016, with the implementation of a surveillance service in zoonoses in the municipality, the Zoonoses Control Sector, which opened in 2014 and became a reference in monitoring urban rabies in 2016. The Sector also provides guidance on how to evict colonies and has prepared a leaflet with guidance on rabies surveillance in bats. The data reveal the importance of the existence of referral services in zoonoses, mainly in the surveillance of the circulation of the rabies virus in urban chiropterans, and show that there was underreporting of suspected and positive bats in the city. *(Chiroptera identified as Lasiurus cinereus).

Name: Valéria Gentil De Tommaso

PP025

Email: valeriatommaso@yahoo.com.br

Session: Bat Rabies & Control

Country: Brazil

Title: Rrabies and the management of a large colony of the insectivorous bat Nyctinomops laticaudatus (Molossidae) in southeastern Brazil

Authors: VG Tommaso, LMR Passos, PHF Teles, KC Scheffer, AR Rosa, RAA Pires, RD Azevedo, SCP Andrade, WO Fahl, SM Pacheco, A Piovezani, SB Franco, W Uieda

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: The presence of bats in urban areas results in many ecological benefits, as well as many inconveniences. We report here the conflicts caused by a colony of 2,000 Nyctinomops laticaudatus sheltered under 2m-wide zinc plates at a height of 15m, which were fixed to the external vertical walls of an urban building in the city of Ribeirão Preto, Southeastern Brazil. Bats flew in and out of the gaps formed under these plates, which resulted in feces and diseased bats falling on neighboring houses, a strong smell, vocalizations and flights at sunset. Between 2017 and 2019, 16 bats from this colony (in a sample of 42) tested positive for rabies. The Instituto Pasteur/SP organized an interdisciplinary and interinstitutional group to formulate strategies and actions to minimize health and environmental risks caused by this colony. Monitoring demonstrated that part of the colony moved to a different area in July/August, which was recognized as the most propitious period for eviction. Due to the height and size of the colony, the team responsible for removing the bats underwent preexposure rabies prophylaxis, and received Personal Protective Equipment and orientation. The zinc plates were sealed with asphalt blankets to remove gaps. For 10 days, two 1m-wide openings with a plastic cover allowed individuals to leave but hindered their return. During this period, the number of bats and the amount of feces in the neighboring buildings decrease expressively, until vocalizations and bats leaving the shelters were no longer perceived. Later on, the plastic cover was removed and the two remaining openings were sealed. The human population of this area was informed and educated, and 239 dogs and 78 cats were vaccinated against rabies. Thus, the group concluded the eviction of a large synanthropic colony, without risks to public health and with apparently little impact on the bats.

Name: Vanessa Lopes da Cunha

PP026

Email: vanessalopesgmv@gmail.com

Session: Bat Rabies & Control

Country: Brazil

Title: Characterization of rabies in herbivores, Ceará, Brazil, from 2014 to 2019

Authors: Vanessa Lopes da Cunha[1], Israeli Gomes de Souza[1], Juliana de Carvalho Xavier[1], Naylê Francelino Holanda Duarte[2], Maria Verônica Moraes Campelo[3]

Affiliations: [1]Humanitarian Environmental Education Association for Animal Welfare, Responsible Guard and Wild Animals – BEAGUARAS, Fortaleza, Ceará, Brazil; [2]Federal University of Ceará, Medical School, Fortaleza, Ceará, Brazil; [3]State University of Ceará, Fortaleza, Ceará, Brazil

Abstract: In Brazil, environmental conditions contribute to the increasement of the population of hematophagous bats, creating a potential risk of disease transmission, especially rabies. The notification of rabies cases in cattle serves as an indicator of the presence of the hematophagous bat Desmodus rotundus, the main transmitter of rabies virus to herbivores, responsible for causing great economic losses. Therefore, the objective of this work is to describe the scenario of rabies in herbivores in Ceará, from 2014 to April 2019 *. A descriptive study was carried out, based on secondary data provided by the Ceará State Health Department - SESA and ADAGRI, with analysis of the following variables: year, municipalities of occurrence and affected species. From 2014 to 2019, 75 cases of rabies-positive herbivores were recorded in the state of Ceará. Of these, 68 (90.67%) were in cattle, one (1.33%) in equine, two (2.67%) in sheep and four (5.33%) in donkeys and mules. During the studied period, the bovine species, presented greater positivity, followed by donkeys and mules, sheep and horses. The largest record of rabies cases in herbivores occurred in 2015 (48.53%), followed by 2017 (19.12%) and 2018 (16.18%). The municipalities with the highest incidence of cases were Aurora with 17 (22.67%), Crateús with 6 (8%) and Aratuba with 4 (5.33%). Although it is a disease that has low or no probability of transmission by herbivores to other species, the incidence of cases is essential to characterize the presence of Lissavirus circulating in rural areas. And, based on that, it is possible to characterize the areas of greatest risk of disease transmission by Desmodus rotundus to humans. In need of strengthening the surveillance of human beings, through focal monitoring and educational actions with the population, preventing the emergence of human cases.

Name: Aline Garcia Casteleti

PP027

Email: aline.casteleti@unesp.br

Session: Canine Rabies & Control

Country: Brazil

Title: Circulation of owners in vaccination stations against rabies of dogs and cats: logistics or cultural habit?

Authors: Aline Garcia Casteleti, José Carlos de Figueiredo Pantoja, José Rafael Modolo, Cassiano Victória

Affiliations: Faculdade de Medicina Veterinária e Zootecnia (FMVZ) Unesp, Câmpus de Botucatu

Abstract: Rabies is responsible for hundreds of deaths and post-exposure treatments over the years. The most effective form of prevention and control is the vaccination of dogs and cats in urban areas, aiming at the epidemiological interruption of disease transmission. As a result, good planning of activities is essential for campaigns to fulfill their role of protecting human and animal health. For the preparation of the study, the information contained in a database obtained during the vaccination campaigns of the municipalities of Botucatu / SP and Lençóis Paulista / SP, pioneer cities in the implementation of such activities in Brazil, was used. The information collected was entered into electronic spreadsheets and arranged in categories according to the city and sector. Then, a descriptive analysis was carried out through the distribution of the frequencies of vaccinated dogs and cats in the two municipalities, figured through the vaccination rate, as well as the elaboration of a graphic statistic through the basis of histograms and diagrams. A model of repeated measures was used to compare the vaccination rate between periods of the day and municipalities and the Tukey test was used to adjust the P-values resulting from multiple comparisons. The results obtained reveal that there was a significant discrepancy in the vaccination rate between species and at different times of the day in the participating municipalities, and during the weekends the peak of vaccination occurs around 1:00 pm to 5:00 pm, while during the week the biggest movement is registered in the period from 09:00 to 13:00. Based on this information, the results of the present study can assist the teams responsible for the logistics of campaign activities, especially those aimed at controlling rabies in dogs and cats.

A raiva é responsável por centenas de mortes e tratamentos pós-exposição ao longo dos anos. A forma mais eficaz de prevenção e controle é a vacinação de cães e gatos das áreas urbanas, visando a interrupção epidemiológica de transmissão da doença. Em razão disso, é imprescindível um bom planejamento das atividades para que as campanhas cumpram com o seu papel de proteção da saúde humana e animal. Para a elaboração do estudo, utilizou-se as informações contidas em um banco de dados obtidas durante as campanhas de vacinação dos municípios de Botucatu/SP e Lençóis Paulista/SP, cidades pioneiras na implantação de tais atividades no Brasil. As informações coletadas foram digitadas em planilhas eletrônicas e dispostas em categorias de acordo com a cidade e setor. Em seguida, foi realizada uma análise descritiva através da distribuição das frequências de cães e gatos vacinados nos dois municípios, figurada através da taxa de vacinação, bem como a elaboração de uma estatística gráfica através da fundamentação de histogramas e diagramas. Um modelo de medidas repetidas foi utilizado para comparar a taxa de vacinação entre os períodos do dia e municípios e o teste de Tukey foi usado para ajustar os valores-P resultantes de comparações múltiplas. Os resultados obtidos revelam que houve discrepância significativa na taxa de vacinação entre as espécies e nos diferentes momentos do dia nos municípios participantes, sendo que durante os finais de semana o pico de vacinação ocorre por volta das 13h00 as 17h00, enquanto que durante a semana o maior movimento é registrado no período das 09h00 as 13h00. Com base nessas informações, os resultados do presente estudo podem auxiliar as equipes responsáveis pela logística das atividades de campanha, especialmente aquelas voltadas para o controle da raiva em cães e gatos.

Name: Anna Czupryna

PP028

Email: aniaczup@gmail.com

Session: Canine Rabies & Control

Country: United Kingdom

Title: Mitigation of rabies exposures and human rabies deaths through domestic dog vaccination in Serengeti District, Tanzania

Authors: Anna Czupryna, Ahmed Lugelo, Matiko Tiringa, Rachel Steenson, Elaine Ferguson, Tito Kagize, Katie Hampson

Affiliations: University of Glasgow, Glasgow, United Kingdom

Abstract: Dog-mediated human rabies is a neglected tropical disease that continues to cause devastating human deaths and expensive economic losses despite the availability of effective vaccines for both humans and animals and known field-tested interventions. Mass dog vaccination implemented consistently and comprehensively to achieve high vaccination coverage can effectively control the incidence of rabies. Mass domestic dog rabies vaccination campaigns in Serengeti District in northern Tanzania have been conducted with the Serengeti District Livestock Office since 2003. We have undertaken extensive contact tracing to quantify human exposures, deaths and animal rabies cases. Annual dog vaccination campaigns have generally improved over a 20 year period, currently reaching all villages within the district and with increasing numbers of dogs vaccinated. As vaccination has improved, the incidence of rabies cases in animals and both human exposures and deaths has decreased, including demand for post-exposure prophylaxis. We present an update of the epidemiological situation following the resumption of vaccination in 2019 after an 18-month interruption due to logistical issues. Our data illustrate that systematic dog vaccination dramatically decreases the burden of rabies, and that continued transmission in neighboring unvaccinated populations poses risks even in vaccinated areas. However, we also caution that planning and sustaining effective vaccinations remains a challenge in resource-limited settings.

Name: Emerson Ricardo de Sousa Capistrano

PP029

Email: emerson.capistrano@gmail.com

Session: Canine Rabies & Control

Country: Brazil

Title: Epidemiological profile of human antirabic care in patients attended in a reference pediatric hospital in the State of Roraima, Brazil

Authors: Emerson Ricardo de Sousa Capistrano, Maria Soledade Garcia Benedetti, José Vieira Filho

Affiliations: State Secretary of Health of Roraima, Brazil

Abstract: Anti-rabies care is among the three most notifiable diseases in the country and in Boa Vista - RR it is the first in number of registration among all the notifiable diseases. The objective is to describe the epidemiological profile of care at the only pediatric referral hospital in the state of Roraima - Brazil. Method: Cross-sectional cohort study of records of antirabic care in pediatric patients between 2007 and 2019 registered in the National System of Notifiable Diseases (SINAN). Sociodemographic variables (age / age group, sex, race / color, education, residence) and specific variables related to the notified condition (type of exposure to the rabies virus, location of the wound, type of injury, species of aggressor, indicated prophylaxis were analyzed) , if there was interruption of prophylaxis, what was the reason for the interruption, if there was abandonment of prophylaxis). Ignored and blank variables were not considered in the analysis. Simple and relative frequencies were used. Results: 28,828 anti-rabies visits were registered in the municipality of Boa Vista, an average of 2,217 visits per year, 4,735 (16.4%) of which were registered at the pediatric hospital. We noticed an increase in attendances from 2015 and after registering 1 case of human rabies in 2016. The most frequent socio-demographic variables were: children under 5 years old (41.5%), brown skin color (82%), schooling 1 to 4 years old (20.9%), urban area (94.4%) and resident in Boa Vista (94%). Bite care was the most frequent (92.1%), with superficial wound (56.5%) and only (56.5%) injury to the lower limbs (29.7%). The most registered aggressor species was canine (91.1%). Regarding treatment, the indication of the vaccine was the most used (40.2%) followed by the observation of the animal plus vaccine (38.07%). Conclusion: There is a need to carry out interventions to reduce the number of accidents by adopting measures to avoid possible cases of rabies, such as rabies vaccination in domestic animals.

Name: Laura Ilarraz Massia

PP030

Email: lauramassia@yahoo.com.br

Session: Canine Rabies & Control

Country: Brazil

Title: Assessment of the knowledge of veterinarians about the state program for the control and prophylaxis of urban rabies in Uruguaiana - RS, extreme southern Brazil

Authors: Laura Ilarraz Massia, Vanuza Azolin, Ana Paula Peres Vargas, Julia Birnie Farias, Phellipe Róges Marengo Silva, Débora da Cruz Payão Pellegrini

Affiliations: Environmental Health Surveillance, City Hall of Uruguaiana, Brazil

Abstract: The state of Rio Grande do Sul is considered an area free of canine rabies (variants 1 and 2), a status achieved through strategic actions applied by the State Program for the Control and Prevention of Rabies (PECPR) for almost three decades (1976-1995). Currently, circulating variants (variants 3 and 4) predominantly affect bats. In 2019, 617 samples were collected from animals potentially transmitting the rabies virus in the state, among which 59 had a positive diagnosis for rabies, being 54 bovines, 01 equine and 04 bats. In 2009 and 2010, 03 insectivorous bats were positive in Uruguaiana - RS. Such data reinforce the relevance of the disease and the importance of surveillance activities integrated with the work of veterinarians on preventing rabies. The aim of this work was to evaluate the knowledge of veterinarians about PECPR and to disseminate it among professionals in Uruguaiana - RS. A report was prepared by veterinary medicine students at Universidade Federal do Pampa with the following topics: epidemiological situation, reservoirs, signs of the disease, prevention and surveillance of rabies, which was delivered to professionals at a meeting held in the city and in visits to clinics. At delivery, a questionnaire was applied to assess the professionals' knowledge about the PECPR. The answers were recorded in an excel table and analyzed by students. 38 veterinarians and 04 veterinary medicine students were interviewed and 42 newsletters were distributed. Of these, 50% knew the PECPR, 40% were not vaccinated against rabies (pre-exposure), 33% knew about the possibility and importance of forwarding samples for rabies diagnosis, 36% recommended rabies vaccination to tutors, and 52% responded that guardians' adherence to vaccination is average. We concluded that, despite the epidemiological situation, it is still necessary to disseminate and implement the actions of the PECPR, combining public and private services.

Name: Maganga Sambo

PP031

Email: smaganga@ihi.or.tz

Session: Canine Rabies & Control

Country: Tanzania

Title: Monitoring and evaluating the performance of a large-scale dog vaccination campaigns against rabies in Tanzania

Authors: Maganga Sambo[1,2], Paul Johnson[2], Elaine Ferguson[2], Katie Hampson[2]

Affiliations: [1]Environmental Health and Ecological Sciences Department, Ifakara Health Institute, Ifakara, Tanzania; [2]Boyd Orr Centre for Population and Ecosystem Health, Institute of Biodiversity, Animal Health and Comparative Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, UK

Abstract: Rabies causes an estimated 59,000 human deaths worldwide annually in over 150 countries, with 95%, mostly in Africa and Asia. A target has been set to eliminate dog-mediated rabies globally by 2030, and large-scale control programs are now advocated. To achieve the global target, effective mass dog vaccination (MDV) campaigns that break rabies transmission cycles in dog populations are required. To break rabies transmissions, MDV campaigns must reach all dog-owning communities (completeness) and vaccinate 70% of the susceptible dog population (coverage), and implemented every year (timeliness). In this regard, monitoring and evaluation the delivery of vaccination campaigns is crucial to determine if MDV campaigns were effectively delivered. In this study, we measured the performance of large-scale MDVs implemented in 25 districts in south-east Tanzania (2010-2017) in terms of completeness, coverage achieved and timeliness and learned the factors associated with, and potentially influencing, the delivery of vaccination campaigns that may give insights about how to improve rabies control programmes. During 2010-2017, five dog vaccination campaigns were carried out and vaccinated 349,513 dogs in 2066 villages. Number of vaccinated dogs increased over the five campaigns. When coverage was being monitored, only 19-21% of villages achieved the recommended coverage threshold of 70%. Our analysis revealed that higher budget predicted higher completeness (districts that spend more had fewer vaccination gaps) but not higher coverage. For example, a twofold difference in district budget predicts a twofold difference in the odds of a village being reached by a campaign (OR: 2.29; 95% CI: 1.69, 3.09). As we approach the 2030 deadline for achieving “zero dog-mediated human rabies deaths”, there are still operational and logistic challenges for delivery of effective MDV campaigns. Our data showed how the MDVs can fail or succeed, therefore these insights could be used to guide future control efforts and improve their success.

Name: Márcio Cruz Pantoja

PP032

Email: marciocruzpantoja@gmail.com

Session: Canine Rabies & Control

Country: Brazil

Title: Serological profile of dogs and cats assisted in rabies vaccination campaigns in the municipality of Curuçá, Pará, Brazil

Authors: MC Pantoja[1], KKG Gomes[1], EA Andrade[1], MB Silva[1], SMM Veríssimo[1], PCR Mesquita[1], LB Chaves[2], KC Scheffer[2], RSC Neto[2], I Abel[1]

Affiliations: [1]Programa de Pós-Graduação em Saúde Animal na Amazônia (PPGSAAM/UFPA); [2]Laboratório de Sorologia do Instituto Pasteur

Abstract: Rabies transmitted by dogs is still the main form of transmission to humans, as it is estimated that approximately 59,000 human deaths occur annually, generating economic losses that can reach 8.6 billion dollars annually. In the northeastern region of the state of Pará, there are areas of exposure to rabies, due to frequent aggressions from animals to humans. Therefore, this study aimed to analyze the immune response to the rabies virus in vaccinated dogs, in the municipality of Curuçá. The study was carried out during the period of the rabies vaccination campaign in the municipality in 2018. For this, the owners of the animals were invited to participate in the research by answering a semi-structured questionnaire and authorizing the collection of data and biological material from their animals through a Term of Consent. Free and Informed Consent (ICF). The animals were visited 60 days and one year after the vaccination date, when new blood samples were collected. All serum samples were sent for screening for neutralizing antibodies against rabies virus. The results were that day zero of serology observation, 33.3% of the animals had antibodies against the rabies virus. Sixty days after vaccination, only 55.6% of the animals still had a response and one year later, when a new vaccination should occur, 56.9% were still protected. The factors related to this occurrence are under analysis.

A raiva transmitida por cães ainda é a principal forma de transmissão a humanos, pois estima-se que anualmente ocorram cerca de 59.000 mortes humanas, gerando perdas econômicas que podem chegar a 8,6 bilhões de dólares anualmente. Na região nordeste do estado do Pará, existem áreas de exposição à raiva, devido a agressões frequente de animais a seres humanos. Por isso, esse estudo teve por objetivo analisar a resposta imune ao vírus rábico em cães vacinados, no município de Curuçá. O estudo foi realizado durante o período de campanha de vacinação antirrábica do município em 2018. Para isso, os proprietários dos animais foram convidados a participar da pesquisa respondendo a um questionário semiestruturado e autorizando a coleta de dados e material biológico de seus animais mediante Termo de Consentimento Livre e Esclarecido (TCLE). Os animais foram visitados 60 dias e um ano após a data da vacinação, quando novas amostras de sangue foram colhidas. Todas as amostras de soro foram enviadas para pesquisa se anticorpos neutralizantes contra o vírus da raiva. Os resultados foram que dia zero de observação da sorologia, 33,3% dos animais apresentavam anticorpos contra o vírus rábico. Sessenta dias após a vacinação apenas 55,6% dos animais ainda apresentavam resposta e um ano depois, quando deveria ocorrer nova vacinação, 56,9% ainda estavam protegidos. Os fatores relacionados com essa ocorrência estão sob análise.

Name: Maria Celeste Castillo Pascual

PP033

Email: celecastillocc@gmail.com

Session: Canine Rabies & Control

Country: Argentina

Title: Use of an application for data collection during an intensive canine rabies vaccination campaign in a priority area of Argentina

Authors: María Celeste Castillo Pascual, Emilio Faro, Natalia Casas, Camila Dominguez, Micaela Gauto, Karina Cardone, Enrique Ríos, Sebastian García, Eugenio Mirkin

Affiliations: Ministerio de Salud de la Nación

Abstract: The city of Salvador Mazza located in the province of Salta, northern Argentina, is on the border of the Plurinational State of Bolivia. The last outbreak of canine rabies V1 in Argentina was in that city, in 2018. With the aim of sustaining a vaccination coverage of 80% and preventing the occurrence of cases, an intensive rabies vaccination campaign was carried out from 5 to 10 August 2019. An application for data collection and georeferencing, Epicollect5, developed by the Imperial University of London, was used for the first time and installed on cell phones. The data analysis was carried out through the application's web support and it was also downloaded in CSV format to be analyzed in other software. The data collection form included the geolocation of the visited homes, number of dogs per home, number of vaccinated and unvaccinated dogs; based on these variables, a register of reluctant dwellings was created to return on a second round of vaccination. 2506 housing records were obtained, entering 2004, where 4406 dogs were vaccinated, leaving 502 houses without being able to carry out the vaccination. According to the 2017 dog census, carried out by municipal personnel, a coverage of 46.3% was achieved during the campaign (4406 dogs vaccinated during the campaign / 9,522 total dogs). The local teams continued with the vaccination, registering a total of 6229 vaccinated canines, giving a final coverage of 65% by 2019, which continues to be an epidemiological risk scenario. The application improved the quality of the data obtained and its analysis, being georeferencing without the need for connectivity, one of its main advantages. This tool would enhance management and collaboration between interdisciplinary public health teams.

Name: Melania Gamboa

PP034

Email: mgamboa@worldanimalprotection.org

Session: Canine Rabies & Control

Country: Costa Rica

Title: All Eyes on Dogs Report - the key to eliminating rabies

Authors: Melania Gamboa, Pankaj KC

Affiliations: World Animal Protection, London, United Kingdom

Abstract: The world has focused for too long on an obligation to treat rabies, rather than on an ambition to eliminate it. Each year, rabies causes 59,000 reported preventable human deaths. If not addressed urgently and efficiently, the rates will increase to 67,000 per year or more than 1,074,000 deaths between 2020 and 2035. The impact on the lives of dogs is not encouraging either. World Animal Protection estimates that more than 10 million dog lives are cruelly lost yearly due to rabies or the human fear of rabies. That is approximately 170 dogs for every one human death from rabies. This is why World Animal Protection is striving to end the inhumane culling of millions of dogs around the globe. Our position is simple: killing dogs and solely focusing on vaccinating humans will not stop rabies. Mass dog vaccination, along with responsible ownership, will. The focus should be on dogs because, when vaccinated and treated responsibly, they hold the solution to ending this disease. The All Eyes on Dogs Report shows that rabies predominantly affects poor and vulnerable populations, living in remote locations around the world. More often than not, ineffective measures like dog culling are undertaken to control rabies – this has never and will never work. Through the report we show how a smart mix of humane dog population management, including mass dog vaccination, responsible ownership and educational campaigns with community engagement, will make the 2030 goal more achievable. Turning our collective attention and efforts to dogs is an opportunity for all stakeholders to help achieve the vision of a dog-mediated human rabies-free world. The report shares a series of actions to illustrate how together, governments, NGOs, corporate citizens (the private sector), the veterinary community, communities, and individuals, can turn our eyes on dogs to eliminate rabies by 2030.

Name: Micaela De la Puente-Leon

PP035

Email: micaela.delapuente@upch.pe

Session: Canine Rabies & Control

Country: Peru

Title: Cave dogs, pigs, and lockdowns: what's the link?

Authors: Micaela De la Puente-León, Olimpia Chuquista, Elvis Diaz, Michael Z. Levy, Valerie Paz-Soldán, Ricardo Castillo-Neyra

Affiliations: Cayetano Heredia University, Lima Peru

Abstract: Farm animals raised in residents' backyards and stray dogs are both elements of the peri-urban ecosystem of Arequipa city, Peru. Previously, residents of peri-urban areas have reported feral dogs living in caves and feeding on garbage dumps and occasionally on small farm animals. Due to the COVID-19 pandemic and the subsequent lockdowns, a chain of events that started with the closure of restaurants, markets and stores that provided food scraps for family farms and free-roaming dogs; reduction in transport; job losses; and generally reduction of families' income has been observed in these peri-urban areas. These events and limitations can impact husbandry practices of farm animals, the population dynamics of local dogs, and the interactions between dogs and farm animals. Using mixed methods in the city of Arequipa, we found that some husbandry practices of farm animals, as well as interactions between farm animals and dogs in the area, changed in response to the lockdown. In some areas of the city, cave dogs have killed and fed on larger farm animals, including adult pigs. We also georeferenced caves where dogs sleep and reproduce, visited them monthly for a year and recorded population changes during the lockdowns. A series of economic and ecological factors triggered by the lockdowns created an imbalance of resources for dogs in the city's periphery with immediate implications on peri-urban households with farm animals. Moreover, there is an effect on the population dynamics of cave dogs, which has potentially positive implications (decrease in the number of feral dogs in the city) and negative implications (growth and movement of free-roaming dogs) for rabies control.

Name: Naseem Salahuddin *(presented by Muhammad Aftab Gohar)*

PP036

Email: naseems101@gmail.com; aftab.gohar@tih.org.pk

Session: Canine Rabies & Control

Country: Pakistan

Title: Effect of collaring on community acceptance of vaccinated street dogs

Authors: Naseem Salahuddin, Naila Baig-Ansari, Rabia Khan, Rahil Barkat, M Aftab Gohar

Affiliations: The Indus Hospital, Department of Infectious Diseases, Karachi, Pakistan

Abstract: The Indus Hospital (TIH) Karachi provides free medical care in Pakistan. Since 2008, TIH has implemented a dedicated clinic for post exposure prophylaxis (PEP) and training. In 2018, TIH started Rabies Free Pakistan (RFP) as One Health Approach, to perform mass vaccination and birth control of street dogs. RFP partnered with Boehringer-Ingelheim to vaccinate street dogs in Karachi. Over 3 months 1491 vaccinated dogs were marked with silicon collars to reduce recapture of vaccinated animals. Collared dogs were also marked with paint to monitor collar retention. During the week after collars were applied, approximately 1 out of 5 marked dogs were missing collars, suggesting need for improved collar design or education in local communities to prevent removal or repurposing of collars. Social media and community feedback suggested that collaring dogs improved acceptance and trust of both the RFP and of street dogs marked with collars. Collared dogs were less likely to be recipients of aggressive behaviors from people, that might elicit a bite. During the study period there were no unprovoked dog bites reported from dogs wearing collars, as these were vaccinated against rabies. RFP plans to conduct additional formal community surveys to better understand perception and acceptance of dog rabies control efforts and the effect of collaring vaccinated dogs on dog welfare and bite prevention.

Name: Rauna N Athingo

PP037

Email: pndinelao@yahoo.com

Session: Canine Rabies & Control

Country: Namibia

Title: Progress and challenges in fighting dog-mediated rabies in the northern communal areas of Namibia

Authors: Rauna Athingo[1], Tenzin Tenzin, Emmanuel H Hikufe, Josephat Peter, Laina Hango, Tangeni Haimbodi, Johannes Lipinge, Frenada Haufiku, Matias Naunyango, Magano Kephas, Hedimbi Nehemia, Tuovi M Siteketa, Ludgerus Amushila, Shuro Thompson, Beatrice Shikongo, Kenneth K Shoombe, Siegfried Khaiseb, Jolandie van der Westhuizen, Moetapele Letshwenyo, Gregorio Torres, Lorenz Nake, Patricia Pozzettii, Thomas C Mettenleiter, Conrad M Freuling, Thomas Müller, Albertina Shilongo

Affiliations: [1]Directorate of Veterinary Services, Animal Disease Control, Subdivision-North West P/Bag 5556, Oshakati, Namibia

Abstract: Dog-mediated rabies is a major public health concern in Namibia with a death toll of more than 242 people during the past two decades. Consequently, under the "One Health" concept, the Namibian government adopted a long-term National Rabies Control Strategy in 2015, which strives to contribute to the global goal of ending dog-mediated human rabies deaths by 2030. With financial and technical support from Germany and the OIE, a dog rabies elimination program was launched in 2016. The ongoing program is flanked by cross-border activities in Southern Angola and an OIE laboratory twinning project. The strong political will to fight dog-mediated rabies and the implementation of such a huge program is a success in itself. Well-coordinated community and public awareness campaigns resulted in initial successes as demonstrated by the declining trend in the number of reported rabies cases both in animals and humans while surveillance data improved. Also, the recent introduction of data loggers improved timely data capturing and analysis of vaccination campaigns. However, this is the first large-scale One Health program in Namibia, encountering challenges under special socio-economic settings. The highly dispersed settlements in the huge, sparsely populated (1.2 M people) Northern Communal Areas covering 263,376 sq km where dog rabies is endemic is a challenge per se and requires immense logistic efforts as regards vaccination points, transport of vaccines and human resources. Other challenges include estimation of the target dog population, a high dog population turnover, unforeseen budgetary constraints at the governmental level, major floodings during the rainy season, and most recently the SARS-CoV-2 pandemic. Therefore, veterinary services had to concentrate on hot spot areas only and recent analysis revealed that vaccination coverage at a local level needs to be improved. A field trial on oral vaccination of dogs was envisaged but had to be postponed to next year.

Name: Ricardo Castillo-Neyra

PP038

Email: cricardo@upenn.edu

Session: Canine Rabies & Control

Country: United States

Title: Adaptive strategies for continuity of canine rabies vaccination programs during the COVID-19 pandemic

Authors: Ricardo Castillo-Neyra, Sergio Recuenco, Olimpia Chuquista, Micaela De la Puente Leon, Gian Franco Condori-Luna, Julianna E Shinnick, Elvis W Diaz

Affiliations: University of Pennsylvania, Philadelphia, Pennsylvania, USA

Abstract: Over the last 40 years, there has been considerable progress towards eliminating canine rabies in Latin America. The main component of this progress has been uninterrupted yearly mass dog vaccination campaigns. However, critical measures to control COVID-19 have had the negative trade-off of jeopardizing these rabies vaccination campaigns in 2020. Furthermore, our ministries and departments of health will continue to be challenged by the COVID-19 pandemic in the next year. Therefore, new strategies to conduct dog vaccination during these challenging times must be evaluated to safeguard the achievements made in Latin America. Our aim was to field-test innovative dog rabies vaccination strategies in response to the pandemic. We conducted a feasibility study in Arequipa, Peru, where the rabies virus circulates in the dog population. First, we conducted 6 rounds of prototyping and piloting safe booths for vaccinators and electronic contactless vaccination certificates. Second, in 38 urban and peri-urban communities, we field-tested a vaccination campaign with 3 key elements (i) safe booths for vaccinators, (ii) promotion and enforcement of social distancing during the campaign, and (iii) contactless registration and electronic vaccination certificates. We vaccinated more than 4,000 dogs, but vaccination coverage varied greatly in our study areas. We report and discuss feasibility indicators and challenges found during the implementation of these campaigns, stratified by urbanization level.

Name: Ricardo Luis Lopez Ingunza

PP039

Email: rlopezingunza@hotmail.com

Session: Canine Rabies & Control

Country: Peru

Title: Genomic sequencing of rabies virus isolated from dogs in Arequipa, Peru

Authors: Carina Rosario Mantari Torpoco, Alfredo Miguel Berrocal Huallpa, Ricardo Luis Lopez Ingunza

Affiliations: National Institute of Health, Lima Peru

Abstract: Canine rabies continues to be a public health problem in southern Peru, due to the re-emergence of this disease in 2014 in the department of Arequipa, with 228 positive cases to date. The objective of the study was to obtain the complete genome of the rabies virus (VR) isolated from the samples of dogs from Arequipa and to analyze its phylogenomic relationships. Five nerve tissue samples obtained from the cryopreservation bank of the Viral Zoonoses Laboratory of the Instituto Nacional de Salud were analyzed. For the amplification of the four regions that cover the genome, three pairs of oligonucleotides previously reported were used and a pair of them elaborated in house. Genomic libraries were generated using the Nextera XT kit (Illumina) and the genomes were sequenced using the Illumina MISeq platform. The quality of the sequencing reads were evaluated with the FastqC v0.11 program and the mapped reads with the BWA v0.7 program, using the GenBank reference genome: KT006769. Phylogenomic reconstruction was performed using the RAxML v0.9. Program, using the General Time Reversible nucleotide substitution model (GTR + G + I) with a statistical support of 1000 bootstraps. 31 reference genomic sequences from Rabies Lyssavirus and an external group of the European Bat Lyssavirus species (GenBank: KY688156.1) were used. All genomes had a coverage of ≥99.9% (11923bp) and an average depth of 13217X. In the phylogenomic reconstruction, bootstrap values of 100% were obtained, evidencing the grouping of the samples with the cosmopolitan lineage. The genomes evaluated will allow to lay the foundations for a higher resolution characterization and phylogenomic analysis, as well as for studies of rabies surveillance and its prevention and control in the country.

Name: Ruth Steinberger

PP040

Email: ruth@spayfirst.org

Session: Canine Rabies & Control

Country: United States

Title: Advancing science in the public interest to reduce trauma on at-risk youth

Authors: Ruth Steinberger

Affiliations: Spay FIRST!, Oklahoma City, Oklahoma, USA

Abstract: Rabies and other zoonotic diseases have catastrophic outcomes in impoverished communities [https://www.cdc.gov/rabies/location/world/index.html]. The perils of this disease make efforts to eradicate rabies paramount, yet with the exception of locations that may be visited by regularly scheduled spay/neuter clinics, the collection and killing of potential vectors may remain the sole means of controlling the size of vector population. Vaccine campaigns are effective if sustained [https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0006490], however, due to the relatively short lifespan of street dogs [citation] and births of new litters, vaccinated dogs may be replaced by litters of unvaccinated canines within a year. Ample research supports the impact of the human/animal bond (HAB) and the effects of loss of a pet [https://www.psychologytoday.com/us/blog/the-truisms-wellness/201608/why-losing-pet-hurts-so-much]. Unfortunately, the overall experience of at-risk youth, particularly regarding their relationships to dogs, remains largely uncounted in this equation. A growing body of research shows the effects of trauma on youth and existing research validates the extent and depth of the HAB; the intersection of these two factors should hasten the expansion of non-lethal methods of canine population control. Our surgical sterilization program has documented positive changes in pet care habits that occur once dogs and cats no longer produce nuisance litters. Significant changes include, most importantly, voluntary compliance with recommended rabies vaccines, a reduction in violence towards animals, the use of flea and tick control products (prevention of additional zoonotic diseases) and buying commercial pet foods. Sadly, the professional resources (veterinarians), and funding that are needed to provide surgical sterilization programs for dogs and cats makes spay/neuter largely unavailable for much of the globe. Recognizing the full impact of the status quo, including trauma to already marginalized youth, provides an impetus for our development of a low cost, effective vaccine to bring non-surgical fertility control to impoverished communities.

Name: Tatiane de Aguiar Sousa

PP041

Email: tatianechan@gmail.com

Session: Canine Rabies & Control

Country: Brazil

Title: Characterization of rabies in the municipality of Caucaia, Ceara, Brazil, 2000 to 2019

Authors: Tatiane de Aguiar Sousa[1], Karina Gatti de Abreu[2], Tatiana Leite Barbosa Araújo dos Santos[2], Bruna Holanda Duarte[2], Juliana de Carvalho Xavier[2], Fernanda Melo Jucá[2], Naylê Francelino Holanda Duarte[3]

Affiliations: [1]Faculdade Terra Nordeste – FATENE - Curso de Medicina Veterinária, Caucaia, Ceará, Brasil; [2]Associação de Educação Ambiental Humanitária de Bem-Estar Animal, Guarda Responsável e Animais Silvestres – BEAGUARAS, Fortaleza, Ceará, Brasil; [3]Universidade Federal do Ceará, Faculdade de Medicina PPG Saúde Pública, Fortaleza, Ceará, Brasil

Abstract: Rabies is considered endemic in Brazil, causing great impact on public health. Between 2007 and 2018, Ceará recorded five cases of rabies in humans and 597 in animals. In recent years, due to the intensification of canine vaccination campaigns, the incidence of human cases with dog transmission has decreased considerably. However, cases of wild mammals are on the rise. This study aims to characterize animal rabies in the municipality of Caucaia, from 2000 to 2019. A cross-sectional study was carried out with secondary data from the State Health Department of the variables: positive cases, year and species from 2000 to 2019 in Caucaia, region metropolitan area of Fortaleza. In this period, there were 1,218 mammals positive for rabies in the state. Of these, 84 (6.9%) occurred in Caucaia, with as the highest positivity species with 56 (66.7%), followed by cat and fox 8 (9.52%), bovine 6 (7.1%), marmosets 3 (3.56%), hematophagous, non-hematophagous bats and others, all with 1 (1.2%) case. The year 2002 presented the greatest positivity 43 (51.2%), dogs with 33 (39.28%), and cats 6 (7.1%) of the cases. From 2008 to the present, 75 samples were sent for diagnosis of rabies, of which 46 (61.33%) were dogs and 16 (21.33%) were cats, but there was no positive result. Results achieved due to the success of rabies vaccination campaigns in recent years, reaching 80% coverage in the municipality. It is concluded that the strengthening of surveillance actions contributes to the success of disease prevention and the non-occurrence of human cases in the municipality. Emphasizing the importance of monitoring the wild cycle continuously, since between 2000 and 2007, the municipality isolated the virus in 12 (14.28%) in these species, and as of 2008, there was only one case when it takes taking into account proof of virus circulation in wild mammals in the state.

A raiva é considerada endêmica no Brasil, ocasionando grande impacto na saúde pública. Entre 2007 e 2018, o Ceará registrou cinco casos de raiva em humanos e 597 em animais. Nos últimos anos, devido a intensificação das campanhas de vacinação canina, a incidência de casos humanos com transmissão por cão, diminuiu consideravelmente. Entretanto, os casos por mamíferos silvestres vêm crescendo. Este trabalho objetiva caracterizar a raiva animal no município de Caucaia, no período de 2000 a 2019. Foi realizado um estudo transversal com dados secundários da Secretaria de Saúde do Estado das variáveis: casos positivos, ano e espécie de 2000 a 2019 em Caucaia, região metropolitana de Fortaleza. Neste período, houve o registro de 1.218 mamíferos positivos para a raiva no estado. Destas, 84(6,9%) ocorreram em Caucaia, sendo o cão a espécie com maior positividade 56(66,7%), seguida do gato e da raposa 8 (9,52%), bovinos 6(7,1%), saguis 3(3,56%), morcegos hematófagos, não hematófagos e outros, todos com 1(1,2%) caso. O ano de 2002 apresentou maior positividade 43(51,2%), os cães com 33(39,28%), e gatos 6(7,1%) dos casos. De 2008 até o presente, foram enviadas 75 amostras para diagnóstico da raiva, sedo 46(61,33%) cães e 16(21,33%) gatos, porém não houve positividade. Resultados alcançados devido ao sucesso das campanhas de vacinação antirrábica nos últimos anos, com alcance de 80% de cobertura no município. Conclui-se que o fortalecimento das ações de vigilância colabora para o sucesso da prevenção da doença e da não ocorrência de casos humanos no município. Ressaltando a importância do monitoramento de forma ininterrupta do ciclo silvestre, pois entre 2000 e 2007, o município isolou o vírus em 12(14,28%) nestas espécies, e a partir

de 2008, houve a ocorrência de apenas um caso quando se leva em consideração a comprovação da circulação do vírus em mamíferos silvestres no estado.

Name: Theresita Legaspi Paul

PP042

Email: legaspit@yahoo.com

Session: Canine Rabies & Control

Country: Mexico

Title: Cost benefit of lateral sterilization in cats

Authors: Hector Espinoza Guillen, Theresita Legaspi Paul

Affiliations: Health Services of Veracruz State, Health Jurisdiction VI, Cordoba, Mexico

Abstract: Sterilization of female dogs and cats can be considered as a strategy within rabies prevention and control measures. In the communities, canines are more appreciated by their owners since they take care of the property, but not cats, who reproduce indiscriminately, especially those that are feral animals and that have contact with wild rabies. The sterilization techniques each have their advantages and disadvantages, being evisceration the most frequent problem since the owners do not follow the postoperative indications that are given, which leads to doubling the costs of care for this species, as well as that the problem of infections increases as well as dying. Sterilization of cats with the lateral technique reduces the incidence of evisceration in females since the incision is smaller, in addition there is no pressure from the viscera as happens in the midline, which facilitates the recovery of the cat and can even be avoided that the owner follow the postoperative instructions in the case of animals that cannot be handled.

Name: Adriana Candido Rodrigues Nasraui

PP044

Email: anasraui@hotmail.com

Session: Diagnostics

Country: Brazil

Title: Rabies diagnosis: a comparative study among Direct Fluorescent Antibody, Mouse Inoculation Test and Rabies Tissue Culture Infection Test

Authors: Adriana Candido Rodrigues Nasraui; Rosa Maria Nascimento Marcusso; Débora Nunes de Souza; Willian de Oliveira Fahl; Graciane Maria Medeiros Caporale; Carla Isabel Macedo; Juliana Galera Castilho Kawai

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: The laboratory diagnosis of rabies is of fundamental importance for the evaluation of suspected cases of rabies virus infection (RABV) and the techniques used must have high sensitivity and specificity, as well as speed in obtaining the results. Confirmation of the result of the direct fluorescent antibody (FAT) through viral isolation (IV) is recommended and mouse inoculation test (MIT) is being replaced by rabies tissue culture infection test (RTCIT) for ethical reasons. The flow of rabies diagnosis at the Institute Pasteur Virology laboratory was evaluated by means of statistical analysis by the index of concordance, sensitivity, specificity and accuracy of the FAT, RTCIT and MIT tests. Results obtained from samples of Central Nervous System (CNS) from different animals from 2008 to 2016 in the diagnostics routine of the Virology Laboratory were used in this study. FAT was the technique that presented the best results of sensitivity (93.58%), specificity (95.90%) and accuracy (95.67%). For the RTCIT, the values of sensitivity, specificity and accuracy were lower than FAT with 70.42%, 86.16% and 84.62%, respectively. The concordance between the RTCIT and FAT was moderate with kappa quotient k= 0.341. The sensitivity, specificity and accuracy of the MIT was 89.58%, 100% and 98.97%, respectively. The concordance between the MIT and FAT, had a substantial k value (0.720). FAT, considered the gold standard, was effective in all animals, except horses. From these analyzed results it was possible to infer that the FAT presented satisfactory results, however the RTCIT did not present favorable results to be used as a confirmatory technique.

Name: Daniel Moura de Aguiar

PP045

Email: danmoura@ufmt.br

Session: Diagnostics

Country: Brazil

Title: Epidemiological survey of rabies in livestock in Mato Grosso, Brazil: 2009 to 2018

Authors: ER Mutzenberg, SM Nassarden, EL Machado, AJG Delfino, ACS Oliveira, RL Negreiros, DM Aguiar

Affiliations: Federal University of Mato Grosso, Faculty of Veterinary Medicine, Cuiabá, Brazil

Abstract: Rabies is a deadly disease that is usually fatal for farm animals, causing economic losses and representing a zoonotic potential. Therefore, an epidemiological survey was conducted to temporally and spatially characterise focal points of the rural rabies cycle in the state of Mato Grosso, Brazil between 2009 and 2018, based on data recorded on disease surveillance forms of the Animal Health Defence Service. In the interval under evaluation, 589 cases were diagnosed at 538 foci. Bovines and equines were the most affected, representing 88.9% and 10.2% of the positive cases, and showing the highest positivity rates, 35.8% and 33.7%, respectively. In 94 of the 141 municipalities in the state there were outbreaks that shifted over the years, concentrated mainly in the west, centre-south and east of the state of Mato Grosso (MT), showing a cluster pattern of outbreaks. The time series indicated a declining trend with no significant seasonality, although the number of outbreaks increased between May and July. The estimated forecast for the 12 months subsequent to the study is for three outbreaks per month, which may vary from zero to nine. The outbreaks were found to decrease over the years, as a result of the disease cycle and of control measures adopted by Official Veterinary Services (OVS). In the event of a recurrence of outbreaks of the disease, it is expected to occur in lower proportions than in previous years.

Name: Diego Caraballo

PP046

Email: diego7caraballo@gmail.com

Session: Diagnostics

Country: Argentina

Title: Evaluation of two Real-Time, TaqMan Reverse Transcription-PCR assays for detection of rabies virus in circulating variants from Argentina

Authors: DA Caraballo[1], MA Lombardo[1], P Becker[1], MS Sabio[2], C Lema[2], LM Martínez[2], Y Li[3], DM Cisterna[2], FJ Beltrán[1]

Affiliations: [1]Luis Pasteur Institute of Zoonosis, Buenos Aires, Argentina; [2]National Administration of Laboratories and Institutes of Health (ANLIS), Buenos Aires, Argentina; [3]Centers for Disease Control and Prevention, Atlanta, Georgia, USA

Abstract: In rabies diagnosis, it is essential to count on a rapid test to give a quick response. Although the direct fluorescent antibody test (FAT) is the gold standard technique, the combined sensitivity and robustness of the TaqMan RT-PCR assays (qRT-PCR) have made these methods a valuable alternative for rabies virus (RABV) detection. We faced a study to test the applicability of two widely used qRT-PCR assays targeting the nucleoprotein gene and Lead sequences of RABV genomes, in all variants circulating in Argentina. A total of 44 FAT and conventional RT-PCR-positive samples corresponding to bats, dogs, cattle, and horses, were used in the study. All variants were successfully detected by the pan-lyssavirus LN34 qRT-PCR assay. The Lyssavirus Genotype 1 (LysGT1) assay positively detected variants V1, V2, V3, V4, Eptesicus, and Histiotus, while V3A, V6, and Myotis samples remained undetectable. We further sequenced the region targeted by LysGT1 and demonstrated that the presence of 3 or more mismatches with respect to the primers and probe sequences precludes viral detection. We conclude that the LysGT1 assay is prone to yield variant-dependent false-negative test results and, in consequence, the LN34 assay should be adopted in diagnostic laboratories for the detection of RABV in Argentina.

Name: Elaine Raniero Fernandes

PP047

Email: elaineraniero@gmail.com

Session: Diagnostics

Country: Brazil

Title: Comparative evaluation of the diagnostic efficacy of direct (dRIT) and indirect (iRIT) rapid immunohistochemical tests for rabies on samples of the central nervous system from different animal species

Authors: REH Canella, F Guedes, SR Silva, ISS Katz, S Achkar, E Mori, ER Fernandes

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: The Direct Rapid Immunohistochemical Test (dRIT) was recently recognized by the WHO as a primary diagnostic test for rabies with similar or even greater sensitivity and specificity than the Direct Fluorescent Antibodies Test (dFAT). Alternatively to dRIT, the Indirect Rapid Immunohistochemical Test (iRIT) can also be applied to the laboratory diagnosis of rabies. The aim of this study was to compare dRIT and iRIT in samples from the Central Nervous System (CNS) sent to the Rabies Diagnosis Laboratory of the Pasteur Institute, São Paulo, Brazil. CNS from different animal species (n=44, 18 bovines, 2 horses, 8 bats, 7 dogs, 5 cats and 1 capybara, 1 guara wolf, 1 ocelot, 1 deer) were tested by dRIT using an anti-RNP IgG biotinylated polyclonal antibody (dilution 1:600), followed of the application of streptavidin conjugated to peroxidase (Vector SA-5704) and by iRIT using an anti-RNP IgG polyclonal antibody (dilution 1:1200), followed of the application of an anti-horse IgG peroxidase antibody (Sigma-Aldrich A6917, dilution 1:400). Both primary antibodies anti-RNP for rabies were produced by the Pasteur Institute, Brazil. The results were compared with the gold standard dFAT. Of the 44 CNS samples tested, 23 were positive and 21 were negative, with agreement between the three techniques applied for the diagnosis of rabies (100%, Cohen's Kappa coefficient = 1). Our findings suggest that both dRIT and iRIT could be used as diagnostic tests for rabies. In addition, the use of dRIT or iRIT, especially in regions in Brazil and Latin America that do not have any diagnostic tools, could contribute to the epidemiological surveillance of this zoonosis that is still a public health problem, especially in developing countries.

Name: Emilio Venegas Cureño

PP048

Email: emilio.venegas@senasica.gob.mx

Session: Diagnostics

Country: Mexico

Title: Phylogenetic analysis of rabies virus (RABV) variants in México

Authors: E Venegas Cureño, M Martínez-Núñez, EU Nieves García, G Robles Pesina

Affiliations: National Service of Agrifood Health, Safety and Quality (SENASICA), National Center for Diagnostic Services in Animal Health (CENASA), Mexico City, Mexico

Abstract: Rabies is a zoonotic disease caused by a virus of the family Rhabdoviridae, genus Lyssavirus. It is estimated that annually the Rabies virus (RABV) kills thousands of people worldwide, and it is responsible for significant economic losses to Livestock industries, so it continues to represent a challenge and a major concern to public health. In this study, a 501 nucleotide region (bases 613 to 992) of the nucleoprotein (N) gene was obtained of 365 rabies virus positive brain tissue samples obtained from bovines, ovines, equines and chiropteran in different geographical areas of México during the years 2018 to beginning of 2020.These were analyzed phylogenetically and compared with sequences from 35 subtype viruses available in the Genbank database. Our results suggest that there is a high nucleotide (95.5 to 100%) and amino acid similarity (96.7 to 100%) among the analyzed sequences. Phylogenetic comparison with RABVs from other parts of the world indicates that there is segregation into two distinct clusters (the bat- and dog-related RABVs). The RABV antigenic variants that were detected were classified into lineages associated with bats and are subdivided into several geographical clades limited to the tropical region of the country.

Name: Fabiana Cabral Ferreira

PP049

Email: bruno_fafabi@hotmail.com

Session: Diagnostics

Country: Brazil

Title: Determination of a humanitarian endpoint in mice submitted to the rabies virus diagnostic test

Authors: Fabiana Cabral Ferreira, Amanda Siena, Keila Iamamoto, Enio Mori, Karin Côrrea Scheffer, Willian de Oliveira Fahl, Claudia Madalena Cabrera Mori, Karen Miyuki Asano, Tamires Santos de Arruda

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: For rabies diagnosis, the direct fluorescence antibody test (DFA) is the gold standard and is often confirmed by other techniques. Although it is recommended to replace the use of animals by cells for viral isolation, the use of mouse inoculation test (MIT) is still common in developing countries. MIT causes animal suffering due to neurological symptoms resulting from disease evolution. Therefore, the objective of this work was to refine MIT, determining a humane endpoint to reduce animal suffering without affecting the diagnosis. Twenty positive samples of different rabies variants were submitted to MIT using 21-day-old mice (5 animals per sample), which were observed and weighed daily. The animals were euthanized at 3 different times: phase 1 – with nonspecific symptoms (weight loss, piloerection, apathy); phase 2 - appearance of neurological symptoms (incoordination, behavioral changes) and phase 3 - terminal phase (locomotor difficulties, tremors, limb paralysis). The CNS were collected and submitted to DFA using polyclonal and monoclonal antibodies, which were classified according to their intensity 1 (+) to 4 (+). Viral titration was performed in N2a cell culture for the 3 phases of 4 samples chosen at random. All animals were positive in DFA, presenting fluorescence intensity between 2 (+) and 4 (+), which demonstrates that there is no impairment of diagnosis even if the animal is euthanized in the early stage of the disease. Viral titration obtained similar titers in all phases, corroborating that it is possible to identify the infection early in the symptoms. From these results, it is suggested that euthanasia may be performed as soon as the animal starts any neurological symptom and can be performed from the first signs (weight loss), minimizing unnecessary pain or distress.

Name: Fernanda Guedes

PP050

Email: fgluiz@pasteur.saude.sp.gov.br

Session: Diagnostics

Country: Brazil

Title: Evaluation of different regions central nervous system for the diagnosis of rabies in cattle and equines

Authors: RBC Torquato, NHF Centoamore, ER Fernandes, K Iamamoto, S Achkar S, SR Silva, ISS Katz, F Guedes

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: The present investigation aimed to evaluate the different regions Central Nervous System (CNS) by direct fluorescent antibody test (dFAT) and indirect rapid immunohistochemistry test (iRIT) to rabies. Therefore, we tested cattle (n=44) and equines (n=19) and performed a semi quantification to determine the rabies virus antigen distribution in the CNS (cortex, cerebellum, hippocampus and brainstem). The amount of viral antigen was scored on a scale of 0 to 4(+) as follows: 0, absence of antigen; 1 (+), rare presence of antigenic material and/or viral inclusions; 2 (+), presence of negative fields and low number of antigenic material and/or viral inclusions; 3 (+), a homogeneous distribution of antigens, but with negative areas; 4 (+), a homogeneous distribution of antigens on the slides, without negative areas. Of all analyzed samples, 35/44 (79.5%) of cattle and 9/19 (43.4%) of equines were positive for rabies by dFAT and iRIT procedures. Analysis of the four regions of the CNS showed that in cattle, regardless of the region, there was a predominance of score 3/4. On the other hand, in samples of equines there was a predominance of score 1/2. Surprisingly, in equine specie, we observed that some samples showed CNS regions negative by dFAT, as cerebellum (40%), hippocampus (29%), cortex (25%) and brainstem (14%); however, no region was negative by iRIT. These data show that the distribution of viral antigen in brain tissue can vary even among animals of the same species and can be associated with factors such as sample integrity, individual reaction to the disease, incubation period and clinical evolution, particularly, in cases of euthanasia in the early stages of the disease. Therefore, our findings suggest that it is essential to send different regions of the brain and to analyze them for better diagnostic accuracy, especially for equine species.

Name: Gabrielle Thaís Miodutzki

PP051

Email: gabriellemiodutzki@gmail.com

Session: Diagnostics

Country: Brazil

Title: Analysis of rabies diagnosis by Fluorescent Antibody Test and Mouse Inoculation Test performed at Zoonosis Diagnostic Laboratory of the São Paulo State University, Botucatu, Brazil

Authors: Evelyn Cristine da Silva, Gabrielle Thaís Miodutzki, Dayane da Silva Zanini, Caroline Muniz Cunha, Karine Bott Mantovan, Benedito Donizete Menozzi, Helio Langoni

Affiliations: Universidade Estadual Paulista "Júlio de Mesquita Filho"

Abstract: Rabies is a viral zoonosis that affects the central nervous system of all mammals. The gold standard diagnosis is fluorescent antibody test (FAT) associated with biological testing, usually the mouse inoculation test (MIT). The biological test is considered a technique with better sensitivity and specificity for the diagnosis of rabies, even though the results may take longer to come out and require the use of live animals. The results of the samples received at the Zoonosis Diagnostic Laboratory of the São Paulo State University for rabies diagnosis were analyzed, from January of 2018 to December of 2019. Altogether 1774 samples were received, of which 161/1774 (9.07%) resulted positive to at least one of the techniques. Of the positive samples, 23/161 (14.28%) were positive only by MIT. Regarding these samples, 16/23 (69.56%) were from equines, 6/23 (26.08%) from bovines and 1/23 (4.34%) was a sample from a cat. It is known that there is a well-established correlation between these two techniques used in diagnosis, although reported the occurrence of false negative results eventually. Several factors can interfere the accuracy of rabies diagnosis, such as the low viral charge in the analyzed fragment, the condition of the sample, the absence of fragments of choice for the technique and the period of ascendancy of the virus in the different animal species, among other factors. Disagreeing results between these two techniques have also been described mainly in horses, which the absence of inclusion bodies in the FAT and the longer virus incubation period in this species are reported. Due to the difficulty of clinical diagnosis and the relevance of this zoonosis in public health, the importance of laboratory diagnosis of rabies is emphasized, which helps directing post-exposure human prophylactic treatment, controlling the disease in the domestic animal population, identifying circulation areas and complements prevention measures.

Name: Guanghui Wu

PP052

Email: guanghui.wu@apha.gov.uk

Session: Diagnostics

Country: United Kingdom

Title: A recombinant virus expressing strong florescence simplifies the detection of neutralising antibodies against rabies virus

Authors: Guanghui Wu, David D Selden, Hooman Goharriz, Elliot Whittard, Anthony R Fooks, Ashley C Banyard, Lorraine McElhinney

Affiliations: Wildlife Zoonoses and Vector-borne Diseases Research Group, Animal and Plant Health Agency (APHA), Weybridge, Surrey, UK

Abstract: Rabies virus causes a fatal encephalitis that can be prevented through vaccination. The levels of neutralising antibody (VNA) against rabies virus induced by vaccination can be measured using the fluorescent antibody virus neutralisation (FAVN) test. This method involves time-consuming fixation of cell monolayers and staining of rabies virus specific antigen using a fluorescein isothiocyanate (FITC) conjugated antibody before the results can be visualised under a fluorescence microscope. Critically, FITC- conjugated antibody is expensive when considering supply to rabies endemic areas and the required quality assurance for each batch. To eliminate those problems, a self-fluorescing rabies virus was constructed to ensure the maximum expression of the mCherry protein enabling the direct visualisation of infected cells under UV stimulation; thus the fixation and staining steps, including requirement and validation of FITC-conjugated antibody, are redundant. In cell culture, the new virus (termed mCCCG) grew indistinguishably to CVS-11, the virus routinely used for antibody measurements. Comparative assessment of mCCCG against CVS-11 in measuring anti-rabies virus neutralising antibodies demonstrated 98% sensitivity and 100% specificity among 60 samples tested. The results show that mCCCG can be used as an alternative to CVS-11 for testing antibody against rabies virus.

Name: Jahnier Andrés Caicedo Martínez

PP053

Email: jahnier.caicedo@ica.gov.co

Session: Diagnostics

Country: Colombia

Title: Retrospective study of histopathological lesions in cattle with neurological syndrome diagnosed at the National Veterinary Diagnostic Laboratory (NVDL) of the Colombian Agricultural and Livestock Institute (ICA) in Colombia in 2019

Authors: Jahnier Caicedo, Gersson Vasquez, Jerson Avila, Ana Lozano

Affiliations: Colombian Agricultural and Livestock Institute (ICA), Colombia

Abstract: Introduction: Passive surveillance of bovine rabies implies sending brain samples to the laboratory for diagnosis by direct fluorescent antibody (DFA), mouse inoculation test and histopathology, for this last analysis, a complete pool of organs can also be included in order to establish other causes of neurological diseases. Objective. Identify the main lesions in bovines with neurological syndrome detected by histopathology made in the LNDV during 2019. Materials and methods. A total of 196 cases originated from passive rabies surveillance program of the ICA of cattle submitted to the NVDL were evaluated. All evaluated samples included brain and were processed, sectioned and stained with routine H&E staining in the NVDL. The lesions were classified as follows: 1) lymphoplasmacytic encephalitis with neuronal eosinophilic intracytoplasmic inclusion bodies (Lyssaviral encephalitis), 2) non-suppurative encephalitis, 3) mixed encephalitis (neutrophils, macrophages, lymphocytes and/or plasmatic cells), 4) suppurative encephalitis, 5) Inconclusive; 6) without microscopic lesions. Additionally, other distant injuries that explained the cause of death were investigated. Results. 64 samples (33%) presented Lyssaviral encephalitis all of them confirmed by DFA; 13 (7%) non-suppurative encephalitis; 7 (4%) mixed encephalitis; 6 (3%) suppurative encephalitis; 7 (4%) cases were inconclusive due to advanced grade of autolysis or freezing artifacts; and 68 (35%) did not present specific microscopic lesions. In 31 samples (16%) the lesions that explained the cause of death were not located in the brain and among the diseases that explained death were diagnosed: 10 septic, 11 hemolytic, 4 combined septic and hemolytic processes, 3 processes toxic and 3 septic processes combined with Protein-energy malnutrition. Conclusion: The present study highlights the use of histopathology in cases of bovine neurological syndrome, since in 61% of the cases it provided information about compatible lesions of rabies but also from others primary or secondary causes of neurological diseases.

Name: Jorge Tamayo

PP054

Email: jorge.tamayo@ica.gov.co

Session: Diagnostics

Country: Colombia

Title: Diagnosis of wild origin rabies in the National Veterinary Diagnostic Laboratory (LNDV) of the ICA, in animals reported with neurological syndrome, Colombia 2018-2020

Authors: Jorge Tamayo, Alexandra Guaqueta, Alejandro Rocha, Adriana Acosta, Alba Porras

Affiliations: National Veterinary Diagnostic Laboratory (LNDV), Colombian Agricultural and Livestock Institute (ICA), Colombia

Abstract: Introduction: For the diagnosis of wild rabies in Colombia, requests in passive surveillance and active surveillance samples are attended, using Direct Immunofluorescence (IFD), Indirect Immunufluorescence (IFI), Biological Test (PB) and histopathology. Objective: detection of the rabies virus in brain tissues using Direct Immunofluorescence, in samples of animals reported with neurological syndrome (passive surveillance) and chiroptera samples (active surveillance), in the LNDV, in the years 2018 to August 2020. Materials and methods: In 2018, 521 samples were analyzed, with 101 positive results for IFD and 107 biological tests were performed; In 2019, 491 samples were analyzed, with 74 positive results for IFD and 58 biological tests were performed; For 2020 until the month of August, 235 samples have been analyzed, with 28 positive results for IFD and 38 biological tests performed. All samples with a positive IFD result in the presence of rabies virus were subjected to viral typing by IFI, using monoclonal antibodies, with results of antigenic variants 3 and 5, mainly. Conclusion: Of the 1247 samples analyzed during the last 3 years, 205 samples have yielded a positive result by IFD. Diagnostic processes and epidemiological research through antigenic typification have allowed the detection of foci in the regions and the determination of their origin (rabies virus of vampire origin), a fundamental basis for the adoption of health prevention and control, equally applicable for the protection of human populations at risk.

Introducción: Para el diagnóstico de rabia silvestre en Colombia, se atienden las solicitudes en muestras de vigilancia pasiva y vigilancia activa, mediante Inmunofluorescencia Directa (IFD) Inmunufluoresencia Indirecta (IFI), Prueba Biológica (PB) e histopatología. Objetivo: detección del virus rábico en tejidos encefálicos mediante Inmunofluorescencia Directa, en muestras de animales reportados con síndrome neurológico (Vigilancia pasiva) y de muestras de quirópteros (vigilancia activa), en el LNDV, en los años 2018 a agosto de 2020. Materiales y métodos. En 2018 se analizaron 521 muestras, con 101 resultados positivos a IFD y se realizaron 107 pruebas biológicas; En 2019 se analizaron 491 muestras, con 74 resultados positivos a IFD y se realizaron 58 pruebas biológicas; para 2020 hasta el mes de agosto, se han analizado 235 muestras, con 28 resultados positivos a IFD y 38 pruebas biológicas realizadas. A todas las muestras con resultado IFD positivo a presencia del virus rábico, se las realizó tipificación viral mediante IFI, uso de anticuerpos monoclonales, con resultados de variantes antigénicas 3 y 5, principalmente. Conclusión. De las 1247 muestras analizadas durante éstos 3 últimos años, 205 muestras han arrojado resultado positivo mediante IFD. Los procesos diagnósticos y la investigación epidemiológica a través de la tipificación antigénica, han permitido la detección de focos en las regiones y la determinación de su origen (virus rábico de origen vampiro), base fundamental para la adopción de las medidas sanitarias de prevención y de control, igualmente aplicables para la protección de las poblaciones humanas a riesgo.

Name: Juliana Ferreira Souza Conceição

PP055

Email: cjuliana.ferreira@gmail.com

Session: Diagnostics

Country: Brazil

Title: Evaluation of anesthetic protocols for the refinement of the mouse inoculation test in rabies diagnosis

Authors: Juliana Ferreira Souza Conceição, Amanda Siena dos Santos, Claudia Madalena Cabrera Mori, Keila Iamamoto, Enio Mori, Karin Côrrea Scheffer, Willian de Oliveira Fahl, Karen Miyuki Asano

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: Mouse Inoculation Test (MIT) is a technique widely used in laboratories of rabies diagnosis and must be susceptible to refinement due to the concern with the quality of life of the animal during the procedures and the need to reduce the risks and the degree of suffering of the animals whenever possible. In accordance with the subject, the present study was conducted in 80 Swiss-Webster mice (Mus musculus), 40 females and 40 males, newly weaned (21 days), weighing 11-14 grams. Five types of association were tested: KX (Ketamine 100 mg/kg and Xylazine 10mg/kg), KXA (Ketamine 80 mg/kg, Xylazine 5mg/kg, and Acepromazine 1 mg/kg), KXT (Ketamine 80 mg/kg, Xylazine 5 mg/kg, and Tramadol 5 mg/kg), KXAT (Ketamine 100 mg/kg, Xylazine 10 mg/kg, Acepromazine 2 mg/kg and Tramadol 5 mg/kg) and ITA (Isoflurane 5% induction and 2.5% maintenance, Tramadol 5 mg/kg and Acepromazine 1 mg/kg). In addition, vital parameters, such as respiratory rate and body temperature were analyzed. The mice were evaluated for the induction period (time between drug administration and loss of reflexes), surgical anesthesia period (length of stay with absence of reflexes) and recovery period (return of reflexes until the return of righting reflex). At the end of the experiment, 44/80 (55%) mice entered the surgical anesthesia as follows: 8/16 (50%) in the KX protocol, 3/16 (18.75%) in the KXA protocol, 3/16 (18.75%) in the KXT protocol, 14/14 (100%) in the KXAT protocol and 16/16 (100%) in the IAT protocol. The KXAT combination presented a mortality of 12.5%, both males. The KXAT and IAT protocols were able to induce anesthesia, with the IAT protocol being the most appropriate and safe to perform the MIT procedure with 100% efficiency, absence of mortality and rapid recovery of respiratory rate and temperature after being subjected to technique.

Name: Luciana Botelho Chaves

PP056

Email: lbchaves@pasteur.saude.sp.gov.br

Session: Diagnostics

Country: Brazil

Title: Validation of two tests to rabies virus neutralizing antibody evaluation: precision parameter to simplified fluorescence inhibition microtest (SFIMT) and rapid fluorescent focus inhibition test (RFFIT) on microplates

Authors: FGM Pancetti, RS Cunha Neto, KR da Silva, AC Rodrigues, A Siena, KC Scheffer, ISS Katz, ACR Silva, LB Chaves

Affiliations: Instituto Pasteur (IP), Av. Paulista, 393, Cerqueira César, CEP: 01311-000, São Paulo, Brasil

Abstract: Rabies is a worldwide zoonosis that affects the central nervous system of mammals and is transmitted by the saliva of infected animals by bites, scratches or contact with mucous membranes. Pre-exposure prophylaxis and evaluation of rabies virus neutralizing antibody (RVNA) every six months or once a year is recommended for people at risk of exposure. RVNA titers ≥ 0.50 IU/mL characterize satisfactory immunization. The most commonly used tests for evaluation of RVNA are cell culture neutralization tests such as the Fluorescent Antibody Virus Neutralization Test (FAVN) and the Rapid Fluorescent Focus Inhibition Test (RFFIT). Simplified Fluorescence Inhibition Microtest (SFIMT) is a simpler, faster reading technique that has been successfully used for RVNA evaluation. Test validation evidences the performance of a method within quality specifications, providing valid results. Validation parameters are intra-assay precision (repeatability), intermediate precision, matrix effect, linearity, specificity, accuracy, and stability. This study aimed to validate the SFIMT and the RFFIT on microplates following the guidelines DOQ-CGCRE-008 of the General Coordination of Accreditation of Brazil. For the precision parameter, 50 human serum samples from people submitted to pre-exposure prophylaxis for rabies were tested by both tests, RFFIT and SFIMT, repeated three times on alternate days. For the reading was performed by two professionals. The results were analyzed by Geometric Coefficient of Variance (GCV) with a 95% confidence interval (CI). The calculated % GCV of the intra-assay precision (repeatability) for SFIMT was 8.46%, (95% CI: 8.44, 8.48) and the overall % GCV of the intermediate precision was 9.19% (95% CI: 9.15, 9.23), which were within the acceptable limit of ≤30%. For RFFIT the % GCV of intra-assay precision (repeatability) was 12,93% (95% CI: 12.83, 13.02) and the % GVC intermediate precision was 12,30 % (95% CI: 12.24, 12.35). The comparison in samples results for the two readers in SFIMT showed only 8% of differences. In conclusion, the acceptance criteria for precision were met.

Name: Micheli Cocchi

PP057

Email: mi_cocchi@hotmail.com

Session: Diagnostics

Country: Brazil

Title: Impact of the COVID-19 pandemic on laboratory of rabies diagnosis in São Paulo State, Brazil

Authors: M Cocchi, VG Tommaso, DB Brogliatto, AML Vieira, L Hardt, K Iamamoto, ACR Silva

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: The first case of the SARS-CoV-2 coronavirus in São Paulo/BR was reported in February/2020 and the main measure adopted was the social isolation, which paralyzed many activities. Considering that the laboratory of rabies diagnosis is fundamental for the disease control, monitoring of viral circulation and definition of prophylaxis, the objective of this work was to evaluate the impact caused by the pandemic of COVID-19 in the forwarding of samples for laboratory diagnosis of rabies in the São Paulo State/BR. A quantitative descriptive observational design was carried out with primary and secondary data obtained from monthly bulletins from the state laboratory network, analyzing the total number, by species and positivity of the samples examined by the laboratories of rabies diagnosis, comparing the period from January to July/2020 with the same period of 2016-2019. There was an average of 5489 samples analyzed in the period 2016-2019, while in 2020, 4439 samples were analyzed (-19.1%). Comparing the number of samples analyzed monthly, a decrease in 2020 was observed in May (-180%), June (-99%) and July (-53%), in relation to the monthly averages of 2016-2019. Analyzing by species, there was a decrease in samples of dogs (-61%), cats (-40%), herbivores (-35%) and other species (-140%), but a slight increase in chiropterans (+ 1%). In 2020, there was 3.60% positivity, while the 2016-2019 average was 3.40%. We concluded that the expressive decrease of samples analyzed from May to July 2020, regardless of the species, except for chiropteran species, and maintaining the positivity unchanged, is related to the period of strict restrictions imposed by government authorities to combat the SARS-CoV-2 pandemic. However, the data demonstrates that carrying out actions of epidemiological surveillance on a continuous basis and in conjunction with local health policies is essential to maintain the control and prevention of rabies.

Name: Mirtha Colmán

PP058

Email: mcolman@senacsa.gov.py

Session: Diagnostics

Country: Paraguay

Title: Rabies cases reported in Paraguay during 2019-2020

Authors: Mirtha Colmán[1], Gladys Riquelme[1], Juan Trinidad[2], Guzmán Sienra[2], Antonio Rodríguez[3], Jorge Miret[4]

Affiliations: [1]Servicio Nacional de Calidad y Salud Animal (SENACSA), San Lorenzo, Paraguay; [2]Programa Nacional de Control de Zoonosis y Centro Antirrábico Nacional (PNCZyCAN), Ministerio de Salud Pública y Bienestar Social, San Lorenzo, Paraguay; [3]Laboratorio de Diagnóstico Veterinario (CEDIVEP), San Lorenzo, Paraguay; [4]Servicio Nacional de Erradicación de Enfermedades Transmitidas por Vectores (SENEPA), Ministerio de Salud Pública y Bienestar Social, Asunción, Paraguay

Abstract: Rabies is a zoonotic disease caused by viruses from the genus Lyssavirus associated with neurological signs because of the de development of encephalitis or meningoencephalitis. In Paraguay, rabies is one the causes of large economic losses in the productive sector (animal deaths) as well as in the public sector due to the elevated costs of monitoring and control programs. The Paraguayan Program for Rabies Control in herbivores aims to prevent the disease in cattle by focusing on the control of vampire bats (Desmodus rotundus), on strategic vaccination and active/passive epidemiological surveillance in humans, dogs and cats. The aim of this study was to describe the epidemiological situation of rabies in Paraguay. It was carried out by using data from the government agency responsible for animal health in Paraguay (SENACSA and PNCZ y CAN), which covers diagnosis from animals suspected of rabies carried out between 2019 and July of 2020. The samples came from all regions of the country and were sent voluntarily by farmers or by both private and public veterinarians. The samples sent to the government animal health laboratory were subjected to the direct immunofluorescence technique and to the biological proof (inoculation in mice). From 2019 to July of 2020, positive rabies cases were detected in 110 animals (99 cattle, 1 dog, 4 horses, 1 sheep, 1 goat and 4 vampire bat). Rabies in Paraguay is part of a complex situation and further research is needed. Several socioeconomic and environmental factors must be taken in accounted. Nevertheless, the method applied in this study allowed us to establish priorities for epidemiologic surveillance.

Name: Morgane Gourlaouen

PP059

Email: mgourlaouen@izsvenezie.it

Session: Diagnostics

Country: France

Title: An inter-laboratory trial as a tool to increase rabies diagnostic capabilities of Sub-Saharan African Veterinary laboratories

Authors: Morgane Gourlaouen, Angélique Angot, Marzia Mancin, Charles Bebay, Baba Soumaré, Francesca Ellero, Barbara Zecchin, Stefania Leopardi, Cristian De Battisti, Calogero Terregino, Paola De Benedictis

Affiliations: Experimental Zooprophylactic Institute of the Venezie (IZSVe), Legnaro (PD), Italy

Abstract: To achieve the goal of eliminating dog-mediated human rabies deaths by 2030, many African countries have agreed to list rabies as a priority zoonotic disease and to undertake both short and long-term control programs. Within this context, reliable local diagnosis is essential to securely implement field surveillance systems, to evaluate the progress of control efforts and importantly, to facilitate the clinical management of potentially exposed patients. Unfortunately, a harmonized, sustainable and supportive diagnostic offer has yet to be achieved in the continent. Because any rabies control or elimination plans mandatorily require the availability of solid testing facilities, diagnostic capacity building is a key priority. In this context, testing laboratories should regularly participate to proficiency test (PT) in order to assess the appropriateness of the protocols and the methodology. Whilst laboratories in developed countries have access to frequent PTs, this is not the case for laboratories in poor-low resources settings although the disease is still endemic over there. Hand in hands with the FAO, we organized in a PT for the diagnosis of rabies which included 14 African laboratories. Importantly, this PT turned out to be more than just a way to assess the diagnostic technique but it was also a possibility to implement a validated molecular protocol in eight of those laboratories, to collect valuable information as regard to the routine activity and to update the vaccination status of the staff. Overall, African laboratories proved to have an excellent level in detecting both positive and negative samples. Given the benefits and the indispensability of proficiency assessment, it is highly important that decision makers support the organization of frequent PTs for the diagnosis of rabies in endemic region.

Name: Scott Brunt

PP060

Email: scott.brunt@health.ny.gov

Session: Diagnostics

Country: United States

Title: Rabies virus variant typing by real-time PCR in the United States

Authors: SJ Brunt, AD Davis

Affiliations: New York State Department of Health, Wadsworth Center, Rabies Laboratory, Slingerlands, New York, USA

Abstract: Rabies virus variants are often phylogenetically divided by species host and furthermore regional specific. In the contiguous United States certain terrestrial hosts, namely raccoons, skunks, and foxes maintain their eponymous unique viral variant. To evaluate the spread or spillover for certain variants, it is abundantly useful to have an accurate and rapid test to determine the rabies virus variant. This variant typing was often originally conducted with methodologies such as monoclonal antibodies, restriction enzymes, or sanger sequencing of small target regions. While these methods are still in use and have benefits, they also have some inherent drawbacks namely some combination of specificity, sensitivity, and speed. We describe two novel real-time RT-PCR assays which are able to discern between north central skunk and south central skunk variants that are endemic in the United States. Real-time RT-PCR is generally more sensitive and specific than the aforementioned methods and can be performed in several hours, often side by side with other molecular diagnostic and research work. There is no known cross reactivity with other rabies variants and each assay has a limit of detection of approximately 100 gene copies per reaction. Combined with a previously published raccoon variant real-time RT-PCR assay by Susan Nadin-Davis (Canadian Food Inspection Agency, Ottawa, Ontario, CA), we are able to discern viral variant and confirm homology extraordinarily rapidly especially in areas heavily surveilled and baited by the United States Department of Agriculture (USDA) as part of their mission to contain the spread of rabies.

Name: Thomas Rosa Menegazzi

PP061

Email: thomas-menegazzi@saude.rs.gov.br

Session: Diagnostics

Country: Brazil

Title: Techniques for diagnosing human and animal rabies

Authors: Thomas Rosa Menegazzi

Affiliations: Secretary of Health, State of Rio Grande do Sul, Brazil

Abstract: The laboratory diagnosis of human rabies can be performed both in vivo and after the patient's death. For in vivo determination, a direct immunofluorescence (IFD) is applied to salivaries by smears, corneal impression or scraping of the lingual mucosa, and they are also used as viral isolation techniques in mice or cell culture. The polymerase chain reaction (PCR) through the saliva and base biopsy of the hair follicle, from the back of the neck becomes more reliable, since the former have low sensitivity, when negative they do not absent the possibility of the presence of the virus. The investigation of serum and liquor of suspected patients, who have not received a prophylactic regimen (serum and / or vaccine), is also likely to be used for in vivo diagnosis. However, after the patient's death and necropsy, different fragments of the central nervous system must be sent to the laboratory. In the case of diagnosis for animal rabies, fragments of the central nervous system are sent, Negri's inclusions are pathognomonic, but do not histologically exclude the virus. For horses, spinal cord and brainstem delivery, samples are also required for the differential diagnosis of other diseases such as equine encephalomyelitis, eastern, western and Venezuelan type, and for West Nile fever. With regard to dogs and wild carnivores, the differential diagnosis for distemper is turned. Among cattle, it is necessary to establish compliance with the standards for the epidemiological surveillance system with differential diagnosis for bovine spongiform encephalopathy. The necropsy professional, from the laboratory or from the requesting municipality, should be immunized and properly trained for the perfect collection of the central nervous system, or its fragments. In order to send the samples, the material must be properly packed, so that it arrives at the laboratory in processing conditions without risks during transport for people.

O diagnóstico laboratorial de raiva humana pode ser realizado tanto in vivo quanto após óbito do paciente. Para determinação in vivo se utiliza a Imunofluorescência Direta (IFD) aplicada em amostras salivares através de esfregaços, impressão de córnea ou raspada de mucosa lingual, e também são utilizadas técnicas como isolamento viral em camundongos ou cultivo celular. A reação em cadeia da Polimerase (PCR) através da saliva e biopsia base do folículo piloso, da região da nuca se torna mais confiável, visto que os primeiros apresentam sensibilidade baixa, quando negativos não ausentam a possibilidade da presença do vírus. A pesquisa de anticorpos em soro e liquor de pacientes suspeitos, que não receberam esquema profilático (soro e/ou vacina), também é passível de ser utilizada para diagnóstico in vivo. No entanto, após o óbito do paciente e necropsia, diferentes fragmentos do sistema nervoso central deverão ser encaminhados ao laboratório. Tratando-se de diagnóstico para raiva animal, encaminham-se fragmentos do sistema nervoso central, inclusões de Negri são patognomônicas, mas não excluem a histologicamente o vírus. Para equinos, remessa de medula e tronco encefálico, também se exige direcionamento das amostras para o diagnostico diferencial de outras enfermidades como encefalomielite eqüina tipo leste, oeste e venezuelana, e para a febre do nilo ocidental. Com relação a cães e carnívoros silvestres, volta-se o diagnóstico diferencial para cinomose. Entre bovinos, é necessário estabelecer cumprir as normas para o sistema de vigilância epidemiológica com diagnóstico diferencial para encefalopatia espongiforme bovina. O profissional necropsista, do próprio laboratório ou do município solicitante, deverá ser imunizado e devidamente treinado para a perfeita coleta do sistema nervoso central, ou de seus fragmentos. Para enviar as amostras, deve-se embalar corretamente o material, a fim de que este chegue ao laboratório em condições de processamento sem riscos durante o transporte para as pessoas.

Name: Vitoria Bueno Vilela Silveira

PP062

Email: svbvtr@gmail.com

Session: Diagnostics

Country: Brazil

Title: Study of herbivore rabies diagnoses by dFAT test with monoclonal and polyclonal antibodies

Authors: VBV Silveira, MER Chierato, DFP Pavani, SM Achkar, KC Scheffer, KM Asano, K Iamamoto, WO Fahl, E Mori

Affiliations: University of Sao Paulo, School of Veterinary Medicine and Animal Science, Sao Paulo, Brazil

Abstract: The present study aimed to inquire about domestic herbivore CNS processing for rabies diagnoses, compare the use of monoclonal (MAB0051 Millipore) and polyclonal (homemade) antibodies and analyze the distinction between pH 7.0 and pH 9.0 glycerin 50%. From May to November 2019, the Pasteur Institute of Sao Paulo received 192 CNS samples. Of those, only 12 bovines and 5 equines were positive for rabies and had the brainstem. The samples were classified according to their anatomical regions (midbrain, pons, and medulla oblongata) and subclassified into subregions: cranial, middle, and caudal locations. A transversal cut was made for each subregion of a region and imprinted on four slides (two for monoclonal [glycerin pH 7.6 and 9.0] and two for polyclonal [glycerin pH 7.0 and 9.0] antibodies). In bovines, the number of corpuscles was higher in the cranial medulla oblongata and in the cranial and middle of the midbrain. The fluorescence intensity was higher in the cranial pons, cranial midbrain, and cranial and middle medulla oblongata. The corpuscle size is larger in the middle midbrain. The corpuscle is more dispersed in the middle medulla oblongata and in the middle midbrain. In equines, the number of corpuscles was higher in the cranial, middle, and caudal regions of the midbrain. The fluorescence intensity was higher in the middle and caudal midbrain. The corpuscle size is larger in the middle midbrain. The corpuscle is more dispersed in the cranial and caudal midbrain. Moreover, there was no evident distinction between pH 7.6 and pH 9.0 glycerin. Although the polyclonal antibody had a better performance, it was noticed that when both antibodies are used, there is a diagnostic advantage, since it is easier to detect the virus in decomposed samples.

Name: Willian de Oliveira Fahl

PP063

Email: wfahl@yahoo.com.br

Session: Diagnostics

Country: Brazil

Title: Use of centrifugation, clarification and ultracentrifugation methods in the preparation of central nervous system samples of horses for the rabies tissue culture infection test

Authors: Ligia Bocamino Viebig, Keila Iamamoto, Karin Corrêa Scheffer, Karen Miyuki Asano, Graciane Maria Medeiros Caporale, Adriana Cândido Rodrigues Nasraui, Francielle Cristina de Freitas, Enio Mori, Willian de Oliveira Fahl

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: The rabies tissue culture infection test (RTCIT) is a widely used technique for rabies diagnosis. Studies demonstrate that the diagnostic tests may present a lower diagnostic sensitivity in equine samples when compared with samples of other species, probably due to the low concentration of viral load in the sample analyzed. Thus, this study compared the positivity of the RTCIT after centrifugation, clarification and concentration by ultracentrifugation methods in the preparation of the sample suspension using different fragments from the central nervous system (CNS) of equines. Fifteen CNS samples from equines with a positive rabies diagnosis by the direct fluorescent antibody test and eight CNS negative samples samples with a negative diagnosis were used. Suspensions at 5% concentration of fragments of the hippocampus (HC), cerebellum (CB), cortex (CX) and bulb (BB) were prepared at a concentration of 5%. The suspensions were subjected to standard laboratory centrifugation (3.000rpm, 30 min.) and fractionated. The suspensions was subjected to the clarification and concentration processes by ultracentrifugation. Then, the suspensions obtained by the three different processes were inoculated in neuro-2A cell culture. The positivity found after the standard centrifugation in HC was 61.5%, in CB 46.2%, in CX 30.8% and in BB 69.2%. After the clarification stage, the positivity found was HC 38.5%, CB 23.1%, CX 15.4% and BB 46.2%. After concentration by ultracentrifugation, 46.2% in HC, 38.4% in CB, 30.8% in CX and 38.5% in BB were found to be positive. The results obtained demonstrated that the clarification and concentration processes did not increase the positivity of the RTCIT in relation to the standard centrifugation; therefore, more studies should be carried out to improve the diagnostic sensitivity of the RTCIT technique, considering mainly the equine samples.

Name: André Alberto Witt

PP064

Email: raiva@agricultura.rs.gov.br

Session: Economics

Country: Brazil

Title: Design of risk areas for herbivory anger in Rio Grande do Sul, Brazil

Authors: André Alberto Witt[1], Wilson Hoffmeister Jr, Fernando Henrique Sauter Groff[2]

Affiliations: [1]Coordenação do Programa Nacional de Controle de Raiva Herbívora, Departamento de Defesa Agropecuária, Secretaria da Agricultura, Pecuária e Desenvolvimento Rural do Rio Grande do Sul; [2]Divisão de Defesa Sanitária Animal, Departamento de Defesa Agropecuária, Secretaria da Agricultura, Pecuária e Desenvolvimento Rural do Rio Grande do Sul

Abstract: Tadarida brasiliensis (I. Geoffroy, 1824) (Molosidae, Chiroptera) is one of the most common and abundant bat species in urban areas in Rio Grande do Sul (RS), where it shelters on roofs of houses, forming colonies that range from hundreds thousands of individuals. Among the species of bats found positive for rabies in the cities of RS is, without a doubt, the largest number of cases presents, causing concern of public health authorities. However, little is known about the use and occupation of shelters in the cities by T. brasiliensis, except that in the autumn and winter periods the colonies disappear or are reduced in large part, leading to the belief that they may migrate to other regions. In 2012, the State Health Surveillance Center, through the Rabies Surveillance Program, with the objective of improving knowledge about the role of insectivorous bats in the rabies cycle in urban centers, started a work to mark bats belonging to families Vespertilionidae and Molossidae, with an emphasis on T. brasiliensis. Aluminum and flap washers (Capri model) were used, made with a sequential number and with initials SES / RS / Brazil (SES-State Health Secretariat). So far, the following municipalities have been visited: Alegrete, Arroio Grande, São Lourenço do Sul, São Gabriel, Tavares, Charqueadas, Nova Petrópolis, Bom Jesus, Tupanciretã, Caçapava do Sul, Caiçara, Derrubadas, Ijuí, Maquiné, Palmares do Sul , Pelotas, São Francisco de Paula, Capão do Leão, Santa Cruz do Sul and Montenegro. In total, 1,776 bats of the following species were banded: T. brasiliensis (n = 1,506), Molossus sp. (n = 36), Eptesicus sp. (n = 183), Histiotus montanus (n = 6), Histiotus velatus (n = 16) and Myotis sp. (n = 12). It is expected over the years to obtain information on the use and occupation of refuges in cities, in order to propose strategies and measures to prevent rabies caused by insectivorous bats in urban areas.

A pecuária é um das mais importantes atividades econômicas do Brasil que, somente em 2018, foi responsável por 14,3% da produção bovina mundial. O Rio Grande do Sul é o 7° maior produtor brasileiro, com um população bovina em torno de 12 milhões de bovinos em 2020, representando importância econômica social e poder de integração regional, possibilitando aumento de valor agregado de seus produtos finais e de melhoria da pauta de exportações . Diante deste cenário, um dos grandes desafios encontrados neste setor econômico são os prejuízos ocasionados por morcegos hematófagos da espécie Desmodus rotundus, que causam espoliação dos animais, desvalorizando produtos como o couro, perda de peso, reduzindo a produção de leite e, ainda, ocasionando a morte por raiva e/ou outras zoonoses. O Brasil possui diretrizes legais (Instrução Normativa do IBAMA 141/2006) para controle da população de morcegos hematófagos por parte dos órgãos de defesa sanitária animal. Entretanto essa é uma atividade complexa e de difícil execução, associadas ao alto custo financeiro e demanda de pessoal qualificado, torna-se fundamental elaborar novas estratégias para execução desta tarefa. No Rio Grande do Sul, a Secretaria da Agricultura, ao analisar os fatores de risco para raiva dos herbívoros, observou que a concentração de bovinos está situada no sudoeste e centro ocidental, enquanto a maior parte dos casos de raiva foi registrada na região sudeste e metropolitana de Porto Alegre, independentemente do número de abrigos de morcegos hematófagos existentes em cada região. Analisando a ocorrência dos 819 casos de raiva em herbívoros em 10 anos, delineamos como áreas de risco as áreas endêmicas associadas às bacias hidrográficas,

melhorando e aprimorando as estratégias de controle de morcegos hematófagos no Estado, de maneira a mitigar os impactos ocasionados a pecuária gaúcha.

Name: Ana Paula de Lima e Lima

PP065

Email: anapaula-geo@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Anthropization and aggression by bats in humans in a conservation area in the eastern amazon

Authors: Ana Paula de Lima e Lima[1,2], Samara Maria Modesto Verissimo[2], Patrick Rabelo Jacob[3], Marcio Cruz Pantoja[1], Elane de Araújo de Andrade[1], Kelly Caroline Gomes Nascimento[1], José Guilherme dos Santos Fernandes[2], Isis Abel[1]

Affiliations: [1]Laboratório de Epidemiologia e Geoprocessamento (IMV/UFPA); [2]Programa de Pós-Graduação em Estudos Antrópicos na Amazônia (PPGEAA/UFPA); [3]Institudo Chico Mendes de Conservação da Biodiversidade (ICMBIO-PA)

Abstract: In the state of Pará, Brazil, four outbreaks of human rabies transmitted by vampire bats have been recorded in the last 15 years. Bat attacks on humans have been reported in the municipality of Curuçá, precisely in the Extractive Reserve (Resex) Mãe Grande. The work aims to report the spatio-temporal perception and the dynamics of aggressions by vampire bats in humans in an extractive reserve area in the Amazon. The characterization of the target population was carried out with the information contained in the Survey of families residing and/or using the Resex conducted by ICMBio in May and June 2019. Additionally, residences of those who reported bat bites were georeferenced and of these 30 older social actors were selected for interview. Descriptive statistics was performed in SPSSv.24 and discourse analysis was used in recorded interviews. An analysis of land use was carried out applying attacked people spatialization. Those affected are artisanal fishermen who live with their families or stay for seasons on islands and beaches. Locations where aggressions have not occurred for at least 10 years have been identified. In these, the signs of anthropization can be observed by the distribution of electric energy, the advance of urbanization and the increase of secondary vegetation. In more remote locations, where aggressions continue to occur frequently, there was an advance in the areas of beaches and maintenance of the original vegetation. Due to the discourse captured in this work, the people bitten by bats ends up neglecting it due to cultural issues and the difficult access to health facilities. In general, the interviewees do not relate landscape alteration to the increase in aggressions, but they highlight the reduction of some wild and livestock animal species in this environment. In the fishermen's perception, alcoholism is an important factor for the exposure of these individuals, who become more vulnerable to the vampire bats.

No estado do Pará, Brasil, foram registrados nos últimos 15 anos, quatro surtos de raiva humana transmitida por morcegos hematófagos. Agressões por morcegos em humanos vem sendo relatadas no município de Curuçá, precisamente na Reserva Extrativista (Resex) Mãe Grande. O trabalho tem por objetivo relatar a percepção espaço-temporal e a dinâmica das agressões por morcegos hematófagos em humanos em uma área de reserva extrativista na Amazônia. A caracterização da população alvo foi realizada com as informações contidas no Levantamento das famílias que residem e/ou utilizam a Resex conduzido pelo ICMBio em maio e junho de 2019. Adicionalmente, as residências daqueles que relatassem agressão por morcegos foram georreferenciadas e desses foram selecionados 30 atores sociais mais antigos para entrevista. A estatística descritiva foi realizada no SPSSv.24 e a análise do discurso foi empregada nas entrevistas gravadas. A partir da espacialização dos agredidos foi realizada análise do uso do solo. Os acometidos são pescadores artesanais que vivem fixados com suas famílias ou permanecem por temporadas nas ilhas e praias. Foram identificadas localidades onde agressões não ocorrem há pelo menos 10 anos. Nessas os sinais da antropização podem ser observados pela distribuição de energia elétrica, avanço da urbanização e aumento da vegetação secundária. Já em localidades mais remotas, onde as agressões permanecem acontecendo com frequência, observou-se um avanço nas áreas de praias e manutenção da vegetação original. Pelo discurso captado neste trabalho, a população agredida acaba negligenciando por questões culturais e pelo difícil acesso às unidades de saúde. Em geral, os entrevistados não relacionam a alteração da paisagem com o aumento das agressões, mas destacam a redução de algumas espécies animais

silvestres e de produção nesse ambiente. Na percepção dos pescadores, o alcoolismo é um fator importante para exposição desses indivíduos, que se tornam mais vulneráveis ao morcego vampiro.

Name: Ana Paula Konzen Riffel

PP066

Email: ana-riffel@saude.rs.gov.br

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Profile of anti-rabies treatment in the municipalities of 14th Regional Health Coordination of the Rio Grande do Sul State Health Secretariat, Brazil, 2014-2019

Authors: Ana Paula Konzen Riffel, Patricia de Moura Freitas, Fernando Renato Klaus, Estela Maria Rossato, Doris Clarita Buttenbender, Salete Maria Gerhardt Heldt, Bernadete Kuhn, Andre Jarenkow, Fabiane Cristine da Silva, Aline Alves Scarpellini Campos

Affiliations: 14th Regional Health Coordination of the Rio Grande do Sul State Health Secretariat, Brazil

Abstract: Rabies is a zoonosis with almost 100% lethality, and therefore, post-exposure prophylactic treatment is indicated in all cases of contact with saliva and secretions of animals potentially transmitting rabies virus. This work evaluated the profile and conduct of human anti-rabies care (AARH) post-exposure occurred in the 22 municipalities covered by the 14th Regional Health Coordination Office (CRS) of the Rio Grande do Sul state (RS) Health Secretariat (SES), between 2014-2019. A descriptive observational study was carried out, evaluating the AARH data from 2014 to 2019 at the 14th CRS/SES/RS, obtained from System for Notifiable Diseases (SINAN). In the evaluated period, there were 3674 AARH and most of the incidents occurred in urban areas (70%), regardless of the species involved. There was no significant change in the number of total AARH over time. The exposure occurred predominantly due to bites (89.0%) caused mainly by dogs (88.3%). There were also reports of accidents with cats (7.4%), domestic herbivores (0.59%), wild mammals (bats, foxes and primates, 0.57%), and others (3.16%). Most patients were males, aged 0-9 years (17.8%). However, in accidents with wild mammals, the mainly age group was 50-59 years (23.8%). The wounds were predominantly unique (60.6%), superficial (54.8%) and located on the lower limbs (41%). Regarding the conduct of prophylaxis adopted, there was an improvement in the quality of prophylaxis adopted, since 75.8% and 92.7% of adopted conducts was considered adequate in 2014 and 2019, respectively. Health education actions for health surveillance are essential to improve the completeness of the data and the appropriate conduct in cases of AARH. Therefore, the inclusion of the "species" field in SINAN would enable a more careful assessment of AARH and more assertive prevention strategies. In addition, the rational use of immunobiological is encouraged, ensuring the availability of adequate treatment for serious accidents.

Name: Clayton Bernardinelli Gitti

PP067

Email: cbgitti@yahoo.com.br

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Human rabies from prevention to treatment: experience report of the development of an online course

Authors: Danielle Amaral de Freitas, Alexandra Schmitt Rasche, Ana Maria Bezerra Bandeira, André Luiz Ferreira Bezerra, André Penna-Firme, Julia Verli Rosa, Rayza Garcia Nascimento, Ricardo Lacerda Caiado, Ester Souza Da Silva, Wagner Brito de Barros, Ana Carolina Cardoso Arruda Carvalho de Moura, Karoline Moreira Duffrayer, Maria Lucia Ferreira dos Santos Fernandes Filha, Juliana Dias Vieira Lima, Andrea Azeredo, Mônica Agostinho da Silva, Clayton Bernardinelli Gitti

Affiliations: Rural Federal University of Rio de Janeiro, Seropédica, Brazil

Abstract: Due to the high death rate from rabies in humans, the lack of qualification to deal with prophylaxis cases and the recent spike of cases in some regions of Brazil, urgent planning the prevention management qualifications is required, intensifying health checks through health professionals training. Utilizing an online course will work as a strategy to reach a big number of students, enhancing health care availability especially to remote areas. This work means to describe the experience of planning, application and management of an online course about rabies in humans. A multidisciplinary group planned the didactic pedagogical content, which was made available through video recorded lessons arranged in modules, provided in the virtual learning lounge of the Moodle platform from the Federal University of Rio de Janeiro. The Screen Recorder tool was used for the creation of the video recorded lessons building a question bank for taught content evaluation. To complete the evaluation activities, clinical cases were presented as comic strips. One hundred candidates were selected for the spots available. The team was made of nineteen people. Twelve from Federal University of Rio de Janeiro, being five from the graduation course and nine from other areas. Sixteen video recorded lessons were made, arranged in five modules. An evaluation form was created for previous theme knowledge, as well as a form for content evaluation per module and a final form for final course content evaluation including ten clinical case studies. In order to enhance the knowledge about prophylaxis caused by rabies in humans, this extension action taught and trained professionals acting in virtual environments and online courses throughout didactic planning for information sharing. The first class graduated in August 2019, helping with the execution team interaction, wishing to innovate the practices of teaching and learning as well as promoting health care.

Name: Émerson Salvagni

PP068

Email: emerson-salvagni@saude.rs.gov.br

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Epidemiological profile of human antirabic care in municipalities of 4th Regional Health Coordination, Rio Grande do Sul, Brazil

Authors: Émerson Salvagni, Lisiane Löbler, Fabiele Feltrin Paniz, Jacqueline Cassol Carvalho Rigo, Junior dos Santos

Affiliations: 4th Regional Health Coordination, State Health Secretariat of Rio Grande do Sul, Brazil

Abstract: Rabies is transmitted to humans by inoculating the virus in the saliva and secretions of infected mammals. Human Anti-rabies Care (HAC) are procedures that minimize the chance of illness in humans involved in accidents with potential for transmission. We aim to characterize the epidemiological profile of HAC in municipalities belonging to 4th Regional Health Coordination, from Rio Grande do Sul - Brazil, to better understand the dynamics of events and collaborate in their prevention. HAC records in Notifiable Diseases Information System - SINAN, between 08/15/2015 and 08/15/2020, of 32 municipalities, were investigated. In the period, 7,878 HAC were notified, with records in 32 municipalities. A slight increase in the frequency exposures was observed in the last quarter of the year and the species most involved were canine (81%) and feline (11.8%), followed by chiroptera, domestic herbivores and primates. The predominant age group was from 20 to 59 years old and, as for sex, 54% were women. The most common type of exposure was biting (88.3%) and, to a lesser extent, scratching and licking. Lesion location in the lower limbs stands out (42.3%), followed by the hands / feet, upper limbs, head / neck, trunk and mucous membranes, with predominant single (64.9%) and deep wounds. The treatment indicated in 61.5% of cases involved only observation of the offending animal (dog or cat), in 15.7% the patient's vaccination and observation of the animal, 11.5% only vaccine and, in 3.4%, use of serum and vaccine. There was also no treatment (0.9%), 5 cases of reexposure and 349 pre-exposure schemes. Knowing the epidemiological profile of HAC contributes to creation of strategies to reduce the number of human exposures to the rabies virus, number of HAC, inputs and resources involved.

Name: Josimara Fernandes de Moura

PP069

Email: raiva.manaus@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Characterization of anti-rabies care in the period from 2017 to 2020 in the city of Manaus

Authors: Cláudia Mara Rolim Mendes Guimarães, Marinélia Martins Ferreira, Josimara Fernandes de Moura, Cleude Maria de Araújo Pereira

Affiliations: Secretary of Health, City of Manaus, Brazil

Abstract: Introduction: Human Rabies Prophylaxis Program was implemented in order to reduce cases in humans by controlling rabies in domestic animals and prophylaxis in cases of accidents or contact with animals potentially transmitting rabies. Objective: to characterize the anti-rabies care in the city of Manaus in the period from 2017 to 2020. Methodology: the data were collected, by the Excel program, by the consolidation form of human anti-rabies care of each SUS Health Unit with the Program implemented from the period of 2017 to July 2020, considering cases of pre-exposure, post-exposure and re-exposure. Results: there was an increasing variation in the total number of visits made from 2017 to 2020. In relation to people who started treatment, there was an increase of 8.25% in 2018, compared to 2017, followed by a reduction of 38.73% in 2019. In 2017, the rate of treatment abandonment was 11.50%, in the following year, 12.48% and, 18.31% in 2019. In the years 2017 and 2018, it is observed that 71 % and 68.6%, respectively, of the treated people consisted of the application of two doses of vaccine + observation of the animal. A prevalent aggressive animal species was canine, and the most observable. In primates, aggressions in 2020 increased by 93%, 94% and 92% compared to the years 2017, 2018 and 2019, respectively. As for the bat, notifications varied over the course of four years, as an aggressive species, but in 2020 it increased by 72.4%, 60% and 89%, compared to the years 2017, 2018 and 2019, respectively. Conclusion: the continuity of surveillance and the education of the population and health professionals are necessary to reduce the number of treatment dropouts and the number of assaults.

Name: Juan Manuel Serrano Márquez

PP070

Email: mvz_serrano@live.com

Session: Human Rabies & Prophylaxis

Country: Mexico

Title: Description of the medical and anti-rabies care of the person attacked by a dog, cat or other mammal in the Coyoacan health jurisdiction

Authors: Juan Manuel Serrano Márquez

Affiliations: Mexico City Public Health Services, Coyoacan Health Jurisdiction, Mexico City, Mexico

Abstract: The attention to the patient attacked by rabies reservoirs has clear algorithms established in the federal regulations in Mexico. Hence the importance of disseminating this protocol to medical personnel and the general population. As well as the corresponding epidemiological evaluation.

Name: Juan Manuel Serrano Márquez

PP071

Email: mvz_serrano@live.com

Session: Human Rabies & Prophylaxis

Country: Mexico

Title: The role of the veterinarian in public health in the Coyoacan health jurisdiction

Authors: Juan Manuel Serrano Márquez

Affiliations: Mexico City Public Health Services, Coyoacan Health Jurisdiction, Mexico City, Mexico

Abstract: The role of the veterinarian in public health is very diverse. These contributions are rarely known to the population, reason why it is essential to spread these. Regarding rabies prevention, the local contribution ranges from the application of current regulations regarding the initiation of human rabies treatments and the control of rabies in reservoirs, to raising awareness among doctors and other health professionals on the behavior of the main urban rabies reservoirs, among others activities.

Name: Juliana de Carvalho Xavier

PP072

Email: julianacxavier@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Unique Health: educational actions preventive of rabies in a ludic context for schools

Authors: Juliana de Carvalho Xavier[1], Karina Gatti de Abreu[1], Maria Rafaela Feitosa de Sousa[1], Victória Forte Viana[1], Tatiana Leite Barbosa Araújo dos Santos[1], Naylê Francelino Holanda Duarte[2]

Affiliations: [1]Humanitarian Environmental Education Association for Animal Welfare, Responsible Guard and Wild Animals (BEAGUARAS), Fortaleza, Ceará, Brasil; [2] Federal University of Ceará, School of Medicine Public Health, Fortaleza, Ceará, Brasil

Abstract: The concept of Unique Health focuses on animal, human and environmental health. There are several cases of zoonotic and anthropozoonotic pathologies involved in this cycle, including rabies. In Brazil, from 2009 to 2018, 38 cases of human rabies were registered, and of these, 50% had the bat as the main transmitter, followed by dogs, 29%, and 10% by non-human primates. In Ceará, in the years 2007 to 2018, there were five cases of this disease, with the marmoset as the main transmitter. In order to contribute to the reduction of human cases and control of the disease in Ceará, the "BEAGUARAS" Project, formed by academics and multidisciplinary professionals, especially veterinary, has been developing educational actions on rabies and unique health. Therefore, the objective of this work is to describe experiences with actions carried out since May 2018 by BEAGUARAS, especially for children and adolescents, about this theme, seeking to disseminate knowledge on the prevention of risks and injuries transmitted by domestic and wild animals. The actions were carried out in schools, parks and zoos, using playful methodologies, such as: animals theater, origami workshop of bats, thematic games, responsible guard approach and rabies vaccination for domestic animals and prevention of accidents by wild animals. After the end of the activities, it is perceived that the audience assimilates the content passed on, since the target group demonstrates in drawings and games of right and wrong the contents and knowledge learned, as well as, with the teachers' report on the students. It is concluded that the educational actions promoted by BEAGUARAS are of great importance for the promotion of health, because the public learns about the prevention of risks and injuries by wild and domestic animals, therefore it helps in the prevention of Rabies and in the care with Unique Health.

Name: Kellyn Kessiene de Sousa Cavalcante

PP073

Email: kellynveterinaria@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Human rabies and post-exposure anti-rabies prophylaxis: sociodemographic and epidemiological aspects in the state of Ceará, 2007 to 2019

Authors: Kellyn Kessiene de Sousa Cavalcante[1]; Jarier de Oliveira Moreno[1]; Naylê Francelino Holanda Duarte[1]; Caroline Mary Gurgel Dias Florêncio[2]; Carlos Henrique Alencar[2]

Affiliations: [1] Student of the Doctorate in Public Health course of the Postgraduate Program in Public Health, Department of Community Health, Faculty of Medicine, Federal University of Ceará, Fortaleza, Brazil; [2] Doctor of the Postgraduate Program in Public Health, Department of Community Health, Faculty of Medicine, Federal University of Ceará

Abstract: Introduction: Rabies is an almost always fatal disease, whose post-exposure rabies prophylaxis is indicated for people exposed to the rabies virus. Ensuring adequate and timely prophylaxis is a challenge for rabies surveillance in Brazil. Objective: To characterize the sociodemographic and epidemiological aspects of human rabies cases and post-exposure anti-rabies prophylaxis in Ceará, from 2007 to 2019. Methods: Descriptive cross-sectional study of human rabies investigation forms and human anti-rabies care recorded in the Information System of Notifiable Diseases - Sinan. The data were analyzed by Microsoft Excel 2010. Results: There were five cases of human rabies, with a median of 16 years and range from 3 to 37 years of age. The deaths occurred in five municipalities: Camocim-sagui / 2008, Chaval-Cão / 2010, Ipu-sagui / 2010, Jati-sagui / 2012 and Iracema-morcego / 2016. There were 391,106 post-exposure visits, with an annual average of 31,021. The highest rates of attendance occurred in 2018 (48.2 / 100,000 inhabitants) and 2019 (46.6 per 100,000 inhabitants). Assistance was prevalent in males (52.8%), aged 20 to 34 years (19.8%), mixed race (72.6%) and urban areas (67.4%). The exposure was due to a bite (85.9%), of the canine species (68.7%), characterized by single wounds (53.5%), superficial wounds (43.8%), located on the hands / feet (39.5 %). The animal was declared healthy at the time of the accident in 60.2% of the notifications, and 64.3% subject to observation only; however, the most indicated type of treatment was observation and vaccine (44.5%). Conclusions: Rabies continues to be a public health problem in Ceará, given that the last human case was in 2016. The characteristics of the types of aggression suggest that the observation of the aggressor animal is the most appropriate prophylactic treatment, which can reduce prescription of human rabies vaccine and the waste of resources. It is essential that the prophylactic care is appropriate to the Technical Standards.

Introdução: A raiva é uma doença quase sempre fatal, cuja profilaxia antirrábica pós-exposição é indicada para pessoas expostas ao vírus rábico. A garantia da profilaxia adequada e oportuna é um desafio para a vigilância da raiva no Brasil. Objetivo: Caracterizar os aspectos sociodemográficos e epidemiológicos dos casos de raiva humana e da profilaxia antirrábica pós-exposição no Ceará, de 2007 a 2019. Métodos: Estudo transversal descritivo das fichas de investigação de raiva humana e dos atendimentos antirrábicos humanos registrados no Sistema de Informação de Agravos de Notificação - Sinan. Os dados foram analisados pelo Microsoft Excel 2010. Resultados: Houve cinco casos de raiva humana, com mediana de 16 anos e amplitude de 3 a 37 anos de idade. Os óbitos aconteceram em cinco municípios: Camocim-sagui/2008, Chaval-cão/2010, Ipu-sagui/2010, Jati-sagui/2012 e Iracema-morcego/2016. Registraram-se 391.106 atendimentos pós-exposição, com média anual de 31.021. Os maiores coeficientes de incidência de atendimentos aconteceram em 2018 (48,2/100.000 habitantes) e 2019 (46,6 por 100.000 habitantes). Os atendimentos prevaleceram no sexo masculino (52,8%), na faixa etária de 20 a 34 anos (19,8%), raça parda (72,6%) e zona urbana (67,4%). A exposição foi por mordedura (85,9%), da espécie canina (68,7%), caracterizada por ferimentos únicos (53,5%), superficiais (43,8%), localizados em mãos/pés (39,5%). O animal foi declarado sadio no momento do acidente em 60,2% das notificações, e 64,3% passíveis apenas de observação; porém, o tipo de tratamento mais indicado foi observação e vacina (44,5%).

Conclusões: A raiva continua como problema de saúde pública no Ceará, dado que o último caso humano foi em 2016. As características dos tipos de agressão sugerem que a observação do animal agressor seja a indicação de tratamento profilático mais adequada, o que pode reduzir a prescrição de vacina antirrábica humana e o desperdício de recursos. É fundamental que o atendimento profilático seja adequado às Normas Técnicas.

Name: Mateus Borges Silva

PP074

Email: mateus.b.s@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Health professionals' knowledge, attitude and practice regarding rabies in an Amazonian community vulnerable to bat aggression

Authors: Mateus Borges Silva, Ruth Cavalcante Silva Guimarães, Kelly Karoline Gomes do Nascimento, Elane de Araújo Saraiva, Kennedy Edson Silva de Souza, Samara Maria Modesto Veríssimo, Carolina Ferreira de Azevedo, Diego de Arruda Xavier, Marcos César da Rocha Seruffo, Isis Abel Bezerra

Affiliations: Universidade Federal do Pará

Abstract: The municipality of Curuçá, northeastern mesoregion of Pará, Brazilian Amazon, has numerous reports of aggression by hematophagous bats in humans, raising concerns about the likely exposure of these citizens to the rabies virus and recognizing the need for prophylaxis and education actions on rabies more intense. In this sense, health professionals are the biggest disseminators of health information and, therefore, need to be well informed. This study search to analyze the effect of an educational intervention on the Knowledge, Attitude, and Practice - called KAP - of health professionals in the municipality of Curuçá in relation to rabies. A semi-structured KAP questionnaire was applied for 105 health professionals in a municipality before and after six months of training in which aspects about the etiological agent, ways of transmitting the virus, and prophylactic measures were addressed through lectures and workshops. A descriptive analysis of the data was developed in SPSS v24 and Bayesian analysis was applied to verify the effects of the intervention from the score assigned to the participants. The results indicate that training influenced to improve the level of knowledge of the participants (60.5%). However, as the initial KAP was considered unsatisfactory (score 21.20), (67.3%) of health professionals reached a satisfactory level on KAP (score greater than 31.00) after the intervention. The best results were obtained with professionals aged over 40 years, with more than 16 years of health employment. The results also indicate that training mainly improved in the knowledge area of these individuals. This study highlights the importance of continuous training actions about rabies, besides that lectures and workshops are effective to increase the KAP of health professionals.

O município de Curuçá, mesorregião Nordeste do Pará, Amazônia Brasileira, tem numerosos relatos de agressão por morcegos hematófagos em humanos, trazendo a preocupação em relação a provável exposição desses cidadãos ao vírus rábico e reconhecendo a necessidade de ações de profilaxia e educação sobre raiva mais intensas. Para isso, conta-se com o auxílio dos profissionais de saúde, que são os maiores disseminadores de informações sobre a saúde e, portanto, precisam estar bem informados. Este estudo teve por objetivo analisar o efeito de uma intervenção educacional sobre o Conhecimento, Atitude e Prática (CAP) de profissionais de saúde do município de Curuçá em relação à raiva. Um questionário semiestruturado CAP foi aplicado a 105 profissionais de saúde do município antes e depois de seis meses de uma capacitação na qual foram abordados aspectos sobre o agente etiológico, formas de transmissão do vírus e medidas profiláticas, através de palestras e oficinas. A análise descritiva dos dados foi desenvolvida no SPSS v24 e a análise Bayesiana foi aplicada para verificar os efeitos da intervenção a partir do score atribuído aos participantes. Os resultados indicam que a capacitação foi capaz de alterar o nível de conhecimento dos participantes (60,5%). Porém, como o CAP inicial foi considerado como insatisfatório (score 21,20), 67,3% dos profissionais de saúde alcançaram um nível satisfatório no CAP (score maior que 31,00) após a intervenção. Os melhores resultados foram observados entre aqueles profissionais da faixa etária maior de 40 anos, com mais de 16 anos de tempo de serviço. A capacitação interferiu principalmente na área de Conhecimento desses indivíduos. Este estudo demonstrou que ações de capacitação continuada a respeito da

raiva são necessárias para esses profissionais, e que palestras e oficinas são efetivas para aumentar o CAP desses profissionais.

Name: Nailde de Paula Silva

PP075

Email: naildevet@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Rabies virus neutralizing antibodies in a population exposed to bat bites in an extractive reserve, Eastern Amazon, Pará, Brazil

Authors: NS De Paula[1], EA Andrade[1], KKG Gomes[1], ER Fernandes[2], F Guedes[2], SR Silva[2], JF Ferreira[3], RIR Freitas[4], RES Feitosa[5], I Abel[1]

Affiliations: [1]Laboratório de Epidemiologia e Geoprocessamento (IMV/UFPA); [2]Laboratório de Sorologia, Área Imunologia – Instituto Pasteur/SP; [3]Enfermeiro, Secretaria Municipal de Saúde de Marapanim/PA; [4]Programa de Pós-Graduação em Estudos Antrópicos na Amazônia (PPGEAA/UFPA); [5] Coordenadora Municipal de Vigilância em Saúde – Castanhal/PA

Abstract: The latest outbreaks of human rabies in Brazilian Amazon have shown an exposed population that lives under constant attacks by bats and the factors associated with these occurrences need to be investigated. The aim of this study was to analyze the serological profile of individuals exposed to bat attacks in an extractive reserve, in the Amazon context. Individuals battered by bats between 2013-2016 were analyzed (n=58), of which only 18 had received post-exposure prophylaxis. The others (n=40) reported never having been vaccinated. The detection of antibodies was done by the RFFIT and ELISA methods and the individuals answered an epidemiological questionnaire. These people were between 03 and 69 years old, the majority of whom were fishermen (60.4%) from mangrove areas, male (75.4%). All those who were vaccinated produced IgG response to inactivated rabies virus and 55.5% also produced IgM. Neutralizing antibodies (NAbs) titers were ≥0.5 IU/mL in 50% of them, 81.8% were aggressed once in their lives and 56.4% received an incomplete vaccination schedule (1-4 doses), without the application of serum. (37.5%). Among those not vaccinated, 35% produced IgM and 90% IgG responses. NAbs ≥0.5 IU/mL were detected in 7.5% of them, 17.5% presented titers between 0.11 - 0.49 IU/mL and 75% presented NAbs ≤ 0.10 IU/mL. In this group, 21.5% had already been attacked more than five times in their life, with the last aggression having occurred between 2 months and 1 year (55.9%) ago, while sleeping in huts (51.9%), during fishing activity. The fact that there are non-vaccinated individuals, with NAbs titers between 0.11 - 0.49 IU / mL, IgM and IgG responses to rabies virus, indicates exposure possibly related to successive attacks, although these have not induced a protective immune response. Unvaccinated individuals who presented protective titers need further investigation of their vaccination history.

Os últimos surtos de raiva humana na Amazônia brasileira evidenciaram uma população exposta que vive sob constantes ataques de morcegos e os fatores associados a essas ocorrências precisam ser investigados. O objetivo desse estudo foi analisar o perfil sorológico de indivíduos expostos às agressões por morcegos em uma reserva extrativista, no contexto amazônico. Foram analisados 58 indivíduos agredidos por morcegos entre 2013-2016, dentre os quais apenas 18 haviam recebido a profilaxia pós-exposição. Os demais (n=40) relataram nunca ter sido vacinados. A detecção de anticorpos se deu pelos métodos de RFFIT e ELISA e os indivíduos responderam um questionário epidemiológico. Essas pessoas tinham entre 03 e 69 anos, sendo a maioria de pescadores (60,4%) de áreas de mangue, do sexo masculino (75,4%). Todos aqueles que foram vacinados apresentaram IgG contra o vírus da raiva inativado e 55,5% apresentaram também IgM. O título de anticorpos neutralizantes (AcN) foi ≥0.5UI/mL em 50% deles, 81,8% foram agredidos uma vez na vida e 56,4% receberam esquema de vacinação incompleto (1-4 doses), sem aplicação do soro (37,5%). Já entre os não vacinados 35% apresentaram IgM e 90% IgG. Os AcN ≥0.5 UI/mL foram detectados em 7,5% deles, 17.5% tinham títulos entre 0.11 - 0.49 UI/mL e 75% apresentaram AcN ≤ 0.10 UI/ mL. Nesse grupo, 21.5% já tinham sido atacados mais de cinco vezes em sua vida, sendo que a última agressão tinha acontecido entre 2 meses e 1 ano (55.9%) atrás, enquanto dormiam em choupanas (51.9%), durante a atividade de pesca. O fato de existirem indivíduos não vacinados, com títulos AcN entre 0.11

- 0.49 UI/mL, IgM e IgG contra o vírus rábico, indica exposição possivelmente relacionada às sucessivas agressões, embora essas não tenham induzido uma resposta imune protetiva. Indivíduos não vacinados que apresentaram títulos protetores necessitam de maior investigação sobre o histórico de vacinação.

Name: Nathalia Alves Castro do Amaral

PP076

Email: nathaliacastro.medvet@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Human rabies cases in Brazil: situational diagnosis from 2007 to 2019

Authors: Nathália Alves Castro do Amaral, Jurandir Alves de Almeida Júnior, Mariana Gomes Ferreira Machado de Siqueira, Maria Luiza Ferreira Imburana da Silva, Davi dos Santos Rodrigues

Affiliations: Unidade de Vigilância Ambiental e Controle de Zoonoses - UVACZ

Abstract: Rabies is a disease known and recorded by men since the Old Age; it is an acute viral disease characterized by fatal encephalomyelitis. The disease reaches 100% lethality, but is immunopreventable to both humans and other mammals. This study aimed to analyze the profile of reported cases of human rabies in Brazil between 2007 and 2019. To this end, a descriptive epidemiological study was carried out with data from the Information System of Notifiable Diseases (SINAN) from 2007 to 2019, on human rabies cases in Brazil, assessed for sociodemographic characteristics, spatial distribution and vaccine coverage. There were 43 cases of human rabies in Brazil between 2007 and 2019. Regarding the spatial configuration, the Northeast region presented the most notifications (51.15%) in this period of time. In 2018, the highest number of cases was recorded (25.58%); in the same year, the state of Pará was predominant in the occurrence of cases (90.90%). The majority of those affected were males (76.74%), aged between 20 and 39 years (34.88%), with a predominantly brown race (81.39%); it was also observed that the schooling of adult individuals was low (27.90%). In 69.76% of the cases, the patient did not undergo post-exposure prophylaxis, and in 86.04% of the cases, pre-exposure immunoprophylaxis was not performed. In 67.44% of the cases the aggressor animal had not been immunized. Based on these data we see the need to maintain animal anti-rabies vaccination coverage at 70%, as required by the Ministry of Health, as well as the importance of pre-exposure vaccine supply for professional categories that present more risk of mammalian bite and/or scratch accidents, as well as post-exposure vaccine for population that is involved in mammalian bite and/or scratch accidents.

Name: Neuder Wesley França da Silva

PP077

Email: nwvet@hotmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Clinical-epidemiological profile of antirabic care with regard to indigenous race/color in the State of Pará, Amazonian Region, Brazil, from 2007 to 2019

Authors: Neuder Wesley França da Silva

Affiliations: Pará State Department of Public Health, Brazil

Abstract: Introduction: In Brazil, according to the 2010 census, approximately 817 thousand people declared themselves indigenous, with the northern region and the Amazonian environment predominating with 37.4%. In 2018, Pará recorded an outbreak with 10 deaths from human rabies caused by blood-sucking bats, covering the riverside population of Melgaço. Objective: To describe the clinical-epidemiological profile of anti-rabies care in indigenous people in the State of Pará, Amazon Region. Methodology: A quantitative descriptive study was carried out of the anti-rabies care database of the Notifiable Disease Information System of the State Secretariat of Public Health of Pará, by area of residence, according to the indigenous race / color variable from 2007 to 2019. Results: There were 405,687 visits, 2,416 (0.59%) of which were indigenous, occupying the last position among the other races. The highest frequency occurred in 2018 (9.74%), with an annual and monthly average of 186 and 201 cases, respectively, without the presence of seasonality. It encompassed the male sex more (54.25%); in the urban area (62.54%); age range of 1-9 years (46.58%) and 20-34 years (29.18%); through bites (87.48%); in lower limbs (45.96%) and hands / feet (28.68%); caused by dogs (81.11%), cats (7.95%) and bats (5.51%). The treatment indicated was observation + vaccination (54.83%), with 21.38% interrupting the treatment and 31.33% there is no information. Usually the reason for the interruption was without information (78.62%) and 14.46% occurred abandonment. Conclusion: In Pará, there are no reports of rabies in indigenous people, regardless of area of residence, however the present study indicates the category as a risk group due to the frequency of animal exposure susceptible to rabies and flawless prophylactic treatment such as treatment abandonment and lack of information on variables inherent in understanding cases.

Introduction: Le Pará a reconnu 10 cas mortels de rage, à Melgaço, en 2018, causés par des chauves-souris hématophages. Au Brésil, selon le recensement de 2010, environ 817 000 personnes se sont déclarées indigènes, la région nord et l'environnement amazonien en représentant 37,4%. Objectif: Décrire le profil clinique-épidémiologique des soins antirabiques dispensés aux populations indigènes de l'État du Pará, dans la région amazonienne. Méthodologie: Une étude descriptive et quantitative des soins antirabiques enregistrés dans le système d'information du Secrétariat à la Santé Publique de l'État du Pará, de 2007 à 2019, par zone de résidence et par race. Résultats: Les consultations des indigènes sont inférieures à celles des autres races: 2413 sur 405 867 (0.59%). La moyenne annuelle est de 186 avec un maximum de 235 en 2018 et un minimum de 129 en 2015 et sans saisonnalité. Les patients les plus nombreux sont de sexe masculin (54,25%) ; de zone urbaine (62,54%); de 1 à 9 ans (46,58%) et 20 à 34 ans (29,18%); avec des morsures (87,48%); de chiens (81,11%), de chats (7,95%) ou de chauves-souris (5,51%), au niveau des membres inférieurs (45,96%), des mains et des pieds (28,68%). Dans 54,83% des cas, le traitement retenu a été l'observation et la vaccination; son application a été faite à 47.29%, interrompue à 21.38% et non informée à 31,33%. Les raisons de seulement 14.46% des interruptions est renseignée : traitement abandonné par le patient. Conclusion: au Pará, aucun cas de rage n'a été signalé chez les indigènes. Toutefois, cette étude indique qu'il s'agit d'un groupe à risque en raison de son exposition aux animaux sensibles à la rage, du taux d'interruption du traitement et de son manque d'information.

Name: Paula da Fonseca Apolinário

PP078

Email: paulafapolinario@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Human anti-rabies care: epidemiological analysis of the grievance and study of the population's understanding of the behavior of aggressor animals

Authors: Paula da Fonseca Apolinário, Suzana Maria Rocha, Caroline Constantino, Márcio Oliveira Lopes, Vivien Midori Morikawa

Affiliations: Federal University of Parana, Curitiba, Brazil

Abstract: Rabies is a contagious, highly lethal anthropozoonosis. Epidemiologically, it has four transmission cycles: urban, rural, aerial wild and terrestrial wild. The objective of this work was to know the epidemiological profile of those who underwent antirabic care due to biting by dogs and cats, to characterize the profile of the aggressor animals and as situations in which as aggressions occurred in a municipality in the metropolitan region of Curitiba / PR, where the complaint is the second in number of notifications. A descriptive study was carried out based on data contained in SINAN for the period from 2010 to 2016 and a questionnaire was applied on the circumstances of the injuries that occurred in the most frequent months of the year 2018. In the period of epidemiological study, the annual average was 328 calls for different alternatives. Of the records analyzed (2013), with exposure by dog or cat bite, the dog was the main aggressor, a most affected age group, desired from 0 to 19 years and the most affected location, hands / feet and lower limbs. Among light accidents, outside of risk sites, involving healthy and observable animals, 79% (281/355) entered the vaccination scheme, even without indication. Regarding the animal and what happened, in 84% (16/19) of the cases the attacked person reported not having any responsibility for the animal, but 68% (13/19) had already seen the previous animal. In 79% (15/19) the accident was reported as a natural response to animal behavior. And 74% (14/19) of the people interviewed reported not knowing other cycles of rabies transmission. In conclusion, it emphasizes the importance of notions of animal behavior by the population and health professionals in order to reduce the occurrence of aggressions and improve the conduct of care, such as observation of the animal whenever possible with optimization of public resources, such as the vaccine anti-rabies.

Name: Thomas Rosa Menegazzi

PP079

Email: thomas-menegazzi@saude.rs.gov.br

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Primordial methods of prophylaxis for human rabies in Brazil

Authors: Thomas Rosa Menegazzi

Affiliations: Secretaria Estadual da Saúde, Rio Grande do Sul, Brasil

Abstract: Rabies is typified as an anthropozoonosis where exclusively mammals become ill and transmit the virus. The temerity with public health is concentrated both on the ease of transmission of the virus via secretions and saliva and on the lethality of the disease, standing at around 100%. The incubation period varies from 2 to 10 days in humans, first, nonspecific symptoms shared by numerous diseases appear, then motor and behavioral changes stand out. Possible human exposures to the virus, regularly reported in Brazil, are characterized by contact with the following species of mammals: farm animals such as horses, cattle and pigs; wild animals; bats; dogs and cats. The prophylactic procedure consists of an intramuscular or intradermal vaccine and / or the use of anti-rabies serum and conducted according to the aggressor species or accidental contact, it is defined as pre-exposure and post-exposure. The severity and location of the lesion is evaluated, categorizing it as severe, located in the extremities, deep, multiple or extensive wounds in any region of the body, deep punctures, licking of mucous membranes or where lesions already exist, and mild as superficial. In cases involving bats and wild animals, a vaccination scheme is carried out together with the application of serum. Accidents with farm animals are evaluated for severity and extent, within this classification the application of vaccines and serum is determined in the injury of severe cases. For accidents with dogs and cats, the possibility of observing the aggressor for 10 days is evaluated, a period characterized by incubation / transmission in these animals, positive observation and the animal remains healthy during this period, if the case ends, the same disappears or if making the vaccine and serum schedule rabid, the impossibility of observing the animal characterizes the accident as mild or severe, starting the serum if necessary with vaccines. Pre-exposure prophylaxis is based on occupational protection for professionals with presumed viral contact.

A raiva é tipificada como uma antropozoonose onde exclusivamente os mamíferos adoecem e transmitem o vírus. A temeridade com a saúde pública se concentra tanto na facilidade de transmissão do vírus via secreções e saliva quanto na letalidade da doença, situando-se em torno de 100%. O período de incubação oscila de 2 a 10 dias em seres humanos, primeiramente, manifestam-se sintomas inespecíficos compartilhados por inúmeras enfermidades, em seguida, sobressaem-se alterações motoras e comportamentais. Possíveis exposições humanas ao vírus, regularmente relatadas no Brasil, são caracterizadas pelo contato com as seguintes espécies de mamíferos: animais de produção como equinos, bovinos e suínos; animais silvestres; morcegos; cães e gatos. O procedimento profilático é composto de vacina intramuscular ou intradérmica e/ou utilização do soro antirrábico e conduzido conforme a espécie agressora ou de contato acidental, define-se como pré-exposição e pós-exposição. Avalia-se a severidade e localização da lesão, categorizando entre grave, situada em extremidades, ferimentos profundos, múltiplos ou extensos em qualquer região do corpo, puntiformes profundos, lambedura de mucosas ou onde já existam lesões, e leves como superficiais. Nas ocorrências com morcegos e animais silvestres, realizam-se esquema vacinal juntamente com a aplicação do soro. Acidente com animais de produção se avalia gravidade e extensão, dentro dessa classificação se determina aplicação das vacinas e soro na lesão dos casos graves. Para acidentes com cães e gatos, avalia-se a possibilidade de observar agressor por 10 dias, período caracterizado pela de incubação/transmissão nesses animais, positivada a observação e o animal se mantém saudável nesse período se encerra o caso, desaparecendo o mesmo ou se tornando raivoso se inicia o esquema vacinal e soro, na impossibilidade de observar o animal se caracteriza o acidente como leve ou grave iniciando o soro se

necessário com vacinas. A profilaxia pré-exposição se baseia em proteção ocupacional de profissionais com presumível contato viral.

Name: Camila Appolinario

PP080

Email: camilaapp.vet@gmail.com

Session: Human Rabies & Prophylaxis

Country: Brazil

Title: Klrb1b selectively upregulated in brain gene of mice infected with V3 (Desmodus rotundus variant) and not V2 (dog variant) street rabies virus

Authors: CM Appolinario[1], RD Emes[2], MG Peres[1], BD Ribeiro[1], MR Mioni[1], AF Vicente[1], CR Fonseca[1], J Daly[2], J Megid[1]

Affiliations: [1]Faculdade de Medicina Veterinaria e Zootecnia- Universidade Estadual Paulista "Julio de Mesquita Filho"- Botucatu, Sao Paulo; [2]University of Nottingham, School of Veterinary Medicine and Science, Sutton Bonington, United Kingdom

Abstract: Rabies virus strains can vary in their ability to transpose immune response. The aim of this study was to evaluate the gene expression profile in brains of mice infected with a dog variant (V2) and a Desmodus rotundus variant (V3). A total of 16 C57/BL6 mice, SPF, female, 4-6 weeks-old, were inoculated via intracerebral route with 30uL of rabies virus inoculum (LD50 10-6,66), being 8 animals for each variant; at the same time 8 mice were left as negative controls. Inoculated animals were observed and weighted daily, in order to determine the onset of clinical signs. Whole brain was collected immediatelly after death for microarray analyse. Extraction of total RNA was performed with a commercial kit; Gene expression analyse was performed using the microarray GeneChip® Mouse Gene 2.0 ST Array from Affymetrix®. Gene enrichement, canonical pathways and gene ontology were determined using NIPA. Comparison between V2 and V3 gene expression demonstrates one exclusively upregulated gene expressed by V3, Klrb1b (killer cell lectin-like receptor subfamily B member 1B). Klrb1b (NKR-P1) is an inhibitory NK cell receptor isoform in mice. NK cell is involved in innate immune response against infections and its inhibition is considered a viral evasion mechanism. Lethality rate was different between V2 (100%) and V3 (60%), but both presented same incubation and evolution periods. Interesting to note that up-regulation of NK cells inhibititory receptors should have been considered a viral advantage and thus leading to a higher lethality rate. Further and different molecular biology studies are necessary to explain the real significance of this gene expression result in rabies pathogenesis due to this wild variant strain, why it occurs in a later phase of the disease and if it is somehow correlated to the ability of this virus to cause death.

Name: Iana Suly Santos Katz

PP081

Email: ianasuly@gmail.com

Session: Pathogenesis & Immunology

Country: Brazil

Title: The role of inflammation in the pathogenesis of rabies maintained in bat genus Eptesicus sp and Myotis sp

Authors: LP Guimarães, ER Fernandes, SR Silva, F Guedes, OG Ribeiro, ISS Katz

Affiliations: Pasteur Institute, São Paulo, Brazil

Abstract: Rabies lyssavirus (RV) is a neurotropic virus that causes fatal neuroinflammation in humans and animals. Studies demonstrated that inflammatory mechanisms also contribute to clearance of RV infection. Effective therapy is lacking and hampered by gaps in the understanding of virus pathogenicity. The number of animals infected with RV isolates from wild animals, such as bats, skunks and foxes, increases each year, suggesting that these environments pose a risk to both humans and domestic animals. New knowledge of the pathogenesis of RV maintained by synanthropic animals is required to develop more effective epidemiologic surveillance and control of human rabies. Here the role of inflammation in the pathogenesis of RV maintained in bat genus Eptesicus sp and Myotis sp were investigated. We observed that the insectivorous bats strain showed higher replication rate and lesser pathogenicity in mice when compared to the fixed virus (CVS-31). Histopathological examination of the RV-infected mice showed a marked inflammation. CNS inflammatory responses were performed by immunohistochemistry. Insectivorous bats RV strains showed significantly ($p=0.0032$) higher IL-1β expression in the cerebellum and meninges compared with fixed virus-infected mice. We also found that IL-6 expression in CNS of infected-mice were significantly ($p=0.0020$) higher than those of control mice. These findings indicate that RV isolated from insectivorous bats have a marked inflammation in the CNS accompanied by the high replication rates and low lethality of RV-infected mice. Furthermore, IL-1β and IL-6 could increase RV-induced neuroinflammation and virus clearance leading lower potential pathogenicity in mice infected with RV isolates from insectivorous bats. These results provide novel insights into RV-host interactions and the importance of inflammatory response in protection against RV disease.

Name: Olimpia Chuquista Alcarraz

PP082

Email: olimpia.chuquista@upch.pe

Session: Pathogenesis & Immunology

Country: Peru

Title: Rabies antibody titers in dogs of Lima, Peru: factors potentially affecting herd immunity and vulnerability to rabies re-establishment

Authors: Olimpia Chuquista, Néstor Falcón, Marco Vigilato, Felipe Rocha, Gisely Toledo, Juliana de Amorin, Sergio Recuenco, Ricardo Castillo-Neyra

Affiliations: Cayetano Heredia University, Lima, Peru

Abstract: Lima, Peru, has not had cases of human or dog rabies in more than 20 years. However, the city presents several factors that favor the reintroduction of the rabies virus including a large population of free-roaming dogs and a high rate of canine immigration from endemic zones. Reintroduction of the virus alone is not enough to result in re-establishment in the canine population. For this to occur, another factor is necessary: the immunological susceptibility of the local dog population. Our objective was to evaluate the susceptibility of dogs in the city of Lima to the rabies virus preceding a rabies vaccination campaign. We collected 141 blood samples from dogs (3+ months), of both sexes in the district of Surquillo, a central urban area. To quantify the rabies antibody titers we used fluorescent antibody virus neutralization (FAVN) in the Laboratory for Zoonosis Control in Sao Paulo. We conducted surveys with the dog owners to reconstruct the dogs' vaccination history. We classified dogs as never vaccinated (n=31) and sometimes vaccinated (n=110). Almost three quarters of the previously vaccinated dogs exceeded the seroconversion limit of 0.5 UI/ml (OMS). However, only 58.2% of the sampled dogs reached the limit of seroconversion. Furthermore, young dogs (<1 year old) showed lower seroconversion than older dogs (1+ years old) (Chi2=; p=0.011). Dogs vaccinated with mono-dose vaccines presented greater seroconversion than those that received poly-dose vaccines (Chi2= ; p=0.005). Also, antibodies quickly decline during the first year post-vaccination, and later the curve flattens and antibodies are detectable for several more years. We discuss implications for rabies surveillance and prevention in the fifth largest city in Latin America. It should be noted that the sample of dogs is from a central zone of Lima but other more peripheral areas, where there are more free-roaming dogs, may have lower levels of seroconversion.

Name: Fabíola Maria de Girão Lima

PP083

Email: biulagirao@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Brazil

Title: Animal Rabies Information System (AnRIS) - computerizing and improving rabies surveillance

Authors: Fabíola Maria de Girão Lima, José Iranilson de Oliveira Gomes, Francisco Bergson Pinheiro Moura

Affiliations: Health Secretary of the State of Ceará, Fortaleza, Brazil

Abstract: The Brazilian Unified Health System (UHS) has several Health Information Systems (HIS), all aiming to instrumentalize and support management in different governmental spheres. Thus appear as essential supports in different health sectors, enabling the development of planning strategies, control and evaluation. Municipalities of Health Region East Litoral Superintendence / Jaguaribe (HRELS), in Ceará / Brazil registered 28 animals positive for rabies until July 2020 (1 canine, 25 chiropterans, 1 wild canid and 1 procionid). Among them, 96.4% of the species were wild. However, animal rabies surveillance occurs without a specific information system. The present study aims to introduce an Information System on Animal Rabies created to further the generation of data for the better planning of identification, evaluation, measurement and mitigation actions of disease transmission risk. The initial purpose is, as a pilot experiment, the implementation in the HRELS's municipalities. The project application is developed on a Java platform with the tool and database in free format, compatible with Windows versions. Certainly, the instrument will allow managers to reduce uncertainties, favoring timely decisions to prevent animal and human rabies, likewise intervening with greater efficiency and operations lower costs. This new system will offer results aimed at recording information regarding animal census of dogs and cats - the basis for the development of local prevention actions such as routine rabies vaccination, blocking of focus and campaigns; adverse events to the vaccine, among others. Additionally, it will be possible to monitor the diagnosis of animal samples suspected of rabies, sent to the laboratory, to monitor the disease in chiropterans and other wild animals. The tool will provide a mapping of surveillance areas through locations georeferencing, a useful resource for targeting prevention actions in a timely manner, using few resources. In summary, this study presents a new tool for surveillance that will contribute to disease prevention actions.

Name: Florencia Buteler

PP084

Email: florbuteler2110@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Argentina

Title: Retrospective analysis of the epidemiological situation of rabies in the province of Córdoba, Argentina

Authors: Florencia Buteler, Marisa Ghersi, José Gallegos, Florencia Scaramuzza, Patricia González, Laura López

Affiliations: Instituto de Zoonosis, Área de Epidemiología, Ministerio de Salud de Córdoba, Argentina

Abstract: From 2017, the Institute of Zoonosis of Córdoba (IZC), belonging to the Health Ministry of the Province, has been working to strengthen the rabies surveillance program. The retrospective analysis shows a notable increase in the admission of samples in the last two years, concerning 2017 [2017 (128), 2018 (337) and 2019 (267)], due to a greater admission of bat samples [2017 (47%), 2018 (66%), 2019 (77%)] and a reduction in the number of samples of dogs and cats [2017 (35%), 2018 (22%) and 2019 (13%)]. In the current year, the observed trend is maintained. On the other hand, a greater acceptance of the prevention indications is also observed among the total of people who consulted the IZC for potentially rabies accidents, [2017 (no records), 2018 (76%), 2019 (92%)], an increase in the observation of rabies in biting animals [2018 (50%), 2019 (56%)], and the consequent decrease in referral for post-exposure prophylaxis treatment [2018 (48%), 2019 (41%)]. In the last three years, there have been improvements in prevention actions, tending to avoid unnecessary vaccination in bitten people when there is the possibility of observing the biting animal. However, it is still necessary to continue carrying out awareness campaigns towards the population and the health team, due to the persistence of a percentage of bitten people who do not take prevention actions [2018 (24%), 2019 (8%)], a large number of stray dogs and limited surveillance in numerous towns in the interior of the province which, among other situations, still represent weaknesses in the health system to prevent and control this disease. Consequently, it is necessary to continue strengthening rabies surveillance, prevention, and control actions, to achieve the elimination of this zoonosis in the province of Córdoba.

Name: Helena Beatriz de Carvalho Ruthner Batista

PP085

Email: batistahbcr@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Brazil

Title: World Rabies Day: Pasteur Institute of open doors

Authors: Helena Beatriz de Carvalho Ruthner Batista, Willian de Oliveira Fahl, Carla Isabel Macedo, Cláudio Celso Monteiro Júnior, Daniela Barroso Brogliatto, Elpídio Ferreira, Juliana Galera Castilho Kawai, Maria Aparecida da Silva, Pedro Carnieli Junior, Rene dos Santos Cunha Neto, Valéria Gentil De Tommaso, Karin Correa Scheffer

Affiliations: Pasteur Institute, Sao Paulo, Brazil

Abstract: [No English abstract submission; English from Google Translate]
In the state of São Paulo, Brazil, urban rabies is under control. It must be considered, however, that this epidemiological status has been achieved due to the incessant surveillance work carried out. There are several actions related to surveillance and among these actions, health education stands out. The Pasteur Institute, aware of its role in rabies control in the state of São Paulo, since 2016, has opened the institution's doors to celebrate advances in rabies control, through the "World Rabies Day: Pasteur Institute of Open doors". In 2016, 2017 and 2018, the event was held in the form of guided tours, with an average audience of 226.67 people in these 3 years. In 2019, the event was held on September 29 in a new format: spontaneous and continuous flow visitation, with 799 participants this year. The following activities were carried out, addressing, in a playful way, the diagnosis, treatment and prophylaxis of rabies: roulette and right / wrong box, both with questions and answers about rabies; presentation of the historical collection of the Pasteur Institute, puppet theater, scenographic cave of bats, exhibition of different species of bats, film, "chat about rabies", mask painting, word search and board games. The numbers of participants described here highlight the importance of these actions in raising the awareness of the lay population about rabies and highlight the fundamental role of health education actions for the effective control of important diseases such as rabies. The format of the event, with continuous flow visitation, allowed the visitation of both the female and male audiences, with a significantly larger number of the target audience, when compared to previous years. The success of the event highlights the importance of educational actions so that rabies is an increasingly less neglected disease.

No estado de São Paulo, Brasil, a raiva urbana está controlada. Deve-se considerar, porém que este status epidemiológico foi alcançado devido ao incessante trabalho de vigilância realizado. Diversas são as ações relacionadas à vigilância e entre tais ações destaca-se a educação em saúde. O Instituto Pasteur, consciente do seu papel para o controle da raiva no estado de São Paulo, desde 2016, tem aberto as portas da instituição para celebrar os avanços sobre o controle da raiva, através do "Dia Mundial contra a Raiva: Instituto Pasteur de Portas Abertas". Nos anos de 2016, 2017 e 2018, o evento foi realizado na forma de visitas guiadas, com uma média de público, nestes 3 anos, de 226,67 pessoas. Em 2019, o evento foi realizado no dia 29 de setembro em um novo formato: visitação espontânea e de fluxo contínuo, tendo sido contabilizados, neste ano, 799 participantes. Foram realizadas as seguintes atividades, abordando, de forma lúdica, o diagnóstico, tratamento e profilaxia da raiva: roleta e caixa certo/errado, ambas com perguntas e respostas sobre a raiva; apresentação do acervo histórico do Instituto Pasteur, teatro de fantoches, caverna cenográfica de morcegos, exposição de diferentes espécies de morcegos, filme, "bate-papo sobre raiva", pintura de máscaras, caça palavras e jogos de tabuleiro. Os números de participantes aqui descritos ressaltam a importância destas ações na conscientização da população leiga sobre a raiva e destacam o papel fundamental de ações de educação em saúde para o controle efetivo de importantes doenças como a raiva. O formato do evento, com visitação de fluxo contínuo, permitiu a visitação, tanto do público feminino, quanto do masculino, com número significativamente maior do público alvo, se comparado aos anos

anteriores. O sucesso do evento destaca a importância de ações educativas para que a raiva seja uma doença cada vez menos negligenciada.

Name: Kirstyn Brunker

PP086

Email: kirstyn.brunker@glasgow.ac.uk

Session: Progress Towards the Goal of Zero by 2030

Country: United Kingdom

Title: Real-time genomic surveillance: a new opportunity for rabies control and elimination in Latin America

Authors: Kirstyn Brunker, Ricardo Castillo-Neyra, Katie Hampson

Affiliations: University of Glasgow, Glasgow, UK

Abstract: Genomic surveillance has become a key tool in contemporary disease management, providing unique insights into virus spread and control. Technological advances mean that sequencing can now be deployed and conducted in near real-time to inform rapid targeted control measures. Yet, challenges such as limited laboratory infrastructure, lack of genomics expertise and costs have fed into a narrative that cutting-edge genomics is inaccessible in low- and middle-income countries. Here we show that such challenges can be overcome, demonstrating the application of real-time sequencing in Arequipa, a city in Peru where rabies virus continues to circulate in the dog population since it re-emerged in 2015. Local, low-cost sequencing capacity was installed by using the MinION (a portable real-time sequencer) and training scientists from the local Ministry of Health and university laboratories to build sustainable genomics expertise. Samples (n=55) collected from 2015-2019 were sequenced in Arequipa and an accessible rabies sequence analysis tool, RABV-GLUE, was used to interpret new sequences in the context of global RABV. We found that RABV in Peru forms a new genetic cluster distinct from previously characterised lineages found in Latin America. While new sequences showed similarity to existing partial genome data from neighbouring countries, interpretation was limited by the lack of publicly available sequences and genetic resolution for dog RABV in Latin America. However, within Arequipa we were able to use sequences in combination with epidemiological data to inform in-depth phylogenetic analyses. Characterising rabies virus circulation within Arequipa, we reveal patterns of local rabies transmission that should inform more effective control. We report on implications for the future of rabies surveillance and control activities in Peru and how genomic surveillance can contribute to the regional goal of eliminating dog-mediated rabies.

Name: Naylê Francelino Holanda Duarte

PP087

Email: nayle.holanda@gmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Brazil

Title: Strengthening of wild rabies surveillance through health education for surveillance professionals in Serra da Ibiapaba, Ceará Brazil: experience report

Authors: Naylê Francelino Holanda Duarte, Raphael William Ponte Neres, Bruna Holanda Duarte, Kellyn Kessiene de Sousa Cavalcante, Cristiane Eleutério Freire Ibiapino, Francisco Giovanni de Pinho Carvalho, Carlos Henrique Alencar, Jorg Heukelbach

Affiliations: Universidade Federal do Ceará, Fortaleza, Brasil

Abstract: Community awareness and participation in the prevention of human rabies are essential to reduce the risk of transmitting the virus to susceptible individuals. The participation of the enlightened community, together with Community Health and Endemic Control Agents, reduces the occurrence of new cases. These professionals play a relevant role in the identification and disclosure of risk factors to local communities. Here we describe experiences with actions carried out in seminars on the control of human rabies, carried out for 231 professionals who work in the surveillance of the disease in four municipalities of Serra da Ibiapaba, state of Ceará - Brazil, in January 2020. The seminars were promoted by the Association of the Endemic Agents of Serra da Ibiapaba - (AGENSI), in partnership with the Regional Council of Veterinary Medicine, and had the support of the Municipal Health Secretariats. The content included: theoretical-practical explanation about general aspects of the disease, epidemiological surveillance and identification of hematophagous and non-hematophagous bats. In the end, an evaluation was carried out, contextualizing: knowledge about anger; expectations about the moment; and suggestions for future training. Of the 231 respondents, 68.8% had little knowledge, only 6.5% expected to approach: clinical signs, canine rabies vaccination, collection and sending of samples, Zoonoses Surveillance Units, rabies prophylaxis, chiropteran management and rabies ratio visceral leishmaniasis. And 30.3% proposed to increase the workload, distribution of didactic material, more support from the municipality, field classes and more lectures for health professionals. It is concluded that there are important gaps in health professionals about the knowledge of rabies, especially in the wild cycle. Government agencies should invest more in maintaining the knowledge of health professionals, as training is of fundamental importance for strengthening surveillance actions and preventing the occurrence of new cases of human rabies.

A conscientização e participação da comunidade na prevenção da raiva humana são fundamentais para reduzir o risco de transmissão do vírus a indivíduos suscetíveis. A participação da comunidade esclarecida, juntamente com Agentes Comunitários de Saúde e de Controle de Endemias, permite a redução da ocorrência de novos casos. Esses profissionais desempenham um papel relevante na identificação e divulgação de fatores de risco para as comunidades locais. Aqui descrevemos experiências com ações realizadas em seminários sobre o controle da raiva humana, realizados para 231 profissionais que atuam na vigilância da doença em quatro municípios da Serra da Ibiapaba, estado do Ceará – Brasil, em janeiro de 2020. Os seminários foram promovidos pela Associação dos Agentes de Endemias da Serra da Ibiapaba – (AGENSI), em parceria com o Conselho Regional de Medicina Veterinária, e contou com o apoio das Secretarias Municipais de Saúde. O conteúdo incluiu: explanação teórico-prática sobre aspectos gerais da doença, vigilância epidemiológica e identificação de morcegos hematófagos e não hematófagos. No final, realizou-se avaliação contextualizando: conhecimentos sobre raiva; expectativas sobre o momento; e sugestões para treinamentos futuros. Dos 231 respondentes, 68,8% tinham pouco conhecimento, apenas 6,5% esperavam abordagem sobre: sinais clínicos, vacinação antirrábica canina, coleta e envio de amostras, Unidades de Vigilância de Zoonoses, profilaxia antirrábica, manejo de quirópteros e relação da raiva com a leishmaniose visceral. E 30,3% propuseram aumentar a carga horária,

distribuição de material didático, mais apoio do município, aulas de campo e mais palestras para profissionais da área da saúde. Conclui-se que existem lacunas importantes dos profissionais de saúde sobre o conhecimento da raiva, em especial do ciclo silvestre. Os órgãos governamentais devem investir mais na manutenção do conhecimento dos profissionais de saúde, pois as capacitações são de fundamental importância para o fortalecimento das ações de vigilância e prevenção da ocorrência de novos casos de raiva humana.

Name: Sylvia Dreyer *(presented by Anna Fahrion)*

PP088

Email: sylvia.dreyer@fli.de; Anna.Fahrion@fli.de

Session: Progress Towards the Goal of Zero by 2030

Country: Germany

Title: Supporting WHO and OIE in the development of a rabies-specific toolbox for bridging IHR and PVS

Authors: Sylvia Dreyer, Anna Fahrion, Frank Busch, Bernadette Abela-Ridder, Conrad Freuling, François Caya, Gregorio Torres, Guillaume Belot, Patricia Pozzetti, Stéphane de la Rocque, Thomas Müller, Klaas Dietze

Affiliations: Friedrich-Loeffler Institut, Greifswald, Germany

Abstract: For addressing global health security, the WHO International Health Regulations (IHR) and the OIE Terrestrial Animal Health Code provide standards targeting public and animal health, respectively. The IHR Monitoring and Evaluation Framework (IHR-MEF) and the Performance of Veterinary Services (PVS) Pathway represent the associated monitoring frameworks. To improve collaboration between human and animal health sectors in the prevention and response particularly to zoonotic diseases at the animal-human interface, an IHR-PVS National Bridging Workshop (NBW) methodology has been developed and facilitated by both WHO and OIE. During numerous generic NBWs held so far worldwide, participants expressed the need for disease tailored workshops in particular for rabies. To strengthen a multisectoral approach in the implementation of national action plans for the control of rabies, we aimed at developing a complementary rabies-specific NBW (NBW-R). In a first step, to verify gaps and demonstrate potential areas of use and added value of a NBW-R, a database capturing up-to date country specific rabies related denominator data was created. Existing rabies-specific tools for the self-assessment of countries were screened for potential use within a NBW-R. All information was summarized in a concept paper detailing links between (national) rabies programmes, NBW-R and the respective monitoring frameworks. Via an online-survey, the target audience, format and content of the workshop was further specified. The outcome is a generic, ready-to-use rabies tailored NBW that strives to contribute to the Global Strategic Plan of ending dog-mediated human rabies deaths by 2030. Furthermore, this format could be a blueprint for other One Health topics in NBWs.

Name: Victória Forte Viana

PP089

Email: victoria_forte_2015@hotmail.com

Session: Progress Towards the Goal of Zero by 2030

Country: Brazil

Title: Importance of antirabic vaccination and environmental education for animals and community health, Fortaleza, Ceará, Brazil

Authors: Victória Forte Viana[1], Bianca Ferreira Gomes da Silva[1], Dalana Oliveira Veras[1], Rodrigo Rabelo de Castro Sousa[1], Davi Renan Moreira Carvalho Melo[1], Isabelle Barroso Bezerra[1], Naylê Francelino Holanda Duarte[2]

Affiliations: [1]Humanitarian Environmental Education Association for Animal Welfare, Responsible Guard and Wild Animals (BEAGUARAS), Fortaleza, Ceará, Brasil; [2]Federal University of Ceará, School of Medicine Public Health, Fortaleza, Ceará, Brasil

Abstract: In Brazil, in 1973, the National Rabies Prophylaxis Program (NRPP) was created, and through it, systematic measures of rabies vaccination for domestic and production animals were implemented, as well as awareness campaigns for the population about the prevention of the disease. This program has fundamental importance for the guarantee of One Health, since, with the control and prevention of this zoonosis in animals, it enables animal health and thus, human health. Aiming to contribute to the promotion of knowledge and prevention of rabies, the BEAGUARAS Project, formed by multidisciplinary academics and professionals, especially in veterinary medicine, participated in the action "SEMANA 4 PATAS" idealized by "Rede Super do Povo", with antirabies vaccination campaign for dogs and cats, humanitarian education to prevent risks and illnesses with domestic animals and animal adoption. Here, we describe the experience with the action performed in 05/10/2020, in three neighborhoods of Fortaleza - CE, Henrique Jorge, Passaré and Pátio Arvoredo. The actions were conducted by veterinary academics under the supervision of a professional. Occurring, vaccination of dogs and cats (300), microchipping and adoption of 21 animals. During the activities, health education was carried out about responsible guarding, addressing the importance of antirabies vaccination and prevention of risks and diseases of animals in relation to wild mammals, potentially transmitters if infected with Lyssavirus. During the action, it was found that few tutors were aware of the vaccination protocol and that not all of them made the vaccination annually. Thus, it is understood the importance of combining the realization of the anti-rabies campaign and health education with the engagement of the academic community and animal protection projects, aiming to promote the health of the community and its animals, thus guaranteeing the One Health.

No Brasil, no ano de 1973, foi criado o Programa Nacional de Profilaxia da Raiva (PNPR), e através deste, foram implantadas as medidas sistemáticas de vacinação antirrábica para animais domésticos e de produção, como também campanhas de conscientização para a população à cerca da prevenção da doença. Este programa é de fundamental importância para a garantia da Saúde Única, uma vez que, com o controle e prevenção dessa zoonose em animais, possibilita a saúde animal e assim, a saúde humana. Objetivando contribuir com a promoção de conhecimentos e saberes e a prevenção da raiva, o Projeto BEAGUARAS, formado por acadêmicos e profissionais multidisciplinares, especialmente da medicina veterinária, participou da ação “SEMANA 4 PATAS”, idealizada pela Rede Super do Povo, com realização de campanha de vacinação antirrábica de cães e gatos, educação humanitária para a prevenção de riscos e agravos com animais domésticos e adoção de animais. Aqui, descrevemos a experiência com a ação realizada em 05/10/2020, em três bairros de Fortaleza – CE, Henrique Jorge, Passaré e Pátio Arvoredo. As ações foram realizadas por acadêmicos de medicina veterinária sob a supervisão de um profissional. Ocorrendo, vacinação de cães e gatos (300), microchipagem e adoção de 21 animais. Durante as atividades, foi realizada educação em saúde sobre guarda responsável, abordando a importância da vacinação antirrábica, e sobre prevenção de riscos e agravos dos animais em relação a mamíferos silvestres, potencialmente transmissores se infectados com o Lyssavirus. Durante a ação, foi constatado que poucos

tutores tinham conhecimento do protocolo de vacinação e que nem todos faziam a vacinação anualmente. Dessa forma, entende-se a importância de aliar a realização da campanha antirrábica e a educação em saúde com envolvimento da comunidade acadêmica e projetos de proteção animal, visando a promoção da saúde da comunidade e de seus animais, garantindo assim a Saúde Única.

Name: Waqas Ahmad

PP090

Email: waqas.hussain@uvas.edu.pk

Session: Progress Towards the Goal of Zero by 2030

Country: Pakistan

Title: Challenges and concerns towards rabies elimination in Pakistan

Authors: Waqas Ahmad, Qaiser Akram, Ali Ahmad, Muhammad Younus

Affiliations: University of Veterinary and Animal Sciences-Lahore, KBCMA College of Veterinary and Animal Sciences, Department of Clinical Sciences, Narowal, Pakistan

Abstract: Background: Rabies is an underestimated and oldest recorded lethal viral zoonosis in the indo-Pakistan subcontinent. The disease is neglected and lingering endemic in Pakistan for many years. Stray dog is the principal reservoir and causes more than 95% of rabies cases mainly in Pakistan and adjacent Asian countries where massive dog vaccination and recommended prophylactic measures are both poorly and inadequately available or neglected as a whole. Compared to the certain achievements depicted in neighboring Asian countries against rabies, Pakistan is extremely deficient in having actual data about field, experimental and genetic epidemiology of rabies because disease is unreported, absence of community sensitization for general awareness, poor attitude of health practitioners and lack of cross-sectorial coordination among private and government officials. Material and Methods: A detail follow through of the published and available scientific reports and articles in Pakistan were analyzed that could help scientist, policy makers and administrative health officials for better understanding the risk factors and epidemiological constraints hindering the rabies control interventions determinedly. Results and Conclusions: The review presents the updated information on the scientific understandings of the disease in Pakistan, pinpoints the major problems and obstacles that keep the negativities underway. The solutions to these concerns with published literature have also been discussed.

Name: Luis Giovani Oliveira Guardalini

PP092

Email: giovaniguardalini@usp.br

Session: Vaccines & Antivirals

Country: Brazil

Title: Biokinetic studies to scale up cell cultures of Spodoptera frugiperda (Sf9) producing Virus like particles (VLPs) of Rabies Lyssavirus

Authors: Luis Giovani Oliveira Guardalini, Soraia Attie Calil Jorge, Eutímio Gustavo Fernándes Núñez, Renato Mancini Astray

Affiliations: Universidade de São Paulo e Instituto Butantan, São Paulo, Brasil

Abstract: Despite the availability of effective and safe vaccines for the protection of humans and animals, rabies remains a widespread disease worldwide, being transmitted by domestic and wild animals. Rabies is still responsible for the deaths of approximately 59,000 people a year worldwide and most deaths occur in countries that are still unable to produce modern vaccines or use less effective vaccines (approximately 90% of accidents occur in Asia and Africa). Over the past three decades, virus-like particles have evolved to become a widely accepted technology, especially in the field of vaccinology. Among the numerous methods for producing VLPs, we highlight the use of the recombinant baculovirus system. Baculoviruses have been widely used in this area because they are easy to handle, safe and inexpensive. The overall objective of this project is to produce virus-like particles (VLPs) and to evaluate the expression of recombinant rabies Lyssavirus glycoprotein (RVGP) by Sf9 baculovirus system on 100 to 2000mL scales using Spinner flasks. and bioreactors; Detect and quantify RVGP expressed by ELISA, flow cytometry, and Western blot techniques. At first, we obtained viral batches through the infection of Sf9 cells. We determine the ideal rates of cell growth and death. We also quantify the consumption of limiting substrate and the production of toxic metabolites. We determine the best physiological and biokinetic conditions for cell culture and viral infection. We established the best multiplicity of infection (MOI) and the best collection times. We expressed rabies virus VLPs and were able to quantify and qualify them using Western, Dot, ELISA and electron microscopy. Thus, this work showed the efficiency in the expression of RVM and RVGP proteins from the infection of recombinant BVs in Sf-9 cells. Our next goal is to scale production on a bench-top bioreactor batch system.

Name: Maria Soledade Garcia Benedett

PP093

Email: soledadebenedetti@hotmail.com

Session: Vaccines & Antivirals

Country: Brazil

Title: Coverage of animal antirabic vaccination campaigns in Roraima, Brazil

Authors: Maria Soledade Garcia Benedetti, Emerson Ricardo de Sousa Capistrano, José Vieira Filho

Affiliations: Federal University of Roraima; State Secretariat of Health of Roraima

Abstract: Rabies is considered a public health problem in Brazil. Anti-rabies care is among the three most reported diseases in the country. The state of Roraima recorded two cases of human rabies, one in 1976 and the other in 2016. The objective is to describe the coverage of canine rabies vaccination campaigns in the state of Roraima, Brazil. Method: a descriptive study on the coverage of canine rabies vaccination campaigns in the state of Roraima, between the years 2012 and 2017. This interval was chosen due to the fact that data are available for public consultation. The data were obtained through the Informatics Department of the Unified Health System (DATASUS) and made available at the electronic address (http://www.datasus.gov.br). Results: in the study period, the average canine vaccine coverage was 55.84%, considering the vaccination target of 290,072 dogs, only 41.55% (120,529) were vaccinated. There was a gradual increase in vaccination coverage (VC) in the period. The vaccination target for dogs and the annual VC reached was: 2012 (target 56,700, VC 0,0%), 2013 (target 56,700, VC 12,25%), 2014 (goal 56,700, VC 47,89%), 2015 (goal 49.700, VC 46.28%), 2016 (goal 49.536, VC 55.64) and 2017 (goal 20.736, VC 172.98%). 2017 had the highest coverage, but the lowest goal in the series. Conclusion: there was an increasing increase over the years evaluated of the canine VC, however not accompanied by the record of increase in the number of animals that practically remained in the same vaccination goal for each year except for the year 2017 that shows a discrepant coverage in relation to the number of animals registered in previous years, which may indicate an underreporting of these given the absence of existing methodologies for surveying this population such as a canine and feline census.

A raiva é considerada um problema de saúde pública no Brasil. O atendimento antirrábico está entre os três agravos de maior notificação no país. O estado de Roraima registrou dois casos de raiva humana, um em 1976 e outro em 2016. O objetivo é descrever a cobertura das campanhas de vacinação antirrábica canina no estado de Roraima, Brasil. Método: estudo descritivo sobre a cobertura das campanhas de vacinação antirrábica canina no estado de Roraima, entre os anos de 2012 e 2017. Este intervalo foi escolhido devido ao fato de apresentarem dados disponíveis para consulta pública. Os dados foram obtidos por meio do Departamento de Informática do Sistema Único de Saúde (DATASUS) e disponibilizados no endereço eletrônico (http://www.datasus.gov.br). Resultados: no período de do estudo, a média da cobertura vacinal canina foi de 55,84%, considerando a meta de vacinação de 290.072 cães, somente 41,55% (120.529) foram vacinados. Houve aumento gradual da cobertura vacinal (CV) no período. A meta de vacinação de cães e a CV alcançada anual foi de: 2012 (meta 56.700, CV 0,0%), 2013 (meta 56.700, CV 12,25%), 2014 (meta 56.700, CV 47,89%), 2015 (meta 49.700, CV 46,28%), 2016 (meta 49.536, CV 55,64) e 2017 (meta 20.736, CV 172,98%). O ano de 2017 teve a maior cobertura, porém a menor meta da série. Conclusão: houve um aumento crescente ao longo dos anos avaliados da CV canina, entretanto não acompanhado pelo registro de aumento do número de animais que praticamente se manteve na mesma meta de vacinação para cada ano com exceção do ano 2017 que demonstra uma cobertura discrepante em relação ao número de animais registrados em anos anteriores o que pode indicar um sub registro destes dada a ausência de metodologias existentes para levantamento dessa população como um censo canino e felino.

Name: Nathalia Alves Castro do Amaral

PP094

Email: nathaliacastro.medvet@gmail.com

Session: Vaccines & Antivirals

Country: Brazil

Title: Easy access technology at the service of anti-rabies vaccination campaigns for dogs and cats in Recife, PE, Brazil

Authors: Nathália Alves Castro do Amaral, Jurandir Alves de Almeida Júnior, Maria Luiza de Melo Coelho da Costa, Mariana Gomes Ferreira Machado de Siqueira, Davi dos Santos Rodrigues

Affiliations: City of Recife, Secretary of Health, Environmental Surveillance and Zoonosis Control Unit (UVACZ), Recife, PE, Brazil

Abstract: Rabies is a viral zoonosis with lethality of approximately 100% of human cases. Although old, it is still a serious public health problem in the world, occurring in more than 150 countries. The actions carried out by the Environmental Surveillance and Control of Zoonosis Unit of Recife (UVACZ) directed to the surveillance of animal rabies range from improved activities, such as identification of the species of bats that inhabit the territory of Recife, routine vaccination activities of dogs and cats and Annual Mass Vaccination Campaigns. Due to the importance of vaccination, both for animal and human health, the acquisition and delivery of these immunobiologicals is fully funded by the Ministry of Health. The main objective in Vaccination Campaigns is to enable the minimum coverage of 70% of the animals in the territory of each municipality. In the 2019 Anti-rabies Vaccination Campaign, technologies were used to train participants to standardize institutional procedures, minimize situations of non-compliance with procedures and additional costs with losses of inputs due to inadequate use. It was offered educational material created by UVACZ professionals, consisting of presentations of Microsoft PowerPoint software. Each presentation contained videos with topics presented by expert professionals. All the material was made available free of charge on the site of Recife City Hall. In addition, the Google Forms tool was used to create forms for the registration of volunteers. This significantly streamlined the process of attracting volunteer Veterinary medicine students, previously carried out in universities in a bureaucratic manner. The time, the planning of actions and the forecast of inputs were factors benefited by the new processes of training and registration of volunteers, enabling greater efficiency of the service offered to the population. Digital devices can contribute to professional qualification; technological tools can improve these processes virtually, adding a new format of exchange.

Name: Ana Carolina da Silva Monteiro

PP095

Email: ana.smonteiro26@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Saguis aggressions (Callithrix jacchus) to humans and the risk of rabies transmission, Ceará, Brazil, 2007-2018

Authors: Ana Carolina da Silva Monteiro[1], Renata Galvão Oliveira[2], Sthefany Cristine Bandeira Melo[1], Vitória Senna Sá Esteves[3], Esaú Marlon Franco da Paz[2], Naylê Francelino Holanda Duarte[4]

Affiliations: [1]University Center of Faculdades Metropolitanas Unidas, Faculty of Veterinary Medicine, São Paulo, SP, Brazil; [2]Federal University of Bahia, Institute of Biology, Salvador, Bahia, Brazil; [3]Federal University of Bahia, School of Veterinary Medicine and Animal Science EMEVZ, Salvador, Bahia, Brazil; [4]Federal University of Ceará, School of Medicine PPG Public Health, Fortaleza, Ceará, Brazil

Abstract: In the state of Ceará, it is common to catch Saguis (Callithrix jacchus) to be raised as pets, consequently increasing the risk of aggression. In the period from 2007 to 2018, Ceará recorded five cases of human rabies, of these, three were transmitted by marmosets (60%), thus, they are the main responsible for the transmission of the disease to man. In recent years, a greater number of attacks by marmosets on humans and an increase in the circulation of the virus in wild mammals has been observed. Thus, this study aimed to describe the characteristics of marijuana attacks on humans, in the state of Ceará, from 2007 to 2018. A descriptive retrospective study of marijuana attacks on humans in the period in question was carried out, with use of secondary data from the Notifiable Diseases Information System - SINAN. 321,093 assaults on human beings were recorded, 3,737 (1%) of which were marmosets. The aggressions occurred mainly in individuals with the age group between 20 to 29 years old (18%) of the male sex with 945 (54%) of the occurred ones. The urban region was the most affected, with 1,188 cases (68%). The most frequent type of exposure was biting, with 1,434 (84%), on the hands and feet, with 871 (54%) of the records. Given this, the marmoset may not be the main aggressor, however, it is the biggest transmitter of rabies in Ceará in recent years. Putting the state on alert, therefore, the aggressions by these species, pose a risk of the occurrence of new human cases. The high rate of cases may be related to the lack of investment in research and monitoring in the field to locate the areas of greatest incidence. For that, it is important to adopt epidemiological, sanitary and socio-educational measures, in order to promote the reduction of aggressions and future transmission.

No estado do Ceará, é comum a captura de Saguis (Callithrix jacchus) para serem criados como animais de estimação, consequentemente, aumentando o risco de agressões. No período de 2007 a 2018, o Ceará registrou cinco casos de raiva humana, destes, três foram transmitidos por saguis (60%), assim, são os principais responsáveis pela transmissão da enfermidade para o homem. Nos últimos anos, foi observado um número maior de agressões de saguis a humanos e um incremento da circulação do vírus em mamíferos silvestres. Sendo assim, esse estudo teve como objetivo descrever as características das agressões por saguis em humanos, no estado do Ceará, no período de 2007 a 2018. Foi realizado um estudo descritivo de caráter retrospectivo das agressões por saguis a humanos no período em questão, com uso de dados secundários do Sistema de Informação de Agravos de Notificação – SINAN. Foram registradas 321.093 agressões a seres humanos, sendo 3.737 (1%) por saguis. As agressões ocorreram majoritariamente em indivíduos com a faixa etária entre 20 a 29 anos (18%) do sexo masculino com 945 (54%) dos ocorridos. A região urbana foi a mais afetada, com 1.188 casos (68%). O tipo de exposição mais frequente foi a mordedura, com 1.434 (84%), nas mãos e pés, com 871 (54%) dos registros. Diante disso, o sagui pode não ser o principal agressor, porém, é o maior transmissor da raiva no Ceará nos últimos anos. Colocando o estado em situação de alerta, pois, as agressões por essas espécies, oferecem risco da ocorrência de novos casos humanos. O elevado índice de casos, pode estar relacionado com a falta de investimento em pesquisa e monitoramento em campo para localizar as áreas de maior incidência. Para tal, faz-se importante a adoção de

medidas epidemiológicas, sanitárias e socioeducativas, a fim de promover a diminuição das agressões e futura transmissão.

Name: Ana Lee Aparecida Francisco

PP096

Email: ana_lika2007@hotmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: In vitro characterization of rabies virus samples isolated from wild and domestic canines

Authors: Ana Lee Aparecida Francisco, Camila Mosca Barboza, Jaíne Gonçalves Garcia, Raphaela Mello Zamudio, Marcelia Emanuele Sad Fernandes, Juliana Galera Castilho Kawai, Pedro Carnieli Junior, Helena Beatriz de Carvalho Ruthner Batista

Affiliations: Federal University of ABC, Graduate Program in Biosystems, Santo André, Brazil; Pasteur Institute, São Paulo, Brazil

Abstract: Rabies is maintained in nature by different epidemiological cycles that eventually interrelate. Canids play an important role in maintaining the disease, whether domestic dogs in the urban cycle or wild canids (Cerdocyon thous) in the terrestrial wild cycle. It is now known that each of these reservoirs is responsible for maintaining a genetic strain characteristic of rabies virus (RABV). Considering the epidemiological importance of these animals for rabies control, the study described below aimed to analyze the in vitro behavior of these RABV genetic strains. For this, two RABV samples with a genetic lineage characteristic of Cerdocyon thous (IP4871 / 11 and IP3208 / 11) and the standard sample of RABV Pasteur Virus (PV) were used. Initially the samples were adapted to HEK-293T cells, submitted to viral titration, direct immunofluorescence and viral growth curve. On the viral growth curve, the two samples of the genetic line characteristic of C. thous had a virus 24 hours after inoculation (hai), with an increase in viral load up to 84 hai, from 96 hai on, there was a decrease in viral load. As for PV, it was possible to identify 12 hai viruses, an increase in viral load up to 72 hai and from 84 hai on, there was a decrease in viral load. With the results obtained so far, it is possible to conclude that the RABV samples with a genetic line characteristic of C. thous have a later growth when compared with the PV sample. The study provides for comparison with the RABV genetic strain characteristic of domestic dogs. The preliminary results indicate the difference in in vitro behavior of the different RABV genetic lines analyzed so far. Such results can contribute to the development of in vitro studies on RABV and thus collaborate for future strategies aimed at the control of wild rabies in Brazil.

A raiva é mantida na natureza por diferentes ciclos epidemiológicos que eventualmente se inter-relacionam. Os canídeos têm papel de destaque na manutenção da doença, seja os cães domésticos no ciclo urbano ou os canídeos silvestres (Cerdocyon thous) no ciclo silvestre terrestre. Atualmente se sabe que cada um destes reservatórios é responsável por manter uma linhagem genética característica de vírus da raiva (RABV). Considerando a importância epidemiológica destes animais para o controle da raiva, o estudo descrito a seguir teve por objetivo analisar o comportamento in vitro dessas linhagens genéticas de RABV. Para isso foram utilizadas duas amostras de RABV com linhagem genética característica de Cerdocyon thous (IP4871/11 e IP3208/11) e a amostra padrão de RABV Pasteur Virus (PV). Inicialmente as amostras foram adaptadas em células HEK-293T, submetidas à titulação viral, imunofluorescência direta e curva de crescimento viral. Na curva de crescimento viral as duas amostras de linhagem genética característica de C. thous apresentaram vírus 24 horas pós inoculação (hpi), com aumento da carga viral até 84 hpi, a partir de 96 hpi houve diminuição da carga viral. Já para o PV, foi possível identificar vírus 12 hpi, aumento da carga viral até 72 hpi e a partir de 84 hpi houve diminuição da carga viral. Com os resultados obtidos até o momento é possível concluir que as amostras de RABV com linhagem genética característica de C. thous tem crescimento mais tardio quando comparadas com a amostra PV. O estudo prevê a comparação com a linhagem genética de RABV característica de cães domésticos. Os resultados preliminares indicam a diferença no comportamento in vitro das diferentes linhagens genéticas de RABV analisadas até o momento. Tais resultados podem contribuir para o desenvolvimento de estudos in vitro sobre o RABV e assim colaborar para futuras estratégicas visando o controle da raiva silvestre no Brasil.

Name: Are Berentsen

PP097

Email: are.r.berentsen@usda.gov

Session: Wildlife Rabies & Control

Country: United States

Title: Rabies virus exposure in the small Indian mongoose across Puerto Rico: preliminary results

Authors: Are R Berentsen[1], Mel J Rivera-Rodriguez[2], Fabiola B Torres-Toledo[1], Shylo R Johnson[1], Christine K Ellis[1], Chad K Wickham[1], Richard B Chipman[3], Amy T Gilbert[1]

Affiliations: [1] United States Department of Agriculture (USDA), Wildlife Services (WS), National Wildlife Research Center, Fort Collins, Colorado, USA; [2] USDA, WS, Alabama/Puerto Rico/Virgin Islands Program, Auburn, Alabama, USA; [3]USDA, WS, National Rabies Management Program, Concord, New Hampshire, USA

Abstract: The small Indian mongoose (Urva auropunctata) is a rabies virus reservoir on several islands in the Caribbean, including Puerto Rico. Oral rabies vaccination (ORV) is a recognized method to control rabies virus circulation in wild carnivores. Recent research has demonstrated proof of concept for bait delivery to target free-ranging small Indian mongoose populations. The presence of rabies virus neutralizing antibodies (RVNA) is often considered evidence of natural exposure among wildlife, possibly due to an abortive infection or other exposure. We surveyed mongoose populations across 9 properties in Puerto Rico. Pairwise distance between 7 non-adjacent properties ranged from 0.5 to 150 km. We captured and anesthetized mongooses to collect whole blood samples, which were centrifuged to extract sera. Sera were stored frozen and screened by modified Rapid Fluorescent Foci Inhibition Test (RFFIT). Titers > 0.1 IU per mL were considered RVNA positive. We tested 504 unique mongoose sera across all properties during 2011-2019 and 110 (21.8%; 95% CI: 18.3 – 25.5%) were RVNA positive. Among mongooses where sex was recorded, 26.2% (74/282, 95% CI 21.5 – 31.7%) of males and 17.2% (36/209, 95% CI 12.7 – 22.9%) of females were RVNA positive ($\chi 2 = 2.25$, $P = 0.1342$). Of mongooses where age estimates were recorded, 24.3% (106/436, 95% CI 20.5 – 28.6%) of adults and 7% (3/45, 95% CI 2 – 18%) of juveniles were RVNA positive ($\chi 2 = 9.27$, $P = 0.0025$). During the study, 57 mongooses were recaptured at least once during separate events and seven changed RVNA status between captures 3 – 35 months later. Our results support previous reports of evidence of natural exposure to rabies virus among mongoose populations in Puerto Rico. Background seroprevalence should be taken into consideration when developing ORV strategies targeting this species in Puerto Rico, especially for evaluation of management actions through changes in population level RVNA seroprevalence.

Name: Bonnie Gulas-Wroblewski

PP099

Email: bonnie.gulas-wroblewski@bcm.edu

Session: Wildlife Rabies & Control

Country: United States

Title: On the frontlines: wildlife rehabilitators in the fight against rabies in the Americas

Authors: Bonnie E. Gulas-Wroblewski

Affiliations: Department of Pediatrics-Tropical Medicine, Baylor College of Medicine and Texas Children's Hospital, Houston, Texas, USA

Abstract: Wildlife rehabilitators play a central role in the potential spread and control of wildlife-sourced rabies virus. In the course of their wildlife rescue, rehabilitation, and release activities, they not only face an elevated risk of rabies virus exposure from animals in their care, but also bear the responsibility of preventing the transmission of rabies from infected patients to human caregivers, wildlife and domestic animals in their facility, and wildlife populations adjacent to their facility and/or release site(s). In addition, wildlife rehabilitators operate at a pivotal point for the surveillance of rabies-vector wildlife species, admitting a wide range of taxa representing a diversity of age groups, sexes, and geographic locations. Through partnering with these wildlife professionals, public health workers can greatly expand their rabies surveillance capabilities for a fraction of the cost of other sampling initiatives. Public health agencies can also further the reach of their rabies messaging by leveraging the outreach efforts of wildlife rehabilitators, who often offer educational programs and wildlife management advice to local communities. In the United States, wild mammal rehabilitation activities are regulated at the state level. The state to state divergence in requirements and restrictions for wildlife caretakers provides an opportunity to assess the efficacy of these regulations in fostering prevention and mitigation behaviors among wildlife rehabilitators as well as in the overall protection of human and wildlife populations from exposure to rabies. This presentation will: 1. review the importance of wildlife rehabilitators in the One-Health-waged fight against rabies in the Americas, 2. critically evaluate wildlife rehabilitation laws across the United States in order to generate universal recommendations for regulations that promote the control of wildlife-sourced rabies, and 3. discuss effective strategies for the integration of wildlife rehabilitators into public health policies targeting rabies and other zoonotic diseases.

Name: Bruno Egidio Cappelari

PP100

Email: brunocappelari@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Analysis of sampling practices and geographical distribution of bovine rabies in Rio Grande do Sul in 2019

Authors: Bruno Egídio Cappelari, Julio César de Almeida Rosa, José Carlos Ferreira, Giovana Dantas

Affiliations: Instituto de Pesquisas Veterinárias Desidério Finamor (IPVDF), Eldorado do Sul, Brazil

Abstract: Rabies is a zoonosis caused by viruses of the genus Lyssavirus that affects mammals. Brazil still record cases of rabies in humans, as well as in production animals, domestic animals and reservoirs such as bats. In Rio Grande do Sul (RS), the disease is considered controlled in urban areas, but bovine rabies, usually transmitted by infected bats, is considered endemic. During 2019, it was observed an increased number of cases when compared with previous years. Therefore, this study aimed to verify geographical distribution and positivity rates of bovine rabies in RS in 2019 by analyzing the results of 123 samples submitted to diagnosis at the Rabies Laboratory of the Instituto de Pesquisas Veterinárias Desidério Finamor (IPVDF). There was, in fact, an increase in positivity in 2019: 56 positive samples, but it did not differ statically from 2016, 2017 and 2018 (respectively, 43, 30 and 38 positive samples). The regions Metropolitan of Porto Alegre, Northwest and Eastern made up for 87% (107) of the samples submitted, and 54 of 56 (96,4%) positive samples diagnosed in 2019 – Northwest and Southeast each had one positive sample. The regions of Southwest and Western only sent 9 samples, and all tested negative. These results highlight the importance of improving sampling practices of regions Southwest and Western, that concentrate much of the bovine production but have been sending few samples to diagnosis. Besides this, control actions must be taken in the East and Northwest portions of the state in order to contain outbreaks. It is worth noting there were only two bats diagnosed with rabies in 2019, none of which being Desmodus rotundus, the hematophagous species that occurs in RS. The strengthening of passive surveillance is imperative for accurate estimates of rabies impacts, especially of bat populations and under-sampled regions.

Name: Caio Henrique de Oliveira Carniatto

PP101

Email: caiocarniatto@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Rabies in Brazilian wild cats: current panorama

Authors: Caio Henrique de Oliveira Carniatto

Affiliations: UniCesumar - Maringá/PR, Brazil

Abstract: The occurrence of diseases in wildlife is a global concern, considering outbreaks of pandemics and zoonotic diseases among different wild and domestic species, including humans. Rabies, an infectious viral disease that affects mammals, with a lethality close to 100%, stands out in this scenario, since studies on the prevalence and incidence of rabies in free-living populations are scarce, requiring huge logistical and financial efforts, as well as containment and individual handling and collection of biological samples. To promote correct management, it is essential recognize which wild species are most vulnerable to acquire (and propagate) rabies in free-ranging populations. Felines are predatory mammals at the top of the chain, with varied ecological niches, with small, medium and large species. In Brazil, eight species of felines are found, jaguar (Panthera onca), cougar (Puma concolor), jaguarondi (Puma yagouaroundi), ocelot (Leopardus pardalis), margay (L. wiedii), Oncilla (L. tigrinus), Southern tiger cat (L. guttulus), Geoffroy's cat (L. geoffroyi) and Pantanal cat (L. colocolo). Although studies are focused on ecological aspects, little is known about the presence of rabies in free-ranging populations and in zoo animals. Although captive cats are constantly monitored for their health aspects, free-ranging populations are poorly studied. Studies report the presence of rabies virus antibodies in P. onca, L. pardalis, P. concolor, L. colocolo and L. tigrinus. Wild cats have, in recent years, replaced their natural spaces with crops and livestock, and the populations are confined in small and dispersed fragments. In some cities, wild animals are found in urban areas, being potential vectors of infectious or zoonotic diseases. Studies should be conducted with the aim of investigating the presence of rabies in free-ranging felines, and considering them as possible reservoirs of rabies.

Name: Carina Rosario Mantari Torpoco

PP102

Email: carinamantari@gmail.com

Session: Wildlife Rabies & Control

Country: Peru

Title: Complete sequence of the genome of the rabies virus from Potos flavus in Peru

Authors: Carina Rosario Mantari Torpoco, Alfredo Miguel Berrocal Huallpa, Ricardo Luis Lopez Ingunza

Affiliations: National Institute of Health, Lima Peru

Abstract: Few animals are reservoirs for rabies in the South American continent. The Potos flavus (“chosna”), is an arboreal, frugivorous and nocturnal mammal, located from Mexico to the jungle of Bolivia and the region of Mato Grosso in Brazil. These “chosnas” have been confirmed with rabies by the Viral Zoonoses Laboratory of the Instituto Nacional de Salud in two districts of the department of Madre de Dios, during the years 2007, 2012, 2013 and 2015 on six occasions, thus showing evidence of a possible new reservoir. The objective of the present investigation was to obtain the complete sequence of the genome of the rabies virus isolated from the nervous tissue of one of the “chosnas”. As a strategy to ensure the complete assembly of the genome, PCR products of sizes greater than 3000bp were amplified. Four pairs of engineered primers and 3 pairs of reported primers were tested in a VR study in raccoons. Genomic libraries were prepared using the Nextera XT kit, and sequencing was performed on Illumina's MiSeq platform. The quality analysis and editing of the readings obtained was performed with the FastQC v0.11 and Trimmomatic v0.35 programs respectively. For the assembly of the genome, the VirusDetect v1.7 program was used, succeeding in sequencing a complete genome of 11,911 bp. The rabies genome obtained does not show relationship to any other genomes obtained from other animal species of South American origin.

Name: Daniela Angulo Mora

PP103

Email: dangulo50@unisalle.edu.co

Session: Wildlife Rabies & Control

Country: Colombia

Title: Description and analysis of rabies virus Variant 1 presentation in foxes in the department of Magdalena, Colombia, from 2006 to 2018

Authors: Daniela Angulo Mora, Natalia Cediel Becerra

Affiliations: Universidad de La Salle, Bogota, Colombia

Abstract: Rabies virus belongs to the Lyssavirus genre, genotype 1 serotype 1, variants from 1 to 11. Lyssaviruses reservoirs are bats, shrews, foxes, skunks, mongooses and dogs. Variant 1 reservoirs are dogs and mongooses. The objectives of this paper are to describe V1 cases in foxes reported to the Instituto Nacional de Salud from the department of Magdalena, since 2006 to 2018, analyze the behavior of such cases and identified possible actions in order to mitigate rabies V1 presentation in foxes. In the early ´90 rabies V1 was endemic in the dog population in the North of Colombia, after massive prophylactic vaccination campaigns in dogs of the region the situation was controlled in most of the departments, but to this day Magdalena still represents the majority of such cases. Animal rabies cases (dogs, cats, wild animals, leaving aside bovine and bat rabies) from Magdalena, since 2006 to 2018, represent 77% of all the cases at a national level in this frame of time, all belonging to V1; this is the only department that has records of V1 presentation in wild animals. Rabies V1 presentation in foxes can be due to cross-species transmission or viral host shift, Magdalena scenario presents the right environmental changes and factors for both scenarios, such as niche overlap, land use change, climactic change, species behavior, phylogenetic closeness between both species, inter-species contact rate, population density, new host immune response, among others. The phylogenetic analysis of the circulating strains is necessary to determine the type of event, the creation of a rabies surveillance system in wild animals and, if necessary, the implementation of oral vaccination or a catch-vaccination-release plan in the population of foxes would help control the rabies in this wild population.

Name: Felipe Fornazari

PP104

Email: ff_vet@yahoo.com.br

Session: Wildlife Rabies & Control

Country: Brazil

Title: Neutralizing antibodies to rabies virus in terrestrial wildlife from Brazil (2008-2017)

Authors: Felipe Fornazari, Karin Corrêa Scheffer, Sandriana Ramos Silva, Karina Ribeiro da Silva, Adriana Cândido Rodrigues Nasraui, Carlos Roberto Teixeira, Luna Scarpari Rolim, Helio Langoni

Affiliations: São Paulo State University, Department of Animal Production and Preventive Veterinary Medicine, São Paulo, Brazil

Abstract: Wildlife has emerged as an important source of human rabies in Brazil, with bats serving as the main reservoirs in the Southeast region of the country. However, rabies among terrestrial wild species, like marmosets and foxes, have also been described in recent years. In order to further investigate the level of exposure to rabies virus (RABV) in diverse wild species other than bats, the present study aimed to analyze retrospectively sera samples from 638 free-ranging terrestrial wild mammals from São Paulo state (SP). The samples were obtained between 2008 and 2017 and comprised 24 animal species distributed in 47 municipalities. Most of the samples were from Botucatu municipality (n=428) and comprised opossums (n=312). Exposure to RABV was accessed through detection of neutralizing antibodies using the rapid fluorescent focus inhibition test (RFFIT), with 0.2 IU/mL cut-off point. Medical records of seropositive animals were investigated for clinical abnormalities compatible with rabies symptoms. Seroprevalence was 1.72% (11/638; CI 95% 0.7 – 2.7) with titers ranging from 0.22 to 0.71 IU/ml. Seropositive animals included five opossums (Didelphis albiventris), two coatis (Nasua nasua), one capybara (Hydrochoerus hydrochaeris), one porcupine (Sphiggurus villosus), one otter (Lontra longicaudis), and one gray brocket (Mazama gouazoubira). Among the seropositive animals, medical records were available for 10 individuals. Eight had no clinical disorders and were considered healthy at the time of sampling. Two individuals (one opossum and one otter) had clinical findings associated to traumatic injuries. The results indicate natural exposure to RABV among diverse terrestrial wild species in Brazil. No evidence of rabies symptoms was found, suggesting abortive infection by RABV. We recommend that public health authorities should monitor terrestrial wildlife as part of rabies surveillance programs.

Name: Natália Maria Sousa Falcão

PP105

Email: nattfalcao@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Health education as a tool for the understanding of schoolchildren about rabies transmitted by marmosets (Callithrix jacchus; white-tufted-ear marmoset), Fortaleza, Ceará, Brazil

Authors: Natália Maria Sousa Falcão, Aline de Oliveira Almeida, Camila Carvalho Fontão, Natacha Mamede Lisboa, Kamila Teixeira de Paula, Ana Vitória Correia Sales, Fernanda Vitória Almeida Magalhães, Naylê Francelino Holanda Duarte, Maria Verônica Moraes Campello

Affiliations: Ceará State University, Fortaleza, Brazil

Abstract: In the context of One Health, it is feasible to integrate efforts to control diseases such as rabies. Despite legal restrictions, the practice of raising marmosets (Callitrix jacchus) in captivity is quite common in Ceará. This practice probably occurs because people are unaware of the risk of imprisoning them. This interaction creates a major public health problem. From 2005 to 2019, in Ceará, four cases of human rabies transmitted by marmosets were reported. Accidents occurred during capture. In the school environment, it is important to pass on information about rabies caused by wild mammals, especially marmosets, which are present in urban areas of the state. Therefore, the objective of this work was to describe educational actions about rabies transmission by marmosets, in public schools in Fortaleza. The actions (lectures and games) were held in classes from the 7th to the 9th grade at a municipal school in Fortaleza, by veterinary medicine students from FAVET-UECE, which are part of the Group of Wild Animal Studies - GEAS. The school students showed interest in the theme. The 9th grade class actively participated in the lectures; the 7th and 8th grades showed greater interest in the "mico" game, which brought questions about the theme. Most of them believed that it was common to breed marmosets at home and were unaware of the risk of rabies transmission by this species. Living with marmosets at home represents a risk to human health due to the possibility of transmission of the rabies virus. In this way, health education actions on rabies are of fundamental importance and serve as tools for decreasing the capture and breeding of these species at home. This also contributes to the understanding of keeping these primates in their natural habitat, which helps preventing the disease, decreasing the emergence of human cases.

Name: Raphael William Ponte Neres

PP106

Email: neres.raphael@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Epidemiological characteristics of rabies in wild mammals, Ceará, Brazil, 2003-2019

Authors: Raphael William Ponte Neres[1], Bruna Holanda Duarte[2], Rodrigo Rabelo de Castro Sousa[1], Maria Ester Crispim Nogueira Fernandes[2], Victoria Forte Viana[2], Fernanda Melo Jucá[2], Naylê Francelino Holanda Duarte[3]

Affiliations: [1]Universidade Estadual do Ceará, Faculdade de Veterinária, Fortaleza, Ceará, Brasil; [2]Associação de Educação Ambiental Humanitária de Bem-Estar Animal, Guarda Responsável e Animais Silvestres – BEAGUARAS, Fortaleza, Ceará, Brasil; [3]Universidade Federal do Ceará, Faculdade de Medicina, Fortaleza, Ceará, Brasil

Abstract: Due to the intensification of vaccination campaigns in Brazil, cases of canine rabies are in decline. Meanwhile, the situation in wild mammals remains in ascendancy, leading to a change in the epidemiological profile of the disease. In the Northeast of the country, the main reservoir of rabies is the hematophagus bat, non-human primates and wild dogs. In Ceará, from 2007 to 2019, 358,525 aggressions by mammals to humans were reported in the Sistema de Informação de Agravos de Notificação, of which 3,946 (1.1%) were caused by monkeys, 2,069 (0.6%) by wild dogs, and 2,017 (0.6%) by bats. The scenario reinforces the need to evaluate the epidemiological picture of rabies in the state. Therefore, this work aims to describe the epidemiology of rabies in wild mammals in Ceará from 2003 to 2019. This is a retrospective descriptive study with data from the Health's Secretary of Ceará, about the rabies situation in wild mammals in the state, from 2003 to 2019. The variables analyzed were year, number of cases and animal species. In the studied period, there were 815 cases of animal rabies in Ceará. Of those, 492 (60.36%) occurred in wild mammals, 214 (26.26%) in bats, 167 (20.49%) in wild dogs, 82 (10.06%) in marmosets, 29 (3.56%) in raccoons and 323 (39.63%) in domestic species, with 128 (15.71%) in dogs and cats. The study indicated that the number of wild rabies cases from 2003 to 2019 is higher than the cases of rabies in dogs and cats, pointing out wild mammals as the maintainers of the rabies virus in Ceará, with wild canids and bats being the main reservoirs. It is necessary to strengthen surveillance measures and educational actions for the population and health professionals about the wild cycle of the disease, avoiding the emergence of new human cases.

Name: Rita de Cassia Carvalho Maia

PP107

Email: rita.carvalho@ufrpe.br

Session: Wildlife Rabies & Control

Country: Brazil

Title: Epidemiological profile of anti-rabies post-exposure care from wild animals' aggressions in Pernambuco, Brazil

Authors: Ana Gabriela de Oliveira do Rêgo, Rita de Cássia Carvalho Maia, Daví dos Santos Rodrigues, Luciana de Oliveira Franco, Leucio Câmara Alves

Affiliations: Federal Rural University of Pernambuco (UFRPE), Recife, Brazil

Abstract: Rabies is endemic in the state of Pernambuco with the last case of the disease recorded in 2017, in the city of Recife. Since knowledge regarding the current epidemiological situation contributes to the establishment of control strategies over the disease in the state, the main objective of this study was to describe and evaluate the profile of notified human anti-rabies care, from wild animals aggressions, registered in the Notifiable Diseases Information System (SINAN) from 2011 to 2017. During the evaluation, 6,363 human anti-rabies consultations were observed, and it was possible to analyze the variables collected during the service and relate them to the Technical Norms of Human Rabies Prophylaxis from the Ministry of Health. The results revealed that adult males compose the profile most attacked with bite-like exposures and with single predominant lesions. Concerning the aggressor animal there was an increase in the incidence of aggressions from Chiropterans. It is concluded that the health actions evaluated in this work need to improve control strategies over the wild rabies cycle, with attention to bats, relevant animals in the epidemiological chain of transmission of primary and secondary forms, and improve actions in the population health education.

Name: Sarah Bonaparte

PP108

Email: sarahcbonaparte@gmail.com

Session: Wildlife Rabies & Control

Country: United States

Title: Electronic Laboratory Reporting (ELR): updates, obstacles, and plans for the United States' rabies surveillance system

Authors: Sarah Bonaparte, David Lowe, Ryan Wallace, Vicki Olson

Affiliations: Centers for Disease Control and Prevention, Poxvirus and Rabies Branch, Atlanta, Georgia, USA

Abstract: Rabies in animals is an enzootic disease throughout the United States and a nationally notifiable condition. Approximately 100,000 animals are submitted for laboratory diagnosis annually with roughly 5% resulting in positive diagnoses. A network of over 130 nation-wide laboratories and USDA field biologists report diagnostic and epidemiological data through several non-standardized methods to the Center for Disease Control and Prevention's (CDC) national rabies surveillance system. This requires manual data review and cleaning by CDC personnel and causes delays in the time to analysis and publication of inter-state trends in animal cases. To correct these issues and create a standardized reporting process, the CDC has collaborated with the Association of Public Health Laboratories (APHL) and state public health, agriculture, and academic laboratories to develop and implement a national electronic laboratory reporting (ELR) system for animal rabies. This system, created in 2016, allows for local labs to adopt the standardized Health-Level Seven (HL7) language to improve national notification mechanisms for animal rabies. To date, 10 laboratories (representing 9 states and the USDA) are actively reporting data to rabies ELR, 5 labs are in the process of on-boarding and system implementation, and several more labs are engaged in discussions with the CDC and APHL regarding ELR implementation. In the past year, COVID-19 has proved to be a severe obstacle in the on-boarding of labs, implementation of the ELR, and in general interest in rabies ELR from not yet on-boarded labs. Going forward, the CDC aims to receive 95% of national animal rabies reporting solely using ELR by 2025, and plans are currently being developed to improve the ELR data visualization interface. The transition to electronic reporting has and will continue to allow for improved animal rabies surveillance and faster detection of and response to epizootics.

Name: Sthefany Cristine Bandeira Melo

PP109

Email: sthefanymelo@gmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Epidemiology of rabies in saguis (Callithrix jacchus) in Ceará, Brazil, 2015-2019

Authors: Sthefany Cristine Bandeira Melo[1], Ana Carolina da Silva Monteiro[1], Renata Galvão Oliveira[2], Vitória Senna Sá Esteves[3], Esaú Marlon Franco da Paz[2], Naylê Francelino Holanda Duarte[4]

Affiliations: [1]University Center of Faculdades Metropolitanas Unidas - FMU, Faculty of Veterinary Medicine, São Paulo, SP, Brazil; [2]Federal University of Bahia, Institute of Biology, Salvador, Bahia, Brazil; [3]Federal University of Bahia, School of Veterinary Medicine and Animal Science EMEVZ, Salvador, Bahia, Brazil; [4]Federal University of Ceará, School of Medicine PPG Public Health, Fortaleza, Ceará, Brazil

Abstract: The importance of the epidemiological study of rabies in Saguis (Callitrix jacchus) is due to the fact that these animals are one of the main transmitters of Lissavirus to humans in Ceará. Even with all the restrictions determined by law, the habit of capturing these animals for breeding is quite common and ends up worsening the spread of the disease. Therefore, the objective of this study is to describe the epidemiological profile of rabies in Saguis in the state of Ceará, in order to determine the risk of transmission of rabies virus from these to humans, in different geographical areas. A descriptive study of cases of rabies in marmosets was carried out, from January 2015 to April 2019, with secondary data from the Department of Health of the State of Ceará (Sesa), with analysis of the variables: number of cases, year, municipality of occurrence and species. During the period studied, there were 336 mammals positive for rabies in Ceará, in 14 (7.60%) of the municipalities in the state. Of these, 22 (6.54%) were marmosets. The year with the highest incidence of cases was 2018 with 12 (54.54%), followed by 2015 with 4 (18.18%), 2017 and 2019* with 2 (9.09%) cases each year and 2016 with 1 (4.54%) case. The municipality with the highest incidence was Ibiapina with 5 (22.72%), followed by Uruburetama with 3 (13.63%), Camocim and Icó with 2 (9.09%) and the other municipalities presented a case. Ibiapina and Uruburetama have similar characteristics in relation to the cold climate and are quite wooded. Given the above, the intense circulation of the rabies virus in the marmoset population in the State of Ceará is evident. Therefore, it is necessary to invest in strengthening surveillance, through viral monitoring, together with socio-educational work so that the population recognizes the potential risk of rabies transmission. In addition, the commitment and preservation of wildlife.

A importância do estudo epidemiológico da raiva em Saguis (Callitrix jacchus) deve-se ao fato desses animais serem um dos principais transmissores do Lissavírus para o homem no Ceará. Mesmo com todas as restrições determinadas por lei, o hábito de capturar esses animais para criação, é bastante comum e acaba agravando a difusão da doença. Desta forma, o objetivo desse estudo é descrever o perfil epidemiológico da raiva em Saguis no estado do Ceará, a fim de determinar o risco de transmissão do virus da raiva destes para o homem, nas diferentes áreas geográficas. Foi realizado um estudo descritivo dos casos de raiva em saguis, de janeiro de 2015 a abril de 2019, com dados secundários da Secretaria da Saúde do Estado do Ceará (Sesa), com análise das seguintes variáveis: número de casos, ano, município de ocorrência e espécie. No período estudado, houve o registro de 336 mamíferos positivos para raiva no Ceará, em 14 (7,60%) dos municípios do estado. Destes, 22 (6,54%) foram saguis. O ano com maior incidência de casos foi 2018 com 12 (54,54%), seguido de 2015 com 4 (18,18%), 2017 e 2019* com 2 (9,09%) casos em cada ano e 2016 com 1 (4,54%) caso. O município com maior incidência foi Ibiapina com 5 (22,72%), seguido de Uruburetama com 3 (13,63%), Camocim e Icó com 2 (9,09%) e os demais municípios apresentaram um caso. Ibiapina e Uruburetama possuem características semelhantes em relação ao clima frio e serem bastante arborizados. Mediante ao exposto, fica evidente a intense circulação do vírus da raiva na população de saguis no Estado do Ceará. Diante disso, é necessário investir no fortalecimento da vigilância, através do

monitoramento viral, juntamente com um trabalho socioeducativo para que a população reconheça o potencial risco de transmissão da raiva. Além, do comprometimento e preservação da vida selvagem.

Name: Vanessa Slack

PP110

Email: vanessa.m.slack@gmail.com

Session: Wildlife Rabies & Control

Country: United States

Title: Sylvatic rabies cases and resulting exposures to humans and domestic animals in Colorado from 2016-2019

Authors: Vanessa M. Slack

Affiliations: Colorado School of Public Health Graduate, Aurora, Colorado, USA

Abstract: Background: Rabies virus is commonly transmitted by the bite of an infected mammal. Rabies causes acute encephalomyelitis and death if untreated. Adequate surveillance is lacking worldwide but crucial for rabies management and prevention. This study examined the distribution and source of rabies exposures in Colorado. Methods: A retrospective cohort study was conducted using passive rabies surveillance data in Colorado from 2016-2019. A Poisson model with log-link function generated relative risks and 95% confidence intervals between rabid species and human exposure events, stratified by geographic region. Descriptive analyses were conducted to estimate the burden of rabies exposures. Results: Rabies was diagnosed in 744 (11.1%) of 6,686 animals tested. At least 287 humans and 1,654 domestic animals were exposed to rabies. Risk of human exposure from domestic animals was almost nine times that of rabid skunks (RR 8.83; 95% CI: 5.21, 15.40). Risk decreased among bats (RR 2.68; 95% CI: 1.85, 3.90) and other wildlife (RR 3.70; 95% CI: 1.58, 8.67). Compared to skunks in the North Central region, multiplicative interactions existed for the other species in all regions. Antagonistic interactions occurred among domestic animals and bats while synergistic interaction occurred among other wildlife. Conclusions: This study suggests that rabid domestic animals pose the greatest risk for human exposures in Colorado. Risk of exposure varies by rabid host species and geographic region. Despite spillover events, independent circulation of the virus is not supported by other sylvatic reservoir species in Colorado and enzootic rabies cycles are sustained among bat and skunk populations.

Name: Vitória Senna Sá Esteves

PP111

Email: sennavi@hotmail.com

Session: Wildlife Rabies & Control

Country: Brazil

Title: Epidemiology of rabies in non-human primates in Northeast Brazil, 2015-2020

Authors: Vitória Senna Sá Esteves[1], Sthefany Cristine Bandeira Melo[2], Ana Carolina da Silva Monteiro[2], Renata Galvão Oliveira[3], Esaú Marlon Franco da Paz[3], Naylê Francelino Holanda Duarte[4]

Affiliations: [1]Federal University of Bahia, School of Veterinary Medicine and Animal Science EMEVZ, Salvador, Bahia, Brazil; [2]University Center of Faculdades Metropolitanas Unidas - FMU, Faculty of Veterinary Medicine, São Paulo, SP, Brazil; [3]Federal University of Bahia, Institute of Biology, Salvador, Bahia, Brazil; [4]Federal University of Ceará, School of Medicine PPG Public Health, Fortaleza, Ceará, Brazil

Abstract: Wild rabies is a broad challenge for the authorities due to the diversity of reservoirs in Brazil. In the Northeast, non-human primates (PNH) present themselves as reservoirs of the wild cycle of the disease, causing great risk to public health. Thus, the objective of this study was to describe the epidemiological profile of the disease in PNH in relation to other mammals in the states of the Northeast. The study is a descriptive study using data from the Secretariat of Health Surveillance (SVS), of cases of rabies in mammals with an emphasis on PNH from January 2015 to May 2020. During this period, a total of 3,981 mammals were recorded positive for rabies in Brazil, with 915 (23%) from the Northeast with 43 cases of non-human primates (95.5%). 2018 was the year with the highest incidence of rabies cases in PNH with 20 (11%) of the 181 positive mammals, followed by 2019 with 12 (4.37%) of 274 infected animals. In 2015, 78 animals were positive, of which 3 were PNH (3.84%), in 2016 there were 121 cases, being 1 (0.82%) PNH, in 2017 of 239 cases 6 were PNH (2.5%), and finally the year with the lowest incidence was 2020, with 22 positive cases, with 1 (4.54%) PNH, but these are partial results from January to May, not covering all months. Among the states notified with cases of rabies in PNH, Ceará stood out with a total of 27 (62.8%), followed by Bahia and Pernambuco with 6 (14%). Thus, the need to implement rabies surveillance and control actions in the Northeast region of the country is evident, with a greater focus on the state of Ceará, as it has a higher incidence of cases, and to strengthen environmental education in the face of the risks that the approach of the human being to the PNH can offer.

A raiva silvestre se constitui como um amplo desafio para as autoridades devido a diversidade de reservatórios existentes no Brasil. No Nordeste, os primatas não humanos (PNH) se apresentam como reservatórios do ciclo silvestre da doença, ocasionando grande risco a saúde pública. Assim, o objetivo desse estudo foi descrever o perfil epidemiológico da doença em PNH em relação aos outros mamíferos nos estados do Nordeste. O estudo é do tipo descritivo com uso de dados da Secretaria de Vigilância em Saúde (SVS), dos casos de raiva em mamíferos com ênfase em PNH de janeiro de 2015 a maio de 2020. Durante esse período, foram registrados um total de 3.981 mamíferos positivos para raiva no Brasil, sendo 915 (23%) do Nordeste com 43 casos de primatas não humanos (95,5%). O ano de 2018 foi o de maior incidência de casos de raiva em PNH com 20 (11%) dos 181 mamíferos positivos, seguido do ano de 2019 com 12 (4,37%) de 274 animais infectados. Em 2015 foram 78 animais positivados, sendo 3 PNH (3,84%), em 2016 foram 121 casos sendo 1 (0,82%) PNH, em 2017 de 239 casos 6 eram PNH (2,5%), e por fim o ano de menor incidência foi 2020, com 22 casos positivos, sendo 1 (4,54%) PNH, porém são resultados parciais de janeiro até maio, não abrangendo todos os meses. Dentre os estados notificados com casos de raiva em PNH, o Ceará se destacou totalizando 27 (62,8%), seguido da Bahia e Pernambuco com 6 (14%). Dessa forma, fica evidente a necessidade de implementação das ações de vigilância e controle da raiva na região Nordeste do país, com maior foco no estado do Ceará por apresentar maior incidência de casos, e fortalecer a educação ambiental frente aos riscos que a aproximação do ser humano com os PNH podem oferecer.

THANK YOU SPONSORS!

Biogénesis Bagó

KEDRION BIOPHARMA

Boehringer Ingelheim

SANOFI PASTEUR

Empowering Life