



Zoonoses in the Bolivian Amazon: alarming initial results from an NGO-led one health initiative

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the Niemann–Pick C1 (NPC1) receptor, suggesting the virus has zoonotic potential. The bats were also found roosting inside houses, indicating the potential for human transmission. However, further studies are required to investigate whether exposure has actually occurred or if BOMV is pathogenic in humans.

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03.011

Serological evidence of exposure to filoviruses and henipaviruses in wildlife, Malaysia



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Purpose: PCR and serological-based approaches have been used to identify henipavirus and filovirus (e.g. Nipah virus, Ebola virus) exposure or infection in bat populations in Bangladesh, China, and Southeast Asia. Our understanding of the diversity of these viruses in bat reservoirs, and the frequency of spillover to other animals or people, is extremely limited. We hypothesized that henipaviruses and filoviruses were circulating within multiple bat reservoirs and that spillover of these viruses to non-human primate populations has occurred in Malaysia.

Methods & Materials: We utilized a multiplex serological assay to screen sera for reactive IgGs that bound to antigens from henipaviruses and filoviruses. We produced virus attachment glycoproteins (GP) from sixteen virus species in the families Paramyxoviridae and Filoviridae. As part of our ongoing collaboration, we conducted in-country assay training and sera testing at the Department of Wildlife and National Parks, National Wildlife Forensic Laboratory. We screened sera from eight bat genera and sera from *Macaca fascicularis* populations.

Results: Sera samples from *Pteropus hypomelanus* (n = 56) were reactive with Nipah virus GP (25%) and cross-reactive with GPs from closely-related henipaviruses. In these same *P. hypomelanus* samples we detected reactivity with Ebola virus and Sudan virus GPs (10% and 5%, respectively). Sera from several *Hipposideros* species and *P. hypomelaus* reacted with the *Henipavirus* species, Mojiang virus GP. Two *M. fascicularis* sera samples reacted with GPs from Ebola virus and Bundibugyo virus and *M. fascicularis* sera samples specifically reacted with Mojiang virus; all four samples exhibited median fluorescence intensity values > 10,000. We also detected reactivity to Ebola virus and Sudan virus GPs in sera samples collected from *Hipposideros*, *Cynopterus* and *Rhinolophus* species. We did not detect any samples that were reactive with Reston virus GPs.

Conclusion: We detected evidence of past exposure to virus(es) most antigenically-similar to Ebola virus, Bundibugyo virus, and Sudan virus in sera samples from bat and non-human primate populations collected in Malaysia. This is also the first sero-survey for Mojiang virus and the first evidence of exposure to Mojiang virus in bats and non-human primates. Our results suggest that there are different but antigenically related henipaviruses and filoviruses circulating in bats in Malaysia.

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03.012

Zoonoses in the Bolivian Amazon: alarming initial results from an NGO-led one health initiative



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Purpose: Building on prior surveillance experiences from the Bolivian Amazon region, a new initiative aims to improve the livelihood of rural communities by detecting, preventing and combating zoonotic diseases.

Methods & Materials: A new organisational approach has been chosen to develop sustainable health solutions for humans, domestic animals, wildlife and local ecosystems in remote indigenous communities with limited access to health services and whose territory is being affected by anthropogenic changes. The initiative is built on three pillars: research, capacity building and citizen engagement and is led by a local non-profit organisation, Teko Kavi, who works closely with Bolivian regional health and veterinary authorities, laboratories and universities as well as local indigenous community organisations, health centres and schools to improve awareness raising and building of networks and the much needed new capacities. The project is funded by a Danish social capacity building fund, and a Danish NGO-collaboration partner of Teko Kavi and two Danish universities provide One Health and capacity building expertise.

Samples were collected in 2018 from 76 humans and 84 domestic animals in addition to environmental and wildlife samples in two Tacana Indigenous Territory villages in the San Buenaventura municipality located in the Amazon region of La Paz Department, Bolivia. Also, health information was collected for data analysis by face-to-face interviews of the tested people and owners of the tested animals.

Results: The results are alarming: a high proportion of participating humans in the two villages were ill with fever, muscle pain, nausea and fatigue among other symptoms on or shortly prior to the day of sampling. Moreover, a high proportion (27%) of human serum samples were found to contain IgM antibodies directed against *Leptospira* spp., indicative of acute infection, while 63.6% of PCR-tests of urine samples from humans and 50% from animals were *Leptospira*-positive. Besides this hitherto unreported disease in the area, other important zoonotic pathogens were also detected in the samples, including Hantavirus and *Aerococcus viridans*.

Conclusion: Information meetings have been held in the local communities as well as between the health institutions

and workers, and a participatory integrated health intervention strategy is being discussed between partners in the initiative.

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03.013

Hendra virus in the field – risk profiling and management



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Purpose: Hendra virus is a zoonotic pathogen which was first identified in 1994 and spillover events in horses were sporadic in Queensland (QLD) and New South Wales (NSW), Australia until 2010. The predominant differences during 2011–2017 were the number of spillover events (46 incidents during 2011–2017 compared to 14 incidents during 1994–2010), the unprecedented number of incidents in NSW (19 incidents during 2011–2017 compared to one incident during 1994–2010) and the geographic clustering in southeast QLD and northern NSW (30 incidents in southeast QLD and north NSW compared to 16 incidents in central and northern QLD during 2011–2017). Detailed epidemiological investigations on infected property (IP) were conducted on all Hendra virus infected horse properties during 2011–2017 to find any risk factors related to these spillover events and better management recommendations for risk mitigation.

Methods & Materials: Profiling activities involved case history reviews, property visits and interviews with the horse and/or property owners focusing on the infected horse(s) (health, behaviour), husbandry (supplementary feeding, water), property (pasture condition, paddock/yard/stable), vegetation (location and stage of fruiting/flowering trees/shrubs), flying-fox activities (as evidenced by the presence of spats, faeces, partly-eaten fruit/flowers/seeds and/or infra-red/thermal camera photographs) and potential flying-fox – horse interaction site(s).

Results: Findings from IP profiling showed that all infected horses were paddock horses and that flying-fox activities were identified on most infected properties even when the owners reported no flying-fox sightings. Infected property profiling findings also indicated the management of the horses (locations of water/feed troughs, night yarding under flowering/fruiting trees) and horse behaviour may play a role in the Hendra virus transmission through the flying-fox – horse interaction.

Conclusion: Profiling findings have identified several high risk factors related to the horse and human behaviours. Horse personality such as dominance and inquisitiveness could have brought the horses closer to the environment with flying –fox foraging activities. Several human behaviours in related to the decision of horse husbandry could have also placed the horses under higher risk due to indirectly interaction with flying-fox activities. This results have reinforced Queensland government's recommendations to the horse owners on Hendra virus risk management and risk mitigation for animal and human health.

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Oral Presentations: Hot Topics in Emerging Infectious Diseases

08.001

One-shot immunization using a Measles/Lassa vaccine fully protects cynomolgus monkeys against Lassa fever



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Purpose: Lassa fever is a major public health issue in Western Africa and there is still no licensed vaccine. Here we have used the Measles virus (MeV) vaccine platform to generate Lassa fever vaccine candidates expressing the Lassa virus (LASV) glycoprotein GPC alone or in combination with the nucleoprotein NP or the matrix protein Z. We have demonstrated that NP should be mutated to preserve a strong induction of the type I IFN response and activation of human antigen presenting cells in response to the vector. We selected two vaccines, MeV-NPmut/GPC and MeV-Z/GPC, for further testing in non-human primates.

Methods & Materials: Cynomolgus monkeys were immunized with a single dose of MeV-NPmut/GPC, MeV-Z/GPC, or empty MeV vector as a control, one month before being challenged with a lethal dose of LASV. Animals were monitored for biological, clinical, virological, and immunological parameters after immunization and challenge.

Results: The two vectors were safe, did neither replicate in nor shed from vaccinees, and protected all cynomolgus monkeys while controls all died from Lassa fever. Interestingly, MeV-NPmut/GPC conferred almost a sterilizing immunity and animals only experienced a transient elevation in the body temperature but no biological alterations or clinical signs. On the contrary, MeV-Z/GPC –immunized monkeys developed more severe symptoms and a prolonged LASV viremia. Analysis of the immune responses showed that early and robust T cell responses against GPC are critical for enhanced protection after challenge and suggests that T cell immunity against NP may greatly enhance protection. Early transcriptomic and proteomic studies have also been performed after immunization to identify early biological markers correlated with vaccine efficiency. MeV-based vaccines induce a strong humoral response against MeV and could thus be used as bivalent vaccines to prevent Lassa fever and Measles in endemic areas where both MeV and LASV are circulating.

Conclusion: The MeV-NPmut/GPC vaccine is safe, fully protects after a single shot cynomolgus monkeys against a lethal LASV challenge and could be used as a bivalent Measles-Lassa vaccine. Importantly, Themis Biosciences has been selected by the Coalition for Epidemic Preparedness Innovations (CEPI) to further develop the MeV-NPmut/GPC vaccine and test it in phase I and II clinical trials.

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