

In This Issue

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SPECIAL FEATURE: BATS AND DISEASE

Olival kicks off this issue's special feature on 'Bats and Disease' by describing the importance of bats through pollination, seed dispersal, and preying on agricultural pests. Bats provide "ecosystem services" all around the globe and Olival argues that it is time to end scientifically uninformed programs to cull bats. In a forum piece by **Leendertz et al.**, the group notes that evidence confirming fruit bats as single, ultimate, natural reservoir for Ebola viruses is lacking and questions regarding transmission and circulation remain unanswered despite long term, intensive sampling of the main candidate species. **Wood et al.** argue that in order to maximize the chances to control Ebola virus and similar emerging infectious diseases arising from wildlife, public health policy needs to be based on the best available evidence. **Field et al.** used GPS data logger technology to explore the landscape utilization of black flying foxes and horses to study Hendra virus since it is likely transmitted to horses through oro-nasal contact with flying-fox urine, feces, or saliva. **Openshaw et al.** studied mortality and morbidity in livestock allowed to graze on dropped fruit or directly fed bat or bird-bitten fruit in the villages of Bangladesh and found that villagers were more likely to report illnesses and deaths in goats and cattle that were fed dropped fruit or bitten fruit. **McGuire et al.** researched white-nose syndrome, a disease that has killed millions of bats in North America, and used non-destructive diagnostic methods to study the pathophysiology of the disease. **McMichael et al.** identified temporal population physiological changes that inform epidemiological studies and assessment of putative physiological risk factors driving Hendra virus infection in Australian flying-foxes while **Field et al.** sought to identify the diversity and prevalence of coronaviruses in bats in the Australasian region.

MARINE FLU

Influenza viruses are some of the few zoonotic pathogens known to infect marine mammals. Low pathogenic avian influenza viruses are widely distributed globally and strongly associated with aquatic ecosystems. In this study, **Fereidouni et al.** reviewed existing literature with the aim to assess the circulation of influenza A and B viruses in marine mammals. Results show that infections of seals and other marine mammals with influenza A and B viruses have been reported on several occasions, including evidence of transmission of influenza A viruses between seals and man. However, high costs and difficult logistics involved in the monitoring of marine mammals suggest that the real prevalence is likely underestimated.

FLURISK REVIEW

The FLURISK project's main objective was to develop an epidemiological and virological evidence-based influenza risk assessment framework (IRAF) to assess animal influenza A virus strains according to their potential to cross the species barrier and cause infections in humans. Aiming at gathering virological data to include in the IRAF, a literature review was conducted by **Munoz et al.** Several adaptive traits have been identified and a significance of these adaptations for the emergence of zoonotic influenza has been hypothesized. Further research applying a holistic approach and investigating the broader influenza genetic spectrum is urgently needed.

EL NIÑO & CHOLERA ASSOCIATION

Cholera is a preventable water-borne infection that is sensitive to climate and ecosystem changes. Examining

monthly data from 1991 to 2001, **Ramirez and Grady** estimate temporal associations between El Niño-Southern Oscillation and cholera incidence, and explore how local climate mediates this relationship in northern Peru. Their results, while supporting previous work that demonstrated associations between elevated temperatures and cholera epidemics in 1997–1998, also provide evidence that impacts from El Niño were interconnected by flooding, induced by torrential rains. Importantly, the authors found no associations earlier in the decade, disputing the hypothesis that El Niño triggered cholera emergence in 1991.

***Bd* ON THE CALIFORNIA ISLANDS**

Chytridiomycosis, an emerging infectious disease caused by *Batrachochytrium dendrobatidis* (*Bd*), has decimated amphibian populations worldwide, yet little is known of its invasion biology. To better understand this, **Yap et al.** conducted a historical survey of *Bd* on the California islands and found emergence patterns similar to those on the mainland, suggesting geographic isolation did not slow down its invasion. The authors propose that suitable habitat, host diversity, and human visitation influence the spread of *Bd*. They suggest that island systems present a unique framework that could be used to elucidate the invasion biology of *Bd* as well as other emerging infectious pathogens.

PREPAREDNESS AND RESPONSE TO THE EBOLA OUTBREAK

The Ebola outbreak that devastated parts of West Africa in 2014 highlighted several issues that must be addressed by international and interdisciplinary teams of scientists, clinicians, and social scientists before the next major emerging infectious disease event. This commentary by **Jacobsen** presents action items based on lessons learned from the Ebola outbreak about the need for improved early warning systems, strengthened public health systems, and enhanced laboratory science.

VOLUNTEERING IN NATURE

The aim of this study by **Molsher and Townsend** was to investigate changes in wellbeing and understanding of environmental stewardship associated with a program of

volunteering in nature in a rural community on Kangaroo Island, South Australia. Strategic partnerships were established between key environment, health and employment agencies to create a sense of local ownership and community cohesion. Participants engaged in a structured program of environmental volunteering (EV) and information sessions. Significant improvements in wellbeing and mood state were recorded, together with some improvement in environmental stewardship and awareness. EV provides a unique way to enhance the wellbeing of participants while conserving the environment.

HEATWAVE MORBIDITY

Although heatwave-related excess mortality and morbidity have been widely studied, results are not comparable spatially and often longitudinally because of different heatwave definitions applied. The excess heat factor (EHF)—devised by **Nairn et al.** (2009)—quantifies heatwave intensity relative to the local climate, enabling cross-regional comparisons and potential universal adoption. This paper by **Hatvani-Kovacs et al.** analyzes the association of EHF with daily morbidity between 2008 and 2014 in the Adelaide metropolitan region, South Australia. The EHF is found to differentiate days with heatwave-related excess morbidity and predicts the number of excess morbidity significantly better than other widely used weather parameters.

ILLEGAL SEAFOOD

Chaber and Cunningham sampled 18 illegal African bushmeat consignments seized at Charles de Gaulle airport, Paris, France, and tested for the presence of bacteria. Additionally, five smuggled smoked fish were analyzed for polycyclic aromatic hydrocarbons, which are known carcinogens. Chaber and Cunningham identified unsafe levels of bacteria and zoonotic bacterial pathogens in bushmeat and unsafe levels of carcinogens in fish illegally imported to Europe.

TB PRIMATE TESTING

Advances in non-invasive detection methods for mycobacterial infection in primates create new opportunities for exploring the epidemiology of tuberculosis in

free-living species. This study by **Wolf et al.** utilized fecal IS6110 PCR, a recently validated approach, for the non-invasive detection of Mycobacterium tuberculosis Complex (MTC) infection in primates, to screen populations of free-living chimpanzees and baboons in Gombe National Park, Tanzania. MTC infection was not documented in either population, demonstrating the utility of this approach for MTC surveillance in free-living primate populations.

TREE FROG TESTING

Rajakaruna reported on the lone and combined effects of exposure to a parasitic trematode and four pesticides on the survival, growth, and development of the common hour-glass tree frog, *Polypedates cruciger*. During isolation, both parasitic and pesticide exposure significantly decreased frog survival, development, and growth, and increased developmental malformations, such as scoliosis, kyphosis, edema, and skin ulcers. These laboratory studies suggest that ecologically relevant concentrations of agrochemicals increase the threat that trematodes pose to amphibians.

WASTEWATER BACTERIA

Wastewater reuse has become widespread given the scarcity and contamination of hydric resources. Untreated and

inadequately treated wastewater usage in agricultural activities poses a public health risk related with gastrointestinal infections, especially intestinal parasites. In this study **Fonseca et al.** performed microscopic and molecular identification of *Entamoeba* spp in a wastewater treatment plant located in Colombia. The results demonstrated the presence of *E. moshkovskii* in both untreated and treated water, constituting a public health risk for people exposed to waste water.

WOLF AND DOG VIRUSES

Iberian wolves thrive in human-dominated landscapes of northern Spain, being at risk of virus spill-over from rural dogs. **Millán et al.** investigated the factors affecting wolf exposure to important canine viruses and found that exposure to canine parvovirus-2 (CPV) and canine adenovirus-1 was frequent and without seasonal and inter-annual variations in prevalence. However, the probability of wolf exposure to CPV was positively and significantly correlated with farm density. The group also reports infection by canine adenovirus-2 in wolf and absence of exposure to canine distemper virus, for the first time.