

## *In This Issue*

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### SURPRISE! A NEGLECTED ASPECT OF EIDS

Surprise should be a foundational concept for emerging infectious disease (EID) research and management. EIDs arise from complex dynamic socio-ecological systems, and surprises are part of complex systems. However, the idea of surprise is virtually absent in the EID literature because of the focus on research for prediction rather than on means to increase resilience to surprises. In this paper by **Stephen et al.**, a surprised-based strategy to EIDs is proposed. An interproblematic approach, rather than an interdisciplinary approach, may enhance resilience and decrease the likelihood of surprise while at the same time increasing capacity to cope with the next inevitable surprising EID.

### OPERATIONAL CRITERIA FOR ECOSYSTEM APPROACHES TO HEALTH

Implementations of the ecosystem approach to health are guided by its methodological pillars. Yet, the operational specifics of ecohealth programs have been difficult to define. This article by **Richter et al.** sets out to define a set of operational criteria specifically applicable to ecosystem approaches and a protocol suggesting best practice techniques for their procedural implementation.

### HERE WE GOAT AGAIN

Q fever is a zoonotic disease caused by the bacterium *Coxiella burnetii* and has near global distribution. Although reported in the South Asian region, there have been no previous reports of Q fever in Bangladesh. In this study, **Haider et al.** provide the evidence that cattle and goats in Bangladesh have been exposed to *C. burnetii*. Evidence of Q

fever in Bangladesh has important implications for livestock production and public health; veterinarians and physicians should consider Q fever as a differential diagnosis when dealing with animal subjects and human patients with unknown etiology and signs or symptoms compatible with *C. burnetii* infection. This study supports the need for further studies to estimate the disease burden and risk factors for Q fever infections in animals and humans in Bangladesh.

### EXPLORING ECOLOGICAL EMBEDDEDNESS

Human ecosystem inextricability is recognised in public health documents such as the oft-cited Ottawa Charter for Health Promotion (WHO 1986); however, public health discourse and response has not fully engaged with this understanding. **Lewis and Townsend's** exploratory research into the motivations and experiences—including formative influences—of individuals whose pro-environmental behavior is congruent with such an understanding suggests a greater role for public policy, particularly public health policy, in enhancing human nature connectedness both for population health and for ecological health on which the health of populations depends.

### ONE HEALTH: SURVEILLANCE AND ENVIRONMENTAL REPRESENTATION

One Health cuts across global health, veterinary and human medicine, agricultural sciences and ecology, and has gained increasing attention. While One Health approaches acknowledge the critical importance of environmental issues, actual incorporation of environmental data, collaborators, and methodology still lags behind. **Barrett and**

**Bouley** quantified the relative lack of environmental representation in One Health leadership, programs and the scientific literature, and identified strategies to achieve increased engagement. Ecohealth practitioners will play an important role in further integrating environmental data, collaborators, and methodologies into One Health implementation.

Barriers to One Health surveillance include lack of health care, professional divisions, incompatible vocabularies, data sequestration, and territorial borders. Forward thinking leaders are beginning to circumvent these and other barriers and thus gather, analyze, and respond to diagnostic, syndromic, spatial, and temporal data. Some are also training next generation One Health integrators. Here, **Uchtmann et al.** recommend essential collaborations to provide expertise, and to transparently fill, unify, and convey implications of comprehensive datasets on multiple species, health threats, and underlying societal drivers. The aim is to underpin prioritized actions to foster critically needed biomedical and ecological gains—locally, regionally, and globally.

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## MALARIA HYSTERIA

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Adaptive management and ecohealth frameworks were developed for malaria elimination in Amerindian riparian communities of Venezuela. These frameworks were developed as a strategy to capture, organize, and communicate connections among key factors related to local malaria complex systems. Causal relationships between social, economic, and environmental stressors were identified at different levels and assumptions that guide interventions are offered, based on available scientific knowledge and input from stakeholders. Drawing on our experience of action research on the health of Amerindian populations and conservation of areas with biodiversity value, **Bevilacqua et al.** provide lessons to strengthen the practice of the ecohealth approach.

Due to anthropogenically induced global changes, monitoring programs of EIDs are of utmost importance, especially for vector-borne diseases where they might be increasing in range. Avian malaria is a complex disease caused by Haemosporidians that affect all bird species, causing varied symptoms depending on the susceptibility of the host. In the case of penguins, high mortalities have been evidenced in captivity; however, few epidemiological studies have been conducted in the wild. **Sallaberry-Pincheira et al.** analyzed blood samples from Humboldt

and Magellanic penguins in their complete distribution recording a low prevalence of disease in the wild colonies.

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## APRIL SHOWERS BRING BLOOD TRANSFUSION SAFETY

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Infectious diseases threaten the maintenance of a safe blood supply, with arboviruses emerging as significant threats. Climate change may increase the transmission of many vector-borne pathogens, representing an increasing threat to blood transfusion safety. **Faddy et al.** used two endemic Australian arboviruses as test cases to investigate the potential risk posed to Australia's blood supply after increased rainfall, and demonstrated the risk was similar in magnitude to that previously estimated during other arboviral outbreaks. The influence of climate change on the transmission of vector-borne diseases has the potential to impact on the future of blood transfusion safety.

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## INDOOR AIR POLLUTION AND HEALTH

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Approximately, a third of development assistance for health goes toward HIV/AIDS, Malaria, and Tuberculosis; these together accounted for 1.6 million deaths, comparable to the 2 million deaths attributed to indoor air pollution health risks. Yet, the latter has not been sufficiently addressed. **Armah et al.** use complex and multifactorial notions of indoor air pollution to show that multiple determinants including socio-environmental and socio-demographic factors cumulatively affect and reinforce individual exposures. The findings strongly support the hypothesis that most, if not all, of the effect is due to environmental risk factors rather than socio-demographic differences alone.

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## CAT GOT YOUR PARASITE, DEER?

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Felids are the definitive hosts for *Toxoplasma gondii*, contaminating environments with oocysts. White-tailed deer are an urban adapter species, serving as sentinels for environmental contamination. Here, **Ballash et al.** examine risk factors associated with *T. gondii* exposure in cats and deer. Older deer from urban habitats were significantly more likely to be exposed to *T. gondii*. Although no risk factors were associated with exposure in cats, nearly 75% of the sample was located in proximity to urban areas. The

authors concluded that urban areas are highly contaminated, presenting a significant risk for human and animal exposure to *T. gondii*.

## PLAGUE ON THE RANGE

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Sylvatic plague has impacted numerous North American mammals including certain populations of Gunnison's prairie dogs. To determine if this species could be protected from plague using a new oral sylvatic plague vaccine (SPV), **Rocke et al.** conducted a laboratory vaccination and challenge study in animals captured from two different populations. Their results demonstrated that plague susceptibility was equivalent between unvaccinated animals from each population. However, differential plague susceptibility was noticed among vaccinates that was closely linked to age. Vaccination at younger ages improved the likelihood of surviving plague infection. Thus, plague management programs using SPV should be targeted at younger cohorts.

## MONKEYING WITH TB

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Tuberculosis is a global public health concern for humans and a significant conservation concern for nonhuman primates. Standard primate TB diagnostics, developed for a limited number of laboratory primate species, rely upon the host's immune response to detect infection. These diagnostics lack sensitivity and specificity and are impractical for field use. In this study, **Rosenbaum et al.** screened a large and diverse sample of Peruvian Neotropical primates for TB using a minimally invasive buccal swab collection technique and molecular direct detection assays. Their results clearly highlight the importance of establishing systematic, long-term surveillance of Peru's primate populations.

## Bd MOON RISING

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Amphibian populations are decreasing worldwide due to a variety of factors. In South America, the chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*) is linked to many population declines. **Bresciano et al.** study symbiotic bacteria and *Bd* presence in different biogeographic regions of

the tropical Andes, ranging from Amazonian rainforest (450 m above sea level) to Andes mountain (3200 m). A focal altitude amphibian (*Gastrotheca riobambae*) was studied along life history stages, and the resistant-*Bd* skin bacteria *Janthinobacterium lividum* was determined, general bacteria abundance was higher post-metamorphosis stages.

## THE RUNAROUND ON RANAVIRUSES

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**Sutton et al.** evaluated trends in ranavirus prevalence in a plethodontid salamander assemblage in the Great Smoky Mountains National Park from 2007 to 2008. At five total sites, the group assessed infection prevalence 566 of salamanders representing 14 species. Overall, 103 incidences of infection were detected and greater trends of infection were found in *Desmognathus* and *Eurycea* species. The results suggest that climate patterns in a given sampling year along with elevation gradients play a primary role determining infection prevalence in plethodontid salamanders.

Ranaviruses have also been implicated in mass die-offs in fishes, amphibians, and reptiles, yet little is known about how they are transmitted in reptiles. In challenge experiments with turtles, oral inoculation with the virus has mixed success, whereas injection into muscle successfully infects individual turtles. This suggests virus may be transmitted by natural injection via arthropods. **Kimble et al.** detected ranavirus in two genera of mosquitoes captured near a captive turtle population undergoing a ranavirus outbreak, supporting this possibility. Although more work is needed, this suggests that mosquitoes may represent a possible route of transmission of ranaviruses among turtles.

## UNDER THE SEA TURTLE DECLINES

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**Flint et al.** undertook an investigation into the health of green sea turtles near Gladstone, Queensland, in response to a spike in the level of mortality in 2011. Although no single disease entity was found to be a cause of the mortality, the population was generally found to be in poor health, with a range of infectious and non-infectious disease processes identified. Other potential causative factors, including extreme weather events, historical contamination, and regional industrial activities, are also discussed.

## PATAWA VIRUS AND FOREST RODENTS

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French Guiana, located in the Amazonian region, faces increasing environmental pressures, mainly on the coast where most of the population lives. This situation induces an increase in contacts between the wild fauna and humans and, for some years, emerging viral diseases have appeared such as rabies in 2008 and Hantavirus Pulmonary Syndrome in 2009. **Lavergne *et al.*** carried out molecular investigations on 409 rodents allowed detection of a new arenavirus, tentatively named “Patawa virus,” in 2 *Oecomys* species. Further serological investigations, in rodent and human populations, are needed to determine if this virus can infect humans.

## WHITE-NOSE SYNDROME IN BATS

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Persistence of pathogens in the absence of hosts can exacerbate disease impacts. White-nose syndrome, a recently emerged fungal disease of bats, has caused substantial declines in bat populations across Eastern North America. **Hoyt *et al.*** find the causative agent of this disease, *Pseudogymnoascus destructans*, is capable of surviving for greater than 5 years in the laboratory under extreme desiccation in the absence of bats. These results suggest that *P. destructans* may be able to persist for long periods in the absence of bats, preventing recolonization of extirpated populations for many years after the initial impacts occurred.