

In This Issue

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KEEPING A WEATHER EYE ON VECTOR-BORNE DISEASE

Hemorrhagic disease is a vector-borne viral infection that causes significant mortality in white-tailed deer. Vector-borne diseases are considered to be particularly sensitive to climatic variation. Data collected over a 14-year period demonstrate an increasing overall incidence of hemorrhagic disease since 1998. In this study, **Sleeman et al.** describe a strong correlation between seasonal temperature and precipitation and hemorrhagic disease in Virginia white-tailed deer, with higher average temperatures and decreased June rainfall affecting both vector competence and enhancement of vector breeding sites. These results evince the potential of global climate change to alter disease transmission dynamics.

TROUBLED WATERS

Antibiotic-resistant microbes are an emerging public and environmental health concern, no longer limited to hospital settings. In particular, the spread of antibiotic resistance to the environment may be a result of agricultural runoff containing resistant organisms or discarded antibiotics. **Schaefer et al.** describe an alarming incidence of antibiotic-resistant pathogens—that also affect humans—in wild bottlenose dolphins, including methicillin-resistant *Staphylococcus aureus*. Differences were found between geographic areas, potentially due to the different pathways of antibiotics and resistant organisms to marine environments. Bottlenose dolphins are apex predators, potential zoonotic transmitters, and a sentinel species for the health of the coastal marine environment shared with humans. These results indicate the need to further investigate the

pathways and mechanisms of antibiotic resistance in the environment, as well as their impacts on both humans and wildlife.

WEST NILE VIRUS EDUCATION

Without an effective human vaccine available, the prevention of West Nile virus (WNV) depends on mosquito vector control and personal protective behaviors. But are public education campaigns effective in promoting protective strategies among United States residents? **Tuiten et al.** found that perceptions, but not accurate knowledge, of WNV correlate with the implementation of protective strategies and a reduction in the availability of vector breeding sites in residential yards. The authors conclude that more training and education programs with a focus on mosquito control strategies are warranted, though the results of their surveys suggest that mass media WNV prevention campaigns alone may not be effective.

CLIMATE CHANGE AND PUBLIC HEALTH

In the coming decades, global climate change will introduce a host of new challenges to public health management in sub-Saharan Africa via consequences for food security, droughts, floods, population displacement, and malaria and other diseases. Using a series of five hypothetical cases, **Ramin et al.** examine the health impacts of discrete manifestations of climate change at individual and population levels. By exploring the repercussions of climate change within the framework of human ecology and culture, the authors provide a valuable perspective on the complex interplay of physical, ecological, and social elements in public and environmental health.

(NOT) BUYING THE FARM

In response to the increasing demand for foods of animal origin livestock production has transformed within the past decades. The industrialization of livestock production—with its low genetic diversity, high animal density, and rapid turnover—can result in increased risks to both animal and public health. **Liebler et al.** review the recent emergence of distinct influenza viruses. Given the difficulty of pathogen containment in industrialized agriculture, and the recent emergence of contagious human diseases from domestic animal populations, the authors assert the necessity of examining disease exchange in relation to intensified agricultural practice. They also make suggestions regarding incentive-based management of the health risks associated with industrial agriculture.

CLIMATE CHANGE AND ALGAE

Global warming may create favorable conditions for toxic cyanobacteria blooms, with an attendant impact on water quality worldwide. In this study, **Hu et al.** report statistically significant associations of weather variability and sunspot numbers with cyanobacteria bloom, which support the prediction of increased bloom incidence with global climate change. These findings may be of assistance in identifying communities at risk for contamination and coordinating public health interventions to reduce the harm from cyanobacteria outbreaks.

HOLISTIC MEDICINE

Just as biodiversity is vanishing at a disquieting rate, a vast array of cultures reliant on troubled ecosystems is also in danger. In this issue, **Pesek et al.** detail their cooperation with Q'eqchi' Maya healers to create a spatial model prioritizing conservation of regionally scarce and culturally important plants. With the strategic application of local expert knowledge in synergy with mathematical modeling, this project is an example of jointly sustaining ecological integrity and cultural practices.

TROPICAL ALLERGIES RELATED TO GRASS FIRES?

The “grass-fire” cycle is responsible for the transformation of tropical landscapes: as grasses become established, the likelihood of fire rises, facilitating grass dominance and further increasing the likelihood of fire. While many tropical countries have recorded an increasing incidence of atopic disease, this has largely been attributed to urbanization and increased exposure to airborne pollutants. **Johnston et al.** find a correlation between the pollen levels of increasingly abundant native and nonnative grasses in Darwin, Australia, and sales of medication used to treat allergic rhinitis. While much attention has been paid to the ecological impact of grass-fire cycles, the authors provide a perspective on the influence of these cycles on human health and quality of life.

MERCURIAL NATURE

In a region of the Amazon dependent on its rivers and fish, mercury contamination is a serious environmental and public health issue. In this study, **Fillion et al.** examine mercury exposure in relation to reported quality of life among communities in the Brazilian Amazon. Their results show that a traditional lifestyle was associated with both high quality of life, including daily fishing and fish consumption, and elevated mercury exposure. These findings underscore the need to understand the role of quality of life when crafting strategies to reduce mercury exposure and promote good community health.

THE AUGURY OF OUTBREAKS

Evaluating the risk of potential emergence or reemergence of vector-borne diseases requires imagining the ways in which the environment might change in the future, and how these changes will impact transmission risks. **Linard et al.** turn their focus to the Camargue region of France, which is considered a potential site for malaria reemergence. Model simulations show, however, that the constellation of factors required for reemergence in this area—significant land use and climate changes, for example—make the probability of reemergence in this area low. Results from such scenario analyses can help local public

health authorities in policy formulation with regard to potential disease emergence and preparedness.

AMPHIBIAN DECLINE

Global amphibian populations are in a state of unprecedented crisis, dying in numbers that are dramatic even on the scale of the biodiversity loss currently affecting virtually all taxa. Twenty-five years ago, herpetologists noted the beginnings of a sharp decline in amphibian populations. In 1998, researchers tracing the origins of large-scale frog die-offs in Australia and South America independently identified a previously undescribed fungus, *Batrachochytrium dendrobatidis*, as the culprit. Amphibians clinically affected by the fungus die as a result of loss of skin functions; they can no longer maintain fluid balance, electrolyte homeostasis, regular respiration and infection barriers. The disease, chytridiomycosis, has since been linked to mass amphibian mortality in Europe, North America, South America, Australia, and New Zealand, and to the extinction of the sharp-snouted day frog.

Five articles and two letters in this issue focus, in various ways, on limiting the disease's effects. The effort to save amphibian species from extinction by infection must be more than triage if it is to succeed. **Kringer and Hero** offer evidence that the intercontinental trade in amphibians for food, pets, and experimental subjects is the most plausible driver for the extent of the spread of chytridiomycosis. Given the burden of knowledge that the disease can pressure populations to extinction, the authors urge a complete ban on the intercontinental trade in amphibians.

A letter in reply from **Garner et al.** suggests that Kringer and Hero's proposed ban, while sound in theory, is impracticable. Rather than combat the multi-million dollar

trade in amphibians, the authors of this letter suggest cooperation with the traders to regulate trade by instituting practices to certify the disease status of the animals in question. Additionally, they assert that control, though not necessarily elimination, of chytridiomycosis may be possible in the wild, through pond or stream-level applications. **Kringer et al.**'s reply to Garner et al. maintains that, given that one infected individual can introduce the disease, and testing is expensive, time-consuming, and ultimately imperfect, only a total ban can work to help prevent a taxon-level extinction by infection.

St. Hilaire et al., meanwhile, describe a risk assessment protocol for researchers to determine the probability of spreading *B. dendrobatidis* across bodies of water in the course of their fieldwork, based on factors such as number of visitors and intensity of amphibian handling.

Three of the articles address (and raise) questions of infectivity. **Kerby and Storfer** examine the interaction of environmental contaminants and disease as threats to amphibian populations, and find that pesticide exposure significantly increases disease susceptibility in tiger salamanders. On the other hand, **Murphy et al.** explore the resistance to chytridiomycosis seen in Wyoming Boreal toads, and find that, despite a high prevalence of infection, the toads have a remarkably low mortality. Environmental and behavioral factors seem to give them an edge over their Colorado cousins. **Bielby et al.**, however, have graver news: They have observed lethal chytridiomycosis in Tyrhhenian painted frogs. Sardinia had previously been free of the clinical disease, and the IUCN Red List endemic amphibians there are now demonstrably under threat.

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