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Editorial

Emerging Infectious Diseases and the Socio-ecological Dimension

EcoHealth is a forum for mixing disciplines. In this journal, we deal with scientific questions on toxins and biodiversity, land use changes and disease vectors, diseases and ecosystems. Often, they involve a human, social dimension such as population expansion or community health, or disease spread among cities. These interactions span spatial scales from specific factors that affect health (a toxin, a pathogen) to broad environmental changes (climate, deforestation, wildlife trade, biodiversity loss, and human travel). Invariably, this complexity and range pose a new challenge: How do we conduct rigorous science across all of these spatial and temporal scales and across disciplinary divides? In this special issue on socio-ecological systems and emerging infectious diseases, a series of articles address emerging diseases considered from the standpoint of the interaction between human and natural systems. They examine population-scale human influence on pathogen dynamics and health, and the pathogen's influence on humans. These studies also have important implications for global health, ecosystem resilience, and conservation of biodiversity. How? By examining the linkages between the underlying drivers of disease spread and emergence and the pathogens that cause them.

This approach is not new, of course, and the study of public health and epidemiology has been tracing outbreaks back to their point origins for a long time (starting, perhaps, with a water pump in Broad Street, London). But the scale of the approach is wider, and a series of new strategies to study complex disease dynamics are being adopted. For example, there is a strong zoonotic skew to emerging infectious diseases (EIDs) in humans. Some of the most significant of these have wildlife reservoir hosts (e.g., HIV/AIDS). Still others cause outbreaks with high case fatality rates and have neither vaccine nor cure (e.g., Ebola virus, Nipah virus, SARS). In classical epidemiology, outbreaks of these diseases are traced back to their wildlife origin, and studies of human contact with wildlife undertaken. But what of the socio-ecological perspective? Take SARS, for example, a disease which has recently been identified as originating in *Rhinolophus* spp. bats and emerging via the wildlife trade in China (Li et al., 2005). Understanding the process by which SARS emerged may ultimately involve studying the expansion of wildlife trade in China to determine the threshold levels that allowed sufficient contact between bats, civets, and humans to cause pathogen spill-over. It may also involve studying the anthropogenic pressures on these bats: If bats are overcollected and populations thinned, how does this affect transmission dynamics within the wildlife host, pathogen prevalence and, therefore, risk to people? The challenge to scientists here is to break down disciplinary divides—between, for example, medicine and ecology; virology and wildlife biology, and sociology and epidemiology—to better understand the combined ecological and social dynamics at play. More importantly, we need an expansion of funding for these key challenges to public health. First steps toward this end are emerging in the form of multi-agency collaborative ventures such as the NSF/NIH Ecology of Infectious disease program in the US; Canada's Collaborative Health Research Projects program bridging their Health Research and Science and Engineering Research portfolios; Australia Research Council's ''Research Network'' funding to foster collaborative interaction; cross-cutting themes within agencies such as NSF Human and Social Dynamics in the USA.

Neither can the socio-ecological perspective be lost when studying wildlife diseases that do not affect humans. Amphibian chytridiomycosis is a fungal disease responsible for mass mortalities, population declines, and probably species extinctions in Australia, North, Central, and South America, Europe, and likely elsewhere. It doesn't affect humans, but its emergence and spread appear to be closely linked to anthropogenic environmental disturbance: climate change and the trade in amphibians for food, laboratory animals, and pets. To understand how this disease will respond to increasing trade and the complexities of climate change requires the involvement of multiple disciplines including social sciences to investigate the role of trade routes and practices, an ecological examination of disease dynamics, and a sophisticated analysis of global climate change. Such collaboration needs scientists who can understand the different ''languages'' used by different groups to describe often similar issues. It also requires open-mindedness and visionary thinking, while at the same time maintaining a reductionist focus to testing hypotheses. These strategies were at the core of the meeting convened in Hawaii in March 2005, from which this special issue is derived. As we mix ecological with sociological studies, geographic analyses with pathology investigations, the articles presented here help point the way as we address these challenges and reap the benefits envisioned by *EcoHealth*.

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Reference

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