

One Health Approach to Climate-Driven Emergence of Infectious Disease

Lauren E. Charles (laurencharles@pnnl.gov)
(Pacific Northwest National Laboratory, Richland, WA, USA)

Background/Objectives. Climate change is continuously re-shaping the world through changes in global temperature and upsurges in the number of severe weather events. These changes to the environment directly and indirectly increase the emergence of infectious diseases, 75% of which are zoonotic diseases. For example, warmer temperatures lead to new suitable habitats for disease vectors (e.g., mosquitos and tick) as well as accelerated growth and proliferation of pathogens in their current habitats (e.g., water or food products). Increases in severe weather events lead to the displacement and/or migration of humans, domestic animals, and wild animals due to destroyed habitats or loss of key food sources. In these events, there is often a rise in emerging infectious diseases due to increased contact between humans and animals along with increased susceptibility to disease due to environmental stressors. In each of these instances, climate change threatens the health of humans, animals, and plants through disturbances in their environment, which has been shown to result in the emergence of infectious diseases.

Approach/Activities. The One Health approach is built upon the fact that the health of an ecosystem is directly linked to the health of the humans, animals, plants, and surrounding environments that define it. Climate change is unequivocally disrupting this balance of ecosystem health, which is leading to an increase in emerging infectious diseases. To be able to predict, prevent, and mitigate the emergence of these infectious diseases, we need to have a deep understanding of the interconnectedness that bounds the health of humans, animals, plants, and their environments. By applying a One Health approach, the emergence of an infectious disease becomes, not just a single event of a human diagnosed with a disease, but a continuous lifecycle with points of both identification and mitigation across the full ecosystem structure.

PNNL is currently developing a medical intelligence tool, called MedINT, for situational awareness, investigation, and decision support against health threats. Applying a One Health mindset, the tool integrates climate, environmental, animal, and human health with sociopolitical data to develop a holistic view of the health threat landscape. This approach results in the ability to identify and predict potential emerging infectious diseases resulting from a range of indicators, such as climate change and wildlife disease, before they result in severe damage as well as define innovative mitigation measures that extend beyond human medical countermeasures.

Results/Lessons Learned. Climate change is inevitably perturbing ecosystem balance and health, which is resulting in the emergence of infectious diseases. By integrating elements of human, animal, and plant health with environmental changes, new strategic approaches towards more effective early warning and mitigation measures can be achieved. This One Health approach will result in stronger resiliency and preparedness against climate-driven emerging infectious diseases.