

Human disturbances of wild areas increase the likelihood of future pandemics

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As if rapidly accelerating climate change and environmental degradation were not reason enough to undertake major efforts to halt and reverse the ongoing destruction of natural ecosystems by uncontrolled human activities, another urgent incentive is now making itself painfully evident.

New research reinforces the already growing scientific understanding that human incursions into wild areas are increasing the likelihood that disease organisms endemic to animal populations in such areas will “cross over” to humans. The coronavirus that causes COVID-19, most likely originating in bats, appears to be only the latest example of this process.

The zoonotic (animal) origin of a significant number of human diseases has been known for decades (e.g., plague, rabies, Lyme disease, SARS, MERS, West Nile virus). According to a CDC report released last year, “Six out of every 10 infectious diseases in people [in the US] are zoonotic, which makes it crucial that the nation strengthen its capabilities to prevent and respond to these diseases using a One Health approach.

“One Health is an approach that recognizes the connection between people, animals, plants, and their shared environment and calls for experts in human, animal, and environmental health to work together to achieve the best health outcomes for all.” It is notable that a number of these are of recent origin. However, little has been done to address the problem because to do so would collide with powerful economic interests.

A just released study, published in the scientific journal *Nature* (Gibb et al., 5 August 2020), explores the dynamic between human activities and the spread of such diseases. It is based on an analysis of approximately 6,800 ecological communities, focusing specifically on 376 host (i.e., disease-carrying) species on six continents.

The analysis indicates a pernicious relationship between human incursion into wild areas (e.g., by deforestation or urban expansion) and the promotion of animal species that tend to be carriers of diseases likely to infect humans. Such activities tend to reduce biodiversity, creating conditions favorable to species that reproduce rapidly and are flexible in their diets and physical habitat requirements—mice, rats, and pigeons come to mind—at the expense of those with narrower, and thus less flexible, adaptations.

Specifically, the researchers found that species that tend to do well in environments disturbed by human activities, such as rodents, bats, and passerine birds, have a higher probability of carrying disease organisms which have a known propensity for transfer to humans. For those species, the richness (number of species) is 18 to 72 percent higher and the total abundance (size of population) 21 to 144 percent higher in such environments as compared to less disturbed settings.

As we have noted previously, environments with reduced biodiversity (i.e., a lower variety of species) tend to be more unstable than those with greater species diversity. This creates a positive feedback loop. Opportunistic species that thrive in unstable environments outcompete those that are less tolerant of ecological disruption. As human incursions increase, the imbalance is magnified, resulting in animal populations dominated by an abundance of a small number of highly successful species. When these animals harbor pathogens likely to spread to humans, which is what the recent study found, the potential for deadly outbreaks is created.

Deforestation and other human incursions into wild areas increase the ecological “edge” (i.e., length of the border) between developed and undeveloped areas. As a result, not only do people increasingly penetrate

deeper into the natural areas to collect plant and animal resources, but wild animals tend to wander into developed areas due to reductions in their habitats and food supplies, increasing exposures between the two. Stress on wild animal populations is also likely to increase their susceptibility to disease, creating an enlarged reservoir for pathogens that are available for transmission to humans.

The same research team that conducted the study published in *Nature* has found a correlation between socioeconomic factors, development trends and the presence of probable host species with Ebola outbreaks in the Democratic Republic of the Congo.

An important factor contributing to the virulence of zoonotic diseases has to do with the evolutionary history of the disease organisms and their hosts. SARS-CoV-2, the virus that causes COVID-19, and its presumed host, bats, have likely been evolving together for a very long time. The bat population has, through genetic adaptation (i.e., large numbers of deaths), evolved a tolerance to the virus, similar to that of humans to the common cold.

For humans, on the other hand, SARS-CoV-2 is a “novel” pathogen. There has been no co-evolution. Therefore, the interaction between the two is highly unbalanced. This is analogous to the devastation suffered by Native Americans to European diseases, to which they had no prior exposure. The same is true for future potential zoonotic disease, emphasizing the urgent need to address the mechanisms that promote such outbreaks.

In a recent essay in the journal *Science*, an interdisciplinary team urged that controlling deforestation and a reduction in the wildlife trade (sale and consumption of wild animals) would reduce the potential for similar pandemics in the future.

Increasing human incursions into wild areas are primarily driven by economic factors. These include both large scale industry, such as oil exploration, mining and agribusiness, and the movement of small agriculturalists driven by economic necessity. The common underlying force is capitalism—the rapacious quest for profit at any cost on the one hand and impoverishment of workers and peasants on the other. Until this system is abolished, more pandemics on the scale of COVID-19 or greater are inevitable.



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