Accelerating habitat loss behind Covid-19

The microbes, the animals and us

The novel coronavirus came out of a ‘wet market’ in Wuhan. We don’t know its animal origin, but we do know that if we protect wildlife habitats, animal microbes are less likely to cross over into humans.

by Sonia Shah

Repeated close contact makes it easier for animal microbes to cross over to humans
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It could have been a pangolin. Or a bat. Or, as one later-debunked theory suggested, a snake. The race is on to identify the animal source of Covid-19, the coronavirus that now holds several hundred million people in quarantines and *cordons sanitaires* in China and elsewhere. The animal origin of the virus is a critical mystery to solve. But speculation about which wild creature originally harboured the virus obscures a more fundamental source of our growing vulnerability to pandemics: the accelerating pace of habitat loss.

Since 1940, hundreds of microbial pathogens have emerged or re-emerged into territory where they’ve never been seen before. They include HIV, Ebola in West Africa, Zika in the Americas, and many novel coronaviruses. The majority, 60%, originate in the bodies of animals. Some come from pets and livestock. Most, more than two thirds, originate in wildlife.

That’s not the fault of wild animals. Although stories illustrated with pictures of wild animals as ‘the source’ of deadly outbreaks might suggest otherwise (1), wild animals are not especially infested with deadly pathogens poised to infect us. In fact, most of these microbes live harmlessly in animals’ bodies. The problem is that cutting down forests and expanding towns, cities and industrial activities creates pathways for animal microbes to adapt to the human body.

Wild species face extinction

Habitat destruction threatens vast numbers of wild species with extinction (2), including the medicinal plants and animals we’ve historically depended upon for our pharmacopeia. It also forces wild species that hang on to cram into smaller fragments of remaining habitat, increasing the likelihood that they’ll come into repeated, intimate contact with the human settlements expanding into their habitat. It’s this kind of repeated, intimate contact that allows the microbes that live in their bodies to cross over into ours, transforming benign animal microbes into deadly human pathogens.

Cutting down forests forces bats to roost in trees in backyards and farms, increasing the likelihood of a human taking a bite of fruit covered in bat saliva

Consider Ebola. According to a 2017 study, Ebola outbreaks, which have been linked to several species of bat, are more likely to occur in places in Central and West Africa that have experienced recent deforestation. Cutting down forests forces bats to roost in trees in backyards and farms, increasing the likelihood that a human might take a bite of fruit covered in bat saliva, or hunt and slaughter a bat, getting exposed to the microbes sheltering in its tissues. Such encounters allow a host of viruses carried harmlessly by bats, including Ebola, Nipah (notably in Malaysia and Bangladesh) and Marburg, to slip into human populations. When ‘spillover’ events happen frequently enough, animal microbes can adapt to our bodies and evolve into human pathogens.

Mosquito-borne disease outbreaks have similarly been linked to the felling of forests (3), although less because of the loss of habitat than its transformation. As tree leaf litter and roots disappear, water and sediment flow more readily along the barer forest floor, newly open to shafts of sunlight. Malaria-carrying mosquitoes breed in the sunlit puddles. A study in 12 countries found that mosquito species that carry human pathogens are twice as common in deforested areas as in intact forests.

Habitat destruction also scrambles the population sizes of different species in ways that can increase the likelihood that a pathogen will spread. West Nile virus, carried by migratory birds, is one example. Squeezed by habitat loss and other affronts, bird populations in North America have declined by more than 25% over the last 50 years (4). But species don’t decline at a uniform rate. Specialist species, like woodpeckers and rails, have been hit harder than generalists like robins and crows. That increases West Nile virus in bird flocks because, while woodpeckers are poor carriers of the virus, robins and crows are excellent carriers. It gets every more likely that a local mosquito will bite a West-Nile-virus infected bird and then a human (5).

Spread of Lyme disease

The expansion of suburbs into the US northeastern forest increases the risk of tick-borne disease by driving out creatures such as opossums, which help control tick populations, while improving conditions for species like white-footed mice and deer, which don’t. Tick-borne Lyme disease first emerged in the US in 1975; in the past 20 years, seven new tick-borne pathogens have followed (6).

It’s not only habitat destruction that increases the risk of disease emergence; it’s also what we’re replacing wild habitat with. To sate our carnivorous appetites, we’ve razed an area the size of Africa (7) to raise animals to eat. Some of these are delivered through the illicit wildlife trade or sold in ‘wet markets’, where wild species that would rarely if ever encounter each other in nature are caged adjacent, allowing microbes to jump species. This process begot the coronavirus that caused the 2002-03 SARS epidemic and possibly the novel coronavirus stalking us today.

Many more animals are reared in factory farms, where hundreds of thousands await slaughter, packed close, providing microbes with lush opportunities to turn into pathogens. Avian influenza viruses, which originate in the bodies of wild waterfowl, rampage in factory farms packed with captive chickens, mutating and becoming more virulent, a process so reliable it can be replicated in the laboratory. One strain called H5N1, which can affect humans, kills more than half of

those infected. Tens of millions of poultry had to be slaughtered to contain another strain, which reached North America in 2014 (8).
The avalanche of excreta produced by our livestock introduces yet more transference opportunities. Because animal waste is far more voluminous than croplands can possibly absorb as fertiliser, it is collected in many places in unlined cesspools called manure lagoons. Shiga-toxin producing *Escherichia coli,* which lives harmlessly inside the guts of over half of all cattle on American feedlots, lurks in that waste (9). In humans, it causes bloody diarrhoea and fever and can lead to acute kidney failure. Because cattle waste so often sloshes into food and water, 90,000 Americans are infected every year.
This process of transforming animal microbes into human pathogens is accelerated today, but it began with the Neolithic revolution, when humans first cleared wildlife habitat to make way for crops and domesticated wild animals. The 'deadly gifts' from our 'animal friends', as Jared Diamond put it, include measles and tuberculosis from cows, pertussis(whooping cough)from pigs, and influenza from ducks.
The process continued during the era of colonial expansion. Belgian colonists in Congo built the railways and cities that allowed a lentivirus in local macaques to adapt to the human body; British colonists in Bangladesh cut down the Sundarbans wetlands for rice farms, exposing humans to bacteria from the wetlands' brackish waters. The pandemics those intrusions created plague us to this day. The macaques' lentivirus evolved into HIV. The bacteria of the Sundarbans, now known as cholera, have caused seven pandemics so far, the latest in Haiti, just a few hundred miles off the coast of Florida.

What we can do

The good news is that, because we are not passive victims of animal microbes invading our bodies but fully empowered agents who turn harmless microbes into pandemic pathogens, there's much we can do to reduce the risk that these microbes emerge. We can protect wildlife habitats, so that animal microbes don't cross over, an approach championed by the One Health movement (10).

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We can actively surveil places where animal microbes are most likely to transform, hunting for ones that show signs of adapting to the human body — and squelching them before they cause epidemics. For 10 years, scientists funded by the USAID's Predict programme did that, pinpointing more than 900 novel viruses that emerged from changed habitats around the world, including new strains of SARS-like coronaviruses (11).
Today, the shadow of the next pandemic looms, and not just because of Covid-19. In the US, Donald Trump's administration has liberated extractive industries and industrial development from environmental and other regulatory constraints, which will accelerate habitat destruction. In October 2019 the administration ended the Predict programme, reducing the ability to pinpoint the next spillover microbe and contain it when it starts to spread. Officials reportedly felt 'uncomfortable funding cutting-edge science'. In early February, the US proposed cutting funds to the World Health Organisation too, by 53%.
The epidemiologist Larry Brilliant once said that 'outbreaks are inevitable, but pandemics are optional.' But pandemics only remain optional if we have the will to disrupt our politics as readily as we disrupt nature and wildlife. In the end, there is no real mystery about the animal source of pandemics. It's not some spiky-scaled pangolin or furry flying bat. It's populations of warm-blooded primates: the true animal source is us.
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