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COVID-19: One world, one health

EDITORIAL

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Despite scientists' warnings, the global community failed to prevent the COVID-19 pandemic.

It was perhaps by chance that the new coronavirus arose when it did, but it was not by chance that it did so in bats. Nor was it a coincidence that it was transmitted to humans and spread worldwide. Researchers predicted that a new coronavirus could be transmissible from bats to humans in China (1). Despite this knowledge, the outbreak was not prevented.

Zoonotic diseases are infectious diseases that can be transmitted from animals to humans, either directly or indirectly via vectors or food. Zoonotic diseases can also be transmitted from humans to animals, as was the case for influenza A(H1 N1)pdm09 transmitted to pigs in Norway (2). In times gone by, zoonotic diseases were a major public health burden in Norway. That was when we drank unpasteurised milk, lived closer to animals, lacked knowledge of hygiene and had poorer control of animal health. Whereas traditional zoonotic diseases are now under control in Norway, we deal with an increased frequency of new, imported pathogens of zoonotic origin. Pandemics are by no means new, but the rate at which they spread is novel.

Together, humans, animals and the environment share a reservoir of pathogens, and the emergence of new diseases is driven by complex interactions among the three. Changes in this interplay may drive genetic mutations in pathogenic microorganisms, and new variants with increased virulence, new host ranges and new routes of infection may arise.

The animal kingdom is the source of some 60–70 % of emerging/re-emerging infectious diseases, with 75 % originating from wild animals (3). Bats, the second most abundant order of mammals on Earth, are repeatedly the source of zoonotic and pandemic viruses such as Ebola, SARS, MERS, Nipah, Hendra virus and rabies (4). With the exception of rabies, these viruses do not cause disease in bats.

Bats play an important role in healthy ecosystems, but can act as 'witches' cauldrons' and are a reservoir for many virus types and variants. This is due to immunological and physiological factors, and to population size and high density in some bat colonies (5).

> ***«The concept 'one health' acknowledges the mutual interdependence of human, animal and environmental health.»***

Increased contact between humans and wild animals increases the probability of interspecies transmission of pathogens. Movement of animal populations and changes in animal density can alter the interface between humans and wild animals. Anthropogenic impacts such as deforestation, development of agricultural land, intensification of domestic animal production, urbanisation and climate change contribute to the reduction in size and diversity of wild animal habitats, and in the extreme case can pave the way for new pandemics. In Malaysia, bat colonies migrated as a consequence of deforestation. The subsequent increased proximity of bats and humans may have led to the Nipah virus later being transmitted from bats to pigs and humans (6).

Animal markets, trade in wild animals and consumption of meat from wild animals such as bats and pangolins entails a risk of disease transmission between wild fauna and humans. Changing this type of risk behaviour requires long-term advocacy.

The concept of "one health" acknowledges the mutual interdependence of human, animal and environmental health, and promotes an interdisciplinary approach. We must be able to foresee the consequences of the fact that we humans are multiplying, living more closely together and travelling more, and the consequences of intensified animal production and increased deforestation. In addition, we should monitor the pathogens that circulate in wild animals and foresee how changed interactions between humans, animals and the environment can affect the exchange of microorganisms between animals and humans. Sociological factors that drive human behaviour must also form part of the equation.

After many years of improved public health in many countries, the distance between human and veterinary medicine has unfortunately widened. The interaction of these two disciplines, formerly closely interwoven, has now

become more detached. Norway's first veterinary director, Ole Olsen Malm, was a medical doctor and a veterinary surgeon, and zoonotic diseases were high on his agenda. By linking the two disciplines, he laid a solid foundation for the good public health and animal health existing today in Norway.

'One health' unites the sciences devoted to studies of human disease, non-human disease and ecological problems. Interdisciplinary research, surveillance and sharing of information should form the foundation for practical interventions locally, nationally and internationally. It should involve decision-makers, doctors, vets, ecologists and other natural and social scientists. If the global society is to succeed in preventing future pandemics, interdisciplinary and international research and knowledge generation are crucial. It is in Norway's interests to contribute to this.

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