ROLE OF VETERINARY MEDICINE IN THE PREDICTION AND PREVENTION OF THE NEXT GLOBAL PANDEMIC

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Accumulating evidence indicates that the spillover of viral pathogens from natural reservoirs into the human population may initiate a new global pandemic (Kache et al., 2021; Meadows et al., 2023; Plowright et al., 2024; Sparrer et al., 2023; Vora et al., 2022; Vora et al., 2023; Vora et al., 2024; Vora et al., 2021). Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which caused the COVID-19 pandemic (Ralph et al., 2020), is an excellent example of the spillover of zoonotic betacoronavirus from wild animals into humans (Sparrer et al., 2023; Tugizov, 2021; Tugizov S, 2003a, b, c, 2020).

Approximately 75% of all emerging human infectious diseases have a zoonotic origin. Many wild animals, including bats, rodents, primates, raccoons, minks, skunks, and foxes can serve as hosts for zoonotic viruses that can spill over into humans (Kache et al., 2021; Plowright et al., 2024; Vora et al., 2022; Vora et al., 2023; Vora et al., 2024; Vora et al., 2021). The following factors may significantly increase animal-to-human viral spillover: climate change, deforestation, animal migration, globalization, urbanization, and human trafficking (Kache et al., 2021; Plowright et al., 2024; Vora et al., 2022; Vora et al., 2023; Vora et al., 2024; Vora et al., 2021). Agricultural expansion and farm concentration in forest and rural areas may facilitate virus transmission from wild animals into agricultural animals/livestock, including beef, cattle, chickens, turkey, sheep, goats, and others (Grange et al., 2021). Industrial pollution and chemical and radiational contamination may increase the instability of viral genomes due to mutation and recombination. All of these factors may increase the frequency of viral transmission from wild animals to domestic animals, which may facilitate the spillover of the virus to humans (Golchin et al., 2024). Since the human population does not have herd immunity against new viral pathogens, potentially each new zoonotic spillover may cause a new pandemic (Golchin et al., 2024).

Climate change by 2070 may significantly increase cross-species viral transmission risk. Current research suggests that approximately 15 000 wild mammals may migrate due to climate warming and contribute to animal-to-human spillover of zoonotic viruses (Albery et al., 2021; Carlson et al., 2022). This may occur most often in species-rich ecosystems at high elevations, particularly areas of Africa and Asia, and in areas that are densely populated by humans, including Africa's Sahel region, India and Indonesia (Dong et al., 2024; Grimwood et al., 2024; Holmes et al., 2024; Hou et al., 2024; Petrone et al., 2024; Petrone et al., 2023; Tian et al., 2024; Waller et al., 2024). Assuming that the planet warms by no more than 2 °C above pre-industrial temperatures this century, the number of viral transmissions

between species may double by 2070, creating virus-transmission hotspots. Over the next 50 years, cross-species virus spread may happen over 4,000 times among mammals alone, i.e., this may lead to multiple pandemics in the human population (Albery et al., 2021; Carlson et al., 2022).

In summary, for the prediction and prevention of potential new pandemics, each country/region should establish a collaborative scientific project between veterinary medicine virologists, zoologists, and plant/forest biologists for the identification of biodiversity-rich areas. Subsequently, these areas should be investigated by (i) collecting samples from wild and domestic animals; (ii) detecting zoonotic pathogens; (iii) monitoring the migration of zoonotic animals (bats, rodents, etc); (iv) generating regional maps for the migration of zoonotic animals; and (v) establishing diagnostic and prophylactic reagents/system for prevention and treatment of zoonotic disease.

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