

Is COVID-19 the first pandemic that evolves into a panzootic?

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Summary

SARS-CoV-2 is a zoonotic virus that has achieved community spread among humans and become a pandemic. Transmission from humans to dogs, domestic cats, tigers, and lions has occurred. Pigs, cats, ferrets, and primates have been identified as good candidates for susceptibility to SARS-CoV-2. The potential implications indicate the need for One Health surveillance, intervention, and management strategies to mitigate the effects on animal populations and prevent a second preparedness failure during this health emergency.

SARS-CoV-2 is the most recent example of an emerging zoonotic infectious virus that has converted 'pandemic potential' to reality. Whilst the origin of this virus has not yet been confirmed, the most likely candidate is the bat, the pangolin or a combination of both (Andersen *et al.* 2020). Having successfully crossed the species barrier to the human population and achieved intra and inter-community spread, the world now fights to mitigate the human health consequences and survive the socio-economic ramifications. But is this pandemic only a pandemic or can SARS-CoV-2 extend its spread to that of a panzootic? Are we risking multiple spillover episodes in animal populations which may result in SARS-CoV-2 becoming endemic in multiple animal species and populations?

Following the extensive and well documented nature of its spread in humans, as of April 12th 2020, two cases of SARS-CoV-2 transmission to dogs, 2 cases of transmission to domestic cats, 4 cases of transmission to tigers, and 3 cases of transmission to lions have been reported (Government of the Hong Kong 2020 a, b, c, Chini 2020, WCS Newsroom 2020). Although the dogs did not develop clinical signs, one domestic cat presented with vomiting, diarrhea, and breathing difficulties, and the tigers and lions presented with dry coughs and wheezing. In addition, preliminary studies have demonstrated cat to cat spread of SARS-CoV-2 and the production of specific neutralizing antibodies against SARS-CoV-2 in this species (Shi *et al.* 2020, Zhang *et al.* 2020). These observations may be statistical outliers (perhaps

a consequence of close contact of domesticated mammals with very high infectious virus loads from the human population), or as the tipping point from which to acquire the transmission characteristics necessary to achieve intra and inter community spread in the new target species.

Proactive consideration of the potential implications of a 'reverse' zoonosis is appropriate to create management strategies that mitigate the potential for adverse effects on the respective animal populations whilst also seeking to control any future recirculation of adapted animal viruses back into humans. Pigs, cats, ferrets and non-human primates have similar or identical SARS cellular receptors to those found in humans (Wan *et al.* 2020). This potentially provides SARS-CoV-2 with a related cellular entrance mechanism to infect a varied series of hosts without requiring further significant genetic changes. Genetic changes randomly acquired when the virus replicates could lead to it developing the ability to become endemic in some animal populations, including domestic pets.

The SARS-CoV-2 pandemic and subsequent panzootic potential highlight the need for a One Health approach. It is important that harmonized guidelines for surveillance and intervention in wild, captive, and companion animals are developed to facilitate a better understanding of viral spread in novel host populations. The proposed interventions should include quarantine and care packages for infected animals. Whilst potentially at lower risk, food

animals may still be considered in future guidelines as the cellular receptor mechanisms mentioned previously render the target species jump possible even though the risk of close contact with humans is lessened.

With the current information available it is not possible to predict if SARS-CoV-2 will cause a panzootic. However, not being prepared for such an

event would represent a second major preparedness failure during the same public health emergency.

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