

'We should be vaccinating domestic and wild animal species against Covid-19'

Giovanni Di Guardo argues that there is evidence of zoonotic spread of SARS-CoV-2 from wild and domestic animal species to people, and that to limit the development of new variants, vaccines should be developed for, and vaccination programmes include, species capable of becoming infected with and transmitting the virus.

SINCE the start of the Covid-19 pandemic, we have seen a progressively expanding number of mammalian species capable of contracting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), either naturally and/or experimentally.¹ This is also attributed to the potential development of new, highly contagious and/or pathogenic variants of concern (VOCs) and variants of interest (VOIs) in vivo.

Over the past two years, we have already seen a huge number of genetic mutations of SARS-CoV-2, leading to several VOCs and VOIs worldwide (such as the 'alpha', 'beta', 'delta' and the highly contagious and evasive 'omicron' variants to name a few).

For this reason, I believe that SARS-CoV-2 vaccination programmes should include animals, particularly those that are intensely bred (eg, mink) and wild species with marked social ecology that have been shown to enhance intraspecies transmission of SARS-CoV-2 (eg, white-tailed deer).²

Indeed, not only have white-tailed deer (*Odocoileus virginianus*) been found to be susceptible to experimental SARS-CoV-2 infection, based upon the high degree of homology of their angiotensin-converting enzyme (ACE-2) viral receptor with the receptor in people,³ but they have also been found to have a high prevalence of anti-SARS-CoV-2 blood serum antibodies, indicating natural infection.² Furthermore, the omicron variant has recently been detected in deer from New York State and Ohio,⁴

while a suspect case of deer-to-human zoonotic transmission of a highly divergent SARS-CoV-2 strain has been reported in Canada.⁵

Most VOCs and VOIs have developed in people, but in spring/summer 2020, a variant – 'cluster 5' – emerged from intensely bred mink from The Netherlands and Denmark. Following transmission from infected people (ie, viral spillover), SARS-CoV-2 was shown to evolve into the cluster 5 VOC inside the body of mink, which subsequently returned the mutated virus to people (ie, viral spillback).¹ This led to 17 million mink being killed in Denmark due to the public health hazard they posed.

In terms of transmission between domestic animals and people, so far the majority of cases seem to be transmitted from people to animals; for example, cases of infection caused by the alpha variant have been described in two cats and in one dog from France that had suspect myocarditis, whose owners had shown Covid-19-associated respiratory symptoms three to six weeks beforehand.⁶ However, in Hong Kong it has been claimed that pet hamsters were able to carry and then transmit the highly pathogenic delta variant to pet shop workers and visitors.⁷

This pandemic has taught us that human, animal and environmental health are mutually and inextricably linked to each other. With these cases of potential zoonotic transmission of SARS-CoV-2 in mind, I believe that vaccination of animals is paramount to limit the development of VOCs and VOIs capable of facilitating SARS-CoV-2 intra- and interspecies spread. Such a programme would require a robust One Health approach; it should prioritise an 'ad hoc' vaccination campaign for those species with a higher sensitivity

to SARS-CoV-2 (based upon a high degree of homology of their ACE-2 receptor with the human one, as in the case of white-tailed deer). Even though the transmission path from domestic animals to people appears to be a rare event, the programme should then target susceptible species that either live in close proximity to people (eg, cats and dogs), or that are intensely bred (eg, mink). Special consideration should also be given to wild mammalian species threatened by extinction that may also be susceptible to SARS-CoV-2 (eg, lions, tigers, snow leopards, gorillas).⁸

Finally, in order to be better prepared for future pandemics, we urgently need to adopt a scientific, evidence-based, holistic, multidisciplinary and One Health-based approach. In this respect, it is very surprising, if not almost unbelievable, that two years on from its inception, the Italian Covid-19 Scientific Committee still has not appointed any veterinarians as members of the committee – I believe this needs to be urgently addressed for all scientific committees around the world if we are to work more closely together to deal with future disease outbreaks. ●

References

- 1 Di Guardo, G. Future trajectories of SARS-CoV-2 in animals. *Vet Rec* 2021; 188, 475
- 2 Di Guardo, G. White-tailed deer, another SARS-CoV-2-susceptible species. *BMJ* 2021, 374: doi: <https://doi.org/10.1136/bmj.n1734>
- 3 Palmer MV, Martins M, Falkenberg S, et al. Susceptibility of white-tailed deer (*Odocoileus virginianus*) to SARS-CoV-2. *J Virol* 2021;95: doi: 10.1128/JVI.00083-21
- 4 Wetzel C. Discovery of omicron in New York deer raises concern over possible new variants. <https://bit.ly/36FVcf2>. (accessed 22 March 2022)
- 5 Pickering B, Lung O, Maguire F, et al. Highly divergent white-tailed deer SARS-CoV-2 with potential deer-to-human transmission. *BioRxiv* preprint 2022. doi: <https://doi.org/10.1101/2022.02.22.481551>.
- 6 Ferasin L, Fritz M, Ferasin H, et al. Infection with SARS-CoV-2 variant B.1.1.7 detected in a group of dogs and cats with suspected myocarditis. *Vet Rec* 2021;189: 10.1002/vetr.944
- 7 Mesa N. Pet hamsters spread SARS-CoV-2 in Hong Kong. <https://bit.ly/3D2BkPy>. (accessed 22 March 2022)
- 8 Delahay RJ, de la Fuente J, Smith GC, et al. Assessing the risks of SARS-CoV-2 in wildlife. *One Health Outlook* 2021;3: doi: 10.1186/s42522-021-00039-6

Giovanni Di Guardo

Giovanni Di Guardo is a retired professor of general pathology and veterinary pathophysiology at the veterinary medical faculty of the University of Teramo, Italy.



This pandemic has taught us that human, animal and environmental health are mutually and inextricably linked to each other