

Are dogs the source of SARS-CoV-2, the cause of COVID-19 in people? Advice for pet owners and members of the public

This document is a summary created from a short report produced by Professor Alan Radford, on behalf of the SAVSNET team at University of Liverpool. Information was last updated on 15th of April 2020.

A recent study published in *Molecular Biology and Evolution* by Xia entitled "Extreme genomic CpG deficiency in SARS-CoV-2 and evasion of host antiviral defence" is being interpreted by some as providing evidence that dogs, in particular strays, may have been the original source of SARS-CoV-2, the cause of COVID-19 in people.

However, this does not seem to be what the study itself is suggesting. The study identifies genetic patterns which may allow SARS-CoV-2 to evade the host immune response and may explain its aggressiveness in people. A similar genetic pattern was observed in a coronavirus of dogs (canine enteric coronavirus - CECoV), which is very distantly related to SARS-CoV-2.

Both of these viruses can replicate within the intestines of their host, CECoV in dogs and SARS-CoV-2 in humans, and this led the author to suggest that the progenitor of SARS-CoV-2 may similarly have "...infected the intestine of a mammalian species...". This is the main finding. The dog is mentioned just as an example, and any other mammalian species could similarly have been the origin.

Unfortunately however, in the next sentence in the paper, the author only mentions dogs (canid) ..." strong selection against CpG in the viral RNA genome in canid intestine resulted in rapid evolution of the virus" when it seems that this could have occurred in any mammal. This seems not to represent the author's own thoughts and has perhaps been used out of context to suggest the dog as the likely origin of SARS-CoV-2.

To date, the origins of SARS-CoV-2 remain uncertain. Whilst bats host the most related virus, this is still different enough from SARS-CoV-2 that another animal in which the virus evolved is still being looked for. A range of veterinary species, including the dog, also have their own coronaviruses, but these are not closely related to SARS-CoV-2. Whilst experiments do show some animals can be infected with SARS-CoV-2 (notably cats, ferrets and to a lesser extent dogs), there is no evidence for widespread circulation of SARS-CoV-2 in any species other than humans. Most people that unfortunately get SARS-CoV-2 will get it from people.

See also our advice for owners documents for advice on handling pets, on the owners page <https://www.liverpool.ac.uk/sath/owners/>