

## **Note 7 – We share those virus families with many animals (wild and domestic) – Is a lockdown useful knowing that the virus will remain around?**

Some viruses originate in animals, in which they are not pathogenic (this means they do not make the animals sick). These animals serve as natural evolutionary *reservoirs*. That is a place where the virus can stay... *forever*. For some viruses the animals themselves can be sick, the avian and swine flus being examples. Occasionally, viruses mutate and transmission between species can occur and these viruses become pathogenic. Animals can transmit diseases to humans, crossing the inter-human barrier (this is called *zoonosis*). And then human can also give those viruses back to animals... and so on. This back and forth of viruses between species has been going on even before the rise of humans. Strange times when the front pages of some newspapers reported **ONE** dog infected in Honk Kong, **ONE** cat sick in Brussels, some 2 tigers sick in a zoo... as if all of this would be surprising (it is not).

In the case of several coronaviruses, bats and rodents have served as reservoirs. Before passing the inter human barrier, they have infected *intermediate* hosts, such as bovines, dromedaries (in the case of MERS-CoV), palm civets (in the case of SARS-CoV1) and probably pangolins in the case of the new SARS-CoV2 (Ye *et al.*, 2020; Fehr and Perlman, 2016), which often infect humans on wet markets.

Some studies found that SARS-CoV2 replicates poorly in dogs, pigs, chickens and ducks (Shi *et al.*, *Science* 2020). This does not mean that the virus cannot live inside those animals - it does multiply itself, but does not spread itself easily from one animal to another animal. Some dogs sero-converted – this means that although they were not sick, they hosted the virus and developed antibodies against it. The virus ‘survives’ waiting for better hosts. It was also shown that ferrets and cats were permissive to infection (Shi *et al.*, *Science* 2020, and Martina *et al.* *Nature* 2003) – thus they can be sick. Also it was found experimentally that cats are susceptible to airborne infections.

From 2003 on, genetics indicated that the SARS family of coronaviruses originated from a merging of virus from birds and mammals. Some components of the virus were identical to those found in cats, cows, and mice. Some others were identical to those found in chicken and ducks. And some were obviously mixed – this was the case of the main viral protein (linked to the S gene and through which the virus BINDS to its target cells) (see Straviniades & Guttman, *J. Virol* 2003). While such “mosaic” combination of genomes is known, this ‘merging’ hypothesis was not accepted in 2003 - however this showed that if we were to look into birds, we would likely find some of those viruses. This is exactly what was done in 2012 (see Woo *et al.*, 2012), since then it became also known that bats and birds contain various families of coronaviruses. While they are not yet ALL recognized as causing diseases to humans, no sane scientist would bet that it would NOT happen given the mutation rates.

Shall we ask birds to not fly to some countries? SARS like all germs know of no borders!

### References :

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