

Writing Assignment #3

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A Summary of: Comparison of Severe Acute Respiratory Syndrome Coronavirus 2 Spike Protein Binding to ACE2 Receptors from Human, Pets, Farm Animals, and Putative Intermediate Hosts

With the death toll now surpassing 215,000 Americans deceased due to COVID-19, it is ever more important to identify all the potential vectors for the virus to prepare for if not prevent any subsequent waves of new cases. It is believed that bats and palm civets (tree-dwelling mammals resembling a cross between a racoon and a ferret) from Wuhan province in China are the immediate reservoirs for this virus. Although this is not to claim in any way that COVID-19 is the “China Virus.” In epidemiology, a reservoir is referring to the habitat in which the infectious agent normally lives, grows, and spreads. This may or not be the origin from which the agent transfers to a host, in other words Patient Zero. In this case humans are the reservoir, but not the immediate reservoir or origin. This article dives into the comparison of infection rates between humans, pets, farm animals, and other animals reported to be intermediate hosts. Simplistically, they accomplished this by studying how the SARS CoV-2 spike protein attaches to the ACE2 receptors from the aforementioned groups. In order for the coronavirus to infect any cell it first has to attach to it. The angiotensin-converting enzyme 2 (or ACE2) which due to its cell-specific location in the body is thought to play to an important role in regulating fertility and renal and cardiovascular function as well as acting as a receptor for the coronavirus’ spike protein. This presents a problem, since ACE2 plays a vital role in our body we can’t simply remove it and the chance of COVID-19 infecting a cell without major consequences. However, the research team behind this article found that it was not just ACE2 that allowed for transmission. Amino acid differences played an even more important role in showing which animals were susceptible to the coronavirus. Nearly all mammalian species have mutations of the amino acids inside their ACE2 proteins which make them susceptible to COVID-19. Cats and ferrets are the most susceptible (disregarding humans) because of a higher number of mutations in their ACE2 proteins. On the other hand, dogs and pigs were discovered to be the exceptions to the rule. Pigs were not able to be infected by it, despite their ACE2 proteins ability to function as a receptor for SARS CoV-2. Dogs were able to contract the virus but unable to pass it along to other animals it has close contact with. More studies need to be conducted to be certain of the cause, but it is likely that the high number of mRNA in the tissues where ACE2 is expressed, and/or the low levels of ACE2 has the most to do with why. More studies need to be completed to thoroughly understand how animals contract the virus, or in the case of dogs and pigs if they can contract the virus. In order to defeat this virus, we have to think ahead. That means understanding everything about how and which animals (including humans) get have the potential to transmit or catch the virus. This way we can mitigate the risk of this virus coming back later and even stronger, a scenario many health care systems across the world may not be able to surpass.

References:

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