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Zoonotic realism, computational cognitive science and pandemic prevention

Commentary on [Wiebers & Feigin](#) on *Covid Crisis*

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Abstract: Using animals in food and food production systems is one of many drivers of novel zoonoses. Moving toward less dependence on animal proteins is a possible avenue for reducing pandemic risk, but we think that Wiebers & Feigin’s proposed change to food policy (phasing out animal meat production) is unrealistic in its political achievability and its current capacity to feed the world in a cost-effective and sustainable manner. We suggest that improvements in communication strategies, precipitated by developments in computational cognitive neuroscience, can lead the way to a safer future and are feasible now.

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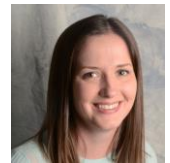


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1. Beyond Meat Zoonoses. COVID-19 has changed many aspects of our lives. Academics now write from home instead of university offices. Some changes reduce COVID-19 risk while increasing other zoonotic risks. Outside my (i.e., TD’s) home office window are bird feeders. Feeding birds is a tradition learned from my grandmother in the Eastern US. It comes with risks. Birds carry risky zoonoses, including salmonella, trichomoniasis, and coccidiosis. Here on the American Frontier, one can catch even scarier infections from mammals scavenging from those feeders. Rodents may carry hantavirus, a respiratory disease deadlier than COVID-19 and transmissible via aerosolized bodily fluids (Mantooth, et al. 2001). Another, *Yersinia Pestis*, is endemic in the fleas carried by frontier creatures like prairie dogs and foxes (McGee, et al., 2006). Now curable, *Yersinia Pestis* decimated cities worldwide for millennia as the disease Europeans called Black Death. Perhaps governments

could ban feeding birds, but it is hard to imagine that happening democratically, given the value the tradition has to many. The risks can be more effectively mitigated through communications about protective strategies -- wearing protective gear, reducing mammalian access, and handwashing, and by seeking cures for present and future zoonoses as we have for zoonoses of the past.

Zoonotic disease epidemics that have arisen in the cracks between those mentioned in the target article (HIV, Ebola, COVID-19) paint a similar picture. Nipah virus is an emerging infectious encephalitis associated with recent outbreaks in Southern Asia. As with COVID-19 and Ebola, bats are implicated, but instead of consumption of bats, human Nipah infections often originate from urine or salivary contamination of palm sap used for beverages (Luby, et al., 2006). Bats play a significant role in global ecosystems and agriculture (Food and Agriculture Organization of the United Nations, 2011). They are primary pollinators of some crops (like durians; Bumrungsri, et al., 2009); they control crop pests and mitigate human and livestock zoonoses like West Nile, Zika virus, and Malaria. Any human-bat interaction could give rise to the next global pandemic, but we mitigate such risks through effective communication instead of fear and retaliation against bats (Davis et al., 2013; MacFarlane & Rocha, 2020).

2. Consensus and Collateral Damage. The use of animal protein for food is a significant driver of zoonoses (Wiebers & Feigin, 2020; W&F). Modern agriculture can theoretically precipitate novel infectious diseases, as does the use of wild game meat. However, like other drivers, it is difficult to see a democratic path forward to full bans or even immediate large scale changes in consumption practices. Here on the Great Plains, the so-called ‘factory farms’ are predominantly family ranches. Hunting in rural areas is a tradition that provides high quality protein and – when carried out with stewardship (Holsman, 2000; Waller et al., 2018) – can control wild animal populations humanely. Meat preparation and consumption provides a cultural link to the past for people of many backgrounds. The “wet markets” of Asia and Africa, although often xenophobically described in popular media as hotbeds of disease risk, are often simply the local farmers’ markets where produce and meats are sold, and cultural knowledge is transmitted. Robbins (2020) warns against the ‘easy solution’ of simply shutting down consumption of animal proteins. Indeed, it is easier in theory than it would be in practice. Worldwide demand for meat is ever-increasing, and laboratory grown meat (Anomaly, 2020) is vastly more energy-intensive and costly than ranching at this stage (Tomiyama, et al., 2020). Ending meat consumption globally would exacerbate existing nutritional disparities, both within lower socioeconomic strata of industrialized nations and within developing nations where nutritional deficiencies due to lack of high-quality protein and dietary iron still abound (Allen, 2003).

3. Technology Neophobia. Technological advancements in food production and animal welfare practices are the One Health solutions (Fox, 2020) we need for a safer future--if people will have them. People are notoriously neophobic when it comes to food technologies, including the plant-based and cultured meat alternatives W&F’s target article advocates (He, et al., 2020). Genetically modified crops are decades old and offer substantial benefits to food security and sustainability but still face resistance from consumers (Lusk, et al., 2014). The organic ideal favored by some commentaries is neither efficient enough to provide food for the world’s population nor does it provide a safer meat-consumption model (Garcia & Teixeira, 2017). Small farms with few animals increase the number of unique human-animal contacts in unique environments, which is precisely how low-probability events like novel zoonotic infections arise.

To reduce zoonosis risk, we must support technologies that increase food production whilst reducing the total number of animals used. Examples of misinformation about technologies abound, such as implicating hormone use with antibiotic resistance (Cao, 2020). Hormones are not antibiotics and play no role in antibiotic resistance or zoonotic disease transmission. They do *safely* increase yields, lowering the number of animals and natural resources needed per animal to produce the same amount of meat (Avery & Avery, 2007). Computational cognitive science can help build a

better understanding of the factors that drive human food neophobia (Davis et al., 2020), paving the way toward better acceptance of vaccines, GMOs, hormone replacement, and other strategies to promote One Health and sustainability. Strategies gleaned from this research may someday convince consumers to eat cultured meat.

4. Effective Communication Through Cognitive Science. There are a wide range of zoonoses and no single way to prevent the next pandemic. Preventing outbreaks depends on better communication. Our team has examined ways that computational cognitive science can be used to craft communications about zoonoses and improve outcomes (Davis et al., 2013; 2017; Davis et al., in press). These strategies harness the power of human generalization (inductive reasoning) by tailoring communications either to increasing peoples' wariness of a wide range of species (Tapp et al., 2018) or to limiting their perceptions of risk to a few species or specific drivers of emerging zoonoses. Such principles have shown success at increasing people's intention to avoid wild game meat and other risky human-animal interactions for a variety of zoonotic diseases, including Ebola.

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