A call for One Health Education

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Abstract

There is an urgent need to integrate One Health education into medical school curricula. One Health is the concept that human health is intrinsically connected to animal health and ecosystem health. The current COVID-19 pandemic highlights the need for physicians and medical students to understand how deforestation, climate change and the loss of biodiversity impact human health and often perpetuate racial inequities. We describe a One Health elective that we developed at Harvard Medical School where students rotate through the Franklin Park Zoo while studying a curriculum focused on disease ecology, climate change and the importance of biodiversity which is taught by the zoo’s head veterinarian. Living through the SARS-CoV-2 pandemic should be a call for our heightened understanding that our health is intimately linked to the health of our planet and its other living creatures in a shared ecosystem. Only through education and training will our future physicians begin to understand these connections and become advocates for climate protections and the preservation of biodiversity.

Keywords: One Health; planetary health; COVID-19; animal health; climate change

One Health

When I (M.M.) walked into Ms. P’s room on the COVID-19 unit, I was struck that the air in the room was thick, not with SARS-CoV-2, but with despair. Ms. P’s labored breathing was the same as yesterday, but it was the look on her face that had changed. When I asked how she was doing she relayed that her sister, a registered nurse, had just died of COVID-19 in the ICU of another hospital just blocks away. Her older sister had passed away five days ago at a nursing home. The cause of death was unknown. While Ms. P adjusted the nasal cannula of oxygen in her nose and wiped tears from her cheek I tried to offer my support behind a thick yellow gown, a green N95 mask and a face shield. I was equipped in that moment to prevent myself from acquiring SARS-CoV-2. But I knew that we had failed to prevent this illness. I told her that we would take good care of her, but in reality, we as a society, had not taken care of her, nor her family for decades. She and her family, who had faced poverty and racism for generations, were being decimated by this disease. Her suffering was the end result of what happens when we don’t take care of our planet, as it is those most vulnerable who will suffer greatest.
Infectious diseases are not manufactured in test tubes, as some speculate, but instead result from the interactions between humans, animals and the environment. When we alter the environment to accommodate human growth and development, we disrupt natural animal habitats, causing novel interactions between humans, wildlife, and domestic animals. This leads to emergent human diseases. The exact origin of SARS-CoV-2, the virus that causes COVID-19, has yet to be determined. It is most closely related to coronaviruses from horseshoe bats and has some similarity to pangolin viruses (Lau et al., 2020). Some, but not all of the first cases of SARS-CoV-2 originated from the Wuhan wet market, where bats, pangolins and other wildlife were being sold for consumption. Whatever the exact proximal non-human origin, this virus occurred because of our increasing interactions with animals at the human-wildlife interface.

Pre-existing social and environmental inequities in our society put our most disadvantaged patients at risk of acquiring many novel infectious diseases, including COVID-19. Early data has shown that patients who have been exposed to high levels of air pollution are more likely to die from COVID-19 (Wu et al., 2020). Like Ms. P, those who are most at risk of acquiring the virus often live in impovised, overcrowded urban neighborhoods which have the highest levels of air pollution coupled with the least amount of greenspace and biodiversity (Hajat, Hsia and O'Neill, 2015).

Physicians have and will continue to serve as advocates for issues that impact the health of their patients. Physicians are not, however, typically taught about how deforestation, climate change and loss of biodiversity are making their patients sick. These are seen as abstract concepts that are far removed from the patients in their exam rooms. Living through the SARS-CoV-2 pandemic should be a call for our heightened understanding that our health is intimately linked to the health of our planet and its other living creatures in a shared ecosystem. If we are to fully understand our current diseases and work to prevent future ones, we as physicians must embrace a One Health approach. One Health is the concept that human health is intrinsically connected to animal health and ecosystem health (CDC, 2020). It is the framework that strives to integrate different disciplines to elevate the health of all beings on the planet.

Here at Harvard Medical School we have partnered with the Franklin Park Zoo to offer a One Health elective for fourth-year medical students (Evrony, 2019). Eighteen students have completed this one-month elective over the past five years. Students accompany the zoo's veterinarians during their daily clinical practice, while also studying a curriculum focused on disease ecology, climate change and the importance of biodiversity which is taught by the Zoo's head veterinarian. Many students are initially drawn to the elective because of the opportunity to participate in diagnosis and treatment of exotic species. They quickly learn that the medicine seems familiar, even if the patients do not. Whether treating a lemur with type 1 diabetes or a meerkat with dilated cardiomyopathy, this basis in comparative medicine serves as the context within which larger discussions are held on ecosystem health and the role of biodiversity in protecting human health. Students learn that humans exist in an ecosystem shared by many other beings and the health of all is interdependent on each other. Veterinarians and many public health experts have long understood the importance of this multidisciplinary approach to health, but physicians have been slow to look outside of their clinic rooms. Students that complete the zoo's rotation emerge as advocates for One Health and transdisciplinary collaboration, and with an understanding of the urgency needed for enacting this approach.

One Health education should be integrated into the medical school curriculum and not be seen purely as an elective experience. We cannot continue to lecture about Lyme disease, Ebola, Zika and West Nile Virus without including how deforestation, climate change and the loss of biodiversity led to these infections (Caminade, McIntyre and Jones, 2019). When we teach our students about the racial inequities in asthma rates we must link it to air pollution (Nishimura et al., 2013). As SARS-Co-V-2 has humbly taught us, our health is intimately linked to the health of our planet. We have to communicate this to our students and our patients and we need to embrace it ourselves as we
advocate for change.

Ms. P survived, but her family and her community have been decimated. We can do better at protecting our planet and all of its members as we move into the future.

**Take Home Messages**

- COVID-19 is a zoonotic infection that originated from our interactions with wildlife
- One Health is the concept that human health is linked to animal health and ecosystem health
- Medical schools should include curriculum on One Health so students can understand how our interactions with this planet directly impact human health

**Notes On Contributors**

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Appendices

None.

Declarations

The author has declared that there are no conflicts of interest.

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