Editorial

Perspective on the COVID-19 Coronavirus Outbreak

The headlines of February 19, 2020, are grim. A substantial portion of China is under quarantine, while scientists, doctors and officials struggle to respond to an epidemic, so novel that official names for the outbreak (COVID-19) and the originating viral strain (SARS-CoV-2) were conferred only days ago. As identified in December 2019, COVID-19 has rapidly accounted for more cases and fatalities [1] than the entire 2002-2003 SARS and 2012 MERS coronavirus epidemics combined [2].

New public health threats invariably breed confusion, but citizens and scientists alike respond best with facts and logic. To this end, in the brevity of a short editorial, let us consider two basic queries.

1) How serious is the COVID-19 outbreak likely to become? What can medicine do to treat or prevent SARS-CoV-2 infections?

These are tricky questions since viral behavior is remarkably difficult to predict. Although far smaller and simpler than bacteria or human cells, viruses are highly adaptive and can evolve tangibly new survival and infective resources in as little as two weeks [3]. Consequently, virology experiments often must account for microbe behavior at the end of a study differing significantly from what was observed at the start. In the real world, viral contagion properties may evolve from month to month, and drug effectiveness might drop off faster than pharmacies and clinics can adapt new dosing guidelines.

Even with these caveats, some predictions are safe. Thus, let’s begin by assuring that, while COVID-19 was just declared an international health concern, it will almost certainly never wreak catastrophe on par with the 1918 Spanish Flu (~50 million fatalities from the H1N1 influenza virus), or the Black Death (75-200 million deaths between 1345-1352 from Yersinia pestis infections). Modern medical technology and public health policy are astronomically superior to those of 1918 or 1352, and have successfully contained pathogens with higher rates of contagion and fatality than SARS-CoV-2.

Comparisons to the ‘Plague’ may be disregarded, since it killed more from egregious hygiene and superstition than by true pathogenicity, but details of the 1918 H1N1 pandemic remain instructive. In fact, setting aside short term devastation, the 1918 flu has actually proven to be of great benefit to subsequent generations. Occurring just as experimental methods in physics, chemistry, biology and engineering were aspiring to modern rigor, the pandemic was regarded not as divine wrath, but rather as a wake-up call, motivating decades of intense research that produced great medical advances in crucial new disciplines like virology and epidemiology.

In the century since 1918, modern research, improved hygiene, and data-drive public logistics have collectively constrained deadly pathogens to far smaller impact. Although coronaviruses pose threats that differ from past epidemics, the lessons learned from influenza have broadly informed our methods for limiting the contagion of other viruses. Thus, whereas the 2012 MERS coronavirus was incredibly deadly, killing 35% of those infected [2], disease containment has kept the total loss of life (fewer than 900 [4]) to a tiny fraction of the average annual toll for seasonal flu (~646,000).

Statistically, COVID-19 has proven far more infectious (73,332 cases on 2/18/2020) than the MERS or SARS outbreaks, but the fatality rate is substantially lower (1.2-5.6%) [1]. This high contagion / lower severity profile makes COVID-19 unusually flu-like, perhaps worth comparing to the 2009 H1N1 pandemic [5]. COVID-19 does not show an imminent threat of attaining 2009-level pandemic proportions, but any comparisons to flu contagion raise a troubling concern that there currently are no coronavirus vaccines – a resource critical for curtailing highly contagious pathogens.

We still have grounds for optimism, as an international partnership (University of Queensland, Inovio, Moderna, and the U.S. NIAID) is already laboring to develop a SARS-CoV-2 vaccine, but we will have to wait for it. Compared to annual flu shot recalibrations, the SARS-CoV-2 vaccine development process is far more challenging and may take 1.5 years to complete.

In the meantime, research is progressing toward medicines for treating existing coronavirus infections. The Chinese government recently (2/17/2020) approved the generic antiviral drug, Faviilavir, for COVID-19 treatment [6]. Other countries have not yet followed suit on Faviilavir, but similar studies have led to the consideration of chloroquine, chlorpromazine, loperamide, and lopinavir as prospective SARS-CoV-2 therapeutics, guided by efficacy on genetically related SARS and MERS targets [7]. Various de novo anti-coronavirus drug design efforts have also shown promise, including research led by William Groutas at Wichita State University [8] and Mark Denison at Vanderbilt University [9]. According to Professor Groutas, “The significant body of work done with SARS and MERS coronaviruses can in principle be used as a launching pad for the development of therapeutics for COVID 19 infection. The potential use of a combination of protease and polymerase inhibitors, as well as repurposed FDA-approved drugs, provides a measure of optimism in this regard”.

So, take heart! On February 18, the number of cured coronavirus patients released from Chinese hospitals exceeded the number of new infections for the first time - an encouraging sign that hard work, cooperation and dedication is paying off! In
1918, our society made a solemn commitment to never again permit viral devastation to threaten our world. One hundred and two years later, I am certain that we will honor our predecessors and prevail in this new challenge.

REFERENCES


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