

Lessons Learned from COVID-19 Pandemic

Humans and microbes have a long-standing, double-edged relationship. Like famines and wars, which have continually inflicted a massive mortality burden on humans, the threat of pathogenic infections has had an overwhelming effect. Infectious diseases have been, and still are, a major cause of human mortality, and thus, they represent a strong evolutive selection pressure.

Anthropogenic pressure on the Earth over the recent decades is marked by an alteration of our environment including global warming, urban crowding, wild and domestic animals trade associate to global travel, which has led to an acceleration of new emerging or re-emerging infectious diseases during this century. Among the most recent since 2000, we noticed an accelerated pace of emergence with important impacts on military operations, such as the Ebola epidemic in West Africa in 2014, the overseas emergence of Chikungunya virus in 2005 and Zika virus in 2016, as well as respiratory viruses responsible of pandemics such as the Swine Flu in 2009, and successive waves of COVID-19 by several variants of SARS-CoV-2 since 2020. These latter outbreaks highlight the major threat of airborne pathogens and in particular RNA viruses, which can mutate easily to escape to vaccines or therapeutics.

The COVID-19 pandemic has overwhelmed the majority of medical services around the world, even those benefiting from innovative technologies for a rapid detection, having high capacities of sequencing to track new variants and using mathematical modeling to predict epidemic progression.

Therefore, this health crisis of unprecedented scale underscores the need for more anticipation by defining a global and collaborative strategy. A critical point to improve is biosurveillance of worldwide hotspots, with the help of high throughput diagnostic technology and algorithms to analyze in real-time large set of biodatas to track emerging diseases in the hope of containing its spread, detecting vulnerable categories of persons and evaluating objectively the actions taken. In addition, new vaccine platforms have contributed fortunately to reduce COVID-19 deaths and severe cases, although the goal of a sterilizing immunity is still awaited to prevent transmission. Interdisciplinary scientific knowledge is strongly required in order to study the complex interactions between these pathogens with pandemic potential, their hosts including animal reservoir, and an environment rapidly changing due to human activities. This would allow investing in the most promising countermeasures and plan its deployment during the crisis period of outbreaks. To counter misinformation fostered by public's concerns, rigorous scientific data will be also helpful for public authorities to improve social acceptance of measures such as lockdown or large-scale vaccination. In the context of geopolitical tensions responsible for population migrations and information concealment, an international cooperation is all the more necessary.