Root Cause, Regulation, Protection, & COVID-19

In this editorial column and short tech briefs, this author and colleagues have written about protective systems, risk quantification, and how engineers could help reduce the spread of the COVID-19 virus.[1] In the Volume 5 - June 2020 editorial column of this newsletter the need for *a priori* protections in hazardous technological systems is reviewed, but the emphasis is on *ex post* systems. Recent news reports are referring to US Department of State assertions that protective system breakdown(s) in a laboratory could have resulted in the spread of an "engineered" version of the relatively common form of the COVID virus.[2] Regardless of theories from where the virus evolved and subsequently spread, the scenario(s) leading to the resulting catastrophic consequences must be understood in order to engineer protections against reoccurrence.

The current data indicate urgency as deaths from COVID-19 are estimated between 3.7 million and 6.9 million worldwide.[3] In perspective, and depending on veracity of the data, the death toll likely exceeds that of any war since the World War ending in 1945, possible exceptions are the Korean War, the Vietnam War, and the Second Sudanese Civil War. The number of COVID-19 deaths likely only exceed those of two pandemics in recent history, the 1918 Spanish Flu (possibly, as many as 100 million deaths) and HIV/AIDS (possibly, 35 million or more deaths.) In summary, the data indicate a need for serious root cause analysis and well-designed engineering protections.

In root cause analysis and solutions, the COVID-19 pandemic appears to be unique in recent history with regard to identification of cause, especially given advancements in information exchange and advances in epidemiological science. Although a handful of theories have been proposed, none of them have been shown to be conclusive for the origin of COVID-19. Hopefully, epidemiologists will be able to pin down the scenario that led to the spread of infection. In my opinion, it is only by knowing this scenario that a similar outbreak can be protected against. Engineers need to understand, for such a scenario, the pathways that must be blocked, the associated costs of protection, and the consequences that follow if protection breaks down. Of course, included in this understanding is the risk for protective system failure.

Protection against pandemic scale disease spread requires early detection at the source and, as implied in its nature, worldwide cooperation and communication. Such protection has greater potential in the current time as opposed to past centuries. Probably the most important protection that could be put in place with existing technologies is a communications system or network that would interconnect country states' disease centers having its purpose to alert all country states when a potentially deadly disease is identified. If

[1] "Engineering in a Season of Pandemic", `https://community.asme.org/safety_engineering_risk_analysis_division/b/weblog/archive/2020/07/07/asme-sera2d-newsletter-2nd-quarter-2020.aspx`.

[2] See for example, Early State Department Reports and More Recent Reports, (websites accessed 6 June, 2021.)

[3] See IMHE Estimates and WHO Estimates, (websites accessed 6 June, 2021.)

developed as a database containing basic clinical information, vector(s) for spread, as well as the disease characteristics such as bacterial or viral, and any scientific findings, the world community could immediately begin to take action against its spread as well as its treatment. The issue is complex since insects, animals, birds, livestock, and people all could carry a deadly disease that could be transmitted among humans by various means. By knowing at the earliest time, the way it may spread, and the nature of its transmission, would give country states valuable information about what protections to implement against a new disease. A feedback mechanism could be included that would give information about the efficacy of protections implemented in different countries. Such feedback would be invaluable for example, to Bayesian analysts.