Optimal COVID-19 vaccination strategy: Single dose versus two doses

Over the last few months, there has been exhilarating news of several vaccines against COVID-19 (Moderna, Pfizer and AstraZeneca) with efficacy ranging between 70-95%. India too has recently approved Covishield (based on the Oxford AstraZeneca vaccine) and Covaxin (by Bharat Biotech) for emergency use. All these have stirred hopes in our minds that a return to normal living could soon be possible.

Most of these vaccines are given in two doses 3-4 weeks apart. Since the target would be vaccinating a majority of the global population, vaccine shortage would be inexorable. Furthermore, it is difficult to assure that those receiving the first dose would turn up for the second. Vaccinating twice as many people with a single vaccine dose would mean a better use of the available resources. Single-dose vaccination seems more alluring as it is easy, less costly, and would probably help in faster achievement of herd immunity. However, its success would highly depend on the protection rendered by one dose of the vaccine, termed single dose efficacy (SDE).

A recent study, using an age-stratified mathematical model combined with optimization algorithms, ascertained the optimal vaccine allocation with one and two doses of vaccine to reduce five key metrics of disease burden (total infections, symptomatic infections, deaths, peak non-ICU and ICU hospitalizations) under a varying assumptions (different levels of social distancing, vaccine availability, vaccine's mode of action, vaccination rate). The results suggest that optimal vaccination strategy critically depends on the SDE. If the SDE is high, single-dose vaccination would prevent up to 48% more deaths than a strategy of vaccinating the high-risk group first. If the SDE is low or medium, mixed vaccination campaigns with one and two doses of vaccine would be better.

At a time when we are unsure of the efficacy of vaccines available, this study suggests that it is an absolute necessity to promptly determine the efficacy of a single dose of vaccine to use it optimally to end the pandemic and resume our routine activities as quickly as possible.
(MedRxiv preprint 5 Jan 2021)

Increased cooked meat intake linked to childhood wheezing

Prevalence of childhood asthma has been on the rise over the last few years. It has been found that dietary habits established in early childhood may be associated with wheezing and potentially the future development of asthma.

A study has suggested that certain substances in cooked meats might predispose to increased wheezing in children. It included 4,388 children aged 2–17 years from the National Health and Nutrition Examination Survey (NHANES) survey data. It was found that higher intake of non-seafood meats and advanced glycation end products, generated during high-temperature cooking of meat, was significantly associated with wheezing, wheeze-disrupted sleep and exercise, and wheezing requiring medication.

Although further studies would be needed to confirm this finding, the study highlights these pro-inflammatory compounds as early dietary risk factors for asthma. These risks are potentially modifiable. This may have broad clinical and public health implications for the prevention of childhood asthma.
(Thorax 21 Dec 2020)

Novel imaging unveils if antibiotics reach cellular targets

Antibiotics form the cornerstone of management of infectious diseases. An effective therapy must incorporate drugs with the propensity to invade all infected environments. This is particularly important in cases where antibiotics have to attack intracellular organisms. A thorough understanding of how effectively antibiotics concentrate in various subcellular environments, and consequently target the pathogen, is critical in the selection of the antibiotic of choice.

Researchers at the Francis Crick Institute, UK, have developed a novel imaging method – correlative light electron and ion microscopy in tissue (CLEIMiT) – to know if antibiotics have reached bacteria within tissues. This was done by combining a variety of imaging methods – confocal laser scanning microscopy, 3D fluorescence microscopy, electron microscopy and nanoscale secondary ion mass spectrometry. They analyzed lung tissue of mice infected with *Mycobacterium tuberculosis* and treated with bedaquiline, and found that the drug accumulated not only in foamy macrophages of the lung but also in polymorphonuclear cells. This new approach elucidates the subcellular localization of antibiotics and is a powerful methodological advance to investigate if drugs reach their intracellular targets.

CLEIMiT is applicable to other drugs also, and the researchers have continued their work on the technique, adapting it for other categories of antibiotics. If we could select or develop more effective antibiotics based on where they reach, it might help in more effective antibiotic treatment, thereby reducing the duration of treatment and the risk of antibiotic resistance.
(PLoS Biology 31 Dec 2020)

JERIN SEKHAR
drjerincsekhar@gmail.com