mRNA COVID-19 Vaccine Booster After Inactivated Vaccine Primary Series

A booster shot of mRNA vaccine after 2 doses of inactivated virus vaccine significantly increases immune response to the SARS-CoV-2 virus, and may offer better protection against severe COVID-19 than 3 doses of inactivated vaccine, suggests a preliminary study published in Nature Communications.

The study examined 238 plasma samples from 175 healthy patients grouped by vaccination history. An mRNA vaccine booster multiplied IgG antibodies against the receptor-binding domain (RBD) of the SARS-CoV-2 G614 strain by 6.3-fold within 85 days after vaccination and by 17.2-fold after 85 days compared with 2 doses of the BBIBP-CorV or CoronaVac inactivated vaccines. Substantial RBD antibody increases were observed to the Beta, Delta, and Omicron variants as well.

Importantly, 1 mRNA booster after 2 inactivated vaccine doses raised RBD immune response to the level reached by 3 doses of mRNA vaccine or an mRNA booster after natural infection, the authors wrote. By contrast, 3 doses of inactivated vaccine did not significantly increase RBD antibodies compared with 2 doses.

Similarly, 1 mRNA booster increased the number of B cells targeting RBD by up to 73-fold and T cells targeting the virus’ spike ectodomain 1 (S1) protein by up to 24-fold compared with 2 doses of inactivated vaccine. T cells targeting SARS-CoV-2 spike, nucleoprotein, membrane, and open-frame proteins also increased substantially with an mRNA booster.

Cancer Deaths May Double by 2030 in Sub-Saharan Africa

Estimated cancer incidence has doubled in sub-Saharan Africa over the past 30 years, leading to more than 520,000 deaths in 2020. Unless steps are taken to reverse the trends, annual cancer deaths in sub-Saharan Africa will likely reach 1 million by 2030 and incidence will likely double again by 2040, according to a comprehensive report by the Lancet Oncology commission.

Factors driving the increases include infection; aging populations; behavioral changes such as diet, alcohol use, and smoking; environmental exposures; and genetics. At 128.2 per 100,000 people, cancer incidence in the 46 mostly low-income sub-Saharan Africa countries exceeds the average of 115.7 per 100,000 people for low and 108.5 per 100,000 people for medium human development index (HDI) regions globally.

And although sub-Saharan Africa cancer incidence is much lower than the 295.3 per 100,000 people rate in very-high HDI regions, its cancer mortality rate of 87.1 per 100,000 people is close to the 98.7 per 100,000 people seen in very-high HDI regions. Sub-Saharan Africa’s mortality to incidence ratio of 0.7 is more than double that of very-high HDI regions, underscoring the significant challenges in detecting, diagnosing, and treating cancer patients in Sub-Saharan Africa, the authors wrote.

The report recommends developing national cancer control plans that address infectious cancer causes prevalent in Sub-Saharan Africa. Other steps include establishing robust cancer registries, incorporating cancer care into universal health coverage, early screening and detection programs, building the oncology workforce, and increasing use of telemedicine and new technologies. These plans are crucial to meet the United Nation’s Sustainable Development Goal of reducing premature deaths from noncommunicable diseases by one-third by 2030, the authors wrote.

Experimental Open-source Low-cost Ventilator Could Meet Critical Need

An experimental device that meets US Food and Drug Administration (FDA) requirements for emergency use ventilators can be constructed for about $700—far less than the $10,000 for the lowest-cost commercial models, according to an article in PLoS One.

The open-source device, which is not FDA authorized and is currently recommended for research use only, could help meet the global need for a low-cost, rapidly deployable ventilator highlighted by the COVID-19 pandemic, according to the authors. “Most components are available from general hardware suppliers and the chosen parts...did not experience supply chain disruptions due to COVID-19,” they wrote.

Funded by Princeton University, the People’s Ventilator Project (PVP1) device largely follows established design conventions. It includes active and computer-controlled inhalation combined with passive exhalation, supports pressure-controlled ventilation and autonomous breath detection, and incorporates FDA-required alarms. When the PVP1 was tested on a mechanical lung, it detected and corrected abnormally high airway pressure, meeting the FDA Emergency Use Authorization requirement.

Designed for both adult and pediatric use, the device’s performance was also compared with a commercial ventilator on a pediatric lung model. Although the PVP1 device deviated slightly more than a commercial ventilator from target values for pressure, volume, and flow, correlation was high. Deviations of up to 9% were seen in some challenging scenarios, though this performance may be improved with ventilator controller refinements, the authors noted.

Howard D. Larkin

Note: Source references are available through embedded hyperlinks in the article text online.