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Opinion

Precision and personalized vaccines needed to face COVID-19 pandemic

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Among the abounding lessons we learned from the SARS-C0V-2 pandemic is the uttermost determinant that people are not equal before the severity of COVID-19. Indeed, the disease course differs with age, gender, ethnicity, underlying clinical conditions and virus variants. Other diseases modifying factors are associated with genetic traits such as those driving the immune response, the blood groups, the coagulation system and the ACE2 receptor variants [1-4].

Currently, nine different vaccines are being used to face the plethora of biological variety associated with COVID-19. Having been tested using conventional clinical trials focusing mainly on safety and efficacy, these vaccines showed variable efficacy levels and none confers sterilizing immunity. In addition, the efficacy of almost all COVID-19 vaccines is challenged by the emergence of novel viral variants and mitigation efforts have to be pursued post vaccination. Furthermore, some instances of concerning undesirable effects such as thrombocytopenia and micro blood clots is halting the full deployment of at least two vaccines. With no scientific consensus about the availability of a drug for the efficient treatment of COVID-19 particularly the severe forms, vaccination remains the best hope to get out of the pandemic. However, the above issues have introduced a debate on which vaccine to take and some legitimate questions arose:

Could variations in vaccines performance and undesirable effects be associated to the disease modifying factors aforementioned? Is it optimal to deal with a new pandemic frontier by deploying vaccines tested using the conventional way? Can anti-SARS-CoV-2 vaccine(s) allow life to go back to pre-pandemic status?

The answer to these questions would come from conducting multiple clinical trials in defined settings such as clinically and genetically defined groups. We could learn which vaccine would be more adapted to each age group or to people with underlying comorbidities such as obesity, heart disease, or those with a given HLA type, blood groups or a common ACE2 variant.

In addition, development of precision vaccines and personalization of vaccination would probably be a winning strategy to fight the spread of SARS-Cov-2 and help control the pandemic. A precision vaccine for SARS-CoV-2 would be a vaccine that target the genetic changes accumulated by the virus. Personalized RNA-based cancer vaccines are showing spectacular success particularly in treating melanoma [5]. Therefore, RNA vaccine technology that is already used in two of the currently deployed COVID-19 vaccines could be a gateway for introducing precision and personalized vaccination against SARS-CoV-2. However, organizational and economic aspects might limit and/or delay the globalization of precision and personalized anti-SARS-CoV-2 vaccination.

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