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Perspective

COVID-19: Intranasal and Oral Routes of Vaccination

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The mainstay protocol exercised by global health leaders to control the spread of severe acute respiratory syndrome corona virus (SARS-CoV-2) has been screening, the identification of cases, isolation thereof, contact tracing and nation-wide lockdowns. The development of vaccinations against the SARS-CoV-2 virus has marked a new dawn for the war against corona virus disease (COVID-19). [1,2]

First generation immunization against COVID-19:

The first set of vaccinations to be produced were Janssen and Novavax, Johnson and Johnson, Oxford AstraZeneca, Pfizer-BioNTech, Moderna, and Covaxin. All of these produce various side effects with some to the severity that multiple deaths have been recorded. This first generation of vaccines developed against COVID-19 are all administered via the conventional intramuscular route. A more alarming fact is that this first generation of vaccines have a dwindling efficacy and confer little immunity against the new variants of the SARS-CoV-2 virus. [3]

Second generation immunization against COVID-19:

With the innate drawbacks and side effects of the traditional vaccines, coupled with the discovery of the new variants of the SARS-CoV-2 virus; a newer second generation of immunization against the virus is under development. The two new novel methods of immunization are the intranasal vaccine by Oxford Astra Zeneca taking place at Oxford University's Jenner Institute and the oral vaccine which is being developed by Oravax Medical, a joint venture between an Israeli-American company known as Oramed and the Indian company Premas Biotech.[4,5,6]

COVID-19 intranasal vaccine:

The intranasal route of drug administration has been a popular route of delivery for drugs such as antihistamines. It is a rapid, easy, cost effective and high yield route for drug administration. The intranasal vaccine has been developed and is based on a poultry virus which has been designed to produce the spike proteins of SARS-CoV-2. It has shown promising results in animal studies, with a marked decrease and stoppage of viral shedding. This vaccine has now entered phase 1 clinical trials. [4,5,6,7]

Advantages of the intranasal vaccine:

The cost effectiveness will allow for a greater international production capacity. The ease of administration nullifies the need for highly trained medical and paramedical staff. This innate advantage makes this vaccine a better hope for the planet to maintain herd immunity at a more rapid and safe rate due to its scalability. It is indicated that COVID vaccines will have to be developed alongside the discovery of new variants, thus making the vaccine an annual or even biannual necessity. Mass immunization is a monumental and logistical nightmare and thus a vaccine administered via the intranasal will make such vaccination campaigns

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more feasible.[4,7,8,9]

COVID-19 oral vaccine:

The oral vaccine is based off of the protein oral delivery (POD) system developed by Oramed.[6] It is developed using a virus like particle (VLP), it will be a triple antigen vaccine with the intent to hone in on three important viral structural proteins. The premise of the vaccine will be to evoke both a systemic and local immune response via IgA and IgG. Current animal pilot studies have shown promising results with antibody production after a single capsule dose.[10,11]

Advantages of the oral vaccine:

The oral vaccine will be both a more cost effective and widely greater accepted method of receiving the immunization. The production output of the oral vaccine coupled with its hardy nature and no need for a sophisticated cold chain will ensure people in the most remote and rural settings will have access to the vaccine. Nepal is an example where the distribution of drugs on a wide basis is challenging due to economical, topographical and transportation obstacles; the oral route will thus make the attainment of herd immunity in such a nation a feasible possibility. The oral vaccine will confer a double layer of both systemic and local immunity, via IgA and IgG secretion thus decreasing shedding.[6]

Patient compliance:

The intranasal route is a painless route of administration. It is less invasive and is needle free thus ensuring that patients suffering from trypanophobia will not be averse to being immunized. The ability of a patient to self-administer the vaccine will aid and increase patient compliance, thus aiding and boosting immunization rates.[9]

The familiarity of oral administration and ease of use of this vaccine will increase patient compliance as the process of taking the vaccine will not be an entirely foreign concept.[10]

Storage:

An innate challenge with the conventional first generation of vaccinations was the sanctity of the cold chain. The intranasal vaccine will eliminate these complications as storage would be simpler and more cost effective and thus make the logistical supply chain more feasible.[11]

Shelf life:

The first-generation vaccinations have a short shelf-life which has led to the expiry of thousands of doses. Both the oral and intranasal vaccines will have a longer shelf-life and will thus reduce wastage whilst simultaneously allowing for the better management of the international vaccine supply, thereby optimizing the vaccination rollout.[12]

Conclusion:

The only long-term solution to this deadly pandemic will be the establishment of herd immunity across the entire globe. The current vaccinations available on the market are proving near impossible to achieve herd immunity with, due to a plethora of drawbacks. The new variants of COVID-19 are of a great concern and thus, it is believed that a yearly "flu-like" immunization against COVID-19 will be a necessity in future. The current vaccinations available on the market will not suffice and thus it is evident that the second generation via their novel routes of administration have both the cost and scalability potential to ensure a global vaccination roll out which is logistically sound and plausible.

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