Vol 4 | Issue 1 | Pages 43-45

Journal of Cell and Developmental Biology

Original Article

DOI: 10.36959/596/448

Selective Vaccination Could Suffice to Develop a Robust Herd Immunity against SARS-CoV-2

Takele Taye Desta

Department of Biology, College of Natural and Computational Science, Kotebe University of Education, Addis Ababa, Ethiopia

Abstract

This study proposes a balanced and combined use of immunity developed from vaccination and natural infection. This work reviewed literature and enriched further using critical thoughts on integrating vaccination with naturally-induced immunity. Undoubtedly, coronavirus is an extraordinary challenge the present-day world has faced. However, efforts have been in place to vaccinate a significant proportion of the global population. The question is, which preventive strategies need to be adopted to be on the safest side? Thus, should we keep pushing towards mass vaccination, or shall the less vulnerable group of the population remain unvaccinated (contingent on their willingness) to develop naturally-induced immunity? Many factors such as sex, comorbidities, age, and lifestyles underlie the impact of the coronavirus. Robust predictive models that capture most of the variation explained by the underlying factors are vital to developing. Based on the models, coronavirus-resilient individuals might be unvaccinated to develop natural immunity, while the susceptible ones get vaccinated. It might be rational to vaccinate susceptible segments of the global population while leaving the resilient ones to choose between getting vaccinated or developing natural immunity. However, this strategy was proposed for coronavirus and might not work for all diseases.

Keywords

Coronavirus, Mass vaccination, Natural infection, Trade-offs, Underlying factors

Introduction

Coronavirus is an extraordinary challenge the contemporary world has faced [1,2]. Huge resources have been mobilized and promising containment strategies have been invented and adopted to reduce the lethal impacts of coronavirus. A consensus was reached to develop robust immunity against coronavirus [3]. Accordingly, besides non-pharmaceutical interventions such as social distancing, personal hygiene, the use of personal protective equipment, excellent efforts have been made and the-state-of-art technologies and huge resources have been mobilized to develop potent vaccines.

Nevertheless, like other diseases, infection from coronavirus produces a continuum of susceptibilities ranging from asymptomatic to lethal cases. Several underlying factors for the disparity in the severity of coronavirus have been identified such as comorbidities [4], sex/gender [5], age [6], and living standards and lifestyles [1]. This disparity calls for the invention of a range of preventive strategies to save resources and lives while maintaining robust natural immunity acquired by a significant proportion of the global population.

This piece of work specifically deals with the importance of vaccinating all or most people irrespective of their susceptibility to coronavirus. For example, in those groups who are expected to show asymptomatic to mild cases leaving them to their discretion to develop natural immunity may suffice. This strategy however requires mass testing for coronavirus and extensive documentation of the health history, and demographic characteristics of the global population. Moreover, it is high time to develop a robust model to predict the impact of predisposing factors to identify individuals that are expected to be resilient to coronavirus. This strategy could enable us to maximize the best use of herd immunity developed from both vaccination and natural infection.

***Corresponding author:** Takele Taye Desta, Department of Biology, College of Natural and Computational Science, Kotebe University of Education, Addis Ababa, Ethiopia

Accepted: November 09, 2022

Published online: November 11, 2022

Citation: Desta TT (2022) Selective Vaccination Could Suffice to Develop a Robust Herd Immunity against SARS-CoV-2. J Cell Dev Biol 4(1):43-45

Main Text

Methods

This piece of work was based on literature review and critical thinking and synergizes the proper combination of vaccination-triggered and naturally-induced immunity to resolve the significant level of hesitancy observed against coronavirus vaccination.

Results

Efforts have been made to summarize the advantages of vaccination and natural infection to combat the negative impact of the coronavirus, the trade-offs of these preventive strategies, and the pressing need to develop prediction models that determine the level of resilience/susceptibility using health records and demographic data.

Snapshots on the epidemiology of SARS-CoV-2 infection

Two years have been passed since most nations infected by the coronavirus. The coronavirus might have been widely spread especially following the ease of the lockdown and social distancing. The spread of the coronavirus could be higher in overcrowded settings and congested villages and shantytowns-typifying the lifestyle of most of the less developed world citizens. However, although there might be a significant variation in infection and fatality rate associated with coronavirus the impact of the pandemic in less developed countries is not as much as it has been frightened of. The importance of naturally-induced immunity possessed presumably by most of the less developed world citizens and a significantly high proportion of developed nations' inhabitants could not be overlooked while planning to build herd immunity against the coronavirus pandemic.

Both natural infection and vaccination induce immunity

Both natural (wild) infection and vaccination produce antibodies. However, the amount and efficacy of antibodies produced may vary depending on the rate of infection (generally contracting more antigens elicits a robust response). Both mass vaccination and natural infection confer herd immunity - a phenomenon in which a sufficient proportion of the population is protected against the pathogen - at this stage, the spread of the virus could be meaningfully contained [3]. However, the question is at what cost and which one, i.e., natural infection or vaccination could produce robust immunity and might have a long-lasting positive impact on global health?

Natural immunity

Natural immunity has evolved and refined itself in the course of its history. It might be due to this fine-tuned efficacious natural infection confers a stable and highly persistent immunity [7] and does not bring many more reinfections [8]. Vaccines sometimes may produce an off-target effect because natural killer (NK) cells and monocytes of innate cells need to be exposed to certain pathogens to develop a trained phenotype [9]. Often a single natural infection induces immunity but this often requires repeated vaccinations (even a booster). Mass immunization may bring unforeseen, and long-term complications [10].

Natural immunity is long-lasting and has a broad effect [11]. Natural infection is scrutinized by all the body's defense lines, however, for example, a vaccination performed by direct injection into the bloodstream bypasses much of the body's defense routes, which may produce weak immunity [12]. Vaccines recognize a new variant of the contagion in question at a reduced rate [13]. The natural infection with the influenza A/H1N1 (pH1N1) virus has produced a better immune response than induced by a monovalent pH1N1 vaccine [14]. Vaccines as in the case of influenza A virus could last effective for a short time and confer a narrow-based immunity [11]. Immunity resulting from natural infection can curb pandemics, nevertheless, it does not eradicate diseases, therefore, it has to be accompanied by the effective use of potent vaccines [8].

Vaccination

Developing herd immunity through natural infection only may require unbearable sacrifices [8]. Normally vaccines develop a mild to moderate infection [12], which makes them less risky. The high purity of the specific protein in the vaccine [15] leads to a better immune response than natural infection. However, vaccines administered via the oral or as a nasal spray may serve better than the ones administered intramuscularly as they provoke the immune system starting from the naso-oral cavity.

Illness may be encountered from natural infection in susceptible individuals. For most immunities, standardized vaccines not only are safer but produce a more robust response [16]. This efficacy, for example, includes vaccines for HPV, tetanus, and pneumonia [17]. Unlike the unintended acquisition of natural immunity, clients can choose when to get vaccinated. While natural immunity provokes a range of responses, vaccines are designed to create the most significant immune response. Because vaccines are made using parts of the viruses and bacteria that cause disease, the active component of the vaccine that induces immunity is natural. However, other ingredients in vaccines or the route of administration are unnatural [18].

Modeling of predisposing factors

Given the ever-increasing high accumulation of global coronavirus-associated data and the state-of-art computational technologies and skills, the effect of underlying factors can be determined by using robust models and this, in turn, enables to predict susceptibility at the individual's level.

Outlook

It is high time to research the disparity in susceptibility to coronavirus to uncover those social and biological factors conferring resilience/susceptibility to pandemics of these types. Therefore, it might be advisable to vaccinate susceptible segments of the global population while leaving the resilient ones to choose between getting vaccinated or acquiring natural immunity.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The author declared none.

Funding

Not applicable.

Authors' contribution

Not applicable.

References

1. Desta TT (2020) Lifestyles and living standard disparities in the pandemicity of COVID-19 in the Global North versus the Global South Countries. Geriatric Care 6.
2. Desta TT, Mulugeta T (2020) Living with COVID-19-triggered pseudoscience and conspiracies. International Journal of Public Health 65: 713-714.
3. Coronavirus Update 45 (2020) Update on COVID-19 vaccine development. WHO| EPI.Win | Infodemic Management, 21 December 2020.
4. Zheng Z, Peng F, Xu B, et al. (2020) Risk factors of critical & mortal COVID-19 cases: A systematic literature review and meta-analysis. Journal of Infection 81: e16-e25.
5. Foresta C, Rocca MS, Di Nisio A (2021) Gender susceptibility to COVID-19: A review of the putative role of sex hormones and X chromosome. Journal of Endocrinological Investigation 44: 951-956.
6. ECDC (2020) Coronavirus disease 2019 (COVID-19) in the EU/EEA and the UK – eighth update.
7. Baldovin T, Mel R, Bertoncello, C et al. (2012) Persistence of immunity to tick-borne encephalitis after vaccination and natural infection. Journal of Medical Virology 84: 1274-1278.
8. Spellberg B, Nielsen TB, Casadevall A (2021) Antibodies, immunity, and COVID-19. JAMA Internal Medicine 181: 460-462.
9. Siegrist CA (2008) Vaccine immunology. Vaccines 5: 17-36.
10. Seneff S, Nigh G (2021) Worse than the disease? Reviewing some possible unintended consequences of the mRNA vaccines against COVID-19. International Journal of Vaccine Theory, Practice, and Research 2: 38-79.
11. Krammer F (2019) The human antibody response to influenza A virus infection and vaccination. Nat Rev Immunol 19: 383-397.
12. Wassung KW (1997) Challenging the theory of Artificial Immunity. The Economist.
13. Chang X, Augusto GS, Liu X, et al. (2021) BNT162b2 mRNA COVID-19 vaccine induces antibodies of broader cross-reactivity than natural infection, but recognition of mutant viruses is up to 10-fold reduced. Allergy 76: 2895-2998.
14. Kang EK, Lim JS, Lee JA, et al. (2013) Comparison of immune response by virus infection and vaccination to 2009 pandemic influenza A/H1N1 in children. J Korean Med Sci 28: 274-279.
15. Metz B, Van Den Dobbelsteen G, Van Els C, et al. (2009) Quality-control issues and approaches in vaccine development. Expert Rev Vaccines 8: 227-238.
16. Gottlieb SD (2016) Vaccine resistances reconsidered: Vaccine skeptics and the Jenny McCarthy effect. Biosocieties 11: 152-174.
17. Leidner AJ, Murthy N, Chesson HW, et al. (2019) Cost-effectiveness of adult vaccinations: A systematic review. Vaccine 37: 226-234.
18. Dinerstein C (2021) Genetic Literacy Project.

DOI: 10.36959/596/448