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**The mystery behind Childhood sparing by  
COVID-19**

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## The mystery behind Childhood sparing by COVID-19

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### ABSTRACT

In December 2019, the SARS-CoV-2 virus was firstly emerged in Wuhan, China and then spread rapidly worldwide to be declared as a pandemic by the World Health Organization (WHO) in March 2020. COVID-19, the threatening acute respiratory distress disease caused by SARS-CoV-2 virus, showed preferential age groups selection (1).

Data regarding the epidemiologic and clinical features of infected children showed that out of 72,314 cases, recorded by the Chinese Center for Disease Control and Prevention, only less than 1% of the cases were pediatrics younger than 10 years of age and in contrary with the infected adults, most infected children seemed to have a milder clinical course. Also, asymptomatic infections were not uncommon (2).

We suppose that the global routine immunization of children could play a role in protection of the pediatric age form the devastating effect of SARS-CoV-2. MMR, BCG, PPD, and Candida vaccines are already used as treatment options enhancing the ability of the immune system to recognize certain viral antigens (3). For example, in dermatology, verruca that is caused by human papilloma virus can be ameliorated using these above mentioned intralesional vaccinations (4). As reported, COVID-19 patients are manifested by lymphopenia and decreases in the numbers of cytotoxic CD8+ T cells (5). According to our hypothesis, this induced leukopenia could be corrected by these mentioned vaccinations. This correction when happens will accordingly stimulate CD4+ helper T helper 1 cells and induce them to secrete various cytokines provoking the maturation of cytotoxic CD8+ T cell. This scenario is expected to also improve the cytotoxic capabilities of natural killer (NK) cells. Both those types of cytotoxic cells (CD8+ and NK cells) can then recognize and destroy virus-infected cells (6).

The data from China showed that also that pediatric patients less than one year old suffer from severe to critical symptoms while older children are manifested with less symptoms (7). Given that MMR is given after one year (8), this lower severity of the symptoms in children over 1 year could be an indicator for the beneficial role of vaccinations. It could also be a proof against the hypothesis stating that lower immunity in children, because of their imperfect innate immune development (9), dose not exaggerate the immune response against the virus as adults do. Furthermore, in a randomized clinical trial BCG (bacillus Calmette-Guérin) vaccination has been found to induce protection against infection with a weakened form of the yellow fever virus (10, 11). Review reports by the WHO in 2014 and 2016 also concluded that BCG vaccination associates with lower overall mortality in children. In support to our opinion, the results of a recent case study (12) indicated that robust multi-factorial immune responses can be induced against SARS-CoV-2 similar to those found in response to the avian H7N9 disease (13).

Overall, we suggest that the bystander immunity induced after vaccination of children from 1-8 years old can stimulate the immunity against SARS-CoV-2 virus. Therefore, we recommend assessing the use of one or combined vaccination of MMR, BCG, PPD, and Candida to either protect the high-risk groups or to treat the emerging pandemic of SARS- CoV-2 virus and the associated serious complication of COVID-19 as we have recently proposed that routine childhood immunization may protect against COVID-19 (14).

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