

BCG vaccine: Its relevance in the prevention of tuberculosis and beyond

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ABSTRACT

Summary: BCG, a live attenuated vaccine was developed against tuberculosis at the beginning of the 20th century. It has been the most used vaccine in the world, with around 130 million children vaccinated every year. Although, there are varying estimates of its efficacy in preventing pulmonary tuberculosis, protection was higher in trials further from the equator, where environmental mycobacteria are less and with lower risk of diagnostic detection bias. Protection against meningeal and miliary tuberculosis also appeared greater than for pulmonary tuberculosis. BCG Vaccine has been shown to decrease neonatal mortality due to the prevention of neonatal sepsis and various upper respiratory tract infections (URTI). BCG vaccine also has nonspecific protective effects against protozoan infections. This nonspecific effects of BCG vaccine in humans and animal models have been attributed to Heterologous immunity and Trained Immunity. BCG as adjuvant immune therapy is shown promising results for patients of malignant melanoma. Intravesical BCG Vaccine is now being used as standard therapy for non-muscle invasive bladder cancer (NMIBC). . BCC vaccine administered at birth enhances many vaccine responses. Ecological studies suggested that countries and regions that mandate BCG vaccination for their population have a lower number of infections and a reduced mortality from COVID-19. It has been hypothesized that BCG vaccination might be a potent preventive measure against SARS-CoV-2 infection and/or may reduce COVID-19 disease severity. Countries with a low TB incidence and a low BCG coverage had the highest incidence of COVID-19 per 100,000 population. Countries with high TB incidence and BCG coverage had much lower rates of COVID-19 infection. In addition, the case rate fatality rate appeared to be lower in these countries. A study to evaluate the effectiveness of the BCG vaccine in reducing morbidity and mortality in elderly individuals in COVID-19 hotspots in India highlights, the effect of BCG vaccination in modulating the frequencies of both innate and adaptive immune cell subsets and in inducing heightened total antibody levels. Whether this translates to improved protective immunity to non – specific infections like SARS-CoV2 remains to be determined.