

Vaccination Drives against Infections: Its Current Status of Success and Failure

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Received: February 18, 2021

Published: February 27, 2021

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The main purpose of artificial immunity is to provide protection cover or shield against particular pathogenic diseases. For this purpose, individuals have been intentionally exposed to small quantities of denatured antigen and administer with attenuated strain or a live virus to evoke immunity. Artificial induction of immunity makes people immune to specific diseases, and immunized person wait to catch the disease. The main purpose of vaccination is to reduce the risk of death and morbidities felt. Immunity against infections that can cause serious illness is generally beneficial. There are many ways to evoke immunity for example occurrence of measles and chickenpox generates lifelong immunity in diseased person. While antibodies synthesize against corona and flu viruses remain in blood stream for a very short period and they disappear after end of infection. Immune protection through vaccination is always set to achieve long term immunity from individual to community. But a significant difference is observed in vaccinated (responder) and non-vaccinated (non-responder) persons and approach followed. Practically, few vaccines provide lifelong cover against diseases. Therefore, natural immunity come after exposure to disease pathogen, it remains life long as occur in case of some viruses. When antibody protection is acquired by masses and more than 78% of people get infection from disease causing agent, the herd immunity generates [1].

The basic objective of vaccination is a way to make people immune to a disease. Both ways of gaining immunity, either from having an illness or from vaccination, are examples of active immunity. Active immunity evokes when a person's immune system start

producing antibodies and activate immune cells to certain pathogens. If the person encounters that pathogen again, long-lasting immune cells specific to it will already be primed to fight it. These are known as memory cells. Passive immunity is induced artificially when antibodies are given as a medication to a non-immune individual. These antibodies may come from the pooled and purified blood products of immune people or from non-human immune animals, such as horses, sheep and rabbits. These antibodies are known as loaned antibodies, which much ably fight certain infectious diseases [2].

There are several reasons of vaccine failure, it occurs at the level of antigen purification, instability or poor stability of antigen, production and manufacturing time, storage, transport and immunization. Vaccine failure also occurs due to de-naturation or instability of antigen, low antigenic homology between the vaccine and the circulating strain, an insufficient viral antigen load in the vaccine, the use of an adjuvant is not appropriate, and/or not generating appropriate booster vaccinations. Among important reasons of vaccine failures are mutations in epitopic regions of viruses, poor anti-genecity and low neutralization power. Total failure of vaccine is loss of efficacy of immune protection and generation of level of protective immune response after immunization [3]. When vaccine failure occurs, several series of vaccines are given to the patient, and booster doses show very low neutralization power against pathogen. Due to low neutralization power whole exercise of vaccination become futile and fail to produce an immune response. Primary vaccine failure occurs when an organism's immune sys-

tem does not produce antibodies when first vaccinated. A vaccine reported as failed when patients contract a disease in spite of being vaccinated against it [4]. This protection gained after passive immunization is short-lived, usually lasting only a few weeks or months. In immune-compromised persons the protection offered by passive immunization evokes for a very short period, usually it lasts only a few weeks or months. Immune-compromised and poor immunity cases in society are on rise. This has resulted in an increased susceptibility to infectious diseases [5].

There are two common reasons for vaccination failure, one at the level of generation and second at operational level. For production of vaccine, weaker and improperly fed animals cannot generate required level of antibody production. For quality control of vaccine animals should be healthy, disease free, pure line, early age and have no genetic abnormality. Vaccine efficacy also lost due to poor cold storage or lack of maintenance of cold chain from the time of manufacture till vaccination. Vaccine mishandling during transportation also results in loss of their activity. Quality of vaccine deteriorates due to repetitive thawing and cooling. Among other reasons failure of the delivery system to vaccinate is one of the important problems in the developing world. This is commonly occurs due to inadequate vaccine supply. Other important factors include barriers to immunizations, improper use of vaccines, and vaccine ineffectiveness at the time of use. Other factors are negative attitude of clients and lack of knowledge. Failure of the immune response may be either primary or secondary or loss of protection after initial effectiveness.

Most of the ineffective vaccines are developed against wrong strain or a strain specific variation. During development phase blind peer review exercise has been performed and all vaccines are passed through well regulated phases of clinical trials. The data collected from such clinical trials is used to evaluate prophylactic potential and safety of vaccines. Before launching any vaccines all issues regarding safety, protection cover, stability and efficacy are tested. All clinical trials done on testing should be verified, screened and sent for blind peer reviews [6]. Vaccines should administer only after overall testing for its safety, immunogenicity and efficacy into the healthy persons. Before mass vaccination immunizing power and health related risks are being tested.

Due to intensive therapeutic regimens and medical care a healthy ageing society is on rise, it has led to significant demo-

graphic changes in the population. Furthermore, fast urbanization, industrialization and population sprawls and mixing of ethnic groups have increased the chances of transmission of communicable diseases. However, these new changes in life styles and nutrition fostered the initiation of new epidemics in developing and developed countries. In developed countries allergies, obesity, high blood pressure, heart attack and virus generated infections become huge clinical issues. In last 40 years a massive change has been observed in the quality of food materials, most of them having high nitrogen contents due to addition of nitrogenous fertilizers in soil. This high nitrogenous food, malnutrition, lack of vitamins and minerals, is slowly shifting towards an immune compromised immune genetics (total cases). Furthermore, formation of slums, food wastes, slaughter house wastes, hospital wastes, distilleries, and open drainages are major sources of infection in both urban and sub-urban areas. In rural areas major problem is contamination of soil, open defecation, lack of cleanliness, potable drinking water and awareness are major factors. All these conditions and formation of an unhealthy environment influence the immune protection of body and support high infectivity and endemicity of viruses. It also give rise chances of multiple infection, generation of new endogenous strains, loss of self and non-self, high blood pressure, sugar, heart problems, stressful body physiology; improper tissue and cellular respiration. The current status of global health raised worries and sets in for many more future miseries i.e. loss of life, economy and human well being. It will need significant improvements in medical care and therapeutics methods. Today developed countries are under the grip of rising cases of chronic diseases i.e. cancer, cardiovascular, respiratory, hepato-pancreatic, gastric, HIV and corona virus.

Today the great question is efficacy of vaccine against influenza and corona virus. Vaccine misinformation is pervasive and persistent. The major problem is success of vaccination programmes, how long existing vaccine keep us under protection cover, vaccine responsiveness to new mutant variants of corona virus is very poor. In present circumstances and current epidemic phase is vaccine quality dose and safety is sufficient to have optimal protection levels? In future a great worry is new variants of corona virus will reach to its extreme infectivity and may result in uncontrolled disease and may cause high fatality. We are going towards unsafe immune protection because of low disease curing efficacy and point mutations occurring in virus envelope proteins at very fast speed.

What will happen when most of the existing vaccines become non-responsive due to acquiring new antigenic variations acquired by viruses?

About 2 - 10% of healthy individuals fail to mount antibody levels to routine vaccines. Comparing the immune responses to different vaccines in non-responder and high-responder vaccinees revealed that hyporesponsiveness is antigen/vaccine-specific at the humoral but not at the cellular level. We found that T-regulatory as well as B-regulatory cells and the production of IL-10 are involved in non/hypo-responsiveness.

Both primary vaccines and booster dose prove futile and remain unsuccessful. Therefore, natural immunity seems to be only hope. Low, non responsive cases will increase. Exposure to pathogens and development of self immunity seems to a better option rather relying on vaccines. But need of vaccines cannot be denied and we should not deter us from taking maximal advantage of their benefits. Both social distancing and vaccines provide cultural protection, and safeguard the entire community like an umbrella [7].

Vaccination is only way that can successfully cut down diseases incidence, mortality and morbidity. For social welfare, if we want to keep healthy ourselves we should avoid any anti-vaccine movement, to cut down any future disease risk and mortality. All governments must solve public issues related to vaccine safety and immunization. All issues related to vaccination should decide on the basis of humanity rather than on religion, cast, creed and race. Vaccine misinformation is pervasive and persistent. Awareness programs must allow working out any misinformation regarding vaccination. It is important that vaccination is an issue of clinical health rather than political. At observational level before implementation of vaccination program positive public opinion is an important social support, common beliefs and pre-judies must ignore. Problems created by unethical religious groups always endanger public health. Therefore, for successful reduction in disease incidences is only possible through vaccination, and all anti-vaccine movements create chaos, illusion and misconception in the society about scientific researches. In spite of the facts vaccination is lonely hope to reduce disease risk and cut down mortality rate. Public opinion around vaccine safety and market cost should also largely discuss among the people [8]. There is an immense need to generate timely safe and efficacious vaccines against newly emerging bacterial and viral diseases. In next 10-20 years many more virus strain

will emerge and we will need most effective vaccine against these untimely attacks of pathogens. Hence, there is a need to generate new vaccines for infections that must be more disease preventable. It will need continued researches for improving existing technology and quality of vaccines to maintain and extend their efficacy. Non-responsiveness increases with age and in elderly persons > 65 years vaccine schedules and doses differ than the children and adults. Therefore, at least primary vaccination should be adapted according to age may be successful only with extra medicare. In addition, other host-related factors associated with non-responsiveness are overall health status, genetic factors, nutrition quality and diet structure and physical exercise are important for host/vaccinee to mount sufficient protective antibody responses [9].

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