REVIEW

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Aspects Concerning Development of Vaccine and Vaccination

Liana Monica DEAC

First Degree Researcher, Senior Epidemiologist, Assoc Professor Babes -Bolyai University, Cluj- Napoca, Romania

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ABSTRACT

Vaccines can prevent or ameliorate infectious diseases morbidity and mortality. Vaccines generate immunity across the body as a whole, but they can also provoke specific immune responses in specific bodily areas. Vaccination includes various ways of administering immunogenes. Edward Jenner is considered the founder of vaccinology. With his importnata studies it was figured out that when a sufficiently large percentage of a population has been vaccinated, herd immunity results. The revolution of genetic engineering toward the end of the 20th century has greatly impacted vaccine development. Understanding the nature and cause of disease provides a basis for preventive action and control as even to improve the life quality by using the vaccination in the world

∗Corresponding author. E-mail: liana_deac@yahoo.com

General consideration about Vaccination and Vaccin

Vaccination is the administration of antigenic material which means a vaccine, for to stimulate an individual's immune system to develop adaptive to a pathogen. In common speech, *vaccination* and *immunization* have a similar meaning. This distinguishes it from inoculation, which uses unweakened live pathogens, although in common usage either can refer to an immunization. Stimulating immune responses with an infectious agent is known as immunization (Artenstein, 2010). Vaccination includes various ways of administering immunogens. It is known that the process of inoculation was used by Chinese physicians in the 10th century. The first rabies immunization was given by Louis Pasteur to a child after he was bitten by a rabid dog (Plotkin, 2011). While vaccination provides a lasting effect, it usually takes several weeks to develop, while passive immunity, which means the transfer of antibodies, has immediate effect.

Vaccines can prevent or ameliorate infectious disease. When a sufficiently large percentage of a population has been vaccinated, herd immunity results. The effectiveness of vaccination has been widely studied and verified. Most vaccines are given by hypodermic injection as they are not absorbed reliably through the intestines. Live attenuated polio, some typhoid, and some cholera vaccines are given orally to produce immunity in the bowel.

Vaccines generate immunity across the body as a whole, but they can also provoke specific immune responses in specific bodily areas. For this reason, the varying delivery methods of vaccines are important. However, specific delivery routes are also sometimes necessary to minimize the chances of vaccines having adverse effects on the body (Hutin et al., 2003). Depending on the vaccine(s) that are to be administered, and the age and size of the person to be vaccinated, decide on the appropriate injection site and route, and the injection equipment required. Most vaccines available in the world are given intramuscularly. Only a few vaccines are given subcutaneously, orally or intradermally. It is important that infants and children do not move during injection of vaccines. Most vaccines can be administered into the deltoid area. The choice of injection site mostly depends on the age of the person to be vaccinated.

Practice of vaccination

According to the World Health Organization (WHO), 1,500 people die of an infectious disease every hour. Vaccines are given to people when they are at risk of contracting a disease. Many vaccines are given at a young age because children's bodies may not be strong enough to fight off naturally occurring diseases, which puts them at risk. The practice of immunization dates back hundreds of years. According to the literature, the history of vaccination can be traced back to as early as the 7th century when the monks in India tried to immunize themselves by drinking snake venom. The first vaccination was inoculation with human smallpox, a practice widely carried out in ancient India, Arabia, and China.

Edward Jenner is considered the founder of vaccinology in the West in 1796, after he inoculated a 13 year-old-boy with vaccinia virus (cowpox), and demonstrated immunity to

smallpox (Baxby, 2011 in Plotkin, 2011). In 1798, the first smallpox vaccine was developed. Over the 18th and 19th centuries, systematic implementation of mass smallpox immunisation culminated in its global eradication in 1979. Smallpox became a preventable disease by injecting pus extracted from a human infected with cowpox virus. Jenner named the substance "vaccine" after the Latin word "vacca" which means "cow," and thus the process of giving vaccine became "vaccination". The story of vaccines did not begin with the first vaccine–Edward Jenner's use of material from cowpox pustules to provide protection against smallpox.

It is obvious that from the late 19th century, vaccines could be developed in the laboratory. However, in the 20th century, it became possible to develop vaccines based on immunologic markers. In the 21st century, molecular biology permits vaccine development that was not possible before. The revolution of genetic engineering toward the end of the 20th century has greatly impacted vaccine development. Vaccination spread across the globe – although these early vaccines were crude, they worked. The first vaccination programmes dramatically reduced the number of deaths from disease and were crucial in establishing the concept of preventative public health measures. Rather, it begins with the long history of infectious disease in humans, and in particular, with early uses of smallpox material to provide immunity to that disease.

The small pox vaccination efforts had historical significance because ability to control the infectious disease was achieved and the vaccination saved many lives by preventing smallpox during this period. Edward Jenner, Louis Pasteur, and Maurice Hilleman, pioneers in vaccine development receive particular attention as well. Maurice Hilleman was the most prolific vaccine inventor, developing successful vaccines for: measles, mumps, hepatitis A, hepatitis B, chickenpox, meningitis, pneumonia and Haemophilus influenzae.

World War II accelerated vaccine development. Fear of a repetition of the 1918–19 world epidemic of influenza focused urgent attention on all viral diseases, while commercial production of antibiotics taught researchers to grow viruses with less microbe contamination. Also, investigators paid closer attention to vaccine safety and effectiveness through clinical studies before release of a vaccine to the public, especially after the yellow fever vaccine apparently caused hepatitis B in many U.S. soldiers in 1942.

In 1948, Bacillus Calmette-Guérin (BCG) vaccine was produced and inoculated, and in 1949, the Central Quarantine Laboratory produced anti-serum and performed vaccination against 18 preventable diseases. In March 1948, John Enders, Thomas Weller, and Frederick Robbins used human embryonic skin and muscle tissue, grown in a nutrient mix with antibiotics, to prove poliovirus could infect tissue other than nerve cells. Their confirmation meant that researchers could now grow enough poliovirus to create large quantities of vaccine. The three scientists won the Nobel Prize in Physiology or Medicine in 1954, the year polio vaccine had its first large clinical trial. Neither Jonas Salk nor Albert Sabin received a Nobel Prize for their work in creating vaccines.

In 1954, the Infectious Disease Prevention Act was established and routine vaccination was specified. Smallpox, diphtheria, whooping cough, typhoid fever, typhus, paratyphoid fever, and tuberculosis vaccination were given. Diphtheria-tetanus-pertussis (whooping cough). DTP vaccine in 1955, killed polio vaccine in 1958, and inactivated vaccine for typhoid fever in 1960 were used.

In 1991, the Pan American Health Organization located the last wild-type polio case in the Western Hemisphere-a nine-year-old boy in Peru. The last person to contract wild-polio in the western Pacific region occurred in 1997, and in Europe in 1998. In developing nations, the eradication of polio and attempts to control HIV/AIDS and malaria are in competition for funds and workers. India reported only eight new polio cases in 2004; Nigeria reported 257. By comparison, a total of about four million people are living with HIV/AIDS in India and Nigeria. A high success appeared for the end of Polio after using in USA the vaccination.

The middle of the 20th century was an active time for vaccine research and development. Methods for growing viruses in the laboratory led to rapid discoveries and innovations, including the creation of vaccines for polio. Researchers targeted other common childhood diseases such as measles, mumps, and rubella, and vaccines for these diseases reduced the disease burden greatly.

2020 allowed us, an equitable access to safe and effective vaccines which is useful today in the idea to prevent the COVID-19 pandemic (WHO, 2021, library@who.int.). So, it is hugely encouraging to see so many vaccines proving and going into development today. Being vaccinated does not mean that we can throw caution to the wind and put ourselves and others at risk, particularly because research is still ongoing into how much vaccines protect not only against disease, but also against infection and transmission. Now, we must worldwide ensure fair and equitable access to vaccines, and even to ensure every country to receive them and to offer opportunities to can roll them out, in the wished idea to protect their people, starting with the most vulnerable. WHO is working tirelessly with partners to develop, manufacture and deploy safe and effective useful vaccines against this terrible disease. As of 3 June 2021, WHO has evaluated that the following vaccines against COVID-19 and have met the necessary criteria for safety and efficacy: AstraZeneca/ Oxford vaccine, Johnson and Johnson, Moderna, Pfizer/BionTech, Sinopharm, Sinovac. Certainly, it is not vaccines that will stop the pandemic, its vaccination doing this.

To eliminate the risk of outbreaks of some diseases, at various times governments and other institutions have employed policies requiring vaccination for all people. Beginning with early vaccination in the nineteenth century, these policies were resisted by a variety of groups, collectively called, who object on scientific, ethical, political, medical safety, religious, and other grounds. Although vaccination was taken up enthusiastically by many people, but during the time there was some violent opposition as it became more widespread in some lands.

In countries with limited financial resources, limited vaccination coverage results in greater morbidity and mortality due to infectious disease. More affluent countries are able to subsidize vaccinations for at-risk groups, resulting in more comprehensive and effective coverage. WHO estimate that vaccination averts 2-3 million deaths per year, in all age groups and there is proved up that to 1.5 million children die each year due to diseases which could have been prevented by vaccination.

New orientation in the world vaccination activities

The past two decades have seen the application of molecular genetics and its increased insights into immunology, microbiology and genomics applied to vaccinology. Current successes include the development of recombinant hepatitis B vaccines, the less reactogenic acellular pertussis vaccine, and new techniques for seasonal influenza vaccine manufacture.

Molecular genetics sets the scene for a bright future for vaccinology, including the development of new vaccine delivery systems (e.g. DNA vaccines, viral vectors, plant vaccines and topical formulations), new adjuvants, the development of more effective tuberculosis vaccines, and vaccines against cytomegalovirus (CMV), herpes simplex virus (HSV), respiratory syncytial virus (RSV), staphylococcal disease, streptococcal disease, pandemic influenza, shigella, HIV and schistosomiasis among others (Huber, 2014). Innovative techniques now drive vaccine research, with recombinant DNA technology and new delivery techniques leading scientists in new directions. Disease targets have expanded, and some vaccine research is beginning to focus on non-infectious conditions such as addiction and allergies. Therapeutic vaccines may also soon be available for allergies, autoimmune diseases and addictions.

We are still learning about how long immunity to COVID-19 lasts from natural infection, and from vaccination. We are now starting to see evidence that the immunity you get after having COVID-19 can be strong. However, the type of immunity that's developed after infection varies from person to person, making it less predictable than immunity after vaccination. Scientists are working hard to understand this better. The WHO-authorised COVID-19 vaccines have been safely given to billions of people and it is proved already to be much safer to get vaccinated than it is to risk getting COVID-19. As we learn more about COVID-19 and immunity, WHO continues to update our guidance and recommendations.

The criteria for selection of the national immunization program is effectiveness, stability, cost-benefit, convenient application, financial resources, storage and social-cultural standards for each land- country, worldwide, up to the local medical registrant morbidity or mortality incidence and WHO recommendations. It is so a specifies coverage of vaccination everywhere with quality and standard methods of vaccination, detailed by medical policies for to decrease infectious diseases, or even for an eradication plan of some of them, or mostly for the general wish of preventable infectious diseases elsewhere activity (Deac, LM, 2010).

Proper vaccine administration is critical to ensure that vaccination is safe and effective. CDC recommends that all health care personnel who administer vaccines receive comprehensive, need good competency-based training on vaccine administration policies and procedures before administering vaccines. Patients and their family members count on health care personnel to administer vaccines safely. Always screen patients for contraindications and precautions before a vaccine is administered, even if the same vaccine was administered previously. Each vaccine has a recommended administration route and site. This information is included in the manufacturer's package insert for each vaccine. If multiple vaccines are administered at a single visit, administer each injection in a different injection site.

Conclusions

Vaccination is a miracle of modern medicine, with high interest worldwide for the goal to prevent infectious diseases .The growing interest of public health related to vaccination activity, reflects that they are well aware of preventable diseases and safety issues of vaccines unlike in the past and even in the developing use for the future and in worldwide use necessities. The development of vaccination has been highlighted as a striking achievement of medical sciences and it is used for it the most modern and newest technologies as well many modern research fields activities. With spontaneous introductions of new vaccines, the selection of vaccines had to be produced and to be used and must be determined, based on local diseases- disease burden of each infection region data, high quality of epidemiology studies, particular infectious interpretations, applied for a general or particuar infectious morbidity, or even with worldwide applicability today.

Researches in many areas are under way and we hope that some of them may be in fact done in best order for an organized preventable activity in general use, to decrease many infectious well known or newer infectious pathology.

WHO and CDC work out, and watch out worldwide a best activity for development of new vaccines in best use for: children, adults and elderly people.

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There is no conflict of interest

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