Research Article

Vaccination is Health Obligation

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Abstract

Vaccination is one of the most effective preventative measures to protect an individual and the entire population against various infectious diseases. Vaccination is also effective in combating diseases such as diphtheria, tetanus, yellow fever, polio, measles, mumps, rubella, and hepatitis B. By vaccination, several dangerous infectious diseases have been eradicated. Vaccination aims to stimulate the immune system to create specific antibodies and thus to induce immunity against a particular infectious disease. Vaccination as a public health measure is the greatest medical success of the 20th century and vaccination has saved more lives than any other medical intervention in history. Vaccination is the introduction of antigens into the body to produce antibodies, which, when encountered with the micro-organism from which the vaccine originates, will prevent the development of the disease. Antigens are specific foreign bodies that trigger the body's immune response.

Keywords: *Immune System, Vaccination, Health.*

Introduction

The biological basis of successful vaccination is our complex immune system and its response to pathogens (1). Vaccination can induce an immune response that mimics natural infection or tries to do even better than our response to a pathogen. Vaccination induces an immune response in the individual vaccinated.

The population of hosts has a collective level of immunity that results from the level of immunity in the individuals that compose it. The collective immunological status of a population of hosts, as opposed to an individual host, to a given pathogen is called herd immunity. Maintenance of individual immunity can depend on repeated boosting by natural infection. The level of transmission may be diminished by high levels of immunization or natural immunity in a population to the point that natural boosting of immunity does not occur. Thus for some infections, a complex interplay between individual and population-level immunity is maintained through the dependent happenings.

Vaccines function by stimulating the immune system and prompting a primary immune response to an infecting pathogen or molecules derived from a particular pathogen (2). The immune response elicited by this primary exposure to vaccine pathogen creates immunological memory, which involves the generation of a pool of immune cells that will recognize the pathogen and mount a more robust or secondary response upon subsequent exposure to the virus or bacterium. In successful immunization, the secondary immune response is sufficient to prevent disease in the infected individual, as well as prevent the transmission of the pathogen to others. For communicable diseases, immunizations protect not only the individual who receives the immunization, but also others with whom he or she has contact.

High levels of vaccination in a community increase the number of people who are less susceptible or resistant to illness and propagation of the infectious agent. Unvaccinated individuals or those who have not developed immunity to this pathogen are afforded an indirect measure of protection because those with immunity reduce the spread of the pathogen throughout the entire population. The larger the proportion of people with immunity, the greater the protection of those without immunity. This effect is called “herd immunity.” Herd immunity is an important phenomenon as immunization programs rarely achieve 100 percent immunization in a population; and in some cases, previously vaccinated persons may not exhibit effective immunity and disease may result from exposure to the pathogen. For protection, immunization of not only ourselves but also our neighbors are important.

The overwhelming safety and effectiveness of vaccines in current use in preventing serious diseases have allowed them to gain their preeminent role in the routine protection of health. Before an immunization is introduced for population-wide use, it is tested for efficacy and safety. However, immunization is not without risks. For example, it is well established that the oral polio vaccine on rare occasions causes paralytic polio and that vaccines sometimes lead to anaphylactic shock. Given the widespread use of vaccines; state mandates requiring vaccination of children for entry into school, college, or daycare; and the importance of ensuring that trust in immunization programs is justified, safety concerns must receive assiduous attention.

Immune System

The immune system evolved to defend our bodies against infectious microorganisms such as viruses, bacteria, fungi and parasites (3). Throughout history, it has been observed that people who survive an infectious disease acquire protection against that disease, which is otherwise known as immunity. As far back as the fifteenth century attempts have been made to induce immunity against infectious diseases, a process referred to as vaccination. The realization that immunity can be transferred from one person to another demonstrated that soluble factors exist in the blood and body fluids that protect against pathogens. It is now known that cellular components of the immune system are also present throughout the entire body and that these immune cells engage with any harmful substance or microorganism to preserve the integrity of host tissues. The defense against microorganisms is fought on many fronts and there are immune cells and innate components of the immune system within every tissue and organ. There is a multitude of cells and soluble factors that can be considered part of the immune system. For example, the barrier function of the outer layers of the skin, the mucus produced in the airways, the antibodies secreted into the gut lumen of the circulating lymphocytes that destroy virus-infected cells. The immune system comprises several different cell types and a multitude of secreted factors and surface-bound molecules.

The immune system has a multi-layered organization that provides immunity to infectious organisms. Each layer of the immune system can also be considered to have increasing complexity. The first layer is provided by physical barriers such as the skin and the mucosal epithelium of the respiratory and gastrointestinal tracts. These barriers aim to prevent pathogens from gaining access to underlying tissue. The next layer is the non-specific chemical barrier that consists of antimicrobial compounds and factors of the humoral immune system (soluble factors found in body fluids). Other chemical immune defense mechanisms include the acidic environment of the stomach and the proteolytic enzymes produced in the intestines. The third layer is composed of all the cells of the immune system. Therefore, if a pathogen breaches the physical barriers and chemical barriers then the immune system utilizes its immune cells.

It is the task of the immune system to protect the host against invading pathogens and thereby to prevent infectious disease **(**4**)**. A plethora of pathogens exists (i.e. viruses, bacteria, fungi, parasites, and helminths) that have exploited strategies to circumvent an attack by the immune system. Conversely, the immune system has evolved to provide appropriate defense mechanisms at various levels of 'unspecific' (innate) and 'specific' (adaptive) immune responses. In many instances, an appropriate immune response to an infectious agent requires reciprocal interactions between components of the innate and adaptive immune systems.

The various microorganisms have developed different strategies to invade their host. Viruses make use of the host cell's machinery for replication and are thus intracellular pathogens. Helminths, the other extreme, are multicellular organisms that cannot live within host cells but rather behave as extracellular pathogens. In between are bacteria, fungi and protozoa, which, depending on the species, live within or outside host cells.

While the components of the innate immune system are appropriate as the first line of defense, the adaptive (or specific) immune system is activated if the invading microorganism cannot be eliminated, or at least be neutralized, by the abovementioned non-specific effector mechanisms. Two major features characterize the adaptive immune system. Firstly, the immune response is antigen-specific; specificity is made possible through the usage of clonally distributed antigen receptors, i.e. surface Ig on antibody-producing B lymphocytes and T cell receptors (TCRs) on the surface of T lymphocytes. Secondly, the specific immune system develops memory. This allows the rapid response of antigen-specific effector cells upon the second encounter of the relevant antigen. The underlying general principle of vaccination is the stimulation of specific immunity with long-lasting memory by harmless components of an infectious agent or by attenuated strains. This endows the host with the capacity to combat the homologous pathogen with high efficiency and thus prevents disease outbreak.

In newborns, the immune system is not yet able to form disease-specific antibodies to all diseases; rather, it is just beginning to differentiate itself from non-self at a cellular level **(**5**)**. It can form non-specific antibodies to a limited variety of antigens. Generalized immune reactions such as fevers, inflammation, and discharges are also developed in infants. The required antibodies to specific diseases are passed from the nursing mother to the infant through the colostrum (the milky substance produced by the mother before breast milk) in the first days after birth. This colostrum, given that the mother has the antibodies to the specific diseases in question, will provide passive immunity to the child for the first few months to years of its life. Infants who do not breastfeed, as they do not acquire these antibodies, become more susceptible to getting sick.

Public Health

The tension between the interests of individuals in making their own decisions about their health and the collective interests of society in the promotion of health, safety and security are crucial for many aspects of primary health care practice **(**6**)**. For example, successful primary health care interventions often work best if they encourage people to make healthy choices by limiting the availability of unhealthy alternatives. Similarly, health education programs that use complex social marketing campaigns often succeed precisely because they manipulate people's understanding of health issues. Initiatives such as these raise questions about how we can balance the sometimes intrusive and restricting nature of programs that promote health and prevent disease with the need for individuals to take responsibility for their health.

One classic example of this dilemma is the delivery of immunization programs. Immunization has been one of the core activities of primary health care, in both developed and developing countries. Vaccination programs have eradicated or significantly reduced the incidence of several diseases associated with high levels of mortality and morbidity (for example, smallpox and polio). These benefits accrue to individuals, but they also accrue to whole populations in ways that extend beyond the benefits to those individuals who choose to be vaccinated. Mass vaccination programs, if their coverage is extensive enough, can lead to herd immunity, which can protect not only those who are immunized but also those who are not. The dilemma for immunization programs is that allowing individuals to choose not to be vaccinated can also harm people who have been vaccinated. If enough people choose not to be vaccinated, eventually the value of herd immunity is lost, potentially leading to outbreaks which will affect people who have been vaccinated (because vaccines do not have a 100% success rate), a version of the tragedy of the commons.

Disease Prevention

Vaccination is widely considered to be one of the greatest medical achievements of civilization and one of the top breakthroughs of humanity **(**7**)**.

From an almost empirical origin of vaccinology to the present vaccinomics, our knowledge has evolved substantially and we have learned important lessons. Although the main target of a vaccine is direct protection against a particular microorganism or disease, the scope of vaccination has expanded with the discovery that vaccines can also protect unvaccinated people through herd protection, or even that certain vaccines can protect against additional diseases different from those that they were designed to prevent, through so-called heterologous effects.

Disease prevention through vaccination is the most cost-effective health care intervention available. The World Health Organization (WHO) estimates that every year immunization saves between two and three million lives across the world. One hundred years ago, infectious diseases were the main cause of death worldwide, even in the most developed countries. Today, common childhood diseases of previous generations are becoming increasingly rare thanks to vaccines, and there are new vaccines on the horizon with the potential to prevent even more. Mass immunization programs have proven successful at controlling or even eliminating the disease.

The term "herd immunity" was coined a century ago, but its use has become widespread in recent decades to describe the reduced risk of infection among susceptible individuals in a population, induced by the presence and proximity of vaccinated individuals. Herd immunity makes it possible to protect a whole community from infectious disease by immunizing a critical percentage of the population. Just as a herd of sheep uses its sheer number to protect individual members from predators, herd immunity protects a community from infectious disease by the number of immune individuals. The more members of a human herd are immunized, the better protected the whole population will be from an outbreak of disease.

Mass vaccination is the best way to rapidly increase herd immunity either for accelerating disease control and to rapidly increase coverage with a new vaccine or in the setting of an existing or potential outbreak, thereby limiting the morbidity and mortality that might result.

Even if the increase in population immunity is not sufficient to achieve infection elimination owing to low vaccine efficacy or insufficient coverage, the risk of infection among unvaccinated persons may still be reduced. This may be particularly important for those for whom vaccination is contraindicated. The paradox is that for an individual, about vaccination in a population, the best option is that everybody else is vaccinated and the individual is not. This way the individual is protected from infection because of the herd effect but suffers none of the potential adverse effects of vaccination. Finally, these indirect effects may eventually be deleterious, if as a consequence of reducing the risk of infection among those susceptible, there is a displacement of the risk of infection to other age groups and/ or to a more vulnerable population, as has been suggested for varicella or hepatitis A in certain scenarios.

Vaccines

Vaccines are by far the most successful life-saving medical developments in modern times (8). Very successful vaccines have been developed with little knowledge of either the pathogen or the human immune system. Due to a better understanding of the complex biology of viruses, bacteria, and the immune system and because of technological advances in biotechnology, vaccines are now available against a large assortment of microorganisms. Yet despite our advanced knowledge, no vaccine is available to protect against notorious infectious life-threatening diseases like AIDS, TBC, and malaria. Decades of research have not delivered a vaccine against the respiratory syncytial virus (RSV), which is a major cause of pneumonia and bronchiolitis in infants and the elderly. The low-hanging fruit of the easy targets has been picked and this early success strengthened the hope and belief that infectious diseases would be held in check and could be eradicated given enough effort. Eradication has only been achieved for smallpox and is being pursued by other viruses like polio. However, this early optimism has disappeared. Even infectious diseases that are kept in check with effective vaccines still pose a threat because the continuous evolution of microbial reservoirs can cause a return of the disease because of mismatch with the vaccine. Such recurrent update of the vaccine strain is common practice for the influenza virus which is continuously sampled around the globe to select the matching vaccine for next year's epidemic.

Aging population demographics, combined with suboptimal vaccine responses in the elderly, improve vaccination strategies in the elderly a developing public health issue (9). The immune system changes with age, with innate and adaptive cell components becoming increasingly dysfunctional. As such, vaccine responses in the elderly are impaired in ways that differ depending on the type of vaccine (e.g., live attenuated, polysaccharide, conjugate, or subunit) and the mediators of protection (e.g., antibody and/or T cell). The rapidly progressing field of systems biology is useful in predicting immunogenicity and offering insights into potential mechanisms of protection in young adults. Future application of systems biology to vaccination in the elderly may help to identify gene signatures that predict suboptimal responses and help to identify more accurate correlates of protection. Moreover, the identification of specific defects may be used to target novel vaccination strategies that improve efficacy in elderly populations.

The value of vaccines is that they allow an individual to develop immunity to a disease without first contracting the disease and becoming sick (10). The key to this outcome is the presence of modified pathogen antigens in the vaccine. Some vaccines contain killed or inactivated versions of the pathogen itself. Others are genetically engineered so that only antigens from the pathogen and not the whole pathogen are used.

What all vaccines have in common is that the antigens must either be weakened enough or be in a partial form so that they cannot cause the disease they are immunizing against. On the other hand, they must be strong enough to stimulate the production of antibodies and the development of memory cells. When this balance is achieved, the individual acquires immunity without risking the health effects of having the disease and without becoming contagious and passing the disease to others in the community. Immunity acquired through vaccination is called artificially acquired active immunity.

Naturally acquired immunity, created by having a disease and recovering, is the strongest form of immunity, but the individual experiences all the symptoms and risks associated with having the disease. The strength of artificial immunity created by vaccination can last a lifetime or for a shorter period, depending on the disease, the effectiveness of the vaccine, and the strength of the individual's immune system response.

Infections and their associated diseases are arguably the most significant environmental factors impacting individual health, as well as the overall health and wellbeing of populations (11). The successful development and implementation of interventions to prevent and treat infections over the past two centuries have had a profound positive effect on human and animal health. Among these interventions, the use of vaccines in healthy people for the prevention of infection has proven to be one of the most effective, from both public health and economic perspectives. Vaccination has resulted in the eradication of smallpox and, in many parts of the world, substantial control of deadly diseases such as measles, polio, pneumococcal pneumonia, tetanus, diphtheria, rotaviral diarrhea, and hepatitis B. There are numerous other infectious diseases to add to this list, but the control and elimination of these alone have yielded substantial improvements in the quality and quantity of life.

Given this, understanding the technical challenges in vaccine development, manufacture, and supply is critical to assure the continuous availability of existing vaccines and to facilitate the introduction of new vaccines. Vaccines are complex biological products that encompass a full spectrum of entities from whole infectious attenuated organisms to chemically and genetically modified proteins and polysaccharides. The structural and formulation complexities of vaccines are extraordinary and are further amplified by the unique fact that vaccines have no inherent biological activity other than the ability to elicit an effective immune response in the recipient. Accordingly, a thorough analytical understanding is essential to assure a vaccine's biological consistency as it undergoes its developmental transition from the research laboratory to the manufacturing scale. Detailed analytical understanding is also essential to assure a vaccine's consistency of production and effectiveness over the years of use. In the end, analytical understanding is fundamental to the maintenance of effective vaccine supply.

Combination Vaccines

Since the beginning of the vaccination era, the number of vaccine-preventable diseases has continued to increase at a fast rate (12). Traditionally, with each new vaccine included in the vaccination schedule, a new injection was required to administer the immunization, and this sparked multiple responses from different social sectors: on the one hand, general practitioners were confused by the ever-changing immunization schedules; on the other hand, parents were concerned about their children becoming "pincushions". This problem, far from being solved, continued to worsen as the number of vaccines in development raised each year, making the situation more pressing.

Different approaches emerged to address the problem. One of these involved deferring additional injections until the next office visit. However, ultimately, this strategy backfired: the increasing costs and burden on staff associated with the scheduling of new visits, combined with the increased likelihood of vaccinations being missed, ended up jeopardizing vaccination coverages. In this context, the necessity for combination vaccines became acute. Combination vaccines are individual preparations that include two or more antigens of different microorganisms.

Combination vaccines have been used in adults and children alike for over half a century; in 1948, the combination of diphtheria, tetanus, and pertussis antigens into a single vaccine was first used to vaccinate infants and children. Since then, many new techniques have been developed and the number of components combined into a single product has risen greatly.

Immunization Strategy

In 2005, the World Health Assembly adopted resolution WHA 58.15 on global immunization strategy (13). It "urged the Member States to meet immunization targets expressed in the United Nations General Assembly special session on children; to adopt the Strategy as the framework for the strengthening of national immunization programs, to achieve greater coverage and equity in access to immunizations, of improving access to existing and future vaccines, and of extending the benefits of vaccination linked with other health interventions to age groups beyond infancy; to ensure that immunization remains a priority on the national health agenda, ….”

The diversity of the European Region is reflected not only in the cultures and languages but also by economies and health systems. The economic, cultural, and historical differences have all contributed to the resulting diversity seen in the health systems and health governance among them, differences that have contributed to the wide variation of immunization programs currently in place.

All Member States of the European Union and a large number of the non-EU countries in the WHO European Region have a national immunization technical advisory group (NITAG) on immunization, and most of these NITAGs have a legislative basis for making recommendations to the government (i.e., the Ministry of Health). The effect of the recommendations varies according to how immunization programs are organized (centralized or decentralized) and the balance between public and private sector provision of services. In countries such as Belgium, Germany, and Spain, the communities (Belgium), the Länder (Germany), or the “autonomous regions” (Spain) have the responsibility for the prevention and protection of public health. Although each country has a NITAG, its recommendations can be modified at the local level, and the vaccines provided depend on the choice of private practitioners and reimbursement arrangements with insurance companies.

Parents

Parents employ various strategies to make decisions they believe are in their children’s best interests (14). Their decisions are informed by and reflect a complex web of meaning made up of interpretations of culture, experience, tradition, media, peers, expert advice, and their sense of morality. The interplay between parents’ interpretations of cultural meaning and parenting strategies can be seen most clearly in parents’ decisions whether to consent to childhood immunizations. Although all states require certain vaccinations to attend schools, the safety and necessity of vaccines remain controversial.

Parents make decisions for their children based on their assessment of their children’s needs, desires, abilities, and ambitions daily (15). In an expanding number of spheres— schools, media, extracurricular activities— parents generally, and mothers specifically, are expected to be experts on their children. As parents are increasingly expected— and expect— to cultivate children into adulthood, it is not surprising that this culture of individualism and demands for parental expertise extend into areas of healthcare, including childhood vaccine choices. Parents who opt out of vaccines are often portrayed as either ignorant or armed with "internet educations." This dismissive view of the small number of parents who intentionally refuse vaccines underestimates the labor and intent these parents bring to their vaccine choices and to claiming their expertise.

Decisions about vaccines can be said to embody the rational choice framework, in which all individuals are presumed to be informed consumers out to maximize the benefits and minimize the costs for themselves and their children. The public health system asks parents to consent to vaccines based on the general recommendations of scientists and public health practitioners at the same time that most of the healthcare landscape is increasingly individualizing risk and customizing choice. Vaccine decision-makers— that is, those choosing whether to consent to consume vaccines for their children and sometimes themselves— view the vaccine choice through this individualized lens, with disease prevention a process of personal risk assessment, lifestyle adjustment, and individual choice. We see an ethos that disease is largely preventable through personal responsibility. This shift of responsibility from the state to the individual shapes how parents approach their choice about whether to vaccinate.

Anxiety

More than 70 bacteria, viruses, parasites, and fungi are serious human pathogens (15). Vaccines are available against some of these agents and are being developed against almost all the other bacteria and viruses and about half of the parasites. Over the last four decades, routine childhood immunization in the USA has led to the eradication or control of several vaccine-preventable diseases, including smallpox, polio, diphtheria, Hemophilus influenzae type b (Hib), measles, mumps, and rubella. Vaccines have been described as the single most life-saving accomplishment of the twentieth century. Parents and many health care providers of the twenty-first century, particularly in more developed areas of the world such as the USA and WE, have limited or no experience with the devastating effects of these diseases. In the US public health officials now recommend 28–31 vaccine doses before the age of 18 years, many of which are administered together to provide protection early in life, for the convenience of families and health care providers, and to decrease distress to the infant. Public health experts recommend that 95 % of the population be vaccinated to provide herd immunity and minimize the possibility of a resurgence of these deadly infections. However, parents in developed countries who have not seen these diseases or their disastrous consequences sometimes feel that they are being pressured into immunizing their children involuntarily for the public good rather than personal benefit. Some parents even perceive a greater risk to their children from vaccination than from the diseases themselves, not recognizing that the threat from these diseases is reduced simply because we do have effective vaccines to prevent them. Vaccination has thus regrettably become a polarizing issue with some parents stressing their own child's well-being at the one extreme and health experts advocating for public health outcomes on the other.

Vaccines are also special in linking the most global with the most local and personal (17). Aiming to reach every child on the planet, vaccination technology has a uniquely global character. Vaccines are produced, distributed, and monitored within equally globalized systems. Yet vaccination reaches from the global into the most intimate world of parenting and care. At the needlepoint, the most global meets the most personal of worlds. As a technology, it enters the intense social world in which parents and carers seek to help their children flourish, spanning genders and generations, comrades and communities, and advice-givers. These are everyday words that vary enormously across the globe, and over time. Within them, some jostle for vaccination. Others jostle against. Through thinking and talking about vaccination, people often express a great deal about what they value, who they are and whom they identify with.

Controversies over vaccines feed cornerstone debates of our time. For while vaccination is easily represented as a universal, neutral good, it is deeply bound up with politics: with struggles over status, authority and value, writ small and writ large. Thus as some British parents from the 1990s refused to take their children to receive the MMR vaccination, fearing that it would trigger autism, the debates that swirled through policy, professional, media and popular circles ranged widely. They variously evoked notions of trust in government; of media responsibility; of scientific impartiality; of parental choice; of citizenship rights, and the appropriate limits of government action and enforcement in a liberal democracy. From 2003, some northern Nigerian parents refused to take their children to receive oral polio vaccination, fearing that it would reduce their future fertility or infect them with HIV as part of a genocidal plot against Islamic Africa. Again, debates and commentary expanded into far wider questions of governance. They invoked the relations between local and national government; trust in the federal government and its global sponsors; the motivations of US foreign policy; scientific impartiality (Whose science? Whose vaccines?); the value of different health priorities, and, as Nigerian news spread across the airwaves and polio cases reappeared across the region, the role and responsibility of media in a globalized world.

Appreciating the positive in the double-edge of anxiety has broader implications for understanding public engagements with science and technology. Many debates about and explanations for controversies over public issues involving science are framed in terms of public misunderstanding or lack of understanding of science, technology, or its risks. In an extension of this 'deficit model', the lack maybe not just of knowledge, but of trust – in both science itself and its governance. The emphasis is on the negative – deficits of knowledge, deficits of rationality, deficits of trust – on the part of the public. And in response, scientific institutions are called to respond by winning hearts and minds.

But this well-established set of perspectives, in focusing on what people do not think or understand, misses what they do think and understand. It obscures why what they do think might make sense, as part of their everyday lives and experiences, values and conceptualizations of the issues involved. It misses the opportunity to identify the 'framings' – forms of knowledge, value and social commitment – that people bring to an issue, and which shape their anxieties about it, whether positive or negative. And it misses opportunities to identify mismatches between people's framings, and those of the institutions involved with science or governance. A positive perspective that focuses on how members of the public frame issues involving science and technology, in turn, suggests that similar questions should be asked of those developing and promoting technologies, or exerting authoritative governance over issues involving science. How one might ask, do scientific and policy institutions frame the issues, and what kinds of knowledge, social and political values and commitments do these framings embody? This will shed light on why it is that scientific and policy institutions represent the public in the ways that they do.

Recently, the public has frequently asked whether the vaccine is harmful or not [18]. Some claim that the vaccine is harmful and this proves the negative side effects that appear as a result of vaccination. Evidence-based medicines acknowledge that there are rare side effects, but that does not mean that the vaccine will harm every organism who receives it. Although the vaccines eradicated some illnesses, it is difficult to convince someone whose family member has been ill with a disease as a result of the vaccine. Unfortunately, such negative side effects are occurring in the practice.

Conclusion

In the pre-vaccination examination, doctor (school medicine specialist) determines whether vaccination should be postponed (from reasons of acute illnesses, fever, current therapy, etc) or declared contraindicated for the child (from reasons of hypersensitivity to vaccine ingredients, severe adverse reactions with previous vaccine administration, etc.). The decision about the non-vaccination of the child is made exclusively by a doctor. If there are no reasons determined by the vaccine doctor, the parent is obliged to vaccinate the child, otherwise, it endangers the health of the child and the entire population. Each vaccine can cause some side effects, but most vaccinated children have no reactions or they are mild, such as pain, redness, slight swelling at the injection site, a little elevated fever and similar conditions.

References

1.Halloran, M. E.; Longini, jr., I. M.; Struchiner, C. J. (2010.): "Design and Analysis of Vaccine Studies", Springer Science + Business Media, New York, USA.

2.Stratton, K.; Ford, A.; Rusch, E.; Clayton, E. W. (eds) (2012.): "Adverse Effects of Vaccines - Evidence and Causality", The National Academies Press, Washington, USA.

3.Williams, A. E.; Hussell, T.; Lloyd, C. (2012.): "Immunology - Mucosal and Body Surface Defences", Wiley-Blackwell, John Wiley & Sons Ltd, Chichester, UK.

4.Kaufmann, S. H. E.; Kabelitz, D. (2010.): "The Immune Response to Infectious Agents" in Kabelitz, D.; Kaufmann, S. H. E. (eds): "Immunology of Infection, Third Edition", Academic Press, Elsevier, London, UK.

5.Birch, K. (2007.): "Vaccine Free Prevention and Treatment of Infectious Contagious Disease With Homeopathy - A Manual for Practitioners and Consumers", Trafford, Bloomington, USA.

6.Braunack-Mayer, A. J. (2007.): "The Ethics of Primary Health Care" in Ashcroft, R. E.; Dawson, A.; Draper, H.; McMillan, J. R. (eds): "Principles of Health Care Ethics, Second Edition", John Wiley & Sons Ltd, Chichester, UK.

7.Martinon-Torres, F. (2017.): "Expected and Unexpected Effects of Vaccination" in Vesikari, T.; Van Damme, P. (eds): "Pediatric Vaccines and Vaccinations - A European Textbook", Springer International Publishing AG, Cham, Switzerland.

8.Back, J. W.; Langedijk, J. P. M. (2012.): "Structure-Based Design for High-Hanging Vaccine Fruits" in Austen, K. F.; Honjo, T.; Melchers, F.; Uhr, J. W.; Unanue, E. R. (eds): "Synthetic Vaccines", Academic Press, Elsevier, San Diego, USA.

9.Duraisingham, S. S.; Rouphael, N.; Cavanagh, M. M.; Nakaya, H. I.; Goronzy, J. J.; Pulendran, B. (2013.): "Systems Biology of Vaccination in the Elderly" in Katze, M. G. (ed): Systems Biology, Springer-Verlag Berlin Heidelberg, Berlin, Germany.

10.Davidson, T. (2019.): “The Vaccine Debate”, Greenwood, ABC-CLIO, LLC, Santa Barbara, USA.

11.Nunnally, B. K.; Turula, V. E.; Sitrin, R. D. (eds) (2015.): “Vaccine Analysis - Strategies, Principles, and Control”, Springer-Verlag Berlin Heidelberg, Berlin, Germany.

12.Martinón-Torres, F. (2017.): “Pediatric Combination Vaccines” in Vesikari, T.; Van Damme, P. (eds): “Pediatric Vaccines and Vaccinations - A European Textbook”, Springer International Publishing AG, Cham, Switzerland.

13.Van Damme, P. (2017.): “Childhood and Adolescent Immunization Programs in Europe” in Vesikari, T.; Van Damme, P. (eds): “Pediatric Vaccines and Vaccinations - A European Textbook”, Springer International Publishing AG, Cham, Switzerland.

14.Reich, J. A. (2010.): “Parenting and Prevention - Views of HPV Vaccines among Parents Challenging Childhood Immunizations” in Wailoo, K.; Livingston, J.; Epstein, S.; Aronowitz, R. (eds): “Three Shots at Prevention - The HPV Vaccine and the Politics of Medicine's Simple Solutions”, The Johns Hopkins University Press, Baltimore, USA.

15.Reich, J. A. (2016.): “Calling the Shots - Why Parents Reject Vaccines”, New York University Press, New York, USA.

16.Moffatt, K.; McNally, C. (2013.): “Vaccine Refusal: Perspectives from Pediatrics” in Chatterjee, A. (ed): “Vaccinophobia and Vaccine Controversies of the 21st Century”, Springer Science+Business Media New York, New York, USA.

17.Leach, M.; Fairhead, J. (2007.): “Vaccine Anxieties - Global Science, Child Health and Society”, Earthscan, London, UK.

18.Franjic S (2018) “Vaccination–Yes or No”. J Gen Pract (Los Angel).

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