

## A NECESSARY RETELLING OF THE VACCINE STORY

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Our environment is replete with rich varieties of bacteria, viruses and fungi. They do not waste time as they attack the human body as early as at birth, namely during the passage through the birth canal. While many neonates, children and adults become colonized, only some become actually infected by microorganisms, that is, they develop infectious diseases, which are products of the interaction of microorganisms and the human defense system. The microbial world is unpredictable, changeable and adaptable, as is evident in the microbes' abilities to develop high rates of antimicrobial resistance. On the other hand, the human defense system, with its innate and adaptive immunity, has the unprecedented ability to both recognize an almost endless number of antigens that originate from microorganisms and to create protection from them. After an initial response to a specific pathogen, the adaptive immunity has the ability to create an immunological memory that will render it capable to adequately respond to potential subsequent pathogens. All of the aforementioned characteristics, namely adaptive immunity, as

well as antigenic specificity and immunologic memory, are the basis of vaccination.

The invention of vaccination is considered to be one of the greatest medical achievements of modern civilization, and a turning point in the battle between microbes and humans. According to the definition of the World Health Organization (WHO) "A vaccine is a biological preparation that improves immunity to a particular disease. Vaccination is the act of introducing the vaccine into the body" (1). Stimulation of adaptive immunity through the process of vaccination is old/new, and in some cases the only possible strategy and defense in the prevention and control of some of the infectious diseases. The WHO reports that licensed vaccines are currently available to prevent or contribute to the prevention and control of twenty-five infections (1). However, there is still a need for the development of new vaccines against existing as well as newly emerging diseases, especially in a time when many powerful antimicrobials are lost due to resistance.

The pivotal characteristic of the development, production and application of the old/new vaccines is their safety, which must be continuously monitored and reevaluated. Both evaluation and research have successfully demonstrated that vaccination is a powerfully effective method for preventing infectious diseases as is evident in their restriction of morbidity and mortality as causes of vaccine-preventable diseases. Smallpox, for example, which was the most perilous disease

over the past centuries due to its high mortality rate, has been successfully eradicated by rigorous vaccination campaigns. Ever since the establishment of the childhood immunization program, common childhood diseases from the past (poliomyelitis, diphtheria, whooping cough, tetanus etc.) are now hardly observed (2).

Despite their powerful efficiency, vaccines do not come without risks. Some of the side effects of vaccination include allergic reactions, which are manifested as rashes or tenderness at the site of injection, high fevers with convulsions and dangerous infections among those with compromised immune systems. Serious complications due to vaccinations are rare in the general population. They mainly occur among people with weak immune systems, or among those who suffer from genetic and metabolic disorders, and it is difficult to prove that they have been caused by the vaccines themselves (2). Yet to be on the safe side and to avoid any possible complications, it is advised that each person undergoes a medical examination and/or counseling prior to being vaccinated.

Most countries now require vaccination as a means of prevention of a great number of childhood diseases, such as measles, rubella, mumps, diphtheria, whooping cough, poliomyelitis, pneumococcal diseases, haemophilus influenza diseases, hepatitis A and B, and so on. The hope is to achieve 90% to 95% immunity in the population in order to attain what is known as “herd immunity” or “community immunity.” Briefly, the definition of “herd immunity” or “community immunity” is the percentage of immune persons in a community that is needed to prevent the spreading of infections to susceptible persons, such as infants that are too young to receive vaccines, non-vaccinated children and adults, pregnant women, the elderly, individuals with weakened immune systems, and those who are allergic to vaccine components. In order to achieve global immunization, lo-

cal authorities and community leaders play a pivotal role in the decision-making process of national vaccine policy, as well as in the increase of population awareness of the fact that vaccines have the ability to protect vaccinated people and protect non-vaccinated community members via herd immunity.

Vaccination as a means of disease prevention is an ordinary occurrence in modern and wealthy societies today. However, vaccine coverage worldwide remains insufficient as developing countries do not have the socioeconomic means to conduct vaccinations. Developed countries, on the other hand, face yet other obstacles in their efforts to achieve an adequate immunization program, and these include the society’s false beliefs, as well as religious beliefs, a lack of advocacy, ignorance, a fear of medical disorders as complications of vaccinations, and the emergence of the “anti-vaccine movement.”

The anti-vaccine movement is one of the most important social factors that disrupt the efforts of achieving levels of vaccine coverage that would lead to eradication of certain diseases. This movement was established on the premises that vaccination is not straightforwardly beneficial for the health of people. Movement members blame the government, public health institutes, pharmaceuticals companies and some “shady forces” for eliminating proponents of freedom of personal choice, population control or population decrease by inducing diseases such as autism in children, or that there are bioterrorism implications (3). The allusion that there exists a link between childhood vaccinations and the subsequent development of autism has become a major public health issue in the control of vaccine preventable diseases in the community. Unfortunately, despite continuous scientific efforts to confront these claims by publishing valid analyses of the issue, the trend continues. For instance, Taylor et al. (2014) published a meta-analysis with a clear and straightforward title “Vaccines are not as-

sociated with autism: An evidence-based meta-analysis of case-control and cohort studies.” The analysis was based on five cohort studies involving 1,256,407 children, and five case-control studies involving 9,920 children, with the following findings: “Findings of this meta-analysis suggest that vaccinations are not associated with the development of autism or autism spectrum disorder” (5).

According to the WHO strategy plan, measles is one of the diseases that were supposed to be eradicated by 2010; despite the prolongation of the deadline to 2020, the aim has still not been achieved (1). The MMR vaccine is available everywhere in Europe, but vaccine coverage has not yet reached 95%, the requirement for sufficient community immunity, as more and more parents are refusing to vaccinate their children due to the growing influence of the anti-vaccination movement.

Bosnia and Herzegovina battles against an increased number of vaccine-preventable diseases. This is a consequence of recent under-vaccinations caused by anti-vaccine movement influences on one hand, and on the other hand by obstacles of vaccine shortage as well as population migrations during the war and postwar periods. The Federation was struck by the measles, mumps and rubella epidemic outbreaks that took place between 2011 – 2016, and which resulted in more than 15,000 affected children and adults, with high rates of serious clinical presentations, complications and long term consequences (6, 7, 8). The country currently faces outbreak threats of even more vaccine-preventable diseases.

In conclusion, what holds true is that no vaccine is 100% safe. As biological products with biological effects, they are going to cause some side effects, however efficient the vaccination may be. It is prognosticated that the public’s tolerance will keep decreasing as the diseases against which individuals are vaccinated become rare and thus forgotten. As a

result of a lack of knowledge about the perils against which they are vaccinated, patients thus become less likely to accept any side effects that are associated with the vaccination. It remains crucial, therefore, to highlight the fact that the benefits of vaccination greatly exceed the risks.

**Conflict of interest:** The author declares that she has no conflict of interest.

## References

1. WHO. Vaccine. [database on the Internet]. [updated 2016 Apr 16; cited 2017 Jan 10]. Available from: <http://www.who.int/topics/vaccines/en/>.
2. Pulendran B, Ahmed R. Immunological mechanisms of vaccination. *Nature Immunology*, 2011;12(6):509-17.
3. Novella S. The anti-vaccination movement. *Skeptical Inquirer*. 2007;31(6):26-31. Available from [http://www.csicop.org/si/show/anti-vaccination\\_movement](http://www.csicop.org/si/show/anti-vaccination_movement).
4. Poland GA, Jacobson RM. The clinician's guide to the anti-vaccinationists' galaxy. *Hum Immunol* 2012; 73(8):859-66.
5. Luke E, Taylor, Amy L, Swerdfeger, Guy D. Eslick, Vaccines are not associated with autism: An evidence-based meta-analysis of case-control and cohort studies. *Vaccine*. 2014;32(29):3623-9.
6. Hukic M, Hübschen JM, Seremet M, Salimovic-Besic I, Mulaomerovic M, Mehinovic N, et al. An outbreak of Rubella in the Federation of Bosnia and Herzegovina between December 2009 and May 2010 indicates failure to vaccinate during war time (1992-1995). *Epidemiol Infect*. 2012;140(3):447-53.
7. Hukic M, Hajdarpasic A, Ravlija J, Ler Z, Baljic R, Dedeic Ljubovic A, Moro A, Salimović-Besic I, Sausy A, Muller C P, Hübschen J M. Mumps outbreak in the Federation of Bosnia and Herzegovina with large cohorts of susceptibles and genetically diverse strains of genotype G, Bosnia and Herzegovina, December 2010 to September 2012. *Euro Surveill*. 2014;19(33):382-4.
8. Salimović-Besic I, Šeremet M, Hübschen JM, Hukić M, Tihić N, Ahmetagić S, et al. Epidemiologic and laboratory surveillance of the measles outbreak in the Federation of Bosnia and Herzegovina, February 2014-April 2015. *Clin Microbiol Infect*. 2016;22(6):563-7.