



Conference Abstract

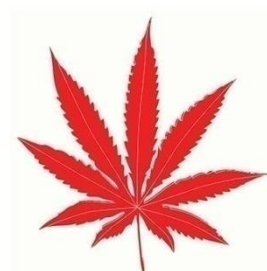
<http://dx.doi.org/10.21065/19204159.pharm.alazhar>

A Response to COVID-19

International Conference of Pharmaceutical and Medical Sciences

September 1-3, 2020 (Tuesday - Thursday)

Faculty of Pharmacy For Girls - Al Azhar University, Cairo, Egypt.



Conference Abstract

VACCINE DEVELOPMENT: HISTORICAL ANALYSIS AND HOW TO ACCELERATE

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Citation:

Mabrouk Aboulwafa . Microbiology and Immunology Department, Faculty of Pharmacy, Ain Shams University. App Pharm. Volume. Vol. 12: 2020. Special Issue 1st International Conference of Pharmaceutical and Medical Sciences; A Response to COVID-19. September 1-3, 2020: Faculty Of Pharmacy For Girls - Al Azhar University, Cairo, Egypt.

Funding:

The authors received no direct funding for this research.

Competing Interests:

ABSTRACT

Vaccines proved to have great impact in public health as they exert primary prevention level in preventive medicine. Their implementation resulted in the eradication of smallpox, near eradication of polio, control of several infectious diseases as well as prevention of millions of deaths each year. They are one of the most effective public health measures available in case of infectious disease. Vaccines development started as early as the end of the 18th century by Edward Jenner who used cowpox-infected materials to immunize against smallpox and introduced the term "vaccine". Louis Pasteur refined Jenner's work and introduced the basic principles of vaccination represented by pathogen isolation, inactivation/attenuation and injection. The introduction of cell culture for virus propagation enabled the development of methods for attenuating viral vaccines resulting in a golden age of first vaccines development that occurred in the second half of the 20th century and licensure of vaccines against polio, measles, mumps, rubella and varicella. Vaccines developed by inactivation/attenuation of infectious agents are termed conventional/traditional vaccines. The second renaissance of vaccine development was introduced by the development of subunit vaccines for which only parts (protein/peptide, carbohydrate antigens) of target pathogens are used to induce appropriate immune responses. The targeted subunit has to be abundant and conserved in the pathogen, recognized by the immune system and able to elicit a protective immune response. The antigenic part of a subunit vaccine can be prepared by either isolating a specific component from the pathogen or synthesis of specific protein by molecular genetic techniques. This allowed the development and licensure of vaccines against Haemophilus influenza type B;

The authors declare no competing interest's

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Meningococcus A, C, W, and Y; Pneumococcus; as well as the introduction of acellular pertussis vaccine, hepatitis B surface antigen (HBsAg) and bivalent or quadrivalent human papilloma virus (HPV)vaccine. The latest renaissance in vaccine development was started to develop vaccines that induce protective immunity beyond the mechanisms evolved by nature against pathogens exhibiting hyper variability (influenza, dengue, HIV-1, HCV), their conventional vaccines exacerbate disease (RSV, dengue) or those leading to persistent/latent infection or have an intracellular phase such as (HIV-1, hepatitis C virus (HCV), cytomegalovirus (CMV), herpes simplex and Mycobacterium tuberculosis and malaria as well as emerging pathogens. New technologies have to be developed for next generation vaccines development against pathogens that fail to induce sterilizing immunity as well as currently emerging ones. These technologies can be divided into three major categories related to antigen discovery, adjuvants and vaccine delivery, and deciphering human immune responses. Reverse vaccinology, genomic-based antigen discovery (antigenome analysis), structural vaccinology/reverse engineering of vaccines and synthetic biology support antigen discovery while viral vector-based vaccine, nucleic acids vaccines and liposomes can encompass vaccine delivery technologies. Platform technologies have to be implemented to act as modular vaccine platforms that accelerate safe vaccine manufacturing at low cost to be used in potential pandemic settings.

Speaker's Biography

Prof. Dr. Mohammed Mabrouk is a Professor of Microbiology and Immunology Department, Faculty of Pharmacy, Ain Shams University. Dr. Mohammed Mabrouk was the former chairman of National Organization for Research and Control of Biologicals. He was the Secretary (general) (12th round) and member (13th round) of permanent scientific promotion committee for professors and associate professors (Pharmaceutical Microbiology and Immunology). He is also an expert member of the committee of pharmaceutical studies sector. Executive Committee for National Strategic Programs of Biotechnology and Genetic Engineering, Ministry of Scientific Research.

Ethics approval and consent to participate: No ethical approval needed for this research work.

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Consent for publication: Author is agreed to submit this abstract for publication in this research journal.

Availability of data and materials: The information and data collected and/ or incorporated in this study is included in this manuscript.

Declaration: The abstract is reviewed and accepted by the Conference Organization Committee of the event entitled "A Response to COVID-19: International Conference of Pharmaceutical and Medical Sciences" dated September 1-3, 2020 (Tuesday - Thursday), held at Faculty Of Pharmacy For Girls - Al Azhar University, Cairo, Egypt. The presenter was

permitted to share his research after final approval of the committee. The scientific information and data is published on behalf of the Conference organization Committee.



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