

is proving successful—members of villages persuaded to change their ways will often become facilitators themselves, visiting nearby settlements and repeating the process.

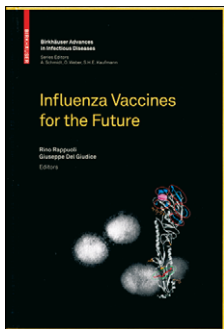
The big necessity does contain the occasional hyperbolic error: the author includes rabies among the diseases risked by descending sewage workers; later, she imaginatively

sums 1 rupee a day to 150 rupees a month. Nevertheless, it is a remarkable, hard-won achievement; one of those uncommon books that changes the way the reader looks at the world.

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Influenza vaccines for the future



Influenza vaccines for the future
 Edited by Rino Rappuoli and Giuseppe Del Giudice.
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The potential public-health threat posed by the next pandemic of influenza A has been highlighted by the global spread among birds of highly pathogenic avian influenza H5N1. Central to preparedness planning is the availability and rapid deployment of vaccine. However, the development of effective vaccines has been slow since the first emergence of H5N1 as a human pathogen in 1997, because conventionally prepared influenza vaccines have proved poorly immunogenic against avian haemagglutinin.

The first two-thirds of *Influenza vaccines for the future* brings together up-to-date and wide-ranging reviews covering virology and epidemiology of influenza, immunological responses following infection or vaccination, and historical and current immunisation approaches. This information is essential for understanding the issues confronting the development of pandemic and novel seasonal vaccines. These background sections are well presented with clear illustrations, and the chapter on the history of influenza vaccines is particularly entertaining.

Serological correlates of protection against seasonal influenza infection by haemagglutinin-inhibition assays have been long established; however, conventional haemagglutinin inhibition is relatively insensitive for detection of antibody to avian influenza. Accordingly, alternative serological tests such as modified haemagglutinin inhibition with horse erythrocytes, neutralising antibody, and single radial haemolysis have been used for pandemic vaccine evaluation. However, the lack of recognised correlates of protection and poorly standardised serological assays complicate the interpretation of clinical vaccine trials and create uncertainty for the regulatory approval of pandemic vaccines. Since the demonstration of pandemic vaccine efficacy in human beings is not possible, animal model data and experience with seasonal influenza vaccines are required to make assumptions about pandemic vaccine immunogenicity. These important issues are often neglected in general vaccine reviews, so the excellent overviews in this book on animal models for influenza research and immunological correlates of protection are particularly welcome.

The section covering influenza vaccines for the future, with an emphasis on pandemic vaccines, offers comprehensive reviews of live-attenuated approaches, and the role of adjuvants to augment existing vaccines. There is a very informative and well-illustrated chapter on the potential of MF59, as an example of an oil-in-water emulsion adjuvant, to enhance and broaden immunogenicity; this choice may reflect the pharmaceutical industry background of some of the contributing authors. Although oil-in-water emulsion adjuvants will have a major role in enhancing immunogenicity of subvirion influenza vaccines in the near-term and medium-term future, perhaps there could have been greater discussion of alternative approaches under preclinical evaluation. For example, there is no mention in the index of vector-based vaccines to deliver influenza antigen such as non-replicating adenovirus or recombinant vaccinia virus vectors.

Another minor criticism could be levelled at the focus on antibody responses to haemagglutinin. Although the haemagglutinin protein is the main ingredient of influenza vaccines, immune responses to other influenza proteins such as neuraminidase, nucleoprotein, and M2 are currently being assessed in alternative vaccines. Overall, these approaches are fairly well addressed here and there, but in future editions it may be preferable to draw them into a single discussion; future novel vaccines may include, or be based on, these additional antigens.

Books like this can become quickly outdated, even by the time of publication, so it is useful that the final chapters present up-to-date discussions of current and future potential pandemic vaccine strategies. The consideration of proactive prepandemic priming strategies, which have only recently gained widespread attention, is summarised in the discussion on the potential use of stockpiled vaccines and challenges of logistics of mass vaccine delivery in the event of a pandemic.

Influenza vaccines for the future is an enjoyable read and should be of interest to general vaccinologists, virologists, physicians, and public-health specialists, as well as those with a particular focus in respiratory virus research.

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