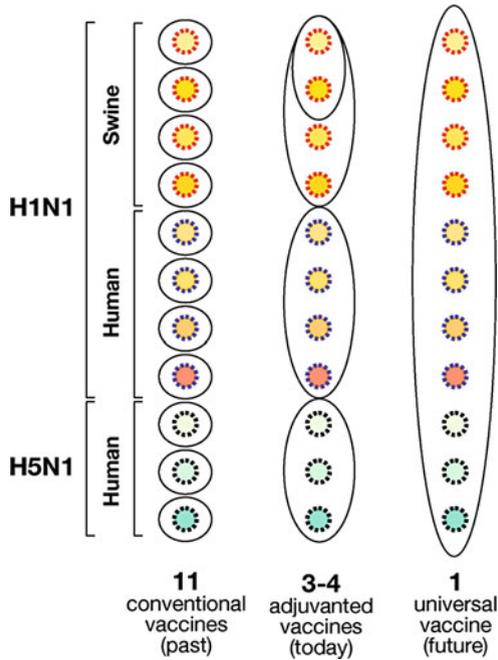


# Preface

The pandemic caused by the 2009 A/H1N1 influenza virus has changed the manner in which the world will respond to pandemics in the future and will have an important place in history. Why is a relatively mild pandemic so important that it will leave a mark on history? The fact is that this event has represented a test of the global pandemic preparedness and has highlighted weaknesses and strengths of the health protection system worldwide. The best strategy to protect mankind against future pandemics is by vaccination. Thanks to the H5N1 avian influenza, during the past 10 years our ability to control a pandemic has improved considerably. Nevertheless, the 2009 A/H1N1 influenza pandemic has demonstrated the many weaknesses of the current pandemic preparedness plans. These weaknesses would have been fatal had this pandemic resulted in the global spread of a more lethal influenza strain. It can be said that this pandemic has provided a unique opportunity, a “fire drill”, to identify the deficiencies that must be urgently addressed to develop a better and more efficient plan for the next pandemics of the twenty-first century.

This second edition of “Influenza Vaccines of the Future” intends to provide the grounds for developing such plans. The major points to be addressed for our future preparedness plans include prediction of pandemics (viral evolution and epidemiology), the features of the immune response to the virus, the development of safe and effective vaccination strategies (including quick reaction by the productive infrastructures), planning for vaccine distribution and coverage of populations at risk, and the major need of global awareness and communication.

In this perspective, the first chapters cover the latest information on the complex biology of the influenza virus and of its epidemiology in different areas of the world, to come to the evolution of the H1N1 pandemic viruses and to the features of the 2009 H1N1 pandemic. This information is instrumental to the understanding of human immunity to influenza and to the consequent development of vaccines. Several chapters are dedicated to the latest studies in searching for new vaccine antigens and effective adjuvants, in setting up predictive *in vitro* and *in vivo* models, in identifying relevant correlates of protection, in tackling possible side effects, in developing novel methodologies for vaccine production, in designing new



**Fig. 1** The development of influenza vaccines

approaches to prophylaxis and treatment. The path of progress of influenza vaccines is summarized in the Fig. 1. Traditionally, we have used a different vaccine for every single virus variant. However, today we can protect against a subgroup of strains using oil-in-water adjuvants that induce an immune response able to cover the diversity of closely related viruses. Hopefully, in future, universal vaccines will be available which may be the final solution to pandemic and seasonal influenza.

The last chapters are dedicated to more perspective considerations, including the economic and social impact and costs of pandemic influenza, and the strategies for implementing global preparedness to the future threats.

The 2009 A/H1N1 influenza pandemic has confirmed that once a pandemic begins, the time to react is limited. The only way to address and control a pandemic is to be prepared. The response to the first influenza pandemic of the twenty-first century benefited from the extensive preparation for an avian influenza pandemic and the mild nature of the 2009 A/H1N1 swine influenza virus. However, the pandemic demonstrated the limited ability to predict influenza pandemics, to anticipate levels of cross-protection, and to deliver vaccines in a timely manner, particularly to low-income countries. The lessons learned from the 2009 H1N1 pandemic are of paramount importance to develop more effective preparations against future pandemics. We must exploit such information straight away. And get ready.

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