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Why and how to predict response to influenza vaccination?

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During recent decades, efforts have been focused on defining markers that can identify individuals who are likely to respond poorly to influenza vaccine. This seemed important because of the conflicting results of published reports on the immune response to influenza vaccine in eldely persons. Now when rapid progress in biotechnology is likely to ensure alternative vaccination approaches, it is even more important to answer this question. Although factors affecting this response are already known, including older age, past exposure to influenza viruses and chronic diseases, the challenge remains in constructing useful model of prediction. A major difficulty is the wide range of factors related to chronic ageing diseases. In relation to this, the theoretical background is limited, as immunoregulatory disorders that might account for the deficient immune response to influenza vaccine observed in chronically ill and elderly patients have not yet been found. It has been realised, for example, that differences in stages of a disease, comorbidity, lifestyle factors, or particular biochemical disorders, can all contribute to the variation of immune response to influenza vaccine. To deal with the complexity of this task, we reached out for the concept of a systems biology, originally applied to analyse highdimensional, non-linear data provided by new sophisticated diagnostic methods, such as genomics and proteomics. The process of construction of the model for prediciting response to influenza vaccine is presented and the model's usefulness for the practical application is discussed.