



Personalised vaccinology describes an approach to vaccine design and development designed to achieve optimum vaccination outcomes in different populations.^{1,2} It takes into consideration several factors that can lead to variation in response to vaccination, such as age, gender and race/ethnicity.³⁻⁵

The purpose of personalised medicine is: “to combine the ancient philosophy of treating patients individually with modern tools made available by the advent of big data, to improve the efficacy, safety and effectiveness of the therapeutic approach”⁶

Key factors that lead to variation in response to vaccination:

- **Gender-based differences³**
- **Age-based differences⁴**
- **HLA system polymorphism^{4,7}**
- **Race/ethnicity⁵**
- **Immune response gene polymorphism^{9,10}**
- **Previous vaccination or infection^{4,11}**

Some key challenges to realising personalised vaccinology:^{2,4,7,8}



Thinking and perception



Accepting a new paradigm of thinking

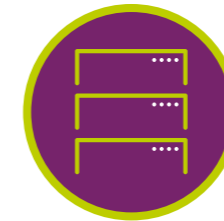


Changing from a population-based to an individualised approach



Countering the perception that it is expensive

Data and technologies



Larger genotype: phenotype data sets needed



Explaining vaccine-induced protection in different population groups



Studies confirming modified vaccines improve protection in different population groups



Need for improved technologies



COVID-19 highlighted the need for a more personalized approach to medicine.

Some vaccines, such as influenza and pneumococcal vaccines, have already achieved some degree of personalisation. However, more must be done to fully integrate personalised approaches to vaccination.



“It is conceivable we can personalise vaccines for individuals based not only on their age but on gender, HLA type and immune response gene polymorphisms”

Raina MacIntyre, Guest Editor

Footnote: HLA, human leukocyte antigen

For further information on this topic see the November 2022 edition of InFluNews which can be found on the [GII LinkedIn page](#).

References: 1. Bragazzi NL, et al. Vaccines Meet Big Data: State-of-the-Art and Future Prospects. From the Classical 3Is ("Isolate-Inactivate-Inject") Vaccinology 1.0 to Vaccinology 3.0, Vaccinomics, and Beyond: A Historical Overview. *Front Public Health* 2018;6:62; 2. Poland GA. The case for personalized vaccinology in the 21st century. Presentation 2017. Available at: [poland_presentation.pdf \(hhs.gov\)](#). Accessed November 2022; 3. Shapiro JR, et al. Roadmap for Sex-Responsive Influenza and COVID-19 Vaccine Research in Older Adults. *Front Aging* 2022;3:836642; 4. Poland GA, et al. Personalized vaccinology: A review. *Vaccine* 2018;36(36):5350-5357; 5. Kurupati R, et al Race-related differences in antibody responses to the inactivated influenza vaccine are linked to distinct pre-vaccination gene expression profiles in blood. *Oncotarget* 2016;7(39):62898-62911; 6. Teodori L, et al. Mass versus personalized medicine against COVID-19 in the “system sciences” era. 18 June 2022. Available at: [Mass versus personalized medicine against COVID-19 in the “system sciences” era - Teodori - Cytometry Part A - Wiley Online Library](#). Accessed November 2022; 7. Poland GA, et al. Personalized vaccines: the emerging field of vaccinomics. *Expert Opin Biol Ther* 2008;8(11):1659-1667; 8. Gorezynski RM. Personalizing Vaccination for Infectious Disease in the 21st Century. *J Vaccines Vaccin* 2020; S5:005; 9. Petrie JG, Monto AS. Untangling the Effects of Prior Vaccination on Subsequent Influenza Vaccine Effectiveness. *J Infect Dis* 2017;215(6):841-843; 10. Kim SS, et al. Effects of Prior Season Vaccination on Current Season Vaccine Effectiveness in the United States Flu Vaccine Effectiveness Network, 2012-2013 Through 2017-2018. *Clin Infect Dis* 2021;73(3):497-505; 11. Fanos V, et al. OMICS technologies and personalized vaccination in the COVID-19 era. *JPNIM* 2022;11(1):e110114.