The Mathematical Analysis of Transmission Dynamics of Varicella

Rita Csuma-Kovács, Gergely Röst
University of Szeged, Hungary

Varicella, also known as chickenpox, is one of the most contagious childhood diseases, with the number of varicella cases being of a similar magnitude to the number of births. It is caused by the Varicella-zoster virus (VZV), which also causes herpes zoster. In Hungary, the vaccine against chickenpox has been available for many years, and it became part of the routine vaccination program in September 2019. In this presentation, a compartmental model describing the transmission dynamics of VZV is considered. We extend it with a realistic age structure (RAS) encompassing 66 age groups and study the implemented two-dose vaccination program. Since the COVID-19 pandemic began spreading in Hungary a few months after the introduction of the vaccine, we also investigate its impact on the transmission dynamics of VZV.

[1] M. J. N. M. Ouwens, K. J. Littlewood, C. Saubion, B. Téhard, F. Denis, P. Boëlle, S. Alain, The Impact of 2-Dose Routine Measles, Mumps, Rubella, and Varicella Vaccination in France on the Epidemiology of Varicella and Zoster Using a Dynamic Model With an Empirical Contact Matrix,*Clinical Therapeutics*, **37(4)** (2015), 816–829.e10, .

[2] M. Brisson, G. Melkonyan, M. Drolet, G. De Serres, R. Thibeault, P. De Wals, Modeling the impact of one- and two-dose varicella vaccination on the epidemiology of varicella and zoster, *Vaccine*, **28** (2010), 3385–3397.

[3] Csuma-Kovács, R., Dudás, J., Karsai, J., Dánielisz, Á., Molnár, Zs., and Röst, G., Challenges in the modelling and control of varicella in Hungary, *submitted to ECMI 2018 Proceedings*

[4] Hethcote, H. W., The mathematics of infectious diseases. *SIAM Rev.* **42(4)** (2000), 599–653.