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A Basis for Immunological Protection from Death Upon Pandemic Influenza Infection

While infection with interpandemic influenza virus strains threatens survival among the elderly and other immunocompromised individuals, the infection with pandemic viral strains frequently proves fatal among immunocompetent adults. Although a precise reason for this contrast is not fully understood, the cause of death in the latter case is attributed to a cytokine storm triggered by the pandemic strains.

However, it is important to note that while an unacceptably large numbers of individuals die, a large majority of infected individuals do survive during each pandemic. It is unclear how the latter escape or survive virus-induced cytokine storm. Understanding the basis for their survival may aid in designing strategies that could minimize the impact of influenza pandemics. To explore an immunological basis for survival, we devised a multidimensional mathematical model that monitors the dynamics of interaction between influenza virus and uninfected and infected respiratory epithelial cells, in the presence of innate and virus-induced adaptive immunities. The results of our simulations indicate that the rate of death of infected epithelial cells can be a major determinant of the course of disease and survival after infection with a pandemic viral strain. This rate may be affected by innate immunity, MHC make up of the individual, and any preexisting adaptive immunity.