



“Antiviral resistance during an influenza pandemic: optimal antiviral strategies driven by individual and population interest”

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Planning a response to an outbreak of a pandemic strain of influenza is a public health priority, and antiviral drugs play a critical role in mitigating the influenza pandemic. However, the administration of antivirals has epidemiological and evolutionary repercussions that affect both the individual patient and the population. Although individuals benefit from reduced probability and/or severity of infection, they may experience adverse effects of antivirals. Within the population, antiviral intervention reduces transmission, but also selects for drug resistance. To evaluate how the balance among these factors results in optimal coverage for both the individual and the population, we developed an epidemiological game-theoretic model of pandemic influenza. We parameterize the model with survey data on actual perceptions regarding infection risk, the level of resistance, the efficacy and adverse effects of antivirals, and the willingness to pay for antivirals during pandemic influenza. We find that the demand for antivirals driven by self-interest (i.e. the Nash strategy) during pandemic influenza would likely be far lower than that which would maximize overall utility for the population (i.e. utilitarian strategy), if individuals made decisions based on their beliefs. However, we demonstrate that the discrepancy between the Nash and utilitarian strategies can be brought into alignment to some extent by providing individuals with accurate knowledge about the epidemiology and risk of pandemic influenza. Thus, public education about the infection risk and the level of resistance associated with antivirals may promote antiviral drug use closer to achieve optimal levels for the population.

Dr. Shim is a Candidate for the NIMBioS Faculty Position in Mathematics for Biology at Below-organism Level