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*Impact of Environmental Changes on Disease Spread: Case study of Avian Influenza*

Virulent outbreaks of Highly Pathogenic Avian Influenza since 2005 have raised the question about the roles of migratory and wild birds in this disease's transmission dynamics. Despite increased monitoring, the role of wild waterfowl as the primary source of the highly pathogenic H5N1 has not been clearly established, and the consequence of outbreaks of HPAI among species of wild birds for the local and non-local ecology where migratory species are established has not been quantified.

Understanding the entangled dynamics of migration and the disease dynamics is key to planning of prevention and control strategies for humans, migratory birds and the poultry industry. The impact of environmental changes on the migration patterns of birds and effect of infection of environment by domestic birds on the migratory bird survival can both be significant. This talk will introduce the various factors involved in the spatial spread of H5N1 and present the results of a few dynamical models of seasonal migration linking the local dynamics during migratory stopovers to the larger-scale migratory routes. The effect of repeated epizootic at specific migratory stopovers for Bar-headed geese (*Anser indicus*) will be discussed as an illustration of the ecological impact of H5N1 outbreaks. Issues relevant to the co-existence and interaction of low and high pathogenic strains will be addressed, and some challenging problems in the theory of monotone periodic processes and nonlinear dynamical systems described by delay differential equations with periodic coefficients will be presented.