Abstract

The specific aim of this proposal is to develop a spatiotemporally explicit, individual-based model of landscape epizootiology, using dynamic contact network modeling developed at EpiCenter. The investigators will use this model to test hypotheses of how ecological patterns of urbanization, including resource distribution, habitat degradation, and physical barriers, shape the epizootiological processes of rabies with a primary focus towards the prediction of public health risk and the effect of disease intervention methods. To develop and parameterize this model, the investigators will compare and contrast the endogenous and exogenous mechanisms of transmission in two distinct strains of rabies that occur in a common host species, the striped skunk. The intellectual merit of the proposal lies in the construction of a spatio-temporal model of epizootiology. The simulation software developed during this project will allow investigators to forecast changes in disease risk associated with the changing rural-urban interface, and explore different disease management scenarios in order to develop cost efficient and effective disease control measures. The strength of the model relies on a hierarchical approach to understanding disease ecology. At the organismal level, the investigators will compare viral transmission properties and characterize the molecular attributes of two virus variants. At the population level, they will characterize seasonal changes in patterns of habitat affinities in striped skunk to estimate contact rates and dispersal probabilities along a clinal ecotone of urban and rural ecosystems. At the regional level, they will use population and landscape genetic approaches to estimate migration rates and identify habitat corridors through which both host and pathogen may flow.