
Plenary Talks

The ecology of emerging tick-borne diseases in a changing world

Richard S. Ostfeld

Institute of Ecosystem Studies, Millbrook, NY 12545 USA, ostfeldr@caryinstitute.org

Most emerging infectious diseases of humans are transmitted to us from non-human mammals and birds, that is, they are zoonotic. For any given disease, only a small group of species maintains and transmits the disease agent; these are called "reservoir hosts". The abundance and distribution of these reservoir hosts affects the probability of disease emergence and epidemics. Recent research reveals that, while reservoir hosts can amplify disease risk, many other species can reduce transmission and disease risk. They can do this, for example, by regulating the abundance of reservoir hosts or by absorbing but not transmitting the disease agents. A prominent example is Lyme disease, for which the white-footed mouse, eastern chipmunk, and

are the main reservoirs of the bacterial agent and prominent hosts for the tick vector. Other hosts, such as foxes and opossums, can reduce abundance of the small mammals or the ticks. Humans inadvertently increase abundance of some small mammals and decrease that of other mammals when they destroy or fragment natural habitat, for instance by suburbanizing the landscape. This presentation will use three tick-borne diseases, all of which are rapidly emerging in the United States and Europe, as case studies to illustrate general principles relating biodiversity to infectious diseases. Meta-analysis of the published literature shows that the loss of biodiversity generally increases the transmission of infectious diseases of humans, animals, and plants worldwide. In addition to the effects of biodiversity, risk of human exposure to tick-borne diseases is predictable from bottom up forces (e.g., acorn masting) and top-down effects of specific mammalian predators on small-mammal reservoir hosts. The community ecology of mammals is clearly relevant to public health policy.