Climate Change and Expansion of Tick Geography

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The expanding range of tick-borne diseases is a growing problem worldwide. Climate change plays a preeminent role in the expansion of tick species, especially for southern ticks in the United States such as *Amblyomma* species, which have introduced new pathogens to northern states.[1-5] In addition to well-known tick-borne diseases, *Amblyomma* ticks have been implicated in the spread of emerging severe and potentially fatal viral illnesses, including Bourbon virus and Heartland virus.[6] The increasing range of *Amblyomma* ticks also exposes new populations to tick-induced meat allergy (alpha-gal) syndrome, whereby development of specific IgE antibodies to the oligosaccharide galactose-alpha-1,3-galactose (alpha-gal) following tick bites results in severe allergic responses to consumption of beef, pork, and lamb.[7]

Amblyomma ticks have now been identified close to the Canadian border in Michigan and New York, and predictions of continued climate change raise the possibility of northward range expansion into all provinces of Canada from Alberta to Newfoundland and Labrador during the coming decades.[8,9] Additional factors that contribute to the expanding range of many tick species include international travel, migratory patterns of birds, competition, and natural predators such as fire ants that feed on tick eggs and influence the feeding behavior of adults.[10]

Traditional methods of tick identification rely on gross morphology, including the presence of festoons, shape of the coxae where the legs attach, and markings on the hard overlying scutum. More recently, molecular identification has improved tick identification, leading to more accurate assessment of tick prevalence. These modern identification studies include analysis of 16S ribosomal DNA (rDNA), 12S rDNA, and ITS1 rDNA, and ITS2 rDNA genes.[11]

The spread of tick vectors has huge public health implications, and better methods to control tick populations are needed.[12] New acaricides and growth regulators are being developed,[13] and early spring applications of acaricides such as bifenthrin can suppress nymphs prior to the initiation of host-seeking activity.[14] Controlled burns within tick habitats have proved helpful in reducing the risk for vector-borne disease.[15,16] Personal protection is best accomplished with the use of a repellent together with clothing impregnated with an acaricide such as permethrin.[17] Efforts to slow climate change and continued surveillance for the spread of tick vectors is urgently needed.

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