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**XUE ZHANG**, York University

*Modeling tick diapause dynamics using multiple delays*

An essential way of the tick's adaptations to seasonally variable climate is diapause, which ensures the survival of tick. We investigate the effect of diapause phenomena on the amount of tick population for improving understanding of tick-borne disease and propose a tick population model with multiple time delays. We explore the property of parameter tangent function by introducing parametric cosine and sine function. We derive threshold conditions for nonlinear oscillations in the vector population. Our purpose is to show that diapause may generate complex oscillation even though seasonality is not included.