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An epidemic model with multiple delays: impact of co-feeding and diapause

In this talk, a dynamic vector–host–pathogen interaction motivated by tick-borne diseases is considered. The vector population is stratified in terms of the stage before and after the vector's contact with hosts where co-feeding transmission may take place and vector development may involve two time lags due to normal development and diapause. We derive threshold conditions for disease persistence and for nonlinear oscillations in the vector population and in the diseased vector and host populations. Our objective in the current study is to use a simple mechanistic model to show that diapause and co-feeding transmission may generate periodic and irregular oscillations even when seasonal variations of the environmental conditions are ignored. These oscillations are not necessary in synchrony with the seasonality of vector development, and hence complicated oscillatory patterns of vector borne disease dynamics in the field and surveillance observations should be expected. This is a joint work with Jianhong Wu and Xue Zhang.