1056-93-407   **Rachael Miller Neilan*** (`rmill48@lsu.edu`), 2139 Energy, Coast, and Environment Building, Louisiana State University, Baton Rouge, LA 70803, and **Suzanne Lenhart** (`lenhart@math.utk.edu`). *Optimal vaccine distribution in a spatiotemporal epidemic model with an application to rabies and raccoons.*

We formulate a S-I-R (Susceptible, Infected, Immune) spatiotemporal epidemic model as a system of coupled parabolic partial differential equations with advection-diffusion movement terms and no-flux boundary conditions. Immunity is gained through vaccination. The objective is to characterize the optimal control, a vaccine distribution schedule which minimizes the number of infected individuals and the costs associated with vaccination over a finite space and time domain. Existence of solutions to the state system and existence of an optimal control are proved and the corresponding sensitivity and adjoint equations are derived. Techniques of optimal control theory are then employed to obtain the optimal control characterization in terms of state and adjoint functions. To illustrate, parameter values are chosen to model the spread of rabies in raccoons. The optimal allocation of oral rabies vaccine baits on a homogeneous domain is compared with the optimal distribution on a heterogeneous domain incorporating rivers and forest cover and long distance raccoon translocation. Numerical results reveal that natural land features affecting raccoon movement and the relocation of raccoons by humans can considerably alter the design of a cost-effective vaccination regime. (Received September 04, 2009)