Cell Communication Group

Model - 11/15/04

C = concentration of virus
I = number of infected cells
U = number of uninfected cells
P = number of virion producing cells

units = number of cells/length (P puts in a delay - perhaps later put in explicit delay?)

$$\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2} - k_1(U + I + P)C + k_2 P$$

$$\frac{\partial I}{\partial t} = k_1 UC - k_3 I$$

$$\frac{\partial U}{\partial t} = -k_1 UC$$

$$\frac{\partial P}{\partial t} = k_3 I - dP$$

Discretizing the first eqn:

$$C_j^{i+1} - C_j^i = \frac{\Delta t D}{\Delta x^2}(C_{j+1}^i + C_{j-1}^i - 2C_j^i) - \Delta t k_1(U_j^i + I_j^i + P_j^i)C_j^i + \Delta t k_2 P_j^i$$

where the current time $= i\Delta t$ and the current position $= j\Delta x$

Parameters: D = diffusion, $D = \dfrac{KT}{\xi}$ with $\xi = 6\pi r\eta$ where r = radius of particle and η = viscosity of fluid.
Also, K = the Boltzmann constant and T = the temperature.
k_1, k_2, k_3, d are unknown to us at this point, for now try various values for these parameters.