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Generalized model

1 Equations

These are the equations for the model:

$$\frac{dS}{dt} = -(\Lambda^1 + \Lambda^2 + \Lambda^3)S + \omega^1 R^1 + \omega^2 R^2 + \omega^3 R^3 - \delta^1 - \delta^2 - \delta^3 \tag{1}$$

$$\frac{dE^1}{dt} = -\nu^1 E^1 + \Lambda^1 S + \delta^1 + \Lambda_1^1 R^1 + \Lambda_2^1 R^2 + \Lambda_3^1 R^3 \tag{2}$$

$$\frac{dE^2}{dt} = -\nu^2 E^2 + \Lambda^2 S + \delta^2 + \Lambda_1^2 R^1 + \Lambda_2^2 R^2 + \Lambda_3^2 R^3 \tag{3}$$

$$\frac{dE^3}{dt} = -\nu^3 E^3 + \Lambda^3 S + \delta^3 + \Lambda_1^3 R^1 + \Lambda_2^3 R^2 + \Lambda_3^3 R^3 \tag{4}$$

$$\frac{dI_{pre}^1}{dt} = -\gamma_{pre}^1 I_{pre}^1 + \nu^1 E^1 \tag{5}$$

$$\frac{dI_{pre}^2}{dt} = -\gamma_{pre}^2 I_{pre}^2 + \nu^2 E^2 \tag{6}$$

$$\frac{dI_{pre}^3}{dt} = -\gamma_{pre}^3 I_{pre}^3 + \nu^3 E^3 \tag{7}$$

$$\frac{dI_s^1}{dt} = -\gamma_s^1 I_s^1 + f_{pre,s}^1 \gamma_{pre}^1 I_{pre}^1 \tag{8}$$

$$\frac{dI_s^2}{dt} = -\gamma_s^2 I_s^2 + f_{pre,s}^2 \gamma_{pre}^2 I_{pre}^2 \tag{9}$$

$$\frac{dI_s^3}{dt} = -\gamma_s^3 I_s^3 + f_{pre,s}^3 \gamma_{pre}^3 I_{pre}^3 \tag{10}$$

$$\frac{dI_m^1}{dt} = -\gamma_m^1 I_m^1 + f_{pre,m}^1 \gamma_{pre}^1 I_{pre}^1 \tag{11}$$

$$\frac{dI_m^2}{dt} = -\gamma_m^2 I_m^2 + f_{pre,m}^2 \gamma_{pre}^2 I_{pre}^2 \tag{12}$$

$$\frac{dI_m^3}{dt} = -\gamma_m^3 I_m^3 + f_{pre,m}^3 \gamma_{pre}^3 I_{pre}^3 \tag{13}$$

$$\frac{dI_a^1}{dt} = -\gamma_a^1 I_a^1 + f_{pre,a}^1 \gamma_{pre}^1 I_{pre}^1 \tag{14}$$

$$\frac{dI_a^2}{dt} = -\gamma_a^2 I_a^2 + f_{pre,a}^2 \gamma_{pre}^2 I_{pre}^2 \tag{15}$$

$$\frac{dI_a^3}{dt} = -\gamma_a^3 I_a^3 + f_{pre,a}^3 \gamma_{pre}^3 I_{pre}^3 \tag{16}$$

$$\frac{dH_m^1}{dt} = -\theta_m^1 H_m^1 + f_{m,H}^1 \gamma_m^1 I_m^1 \tag{17}$$

$$\frac{dH_m^2}{dt} = -\theta_m^2 H_m^2 + f_{m,H}^2 \gamma_m^2 I_m^2 \tag{18}$$

$$\frac{dH_m^3}{dt} = -\theta_m^3 H_m^3 + f_{m,H}^3 \gamma_m^3 I_m^3 \tag{19}$$

$$\frac{dH_s^1}{dt} = -\theta_s^1 H_s^1 + f_{s,H}^1 \gamma_s^1 I_s^1 \tag{20}$$

$$\frac{dH_s^2}{dt} = -\theta_s^2 H_s^2 + f_{s,H}^2 \gamma_s^2 I_s^2 \tag{21}$$

$$\frac{dH_s^3}{dt} = -\theta_s^3 H_s^3 + f_{s,H}^3 \gamma_s^3 I_s^3 \tag{22}$$

$$\frac{dR^1}{dt} = -\omega^1 R^1 + f_{s,R}^1 \gamma_s^1 I_s^1 + f_{m,R}^1 \gamma_m^1 I_m^1 + \gamma_a^1 I_a^1 + \theta_m^1 H_m^1 + \theta_s^1 H_s^1 - \Lambda_1^1 R^1 - \Lambda$$
$$\tag{23}$$

$$\frac{dR^2}{dt} = -\omega^2 R^2 + f_{s,R}^2 \gamma_s^2 I_s^2 + f_{m,R}^2 \gamma_m^2 I_m^2 + \gamma_a^2 I_a^2 + \theta_m^2 H_m^2 + \theta_s^2 H_s^2 - \Lambda_2^1 R^2 - \Lambda$$
$$\tag{24}$$

$$\frac{dR^3}{dt} = -\omega^3 R^3 + f_{s,R}^3 \gamma_s^3 I_s^3 + f_{m,R}^3 \gamma_m^3 I_m^3 + \gamma_a^3 I_a^3 + \theta_m^3 H_m^3 + \theta_s^3 H_s^3 - \Lambda_3^1 R^3 - \Lambda$$
$$\tag{25}$$