SUPPLEMENTARY MATERIAL: EQUATIONS INCLUDING FOREIGN BACTERIA

Modified equations describing the dynamics of bacteria, macrophages, and dendritic cells in the presence of bacteria recognized as *foreign*, B_f. In this system commensal or microfloral bacteria, B_c is assumed to always induce tolerogenic phenotypes in antigen presenting cells and foreign bacteria is assumed to induce differentiation to inflammatory phenotypes upon contact. Variable and parameter symbols are the same for those given in Appendices A and B.

1. Effector site

$$\frac{dM_0^E}{dt} = \lambda_m + \epsilon_r C_a^E + \nu_{M0}(M_1^E + M_2^E) - M_0^E(k(B_c^E + B_f^E) - \mu_m) \tag{1}$$

$$\frac{dM_1^E}{dt} = kM_0^E B_f^E + M_2^E \nu_{21} - M_1^E(\nu_{m0} + \nu_{12} + \mu_m) \tag{2}$$

$$\frac{dM_2^E}{dt} = kM_0^E B_c^E + M_1^E \nu_{12} - M_2^E(\nu_{m0} + \nu_{21} + \mu_m) \tag{3}$$

$$\frac{dD_i}{dt} = \lambda_d + \epsilon_r C_a^E - D_i(k(B_c^E + B_f^E) + \mu_{di}) \tag{4}$$

$$\frac{dD_e^E}{dt} = D_i k B_f^E + D_i^L k_L B_f^L - D_e^E(\epsilon_{EI} + k_T T_r^{E*}) \tag{5}$$

$$\frac{dD_t^E}{dt} = D_i k B_c^E + D_i^L k_L B_c^L - \epsilon_{EI} D_t^E \tag{6}$$

$$\frac{dB_c^E}{dt} = B_c^E(\lambda_b - \phi_b B_c^E - \gamma B_f^E - \mu_b - k(E_p + M_1^E + M_0^E + D_i)) + B_c^L \epsilon_{LE} \tag{7}$$

$$\frac{dB_f^E}{dt} = B_f^E(\lambda_b - \phi_b B_f^E - \gamma B_c^E - \mu_b - k(E_p + M_1^E + M_0^E + D_i)) + B_f^L \epsilon_{LE} \tag{8}$$

2. Lumen

$$\frac{dB_c^L}{dt} = B_c^L(\lambda_b - \phi_b B_c^L - \gamma B_f^L - \mu_b - k_L(E_p + D_i^L) - \epsilon_{LE}) \tag{9}$$

$$\frac{dB_f^L}{dt} = B_f^L(\lambda_b - \phi_b B_f^L - \gamma B_c^L - \mu_b - k_L(E_p + D_i^L)) - \epsilon_{LE}) \tag{10}$$

$$\frac{dD_i^L}{dt} = \lambda_{dl} - D_i^L(k_L(B_c^L + B_f^L) - \mu_{di}) \tag{11}$$