Parameter	Balb-c mice	NOD mice	Units	Meaning
J	$5 \cdot 10^4$	$5 \cdot 10^4$	cells ml^{-1} d^{-1}	normal resting macrophage influx
k	0.4	0.4	d^{-1}	Ma deactivation rate
b	0.09	0.09	d^{-1}	macrophage recruitment rate by M_a
c	0.1	0.1	d^{-1}	macrophage egress rate
f_M	$2 \cdot 0.0623 \cdot 10^{-5}$	$0.0623 \cdot 10^{-5}$	ml cell^{-1} d^{-1}	basal phagocytosis rate per M for Balb-c mice
e_1	10^{-8}	10^{-8}	cell^{-1} d^{-1}	anti-crowding term for macrophages
e_2	10^{-8}	10^{-8}	cell^{-1} d^{-1}	anti-crowding term for macrophages
α_B	0.0334	0.0334	d^{-1}	β-cell growth rate
δ_B	1/60	1/60	d^{-1}	β-cell death rate
η	0.02	0.02	d^{-1}	rate at which T-cells eliminate β-cells
G_{hb}	90	90	mg dl^{-1}	glucose level of half-max β-cell production
s_E	1	1	ml cells^{-1}	Relative impact of effector T-cells on β-cell death
s_R	36	36	ml cells^{-1}	Relative impact of regulatory T-cells on β-cell death
B_{conv}	$2.59 \cdot 10^5$	$2.59 \cdot 10^5$	cell mg^{-1}	β-cells per milligram
Q_{panc}	0.194	0.194	ml	volume of mouse pancreas
d	0.50	0.50	d^{-1}	β-cell death rate
f_{Ma}	$5 \cdot 0.0623 \cdot 10^{-5}$	$0.0623 \cdot 10^{-5}$	ml cells^{-1} d^{-1}	activated phagocytosis rate per Ma
f_{tD}	$1.1899 \cdot 10^{-6}$	$1.1899 \cdot 10^{-6}$	ml cells^{-1} d^{-1}	rate naive DC engulf apoptotic β-cells
D_{ss}	10^5	10^5	cells ml^{-1}	steady-state DC population

f_D	$1.7101 \cdot 10^{-7}$	$1.7101 \cdot 10^{-7}$	ml cells^{-1} d^{-1}	rate naive DC engulf necrotic β-cells
R_0	864	864	mg dl^{-1}	basal rate glucose production
G_0	1.44	1.44	d^{-1}	rate of glucose decay
S_I	0.72	0.72	ml μU^{-1} d^{-1}	insulin rate of glucose elimination
σ_I	43.2	43.2	μU ml^{-1} d^{-1} mg^{-1}	maximum rate of insulin production by β-cells
GI	141.4214	141.4214	mg dl^{-1}	glucose level of half-max insulin production
δ_I	432	432	d^{-1}	rate of insulin decay
b_{DE}	$0.487 \cdot 10^{-5}$	$0.487 \cdot 10^{-5}$	ml cells^{-1} d^{-1}	DC elimination rate by effector T-cells
μ_D	0.51	0.51	d^{-1}	DC death rate
b_{IR}	$0.487 \cdot 10^{-5}$	$0.487 \cdot 10^{-5}$	ml cells^{-1} d^{-1}	DC elimination rate by regulatory T-cells
a_E	0.1199	0.1199	d^{-1}	rate of initial expansion of naive T-cells to effector T-cells
T_{naive}	370	370	cells	number of naive T-cells contributing to initial production of effector and regulatory T-cells
Q_{spleen}	0.1	0.1	ml	volume of mouse spleen
b_p	12	12	d^{-1}	maximum expansion rate of effector T-cells due to DCs
θ_D	$2.12 \cdot 10^5$	$2.12 \cdot 10^5$	d^{-1}	DC value for half-maximal effector T-cell expansion
r_{am}	0.01	0.01	d^{-1}	reversion rate of T-cells to memory T-cells

b_E	10^{-3}	10^{-3}	ml d cells^{-1}	activation rate for effector T-cells from memory T-cells
μ_E	$2 \cdot 10^{-6}$	$2 \cdot 10^{-6}$	d^{-1}	effector T-cell removal rate due to competition
a_R	0.1199	0.1199	d^{-1}	rate of initial expansion of naive T-cells to regulatory T-cells
b_R	10^{-3}	10^{-3}	ml d cells^{-1}	activation rate for regulatory T-cells from Em T-cells
μ_R	$2 \cdot 10^{-6}$	$2 \cdot 10^{-6}$	d^{-1}	regulatory T-cell removal rate due to competition
a_{Em}	0.01	0.01	d^{-1}	memory T-cell death rate

Table 2.2 A list of the parameters used in the single-compartment model. This list was derived from the original paper by Shtylla et al. (2019).

2.4 Remaining Open Questions of the Model

Something worth noting is that, when including a DC treatment in the model, there seemed to be a window of opportunity for which dosages of treatment would work and otherwise wouldn't work. The previously-obtained results can be seen in Figure 2.5.

One explanation of this has to do with the ratio of regulatory T-cells to effector T-cells. Regulatory T-cells mitigate the inflammatory response that the effector T-cells have, thus building up a tolerance to the unknown antigen presented in the body. The higher the ratio, the smaller the immune response. Ideally, we want the immune response to be reduced so that healthy β-cells are not accidentally killed off by the effector T-cells. In Figure 2.6, the graph of R/E seems very similar to the graph of the dosage levels. This is a strong indicator of why the window of opportunity for dosaging exists.