

Table S1: State variables

Category	State variable	Definition	Unit
Maturation signal	MS	amount of maturation signal (e.g., lipopolysaccharide) received	ng
Dendritic cells	ID	number of immature dendritic cells	cell number
	MD	number of mature dendritic cells	cell number
T cells	NT_i	number of naïve helper T cells	cell number
	$AT N_i$	number of activated helper T cells derived from naïve T cells	cell number
	$AT M_i$	number of activated helper T cells derived from memory T cells	cell number
	MT_i	number of memory helper T cells	cell number
	FT_i	number of functional helper T cells	cell number
	NB_i	number of naïve B cells recognizing Ag	cell number
B cells	$AB N_i$	number of activated B cells derived from naïve B cells	cell number
	$AB M_i$	number of activated B cells derived from memory B cells	cell number
	MB_i	number of memory B cells	cell number
	SP_i	number of short-lived plasma cells	cell number
	LP_i	number of long-lived plasma cells	cell number
ADA and Ag	A_i	amount of antibody in plasma	pmole
	Ag_{IS}	amount of antigenic protein at the injection site	pmole
	Ag	amount of antigenic protein in plasma	pmole
	Ag_{ec}	amount of antigenic protein in the extra central compartment	pmole
	Ag_{pt}	amount of antigenic protein in the peripheral tissues	pmole
	Ag^E	amount of antigenic protein in endosome	pmole
	p_i^E	amount of T-epitope peptides j	pmole
	$p_i M_k^E$	amount of T-epitope-MHC-II complex in endosome	pmole
	$p_i M_k$	amount of T-epitope-MHC-II presented on DC membrane	pmole
	Antigen presentation	cp^E	amount of endogenous competing protein in endosome
cpt^E		amount of competing peptide in endosome	pmole
$cpt M_k^E$		amount of competing peptide-MHC complex in endosomes	pmole
$cpt M_k$		amount of competing peptide-MHC complex on DC membrane	pmole
M_k^E		amount of MHC-II in endosome	pmole
M_k		amount of MHC-II on DC membrane	pmole

* The units for the cells in the system are in the unit of cell number, and the antibody, antigenic protein, and the MHC-II proteins are in the unit of pmole.