Supplementary Materials for Modeling the competing effects of the immune system and EMT on tumor development

Daniel R. Bergman[1], Matthew Karikomi [1], Qing Nie [1,2,*] and Adam L. MacLean [3,*]

[1]Department of Mathematics, University of California, Irvine, Irvine, CA 92697, USA
[2]Department of Cell and Developmental Biology, University of California, Irvine, Irvine, CA 92697, USA
[3]Department of Biological Sciences, University of Southern California, Los Angeles, CA 90089, USA
*Correspondence: qnie@uci.edu (Q.N.); macleana@usc.edu (A.L.M.)

Contents

1 Definition of parameters specifying the model **2**

2 Parameter values used for simulation **3**

1 Definition of parameters specifying the model

Name	Description
p	proliferation rate of tissue cells
d_C	death rate of tissue cells
Δ_{MIE}	mesenchymal immune evasion
Δ_{MGA}	mesenchymal growth arrest
Δ_A	mutant cells decreased apoptosis
Δ_{IE}	mutant cells increased immune evasion
Δ_P	mutant cells increased proliferation
K_0	EC50 term for negative feedback of tissue cells on own proliferation
K_1	EC50 term for probability of NK cell finding mutant cell
K_2	EC50 term for Treg inhibition of cytotoxic functions
K_3	EC50 term for how much TGF-β each cell has
E_{NK}	rate of NKs clearing mutants
E_{CTL}	rate of CTLs clearing mutants
σ_{NK}	NK source rate
σ_{CTL}	CTL source rate per cleared mutant cell
σ_{Treg}	Treg source rate per cleared mutant cell
k_{EMT}	EMT/MET rate
σ	standard deviation of noise in TGF-β each cell receives
τ_{max}	max amount of TGF-β any cell can receive
τ_{MUT}	rate of TGF-β production by mutant cells
τ_{Treg}	rate of TGF-β production by Treg

Table 1: The model parameter names and descriptions. Note that many of these values are affected by the inflammation state of the system.

2 Parameter values used for simulation

Name	Description	INFL Low Value	INFL High Value
p	proliferation rate of tissue cells	0.28	
d_C	death rate of tissue cells	0.14	
Δ_{MIE}	MIE	0.6	
Δ_{MGA}	MGA	0.2	
Δ_A	mutant cells decreased apoptosis	0.3	
Δ_{IE}	mutant cells increased immune evasion	0.48	
Δ_P	mutant cells increased proliferation	0.36	
K_0	EC50 term for negative feedback of tissue cells on own proliferation	80	
K_1	EC50 term for probability of NK cell finding mutant cell	8	
K_2	EC50 term for Treg inhibition of cytotoxic functions	5	0.025
K_3	EC50 term for how much TGF-β each cell has	200	
E_{NK}	rate of NKs clearing mutants	10	30
E_{CTL}	rate of CTLs clearing mutants	200	600
σ_{NK}	NK source rate	1.3	
σ_{CTL}	CTL source rate per cleared mutant cell	100	
σ_{Treg}	Treg source rate per cleared mutant cell	200	
k_{EMT}	EMT/MET rate	0.01	
σ	standard deviation of noise in TGF-β each cell receives	6	
$\tau_{\max}$	max amount of TGF-β any cell can receive	500	
τ_{MUT}	rate of TGF-β production by mutant cells	0.05	
τ_{Treg}	rate of TGF-β production by Treg	0.5	
	RP Cancer Line	0.5	
	INFL High Duration	30	
	INFL Low Duration	30	
	Mes Threshold	0.7	
	maximum initial mutation damage after warmup	0.01	
	increase in probability to mutate for non-mutating proliferating cells	0.0001	

Table 2: The model parameter names, descriptions, and values during both low and high inflammation. Parameters with only one value do not change with the inflammatory state.