**Supplementary Text S1**

**List of Parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Parameter** | **Description** | **Units** | **Value** | **Reference#** |
|  | **βM2** | Rate of IL-10 production from M2 cells | ng cell-1day-1 | 1x10-15 | Expected |
|  | **βTc** | Rate of IFN-γ production from Tc cells | ng cell-1day-1 | 1x10-8 | Expected |
|  | **βTh1CK2** | Rate of IFN-γ production from TH1 cells | ng cell-1day-1 | 1x10-7 | Expected |
|  | **βTh1CK3** | Rate of IL-2 production from TH1 cells | ng cell-1day-1 | 1 x10-8 | Expected |
|  | **βTh2** | Rate of IL-10 production from TH2 cells | ng cell-1day-1 | 1 x10-9 | Expected |
|  | **βTreg** | Rate of IL-10 production from Treg cells | ng cell-1day-1 | 1 x10-10 | Expected |
|  | **γC** | Birth rate of Cancer cells | day-1 | 0.1282 | Estimated |
|  | **γCR** | Birth rate of Cancer resistant cells | day-1 | 0.1282 | Expected |
|  | **γM1** | Birth rate of M1 cells | day-1 | 0.7 | Expected |
|  | **γM2** | Birth rate of M2 cells | day-1 | 0.01 | Expected |
|  | **γS** | Birth rate of Stem cells | day-1 | 0.15 | Expected |
|  | **γTc** | Birth rate of Tc cells | day-1 | 1.0 | [[1](#_ENREF_1)] |
|  | **γTh1** | Birth rate of TH1 cells | day-1 | 2.0 | [[2](#_ENREF_2)] |
|  | **γTh2** | Birth rate of TH2 cells | day-1 | 2.0 | [[2](#_ENREF_2)] |
|  | **γTreg** | Birth rate of Treg cells | day-1 | 0.3 | [[3](#_ENREF_3)] |
|  | **δC** | Death rate of Cancer cells | day-1 | 0.8055 | Estimated |
|  | **δCk1** | Degradation rate of IL-10 | day-1 | 19.757 | Estimated |
|  | **δCk2** | Degradation rate of IFN-γ | day-1 | 6.1212 | Estimated |
|  | **δCk3** | Degradation rate of IL-2 | day-1 | 8.664339 | Calculated [[4](#_ENREF_4)] |
|  | **δCR** | Death rate of Resistant Cancer cells | day-1 | 5.37 x10-5 | Estimated |
|  | **δM1** | Death rate of M1 cells | day-1 | 1.02 | [[5](#_ENREF_5)] |
|  | **δM2** | Death rate of M2 cells | day-1 | 0.05 | [[5](#_ENREF_5)] |
|  | **δS** | Death rate of Stem cells | day-1 | 2 x10-7 | Expected |
|  | **δTc** | Death rate of Tc cells | day-1 | 5.2939 | Estimated |
|  | **δTh1** | Death rate of TH1 cells | day-1 | 2.0 | [[6](#_ENREF_6)] |
|  | **δTh2** | Death rate of TH2 cells | day-1 | 2.0 | Expected |
|  | **δTreg** | Death rate of Treg cells | day-1 | 1.0 | [[7](#_ENREF_7)] |
|  | **λM1** | Saturation constant for M1 activation | cells ml-1 | 1x108 | Expected |
|  | **λM2** | Saturation constant for M2 activation | cells ml-1 | 1 x106 | Expected |
|  | **λTc1** | Saturation constant for Tc activation by cancer cells | cells ml-1 | 1 x105 | Expected |
|  | **λTc2** | Saturation constant for Tc inhibition by stem cells | cells ml-1 | 5 x105 | Expected |
|  | **λTc3** | Saturation constant for Tc inhibition by Treg cells | cells ml-1 | 5 x1010 | Expected |
|  | **λTc4** | Saturation constant for Tc activation by TH1 cells | cells ml-1 | 1 x105 | Expected |
|  | **λTh1** | Saturation constant for TH1 | cells ml-1 | 1 x105 | Expected |
|  | **λTh2** | Saturation constant for TH2 | cells ml-1 | 1 x105 | Expected |
|  | **λTreg2** | Saturation constant for Treg | cells ml-1 | 1 x107 | Expected |
|  | **μC1** | Rate of activation of C and CR by IL-10 | day-1 | 0.75 | [[8](#_ENREF_8)] |
|  | **μC2** | Rate of killing of C and CR by IFN-γ | day-1 | 0.9 | [[9](#_ENREF_9)] |
|  | **μS** | Rate of killing of S by IFN-gamma | day-1 | 0.17 | [[9](#_ENREF_9)] |
|  | **μSR** | Rate of killing of SR by IFN-gamma | day-1 | 0.18 | Expected |
|  | **μTcS** | Rate of Tc killing by S and SR cells | day-1 | 1 x10-10 | [[10](#_ENREF_10)] |
|  | **μTcTreg** | Rate of Tc killing by Treg cells | day-1 | 1.5x10-5 | [[11](#_ENREF_11)] |
|  | **μTh1Ck1** | Rate of TH1 killing by IL-10 | day-1 | 1 x10-9 | [[12](#_ENREF_12)] |
|  | **μTh1Ck3** | Rate of TH1 activation by IL-2 | day-1 | 0.1245 | [[13](#_ENREF_13)] |
|  | **μTregCk1** | Rate of Treg activation by IL-10 | day-1 | 1 x10-7 | Expected |
|  | **Cmax=Ktumor/2** | Carrying capacity for Cancer cells **,** where Ktumor=2 x1010 is the total Carrying capacity of non-stem tumor cells | cells ml-1 | 1 x1010 | [[14](#_ENREF_14)] |
|  | **CRmax=Ktumor/2** | Carrying capacity for Resistant Cancer cells**,** where Ktumor=2 x1010 is the total Carrying capacity of non-stem tumor cells | cells ml-1 | 1 x1010 | Expected |
|  | **k1** | Saturation constant for inhibition of S by IFN-γ | ng ml-1 | 10.0 | Expected |
|  | **k11** | Saturation constant for activation of Treg by IL-10 | ng ml-1 | 0.001 | Expected |
|  | **k2** | Saturation constant for inhibition of SR by IFN-γ | ng ml-1 | 10.0 | Expected |
|  | **k3** | Saturation constant for activation of C by IL-10 | ng ml-1 | 2.0531 | Estimated |
|  | **k4** | Saturation constant for inhibition of C by IFN-γ | ng ml-1 | 3.02 | Estimated |
|  | **k5** | Saturation constant for activation of CR by IL-10 | ng ml-1 | 6.7979 | Estimated |
|  | **k6** | Saturation constant for inhibition of CR by IFN-γ | ng ml-1 | 6.9937 | Estimated |
|  | **k8** | Saturation constant for inhibition of TH1 by IL-10 | ng ml-1 | 0.01 | Expected |
|  | **k9** | Saturation constant for activation of TH1 by IL-2 | ng ml-1 | 0.001 | Expected |
|  | **ktc1** | Saturation constant for inhibition of S by Tc | cell ml-1 | 1 x109 | Expected |
|  | **ktc2** | Saturation constant for inhibition of SR by Tc | cell ml-1 | 1 x108 | Expected |
|  | **ktc3** | Saturation constant for inhibition of C by Tc | cell ml-1 | 1 x109 | Expected |
|  | **ktc4** | Saturation constant for inhibition of CR by Tc | cell ml-1 | 1 x109 | Expected |
|  | **mC** | Probability of Stem cell transformation into Stem resistant cells | - | 0.01 | Expected |
|  | **mS** | Probability of Cancer cell transformation into Cancer resistant cells | - | 4 x10-7 | [[14](#_ENREF_14)] |
|  | **p1** | Probability of Asymmetric differentiation of stem cells | - | 0.2 | [[14](#_ENREF_14)] |
|  | **p2** | Probability of Symmetric differentiation into two differentiated cancer cells | - | 0.05 | [[14](#_ENREF_14)] |
|  | **r1** | constant |  | 0.0001 | Expected |
|  | **r2** | constant |  | 1x x10-5 | Expected |
|  | **tck** | Rate of killing of tumor by Tc cells | day-1 | 0.1 | Expected |
|  | **µM1Ck2** | Rate of M1 activation by IFN-γ | day-1 | 0.01 | Expected |
|  | **µM2Ck1** | Rate of M2 activation by IL10 | day-1 | 0.01 | Expected |
|  | **k7** | Saturation constant for proliferation of M1 by IFN-γ | ng ml-1 | 0.2 | Expected |
|  | **k10** | Saturation constant for proliferation of M2 by IL10 | ng ml-1 | 0.01 | Expected |

**#** Estimated parameter values have been determined by the MCMC techniques using the time course experiment cytometric data for cancer cell proliferation for Gastric cancer cell line (SGC7901) (Refer *Methods* of Main Article) [15].

Expected parameter values are estimated by varying the parameters within the biologically feasible ranges found in various Literatures so as to determine its expected value to calibrate the model with experimental observations.

**List of Initial values**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Symbol** | **Initial Values** | **Reference** |
| Stem Cell | S | 1 | - |
| Stem Resistant Cell | SR | 0 | - |
| Cancer Cell | C | 0 | - |
| Cancer Resistant Cell | CR | 0 | - |
| Type-I Tumor Associated Macrophage | M1 | 85000 | Calculated [[5](#_ENREF_5)] |
| Type-II Tumor Associated Macrophage | M2 | 15000 | Calculated [[5](#_ENREF_5)] |
| Type-I Helper T Cell | TH1 | 71000 | [16] |
| Type-II Helper T Cell | TH2 | 12000 | [16] |
| Cytotoxic T Cell | Tc | 56000 | [16] |
| Regulatory T Cell | Treg | 8000 | [16] |
| Interleukin-10 | IL10 | 0.0085 | [17] |
| Interferon-γ | IFN-γ | 0.12 | [17] |
| Interleukin-2 | IL2 | 0.0094 | [17] |

**Reference**

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