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function P=HNSCC\_parameters\_immune\_desert\_modelling(alpha)

## Load the parameters

## Resource to cancer cells

K\_RCST=100;  
P(1)=K\_RCST; % per unit of resource per unit of time. Resource to T-exposed tumor stem cell  
  
K\_RCSNT=100;  
P(2)=K\_RCSNT; % per unit of resource per unit of time. Resource to Non-T-exposed tumor stem cell  
  
K\_RCNPDL1=120;  
P(3)=K\_RCNPDL1; % per unit of resource per unit of time. Resource to T-exposed PDL1- tumor cell  
  
K\_RCRNPDL1=120;  
P(4)=K\_RCRNPDL1; % per unit of resource per unit of time. Resource to Non-T-exposed PDL1- tumor cell  
  
K\_RCPDL1=60;  
P(5)=K\_RCPDL1; % per unit of resource per unit of time. Resource to T-exposed PDL1+ tumor cell  
  
K\_RCRPDL1=60;  
P(6)=K\_RCRPDL1; % per unit of resource per unit of time. Resource to Non-T-exposed PDL1+ tumor cell  
  
K\_RIn=1500;  
P(7)=K\_RIn; % Resource per unit time. Default resource intake rate  
  
alpha\_Comp=0.0005; % Resource consumption rate  
P(8)=alpha\_Comp;

## Cancer cell proliferation, interactions, and death

Y\_CST=10^4;  
P(9)=Y\_CST; % Carrying capacity for PD1- T cells  
  
Y\_CPDL1M=10^4;  
P(10)=Y\_CPDL1M; % Carrying capacity for PD1+ T cells  
  
Y\_RM=40;  
P(11)=Y\_RM; % Resources. Maximum resource withholding capacity.  
  
K\_TXC=50;  
P(12)=K\_TXC; % Exhausted T cells-driven growth of tumor cells.  
  
K\_FWTC=0.005;  
P(13)=K\_FWTC; % Fraction of wild type fibroblasts in proximity with the tumor cells.  
  
K\_CAFC=80;  
P(14)=K\_CAFC; % CAF-driven growth of the tumor cells.  
  
K\_CAFCR=2.5;  
P(15)=K\_CAFCR; % CAF-driven growth of the tumor non-T exposed cells.  
  
K\_TKC=0;  
P(16)=K\_TKC; % T cells-driven apoptosis of tumor cells.  
  
K\_Lac=0.005;  
P(17)=K\_Lac; % Inhibition rate of lactate  
  
K\_TKCIFNG=0;  
P(18)=K\_TKCIFNG; % IFNG induced T cells-driven apoptosis of tumor cells.  
  
P(19)=alpha; % CAF barrier  
  
K\_CAFB=0.001;  
P(20)=K\_CAFB; % Barrier formation rate  
  
K\_CSTCNPDL1=8;  
P(21)=K\_CSTCNPDL1; % Stem to PDL1-  
  
K\_CSTCPDL1=0;  
P(22)=K\_CSTCPDL1; % Stem to PDL1+  
  
K\_CPDNPD=8;  
P(23)=K\_CPDNPD; % NPDL1 to PDL1 conversion  
  
K\_CSTD=0.0005;  
P(24)=K\_CSTD; % Death rate of Tumor stem  
  
K\_CNPDL1D=8;  
P(25)=K\_CNPDL1D; % Death rate of NPDL1  
  
K\_CPDL1D=8;  
P(26)=K\_CPDL1D; % Death rate of PDL1  
  
K\_ResD=8;  
P(27)=K\_ResD; % Degradation of Resources  
  
Delta=10^-3;  
P(28)=Delta; % Width of the barrier

Not enough input arguments.  
  
Error in HNSCC\_parameters\_immune\_desert\_modelling (line 60)  
P(19)=alpha; % CAF barrier

## T cell proliferation, interactions, and death

Y\_TKM=5000;  
P(29)=Y\_TKM; % Carrying capacity for PD1+ T cells  
  
K\_TKPD=2;  
P(30)=K\_TKPD; % Proliferation rate of PD1+ T cells  
  
K\_TKNPD=1.5;  
P(31)=K\_TKNPD; % Proliferation rate of PD1- T cells  
  
K\_TH=1;  
P(32)=K\_TH; % Proliferation rate of helper T cells  
  
K\_TREG=1.2;  
P(33)=K\_TREG; % Proliferation rate of regulator T cells  
  
K\_TEX=9; % Proliferation rate of exhausted T cells  
P(34)=K\_TEX;  
  
K\_TKPDNPD1=150000;  
P(35)=K\_TKPDNPD1; % Conversion from PD1+ to PD1- T cells  
  
K\_TKPDTEX=0.8;  
P(36)=K\_TKPDTEX; % Conversion from PD1+ T cels to exhausted T cells  
  
K\_THTK=2;  
P(37)=K\_THTK; % Helper induced proliferation of Killer T cells  
  
K\_IL2TK=1;  
P(38)=K\_IL2TK; % IL-2 induced proliferation of killer T cells  
  
K\_CNPDT=1.5;  
P(39)=K\_CNPDT; % MHC sensing of tumor cells for immune activation  
  
K\_CAFTREG=1;  
P(40)=K\_CAFTREG; % CAF induced proliferation of regulatory T cells  
  
K\_TREGTH=0.001;  
P(41)=K\_TREGTH; % TREG induced inhibition of helper T cells  
  
K\_TKPDD=10;  
P(42)=K\_TKPDD; % Death rate of killer PD1+ T cells  
  
K\_THD=7;  
P(43)=K\_THD; % Death rate of helper T cells  
  
K\_TREGD=9;  
P(44)=K\_TREGD; % Death rate of regulatory T cells  
  
K\_TEXD=8;  
P(45)=K\_TEXD; % Death rate for exhausted T cells

## CAF proliferation, interactions, and death

Y\_FWTM=5000;  
P(46)=Y\_FWTM; % maximum carrying capacity of Fibroblasts  
  
K\_FWT=50;  
P(47)=K\_FWT; % Proliferation rate of wild type fibroblasts  
  
K\_CAF=1;  
P(48)=K\_CAF; % Proliferation rate of CAF cells  
  
K\_OPNCAF=50;  
P(49)=K\_OPNCAF; % OPN-induced Proliferation rate of CAF cells  
  
K\_CTCAF=0.5;  
P(50)=K\_CTCAF; % Tumor cells-induced growth of CAF  
  
K\_CTCAFR=2;  
P(51)=K\_CTCAFR; % Proximity factor for CAF and resistant tumor cells  
  
K\_LIF=0.0005;  
P(52)=K\_LIF; % LIF fraction available for conversion  
  
K\_LIFT=1;  
P(53)=K\_LIFT; % Hill like dissociation constant  
  
K\_M2CAF=2;  
P(54)=K\_M2CAF; % M2-driven proliferation rate for CAFs  
  
K\_FWTCAF=50;  
P(55)=K\_FWTCAF; % LIF-driven conversion rate from FWT to CAFs  
  
K\_CAFFWT=9;  
P(56)=K\_CAFFWT; % Conversion from CAF to wild type fibroblasts  
  
K\_FWTD=10;  
P(57)=K\_FWTD; % Death rate of wild type fibroblasts  
  
K\_CAFD=10;  
P(58)=K\_CAFD; % Death rate of CAFs

## Macrophage proliferation, interactions, and death

Y\_MM=5000;  
P(59)=Y\_MM; % Carrying capacity  
  
K\_M1=15;  
P(60)=K\_M1; % Growth rate of M1 phase macrophage  
  
K\_M2=5;  
P(61)=K\_M2; % Growth rate of M2 phase macrophage  
  
K\_CANM1=10;  
P(62)=K\_CANM1; % Tumor cells-driven proliferation of macrophages  
  
K\_M2M1=3;  
P(63)=K\_M2M1; % Default conversion rate  
  
K\_M1M2ICAM1=30;  
P(64)=K\_M1M2ICAM1; % ICAM1-driven conversion rate  
  
K\_ICAM1=5\*10^-4;  
P(65)=K\_ICAM1; % Fraction of ICAM1 in proximity with M1 macrophage.  
  
  
K\_CAFM2=120;  
P(66)=K\_CAFM2; % Tumor cells-driven proliferation of macrophages  
  
K\_M1D=10;  
P(67)=K\_M1D; % Death rate of M1 phase macrophage  
  
K\_M2D=10;  
P(68)=K\_M2D; % Death rate of M2 phase macrophage

## Cytokines, Chemokines, and Lactate

## IL-2

K\_TIL2=5;  
P(69)=K\_TIL2; % IL-2 secretion by T cells  
  
K\_IL2D=6;  
P(70)=K\_IL2D; % IL-2 degradation

## IFNG

K\_TIFNG=20;  
P(71)=K\_TIFNG; % IFNG secretion by T cells  
  
K\_OPNIFNG=0.01;  
P(72)=K\_OPNIFNG; % IFNG inhibition by OPN  
  
K\_IFNGD=5;  
P(73)=K\_IFNGD; % IFNG degradation rate

## ICAM1

K\_TICAM1=5;  
P(74)=K\_TICAM1; % ICAM1 secretion by T cells  
  
K\_ICAM1D=5;  
P(75)=K\_ICAM1D; % ICAM1 degradation rate

## OPN

K\_CANOPN=3;  
P(76)=K\_CANOPN; % OPN secretion by Tumor cells  
  
K\_CAFOPN=5;  
P(77)=K\_CAFOPN; % OPN Secretion by CAF  
  
K\_IRFOPN=0.05;  
P(78)=K\_IRFOPN; % IRF-driven inhibition of OPN  
  
K\_OPND=4;  
P(79)=K\_OPND; % OPN Degradation rate

## LIF

K\_CANLIF=6;  
P(80)=K\_CANLIF; % LIF secretion by Tumor cells  
  
K\_CAFLIF=0.05;  
P(81)=K\_CAFLIF; % LIF Secretion by CAF  
  
K\_LIFD=8;  
P(82)=K\_LIFD; % LIF Degradation rate

## IL-8

K\_CANIL8=2;  
P(83)=K\_CANIL8; % IL8 secretion by Tumor cells  
  
K\_CAFIL8=2;  
P(84)=K\_CAFIL8; % IL8 Secretion by CAF  
  
K\_M2IL8=15;  
P(85)=K\_M2IL8; % IL8 secretion by M2  
  
K\_IL8D=5;  
P(86)=K\_IL8D; % LIF Degradation rate

## IRF8

K\_M1IRF8=2;  
P(87)=K\_M1IRF8; % IRF8 secretion by M1  
  
K\_IRF8D=2;  
P(88)=K\_IRF8D; % IRF8 Degradation rate

## Lactate

K\_M2Lac=2;  
P(89)=K\_M2Lac; % Lac secretion by M2  
  
K\_CANLac=0.2;  
P(90)=K\_CANLac; % Lac secretion by Tumor cells  
  
K\_LacD=4;  
P(91)=K\_LacD; % Lac Degradation rate

end

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