MODELING CAR T-CELL THERAPY WITH PATIENT PRECONDITIONING

By: Ansley Bentley and Charlotte Ingram
abentle1@spelman.edu
cingram6@spelman.edu
Mathematical Models Final
Dr. Kara
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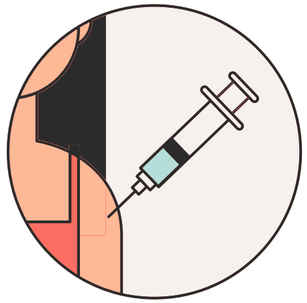
Introduction/Summary of Paper

The goal of the paper was to explore combinations of chemotherapy preconditioning and CAR T-cell doses from a range that captures the standard procedures for the two FDA-approved CAR T-cell treatments.

Major Results

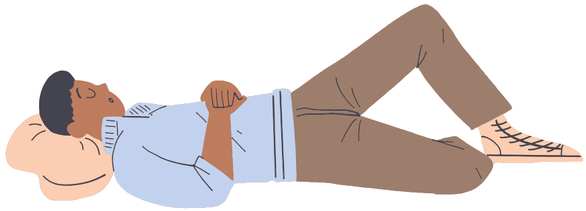


1. Without preconditioning chemotherapy, dangerous levels of of CAR T-cell injections would be required to treat medium to large tumors.

*Successful preconditioning lowers a patient's initial tumor and effector cells so that safe levels of CAR T cell doses can be effective.

2.Chemotherapeutic lymphodepletion can reduce the necessary CAR T-cell dosage for a successful treatment.

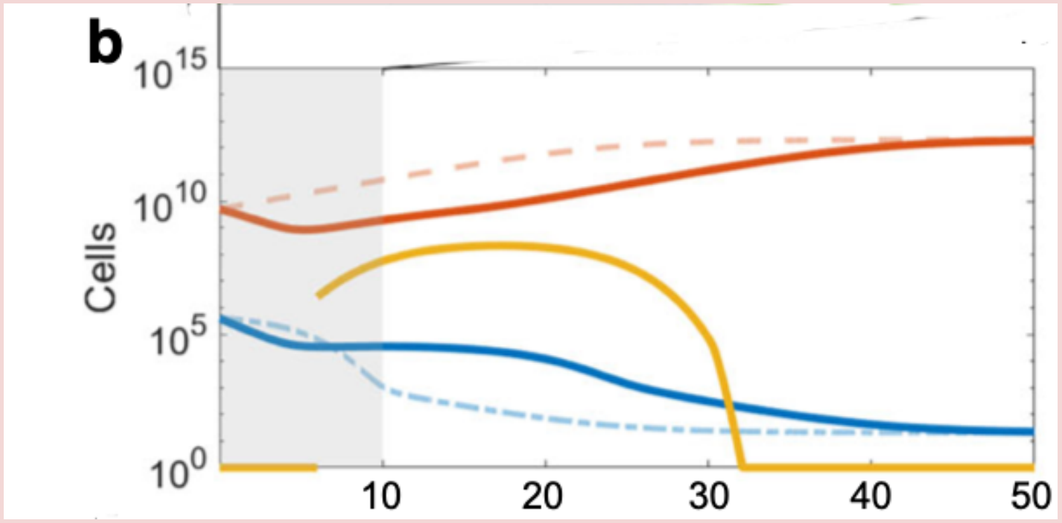
*Choosing an optimal lymphodepletion plan can make CAR T-cell threapy safer.

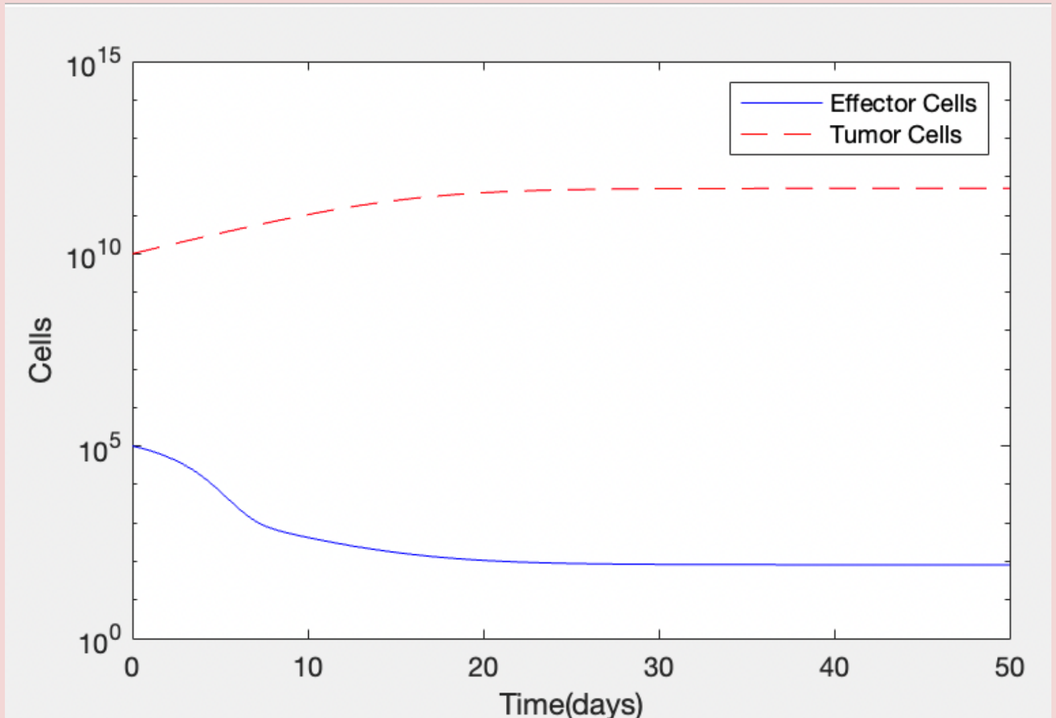


3.The rest days between chemotherapy and CAR T-cell injection play an essential role in the success of a treatmennt.

*The recovery days in the treatment plan are significant because if too many rest days are incorporated the benefits of the chemotherapy may be lost.

Figure 3b


b
Cells
10^{15}
10^{10}
10^{5}
10^{0}
10
20
30
40
50


Effector Cells
Tumor Cells
Cells
10^{15}
10^{10}
10^{5}
10^{0}
0
10
20
30
40
50
Time(days)

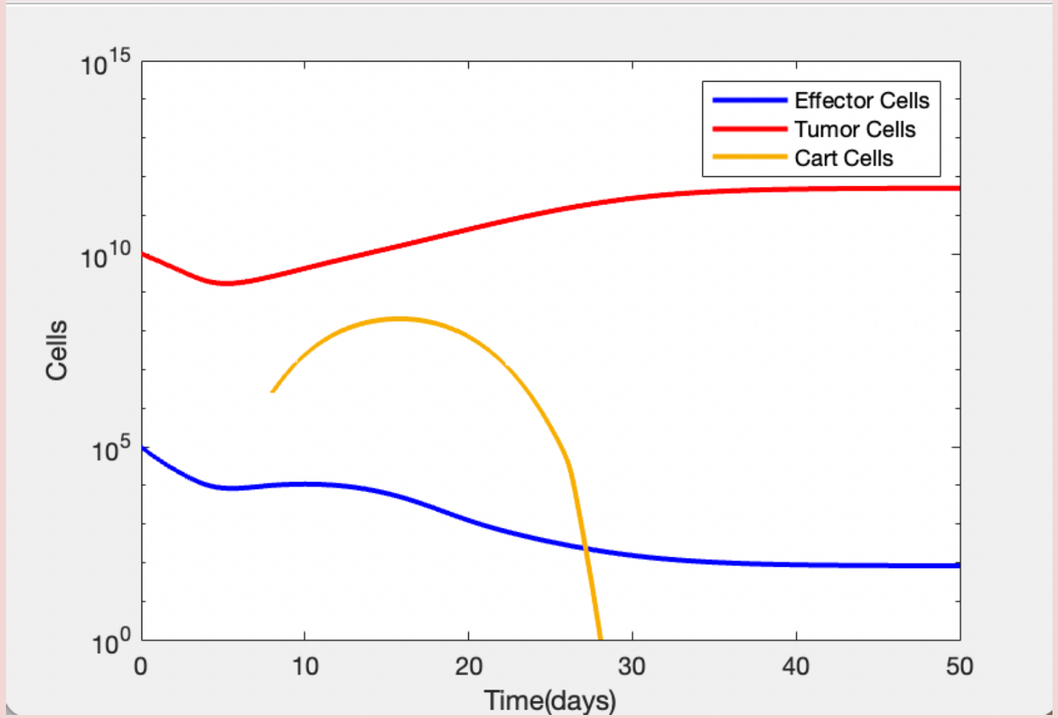
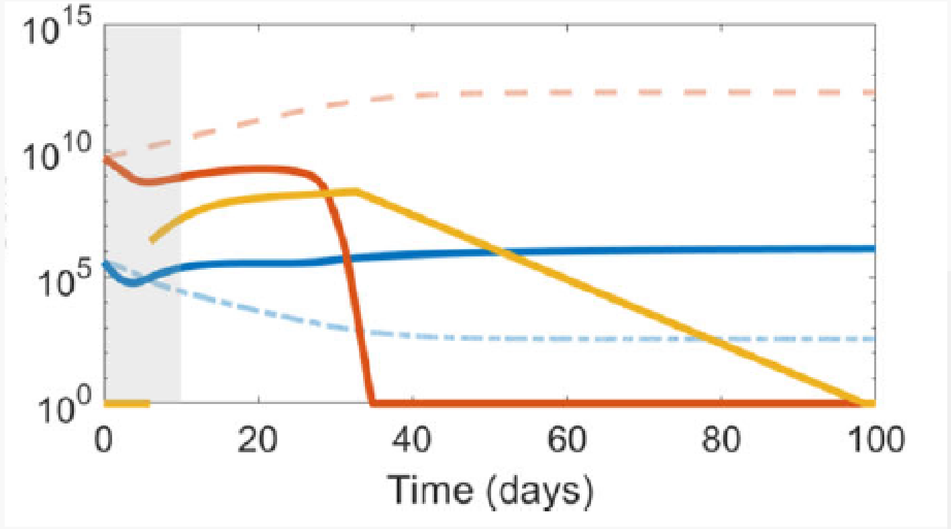
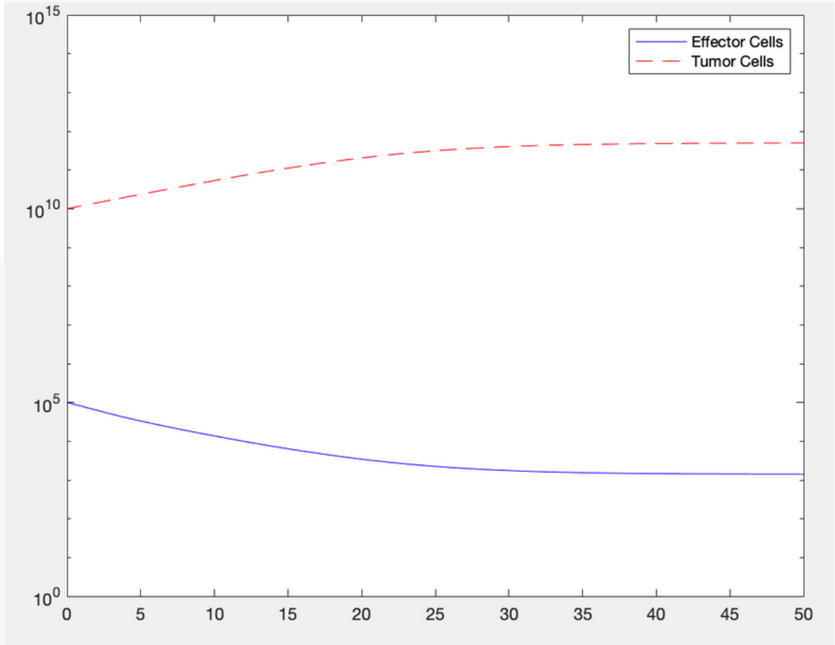

Effector Cells
Tumor Cells
Cart Cells
Cells
10^{15}
10^{10}
10^{5}
10^{0}
0
10
20
30
40
50
Time(days)

Figure 3c


10^{15}
10^{10}
10^{5}
10^{0}
0
20
40
60
80
100
Time (days)


Effector Cells
Tumor Cells
10^{15}
10^{10}
10^{5}
10^{0}
0
5
10
15
20
25
30
35
40
45
50

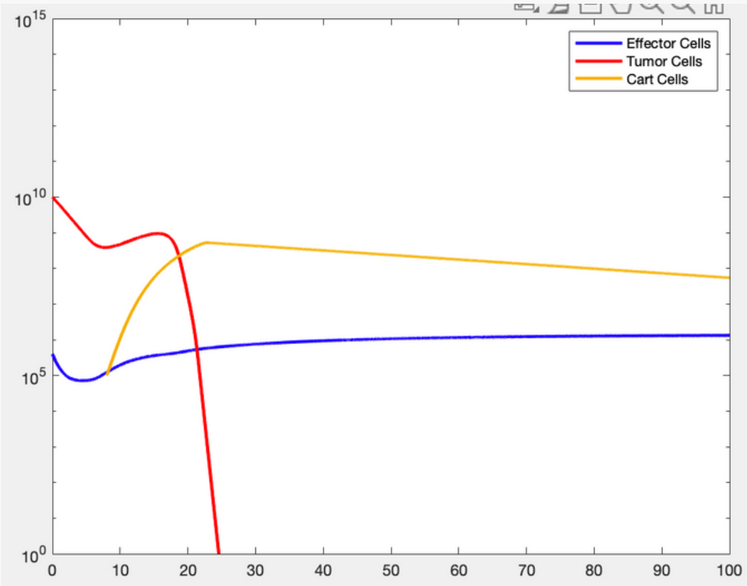
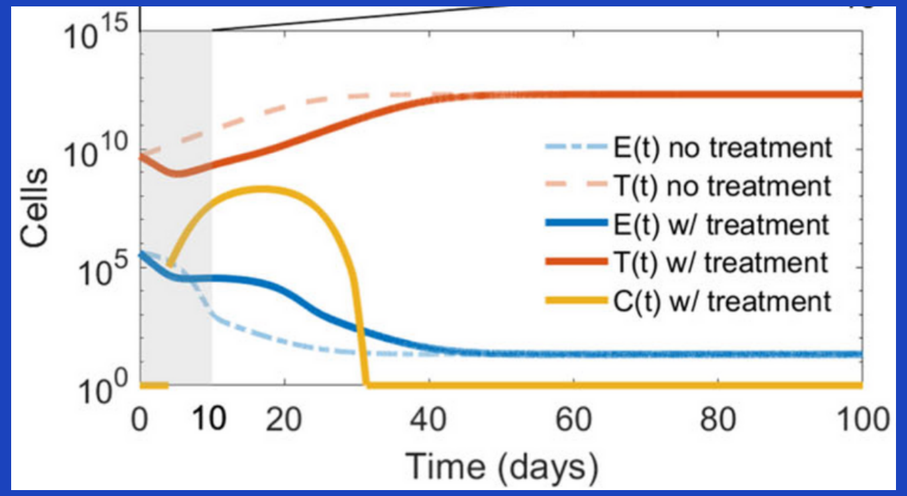
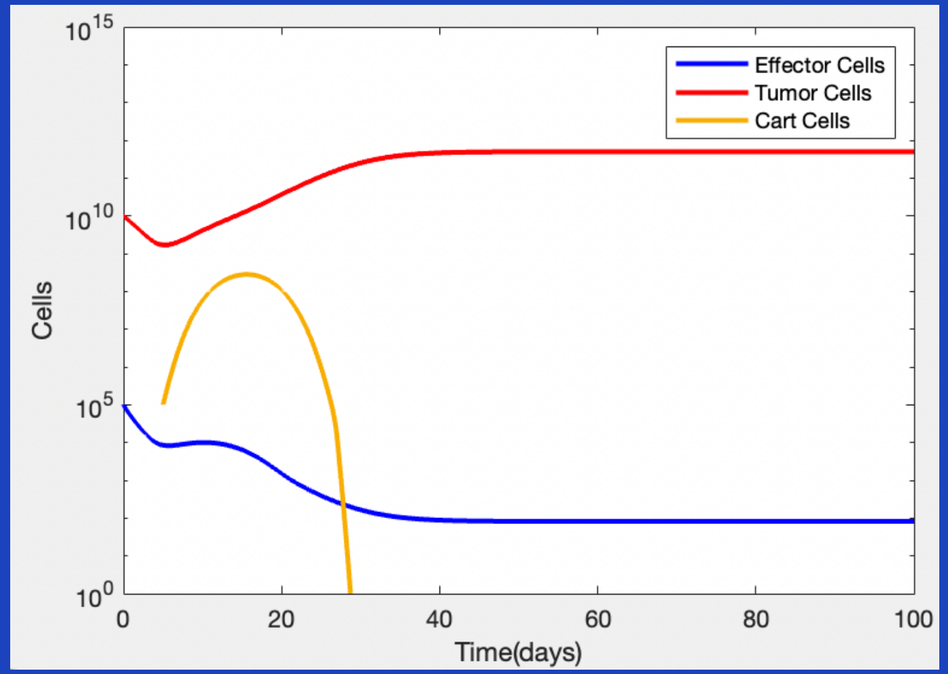

Effector Cells
Tumor Cells
Cart Cells
10^{15}
10^{10}
10^{5}
10^{0}
0
10
20
30
40
50
60
70
80
90
100

Figure 5a


Cells
Time (days)
E(t) no treatment
T(t) no treatment
E(t) w/ treatment
T(t) w/ treatment
C(t) w/ treatment


Cells
Time(days)
Effector Cells
Tumor Cells
Cart Cells

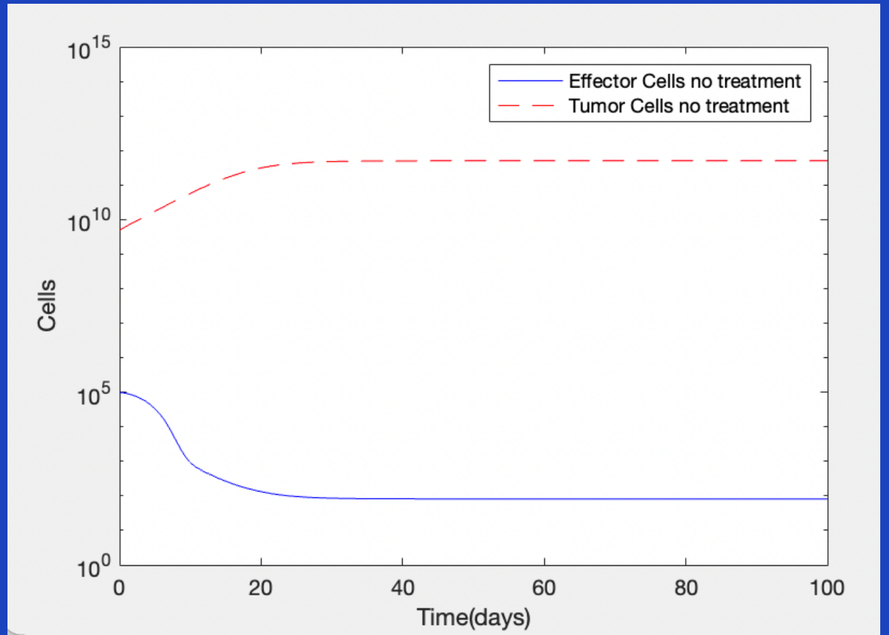
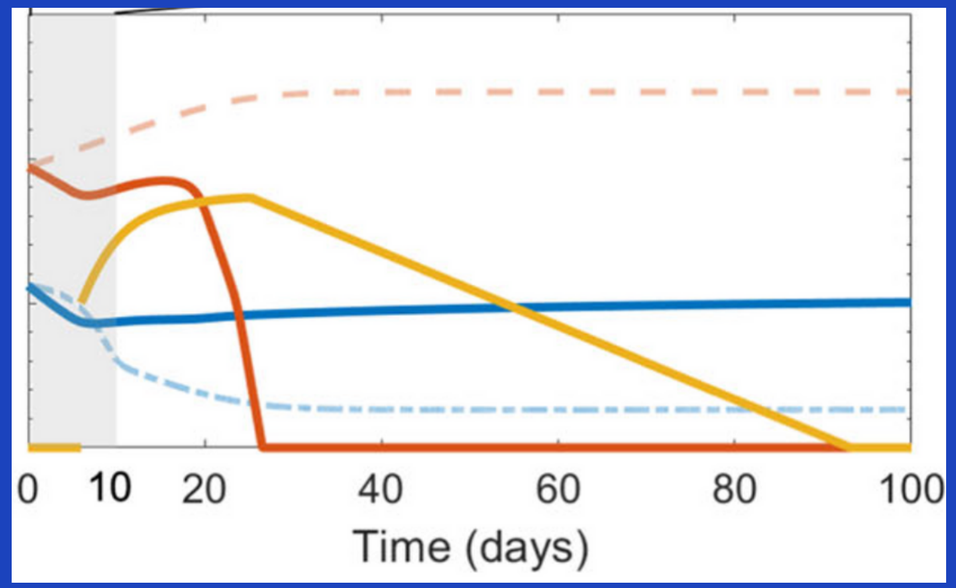
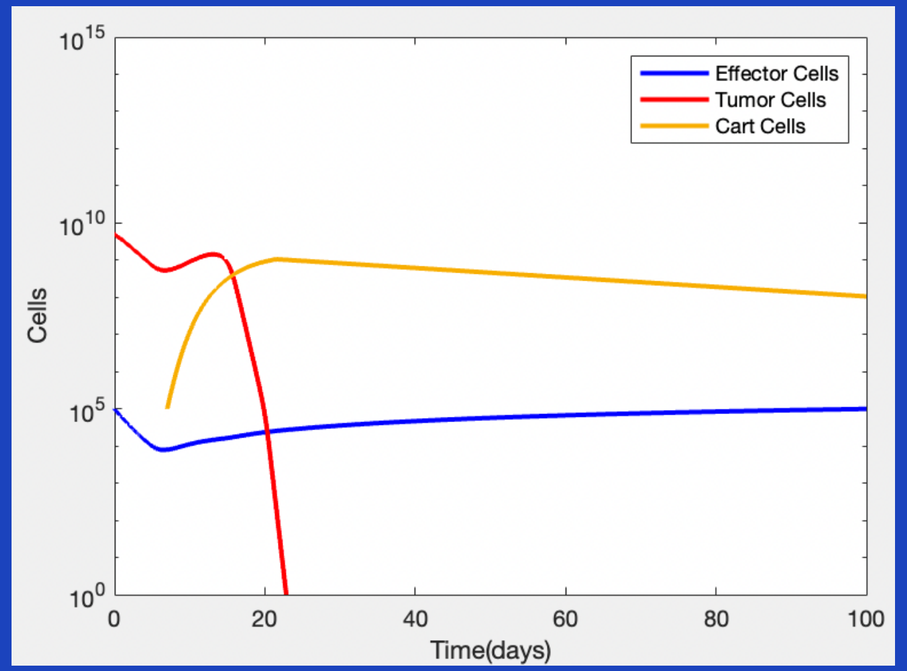

Cells
Time(days)
Effector Cells no treatment
Tumor Cells no treatment

Figure 5b


0
10
20
40
60
80
100
Time (days)


Effector Cells
Tumor Cells
Cart Cells
Cells
Time(days)

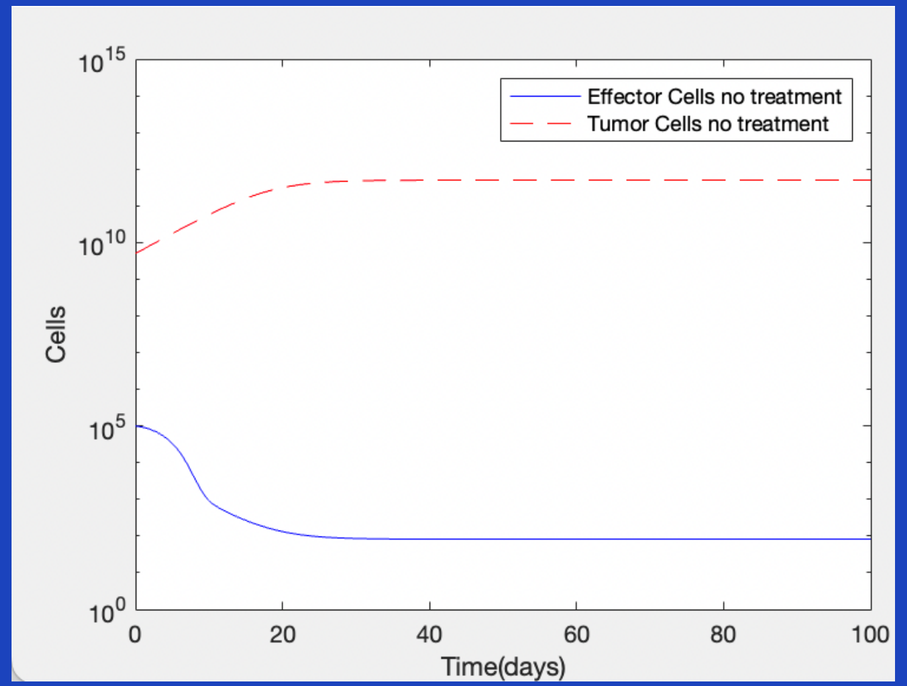
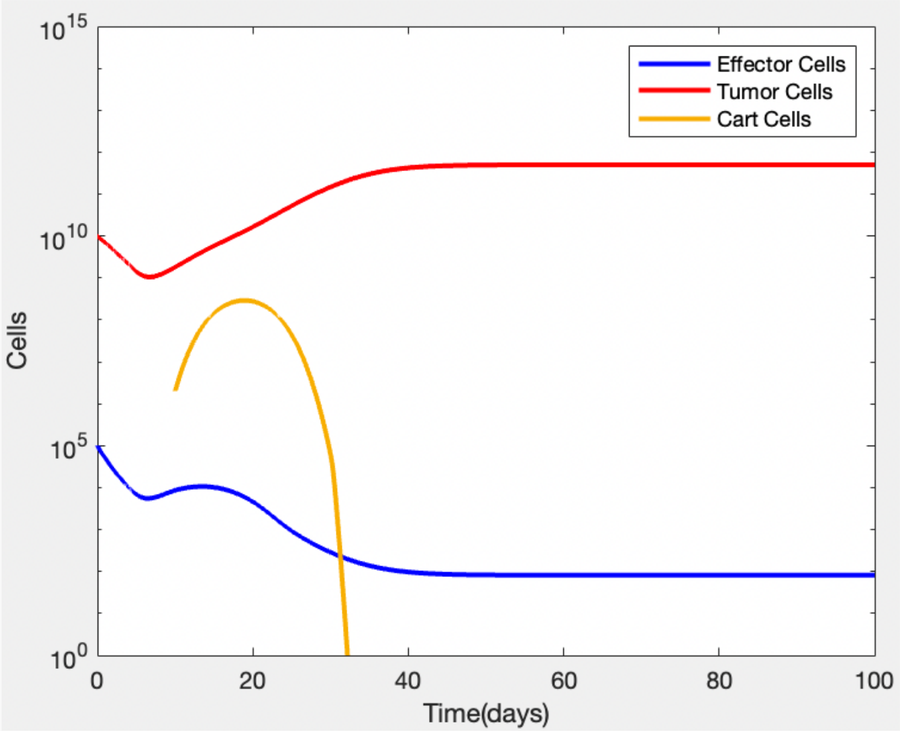
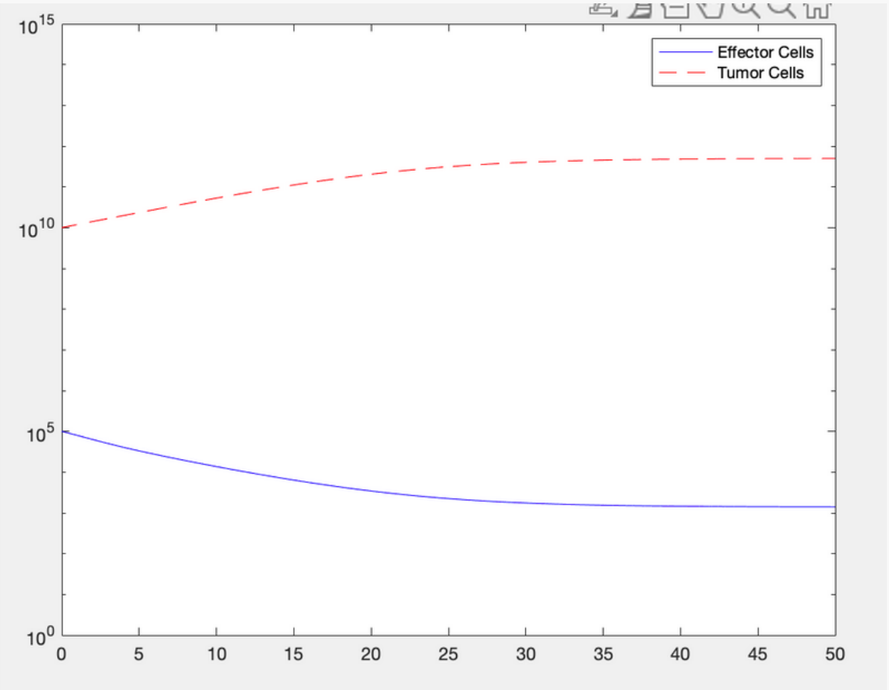

Effector Cells no treatment
Tumor Cells no treatment
Cells
Time(days)

Figure 6a


Effector Cells
Tumor Cells
Cart Cells
Cells
Time(days)


Effector Cells
Tumor Cells

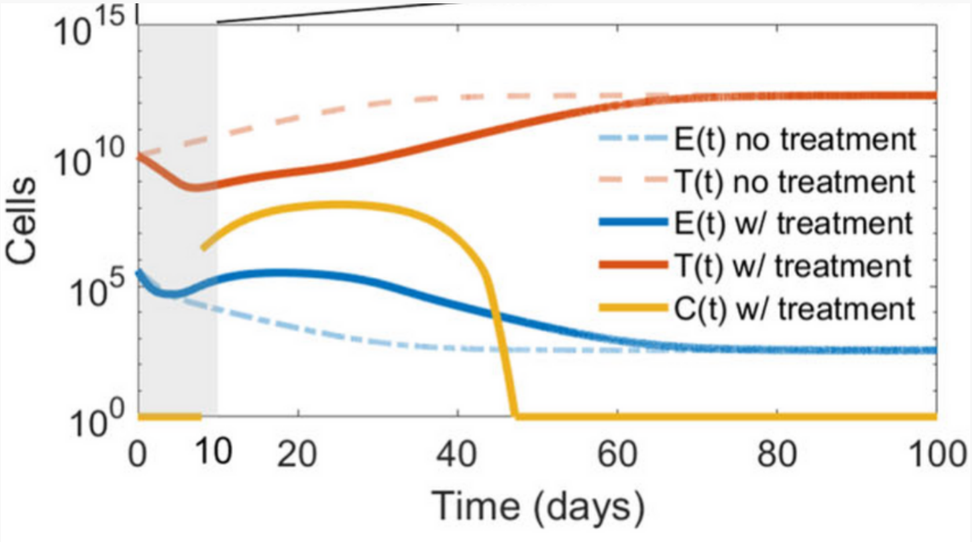
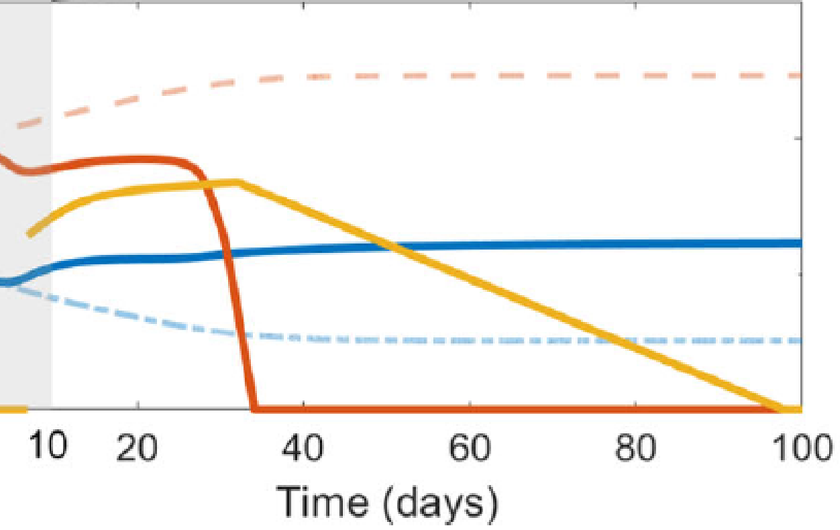
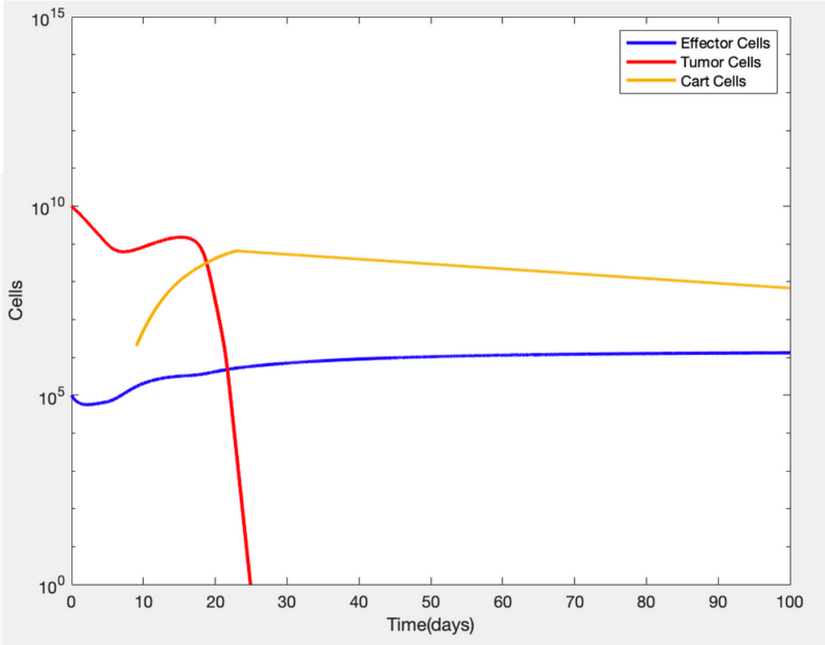
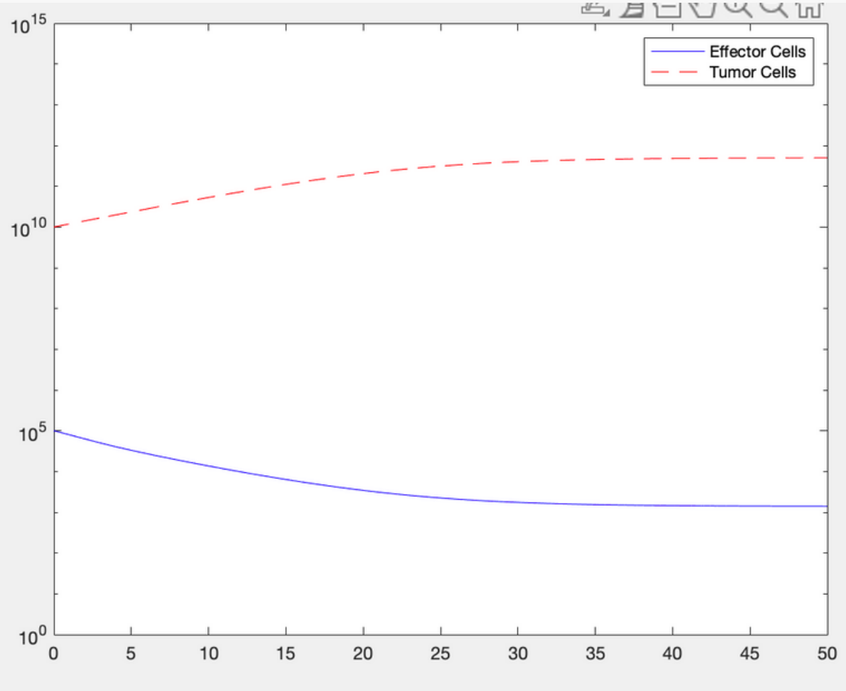

E(t) no treatment
T(t) no treatment
E(t) w/ treatment
T(t) w/ treatment
C(t) w/ treatment
Cells
Time (days)

Figure 6b


10
20
40
60
80
100
Time (days)


Effector Cells
Tumor Cells
Cart Cells
Cells
Time(days)


Effector Cells
Tumor Cells

Works Cited

Owens K, Bozic I. Modeling CAR T-Cell Therapy with Patient Preconditioning. Bull Math Biol. 2021 Mar 19;83(5):42. doi: 10.1007/s11538-021-00869-5. PMID: 33740142.