

Mathematical insights for immuno-oncology: side effects in CAR-T cell therapy, and plasticity-mediated tumor survival

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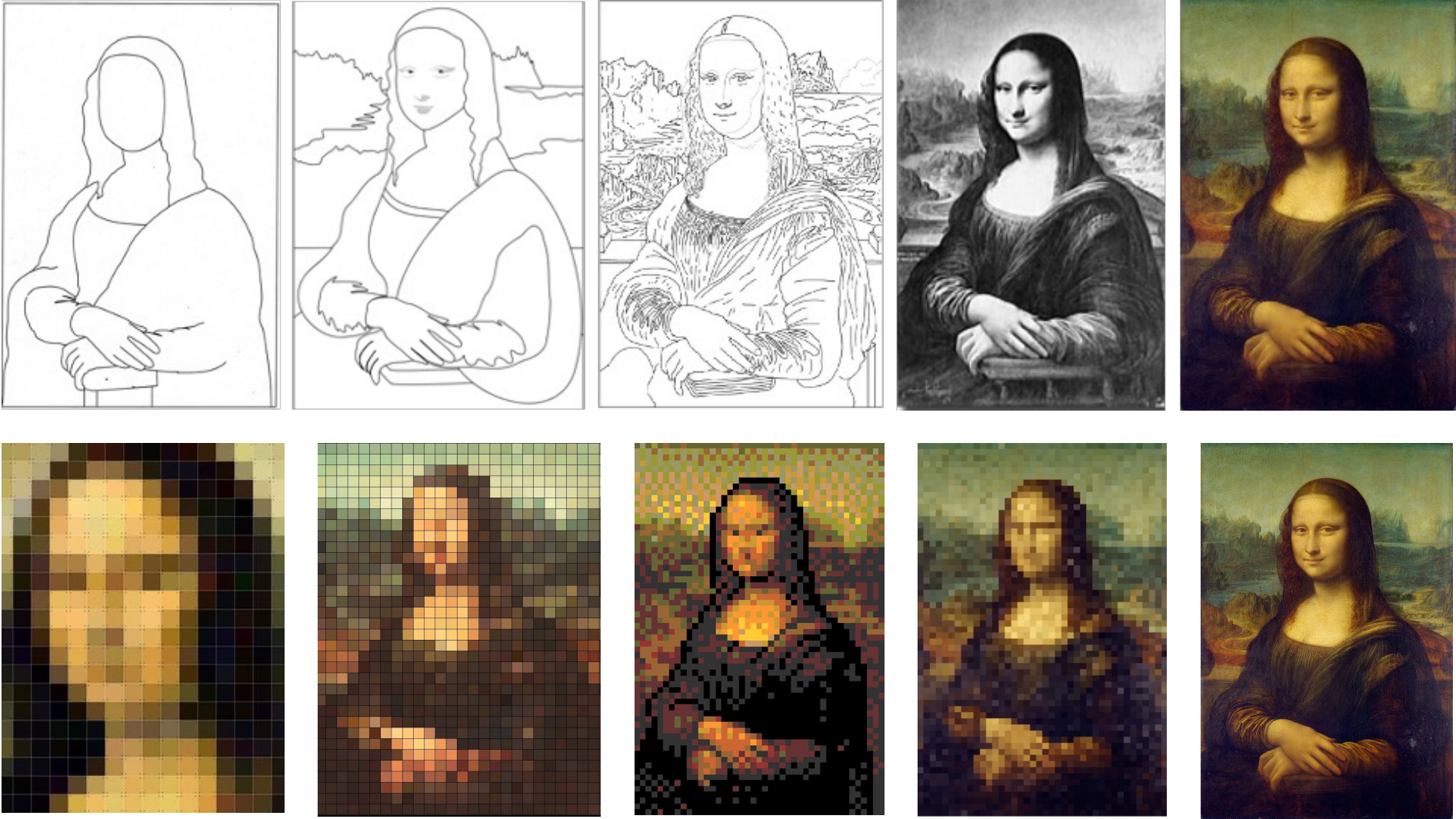
ZIH colloquium 30.04.2024



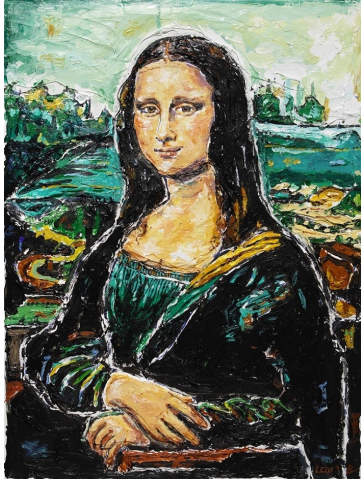
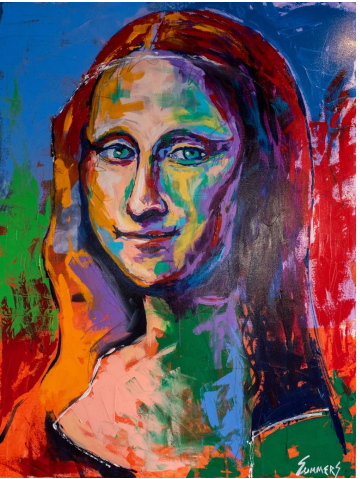
Mathematical modeling



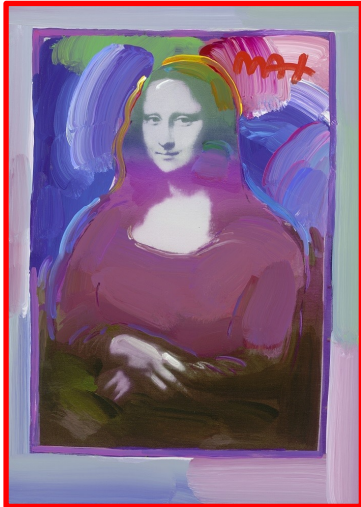
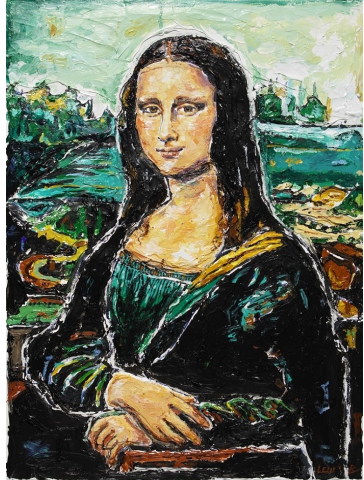
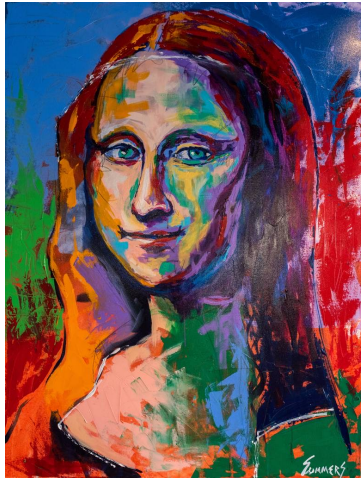
Mathematical modeling



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Acknowledgments

Joint work with

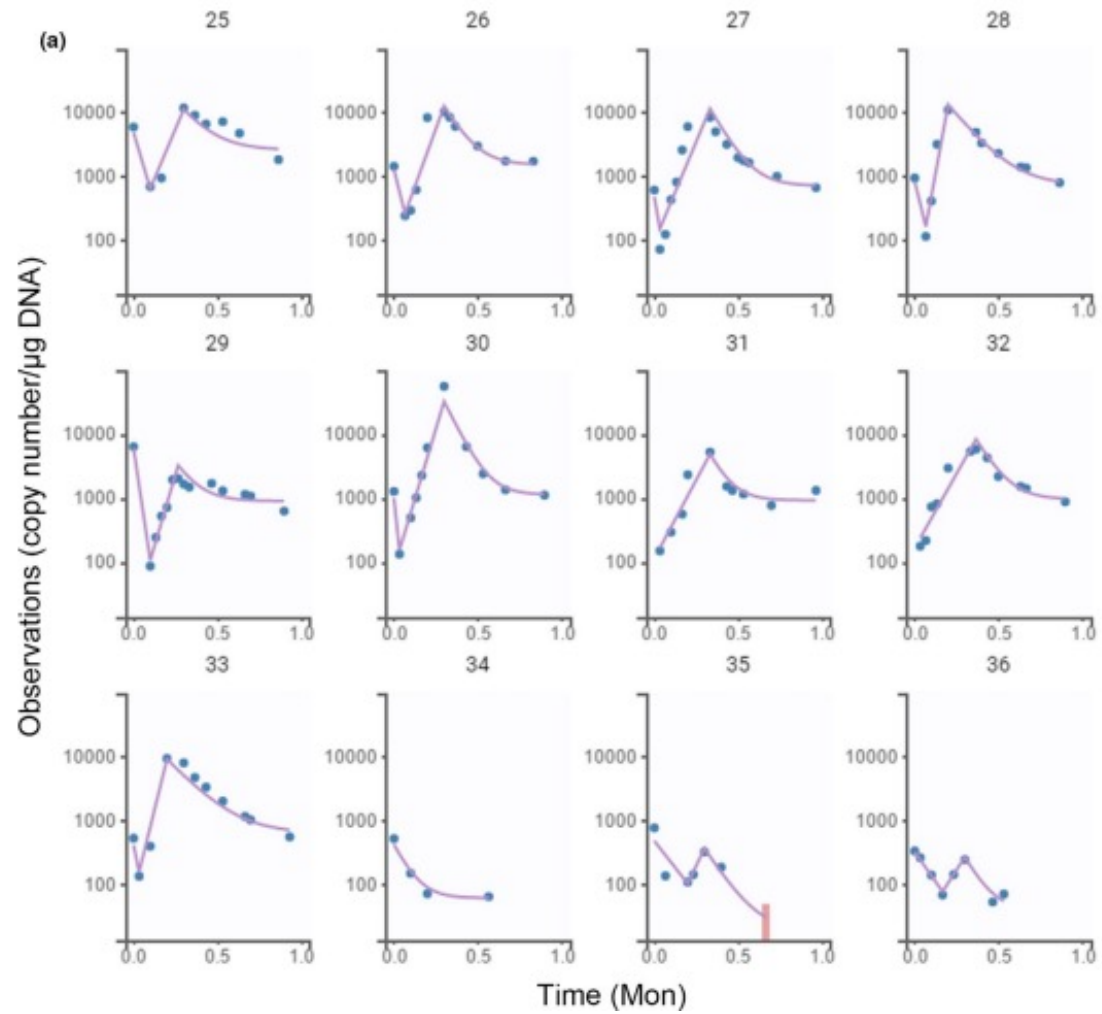
Daniela Santurio (Certara, UK)

Luciana Barros (Instituto do Câncer de São Paulo, Brazil)

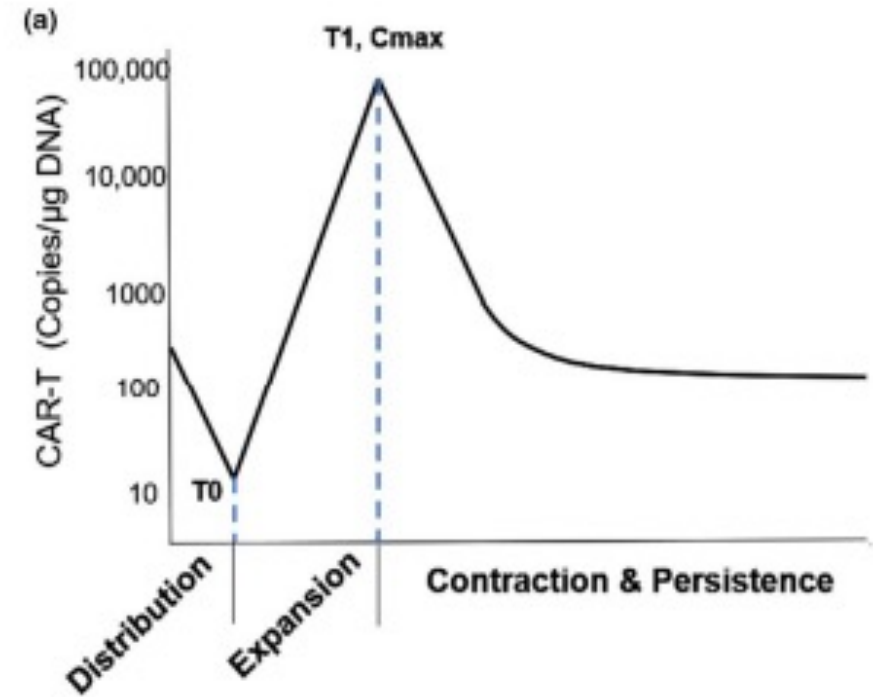
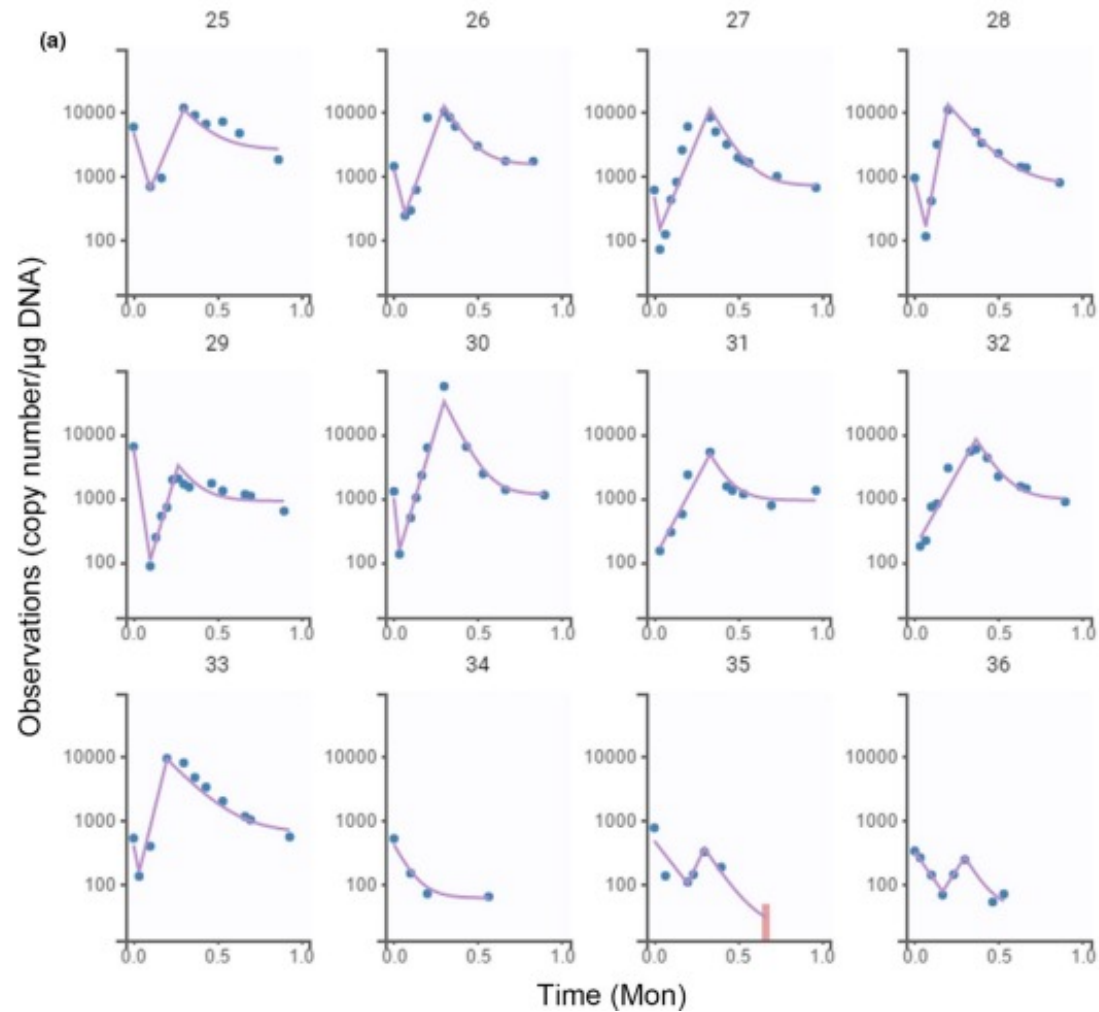
Ingmar Glauche (TUDresden, Germany)



Multiphasic dynamics of CAR-T cell therapy



Multiphasic dynamics of CAR-T cell therapy



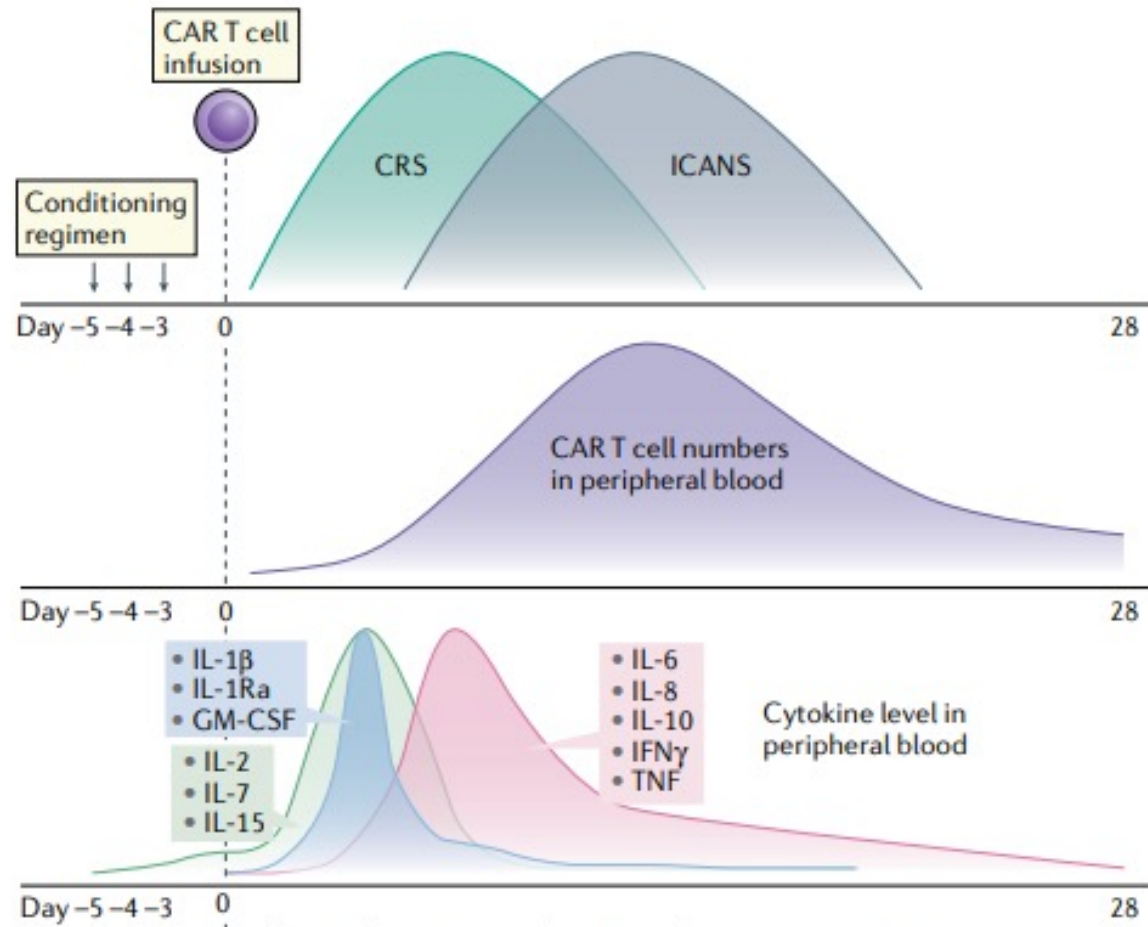
$$\text{when } t \leq T_0 \quad \frac{dE}{dt} = -d \cdot E$$

$$\text{when } T_0 \leq t \leq T_1, \quad \frac{dE}{dt} = \rho \cdot E$$

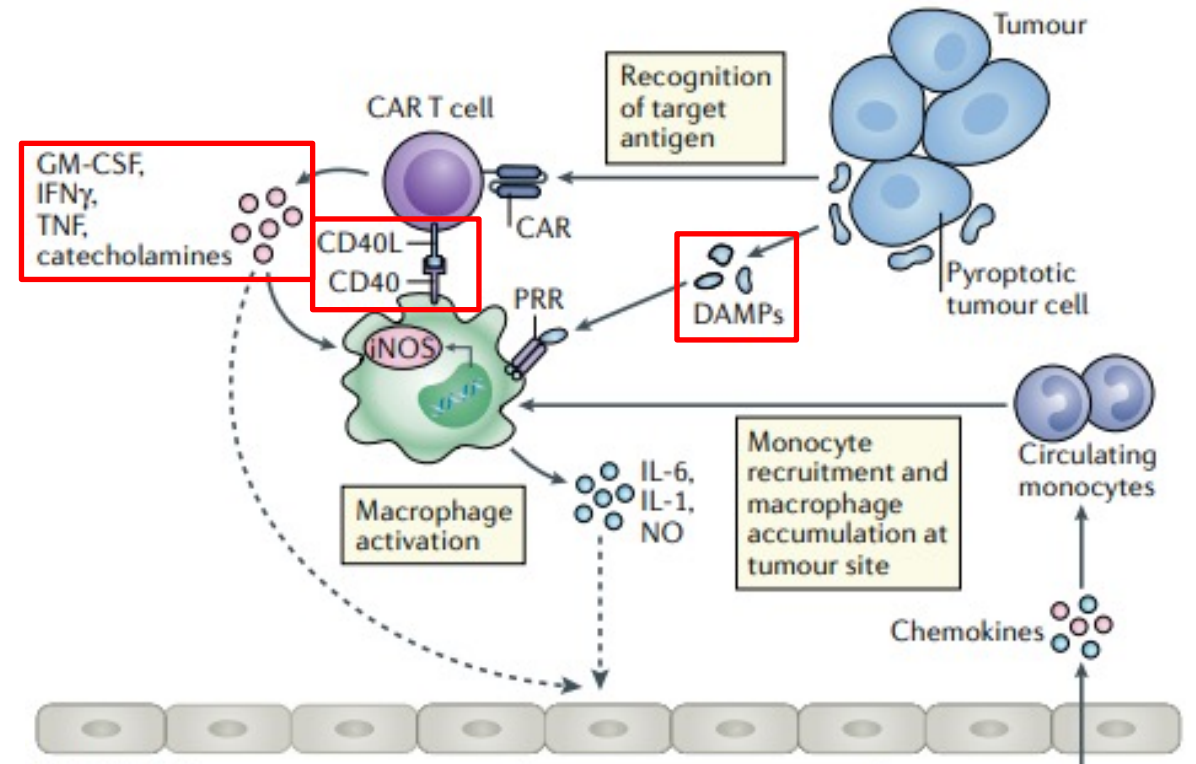
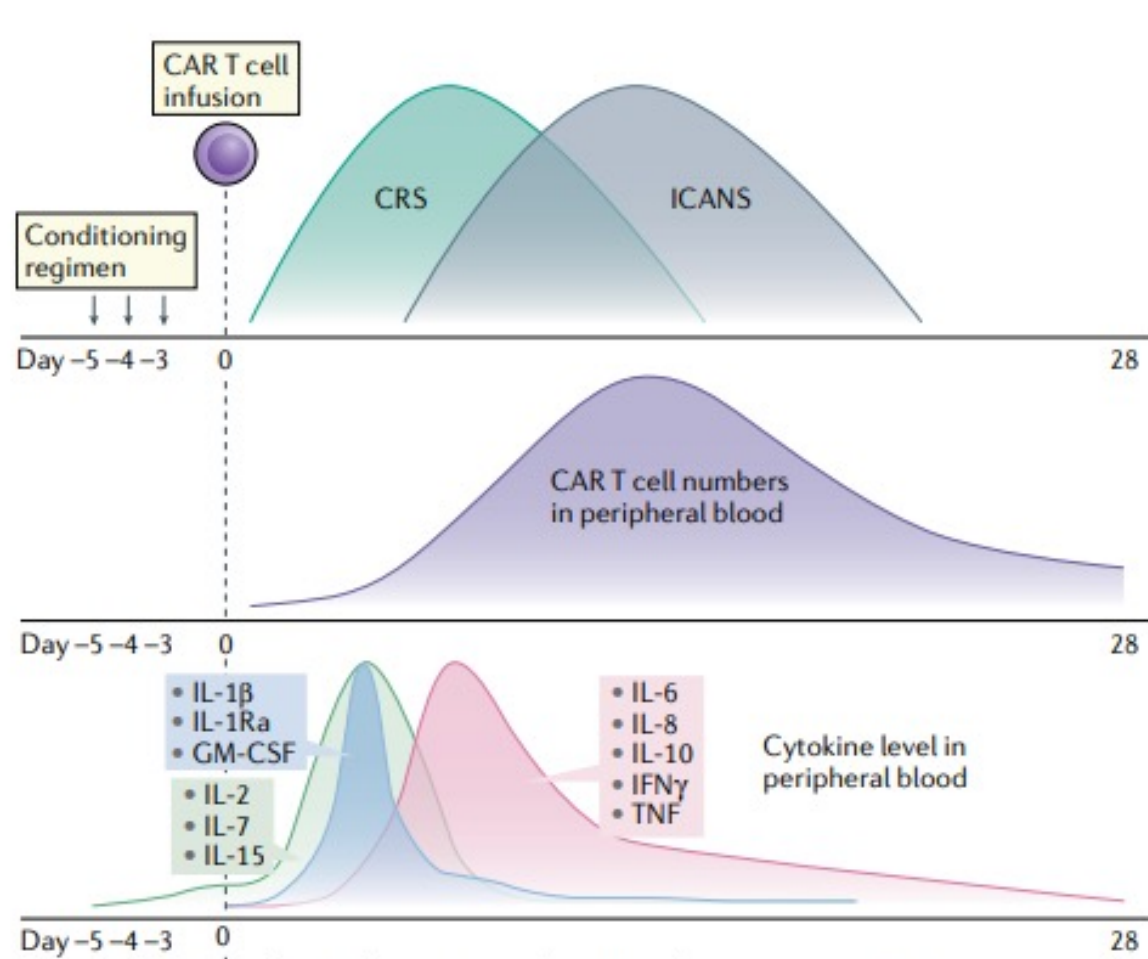
$$\text{when } t > T_1, \quad \frac{dE}{dt} = -\alpha \cdot E - \delta_E \cdot E - r_M \cdot E$$

$$\frac{dM}{dt} = r_M \cdot E - \delta_M \cdot M$$

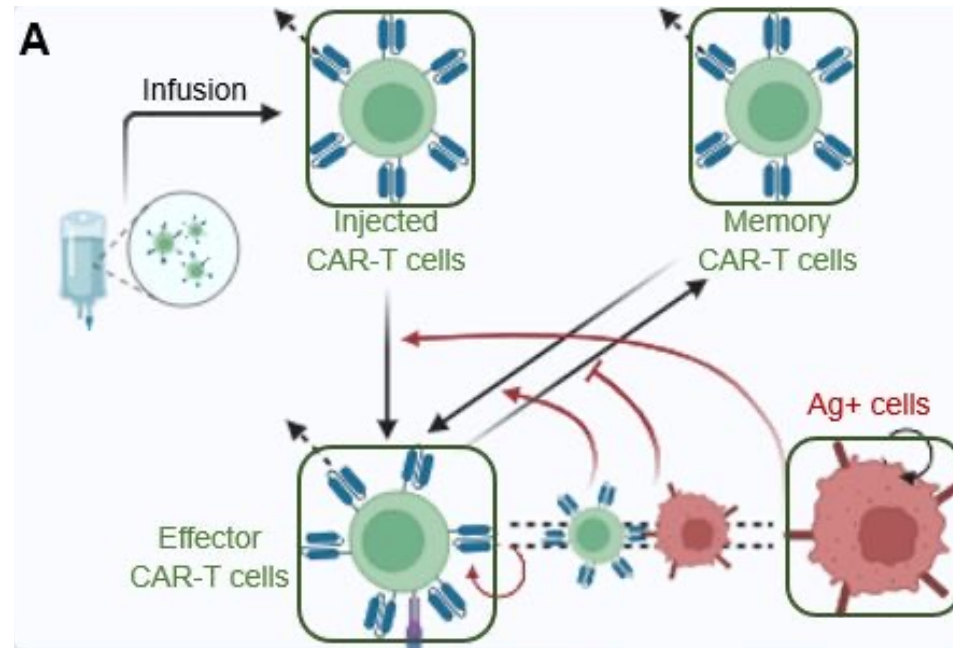
Macrophage-mediated CRS



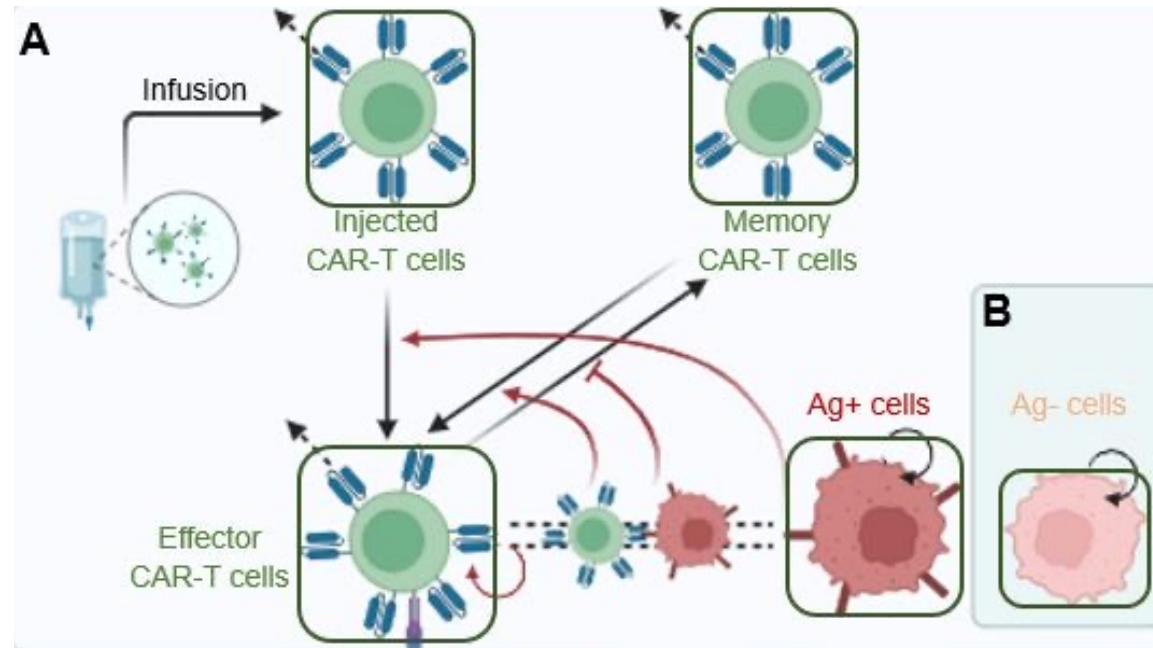
Macrophage-mediated CRS



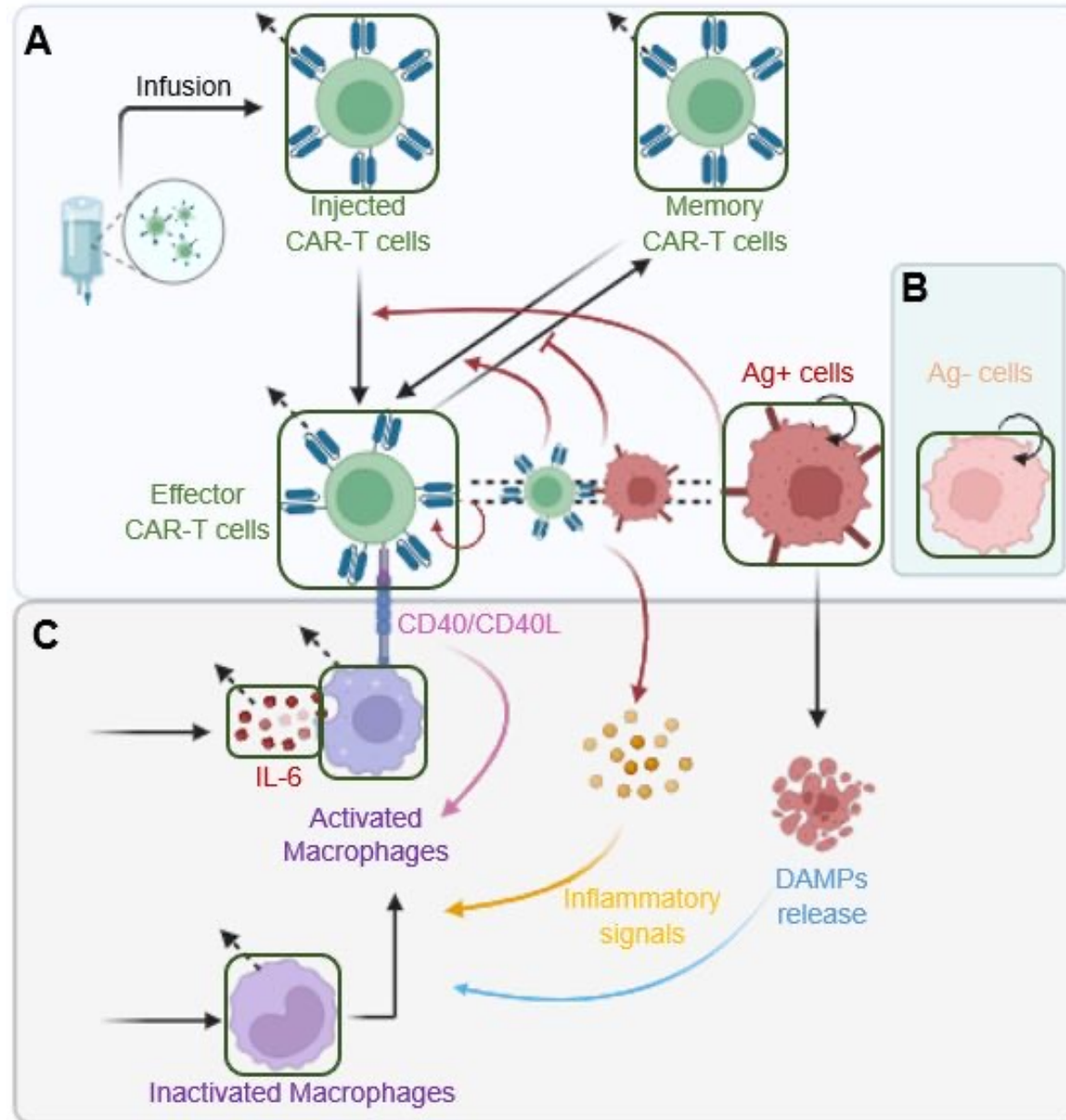
Mathematical modeling



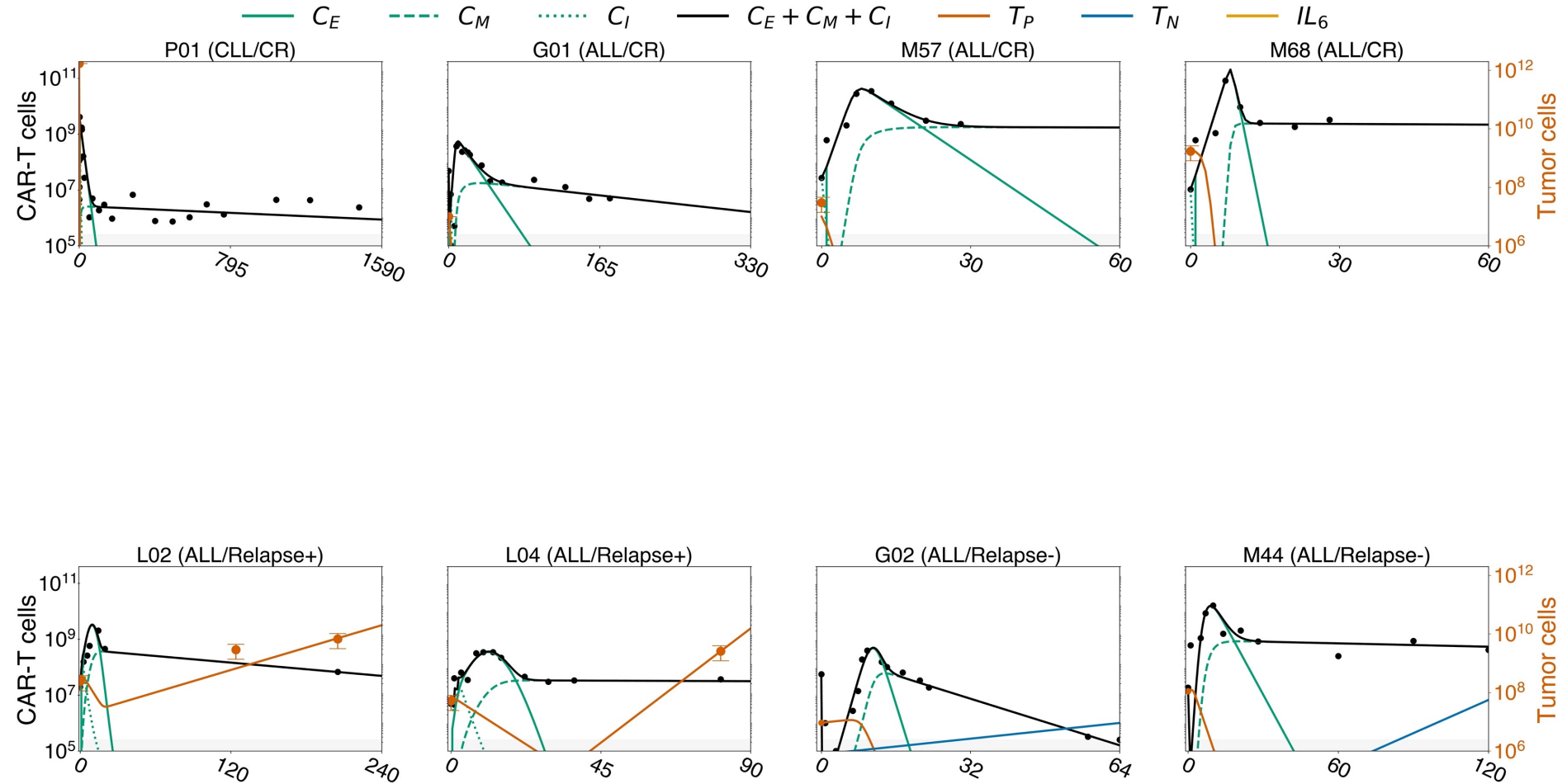
Mathematical modeling



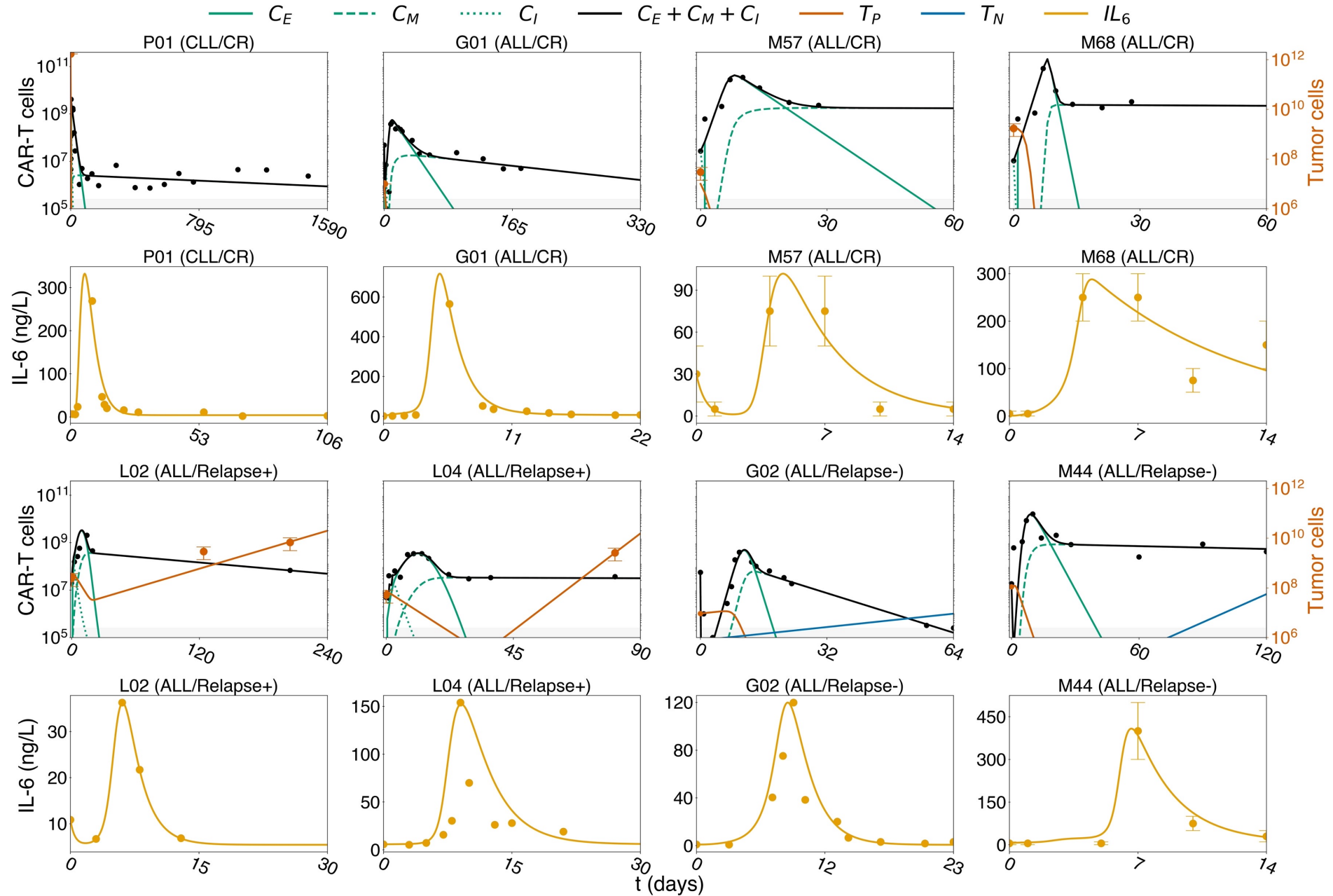
Mathematical modeling



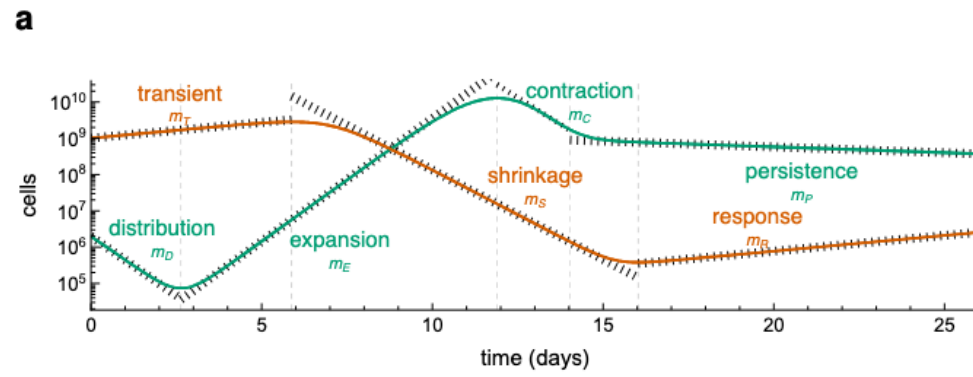
Model fits



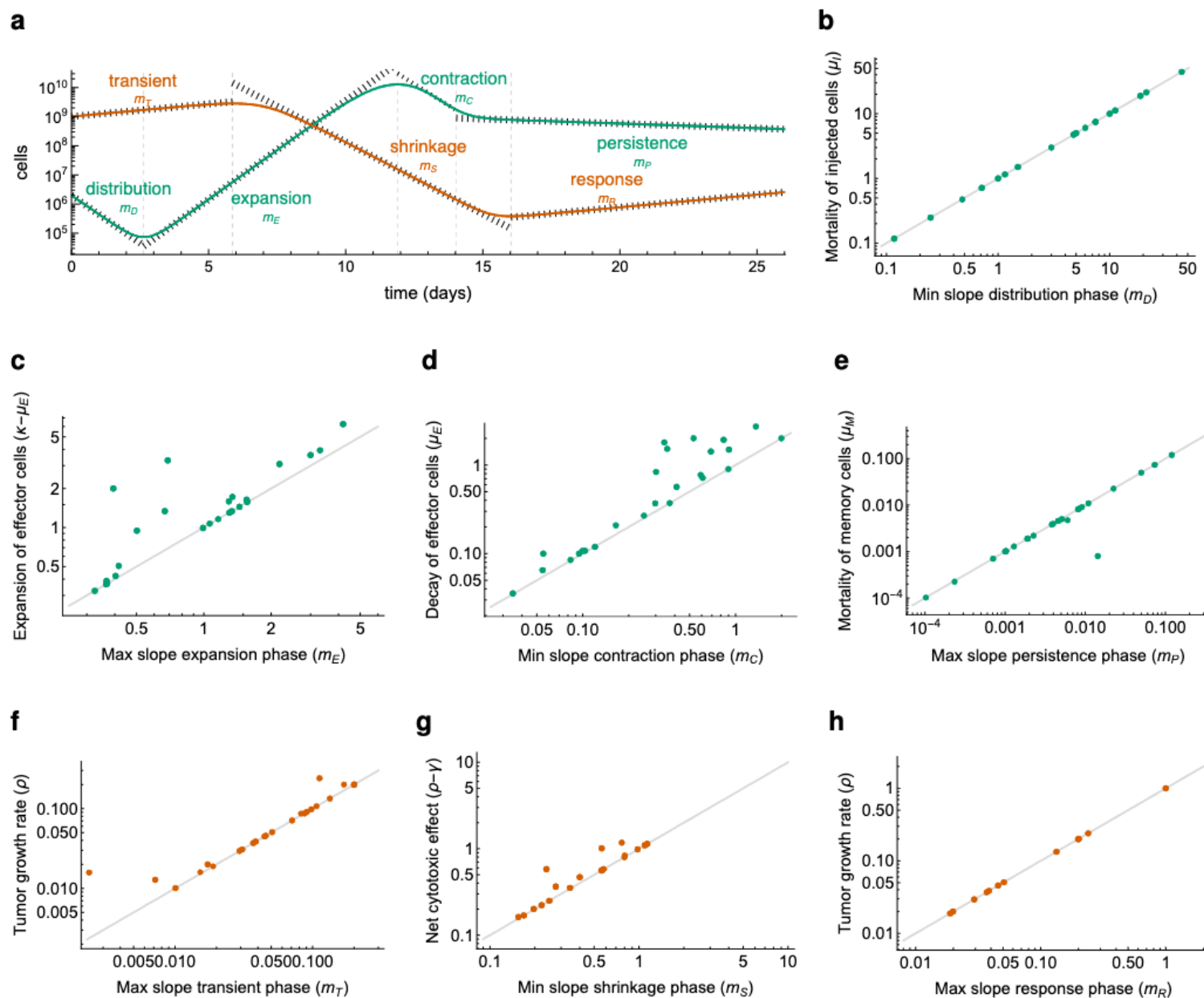
Model fits



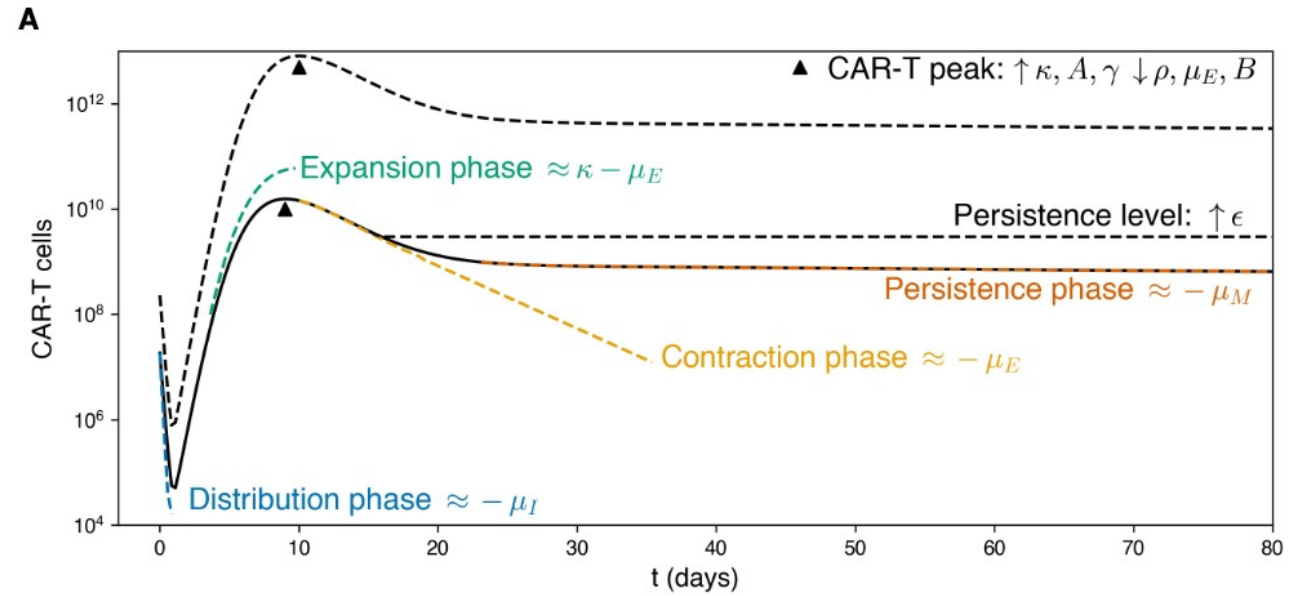
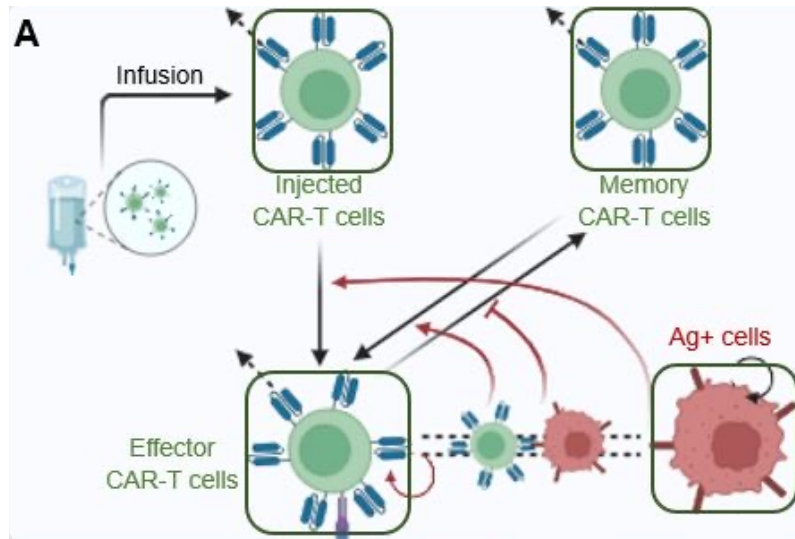
Mechanistic description of multiphasic dynamics



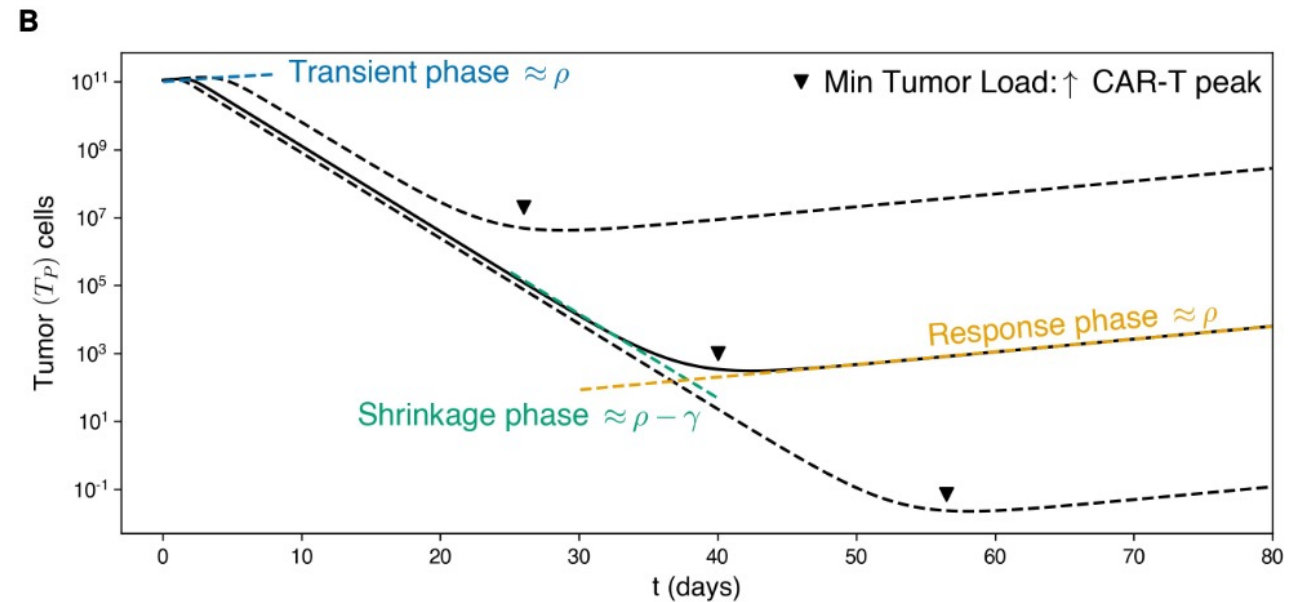
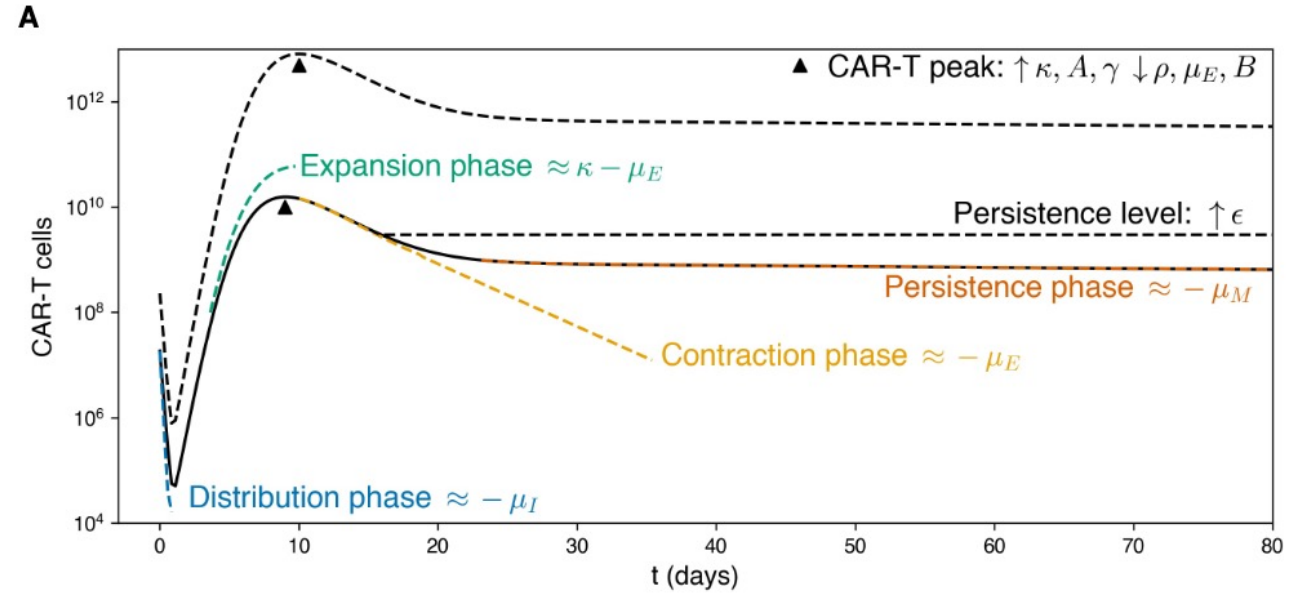
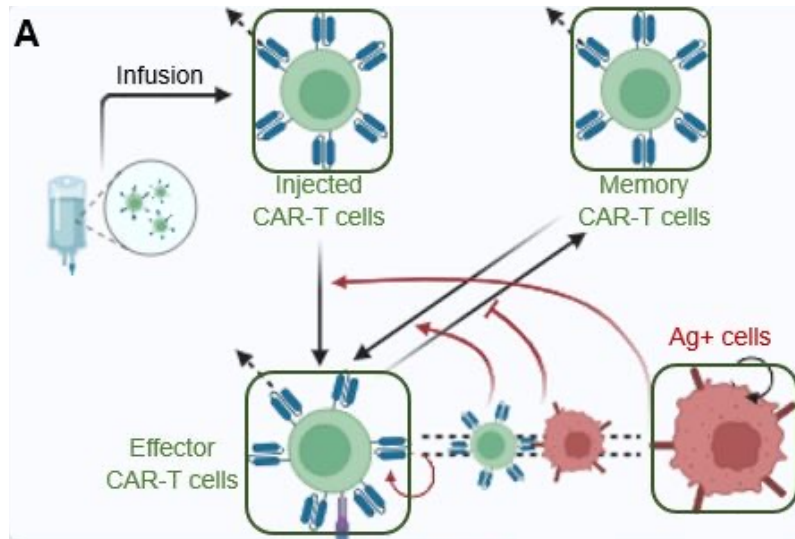
Mechanistic description of multiphasic dynamics



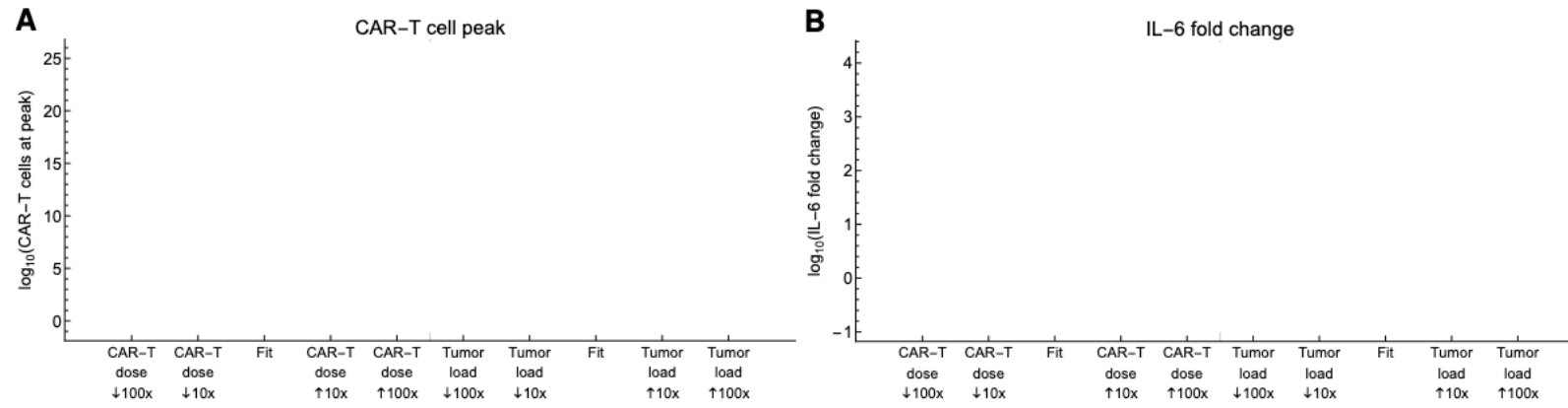
Mechanisms underlying multiphasic kinetics



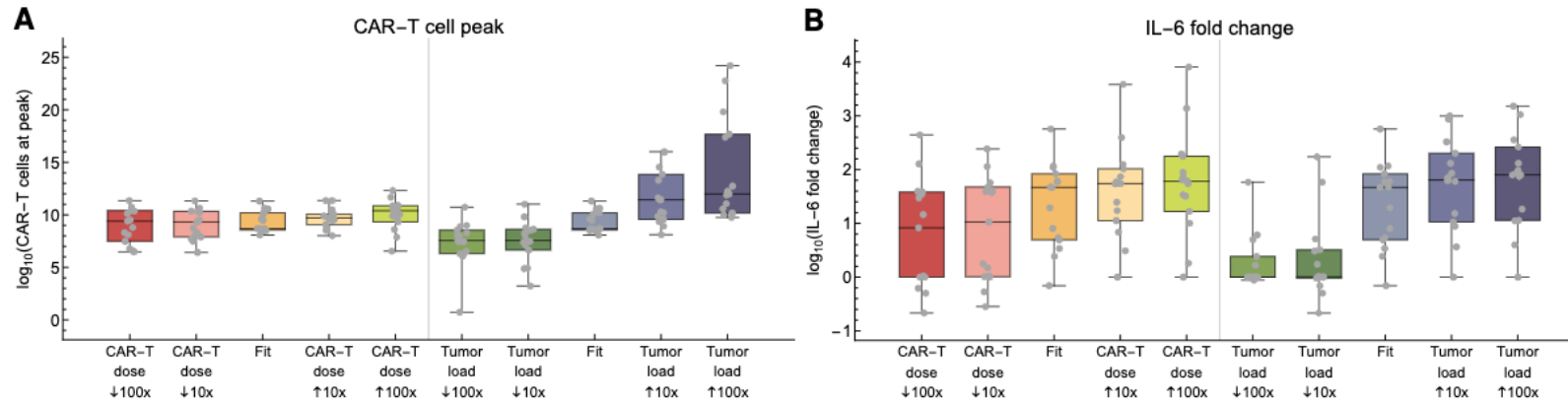
Mechanisms underlying multiphasic kinetics



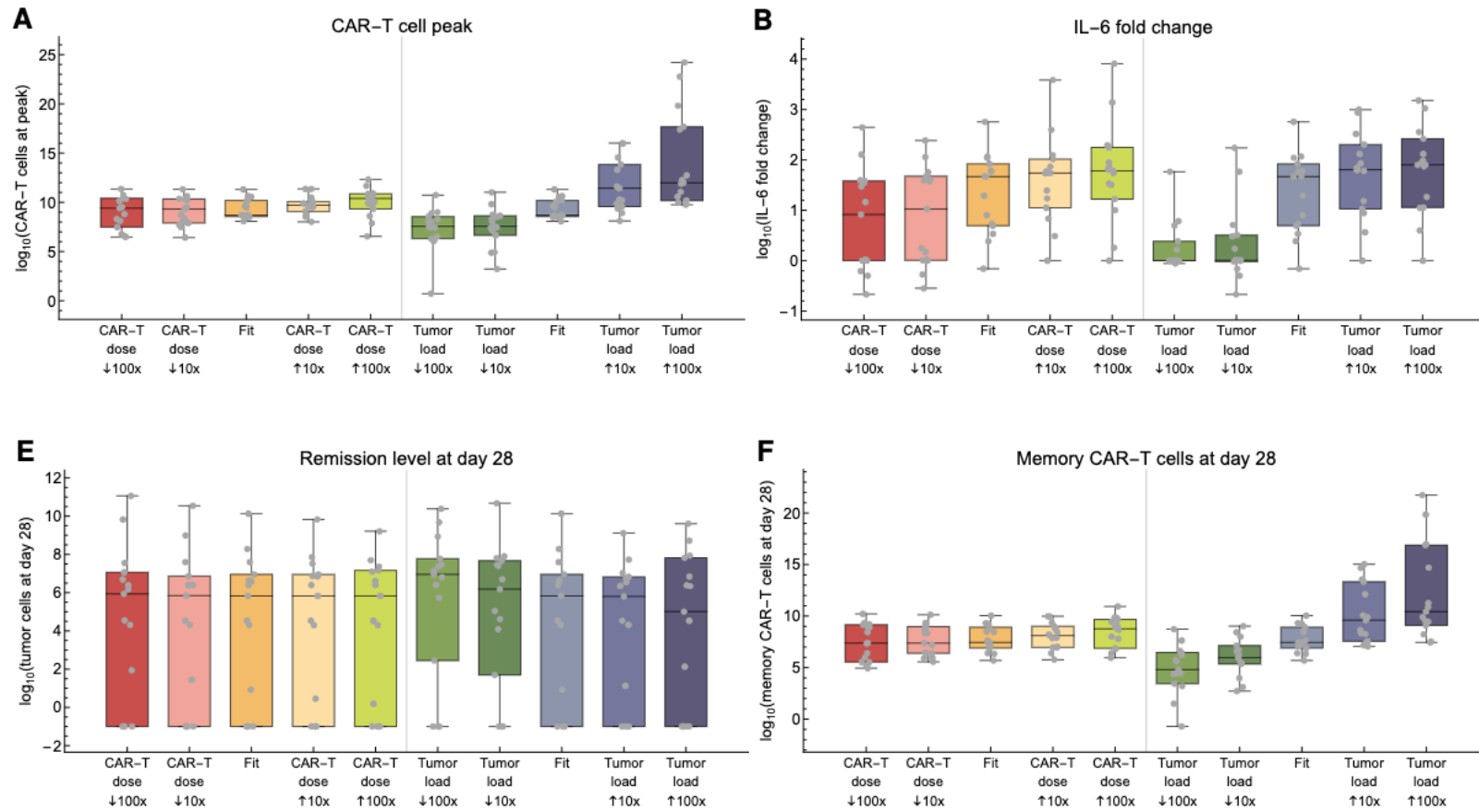
Retrospective dosing experiments



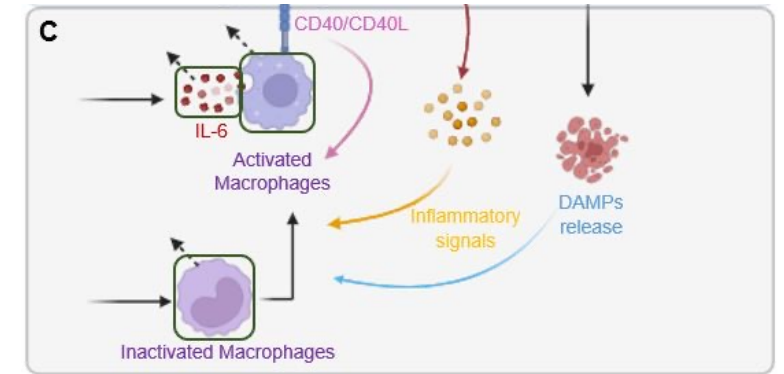
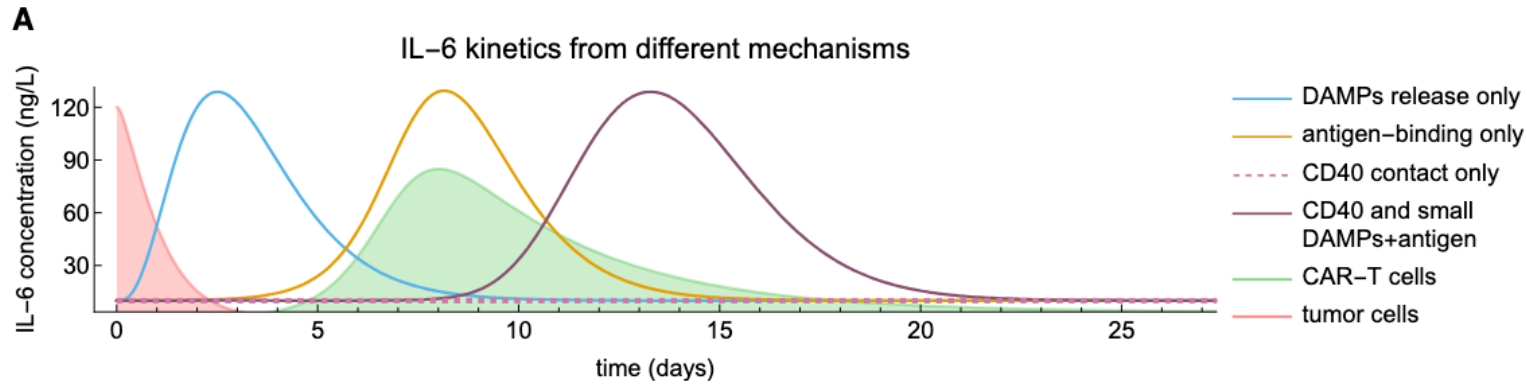
Retrospective dosing experiments



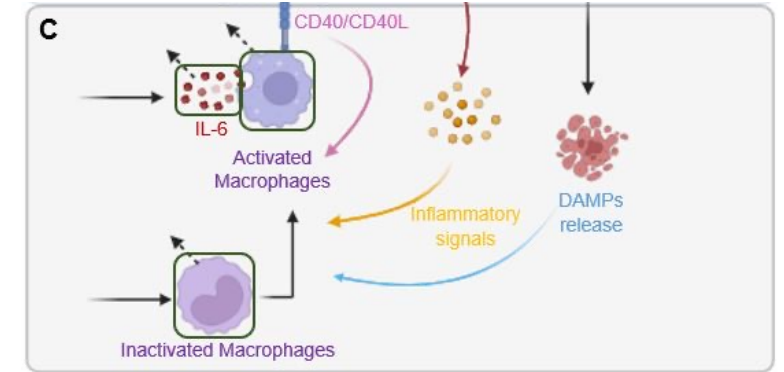
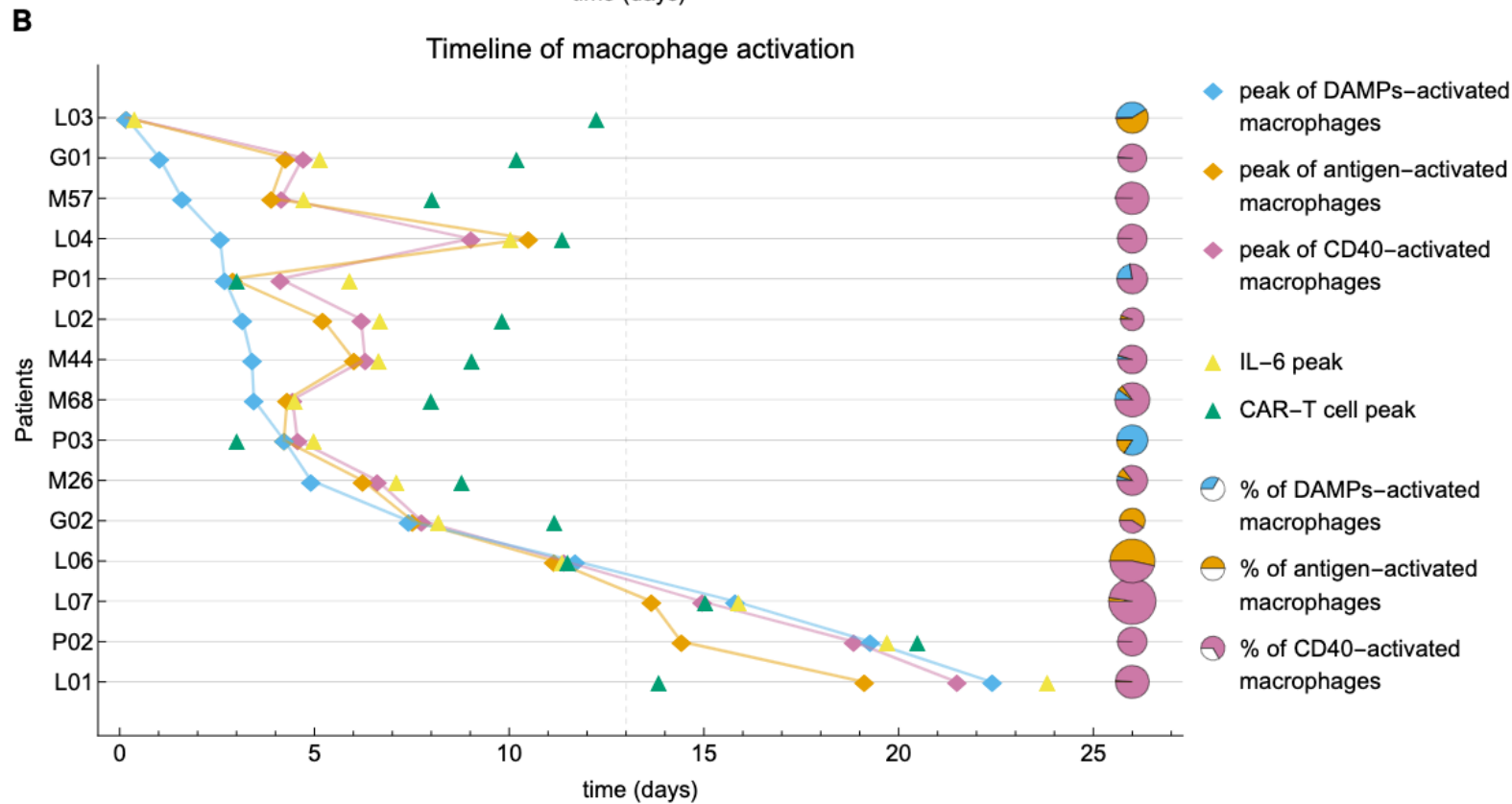
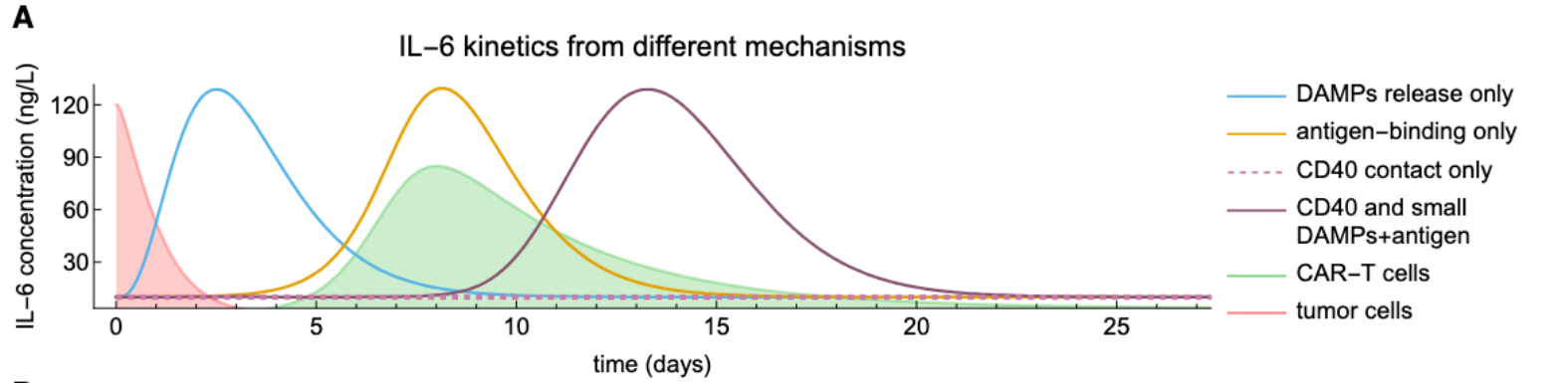
Retrospective dosing experiments



Disentangling mechanisms of macrophage activation and CRS



Disentangling mechanisms of macrophage activation and CRS



Disentangling mechanisms of macrophage activation and CRS

