Modeling of Tumor Growth Undergoing Virotherapy

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Current virotherapy models do not provide appropriate equilibrium conditions.

Tumor vascularization is not being considered in current models.

Need to establish optimal virotherapy treatment applied at the body blood compartment.
Tumor is considered in equilibrium (no growth) when $\frac{dR}{dt} = 0$.

Virotherapy treatment is limited by the immune suppression drug concentration in the blood.

Therefore, virotherapy should be targeted to reach at least $\frac{dR}{dt} = 0$, case B in plot.
Equilibrium Lines

- Equilibrium line (green) provide the right amount of immune suppression drug (P) to allow virus to stop tumor growth.

- Doses above the equilibrium line (blue) shrink the tumor, while points below (red) do not stop tumor enlargement.

- $\beta$ represents the degree of virus replication inside the tumor cells.
Phase Plots

- Phase plots can be used to compare model responses.
- Irrigation model is here compared against convection and diffusion models.
- Results demonstrate that the irrigation model provides an accurate representation of the body blood compartment.
- This blood compartment can be used to apply the control action and estimate the states of the system.