

# HIV MODELS: CELLULAR TO SYSTEMIC.

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We consider several classes of mathematical models used to aid in understanding of disease progression and possible treatment regimes. These range from cellular level models investigated with in vitro mouse data to systemic models supported with longitudinal clinical data for HIV patients undergoing treatment interruptions. In the first class we employ delay dynamical systems to investigate intercellular pathways. Inverse problem techniques along with sensitivity analyses are discussed. In the second class we use non-linear dynamical mathematical models in attempts to fit individual patient data as well as infer population level characteristics. A statistically-based censored data method is combined with inverse problem techniques to estimate dynamic parameters. The predictive capabilities of this approach are demonstrated by comparing simulations based on estimation of parameters using only partial longitudinal observations to the full longitudinal data sets. The viral blips observed in patients undergoing therapy are investigated using an expanded immune response component of the systemic models. As time permits we will also discuss use of control theory to design Structured Treatment Interruption (STI) therapies.