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Mathematical modeling of the CD8 T-cells immune response

Infection of an organism by a pathogen triggers the activation of the CD8 T-cells and the initiation of the immune response. The result is a complex program of proliferation and differentiation of the CD8 T-cells, controlled by the evolution of their molecular content. I will introduce two mathematical models of the CD8 T-cell response. The first one is presented as an impulsive differential equation by which we study the effect of unequal molecular partitioning at cell division on the regulation of molecular heterogeneity. The second one is an agent-based-model that couples the description of a discrete population of CD8 T-cells and that of their molecular content. This model can reproduce the different typical phases of the CD8 T-cell response at both the cellular and the molecular scales. These two studies support the hypothesis that the cell dynamics observed *in vivo* is a consequence of the molecular heterogeneity structuring the CD8 T-cell population.