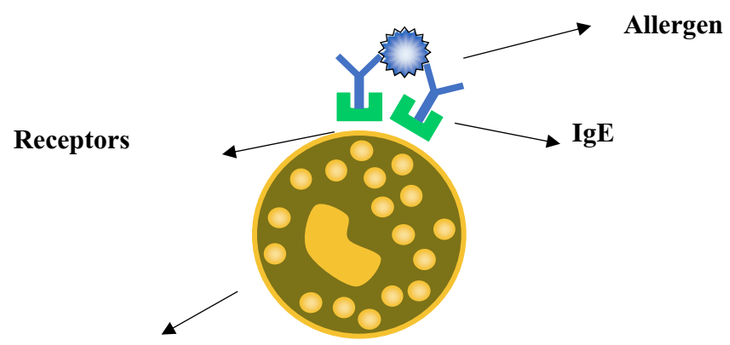
Improving the Mathematical Model of T1-T2-Treg interactions in Allergy and Specific Immunotherapy

Presenting: Paz Cheredman
Lecturer: Svetlana Bunimovich Ph.D

Biological framework

- An allergy reaction is a reaction caused by our immune system.
- It occurs only if there was a first introduction between the immune system and the allergen before.
- The allergic response activates after the receptors onto the surface of the mast cell connect with the IgE molecules.



Sensitization process in mast cells: An IgE antibodies produced in allergic individual. Those antibodies moving in the blood stream and attached the receptors on the surface of the mast cells.

Dose Allergy Treatment Model

$$\dot{N} = -N + \alpha - NA\left(\frac{T_1}{1+\mu_2 T_2} + c\right) - \phi NA(T_2 + c) - xNA(T_r + c)$$

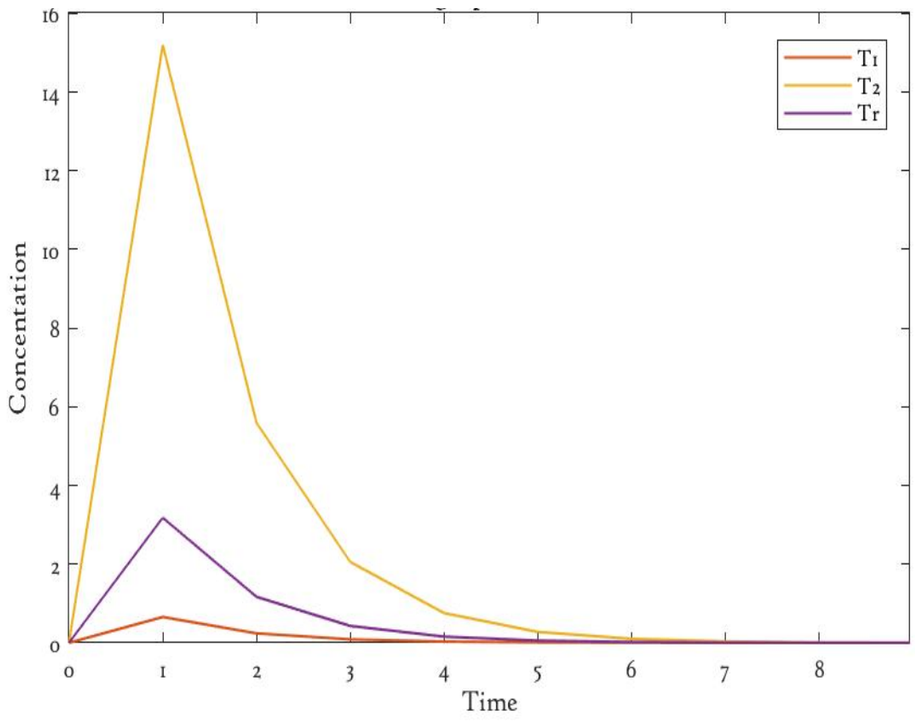
$$\dot{T_1} = -T_1 + \frac{vNA}{1+\mu_r T_r}\left(\frac{T_1}{1+\mu_2 T_2} + c\right)$$

$$\dot{T_2} = -T_2 + \phi\frac{vNA}{1+\mu_r T_r}\left(\frac{T_2+c}{1+\mu_1\frac{T_1}{1+\mu_2 T_2}}\right)$$

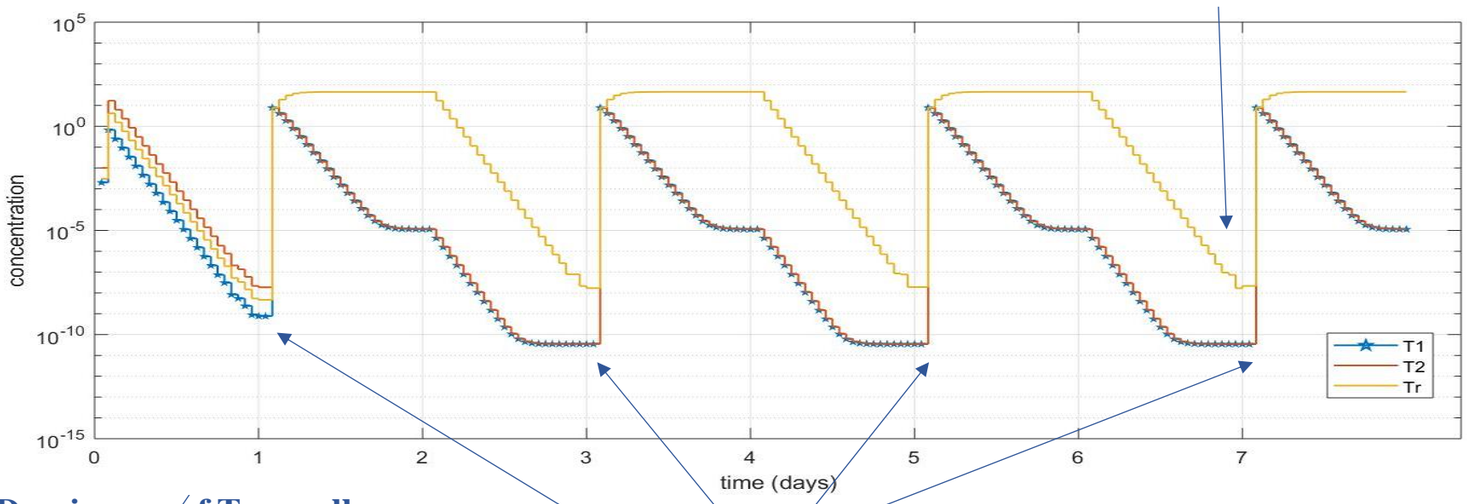
$$\dot{T_r} = -T_r + xvNA(T_r + c)$$

$$\dot{A} = -A(T_1 + T_2 + T_r) + dose$$

No treatment simulation- Th2 dominates the system



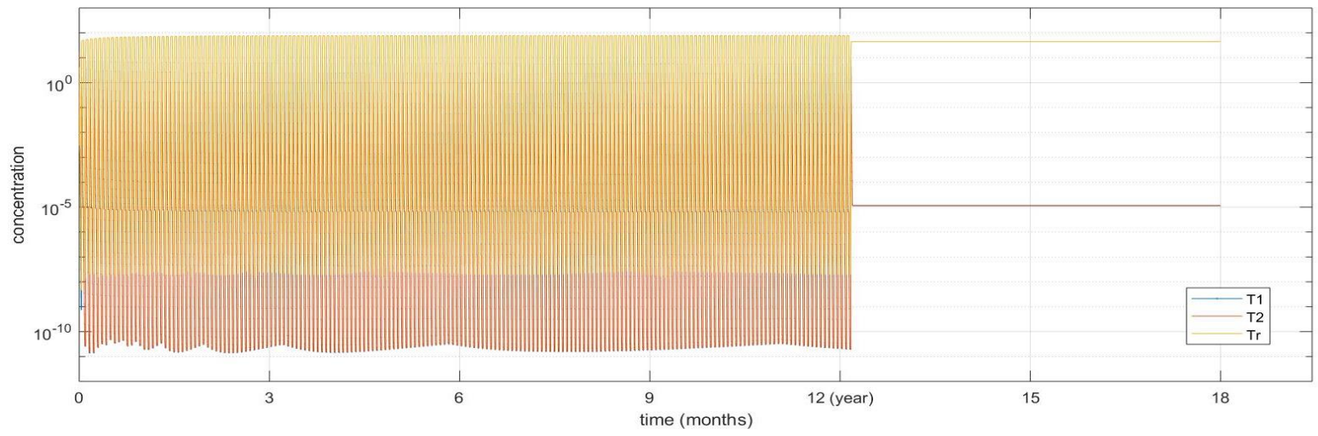
One week simulation:



Goals

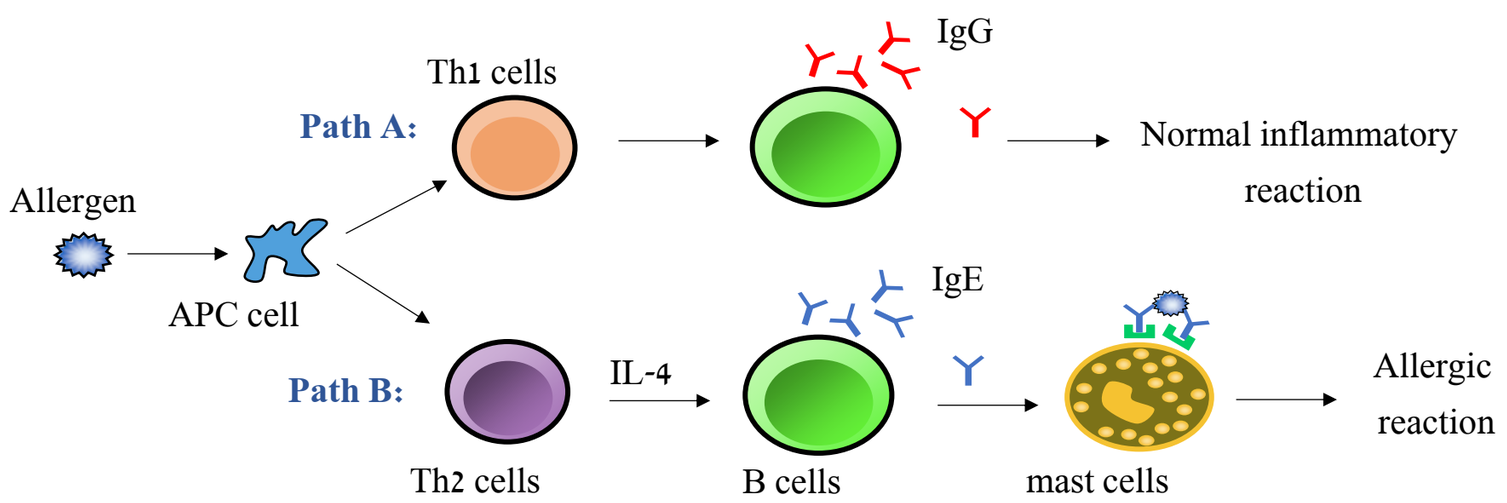
- Educate the immune system by achieving increment in Treg concentration
- Gain balanced system between sessions.
- Give our patients have a better quality of life.

18 months simulation: Treg concentration greater than Th2 and Th1



Path A: Individuals that will develop a normal response an APC cells activate T cells and force them to differentiate to Th_1 cell that will activate B cells that discharge IgG antibodies and eventually cause a normal inflammatory reaction that is vital to our body in order to cope with foreign factors.

Path B: Individuals that has the hereditary genetic predisposition that triggers the immune system to produce IgE antibodies, APC cells activate T cells and force them to differentiate to Th_2 cells, which activate B cells by using IL-4, discharge IgE antibodies, and causing allergic response that activates mast cells.



svetlanabu@ariel.ac.il pazcheredman2@gmail.com