

The movie of dendritic cell, T cell and B cell movements in lymph node for the 1st 50 hr after injection of 1 μ g antigen in skin.

The S1 movie sets the stage; the S2 movie begins with the injection of antigen at a distant site.

Players:

- T cells are green
- B cells are yellow
- Dendritic cells (DC) are purple
- Antigen is red and when DC take up antigen a few minutes after injection of antigen, they become pink; when B cells take up antigen a few minutes about 2 hr after injection of antigen, they become red

Story:

The movie demonstrates how antigen-specific T_H cells in a lymph node become activated by interaction with DC that have taken-up antigen and how these activated T cells interact with B cells to activate them. At the end of the movie, the B cells are activated and will go on to become either a memory B cell or an antibody-secreting plasma cell.

Note that in the area of lymph node shown, there are only two antigen-specific T cells and only two antigen-specific B cells (among thousands of T and B cells specific for other antigens). The number of antigen-specific T and B cells increases as the cells become activated and divide.

Details of the movie:

1. Antigen found in subcapsular sinus within 15 to 30 min (red) after injection of antigen
2. DC pick up antigen between 30 min and 3 hr and presents antigen (turns from purple to pink) 1 hr later
3. T cells and DC interact (T cell flashes orange to indicate activation)
4. At 18 hr, a DC from the site of injection appears with larger amounts of antigen displayed (more pink than other DC)
5. T cells begin to divide 30 hr after antigen following interaction with DC
6. B cells (yellow) take up antigen by 2 hr (turn red) and by 5 hr migrate toward the T cell area
7. B cells with antigen interact with activated T cells near B-T border and B cells become activated (B cells flashes white; T cell flashes orange to indicate activation)
8. The B cells will then likely divide, form germinal centers and eventually become either memory B cells or plasma cells.

Conclusion:

Within 48 hr from introduction of antigen the T_H cells specific for that antigen have become activated and divided at least twice. These activated T_H cells have also activated B cells and development of antibody against the antigen has begun. In the next stage, the activated B cells will form germinal centers where the immunoglobulin genes will undergo somatic mutation to form higher affinity antibody. Within the germinal center, B cells with the high affinity antibody will be positively selected to divide. Some of these B cells will become memory B cells and others will

become plasma cells (mechanism by which this choice is made remains a mystery). The plasma cells will secrete antibody while the memory B cells will circulate in the periphery and be ready for the next encounter with antigen.

Taken from: Catron et al (2004) *Immunity* 21:341.