TEXT SUPPLEMENT (Ch 15): Suppression

Suppression: turning off an immune response

Once an immune response has been activated, it does its job of removing antigens, whether the antigens are soluble molecules such as toxins, or molecules that are part of bacteria, viruses, or cancer cells. As long as the nonself antigen is present, the immune response stays activated. Once the antigen is no longer present, it would be inefficient for the process to continue in high gear. As in many other physiological systems, feedback inhibition shuts off the response when it is no longer needed. Secreted antibody feeds back to suppress the production of more antibody by B lymphocytes. Cytotoxic T lymphocyte activity is also suppressed by feedback inhibition.

Activation and suppression are not on–off phenomena. Remember that we are dealing with subpopulations (clones) of lymphocytes. At any given instant, some of the lymphocytes able to react to a given antigen are being stimulated and others are being suppressed. Measured on a population basis, when the activity curve is going up, more cells are being activated than are being suppressed. This stage is called activation. An **equilibrium** is reached, with the same numbers of cells being activated as are being suppressed. The same individual cell is not being both activated and suppressed; rather, the number of cells in the antigen-specific clone that is being activated is equal to the number being suppressed. As the activity curve slopes back down, more cells are being suppressed than activated, a stage called suppression. When the curve achieves a new baseline level, another equilibrium state has been reached. These stages are illustrated in the left-hand graph in the Figure below.

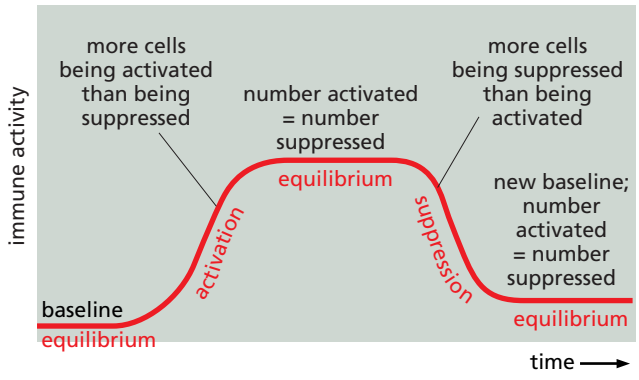
It is important to realize that when the population activity has returned to the baseline, it does *not* mean that nothing is happening. A small number of cells are being activated and suppressed, keeping the immune system 'tuned up' and ready for its next response.

Activation of an immune response is antigen-specific; that is, not all of the B lymphocytes or T lymphocytes are activated, only those that match the antigen. Feedback inhibition is also antigen-specific; the entire immune system is not shut off, only those cells of the clone that had been reacting to that antigen.

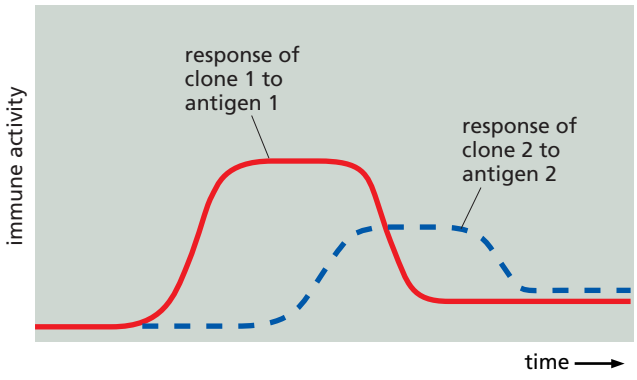
Because the activation and later suppression of each immune response are antigen-specific, several immune responses can be occurring at one time and be at different stages. As shown in the right-hand graph in the Figure below, a response to one antigen may be in the suppression phase, while a response to another antigen is just beginning.

The strength of the response to an antigen is shown by the maximum height of the activity curve. The strength of the response may be different to different antigens. Response strength depends on the number of cells in that lymphocyte clone; clones with more cells produce bigger responses. For example in the Figure below, clone 1 produced in response to antigen 1 contains more cells than clone 2 produced in response to antigen 2; consequently, the strength of the immune response is greater to antigen 1 than to antigen 2.

The activity measured in a subpopulation (clone) of specific lymphocytes is the sum of the actions of the individual lymphocytes.



Activation and suppression to two antigens occurs independently but at the same time.



Antigen-specific activation and suppression of immune responses.