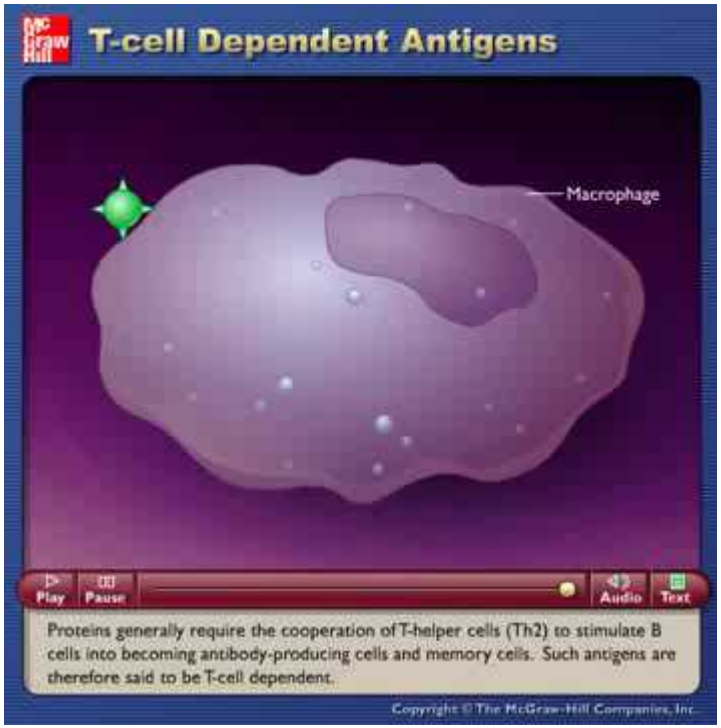
Antibody Production

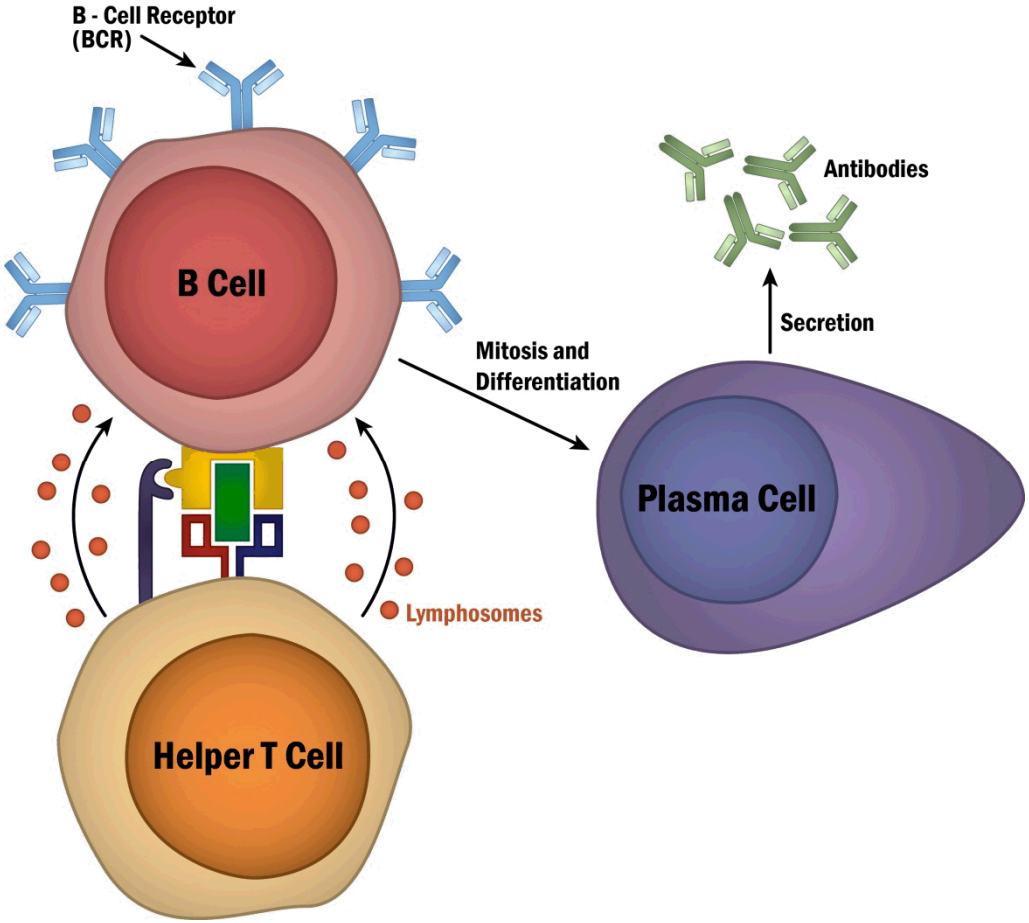
- T helper cells initiate antibody production



Antibody Mediated Immunity

- **Soon after immunity was demonstrated after vaccination by Louis Pasteur, it was determined that the substance that produced immunity was found in serum**
  - Serum from an immune animal could induce temporary immunity in an naïve animal
- **Antibody mediated response is primarily mediated by secreted antibodies produced by B lymphocytes**
  - B cells are selected by clonal selection
  - Converted to plasma cells that secrete antibodies
  - Helper T cells and antigen presenting cells stimulate differentiation of B lymphocytes to produce antibodies
- **Secreted antibodies bind to antigens on the surface of invading pathogens which targets them for destruction by phagocytic cells**

Antibody Production



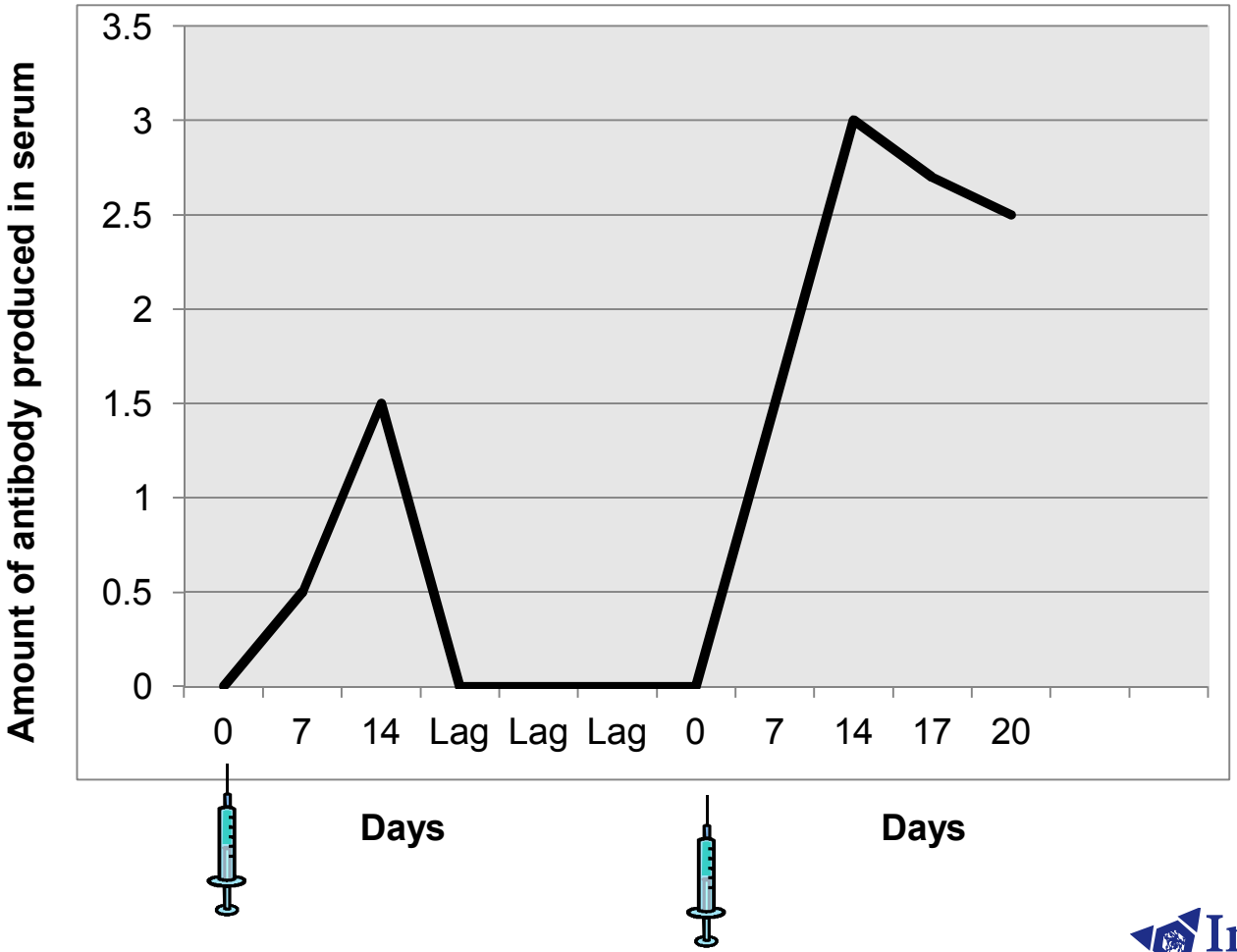
Antibody Production

- **Example – Vaccination against tetanus in horses**
- **Tetnus toxin is a foreign substance (antigen) that stimulates the adaptive immune response**
- **Tetnus toxin is injected into horses as a vaccine – the tetnus toxiod vaccine**
  - Antibodies are produced only against the toxin
  - Antibodies bind toxin and neutralize it so that it is no longer toxic
    - **The toxin is no longer lethal**
- **Time course after vaccination or injection with toxin can be measured by collecting antibodies from the serum and testing the ability of that serum to neutralize standard amount of toxin**
  - Only after several days is antibody detected
  - Antibody production peaks by 10 to 20 days
  - Declines and then disappears – protection acquired is relatively small

Antibody Production: Second Exposure or Anamnestic Response

- **The second exposure produces a larger response**
- **The horse that has received a first injection of tetanus toxin receives a second dose**
  - Antibodies are produced much faster – within 2 to 3 days
  - Production rises rapidly to very high levels
  - Slowly declines over time
  - Antibodies may be detected for months or years after the second exposure
- **The third dose will produce an even larger response**
  - Antibody production will occur very rapidly
  - Antibody levels will be very higher and will remain high for a longer period of time
- **Antibodies produced after repeated exposures will be more effective at neutralizing antibody than those initially produced**

Antibody response



Binding of Antibodies

- **Antibody binds to the antigen and targets the bound complex for degradation**
  - Degraded by phagocytic cells
  - Degraded by complement activation
- **Antibody binding neutralizes toxins and pathogens**
- **Antibody response is critical for vaccination success**

Cell Mediated Immunity

- Primarily mediated by T cells, macrophages and cytokines
- Recognize infected cells and causes cell death-apoptosis
- Antigen presented by macrophages to T helper 1 cells stimulates cell mediated immunity by cytotoxic T cells

Clonal Selection

- Lymphoid stem cells differentiate randomly to produce clones of lymphocytes each of which is committed to respond to a single epitope
- Antigen binding to receptors triggers them to proliferate and differentiate into antibody producing cells, effector cells and memory cells
- The specificity of the antibodies produced by a lymphocyte is identical to that of its antigen receptors
- Tolerance results when a clone of antigen-binding cells is destroyed or suppressed
- Why vaccination works!

Review of Acquired Immunity