Figure 3.1 The Immune System, 3ed. (© Garland Science 2009)
Antibodies made during infection with measles virus bind to the virus and prevent reinfection with measles virus.

Antibodies made during infection with measles virus do not bind to influenza virus.

Figure 3.2 The Immune System, 3rd ed. (© Garland Science 2009)
IgM is the first antibody made against an infecting pathogen

Somatic hypermutation selects for antibodies that bind more tightly to the pathogen

Switching antibody isotype to IgG allows delivery of the pathogen to phagocytes
Figure 3.1 The Immune System, 3ed. (© Garland Science 2009)
Germline configuration

Somatic recombination

Rearranged gene

Figure 3.3 The Immune System, 3rd ed. (© Garland Science 2009)
Germline configuration of genes encoding B-cell and T-cell receptors cannot be transcribed

Gene rearrangement with nucleotide insertions at the joint produces a functional gene

Different rearrangements and insertions occur in each lymphocyte

Each lymphocyte has a single receptor but the population of lymphocytes has numerous receptors

Figure 3.4 The Immune System, 3ed. (© Garland Science 2009)
During development, progenitor cells give rise to large numbers of circulating lymphocytes, each having a different form of cell-surface receptor.

The receptors of only a few circulating lymphocytes interact with any given pathogen.

Pathogen-reactive lymphocytes are triggered to divide and proliferate.

Pathogen-activated lymphocytes differentiate into effector cells that eliminate the pathogen.

Figure 3.5 The Immune System, 3ed. (© Garland Science 2009)
Figure 3.6 The Immune System, 3ed. (© Garland Science 2009)
B-cell receptors and antibodies recognize native protein antigens

Figure 3.12 The Immune System, 3ed. (© Garland Science 2009)
Figure 3.7 The Immune System, 3ed. (© Garland Science 2009)
Figure 3.10 The Immune System, 3rd ed. (© Garland Science 2009)
Macrophage engulfs and degrades bacterium, producing peptides

Bacterial peptides bound by MHC class II in vesicles

Bound peptides transported by MHC class II to the cell surface

Helper T cell recognizes complex of peptide antigen with MHC class II and activates macrophage

Figure 3.11 The Immune System, 3rd ed. (© Garland Science 2009)
Cell-surface immunoglobulin of B cell binds bacteria; the cell engulfs and degrades them, producing peptides.

Bacterial peptides bound by MHC class II in endocytic vesicles.

Bound peptides transported by MHC class II to the cell surface.

Helper T cell recognizes complex of peptide antigen with MHC class II and activates B cell.
In the thymus, T-cell progenitors give rise to billions of thymocytes, each with a different T-cell receptor.

Thymocytes are positively selected by epithelial cells in the cortex of the thymus.

Positively selected thymocytes survive and divide.

Positively selected thymocyte clones are negatively selected in the thymic medulla.

Clones surviving negative selection leave the thymus for the circulation.

Pathogens select upon less than 1% of T cells originating in the thymus.

Figure 3.16 The Immune System, 3rd ed. (© Garland Science 2009)
Inhalation of pollen particles produces the symptoms of a respiratory infection through IgE-mediated degranulation of mast cells.

Figure 3.18 The Immune System, 3rd ed. (© Garland Science 2009)
In childhood a viral infection of the upper respiratory tract is terminated by the adaptive immune response.

By chance one clone of virus-specific T cells also reacts with MHC:peptide complexes on the surface of healthy β cells in the pancreas.

Activated T cells attack and kill pancreatic β cells.