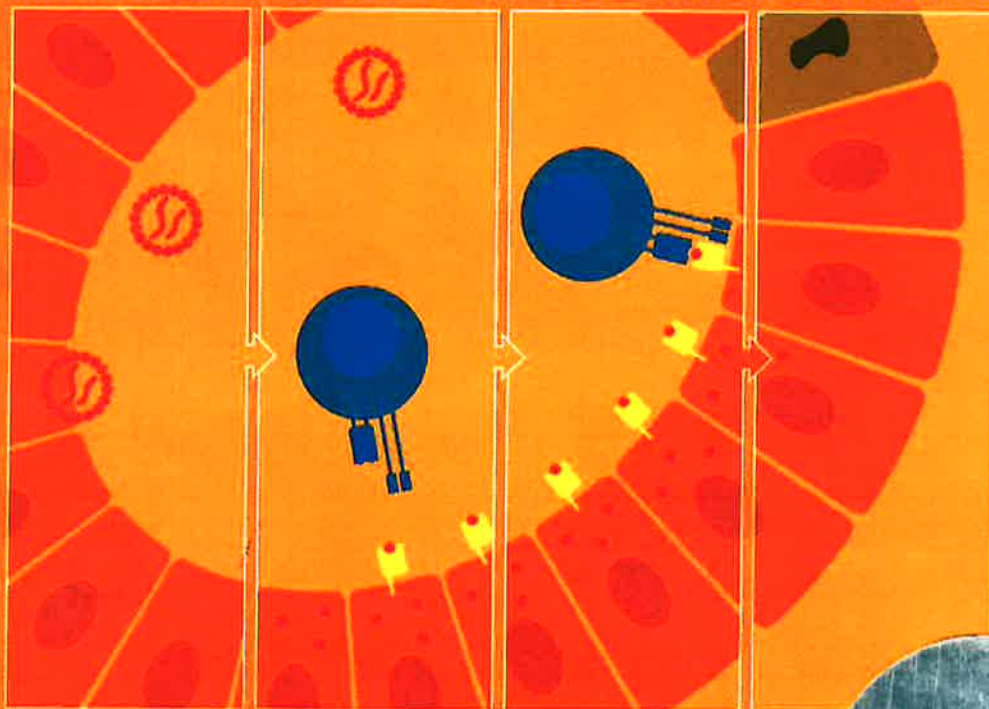


immuno biology 5

THE IMMUNE SYSTEM IN HEALTH AND DISEASE



FIFTH EDITION



CHARLES A JANEWAY • PAUL TRAVERS
MARK WALPORT • MARK SHLOMCHIK

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Charles A. Janeway, Jr.

Yale University School of Medicine



Paul Travers

Anthony Nolan Research Institute, London



Mark Walport

Imperial College School of Medicine, London



Mark J. Shlomchik

Yale University School of Medicine



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The Humoral Immune Response

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Many of the bacteria that cause infectious disease in humans multiply in the extracellular spaces of the body, and most intracellular pathogens spread by moving from cell to cell through the extracellular fluids. The extracellular spaces are protected by the **humoral immune response**, in which antibodies produced by B cells cause the destruction of extracellular microorganisms and prevent the spread of intracellular infections. The activation of B cells and their differentiation into antibody-secreting plasma cells (Fig. 9.1) is triggered by antigen and usually requires helper T cells. The term 'helper T cell' is often used to mean a cell from the T_H2 class of CD4 T cells (see Chapter 8), but a subset of T_H1 cells can also help in B-cell activation. In this chapter we will therefore use the term **helper T cell** to mean any armed effector CD4 T cell that can activate a B cell. Helper T cells also control isotype switching and have a role in initiating somatic hypermutation of antibody variable V-region genes, molecular processes that were described in Chapter 4.

Antibodies contribute to immunity in three main ways (see Fig. 9.1). To enter cells, viruses and intracellular bacteria bind to specific molecules on the target cell surface. Antibodies that bind to the pathogen can prevent this and are said to **neutralize** the pathogen. Neutralization by antibodies is also important in preventing bacterial toxins from entering cells. Antibodies protect against bacteria that multiply outside cells mainly by facilitating uptake of the pathogen by phagocytic cells that are specialized to destroy ingested bacteria. Antibodies do this in either of two ways. In the first, bound antibodies coating the pathogen are recognized by Fc receptors on phagocytic cells that bind to

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