Skin
(innate—non-specific)

Mucus membranes
(innate—non-specific)

Macrophages
(arise from white blood cells)
(non-specific)

Neutrophils
(non-specific)

Cytokines and chemokines
signaling proteins,
i.e., interleukins, interferons
(non-specific)

Antimicrobial peptides (AMPs)

Antigen-presenting cells
(adaptive, acquired–specific)

Major Histocompatibility Complex class I receptors

Line the mouth, nose, and other body openings to “catch” foreign invaders in mucus

Physical barrier to keep pathogens out

Rapidly ingest microorganisms and kill them through a process called phagocytosis.

Engulf and digest cellular debris, pathogens, and other foreign substances in the body by phagocytosis.

Contain pattern recognition or toll-like receptors **(TLRs)** that detect pathogen associated molecular patterns **(PAMPs).**

Defensins; drill holes in bacterial cells

“Tell” immune cells how to respond to threats and injuries; cause inflammation or call more macrophages to be recruited; release antimicrobial peptides.

Found on all body cells; recognize exact viral cells

Macrophages with a series of receptors called major histocompatibility complex **(MHC class II receptors);** recognize exact bacterial invaders

T cells lymphocytes
(adaptive, acquired–specific)

B cells lymphocytes
(adaptive, acquired–specific)

Produce antibodies

Differentiate into **cytotoxic** (killer), **helper** (recruit more immune cells), **memory,** and **regulatory** T cells.