Barriers to entry – protective covering, epithelia covers in mucus, hydrochloric acid in stomach

Phagocytosis

- Phagocyte attracted to pathogen by chemoattractants, moves towards pathogen along concentration gradient
- Phagocyte bonds to pathogen
- Lysosome within phagocyte migrate towards phagosome formed by engulfing the bacterium
- Lysosomes release lytic enzymes into phagosome, where break down bacterium
- Breakdown products of bacterium area absorbed by phagocyte

B lymphocytes (B cells) – humoral immunity, immunity involving antibodies present in body fluids

T lymphocytes (T cells) – cell-mediated immunity, immunity involving body cells

Cell mediated diffusion

- Pathogens invade body cells or taken in by phagocytes
- Phagocyte places antigens from pathogen on cell-surface membrane
- Receptors on certain T helper cells fit exactly onto antigens
- Activates other T cells to divide rapidly by mitosis and form clones
- Cloned T cells:
  - Develop into memory cells that enable rapid response to future infections by same pathogen
  - Stimulate phagocytes to engulf pathogens by phagocytosis
  - Stimulate B cells to divide
  - Kill infected cells

Humoral immunity

- Surface antigens of invading pathogen taken up by B cells
- B cells process antigens and present them on their surface
- T helper cells attach to processed antigens on B cells, activating them
- B cells activated to divide by meiosis to give clone of plasma cells
- Cloned plasma cells produce antibodies that exactly fit antigens on pathogens surface
- Antibodies attach to antigens of pathogen and destroy them (primary immune response)
- Some B cells develop into memory cells, respond to future infections by same pathogen by dividing rapidly and developing into plasma cells that produce antibodies (secondary immune response)

Antibodies – heavy/light chains, antigen-antibody complex, variable region (binding site), constant region

Monoclonal antibodies have number of useful functions in science/medicine

- Separation of a chemical from a mixture
- Immunoassay
- Cancer treatment
- Transplant surgery