- 3. Contrast endogenous antigen processing with exogenous antigen processing.
  - a. Endogenous antigen processing
    - i. A few molecules of each polypeptide are catabolized into smaller pieces.
    - ii. These small pieces, epitopes, are loaded onto complementary MHC I proteins in the ER.
    - iii. Golgi bodies package MHC I protein-epitope complexes into vesicles.
    - iv. These vesicles fuse with the cytoplasmic membrane.
    - v. MHC I protein-epitope complexes are then displayed on the surface of the membrane of all nucleated cells.
  - b. Exogenous antigen processing
    - i. Only antigen-presenting cells (APCs), usually dendritic cells, process exogenous antigens.
    - **ii.** First, a dendritic cell phagocytizes an invading pathogen and catabolizes the pathogen's molecules, producing peptide epitopes.
    - **iii.** Another vesicle, already containing MHC class II molecules in its membrane, fuses with the phagolysosome.
      - **1.** MHC II molecules bind complementary epitopes.
    - iv. The vesicle then fuses with the cytoplasmic membrane, leaving MHC II– epitope complexes on the cell's surface.
      - 1. Any empty MHC II molecules are not stable or cel'ssurface so they degrade.

## **Cell-Mediated Immune Responses**

- 1. Describe a cell-mediated immune
  - a. The body uses tell mediated immune reponses primarily to fight intracellular pathogen, and abnormal body tells.
    - The body induces col-mediated immune responses only against specific endog not carefyens.



## Compare and contrast the two pathways of cytotoxic T cell action.

## a. The Perforin-Granzyme Cytotoxic Pathway

- i. The cytoplasm of cytotoxic T cells has vesicles containing two key protein cytotoxins, *perforin* and *granzyme*.
- ii. When a cytotoxic T cell first attaches to its target, vesicles containing the cytotoxins release their contents.
- iii. Perforin molecules aggregate into a channel through which granzyme enters, activating apoptosis in the target cell.
- iv. Having forced its target to commit suicide, the cytotoxic T cell disengages and moves on to another infected cell.

## b. The CD95 Cytotoxic Pathway

- i. This pathway involves an integral glycoprotein called *CD95* that is present in the membranes of many body cells.
  - 1. Activated Tc cells insert the *CD95L receptor* into CD95.
- ii. This then activates enzymes in the infected cell that trigger apoptosis, killing the target cells.
  - 1. This pathway does not involve the travel of enzymes from Tc cells.