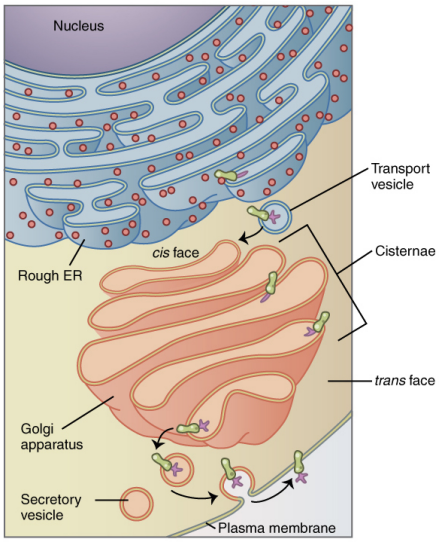
CONCEPT: VESICULAR BUDDING, TRANSPORT, AND COATS

Overview

- **Transport vesicles** carry molecules between organelles and the plasma membrane
  - □ **Secretory pathway** beings in the ER, moves to the Golgi, and ends at the cell surface
  - □ **Endocytic pathway** beings at the plasma membrane, and brings molecules into different organelles

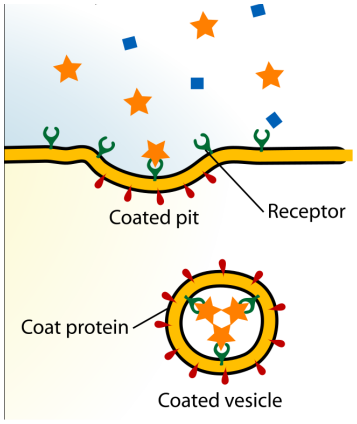
EXAMPLE: Secretory pathway in the cell



Vesicular Coats

- Many times, vesicles bud from organelles or other cellular structures surrounded by a _____ coat
  - □ There are three main types of vesicular coats
    - **Clathrin coated vesicles** travel between the Golgi and plasma membrane
    - **COPI** coated vesicles bud from the Golgi towards the ER
    - **COPII** coated vesicles bud from the ER

EXAMPLE: Coated vesicle



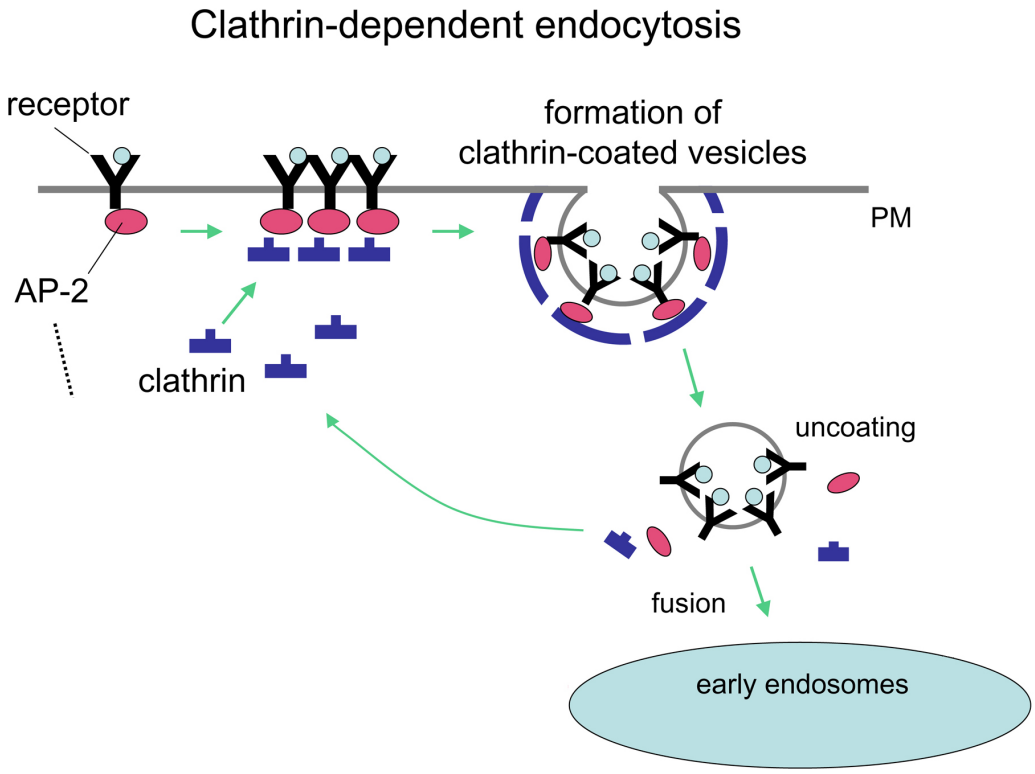
□ Clathrin coats drive vesicular _____

- **Adaptor proteins** bind the clathrin, and transmembrane proteins that are being transported

- **Cargo receptors** are transmembrane proteins that capture soluble cargo

- **Dynamin** is a cytoplasmic protein that assembles a ring around the neck and uses GTP to pinch it off

EXAMPLE: Clathrin coated vesicle formation



□ GTPases regulate recruitment of _____ to the membrane

- A coat protein binds to a cargo molecule or adaptor – which triggers a GDP to GTP transition

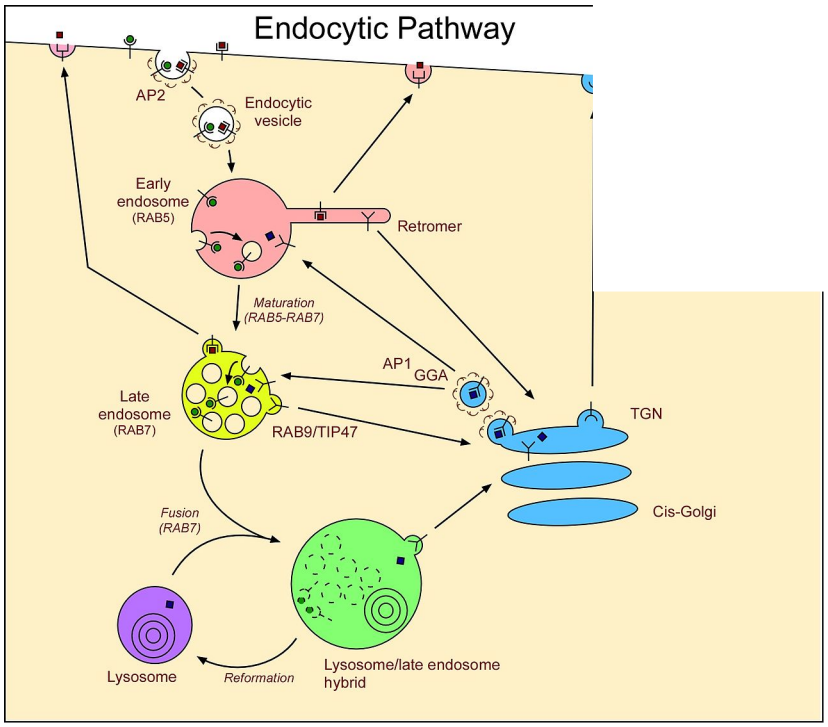
- GTP activated coat protein associates with the membrane and recruits more coat proteins

- **Rab** proteins are GTPases that control specificity of coat proteins and specificity of transport

- GTP form is tightly associated with membranes

- Each vesicle contains unique combination of Rab proteins

EXAMPLE: Rab proteins in various organelles



SNARE Proteins and Vesicular Fusion

● **SNARE** proteins are responsible for catalyzing membrane fusion and providing specificity to membrane fusion

□ There are two types of SNARES which reside within the _____

- **T-snare** has 2-3 target snares and resides on the target organelle.

- **V-snare** is 1 protein that resides on the vesicle

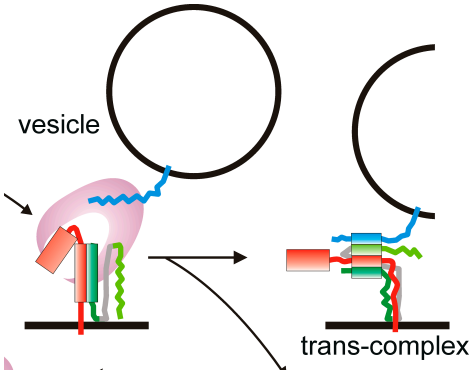
□ The two SNARES come together to form a four helix bundle (*trans-SNARE complex)*

- Causes fusion of the vesicle to the target membrane

□ To unravel the SNAREs energy from ATP is needed

- **NSF** (N-ethylmaleimide sensitive factor) releases V and T SNARES using ATP hydrolysis

EXAMPLE: SNARE protein and vesicular fusion



PRACTICE:

1. Which of the following is not a protein coat?
    a. COPI
    b. COPII
    c. COPIII
    d. Clathrin

2. Which of the following coats is used on vesicles that transport molecules from the Golgi to the ER?
    a. COPI
    b. COPII
    c. COPIII
    d. Clathrin

3. Vesicle fusion requires all but which of the following?
    a. T SNARES
    b. V SNARES
    c. *Trans* SNARE complex
    d. Rab GTP proteins