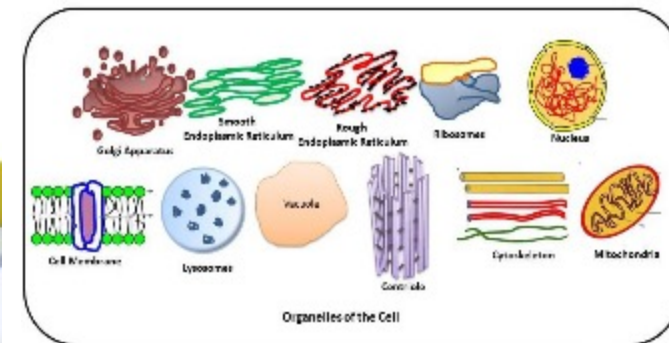
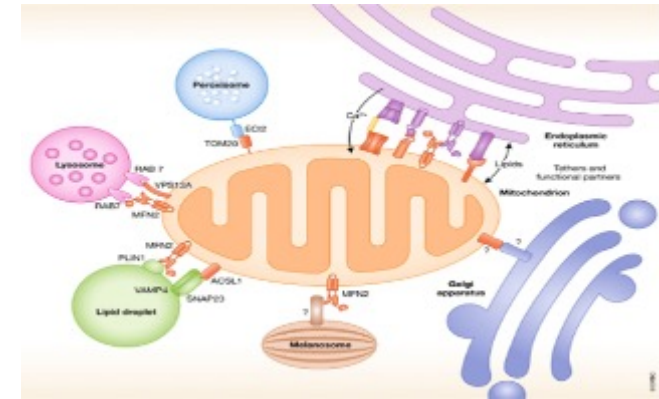
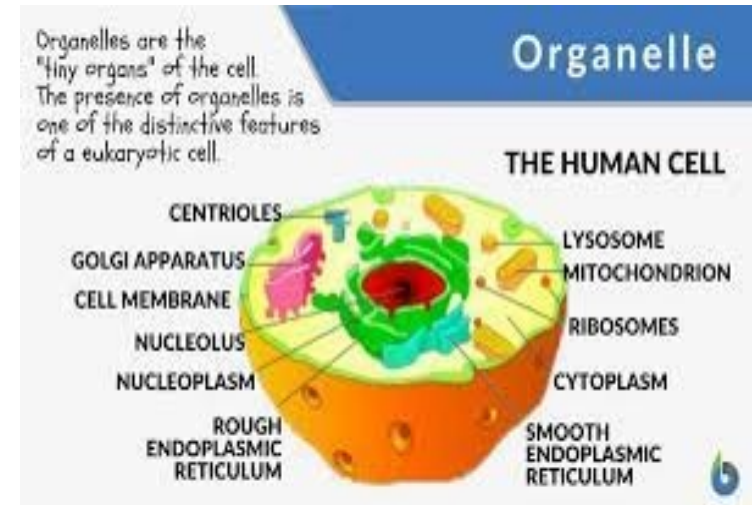


Cell organelles, their function, and the relationship between them

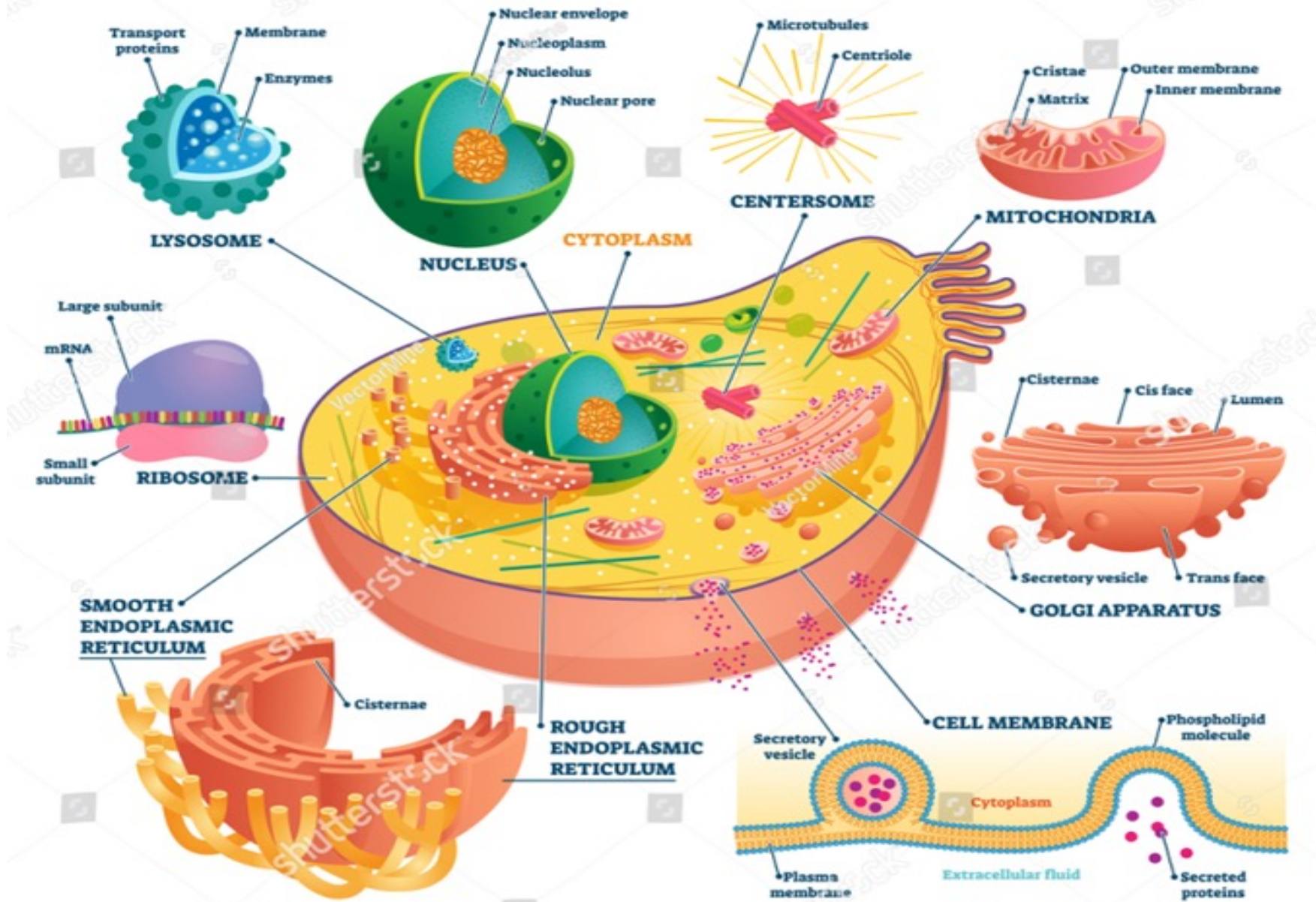


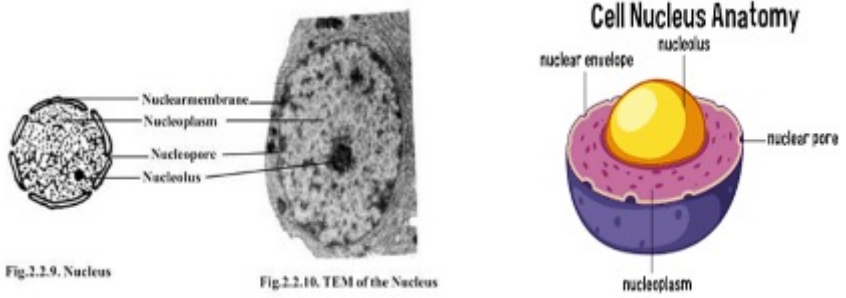
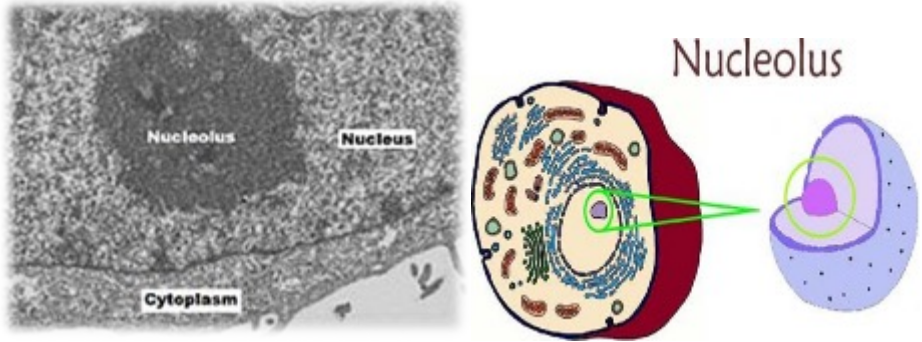
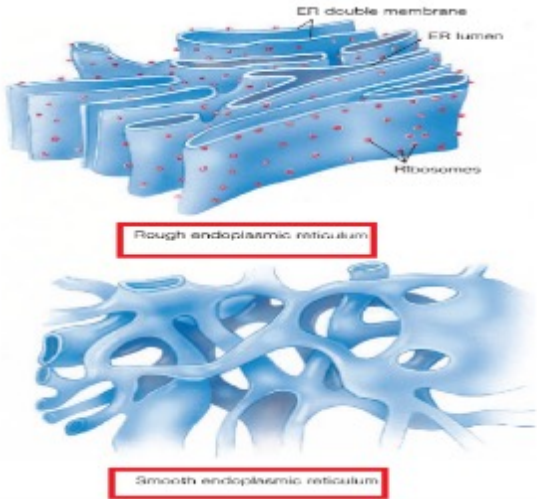
Organelles


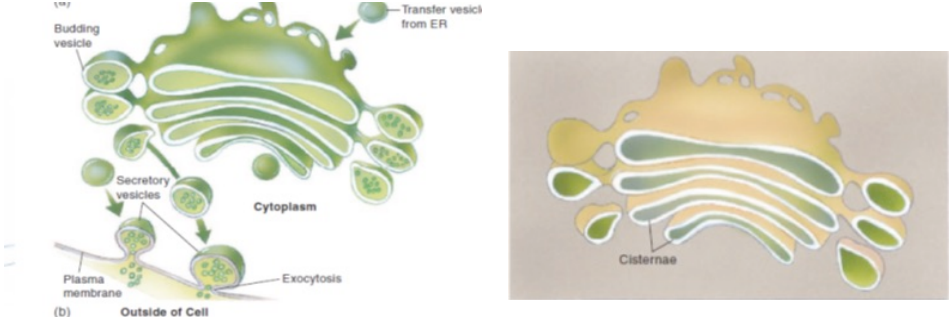
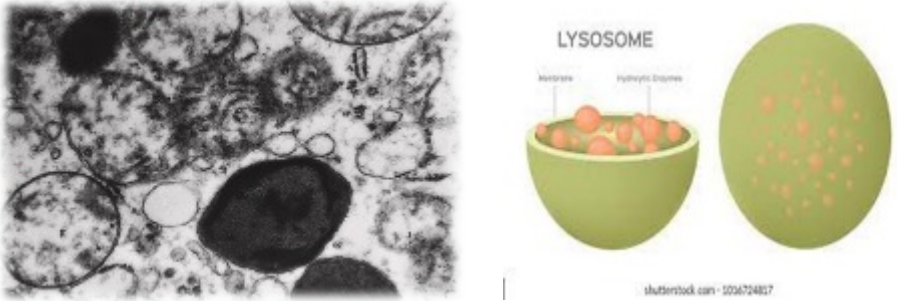
- An organelle is a **component of a cell** that carries out a specialized function in cell biology.
- Numerous cellular processes that **take place in the cytoplasmic compartment** are influenced by the activity of certain organelle-containing structures.

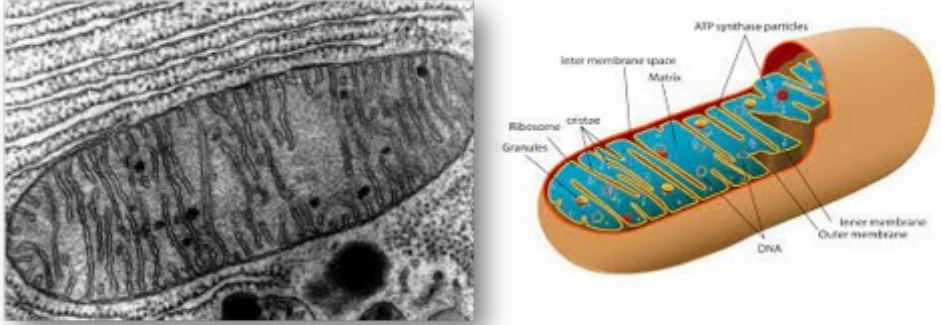
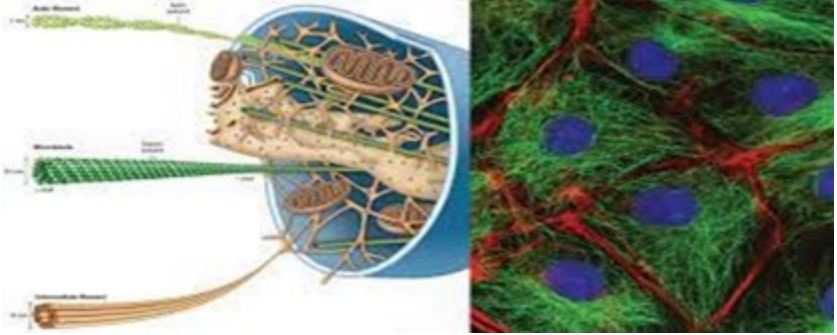
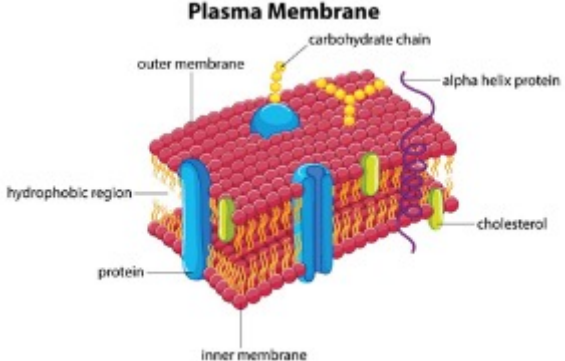


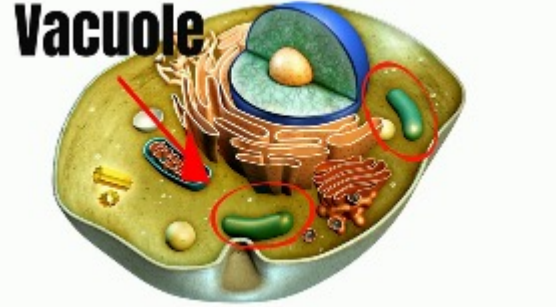
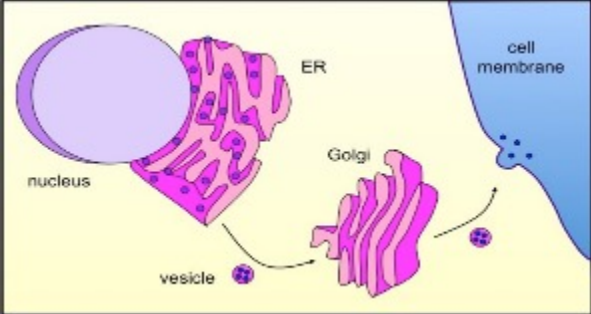
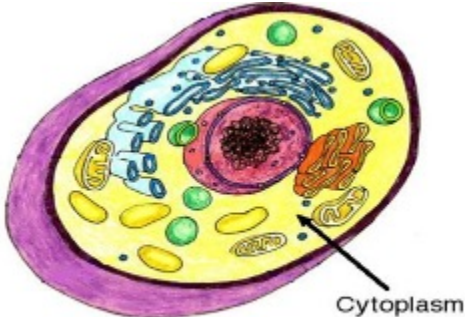
CELL ORGANELLES



Organelles	Structure	Function	Shape
<p>Nucleus</p>	<p>Nucleolus and DNA are located inside a spherical structure that is encircled by a nuclear envelope</p>	<p>DNA in cells regulates their genetic code and metabolic processes</p>	 <p>The diagrams illustrate the nucleus. On the left, a 3D model (Fig. 2.2.9) shows the nuclear membrane, nucleoplasm, nucleopore, and nucleolus. In the middle, a transmission electron micrograph (TEM) (Fig. 2.2.10) shows the internal structure of the nucleus. On the right, a cross-section (Cell Nucleus Anatomy) shows the nuclear envelope, nucleolus, and nuclear pore, with the nucleoplasm filling the interior.</p>
<p>Nucleolus</p>	<p>RNA and protein are found in the nucleus' rounded bulk.</p>	<p>Ribosome preassembly point</p>	 <p>The diagrams show the nucleolus. On the left, a TEM image shows the nucleolus within the nucleus, with the cytoplasm visible below. On the right, a 3D diagram (Nucleolus) shows the nucleolus as a dense, spherical structure within the nucleus, which is surrounded by the nuclear envelope.</p>
<p>Endoplasmic reticulum (ER)</p>	<p>The cytoplasm is filled with a vast membrane network that stretches from the plasma membrane to the nuclear envelope.</p>	<p>Internal transport and storage. Rough ER serves as a location for ribosome attachment produces protein. Smooth ER produces lipids.</p>	 <p>The diagrams illustrate the endoplasmic reticulum. The top diagram shows the rough endoplasmic reticulum (Rough endoplasmic reticulum) with its characteristic flattened sacs (cisternae) and the presence of ribosomes on its surface. Labels include 'ER double membrane', 'ER lumen', and 'Ribosomes'. The bottom diagram shows the smooth endoplasmic reticulum (Smooth endoplasmic reticulum) with its tubular structure and lack of ribosomes.</p>

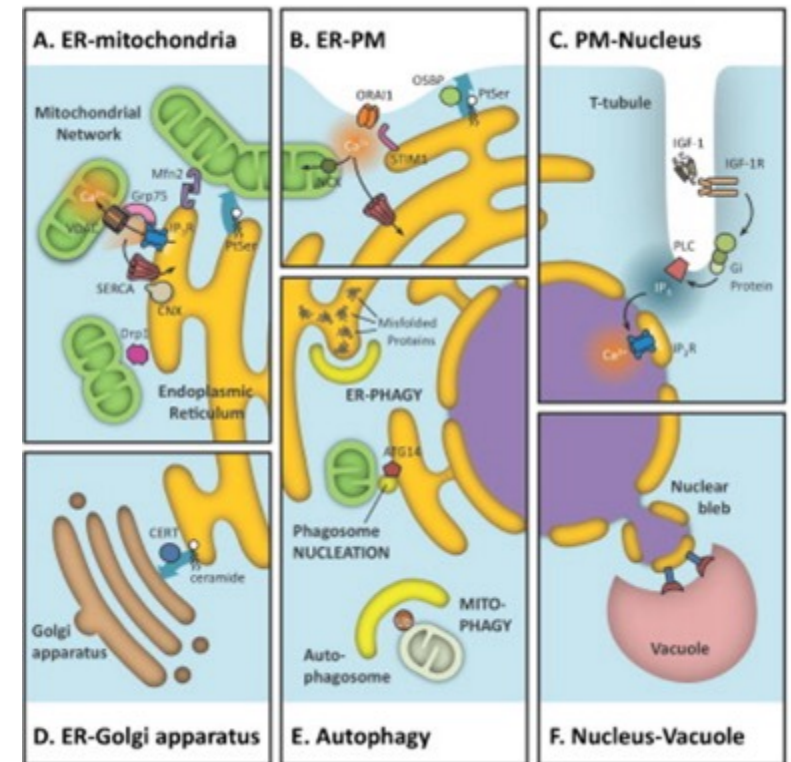
Organelles	Structure	Function	Shape
Ribosome	RNA and protein are present; some are free and some are attached to the ER	Site of protein production; purpose	
Golgi apparatus	Stacks of membranes with a disk shape	Sorts, packs, and routes the products that the cell has created	
Lysosome	Membrane-bound sphere	Digests materials	

Organelles	Structure	Function	Shape
<p>Mitochondrion</p>	<p>Cellular structure with two folded membranes</p>	<p>Energy is changed into a form that the cell can utilize</p>	
<p>Cytoskeleton</p>	<p>Microfilaments and microtubules that join one another; adaptable cellular structure</p>	<p>Facilitates cell mobility, offers assistance, and acts as a binding site for particular enzymes</p>	
<p>Plasma membrane</p>	<p>The trilayer cell envelope made up of phospholipid, cholesterol, and protein</p>	<p>Cell-to-cell recognition, material transport control, and protection</p>	<p>Plasma Membrane</p> 

Organelles	Structure	Function	Shape
Vacuole	Big, often membrane-surrounded sac in the cytoplasm	Stores food and other substances; also, remove water from cells (e.g., contractile vacuole)	
Vesicle	Enzymes or secretory products are contained in this tiny, membrane-enclosed sac	Site of digesting, storing, or transport inside the cell	
Cytoplasm	Fluid cytosol, organelles, and other components make up the semifluid that is contained within the plasma membrane	It dissolves things and contains vesicles and organelles	

Cell organelle's function, and the relationship between them

- Cellular organelles **do not function as isolated** or static units, but rather form **dynamic contacts between one another** that can be modulated according to cellular needs.
- For the **maintenance of Ca²⁺ and lipid** homeostasis, as well as for the **regulation** of other crucial processes including **metabolism, signaling, organelle integrity, and the execution of the apoptotic program**, the physical interfaces between organelles are crucial.
- New research emphasizes the **significance of organelle communication in diseases** including Alzheimer's disease, pulmonary arterial hypertension, cancer, and malfunctioning of the skeletal and cardiac muscles.



Relationships among organelles of the endomembrane system

1

Nuclear envelope is connected to rough ER, which is also continuous with smooth ER

2

Membranes and proteins produced by the ER flow in the form of transport vesicles to the Golgi

3

Golgi pinches off transport Vesicles and other vesicles that give rise to lysosomes and Vacuoles

4

Lysosome available for fusion with another vesicle for digestion

5

Transport vesicle carries proteins to plasma membrane for secretion

6

Plasma membrane expands by fusion of vesicles; proteins are secreted from cell

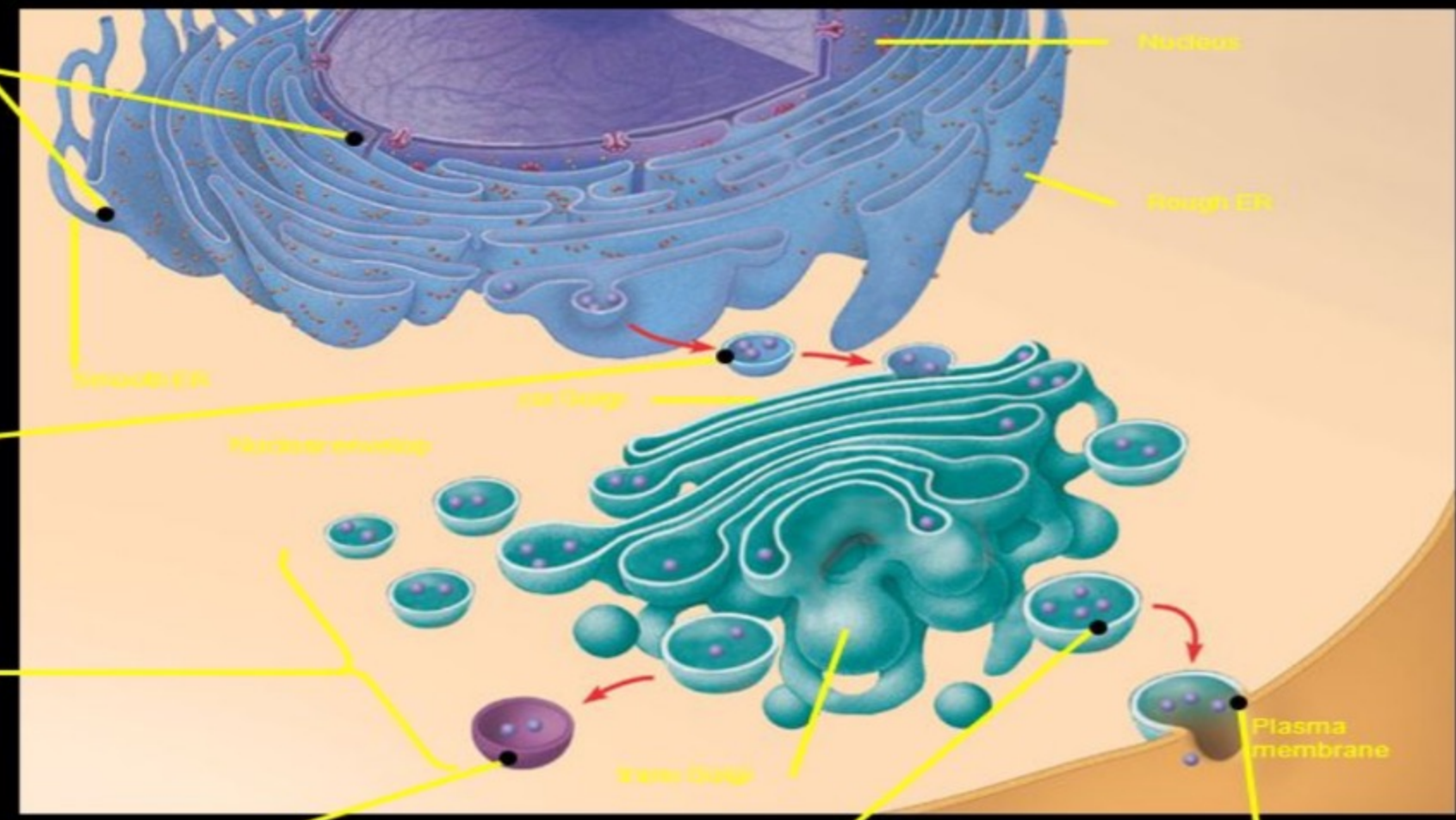
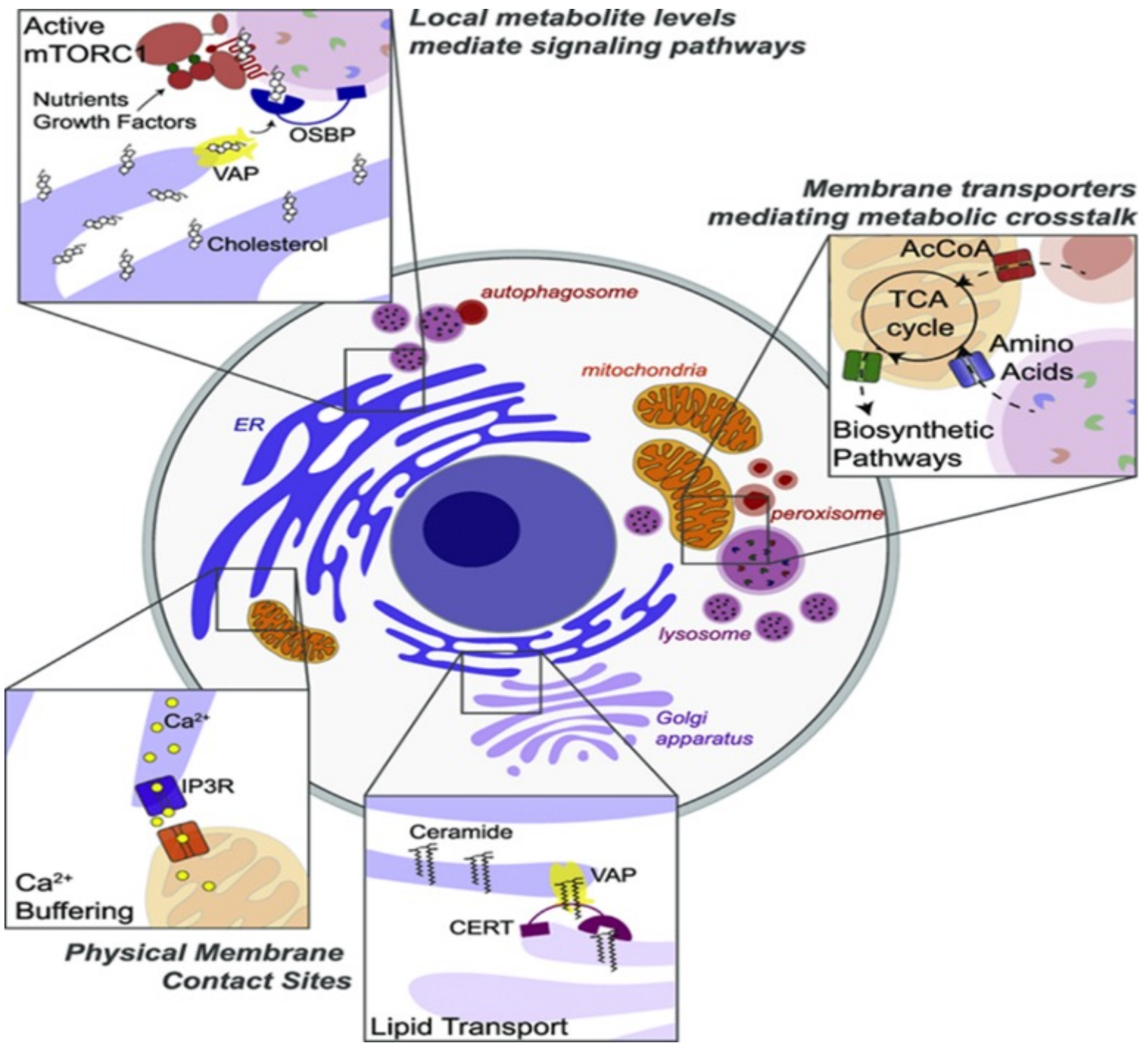
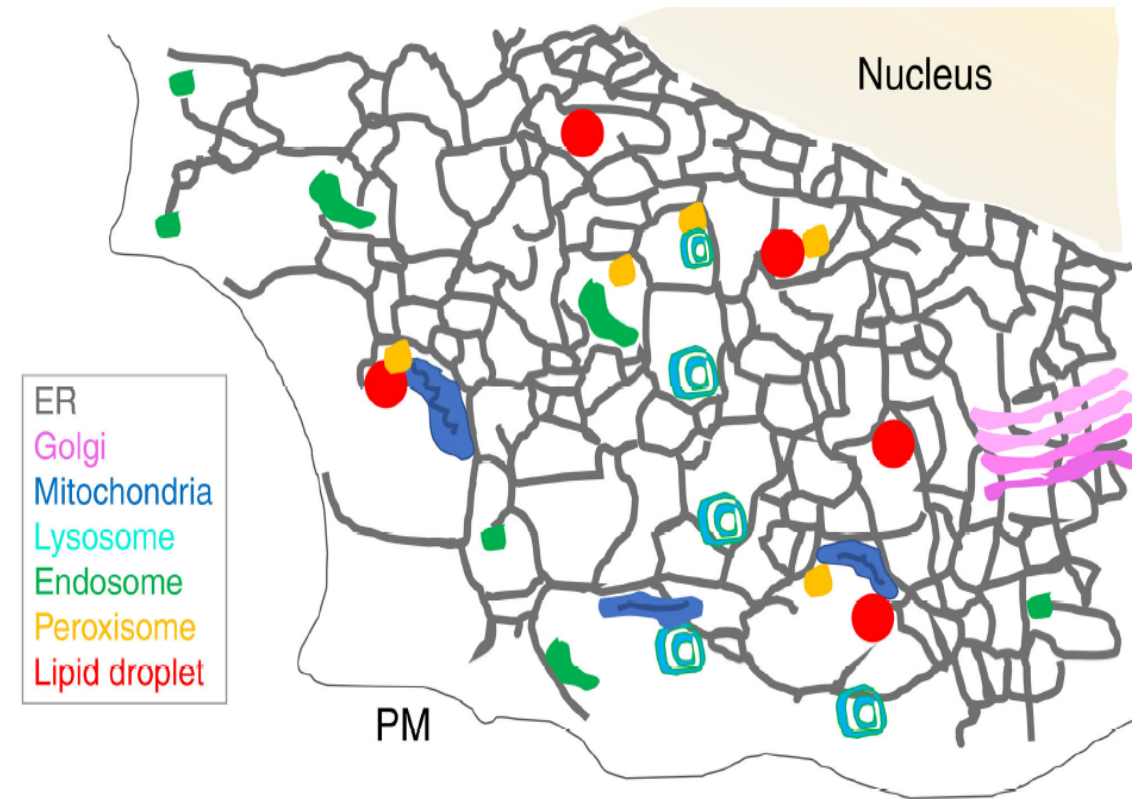


Figure 6.16



- **Organelle interactions** that have at least one known protein mediating the contact are displayed.
- **Organelle fission**, Ca^{2+} dynamics, and **lipid exchange** are all impacted by **ER-lysosome** and **ER-endosome interactions**.
- At the **lysosome-mitochondria-ER contact regions**, lysosomes also **contribute to mitochondrial fission**.
- **Lipid and Ca^{2+} exchange** takes place at **ER-plasma membrane (PM) contact sites**.
- **Every other organelle contact** in the image has a **lipid exchange function** that has been postulated.
- **Proteins can also move across these organelles** through **ER-LD interactions**.



Functions of organelle contacts

- Also, rough ER produces the lysosomal enzymes, which are then transported to the Golgi and lysosomes.
- Fatty acids are broken down into smaller molecules by certain peroxisomes using oxygen, which are then transferred to mitochondria and utilized as fuel for cellular respiration.

