Difference Between Free and Attached Ribosomes

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Key Difference – Free vs Attached Ribosomes

A ribosome is a small round organelle which is known as the protein factory of the cell. Ribosomes are produced in the nucleolus and transported to the cytoplasm of the cell. Two types of ribosomes are found in the cytoplasm. They are free form or bound (attached) form. The key difference between free and attached ribosomes is that **free ribosomes are not attached and freely located in the cytoplasm**while **attached ribosomes are attached to the endoplasmic reticulum.**

What is the Function of Ribosomes?

It is important to understand the function of ribosomes before reading about the difference between free and attached ribosomes. Both prokaryotic and eukaryotic cells contain ribosomes. Proteins synthesis occurs in the ribosomes of the cells. When genes are transcribed, the resultant mRNA molecules are translated into respective proteins. Translation occurs in ribosomes. Ribosomes are composed of ribosomal RNA molecules and proteins. The ribosome has two subunits named large subunit and small subunit. Four rRNA molecules hold the structure of ribosome together. Prokaryotic ribosomes are 70S size and eukaryotic ribosomes are 80S in size.

Both free and bound ribosomes produce proteins. Protein synthesis from DNA is explained in the following video.

https://www.youtube.com/watch?v=gG7uCskUOrA

What are Free Ribosomes?

Some of the ribosomes located in the cytoplasm are not attached to any other organelle. They are freely located in the cytoplasm in an unbound state. They are known as free ribosomes. These ribosomes group together and form structures called polysomes. They are freely floating in the cytoplasm and move all around the cell.

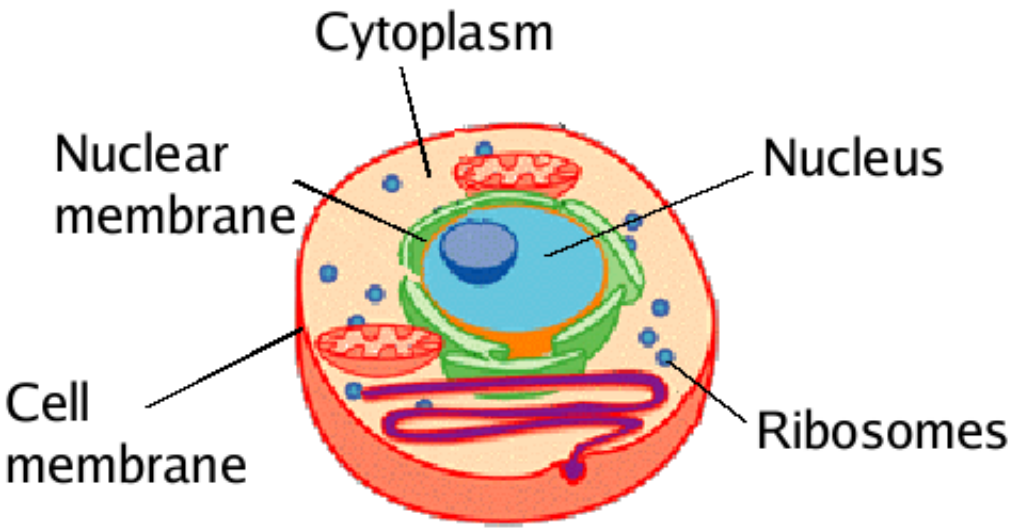

Figure 01: Free Ribosomes

Free ribosomes synthesize proteins in the cytoplasm. Most of the proteins synthesized by free proteins are for the use within the cell. Most of these proteins are enzymes and are involved in the metabolism of macromolecules. Other proteins are also used for the metabolism of food.

What are Attached Ribosomes?

Most of the ribosomes in a cell are located on the surface of the endoplasmic reticulum. They are known as attached or the bound ribosomes. An endoplasmic reticulum with ribosomes attached to it is called a rough endoplasmic reticulum. Once these ribosomes are attached, they cannot move around the cell. Bound ribosomes are attached to the cytosolic side of the endoplasmic reticulum.

Attached ribosomes produce proteins which are exported from the cell to the outside. These proteins include digestive enzymes, polypeptide hormones, cell surface receptors, cell signaling molecules, etc. These proteins are secreted from the cell using secretory vesicles.

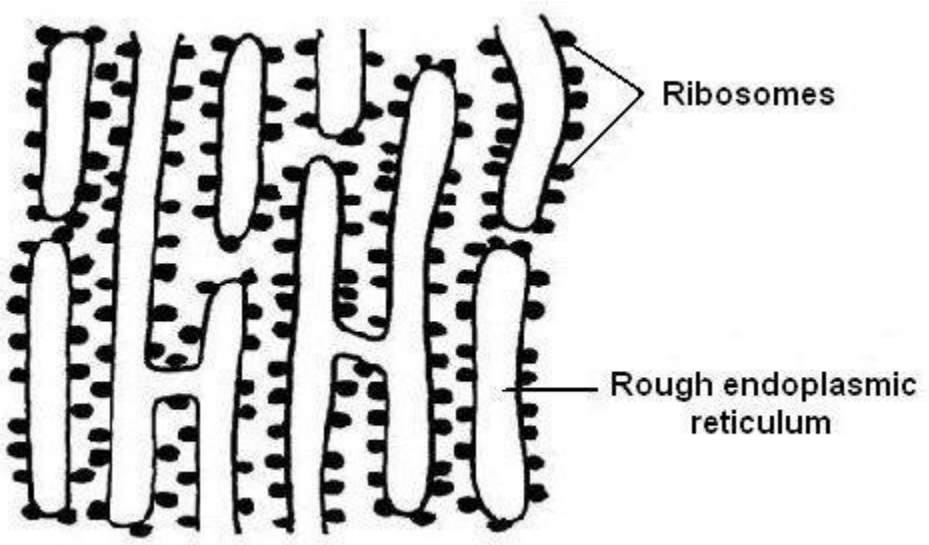

Figure 02: Bound Ribosomes

What are the similarities between Free and Attached Ribosomes?

- Free and attached ribosomes synthesize proteins.
- Both types of ribosomes are made from rRNA and proteins.
- Both types of ribosomes found outside the nucleolus of the cell.

What is the difference between Free and Attached Ribosomes?

Free vs Attached Ribosomes	
Free ribosomes are the small organelles located in the cytoplasm.	Attached ribosomes are the small organelles attached to the surface of the endoplasmic reticulum.
Attachment	
Free ribosomes are not attached to any structure of the cell.	Attached ribosomes are bound to the endoplasmic reticulum.
Movement	
Free ribosomes can move all	Attached ribosomes cannot move to other

around the cell.	areas of the cell.
Proteins Produced	
Free ribosomes synthesize proteins for use within the cell.	Attached ribosomes produce proteins that are transported out of the cell.

Summary – Free vs Attached Ribosomes

A ribosome is a small organelle of the cell. It is the organelle which synthesizes proteins from mRNA molecules. Hence, ribosomes are known as small protein factories in the cell. There are two types of ribosomes in a cell. Some ribosomes are free in the cytoplasm without being attached to any other organelle. They are known as free ribosomes. Some ribosomes are attached to the endoplasmic reticulum and form rough ER. They are known as bound or attached ribosomes. Both ribosomes are involved in synthesizing proteins that are necessary to use within the cell and that are necessary to secrete outside the cell or use in lysosomes. Free ribosomes freely move around the cell while bound ribosomes cannot change their locations. This is the difference between free and attaché ribosomes.

References:

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2. "Ribosome." Nature News. Nature Publishing Group, n.d. Web. Available here. 24 July 2017.

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