Ribosomes- Definition, Structure, Functions

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The ribosome word is derived – 'ribo' from ribonucleic acid and 'somes' from the Greek word 'soma' which means 'body'.
Ribosomes are tiny spheroidal dense particles (of 150 to 200 A^0 diameters) that are primarily found in most prokaryotic and eukaryotic.
They are sites of **protein synthesis**.
They are structures containing approximately equal amounts of RNA and proteins and serve as a scaffold for the ordered interaction of the numerous molecules involved in protein synthesis.
The ribosomes occur in cells, both prokaryotic and eukaryotic cells.
In prokaryotic cells, the ribosomes often occur freely in the cytoplasm.
In eukaryotic cells, the ribosomes either occur freely in the cytoplasm or remain attached to the outer surface of the membrane of the endoplasmic reticulum.
The location of the ribosomes in a cell determines what kind of protein it makes.
If the ribosomes are floating freely throughout the cell, it will make proteins that will be utilized within the cell itself.
When ribosomes are attached to the endoplasmic reticulum, it is referred to as rough endoplasmic reticulum or rough ER.
Proteins made on the rough ER are used for usage inside the cell or outside the cell.
The number of ribosomes in a cell depends on the activity of the cell.
On average in a mammalian cell, there can be about 10 million ribosomes.
A ribosome is made from complexes of RNAs and proteins and is, therefore, a ribonucleoprotein.
Around 37 to 62% of RNA is comprised of RNA and the rest is proteins.

Structure of Ribosome

- Each ribosome is divided into two subunits:

1. **A smaller subunit** which binds to a larger subunit and the mRNA pattern, and
2. **A larger subunit** which binds to the tRNA, the amino acids, and the smaller subunit.

- Prokaryotes have 70S ribosomes respectively subunits comprising the little subunit of 30S and the bigger subunit of 50S.
- Their small subunit has a 16S RNA subunit (consisting of 1540 nucleotides) bound to 21 proteins.
- The large subunit is composed of a 5S RNA subunit (120 nucleotides), a 23S RNA subunit (2900 nucleotides) and 31 proteins.
- Eukaryotes have 80S ribosomes respectively comprising of little (40S) and substantial (60S) subunits.
- The smaller 40S ribosomal subunit is prolate ellipsoid in shape and consists of one molecule of 18S ribosomal RNA (or rRNA) and 30 proteins .
- The larger 60S ribosomal subunit is round in shape and contains a channel through which growing polypeptide chain makes its exit.
- It consists of three types of rRNA molecules, i.e., 28S rRNA, 5.8 rRNA and 5S rRNA, and 40 proteins.
- The differences between the ribosomes of bacterial and eukaryotic are used to create antibiotics that can destroy bacterial infection without harming human cells.
- The ribosomes seen in the chloroplasts of mitochondria of eukaryotes are comprised of big and little subunits composed of proteins inside a 70S particle.
- The ribosomes share a core structure that is similar to all ribosomes despite differences in its size.
- The two subunits fit together and work as one to translate the mRNA into a polypeptide chain during protein synthesis.
- Because they are formed from two subunits of non-equal size, they are slightly longer in the axis than in diameter.
- During protein synthesis, when multiple ribosomes are attached to the same mRNA strand, this structure is known as polysomes.

The important ribosome function includes:

1. It assembles amino acid to form proteins that are essential to carry out cellular functions.
2. The DNA produces mRNA by the process of DNA transcription.
3. The mRNA is synthesized in the nucleus and transported to the cytoplasm for the process of protein synthesis.
4. The ribosomal subunits in the cytoplasm are bound around mRNA polymers. The tRNA then synthesizes proteins.
5. The proteins synthesized in the cytoplasm are utilized in the cytoplasm itself, the proteins synthesized by bound ribosomes are transported outside the cell

References

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