

Hello students and welcome to this presentation. The course title is microbiology and biochemistry 2 and the course code for this presentation is MIC 102. Hi I'm Dr. Sheryanne Velho- Pereira and the title of the unit that I'll be covering today is eukaryotic cells structure and functions. The name of this module, eukaryotic cell organelles and today we'll be discussing endoplasmic reticulum. The outline of this module is as follows. Will be discussing the structure of the ER (endoplasmic reticulum) and the functions of the ER. Once we complete this module, you will be in the position of stating the structure of the endoplasmic reticulum. The types of the endoplasmic reticulum, and finally the uses of the two types of endoplasmic reticulum. That is the rough ER and the smooth endoplasmic reticulum are abbreviated as RER and SER respectively. So as we just discussed, endoplasmic reticulum are of two types.

You can see here the nucleus is there, in particular the nuclear envelope is continuous with the rough ER. The small globular orange structures that you see there is nothing but the ribosomes or the protein factories. And on the other side you see the non-studied appearance of the ER. That is the smooth or the transitional ER. Now both of them are distinct in that they appear differently and they also have different functions. Let's see what they are.

What does the ER do? The ER is only seen in eukaryotic cells. However, there are exceptions like sperm cells and RBCs do not have ER. It is located in the cytoplasm. Its membranes form continuous folds that eventually join the outer layer of the nuclear membrane. Its primary role consists of synthesis, folding, modification and transportation of proteins. ER is an irregular network comprising of two things, number one branched and fused membranes to use which have a diameter of around 40 to 70 nanometers. and flattened sacs, called the cisternae; a singular one being sister cisterna)

Now when the cells are disrupted by human homogenisation, the ER breaks into small fragments. And these in turn reseals to form little vesicles. They are known as microsomes. Now the microsomes that are derived from the rough ER are studded with ribosomes and hence these microsomes are known as rough microsomes. That is the microsomes that lack the ribosomes are known as smooth microsomes.

Let's now study what is the rough ER or the R ER? The structure of the rough ER is said to be so because of the presence of the ribosomes that are on its surface. It is a series of connected flat tubes in stacks which have the ribosomes on the outside. It synthesizes and secretes proteins in the liver, hormones and other substances in glands and membrane molecules like the phospholipids. The RER is prominent when there is ample protein synthesis happening especially in cells of the liver, which are known as the hepatocytes.

They are associated with protein synthesis and play a crucial role in protein folding and protein sorting. It thus ensures quality control in the synthesis of proteins. By ensuring that the protein correctly folds before it reaches its target destination. The proteins synthesized by the ribosomes on the RER first enters the cisternae of the ER.

In the ER they undergo protein processing and sorting. In some cases the enzymes attach proteins to carbohydrates leading to the formation of glycoproteins. In some cases, enzymes attach proteins to phospholipids. These molecules then may be incorporated into the organelle membranes or the plasma membrane. The next one that we're going to be studying is a smooth or the transitional ER. As I told you doesn't have ribosomes. The smooth ER lacks ribosomes and hence has a smooth appearance. It has a tubular form. The functions it participates in the production of membrane lipids like the phospholipids and cholesterol. And here the synthesis generally is confined to the cytosol of the ER in the hepatocytes or the liver cells. Enzymes of the smooth ER help to release glucose in the bloodstream.

It functions in the inactivation and the detoxification of drugs and alcohol. It also plays a role in the detoxification of xenobiotic compounds like (SER of the liver cells by virtue of cytochrome P450 helps in the detoxification of xenobiotic compounds). In muscle cells, the calcium ions released from the sarcoplasmic reticulum that is a smooth ER of the muscle cells helps in the triggering the contraction process. It is also involved in the synthesis of fats steroids, namely the hormones such as estrogens and testosterone. The smooth RER transports the products from the ER to other organelles like the Golgi apparatus.

So basically, the SER is the middleman, transferring the proteins from the RER to the Golgi apparatus. The protein synthesized in the RER, by virtue of the ribosomes present on it, are sent to the SER, and finally they are sorted in the Golgi apparatus. So, the Golgi apparatus is very similar to our post office, wherein the letters are segregated depending upon the postal stamps, right? So in SER, the flagging of the proteins happens.

So now let's wrap up this presentation with a little quiz. What is the microsome? Your options are compartment of the golgi apparatus, smaller ribosomes, small ER small vesicles of fragmented ER. I give you a moment to look at the options. Yes, the answer is there. Small vesicles or fragmented ER. Which are formed on account of homogenisation of the ER. Let's do the next one. The rough ER is implicated in the detoxification of xenobiotic compounds. Is this statement true or false? Yes, the answer is the statement is false. The references. I thank you for your attention.