



Working together

Cellular organelles work together

After transcription in the nucleus, proteins are synthesised in translation using the genetic code of mRNA by ribosomes. Some ribosomes are attached to the rough endoplasmic reticulum (rER) and allow proteins to be directed into the rER as they are created. Other ribosomes are found 'freely' in the cytoplasm, where they create proteins that are then transported to the rER.

Inside the rER lumen the proteins fold up, helped by special proteins called 'chaperones' that ensure each protein folds correctly into its 3D shape. While they are in the ER, proteins undergo some modifications – usually the addition of sugar chains – that can help the proteins fold correctly and prevent them being broken down.

The next stop on the proteins' journey is the Golgi apparatus. The proteins in the rER are packaged up into membrane-bound vesicles and, with the help of the cytoskeleton, moved along to the Golgi apparatus. The Golgi apparatus is a stack of multiple compartments. As the proteins move through, each compartment modifies the protein in a different way as each has different specialised enzymes. These modifications often include adding or changing sugar chains. After the modifications are complete, the proteins are again packaged up into vesicles, and from the Golgi apparatus they face one of three fates.

ABOUT THIS RESOURCE

This resource first appeared in 'The Cell' in September 2015. Published by the Wellcome Trust, a charity registered in England and Wales, no. 210183.
bigpictureeducation.com

BigPicture

First, many proteins are transported to the plasma membrane, where the vesicle membrane and plasma membrane fuse, releasing the contents into the extracellular matrix – a process known as exocytosis. Second, some vesicles will be ‘held’ at the plasma membrane, only to be released upon a specific signal. Neurotransmitters, for example, are held in vesicles until an action potential causes depolarisation. This depolarisation causes a calcium influx that allows the vesicle to fuse with the plasma membrane and release the neurotransmitter into the synaptic cleft.

The third fate acts as a quality control for the cell: any misfolded proteins will be transported to the lysosome to be degraded. Proteins that don’t fold correctly may not be able to do their job properly or might even be harmful for the cell.

Lead image:

Caption/credit:

Protein transport through the Golgi apparatus.
The Journal of Cell Biology/Flickr.

ABOUT THIS RESOURCE

This resource first appeared in ‘The Cell’ in September 2015. Published by the Wellcome Trust, a charity registered in England and Wales, no. 210183.
bigpictureeducation.com