Cell Transport

(0:08 - 0:26)

Have you ever wondered what it might be like to be inside a cell? Imagine the genetic material, the cytoplasm, the ribosomes. You'll find those in almost all cells, prokaryotes and eukaryotes. Eukaryote cells, in addition, have membrane-bound organelles.

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All of those structures and organelles have different functions. But cells are not isolated little worlds. They do have a lot going on inside them, but they also need to interact with their environment.

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It makes sense that to keep a stable environment inside themselves, otherwise known as keeping homeostasis, they must have some control on what goes in and what goes out of them. A very important structure for this that all cells contain is the cell membrane. By controlling what goes in and out, the cell membrane helps regulate homeostasis.

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It's the homeostasis king. Let's take a look at the cell membrane. You could have a whole course on the cell membrane itself.

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It has amazing structure. It has signalling abilities. But to stick to the very basics, it's made of a phospholipid bilayer.

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Bilayer means two layers, so you have these two layers of lipids. Now these lipids, they're called phospholipids, well, they have a head that is polar and they have a tail that is nonpolar, making them quite unique. Some molecules, they have no problem going through the cell membrane and they directly go through the phospholipid bilayer.

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Very small, nonpolar molecules, they fit in this category. They're a great example. Like some gases, oxygen and carbon dioxide gas, those are great examples.

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This is known as simple diffusion. Also, it doesn't take any energy to force those molecules in or out, so it's known as passive transport. Simple diffusion moves with the flow, meaning it moves with the concentration gradient.

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Molecules move from high concentration to low concentration. So when you hear someone saying that something's going with the concentration gradient, that's what they mean. They mean it's going from a high concentration of molecules to a low concentration of molecules.

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Now, remember how we said the cell membrane is actually a pretty complex structure? Well, one thing we haven't mentioned yet are proteins in the membrane and some of them are transport proteins. Some transport proteins act as channels. Some of these proteins actually change their shape to get things across.

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Some of them open and close based on some kind of stimulus. All of these are good things because it's helping with molecules that may be too big to cross the membrane on their own or molecules that are polar and therefore need the help of a transport protein. This is known as facilitated diffusion.

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It's still diffusion and it still moves with the concentration gradient of high to low. It doesn't require energy though, so it's also a type of passive transport. It's just the proteins are facilitating or helping things pass.

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Charged ions often require a protein channel in order to pass through. Glucose needs the help of a transport protein to pass through. In osmosis, for water to travel at a fast rate across the membrane, it passes through protein channels called aquaporins.

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So these are all examples of facilitated diffusion, which is a type of passive transport and moves with the concentration gradient of high to low concentration. Now all the transport we've mentioned has been passive in nature. That means it's going from high concentration to low concentration.

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But what if you want to go the other way? For example, the cells lining your gut, they need to take in glucose. But what if the concentration of glucose in the cell is higher than the amount of glucose concentration in the environment? We still need to get the glucose in, so it's going to have to be forced against the regular gradient flow. Movement of molecules from low to high concentration will take energy because that's against the flow.

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Typically, it's going to require ATP energy. A reminder that ATP, adenosine triphosphate, it has three phosphates. And when the bond for the last phosphate is broken, it releases a great amount of energy.

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Yeah, so ATP is a pretty awesome little molecule. ATP can power active transport to force molecules to go against their concentration gradient. And one way it can do that is actually energising the transport protein itself.

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One of our favourite examples of active transport is the sodium-potassium pump. So that's definitely something worth checking out. There's other times a cell needs to exert energy for transport.

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We're still in active transport right now. But let's say a cell needs a very large molecule. Let's say a big polysaccharide.

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If you check out our biomolecule video, that's a large carbohydrate. Well, you may need the cell to fuse with the molecules it's taking in in order to bring it inside. And this is called endocytosis.

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Think endo for in. Often, this fusing of substances within the cell membrane will form vesicles that can be taken inside the cell. Endocytosis is kind of a general term.

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There are different types of endocytosis depending on how that cell is bringing substances inside. Amoebas, for example, rely on a form of endocytosis. In this example, pseudopods stretch out around what they are going to engulf and then it pulls it into a vacuole.

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And there are other forms too, such as the fancy receptor-mediated endocytosis. This is where cells can be very, very, very picky on what's coming in because the incoming substances actually have to bind to receptors to even get in. Or penocytosis.

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This allows cells to take in fluids. So, to the Google to find out more details of the different types of endocytosis. Exocytosis is the reverse direction of endocytosis.

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Think exo and exit. They sound very similar too. Exocytosis can be used to get rid of cell waste, but it's also really important for getting valuable materials out that the cell has made.

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Want a cool example? Think back to those polysaccharides. Did you know that large carbohydrates are also really important for making plant cell walls? Cell walls are different from cell membranes. All cells have membranes, but not all cells have a wall.

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But plant cells do. And if you're going to make a cell wall, you're going to need to get those carbohydrates that are produced in the plant cell out of the cell to make the wall. So there's a great example of when you'd need exocytosis right there.

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Well, that's it for the amoeba sisters, and we remind you to stay curious.