Active Transport **Reading Comprehension**

Active transport is the process of moving substances across membranes, from a more dilute solution to a more concentrated solution, against a concentration gradient. This process requires energy which is released by mitochondria during respiration. Cells which are adapted to transport substances by active transport, such as cells lining the small intestine in mammals and root hair cells in plants, contain many mitochondria.

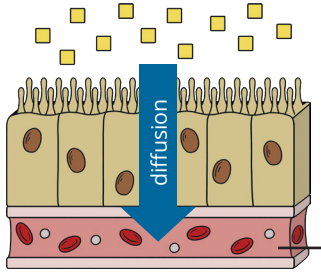
Active Transport in Animals

In most mammals, the villi found in the small intestine are responsible for absorbing nutrients released during the digestion of food. An important nutrient is glucose; it is one of the reactants in respiration, the process which releases energy. It is therefore important that all available glucose is transported from the small intestine into the bloodstream. The villi are adapted to have a large surface area to volume ratio, to maximise the rate of uptake.

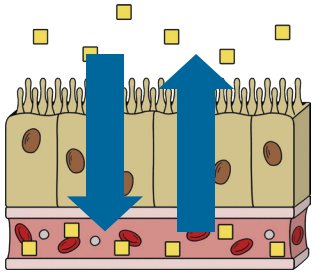
At the beginning of digestion, the amount of sugar in the small intestine is greater than in the bloodstream, therefore glucose diffuses from the small intestine into the bloodstream. After some time, however, or after a low sugar meal, the concentration of nutrients within the small intestine and the bloodstream will reach an equilibrium.

The remaining small amounts of glucose are transported across the intestinal lining, against the concentration gradient via active transport.

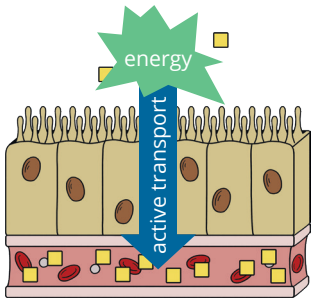
inside the small intestine



Initially, the concentration of glucose ( ) in the small intestine is high, and the concentration inside the bloodstream is low. Glucose moves by diffusion, down the concentration gradient.



After some time, the concentration of glucose in the small intestine and the bloodstream reaches equilibrium. Glucose diffuses between the two at an equal rate.



To make sure all the glucose is absorbed from the small intestine, active transport begins to occur.

Glucose is transported into the bloodstream and continues to be moved over the lining even as the concentration in the bloodstream becomes higher.

Active Transport in Plants

Plants require a plentiful supply of mineral ions, such as nitrate ions, to ensure healthy growth. However, most mineral ions are found in low concentrations in ground soil. This means there is already a higher concentration of mineral ions inside the plant than in the surrounding soil. Therefore, plants cannot rely on mineral ions moving into the plant cells by diffusion.

Mineral ions must be transported against a concentration gradient. Active transport ensures that the required mineral ions are absorbed from the dilute solutions within the soil into the root hair cells. This process requires energy.