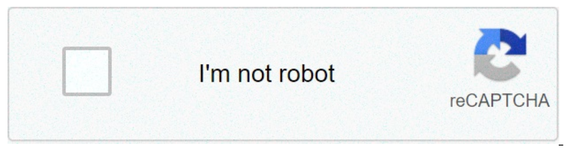

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What is difference between active and passive transport

Active Transport vs Passive Transport Every living being or thing is made up of cells. Bodies of plants and animals, from micro organisms, the smallest bacteria to the largest animal, are all made up of cells. The health of these cells is vital in their growth and development. To feed our cells with the nutrients and other substances that they need, our bodies have developed a transport system. These are classified into two, the active and the passive transport systems. Although these two transport systems have the same function, they work differently from each other and in order to understand more about their differences, it is important to learn how cells in our bodies work. We eat to nourish our bodies, to make it strong and healthy; and the food we take into our bodies are converted into substances for easy absorption in the cell membranes. The concentration of substances in our cells differs significantly from each other. The concentration of substances inside the cells is usually higher and more concentrated than those outside of it. It can also happen in reverse depending on the biological factors affecting them. Due to this difference in concentration gradients, the transport system needed varies. In cases wherein a cell wants to transport a certain substance towards itself, its protein and sodium pumps would require more energy in order to function and successfully transport the substance. Â This chemical energy source is called Adenosine Triphosphate (ATP), an important component in active transport. There are actually two types of active transport, the primary active transport which uses ATP and the secondary active transport which uses electrochemical gradients. In cases wherein a cell wants to transport a certain substance from inside itself to the outside, considering the fact that the substance being transported out is more concentrated than the substances outside, no energy is needed. This is because the transport will then follow along a favorable concentration gradient. This is called passive transport. Active transport therefore is the movement of a substance or substances against its concentration gradients. This usually happens when the cells need high concentrations of molecules like when glucose is transported to the intestines and when mineral ions are transported to the roots of plants. Passive transport is the movement of substances along the concentration gradient, that is, from a higher concentration gradient to a lower one. Â The movement is automatic and depends upon the pores or openings in the cell membrane and its lipid and protein content. Â Diffusion, facilitated diffusion, filtration and osmosis, are the four main kinds of passive transport. Summary: 1. Active transport needs energy and uses chemical energy sources, while passive transport does not because it follows the rule of normal diffusion or the normal process of the mixing of substances together. 2. Active transport is the transfer of substances from a lower concentration gradient to a higher one, while passive transport is the transfer of substances from a higher concentration gradient to a lower one. 3. Active transport involves going against the flow, while passive transport goes along it. Updated August 06, 2018 By Jennifer Sobek Both active and passive transport are the movement of molecules across the cell membrane, or concentration gradient, but there is a key distinction between active and passive transport. Active transport is the movement of molecules against the gradient, while passive transport is the molecular movement with the gradient. Two differences exist between active vs passive transport: energy usage and concentration gradient differences. The main difference between active and passive transport is the use of energy during cell transport of materials. Active transport uses energy and passive transport does not. In active transport, molecules are moving against a concentration gradient (or membrane), meaning the cell moves materials from an area of low concentration to an area of high concentration. The cell uses ATP (adenosine triphosphate) as its energy source to move substances in and out of the cell membranes. Passive transport, on the other hand, is the movement of molecules from higher to lower concentration. Because material is moving with the gradient, energy is not required. Active and passive transport also have a difference in the concentration gradient. The substances that gather on either side of the cell membrane are different. The cell’s contents have a higher concentration gradient than the outside of the cell. For example, should the cell desire to bring more substances toward itself, then it needs energy to do this. Therefore, active transport accomplishes its task by going against this gradient by using some of the cell’s energy. Diffusion is a type of passive transport in which molecules move from an area of high concentration to low concentration. Diffusion occurs along the concentration gradient, or the gradual difference in the concentration of substances between two areas. Facilitated diffusion is how molecules move down a concentration gradient with the help of proteins. When certain molecules can’t get past the membrane, the special proteins undergo a change to allow the molecule to pass through. Osmosis is the other type of passive transport where water is diffused through a membrane. Water always moves along the osmotic gradient, or the difference in the concentration of particles on either side of the membrane. If there is an equal amount of particles on both sides of the membrane, then the cell is isotonic and water will not move by osmosis. However, if the particle concentration is higher inside the cell, then the cell is hypertonic. If the cell has a lower particle concentration than the outside, then the cell is hypotonic. Active and passive transport are biological processes that move oxygen, water and nutrients into cells and remove waste products. Active transport requires chemical energy because it is the movement of biochemicals from areas of lower concentration to areas of higher concentration. On the other hand, passive trasport moves biochemicals from areas of high concentration to areas of low concentration; so it does not require energy. Active Transport versus Passive Transport comparison chart Active TransportPassive TransportDefinition Active Transport uses ATP to pump molecules AGAINST/UP the concentration gradient. Transport occurs from a low concentration of solute to high concentration of solute. Requires cellular energy. Movement of molecules DOWN the concentration gradient. It goes from high to low concentration, in order to maintain equilibrium in the cells. Does not require cellular energy. Types of Transport Endocytosis, cell membrane/sodium-potassium pump & exocytosis Diffusion, facilitated diffusion, and osmosis. Functions Transports molecules through the cell membrane against the concentration gradient so more of the substance is inside the cell (i.e. a nutrient) or outside the cell (i.e. a waste) than normal. Disrupts equilibrium established by diffusion. Maintains dynamic equilibrium of water, gases, nutrients, wastes, etc. between cells and extracellular fluid; allows for small nutrients and gases to enter/exit. No NET diffusion/osmosis after equilibrium is established. Types of Particles Transported proteins, ions, large cells, complex sugars. Anything soluble (meaning able to dissolve) in lipids, small monosaccharides, water, oxygen, carbon dioxide, sex hormones, etc. Examples phagocytosis, pinocytosis, sodium/potassium pump, secretion of a substance into the bloodstream (process is opposite of phagocytosis & pinocytosis) diffusion, osmosis, and facilitated diffusion. Importance In eukaryotic cells, amino acids, sugars and lipids need to enter the cell by protein pumps, which require active transport.These items either cannot diffuse or diffuse too slowly for survival. It maintains equilibrium in the cell. Wastes (carbon dioxide, water, etc.) diffuse out and are excreted; nutrients and oxygen diffuse in to be used by the cell. There are two types of active transport: primary and secondary. In primary active transport, specialized trans-membrane proteins recognize the presence of a substance that needs to be transported and serve as pumps, powered by the chemical energy ATP, to carry the desired biochemicals across. In secondary active transport, pore-forming proteins form channels in the cell membrane and force the biochemicals across using an electromagnetic gradient. Often, this energy is gained by simultaneously moving another substance down the concentration gradient. Example of primary active transport, where energy from hydrolysis of ATP is directly coupled to the movement of a specific substance across a membrane independent of any other species. There are four main types of passive transport: osmosis, diffusion, facilitated diffusion and filtration. Diffusion is the simple movement of particles through a permeable membrane down a concentration gradient (from a more concentrated solution to a less concentrated solution) until the two solutions are of equal concentration. Facilitated diffusion uses special transport proteins to achieve the same effect. Filtration is the movement of water and solute molecules down the concentration gradient, e.g. in the kidneys, and osmosis is the diffusion of water molecules across a selectively permeable membrane. None of these processes require energy. Three different mechanisms for passive transport in bilayer membranes. Left: ion channel (through a defined trajectory); center: ionophore/carrier (the transporter physical diffuses through with the ion); right: detergent (non-specific membrane disruption). Video explaining the differences Here's a good video explaining the process of active and passive transport: Examples Examples of active transport include a sodium pump, glucose selection in the intestines, and the uptake of mineral ions by plant roots. Passive transport occurs in the kidneys and the liver, and in the alveoli of the lungs when they exchange oxygen and carbon dioxide. References Wikipedia: Active Transport Wikipedia: Passive Transport Follow Share Cite Authors Share this comparison: If you read this far, you should follow us: "Active and Passive Transport." Diffen.com. Diffen LLC, n.d. Web. 3 Jul 2021. < > Active and passive transport are similar in that they both transport ions, using ion channels to move ions across the cell membrane. Active and passive transport are different in that active transportation requires energy, moves molecules against the concentration gradient, and may require an ion pump, while passive transport does not. DifferencesPassive transport doesn't require energy (ATP), active transport does require energy.Passive transport moves molecules WITH the concentration gradient (high to low), while active transport moves molecules AGAINST the concentration gradient (Low to High).SimilaritiesThey both allow the cell to maintain homeostasis by maintaining an equilibrium of subtances in and out of the cell.They both involve moving material across or through the plasma membrane. Approved by eNotes Editorial Team Similarities:Both involve ion movement. Both use ion channels to move ions across the cell membrane, in or out of the cell.Differences:Passive Transport (or Diffusion) moves ions from high concentration to low, using no metabolic energy. Active Transport moves ions from low concentration to high, using metabolic energy in the form of ATP. Active Transport uses an ion pump (or Sodium/Potassium pump) to move 3 sodium ions out of the cell and 2 potassium ions in to the cell through the energy of 1 ATP molecule. Approved by eNotes Editorial Team Start your 48-hour free trial and unlock all the summaries, Q&A, and analyses you need to get better grades now. 30,000+ book summaries 20% study tools discount Ad-free content PDF downloads 300,000+ answers 5-star customer support Start your 48-Hour Free Trial Already a member? Log in here. Are you a teacher? Sign up now eNotes.com will help you with any book or any question. Our summaries and analyses are written by experts, and your questions are answered by real teachers. Join eNotes ©2021 eNotes.com, Inc. All Rights Reserved Active and passive transport are systems that are meant for transporting molecules through the cell membrane. A cell membrane is a multi-task component which gives structure to the cell while protecting the cytosolic content from the outer environment. The movement of molecules from in and out of the cell is guided by the phospholipid bilayer, sustaining a delicate homeostasis state of the cell. The phospholipid bilayer is semi-permeable in nature, permitting certain molecules to freely pass the membrane through a concentration channel and certain molecules to use distinct structures in order to travel the membrane and others to travel the membrane by consuming cellular energy. The key difference between active and passive transport is that active transport forces molecules against the concentration gradient with help of ATP energy whereas passive transport let the molecules to pass across the membrane through a concentration channel, requiring no cellular energy.The main purpose of both transport systems is to transport molecules and ions across the cellular membrane. The external layer is made up of the phospholipid bilayers, which preserves the homeostasis condition of the cell and regulates the entry of the materials. Few particular proteins along with a semi-permeable membrane support the entrance of the molecules. In simple words, Active and passive transport are the two key biological process which plays a vital role in supplying nutrients, water, oxygen, and other vital molecules to cells and also by eliminating waste products. Both active and passive transport works for a similar cause, but with a different action.What is Active Transport?Active transport is the movement of molecules like water oxygen and other important molecules across the membrane against the concentration channel with the help of enzymes and usage of cellular energy. It is required for the gathering of molecules like amino acid, glucose, and ions inside the cell in high concentrations.Active transports are of two types:Primary Active Transport: In the primary active transport, for transporting the molecules it, uses chemical energy to push the molecule.Secondary Active transport: In the secondary active transport, proteins present in cell-membrane uses the electromagnetic gradient to move across the membrane.Primary Active TransportDuring primary active transport, the existence of molecules in the extracellular fluid that is necessary by the cell is recognized by the specific trans-membrane proteins on the cell membrane, which acts as pumps of transferring the molecules. These transmembrane proteins are run by ATP. The primary active transport is utmost obvious in the sodium/potassium pump (Na+/K+ ATPase), which regulate the resting potential of the cell. The energy-free by the hydrolysis of ATP is used to force three sodium ions out of the cell and two potassium ions into the cell. Here, sodium ions are shifted from a lower concentration of 11 mM to a higher concentration of 146 mM. Potassium ions are transferred from a 146 mM concentration inside the cell to a 4 mM concentration of the extracellular fluid. The proton/potassium pump (H+/K+ ATPase) is present in the lining of the stomach, preserving an acidic environment inside the stomach. Omeprazole is a type of proton/potassium pump inhibitor, reducing the acid reflux inside the stomach. Both oxidative phosphorylation and photophosphorylation of electron transport chain use the help of primary active transport to generate a reducing power as well.Secondary Active TransportSecondary active transport is governed by an electrochemical gradient. In here, channels are made by pore-forming proteins (Pore are the small hole). A simultaneous movement of another molecule against the concentration gradient can be seen with the secondary active transport. Therefore, the channel proteins which are involved in the secondary active transport can be recognized as co-transporters. There are two kinds of co-transporters: symporters and antiporters. Specific ion and the solute are shifted in opposite directions by antiporters. Calcium/Sodium exchanger, which permits the restoration of calcium ion concentration in the cardiomyocyte after the action potential, is the most common example for antiporters co-transporter. Ions are transferred through the concentration gradient while the solute is transferred against the concentration gradient by symporters. Here, both molecules are shifted in the same direction across the cell membrane. SGLT2 is a symporter co-transporter that transports glucose into the cell along with the sodium ions. The role of symporter and antiporter is shown in the image below.Importance of Active Transport: In eukaryotic cells, sugar, lipids, and amino acids want to enter the cell by protein pumps, which require active transport. These items either cannot diffuse or diffuse too slowly for existence. Active transport is essential for the entry of large, insoluble molecules into the cell.What is Passive Transport?Passive transport is the transport of molecules across the membrane through a concentration gradient without the use of cellular energy by the movement. It uses natural entropy to transport molecules from a higher concentration to a lower concentration until the concentration becomes balanced. Then, there will be no net transport of molecules at the equilibrium. Four main kinds of passive transport are found: osmosis, simple diffusion, facilitated diffusion, and filtration.OsmosisIn the process of osmosis, the water, and other molecules or substance are transport through the selectively permeable cell membrane. There are many aspects that affect this transport. One of the main factors is the cell having less negative water potential and other factors are the solute potential of a molecule and the pressure potential of a cell membrane.Simple DiffusionIn the process of simple diffusion, the transportation of molecule or solute across a permeable membrane this process is known as simple diffusion. Mainly non-polar molecules use simple diffusion, to maintain the better flow of molecules the distance should be less.Facilitated DiffusionFacilitated diffusion is the natural passive transportation of molecule or ions across the cell membrane through the specific-trans membrane of integral proteins. The molecules, which are big and insoluble needs a carrier molecule for their transportation through the plasma membrane. This process does not require any cellular energy or external energy.FiltrationThe cardiovascular system (CVS) in the human body produces a hydrostatic pressure, which helps water and other soluble biochemical molecules or substance to travel across the cell membrane. This process is named as filtration because the cell membrane permits only substances which are soluble and could freely pass through the membrane’s pore.Passive transport across the membrane is shown in the image below:During facilitated diffusion, different transport proteins are used to monitor the movement of polar molecules and big ions. These carrying proteins are glycoproteins and are specific to a certain protein. The GLUT4 is a glucose transporter that helps to transports glucose from the bloodstream into the cell. It is typically found in fat and skeletal muscles. Three sorts of transport proteins are engaged in facilitated diffusion: channel proteins, carrier protein, and aquaporins. Channel proteins make hydrophobic channels across the membrane, permitting the selected hydrophobic molecules to travel through the membrane. Certain channel proteins are opened at all times, and several are gated like ion channel proteins. Aquaporins permit water to cross the membrane swiftly. Carrier proteins alter their shape, transporting target molecules across the membrane.Importance of Passive TransportIt maintains balance in the cell. Wastes like carbon dioxide, water, etc. are diffuse out and excreted; nutrients and oxygen diffuse in to be used by the cell. Passive transport also allows the maintenance of a delicate homeostasis condition between the cytosol and extracellular fluid.Active TransportPassive TransportActive transport Requires cellular energy.Passive transport does not require cellular energy.It flows from lower concentrated areas to the higher concentrated areasIt flows from the higher concentrated areas to the lower concentrated areasActive transport involved in transporting all the molecules including complex sugars, proteins, large cells, ions, etc.Passive transport is usually involved in transporting the stuffs like soluble molecules which includes water, oxygen, carbon dioxide, monosaccharides, lipids, sex hormones.It involved in the transportation of different molecules in the cell.It is involved in maintaining the equilibrium level in the cell.Active transport is an energetic process.It is a physical process.It is extremely selective.It is partially non-selectiveIt is a quick process.It is a moderately slow process.It Occurs in one direction.It Occurs in bidirectional.It is Affected by temperature.It is not affected by temperature.It requires carrier proteins.It carrier proteins are not involvedThis procedure reduces or stops as the level of oxygen content is reduced.This procedure is not affected by the oxygen content.In active transport Metabolic inhibitors stop the active transport.In passive transport Metabolic inhibitors do not influence passive transport.Example: Endocytosis, exocytosis, cell membrane or the sodium-potassium pump, are different types of Active Transport.Example: Osmosis, diffusion, and the facilitated diffusion are different types of Passive TransportConclusionActive and passive transport are the two systems of transporting molecules across the cell membrane. Active transport pumps molecules or substance against a concentration gradient using cellular energy. In primary active transport, ATP is used in form of the energy. In secondary active transport, the electrochemical gradient is used to transport molecules across the membrane. Nutrients are concentrated into the cell with the help active transport. Passive diffusion also allows small, non-polar molecules or substance to travel across the membrane. It only happens through a concentration gradient. Therefore, no energy is utilized by the system. However, the key difference between active transport and passive transport is their mechanisms of transporting molecules or substance across the membrane.