Organelle Card Sort

Instructions for teachers:

1. Print out the cards
2. Group your students into groups of 3 (Note, groups can be larger if needed or smaller, but groups of 3 should work best)
3. Distribute cards to the groups. Students will match the name, function, and patient correctly.

Patient 1: Jackie

Jackie was a healthy baby when she was first born, but after 4 months, she had gained little weight. Her parents suspected something was seriously wrong. Her head became disproportionally large for her face. She experienced hair loss, and her skin became thin and wrinkled. Jackie's doctors told them that the condition was progeria which occurs when the genetic material doesn't have proper protection. This disease is incredibly rare. It affects only one in every 4-8 million births. It is caused by a mutation in a gene called LMNA, but is not hereditary. This disease causes premature aging. People with progeria have an average life expectancy of 14 years and usually die from heart disease related to their "aging" body.



Nuclear Envelope

Mitochondria

Cilia

Lysosome

Flagella

Golgi Bodies

Ribosomes

Cytoskeleton

Cell Membrane

Double-layered membrane that encloses and protects the contents of the nucleus during most of the cell's life cycle.



Patient 2: Fiona

Fiona is a freshmen in college. She is a good student who does her work on weekdays and likes to party on the weekends with her friends. A few months ago, Fiona developed a cough that wouldn't to go away and worsened over time. She has also had difficulty breathing over the past week or so. Her friends encouraged her to see the doctor, so she finally made an appointment. The doctor asked her whether or not she smoked cigarettes. Fiona responded that she started smoking cigarettes (about 2 per day) her freshman year of high school. The doctor decided it was necessary to take a biopsy of the cells that line the bronchus (passageway to the lungs). After several days,the biopsy report has come back along with a micrograph of the bronchial cells. Fiona's cigarette smoking has badly damaged these organelles which are responsible for mucous and dirt moving up and out of her respiratory system. What cell organelles have been damaged?



Small hair-like protuberances on the outside of eukaryotic cells. They are primarily responsible for locomotion, either of the cell itself or of fluids on the cell surface.

Patient 3: Zeke and Morgan

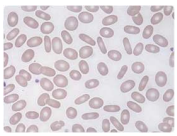
Zeke and Morgan have lived in Vermont most of their lives. They are both in their late 20's and recently married. They have been trying to have their first child for a number of months but Morgan has been unable to get pregnant. Zeke and Morgan decided to go to their family physician to see if there may be something wrong. The physician obtained a sample of Zeke's sperm cells and had it sent to a lab for microscopic analysis. After several days, the physician received a micrograph of the sperm cells and noted a structural defect in the organelle responsible for cell movement. Help determine the organelle responsible for Zeke and Morgan's inability to have a baby.



Long, whip-like filamentous protein
Structures found in bacteria, archaea, and eukaryotes, though they are most commonly found in bacteria. They are typically used to propel a cell through liquid.

Patient #4: Trevor

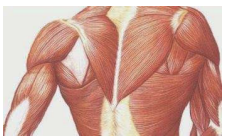
Trevor is a 20-year old male who has suffered from repeated episodes of hemolytic anemia. During these episodes, Trevor's red blood cell counts drop off dramatically due to rupturing of large numbers of cells and the inability of his bone marrow to replace the ruptured cells fast enough. When Trevor comes into a clinic for treatment, he is diagnosed initially with a hereditary deficiency in the enzyme glucose-6-phosphate dehydrogenase, but biochemical tests rule this out. An examination of his blood reveals that many of his red blood cells have an elliptical shape which leads to the diagnosis of hereditary elliptocytosis.Structures within the red blood cells alter the shape of the cell from the normal biconcave, disc shape to an elliptical shape, causing premature damage and rupture of the cells.



Provides support in a cell. It is a network of protein fibers supporting cell shape and anchoring organelles within the cell.

Patient #5: Rosanna

Rosanna is a 39-year old woman who comes to visit an urban New York City clinic. Despite rarely working out, she has a very muscular build, suggesting a hypertrophy (enlargement) of her muscles. She has suffered from bouts of extreme muscle stiffness, especially in her legs, and often brought on by cold weather throughout her life. Her father and paternal grandmother also had these symptoms. After genetic screening and biochemical tests, the doctors determine that she is suffering from myotonia congenita, a"channelopathy" involving a malfunction of chloride channels, which regulate the movement of chloride ions between the outside and inside of the cell.

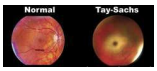


The border between the interior and exterior of a cell. It controls passage of various molecules—including sugars, amino acids, ions, and water—into and out of the cell.

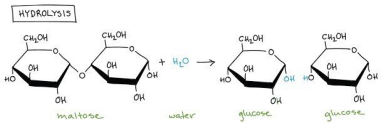


Patient #6: Harvey

Harvey was a perfectly happy baby with normal development until about six months of age. He had learned to roll over and sit up for a few seconds, but then was suddenly unable to do either of these things. He stopped turning and smiling at his mother's voice as he had before, and he did not seem as interested in his toys as he once was. Harvey's parents took him to the doctor because they were concerned about these changes. It took exams by several specialists to diagnose Harvey's Tay-Sachs disease. This disease has become very rare (fewer than ten cases appear each year) in large part due to screening programs in population groups known to have this inherited illness. Harvey's parents were not among those ethnic groups most as risk. Also, they had no idea that they both were carriers of the gene that causes this very rare illness. A neurologist verified her hypothesis of Tay-Sachs by looking into Harvey's eyes, where she saw the telltale cherry red spot indicating the illness. There was a build up fatty material on his nerve cells that his cells couldn't break down. His nervous system would continue to fail, and he would be paralyzed and unable to see or hear by the time he died before the age of four.



A vesicle that contains hydrolytic enzymes that can break down many kinds of biomolecules

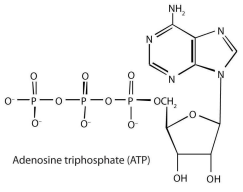


Patient #7: Kathy

Kathy is a fifteen-year-old soccer player at a nearby high school. She arrived in the ER at 6:07 p.m. She was experiencing extreme muscle weakness and loss of muscle coordination, particularly in her arms and legs! She told the doctors that for the past few days, she had been extra tired with little energy to do anything. The doctors decided to do some blood work which showed one particular abnormality. Kathy's glucose levels were rather high although she was an athlete and did mention she usually ate carbohydrates the night before a game. However, this explanation could be dismissed since she did not have a game in the past week. The doctors agreed that something else must be going on to cause such high glucose levels (i.e. something was not breaking down these sugar molecules). The doctors ordered for a muscle biopsy to be performed. The doctors viewed the tissue sample under the microscope, and saw that the muscle fibers were ragged red which contained mild accumulations of glycogen and decreased activity for the enzyme cytochrome c oxidase.

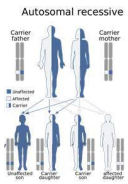


Rod-shaped organelles that can be considered the power generators of the cell, converting oxygen and nutrients into adenosine triphosphate (ATP)



Patient #8: Lucy and Jim

Lucy and Jim have been married for 5 years and have decided they would like to try to have a child. However, a rare genetic disorder runs in both or their families, so they decide to go to a genetic counselor to determine the chances that their future child will be affected. The disease achondrogenesis 1a affects the ability of proteins necessary for bone and cartilage development to be modified and packaged properly after leaving the endoplasmic reticulum. The results are devastating. Individuals with this disorder are often stillborn or die soon after birth from respiratory failure. Fortunately, after doing a genetic screening, the genetic counselor determined that while Jim is a carrier for this autosomal recessive disorder, Lucy is not. Therefore, if they do have a child it is unlikely that their child will be affected.

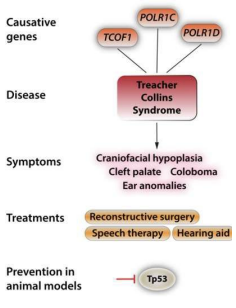


Gathers simple molecules and combines them to make molecules that are more complex. It then takes those big molecules, packages them in vesicles, and either stores them for later use or sends them out of the cell. It is also the organelle that builds lysosomes.

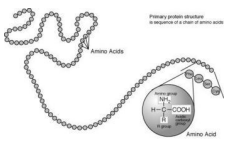


Patient #9: Vera

When Vera came home from her first day of kindergarten, she was very upset. She always knew she was different, but she had never been around this many new people who were staring and whispering. Vera was born with Treacher Collins syndrome. She has it because there is a mutation in her DNA that codes for the part of the cell responsible for assembling proteins. Because these cells are unable to make proteins, they undergo apoptosis (programmed cell death). Doctors don't know why but this cell death occurs only in the cells necessary for the development of facial bones and tissues. Even though Vera has had several plastic surgeries in her life to make her appearance less affected by the disease, she continues to have distinct facial characteristics, such as underdeveloped cheekbones, unusually formed ears, and a very small jaw and chin.



Link amino acids together in the order designated by the mRNA to create proteins, can be found floating free in the cytoplasm or attached the endoplasmic reticulum



Key:

Name o Organe e	P cture	Funct on	Pat ent/D sease
Nuclear Envelope		Double-layered membrane that encloses and protects the contents of the nucleus during most of the cell's lifecycle	Patient #1 Jackie Progeria
Cilia		Small hair-like protuberances on the outside of eukaryotic cells. They are primarily responsible for locomotion, either on the cell itself or of fluids on the cell surface	Patient #2 Fiona Cough from smoking/COPD
Flagella		Long, whip-like filamentous protein structures found in many bacteria, archaea, and eukaryotes, though they are typically used to propel a cell through liquid	Patient #3 Zeke and Morgan Infertility/MMF
Cytoskeleton		Provides support in a cell. It is a network of protein fibers supporting cell shape and anchoring organelles within the cell.	Patient #4 Trevor Hereditary Elliptocytosis
Plasma Membrane		The border between the interior and exterior of a cell. It controls passage of various molecules – including sugars, amino acids, ions, and water – into and out of the cell.	Patient #5 Rosanna Myotonia Congenita
Lysosome		A vesicle that contains hydrolytic enzymes that can break down many kinds of biomolecules	Patient #6 Harvey Tay-Sachs
Mitochondria		Rod-shaped organelles that can be considered the power generators of the cell, converting oxygen and nutrients into adenosine triphosphate (ATP)	Patient #7 Kathy Decreased Cytochrome C Oxidase/Myopathy
Golgi		Gathers simple molecules and combines them to make complex ones. It modifies proteins, sorts the resulting molecules, packages them in vesicles, and either stores them for later use or sends them out of the cell. It is also the organelle that builds the lysosomes.	Patient #8 Jim and Lucy Achondrogenesis 1a
Ribosomes		Link amino acids together in the order designated by the mRNA to create proteins, can be found floating free in the cytoplasm or attached to the endoplasmic reticulum.	Patient #9 Vera Treacher Collins