Name: _____ Peiord:_____-Date:_____

Ms. Randall A & P (compliments of biology corner)
Mitochondria, Aging, and Metabolism - CER

Aristotle believed that we possess a finite amount of some "vital substance." When that substance is consumed, we die. The idea was based on the principle that if you use something long enough, it will eventually wear out. Some philosophers even argued that each person had only a finite, predetermined number of breaths or heartbeats and that once they were used, you would die.
Biologists have always been curious about what causes aging and death, and solving that riddle may be the key to longer lifespans and better quality of life. Scientists proposed a new hypothesis based on this old idea of a "vital substance," that energy consumption limits longevity. In other words, an organism's **metabolic rate** determines its lifespan.

As we age, the mitochondria become larger and less numerous, and sometimes develop abnormalities with their structure. Experiments performed on mice shows that increased levels of mitochondrial mutations are related to a variety of age related changes, such as osteoporosis, hair loss, and weight reduction. The "Mitochondrial Theory of Aging" posits that the accumulation of damage to the DNA of a mitochondria leads to aging in humans and animals.

Mitochondria are unique in that they are the only organelle in animal cells that possess their own DNA, referred to as **mtDNA**, which is separate from the DNA in the cell nucleus. When a cell divides, the mitochondria divide independently, and new mitochondria are passed to the new cells. New daughter created through mitosis are identical to the original cell but may contain mitochondria that have new mutations. Every new cell division has the possibility of resulted in mutations within the cell's nucleus and within the mtDNA.

How are mitochondria and metabolic rate related?

Metabolic rate refers to the amount of energy that is used by an organism to maintain life processes. On a cellular level, the mitochondria use oxygen to convert food (glucose) to an energy storing molecule called adenosine triphosphate, or just ATP. This process is called **cellular respiration**. The ATP produced in this reaction is then used by the cell to maintain homeostasis and ensure that the cell and body function normally.

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1. What CLAIM is being made by the author? (This is the main point of the reading, also called a thesis and usually found in the first paragraph of an essay).

2. What EVIDENCE is provided to support the author's claim? Write 1-2 sentences that summarize how the other supports her position.

3. Provide REASONING for the claim by connecting the evidence with the CLAIM being made or connecting it to other scientific principles. .

Resources:

Bratic, I. & Trifunovic, A. Mitochondrial energy metabolism and ageing. Biochimica et Biophysica Acta (BBA) - Bioenergetics 1797, 961-967 (2010). *http://www.sciencedirect.com/science/article/pii/S0005272810000058*

Wei YH, e. Mitochondrial theory of aging matures--roles of mtDNA mutation and oxidative stress in human aging. - PubMed - NCBI. Ncbi.nlm.nih.gov (2018). at <https://www.ncbi.nlm.nih.gov/pubmed/11499335>