BIOL 293

Reflection Assignment # 2

1) ***"Novel discovery reveals protein involved in Parkinson's disease also drives skin cancer." Different behaviors of same key protein in neurons and skin cells*** –

   Provide a paragraph detailing the name of the protein and its function, identification, mechanism of action, and what it means for both Parkinson's disease and skin cancer research and potential therapies. (*Cite any sources used to answer question*)

The protein that is being described is called alpha-synuclein. Alpha-synuclein, also referred to as αSyn, is a protein that primarily functions in the brain, where it participates in sensing and stabilizing curved membranes, the release of neurotransmitters, and the movement of synaptic vesicles, among other roles. αSyn is primarily associated with Parkinson's disease, where it aggregates into cytoplasmic inclusions called Lewy Bodies in the neurons (1). It is known to misfold and aggregate in the cytoplasm, which disrupts various neuron functions and leads to cell death and neurodegeneration. However, αSyn has also been found to be present in melanoma cells, where it displays a contrasting behavior with opposite results. Here, αSyn accumulates in the nucleolus, a substructure of the nucleus that is responsible for DNA repair, and "facilitate[s] DNA double-strand break (DSB) repair, promoting genomic stability" (1). The stability from increased repair ability enabled by αSyn allows for melanoma cell division to continue at much higher rates, which leads to tumor growth. This discovery provides a potential clue to the reasoning behind the well-documented link between Parkinson's and increased melanoma risk. The opposing nature of αSyn's effect on Parkinson's and melanoma could lead to the development of treatments and therapies that take advantage of those conflicting effects. For example, a Parkinson's treatment that focuses on preventing the aggregation of αSyn and prioritizing its repair-boosting capabilities could prevent neuron death and decrease neurodegeneration.

1. Moriah R. Arnold *et al.*, Alpha-synuclein regulates nucleolar DNA double-strand break repair in melanoma. *Sci. Adv.* **11**, eadq2519(2025). DOI:10.1126/sciadv.adq2519

2) **"CAR T-cell therapy"** – provide a paragraph detailing where, how, whom, when and what this is. (*Cite any sources used to answer question*)

Chimeric Antigen Receptor T-cell therapy is a form of cell-based gene therapy that utilizes modified examples of a patient's T-cells to find and destroy cancer cells (2). T-cells are taken from the patient's blood and then modified through the addition of a gene that expresses Chimeric Antigen Receptors, which bind to specific antigens on the surface of a cancer cell. Since different types of cancers have different antigens, receptors must be made for each type of antigen. Once the CAR T-cells are separated and multiplied, they are infused back into the patient along with mild chemotherapy, and the CAR T-cells bind to cancerous cells, destroying them and multiplying to continue the process. This treatment was developed by Carl H. June and his team at the University of Pennsylvania in the late 200s, and was first approved by the FDA

for use with patients of certain blood cancers in 2017. CAR T-cell therapy is particularly effective as a last-resort treatment against types of leukemia, lymphoma, and multiple myeloma, but studies are being conducted to assess its viability as a treatment for many other types of cancer (2).

2) American Cancer Society. (n.d.). *Car T-cell therapy and its side effects*. American Cancer Society.https://www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy/car-t-cell1.html#:~:text=Chimeric%20antigen%20receptor%20(CAR)%20T,find%20and%20destroy%20cancer%20cells.

3) End-of-term Reflection:

Describe at least ONE thing IN DETAIL that you learned in this class that helped you make a connection to other coursework (especially in your desired field-of-interest/future profession within biology/biochemistry). Be specific; this should (hopefully) show you why Cell Biology is relevant to your studies and one way that it helped you grow as a student.

One thing that I learned that was particularly memorable was during a class discussion on Henrietta Lacks and the ethical debate surrounding HeLa cells. We debated whether the moral concerns surrounding Thermo-Fisher's exploitation of a young, disadvantaged woman and subsequent monetization of her biological data and remains outweighed the incredible benefits that HeLa cells had on medical research and our understanding of cervical cancer. In my freshman year at ODU, I took an online Bioethics course. The class was a 3-hour-long Zoom lecture, and largely eschewed class debates and open discussion in favor of our professor reading off a PowerPoint and giving their views on various topics. This was disappointing to me because bioethical debates have always been a topic that I enjoy reading and learning about, and I had hoped that the class would be an opportunity to discuss such topics that are often ignored in traditional lecture-based science courses. That in-class discussion reminded me of what I wished the Bioethics course was, and helped me recalibrate my process for learning and analyzing to include consideration of the ethical implications of the decisions of past scientists, rather than just their discoveries.