ANTIFREEZE PROTEINS OF ORGANISMS IN THE ARCTIC

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1. Introduction

A huge problem that someone may encounter in the poles is the cold that in the winter sometimes surpasses -50^{o}C. The organisms in the Arctic overcome the cold climate, by using specific proteins, called Antifreeze Proteins. The purpose of the research is to explain the methods those polypeptides use and how humanity can take advantage of those processes.

2. Research Methods

This research has been conducted by analyzing a series of articles and papers in the area of Environmental Stress, Arctic Ecosystems and Biomolecular Structure.

3. Results

It turns out that the arctic organisms withstand the cold thanks to a class of polypeptides called Antifreeze Proteins (AFPs) or Thermal Hysteresis Proteins, that depress the freezing point while not affecting the melting point, making them freeze avoidant or tolerant. Antifreeze proteins (AFPs) inhibit the ice crystallization and minimize ice crystal growth to manageable sizes, inside the cytoplasm of the organisms, not allowing them to grow and freeze [1]. They are able to do that, because of threonine, an amino acid that binds with the water molecules [2].

AFPs can also lower the freezing point of the organisms, a process called thermal hysteresis. The thermal hysteresis proteins also differ, depending on the kind of organism. For example, insect antifreeze proteins are far more effective than those of fish [3]. They also have different structures, as you can see in the images below.

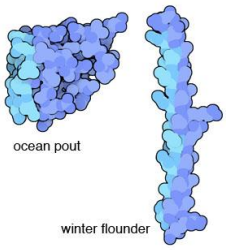

Image 1- Different antifreeze proteins 1 [2]

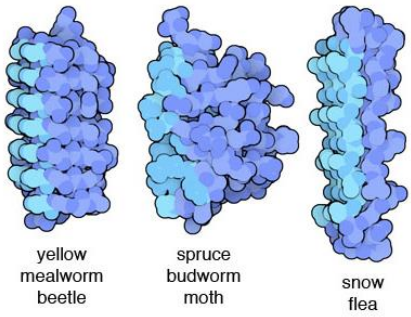

Image 2- Different antifreeze proteins 2 [2]

Antifreeze proteins are also used in ice, since the melting and refreezing of the product, when the temperature changes, creates crystals, which ruin its texture [4].
They are also a great help for the research of cryopreservation of organ transplants [5].

4. Conclusion

To sum up, antifreeze proteins are essential for the survival of plants, animals and microbes in very cold climates. Ice inhabitation and thermal hysteresis can be useful for our modern society and if researched further we can expect great breakthroughs in the world of science. The results of that paper will be presented with the addition of a short stop-motion animation video.

5. References

[1]https://bigpictureeducation.com/exploring-antifreeze-proteins

[2]https://www.newscientist.com/article/dn13178-edible-antifreeze-promises-perfect-ice-cream/