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Mass preparation of fish antifreeze protein

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At the moment water is frozen, the huge number of single ice crystals are generated in the water to be grown and sticked together to create a multicrystalline state, which is the general ice in our daily use. Antifreeze protein (AFP) has an ability to bind to the single ice crystal, which disturbs the general ice formation, as the AFP-coated ice crystals cannot form the multicrystalline state. This mechanism is thought to solve some technical problems regarding the frozen storage of water-containing materials, such as foods and tissues. The fish-derived AFP can also bind to the lipid bilayer to improve the cells viability. This mechanism will also be applied to "cell-pausing", a short-term (one-two weeks) cell preservation method performed near 0° C for use in cell therapies. Hence, we focus on the fish AFP that possesses a wide applicability from industry to medicine, which requires a development of easy method to prepare the massive amount of it. Especially, we need to have the native powder of fish AFP, since it is a mixture of 8-13 AFP molecules (the AFP isoforms) that function together much more effectively than any single isoform. It is theoretically possible to prepare each AFP isoform with the gene technology to make their mixture. However, the yield of the recombinant protein highly depends on each isoform sequence, and the peptide amount in the native mixture is different between the AFP isoforms, implying that we need to know the optimal blending ratio of the isoforms. In the conference, I will introduce our procedure to obtain a large amount of the native fish AFP, and their ability of thermal hysteresis, ice recrystallization inhibition, and the cell preservation under hypothermic (+4°C) temperatures.

Biography

Sakae Tsuda has completed his PhD at the Hokkaido University (Japan) and Post-doctoral studies at the University of Alberta (Canada). His research background is Biomolecular NMR, which gave him the skills of Biochemistry, Biophysics and Structural Biology. He is a Chief Senior Researcher of AIST and also a Professor of HU, who published more than 100 papers. His current research target is the antifreeze proteins, which have originally been explored from Japanese organisms in the last 15 years.

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