
Cat# **SP-88497-0**

Description: Antifreeze Polypeptide (AFP) (HPLC-6), Winter Flounder (AA: Asp-Thr-Ala-Ser-Asp-Ala-Ala-Ala-Ala-Ala-Ala-Leu-Thr-Ala-Ala-Asn-Ala-Lys-Ala-Ala-Ala-Glu-Leu-Thr-Ala-Ala-Asn-Ala-Ala-Ala-Ala-Ala-Ala-Thr-Ala-Arg) (MW: 3242.53)

Size: 1 mg

Purity: >95%

Store: Desiccated at -20oC.

Antifreeze proteins (AFPs) or ice structuring proteins (ISPs) refer to a class of polypeptides produced by certain vertebrates, plants, fungi and bacteria that permit their survival in subzero environments. These proteins bind to small ice crystals and inhibit their growth, which if left uncontrolled would be fatal to cells. The major characteristics of AFP activity are thermal hysteresis and modification of ice crystal growth morphology. AFPs inhibit thermodynamically favorable growth of ice crystals by creating a heterogeneous layer between the solid ice and liquid water. The remarkable diversity and distribution of AFPs suggest the different types evolved recently in response to sea level glaciation occurring 1-2 million years ago. Different types of AFPs may interact with different surfaces. There are five types of AFPs that differ in their primary sequence of amino acids, when each folds into a functioning protein; they share similarities in their three-dimensional or tertiary structure that facilitates the same interactions with ice.

The winter flounder (*Pseudopleuronectes americanus*) produces short, monomeric α -helical antifreeze proteins (type I AFP), which adsorb to and inhibit the growth of ice crystals. The winter flounder is adapted to the harsh environment of the inshore North Atlantic, where it can live in ice-laden water at temperatures that potentially go as low as $-1.9\text{ }^{\circ}\text{C}$, the freezing point of seawater.

Type I AFPs are the best studied AFP type and have been isolated from shorthorn sculpin, winter flounder, and other organisms. The winter flounder AFP HPLC6 has 37 amino acids arranged in three 11-residue repeats. It is approximately 32 kD (two 17 kD dimeric molecules). The protein was isolated from the blood plasma of winter flounder. It is considerably better at depressing freezing temperature than most fish AFPs. HPLC6 is the major component of liver-type antifreeze polypeptides (AFPs) from the winter flounder. The antifreeze mechanism of the type-I AFP molecule was shown to be due to the binding to an ice nucleation structure in a zipper-like fashion through hydrogen bonding of the hydroxyl groups of its four Thr residues to the oxygen molecules in ice lattice, subsequently stopping or retarding the growth of ice pyramidal planes so as to depress the freeze point.

Reference: Protein Expr Purif. (2000)(2):175-81. Fletcher GL (2001). Annu. Rev. Physiol. 63: 359–90. Protein Sci.; 13(6): 1524–1537.

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