

## **Antifreeze proteins: characteristics and potential applications**

### **ABSTRACT**

The freezing of water is usually fatal to most organisms because it causes extensive damage to cell membranes due to the formation of ice crystals. However, several structurally different classes of antifreeze proteins (AFPs) found in fish, insects, plants, and microorganisms, including bacteria, yeast, and fungi, have been found to be capable of modifying the growth of ice crystals by thermal hysteresis and ice recrystallization inhibition. This unique property could potentially be applied to medicine and the industry as it is useful when low-temperature storage is required and ice crystallization must be avoided. However, the application of AFPs today is not economically viable due to the complexity of the large proteins, the laborious procedures required, and the low yields obtained. A wide range of peptides mimicking their parent proteins were recently successfully designed and chemically synthesized. The developed approaches present new opportunities to understand the structure–function relationship of small-structured peptides with antifreeze properties. This mini-review highlights the diversity, classification, and properties of AFPs. The emerging applications of short mimetic peptides of AFPs and their potential application are also described.

**Keyword:** Antifreeze peptide; Antifreeze protein; Ice recrystallization inhibition; Thermal hysteresis