

The Creation of Antifreeze Polyamino Acid with the Cryoprotective Function

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Dimethyl sulfoxide (DMSO) was used for several decades as the most efficient cryoprotective agent (CPA) for many types of cells and tissues in spite of its cytotoxicity and effects on differentiation. Here we report that polyampholytes with an appropriate ratio of amino and carboxyl groups show higher cryopreservation efficiency and lower cytotoxicity than DMSO. Culture medium solutions of ϵ -poly-L-lysine (PLL) with more than 50 mol% of amino groups carboxylated showed excellent post-thaw survival efficiency of 95% murine L929 cells, and rat mesenchymal stem cells fully retained the potential for differentiation without serum. We also found that carboxylated PLLs showed antifreeze protein properties such as ice recrystallization inhibition, which may contribute to successful cryopreservation by membrane protection. Thus, these polyampholytes can replace DMSO as CPAs in various preserving functions and will also be useful in studies elucidating the mechanisms of cryopreservation.

Keywords: Cryopreservation, Polyampholyte, Antifreeze protein

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