Preservation of Blood Components at Cryogenic Temperatures[1]

Dr. Arthur W. Rowe

New York Blood Center, New York, N. Y.

Abstract

The application of cryogenic technology to medical problems has resulted in the development of methods for freeze-preserving two of the cellular components of blood. Cryopreservation of different cell types, e.g., nucleated leukocytes and non-nucleated erythrocytes, cannot be achieved successfully unless techniques designed to prevent cellular damage induced by freezing are used. Unprotected cells can, depending upon the rate of freezing, be damaged in a variety of ways, principally through dehydration, solute effects, and ice-crystal formation. When cryoprotective compounds, such as glycerol, DMSO, etc. are used and the cooling rate is controlled, cell damage can be circumvented, however. A slow cooling rate with an intracellular additive has been found better for preserving nucleated white blood cells, whereas very rapid freezing techniques have in general proven more successful for preserving non-nucleated red blood cells for transfusion. Ultra-rapid freezing of blood in the form of droplets is a useful means of preserving red cells for blood-group studies. Storage and prolonged preservation of biological specimens have been more successful at cryogenic temperatures (e.g., −196 deg C) than at higher storage temperatures (e.g., −85 deg C).

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