Can Caspase 3 and Caspase 3/7 Inhibitors Improve the Quality and Longevity of Corneas Being Stored for Transplant?

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Corneas are among the most frequently transplanted tissues in the United States, with some 46,000 surgeries performed annually. Unfortunately, they can typically be stored for only 7-10 days before they are no longer viable, resulting in the deterioration of many corneas prior to transplant. Enhancing the longevity and quality of tissue can substantially enhance the quality of life for many potential cornea recipients. Caspase 3 and caspase 3/7 inhibitors have been shown to limit the activity of the caspase proteins, which facilitate corneal endothelial cell apoptosis, potentially offering the ability to enhance the quality and longevity of corneal tissue storage for transplant. Herein, caspase 3 and caspase 3/7 inhibitors were investigated to explore whether they can improve the quality and longevity of corneal tissue being stored for transplant. 37 human corneas were divided into control and experimental groups. Experimental groups were treated with either caspase 3 or caspase 3/7 inhibitor solutions and subsequently observed for up to a 24 day period via specular microscopy. Both inhibitors were observed to significantly enhance storage longevity and improve cell retention. Caspase 3 improved cell retention by 29.84% compared to the control, while caspase 3/7 improved cell retention by 13.34%, 43.26%, and 9.46%. The caspase 3/7 inhibitor successfully extended the storage time beyond the expected 7-10 day period and substantially reduced apoptosis up to 24 days post mortem. These observations suggest that the caspase 3 and caspase 3/7 inhibitors offer exciting potential to enhance the quality and longevity of corneas being stored for transplant.

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