

MedEd Mondays



IN RELENTLESS PURSUIT OF HEALING

Placental Allograft Preservation Methods

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Placental tissues, such as amniotic membrane, have been used in the treatment of wounds since the early 1900s. Clinical studies have shown the use of fresh amniotic membrane in the treatment of a variety of wounds such as diabetic foot ulcers (DFUs), venous leg ulcers (VLUs), and burns¹. Preclinical work has shown that fresh amniotic membrane contains growth factors, cytokines, and retains part of the extracellular matrix (ECM)¹. Numerous methods could be used to preserve and store placental tissue allografts while maintaining their beneficial properties. Some methods are hypothermic storage, cryopreservation, dehydration, and lyophilization. These techniques all have their own benefits and advantages depending on the user's needs and requirements.

Some pros and cons of hypothermic storage are that there is no specialized equipment needed, other than a refrigerator, but the product will have a shorter shelf life. Hypothermically stored amniotic membrane (HSAM) is a fresh amniotic membrane allograft that typically maintains a temperature of 1-10°C. The HSAM retains the amniotic membrane's native three-dimensional structure, including the spongy layer in most cases². When compared to unprocessed fresh amniotic membrane, HSAM has been shown to be similar structurally and in growth factor content¹.

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Unlike hypothermic storage, cryopreservation of the tissue allows for a longer shelf life but also requires an ultra-low freezer to reach cryo temperatures. Cryopreservation and tissue storage at ultra-low temperatures can date back to the early 1800s when scientists utilized this method for storing red blood cells³. Later research determined that, with the aid of cryoprotectants or additives to protect the sample during the freezing process, allows for minimal disruption to the cell membranes and tissue structures³. There are a few advantages to using this technique as a storage method, especially for placental tissue allografts. Properties such as tissue thickness, membrane components, and an extended shelf life are maintained when utilizing cryopreservation for allograft storage⁴.

Dehydrated and Lyopreserved tissue do not require any storage equipment and can be kept at ambient temperatures. These processes both utilize the removal of water but achieve this in different ways. Dehydration of placental tissues utilizes the removal of water by heated airflow to preserve the tissue. This preservation method helps maintain the structure and components of the tissue, while allowing for easy storage⁵. Another advantage of dehydrated tissue is the ability to undergo terminal sterilization. Terminal sterilization allows for a reduced risk of microbial growth and infectious disease transmission from the donor tissue⁵. Lyophilization or freeze drying also utilizes the removal of water; however, this process is achieved by sublimation at cold temperatures under vacuum rather than heat. Lyopreservation maintains tissue structure and functional properties, similar to cryopreservation, while eliminating the need for ultra-low temperature storage, and can also be terminally sterilized⁶.

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IN R E L E N T L E S S P U R S U I T O F H E A L I N G

Tissue preservation is an important step when processing placental allografts. The methods and techniques described all achieve the goal of preserving the allograft's beneficial properties, just in different steps. Each has advantages and disadvantages depending on user needs and requirements.

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MKTG-027

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