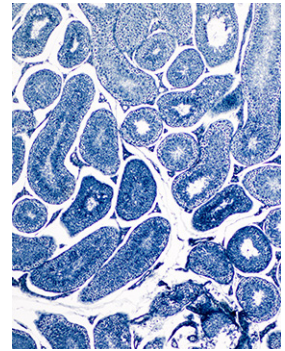
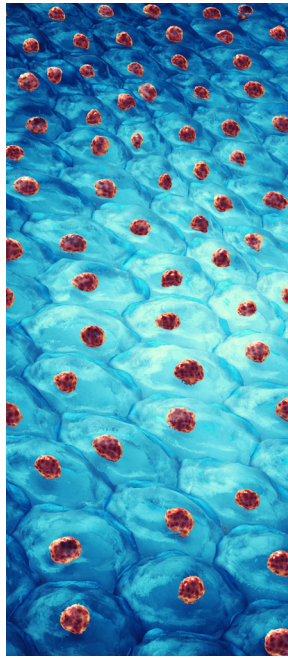


Freeze Drying Tissue

Preserving and Storing Life-Saving Treatments



Epic™ Freeze Dryer Tissue Applications

rev 1/19/2023

MILLROCK
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Preserving and Storing Life-Saving Treatments

Tissue and collagen bio-scaffolds have become a unique yet vital part of various medical specialties, especially emergency medicine. The ever-evolving field of wound care in particular relies on these scaffolds to change and save lives. Once this invaluable raw material is harvested from bovine, porcine, shellfish, human or fish sources, it must be stabilized for preservation, transport, and long-term storage.

That's where freeze drying is crucial – it accomplishes all this without any degradation to the tissue, honoring the donation and providing life-saving treatments.

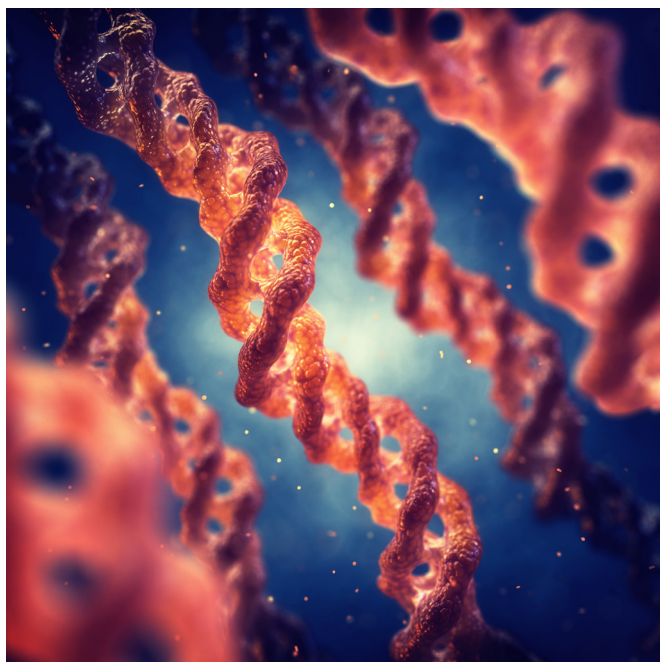
Common Challenges of Freeze Drying Tissue

Tissue freeze drying presents unique challenges due to the broad variation in the content and form of materials as well as the various containers used to handle and store the product.

To develop a consistent and optimized freeze drying process for tissues, the relationship between the application, the equipment, and three steps of freeze drying needs to be fully considered.

Common challenges in choosing the right freeze dryer for tissue:

1. **The Tissue Container** (shelf contact vs. non-shelf contact)
2. **Condensing Rate and Recovery**
3. **Shelf Size/Spacing**



The Tissue Container

Select a freeze dryer designed to accommodate the variety of containers used for tissue freeze drying. Tissues may be placed in bags, trays, petri dishes, tubes, or other containers for handling during freeze drying, presenting challenges to the process of freeze drying that are best addressed in the overall design of the lyophilizer.

While various materials can be used, a container of stainless-steel construction allows for direct and uniform contact with the lyophilizer shelf. Plastic trays can make heat transfer from the lyophilizer shelf more difficult, resulting in more complex considerations for optimal freezing and sublimation. Work in partnership with your freeze dryer manufacturer to understand the heat transfer dynamics as they relate to your container material.

Condensing Rate and Recovery

Freeze drying methods for collagen and tissue vary by application resulting in numerous freeze drying equipment considerations. Collagen products may require units with higher condensing rates due to its high-water content, whereas other tissue based freeze drying typically involves larger shelf surface area considerations.

The combined surface area and moisture for many tissue applications can produce a “flash off” of vapor that can overwhelm typical sized condensers. Other bulk tissue applications have slower drying times, requiring more consistent, increased condensing rates.

When sourcing a freeze dryer for your tissue application, look for one with a larger condenser and higher condensing rate. For example, the Epic Freeze Dryer has a 50L condenser and condensing rate of 40L in 24 hours with a highly robust refrigeration system and exposed coil condenser. A freeze dryer in this category can efficiently handle tissue applications with varying moisture content and large surface areas.

KEY FEATURES FOR TISSUE FREEZE DRYING	EPIC FREEZE DRYER	THE COMPETITION
Shelf Area (Up to 33 sf)	✓	✗
Robust Refrigeration System	✓	✗
50L condenser (40L/24hr condensing rate)	✓	✗
H2O2 integration	✓	✗
+105C Shelf Temp Option	✓	✗

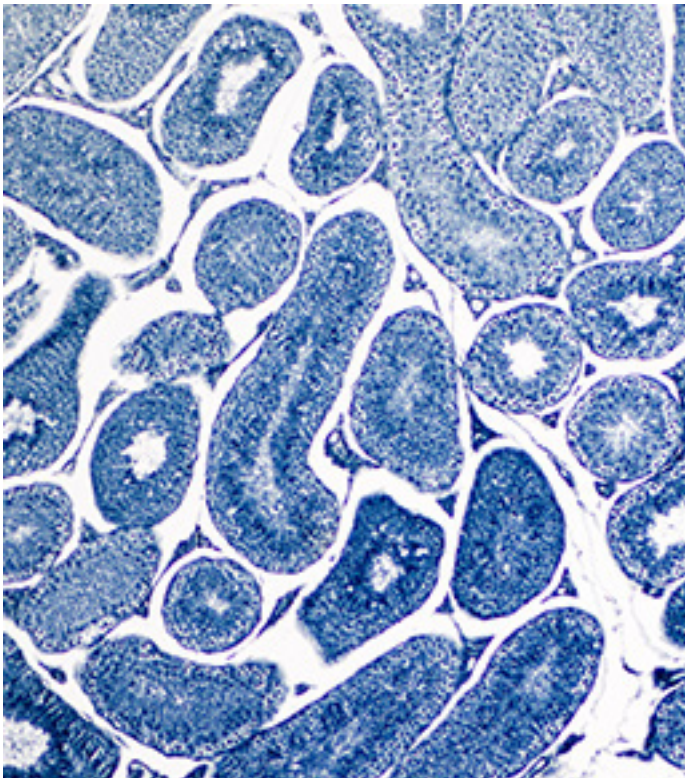
Shelf Size/Spacing

When choosing a freeze dryer, consider one designed to accommodate the larger footprint of tissue grafts, molds and other materials that may require additional space.

Applications, where materials are very thin may work best in a chamber with close shelves



Applications for large containers or thicker material require wider shelf space distances



Customization Options

Instrumentation: Vacuum Sensing, Pirani or Capacitance Manometer

The short answer regarding the type of instrumentation to use is to include the same vacuum sensor in production as was used in protocol development. Typically, in pharmaceutical applications, a Capacitance Manometer is required as it gives the absolute vacuum reading in contrast to Pirani, which is affected by moisture content and changes during the process.

This is not to say that the Capacitance Manometer is necessary for Collagen or Tissue Banking applications. A Capacitance Manometer is not required for many tissue applications and a discussion about your unique application will dictate its requirement.

Caster Mounted or Wall Mounted

Depending on your need, freeze dryers are typically available in both free-standing caster mounted freeze dryers and wall mounted for clean rooms. Other custom mounting options are also available.

Sterilization/Decontamination Options

Tissue Banking often uses a post-process method for sterilization, such as gamma radiation, thereby eliminating the need to sterilize the freeze dryer prior to each run. If your product requires the lyophilizer to be sterilized before processing, the equipment can be designed to accept a vaporized hydrogen peroxide generator. When hydrogen peroxide is used, the chamber must have a stainless-steel door. SIP (Steam In Place) systems are also available.



Additional Resources

For a more in depth look at tissue freeze drying please click here to read "Considerations When Freeze Drying Tissue".

Click here to learn more about our Epic Small Production Freeze Dryer for Tissue Processing.

Experience the Millrock Difference

When you purchase a Millrock product, you get more than a freeze dryer. You get a long-term partner delivering industry-changing innovations, high-performing products, and on-call expert support.

Contact us to learn more about how Millrock Technology can partner with your business to provide the highest-performance, advanced freeze drying services.

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