CPMC's Liver Disease and Transplantation Program Adopts ThawSTAR® Automated Cell Thawing System for Use in Biorepository Sample Quality Control and Cellular Immunology Research

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Introduction

California Pacific Medical Center (CPMC), an affiliate of Sutter Health, is one of the largest private academic medical centers in California, providing health education and a wide variety of health related services to the public. CPMC's goal is to deliver "bench to bedside" health solutions, and as part of this ambition, their physicians and researchers are active in both discovery research and the transformation of that research into clinical studies and personalized medicine. Over 200 clinical trials have been initiated through CPMC's Research Institute, in areas ranging from cancer and liver disease to organ transplant and longevity research.

CPMC is located in San Francisco, where Ann Erickson, a Senior Research Associate at the center, does her work. Ms. Erickson's role there is two-fold; she performs quality control analysis on cells generated for the CPMC's Liver Immunology Biorepository, as well as carrying out translational research on adaptive T-cell response in individuals with liver disease. Since much of her work involves cryopreserving and thawing cells on a weekly basis, Ms. Erickson discusses her experience regarding the introduction of BioLife Solutions' ThawSTAR® automated Cell Thawing System at CPMC.

Why is Cell Thawing so Important?

For the work Ms. Erickson carries out, cell thawing is of upmost priority. The center must ensure that they have a product that is consistently high quality- something people want to be using. Ms. Erickson will typically perform downstream functional assays using EliSpot, flow cytometry, and cell sorting. Rigorous quality control experiments on select biorepository-banked PBMCs, testing for recovery, viability and function after thawing are also routinely performed. These experiments help to determine cell viability at the point of thaw and at 24 hours, but also test cell function, such as the ability to activate in response to various antigens. Ms. Erickson's group thaw approx. 30-75 vials per month, depending on experimental and batch testing needs.

The PBMC's and other cell types the liver immunology group generates for the biorepository are not only used in-house; they are also regularly distributed to outside investigators. Since thawing impacts the performance of the cells in question, cell thawing methods must consistently provide cells capable of generating reproducible, meaningful data. Ms. Erickson's lab will be incorporating the ThawSTAR® thawing method as a cell handling standard operating procedure for cells sent to outside investigators.

"Often investigators ask how the cells are prepared and thawed. By including the ThawSTAR® method in our SOPs, we inform them of the best way to handle the cells to ensure maximal recovery."

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Evaluating the ThawSTAR® Automated Cell Thawing System

Prior to adopting the ThawSTAR® system, cell thawing was done using a traditional warm water bath. Ms. Erickson explains that this wasn't always efficient. The water bath naturally needed to be used outside of the hood, and introduced an element of unpredictability into the thawing process, because it was difficult to tell exactly when a vial was thawed. The lab was eager to integrate a more reliable, efficient thaw method into their process and elected to adopt the ThawSTAR system.

Ms. Erickson evaluated the ThawSTAR® system, initially using confirmation vials as a check on how the system would run, then moving on to control cell samples. In a side-by-side comparison to the water bath, the ThawSTAR system produced cell viability and performance data that was equivalent to or better than the water bath, but with reduced variation and an improved workflow. Ms. Erickson found the system extremely user-friendly, and was pleased with the evaluation results, which exceeded her initial expectations.

"The ThawSTAR® system is portable, and can easily fit inside the tissue culture hood. It streamlined our workflow, and removed much of the anxiety felt about thawing irreplaceable samples. When you have a sample that has been frozen for 10 or more years, or is perhaps the only remaining vial of a certain disease timepoint; that creates a lot of pressure. Using the ThawSTAR system took that concern away."

Ms. Erickson was happy with the workflow the ThawSTAR® system created; she finds thawing 1 vial at a time to be preferable to other methods, because it becomes easy to control the timing of the whole thawing process.

When they are ready to be used, required vials are removed from storage in the liquid nitrogen facility, then placed either in a -80°C freezer, or, in the case of smaller batches, directly into the group's CFT Transporter, to ensure cells are maintained at a safe temperature prior to thawing. Frequently a small batch of 4-5 vials are thawed one at a time. The entire thawing process takes place in the tissue culture hood. Once a vial is thawed, the next vial is placed into the ThawSTAR system. As the second vial thaws, the first vial can be processed: vial contents are diluted with medium, transferred to a centrifuge tube, and spun down. The ThawSTAR® system essentially governs the timing of the whole process. Because detection of the solid-to-liquid phase change and thawing endpoint is automatic, there is no distraction, and timing is consistent from vial to vial.

"I am pleased with the ThawSTAR® system, because it lends a consistency to the cell thawing process that in turn results in cells with excellent viability and functionality. It helps generates reproducible, meaningful data that directly affects the lives of our patient population."

Downstream Impact

Delivering high quality, reproducible data is enormously important downstream, where patient's lives can rely on the accuracy of translational and clinical research results. Ms. Erickson is currently collecting cellular immunology data related to early stage acute hepatitis C, a viral disease that attacks the liver, leading to cirrhosis. During this stage of the disease, the hepatitis C virus (HCV) is engaged by various types of lymphocytes, including T cells,[1] which can kill virus-infected cells, releasing molecular messages that further impact the immune response. Ms. Erickson is comparing T-cell receptors found in routinely cryopreserved and banked peripheral blood mononuclear cells (PBMCs) collected from patients with chronic HCV infections to those in individuals who have resolved their HCV infections. A more thorough understanding of the range of antiviral immune responses and how they are regulated may lead to the improvement of post-transplant outcomes for HCV patients in the United States and other countries, including Egypt, where HCV is endemic.

Reference

1 Cooper, S., Erickson, A. L., Adams, E. J., Kansopon, J., Weiner, A. J., Chien, D. Y., Houghton, M., Parham, P., and Walker, C. M. (1999). Analysis of a Successful Immune Response against Hepatitis C Virus. Immunity, 10, 439-449.

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