

Tolerance of Nunc Cell Factory systems to temperature changes during freeze/thaw cycles

Abstract

Repeated freezing and thawing of the Thermo Scientific™ Nunc™ Cell Factory™ systems may be needed in some cell culture applications. To evaluate the Nunc Cell Factory system's tolerance to temperature variation, a series of experiments was performed. The tolerance of Nunc Cell Factory systems to temperature changes between -20°C and room temperature was verified three times.

Introduction

Nunc Cell Factory systems have been used for anchorage-dependent cell cultures in the fields of vaccines, cell therapy, and gene therapy. The Nunc Cell Factory systems are made of polystyrene, in accordance with FDA regulations. This material is easy to process, and used for sealing in multilayers and surface treatment for cell culture at larger scales. However, there are negative aspects to the use of polystyrene: it becomes brittle between -30°C and -20°C , and it has a heat deflection temperature of 96°C .

Because of this, the maximum recommended temperature is 90°C , requiring careful use at extreme temperatures. As a material used for cell culture, Nunc Cell Factory systems would require undergoing temperature changes in some applications, such as cell harvest and virus production. To investigate these scenarios, we conducted a series of experiments by freezing and thawing the Nunc Cell Factory systems repeatedly.



Materials and methods

The following Nunc Cell Factory systems were used for analysis:

- 1-layer Thermo Scientific™ Nunc™ EasyFill™-2 Cell Factory™ system with sealing caps (Cat. No. 169170)
- 10-layer Nunc EasyFill-2 Cell Factory system with sealing caps (Cat. No. 169173)

The following medium and serum were used for the test:

- Gibco™ OptiPRO™ SFM (Cat. No. 12309-019)
- Gibco™ Newborn Calf Serum (NCS) (Cat. No. 16010-159)

We added 200 mL of medium with 10% NCS per layer to a 1-layer Nunc EasyFill-2 Cell Factory system and a 10-layer Nunc EasyFill-2 Cell Factory system and rotated each system to evenly distribute the medium. We then put each Nunc EasyFill-2 Cell Factory system into a freezer at temperatures below -20°C (Figures 1 and 2).

After the medium was frozen completely (in 8–12 hours), we carefully removed the systems and inspected the systems for any damage such as cracking, leaking, or fragmentation.

After the medium was thawed completely at room temperature (in 4–8 hours), we again inspected the systems for signs of damage. If the Nunc EasyFill-2 Cell Factory systems were not damaged after the initial freeze/thaw cycle, the cycle was repeated twice more per system.

Results

No damage, such as cracking, leaking, or fragmentation, was observed in either system after three freeze/thaw cycles.

Conclusion

The Nunc Cell Factory systems can tolerate changes in temperature such as freezing (below -20°C) and thawing (to room temperature), without becoming damaged.



Figure 1. Nunc EasyFill-2 Cell Factory system frozen below -20°C .



Figure 2. Placement of 1-layer and 10-layer Nunc EasyFill-2 Cell Factory systems in the freezer.

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