Cytomat 2 C450-LiN with Tower Shaker is the most effective automated incubator solution for any biologics workflows

Optimizing cell culture conditions

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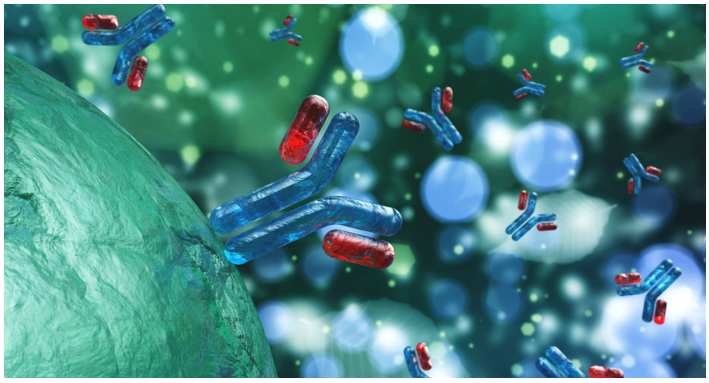

Goal

To prove that the Thermo Scientific™ Cytomat™ 2 C450-LiN equipped with the tower shaker stacker is the best automated incubator solution for a variety of cell culture applications compared to other automated shaking incubators in the market.

In this note, we compare the Cytomat 2 C450-LiN equipped with Tower Shaker Stacker, with another automated shaking incubator in the market and also with an off-line shaking incubator. The shaking patterns of both automated incubators were determined, and the biological relevance of the shaking technology was analyzed in detail.

Introduction

The Thermo Scientific™ Cytomat™ series is the leading brand of incubators in lab automation. TRUE orbital shaking ensures superior cell growth for cells in suspension, which is critical for many applications, especially in biopharma and biologics.

These incubators come in various models with different sizes and capabilities, providing choices for the users to select the right instrument for specific applications and plate types.

The smallest incubator stores 42 standard 96/384 well plates and the largest up to 504 standard 96/384 well plates. The automated incubators offer a wide range of environmental control with temperature choices from 4°C to 70°C, humidity control, CO_2 as standard and O_2 control.

The unique ContraCon decontamination procedures ensure a safe non harmful environment and is standard in all Cytomat incubators. The option Air Purging System (APS) in Cytomat incubators provide an optimum environment for microbial growth, e.g. yeast cell growth where the APS ensures CO_2 reduction to protect the cell health.

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However, the TRUE orbital shaking capability of the Cytomat 2 C450-LiN makes Cytomat distinct among other incubators. A single Cytomat 2 C450-LiN can be equipped with two Tower Shaker Stacker (ToS). The synchronized unique dual magnetic drive system (located at the bottom and top) allows synchronized shaking of all plates (top to bottom) with the same amplitudes. An active plate clamping mechanism holds the plates and lids securely.

Here, we showcase how a Biopharma company in North America has compared the Cytomat 2 Tower Shaking System with another automated incubator. Both incubators were compared to a non-automated shaking incubator to provide optimal cell growth for cells in suspension.

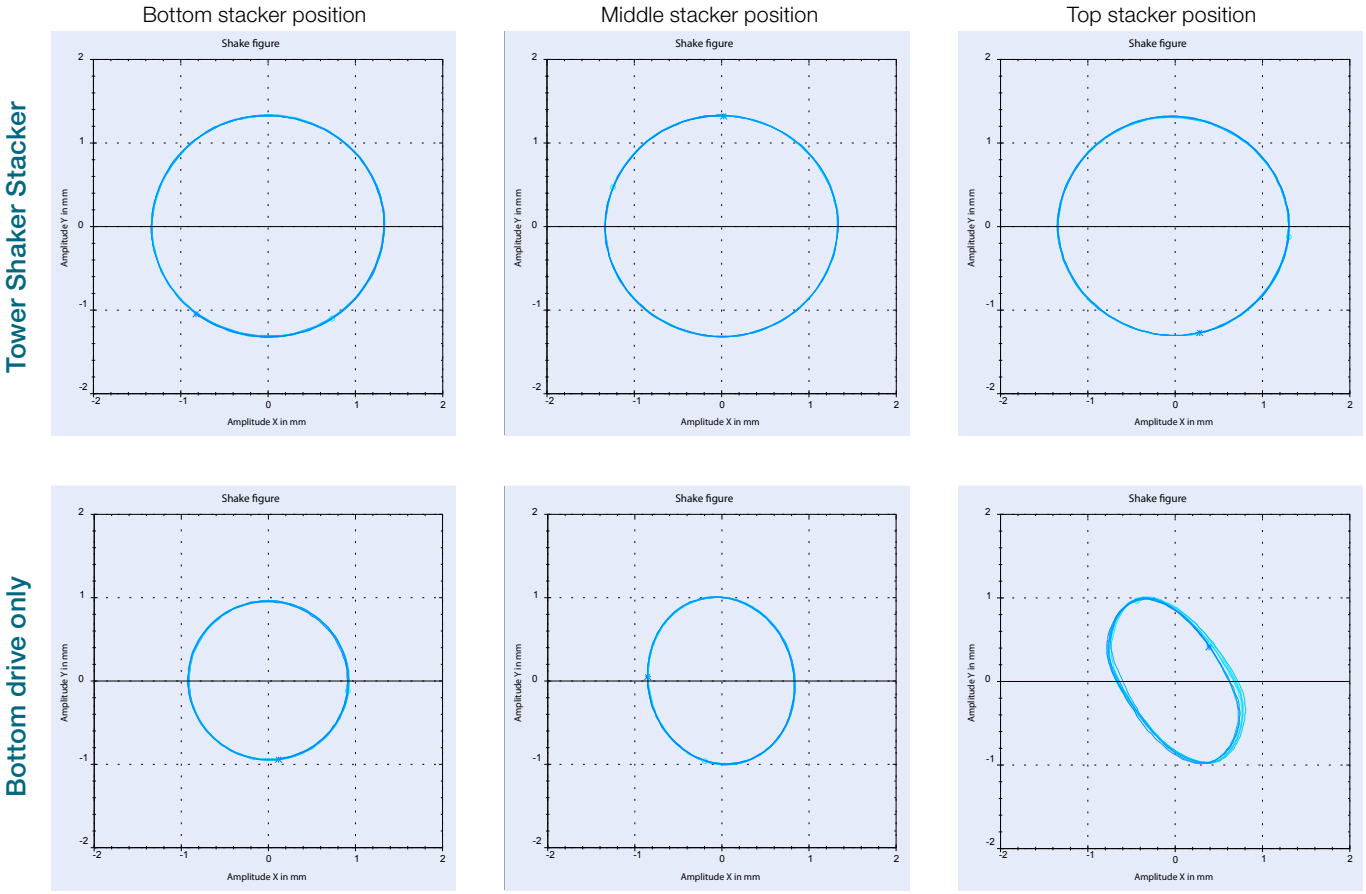

Figure 1. Shaking pattern comparison

Results

Comparison of Shaking pattern

To determine the shaking pattern of the automated incubators, an INHECO measurement plate (IMP) was used. The IMP is a compact and precise measurement tool in SBS format, which can be handled by all common robot arms and therefore the verification of incubators can be automatically performed.

Measurements were done in a Cytomat 2 C450-LiN with Tower Shaker Stacker (Dual magnetic drive) and an automated incubator with bottom shaking drive. For this comparison, the IMP plate was placed at the bottom, middle and top position of a stacker.

Figure 1: Shaking amplitudes are measured on the X and Y axes by the Inheco plate. The top panel shows the shaking pattern of a Cytomat 2 C450-LiN with Tower Shaker stacker and the bottom panel shows an automated shaking incubator with bottom shaking drive only.

Note: The Cytomat has a shaking amplitude of 3 mm, whereas the bottom drive instrument has a shaking amplitude of 2 mm.

The Cytomat 2 Tower shaker consistently showed the same amplitude and pattern (TRUE orbital shaking visualized by a perfect circle) in all stacker positions. In contrast, the bottom shaking drive automated incubator resulted in an elliptical shape from bottom to top position, potentially causing inferior cell growth.

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Comparison of Antibody Expression

To verify the performance of the Cytomat 2 C450-LiN with Tower Shaker versus the automated incubator with bottom shaking drive, a biological experiment was performed. For reference, results from a non-automated shaking incubator were used in comparison to the two automated incubators.

A human cell line, Expi293 that is commonly used in laboratory research to generate antibodies, was used to assess the effect of the shaking patterns on antibody production yields. Expi293 cells were seeded into three 96 Multiwell plates. Wells were transfected with one of eight plasmid pairs each encoding a different IgG protein. Each plasmid pair was transfected 3 times per 96 Multiwell plate and each 96 Multiwell plate had the same transfection pattern. These plates were grown for 16 hours at 37°C with >80% rH and 8% CO_2 inside the two automated and the manual incubators, with a max. shaking speed of 1.000 rpm. After 16 hours, all three 96 Multiwell plates were placed into the non-automated shaking incubator and grown for another 4 days at 37°C with >80% rH and 8% CO_2 inside, with a shaking speed of 1000 rpm.

During incubation, the antibodies were expressed and then purified using a standard protocol for magnetic bead purification of IgG by Protein A and the concentration was measured by absorption at 280 nm wavelength (with a Lunatic from Unchained Lab).

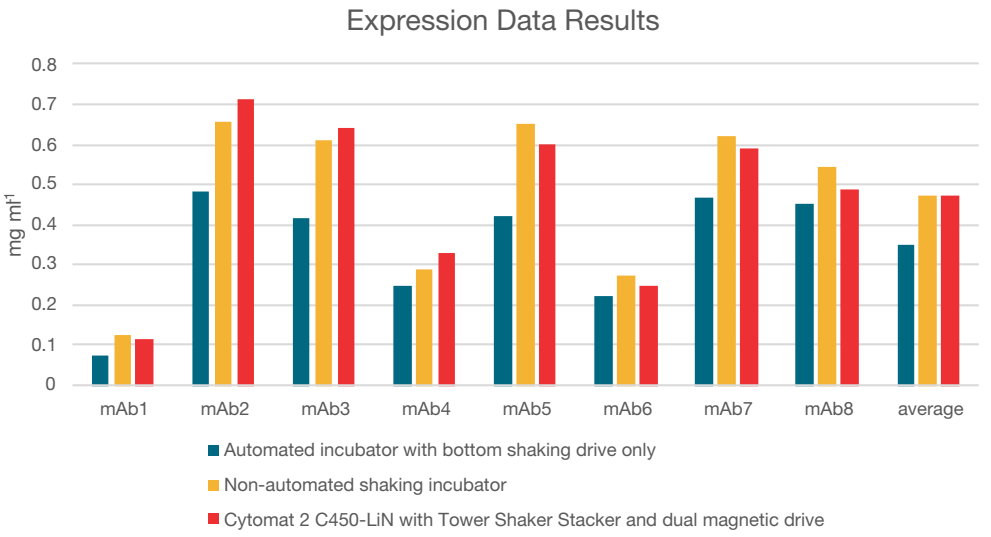

Figure 2. Antibody expression in the different incubators

Figure 2: Eight different sets of antibody expressing plasmids were each transfected in 3 different wells of a 96 Multiwell plate. Averages of the purified antibody concentration is shown here (in mg ml^{-1}). The Cytomat (red) performs as well as the well established not automated incubator (yellow), and always yields a higher antibody amount than from cells grown in a bottom shaking drive incubator (teal).

Conclusion

Thermo Scientific Cytomat 2 C450-LiN with tower shaker stacker showed similar results with its TRUE orbital shaking pattern from top to bottom, compared to the referenced non-automated shaking incubator on the expression data, and is the ideal solution to automate your Biologics workflow.

Find out more at **thermofisher.com/cytomat**

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