Selecting the Optimal Cell Culture Microplate for High Throughput Applications

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Summary

Cell culture is important to basic and translational research for identifying disease targets, assessing drug responses and characterizing genetic disturbances. Although complex in technique, it is more accessible and economical than *in vivo* models, and poses fewer ethical implications.

Cell culture can be conducted in high volume using large bioreactors; at medium volume with flasks and dishes; and low volume using multiwell plates. Cell culture models utilizing multiwell plates are growing increasingly popular as they facilitate the investigation of large numbers of dynamic variables, boosting experimental output and reducing both time and the use of expensive reagents. In addition to standard high-throughput microplates, new specialized microplates also have been developed to aid in the growing field of three-dimensional and organotypic cell culture.

This article provides insights into selecting the right plasticware for 2D and 3D cell culture applications. Key variables to consider include well number, well format, microplate color, and surface treatment.

Well Number

Most users begin tissue culture at medium volumes in tissue culture flasks or dishes. But many applications require multiwell plates, instead. The ideal plate format (that is, well number) depends upon the level of throughput required, the ability to adapt reagent volumes and the availability of instrumentation or robotics. While reagent additions to 96-well plates can be made completely manually, the use of electronic pipettes or robotics is certainly helpful. Moving up to a 384-well plate increases the need for robotics, and a 1536-well plate absolutely requires it. Regardless of instrumentation, the challenge in using higher-density multiwell plates is in “miniaturizing” assay reagent volumes.

Specialized multiwell plates also are available for applications such as 3D cell culture. BrandTech Scientific’s BRANDplates® Insert System has 24-well standard or 6-well specialized plates with feeding ports that are suitable for robotics/automation.

Well Shape

Well bottoms can be flat, round, curved, or conical, depending on both cell type and downstream application. A flat bottom (F-bottom) well is preferred for traditional 2D adherent cell culture (e.g., HeLa, MDCK, MCF-3), especially if imaging or spectrophotometric reading of the culture is required. Cells that lack contact inhibition, and applications requiring microscopy do well in curved-bottom (C-bottom) wells. Here, the slightly curved edges function to decrease edge artifacts and a buildup of excess cells at the well periphery, and also serve to enhance mixing of liquid medium during additions. A round bottom (U-bottom) well shape is ideal for growing cells in suspension (e.g., spheroid cultures), as the rounded surface is more difficult for cells to adhere to and grow on. That said, if you plan to image cells in a round bottom well, your imager must have the ability to focus vertically through the sample. The final well bottom design- conical (or V-shaped) - is not often used for cell culture experiments but can be used when cell pelleting is required.

Microplate Color

Multiwell plate color also is intrinsically linked to the application. For visualizing the cell culture under phase-contrast microscopy or by eye, select a clear plastic. But, for applications outside of the visible range of light (e.g. luminescence or fluorescence), a colored plastic such as white or black is necessary. Colored plates with solid (non-transparent) bottoms are appropriate when using a top-reading instrument (e.g. luminometer), while colored plates with transparent bottoms make sense with microscopes or bottom-reading instruments where the light and detection sources are on opposite sides of the samples. White surfaces typically are selected for luminescent signals to maximize signal reflectance, while black surfaces are used with fluorescent applications above 300nm to absorb the excitation signal. Colored surfaces also prevent signal crosstalk between adjacent wells.

Surface Treatment

Which cell culture surface treatment you choose depends on whether you are growing suspension or adherent cells. For non-adherent, suspension or spheroid cell culture we recommend BRAND inertGrade™ microplates, which are treated with a proprietary ultra hydrophilic hydrogel to inhibit cell and protein attachment. For adherent cells that easily attach (e.g. HeLa cells), a standard tissue culture surface, such as BRAND's cellGrade™ surface will suffice. For cells that have a harder time adhering (such as primary cells) or for applications involving stringent washing steps, we advise using BRAND's cellGrade™ premium microplates. This unique surface is similar to a poly-D-lysine treated surface but is a physical change in the plastic's properties rather than a coating, and thus does not require refrigeration. For applications with sensitive cells or when using reduced serum, we recommend our cellGrade™ plus surface.

High Quality Plastics

Once you identify the correct vessel for your cell culture application, there is one additional factor to consider: quality. Every component that touches cells, including pipette tips and cell culture plastic vessels, should be carefully selected to prevent contamination and cell inhibition or death. BrandTech's BRAND life science plastics are of the utmost quality and are produced in one of the most advanced and largest cleanroom facilities of its kind, with Class 8, 7, and 5 manufacturing environments available. For further information, visit www.brandtech.com.