Application Forum

Improving Cell-based Biotechnological Screening Approaches Using the Novel Advanced TC™ Cell Culture Surface

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INTRODUCTION

Biotechnology is often used to refer to the genetic engineering technology of the 21st century. Combining disciplines like genetics, molecular biology, biochemistry, and cell biology, biotechnology can also be defined as an all-encompassing life science.

Focussing on cellular screening approaches using immortalized cell lines, primary cells or co-culture models, cell based assays are currently one of the most important biotechnological techniques. Researchers in both the academic and industrial markets are increasingly adopting a cell-based approach, shifting their focus away from biochemical analysis of discrete cellular components to the complex analysis of an *in vivo* like system. Therefore the utilization of living cells leads to more comprehensive data, which complement results from earlier biochemical assays.

OBSTACLES OF IN VITRO CELL CULTURE

In vivo cells of a multi-cellular organism are embedded in the three-dimensional structure of the extracellular matrix (ECM) of adjacent cells. In addition to providing structural support, the ECM also comprises a wide range of cellular growth factors and mediates biochemical signals which essentially influence cellular proliferation and survival.

Contrariwise, cultivation of cells *in vitro* mainly refers to a two-dimensional culture on plastic surfaces lacking the vital signals provided by the connective tissue.

OPTIMIZING CELLULAR ADHESION

One approach to optimize cellular adhesion is to coat matrix-specific proteins to the plastic surfaces simulating an ECM-like surrounding to the cell. Poly-D-Lysine (PDL), Poly-L-Lysine (PLL), fibronectin, laminin and collagen are the commonly used proteins for these types of coatings.

An entirely new development is the imitation of the cellular surrounding in a non-biological way. These innovative surfaces feature many advantages.

Due to the production process the modification of the polymer assures a constant, reproducible product quality. Additionally, transport and storage can be carried out at room temperature. Due to the non-biological origin, the surface is not endangered by degradation and stable for several years. Likewise, the possibility of cross reaction or contamination based on the biological protein can be circumvented.

The novel Advanced TC™ polymer modification positively influences cellular features and functions. Enhanced cell attachment and higher proliferation rates improve cell expansion (Figure 1), facilitating cultivation of sensitive and primary cells as well as cells cultivated under restricted growth conditions.

Furthermore, the Advanced TC™ surface facilitates consistent and homogenous cell attachment, increasing the overall cell yield and reducing cell loss during processes such as the automated washing steps of high-throughput applications.

A positive effect on cell morphology is particularly apparent during cultivation of sensitive cells, serum deprivation, or after cellular stress induced by transfection or transduction processes. Moreover, cells cultivated on the Advanced TC™ surface exhibit higher transgene activity after the described gene transfer.

CONCLUSION

The novel Advanced TC™ cell culture surface improves cell adherence, leading to consistent and homogenous cell attachment, an *in vivo*-like morphology, and minimized cellular detachment during media changes or washing steps. It facilitates the cultivation of fastidious and sensitive cells as well as usage of serum-reduced or serum-free media. The optimal cultivation conditions accelerate proliferation, increase cell yield and maximize transgene activity in transfected cells. In summary, the innovative Advanced TC™ technology optimizes assay consistency of cell-based biotechnological screening approaches.

Figure 1: Accelerated proliferation of SKNMC cells. SKNMC cells were seeded in a 96-well plate with a concentration of 20,000 cells/well, cultivated at 37°C and 5% CO₂ for the indicated time period and stained with crystal violet to visualize adherent cells. Due to the improved adherence and accelerated proliferation increased cell numbers can be detected on the Advanced TC™ surface.