

Evaluation of a Novel Micro-bioreactor System for Cell Culture Optimisation

Giles Wilson

Novo Nordisk A/S

Abstract: BioProcessors SimCell™ high throughput cell culture process development system is a robotically controlled micro-bioreactor system capable of conducting over 1000 parallel bioreactor experiments. The animal cell cultures are grown in approximately 600µl volumes in a format capable of simulating environmental control and stresses that are present in conventional fermenters. Each SimCell Micro Bioreactor Array contains 6 x 600 µl mini-fermenters and allows the operator to rapidly screen many different parameters using a robotic control system. In this case we operated the dual chamber SimCell micro-bioreactors in a perfusion mode with a CHO cell line in serum free conditions for over 10 days and examined the effects of temperature and pH in 50 different combinations. With 9 replicate data points for statistical analysis this study, in the normal course of events, would have utilised ten 5 litre tanks for 1 year. In comparison to 5 litre perfusion fermentations (both suspension cell perfusion and microcarrier) the microbioreactors gave equivalent levels of growth and production, demonstrating that the micro-scale system can mimic a larger fermenter. An optimisation of pH and temperature showed that culture pH has a very strong effect on productivity and that small changes in pH can have a large effect upon culture performance. The scalability of these observations made in the SimCell MicroBioreactor Arrays were confirmed in our validated 5L bench top fermenter model.

Key words: CHO, animal component free medium, pH, temperature, SimCell, fermenter, screening, optimisation.