

531f Microalgal Fermentation Scale-up Considerations,

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Although the majority of microalgal species are photosynthetic, a few are capable of heterotrophic growth. Some of these species are being exploited for commercial production of nutritional oils. However, scale-up of algal fermentation to the volumes necessary for economically viable production presents unique challenges. Algal cells range in size from 5 to 50 micrometers in diameter and they display a variety of surface features and flagella. The disparate sizes and morphologies present special challenges with respect to potential susceptibility to shear forces and other energy inputs into the fermentor. Growth and survival of algae in high energy environments exhibits a continuum between the characteristics of the hardiest yeast and sensitive animal cells. Methods are discussed for the isolation and measurement of the forces and physical parameters that place limitations on algal growth and productivity as the fermentation process is scaled up from the laboratory to production scale at thousands of liters volume. A scale-down model allowing simulation of large-scale forces in the laboratory will also be described.