NEWS AND VIEWS

Promise and Problems of Bioreactors for Higher Eukaryotic Cells

The rapid progress in cell culture technology during the last decade has generated a tremendous interest in exploiting these higher eukaryotic cells for the production of biologicals. Therapeutic and diagnostic proteins are, by far, the most sought-after products from animal cells. Although, with the exception of monoclonal/polyclonal antibodies and animal vaccines, none of the products have yet fulfilled their proven market potential, the early indications are very promising. Plant cell technology, on the other hand, is making headway in the consumer market with the recently launched Konebo's 'Bio-Series' of lipsticks, eye shoadow, powder, and bio-perfumes in the offing (*1*). With this promise of an economic bonanza comes the need to scale-up the processes for artificially culturing these higher eukaryotic cells—and that is a totally different story.

Over the past 5–6 decades, the microbial fermentation industry has depended on, grown from, and prospered with a simple stirred-tank fermentor, what Dr. Ronald Cape prefers to describe as "bath tubs with propellers," with various degrees of mechanical and electronic sophistication. The prospective manufacturers interested in exploiting animal cells, however, have to face a formidable challenge in selecting from a large number of cell preparation methods and reactor designs: microcarriers, microcapsules, suspended cells, Gyrogen, Vibro-Fermentor, Acucyst, Mass Culturing Technique (MCT), hollow fibers, spiral tubes, compartmented ceramic cylinders (Opticore), air-lift reactors, gently stirred tanks, cross-flow reactors, compartmented plates, units of stacked up plates—and the list goes on (*2*). Furthermore, most of these systems can be used either in a batch, fed-batch, or perfusion mode. Are the differences in various eukaryotic cell lines significant enough to justify such a gamut of culturing methods? Or is it the eagerness of new and old biotechnology companies to reap the benefits while this field is new and hot? Besides a few glaring differences, such as anchorage-dependence or -independence in animal cells and aggregate

formation or the lack of it in plant cells, the overall needs for effectively cultivating various cell lines are mostly held in common. Also, our present understanding of "cultured" cell physiology is too limited to be exploited in a large facility.

It is apparent that the various available culturing techniques are variations of the same theme and only few are carefully evaluated before being introduced in the market. Thus, a novice in this area is always confronted with the problem of choosing the right system with hardly any proven applications and under the constraints of a tight time-frame. Since this appears to be a rule in modern biotechnology, it is likely that only when the dust settles after the initial war for a place in the booming market, will the truly promising cell culture techniques emerge. Until then, one has to consult the experts or flip a coin.

REFERENCES

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2. ACS Annual Meeting, Sept. 1984, Philadelphia, PA.

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