Multi-author Review

Developments in Biotechnology

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Dedication

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This issue of EXPERIENTIA on 'Developments in Biotechnology' is dedicated to Professor Armin Fiechter who celebrated his 65th birthday in October. He is one of the most eminent promoters of biotechnology in Switzerland and he was instrumental in establishing the Institute for Biotechnology at ETH in 1982 of which he is still director. By pioneering the combination of fundamental and applied aspects he has greatly influenced the advancement of biotechnology in teaching and research in Switzerland.
Distinguished scientists from various countries were invited to contribute to this special issue of EXPERIENTIA to review aspects of yeast physiology, process optimization and control, analytics, and applications. We are well aware that the articles presented here are only a narrow selection of the current activities in biotechnology but since Professor Fiechter has devoted most of his scientific career to research on yeast physiology, process development and instrumentation it is appropriate to focus this issue on these aspects. We thank all the authors who have contributed to mark this special event.
Professor Fiechter continues to actively stimulate progress in biotechnology with a still lively awareness of future developments. May he continue to persue his objectives and, together with Mrs. Fiechter, enjoy the time to come.

Further evidence for the existence of a bottleneck in the metabolism of *Saccharomyces cerevisiae*

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Summary. The growth physiology of *Saccharomyces cerevisiae* strains H1022 and Whi2+ has been studied in aerobic batch and continuous (chemostat) cultures. Results from the measurement of biomass and medium components (off-line) together with oxygen, carbon dioxide and heat measurements (on-line) have been used in an attempt to explore the existence of 'overflow' or 'bottleneck' metabolism as opposed to catabolite repression (Crabtree effect) in these strains. Chemostat experiments indicated that specific oxygen uptake rate (q_{O_2}) was linearly related to the dilution rate (D) at values below the critical dilution rate (D_{crit}), becoming constant above D_{crit}, which is in agreement with the bottleneck theory. However, batch culture experiments indicated negligible oxygen consumption during the initial glucose growth phase, the culture exhibiting purely anaerobic metabolism. The bottleneck theory would propose that q_{O_2} has a constant (maximum) value under these conditions. The results presented here suggest that while the bottleneck theory can be adequately used to describe chemostat growth of *S. cerevisiae*, some other control mechanism must be operating under conditions of high glucose concentrations, such as those initially prevailing in the batch culture experiments.
Key words. Bottleneck theory; calorimetry; chemostat; Crabtree effect; glucose effect; *S. cerevisiae*; yeast metabolism.

The Crabtree or glucose effect in *Saccharomyces cerevisiae* has important repercussions on the metabolism and the physiology of this yeast. *S. cerevisiae* growing aerobically on glucose produces ethanol, which is itself the substrate during a second growth phase. Diauxic growth is the result of the Crabtree effect in batch cul-