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Experimental validation of structured model representing the utilization pattern of substitutable substrates in Rifamycin B fermentation

Avinash Sinha and Pramod P Wangikar

Indian Institute of Technology - Bombay, India

Antibiotic fermentation industries utilize complex raw materials to increase profitability. Complex substrates mostly include byproducts of agriculture and allied industries. Although far more economical, complex media pose the problem of batch to batch variability and non-reproducibility.

A typical complex media consists of diverse array of substitutable carbon and nitrogen sources, making the characterization of industrial antibiotic process extremely challenging. Carbon and nitrogen source play a central role in the metabolism of the microorganism and thus affect the product yield. Most studies on antibiotic production have been done on defined media. It is thus desirable to characterize the influence of multi-substitutable substrates on growth and product formation in terms of mathematical model.

To this end, earlier studies within our research group (Bapat, Bhartiya et al. 2006) have established structured kinetic models for *Amycolatopsis mediterranei* S699 (a rifamycin B producer) in complex medium. One of the important building blocks of these models is the hypothetical enzyme(s) responsible for the uptake of certain substrate. But in earlier studies no attempt has been made to measure these enzymes experimentally, but have been expressed as a latent parameter. We have attempted here to quantify these latent parameters experimentally. To this end we have used two approaches, viz., (1) oxygen uptake based oxygraph studies (where the rate of oxygen uptake is used as an indirect measure of substrate uptake rate) and (2) confirmatory approach based on uptake of ^{14}C-labeled substrate. With this knowledge new substrate feeding strategies could be developed to perform fed-batch fermentation which could lead to increased rifamycin yield.

Biography

Avinash Sinha is a Senior Research fellow at the Department of Biosciences & Bioengineering at IIT Bombay and is currently pursuing his PhD in field of antibiotic fermentation technology and metabolic engineering. His PhD topic is “Sequence of Uptake, Regulation and Fate of Substitutable Substrates in Antibiotic Fermentation”. He has done his M. Tech and B. Tech in the field of chemical engineering. His areas of interest include systems biology, fermentation technology, environmental biotechnology, biotransformation, waste reclamation and environmental pollution control.

References

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