



IV Iberian Congress on Biotechnology
I Ibero-American Meeting on Biotechnology

BIOTEC'98

BOOK OF ABSTRACTS

Edited by

MANUEL MOTA and EUGÉNIO C. FERREIRA

Production of Lactan Using Plain Whey, Whey Permeate and Synthetic Medium as Feedstock

Manuela E. Pintado, Ana I.E. Pintado and F. Xavier Malcata

Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Rua Dr. António Bernardino de Almeida, 4200 Porto, Portugal

Key words: dairy, products, exopolysaccharide, *Rahnella aquatilis*, fermentation

Whey (or whey permeate), a by-product of cheese manufacture, has created a worldwide problem of waste disposal owing to its high biological oxygen demand. Production of lactan has been previously described based on a semidefined medium rich in lactose using *Rahnella aquatilis*. This research was aimed at obtaining lactan directly from whole whey without additional nutrients, as well as and whey permeate obtained after ultrafiltration, using a similar type of strain, and the fermentation process was compared with that using the synthetic medium previously tested.

The growth of biomass growth rate, the polysaccharide production rate and the viscosity of the broth were monitored. Organic acids, lactose, peptides and free amino acids were also determined. The growth curves were similar for the three media, showing a maximum specific growth rate of 0.61 h^{-1} , 0.65 h^{-1} and 0.63 h^{-1} for whey, whey permeate and synthetic medium, respectively. The major increase in polysaccharide production was observed between 12 h (beginning of stationary phase) and 24 h for whey and the synthetic medium; however, the increase in the case of whey permeate is less pronounced and occurs essentially after 24 h. The yield of polysaccharide was $0.59\text{ g/g}_{\text{lactose}}$, $0.56\text{ g/g}_{\text{lactose}}$ and $0.37\text{ g/g}_{\text{lactose}}$ for synthetic medium, plain whey and whey permeate, respectively. The larger amount of citrate present in whey was used by *Rahnella aquatilis* with significant formation of acetic acid in the first 12 h and acetoine thereafter; whey permeate and synthetic media did not lead to acetoine formation. The final yields of the various organic acids for the synthetic medium, whey and whey permeate, respectively, were: 0.08, 0.07 and 0.03 ($\text{g/g}_{\text{lactose}}$) for acetic acid; 0.02, 0.06 and 0.00 ($\text{g/g}_{\text{lactose}}$) for lactic acid; 0.08, 0.08 and 0.02 ($\text{g/g}_{\text{lactose}}$) for formic acid; 0.04, 0.01 and 0.00 ($\text{g/g}_{\text{lactose}}$) for succinic acid; and 0.00, 0.11 and 0.00 ($\text{g/g}_{\text{lactose}}$) for acetoine. Lactose was almost completely depleted by 48 h of fermentation in the case of whey and synthetic medium, but only part of lactose was consumed in the whey permeate (final yield of $0.43\text{ g/g}_{\text{lactose}}$). Small peptides ($< 4,000\text{ Da}$) and most free amino acids were consumed by 24 h in whey and synthetic medium. The whey permeate possessed low amounts of peptides (virtually consumed by 12 h) and very low concentrations of free amino acids, which increased slightly between 12 and 24 h.