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Exopolysaccharide production by *Lactobacillus delbrueckii* ssp. *bulgaricus* RR grown in whey and whey permeate

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JUSTIFICATION: Exopolysaccharides (EPS) produced by lactic acid bacteria may lend functional properties to food systems, including increased water-binding capacity, viscosity and resistance to syneresis. Whey may be used as a fermentation media to produce EPS. Fermentation reduces the biological oxygen demand of whey and decreases associated disposal costs. Growth of *Lactobacillus delbrueckii* ssp. *bulgaricus* RR (RR; EPS-producing) in whey is limited by the lack of low molecular weight nitrogen. Partial hydrolysis of whey proteins prior to fermentation may provide sufficient low molecular weight peptides for growth and EPS production by RR.

OBJECTIVES: To determine the effect of partial protein hydrolysis on EPS production by RR grown in whey and whey permeate.

METHODS: Cheddar cheese whey from the Penn State Creamery was clarified by centrifugation, partially hydrolyzed with Flavourzyme, a protease/peptidase complex, to 7.5% degree of hydrolysis then ultrafiltered into permeate and retentate using a 10,000 molecular weight cut-off membrane. Whey, whey permeate, hydrolyzed whey and hydrolyzed whey permeate were evaluated as fermentation substrates. Media were fermented at constant pH and temperature (5.0 and 38.0°C) with agitation (200 rpm) in a 2.5-L fermentor vessel. All fermentations were conducted in duplicate. Cell numbers, cell dry weight, and EPS content were determined initially and upon termination of the fermentation. Lactose utilization was determined periodically to monitor fermentation progress. Compositional analysis (carbohydrate, protein, total solids content) was performed on all media.

RESULTS: Hydrolysis of whey protein resulted in a significant increase ($p < 0.05$) in the EPS content of whey (198.97 mg/L vs. 4.55 mg/L non-hydrolyzed whey) and whey permeate (117.89 mg/L vs. 5.95 mg/L non-hydrolyzed whey permeate). Fermentation of the hydrolyzed media resulted in more complete (>90%) utilization of the original lactose (40% and 23% in whey and whey permeate, respectively).

SIGNIFICANCE: Partial hydrolysis of whey proteins prior to fermentation resulted in increased production of EPS by RR.