Studies on the separation of proteins and lactose from casein whey by cross-flow ultrafiltration

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\textbf{ABSTRACT}

A novel strategy has been developed for separation of individual whey protein fractions and lactose from casein whey by a cascade of different molecular weight cut-off (MWCO) cross-flow ultrafiltration (UF) membranes. Centrifugation (166.67 r.p.s., 277 K, 1800 s) followed by microfiltration (MWCO: 0.45 \times 10^{-6} m) were employed for separation of fat molecules and suspended solids from casein whey. Immunoglobulins, such as IgG, IgA, and IgM were separated as retentate of 100 kg mol\textsuperscript{-1} UF membrane; bovin serum albumin, lactoperoxidase, and lactoferrin were separated as retentate of 50 kg mol\textsuperscript{-1} UF membrane; lactose were separated by 5 kg mol\textsuperscript{-1} UF membrane as permeate, and major proteins like \(\beta\)-lactoglobulin (molecular weight 18.3 kg mol\textsuperscript{-1}) and \(\alpha\)-lactalbumin (molecular weight 14.2 kg mol\textsuperscript{-1}) were separated by proper control of pH. At pH 5.4 the most dominant whey protein, \(\beta\)-lactoglobulin (isoelectric point 5.2–5.4), formed dimer which was found to have immense effect on the separation characteristics. Hydrodynamic studies were conducted under different trans-membrane pressures (TMPs), 0.686–2.942 bar using four-stages of discontinuous diafiltration (DD) with constant volume concentration factor (VCF 2). In all cases highly purified proteins were obtained at the 3rd stage of DD process under an optimum TMP of 2.06 bar.

\textbf{Keywords:} Ultrafiltration; Whey protein; Lactose; Permeate flux; Trans-membrane pressure; Discontinuous diafiltration stage