Production and recovery of bacteriocins from cheese whey by fermentation and nanofiltration – a first insight using ceramic membrane technology

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In the dairy industry, cheese production generates large quantities of liquid whey, the disposal of which is associated with environmental problems. However, cheese whey can be used as a nutrient medium to produce high-value compounds such as bacteriocins through fermentation with lactic acid bacteria (LAB). The application of new efficient methods for the concentration of functional food ingredients can give an important contribution to the valorisation of this sub-product. Therefore, the aim of the present study is to investigate the use of whey to produce bacteriocins by fermentation with bacteriocinogenic LAB and the application of nanofiltration techniques using ceramic membranes as a simple method to obtain bacteriocins.
E. faecalis L3B1K3 isolated from an artisanal cheese from the Azores previously showed antimicrobial activity against *Listeria* spp. and *Clostridium* spp. by producing a 3 kDa bacteriocin. This strain was used to ferment sweet whey at 30°C for 48 hours. The results showed that sweet whey was a suitable medium to promote both bacterial growth and bacteriocin production. The fermented whey was then subjected to a nanofiltration protocol using a 3 nm ceramic membrane. The measured chemical oxygen demand (COD) increased fourfold (48.4 g/L) in the retentate compared to the initial sample. Bacteriocin activity in the retentate was also increased fourfold compared to fermented whey (12800 AU/mL and 3200 AU/mL, respectively), while no antimicrobial activity was detected in the permeate. The presence of bacteriocin in the whey, retentate and permeate was confirmed by RP-HPLC (retention time of 2.2 minutes). However, the peak area of bacteriocin in the retentate was ten times higher than in the permeate, demonstrating the efficiency of nanofiltration as a concentration method for antibacterial compounds (bacteriocins). In conclusion, these preliminary results have shown that nanofiltration methodologies can overcome the difficulties in recovery and concentrate bacteriocins produced in cheese whey.