

Valorization of byproducts from meat and dairy industries through fermentation to obtain protein hydrolysates

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Background

Waste stream has become a global, ongoing problem in the 21st century, especially in the food industry. Valorization of food wastes by recovering their valuable nutrients and incorporating them into new products has been considered a more sustainable approach to overcome the world's growing human population and the massive production of food byproducts. However, due to the limitations of the protein extraction methods, a new, innovative bioprocessing technology needs to be developed to efficiently extract these components.

Objective

The objective of this study is to control protein hydrolysis with a fermentation procedure of waste streams from the meat and dairy industries.

Methods

Sodium-citrated whole blood from cattle and pre-sterilized acid whey from cottage cheese production were mixed in a ratio of 1:3 (v/v) with the addition of molasses as a carbohydrate source. Starter culture of *Lactobacillus rhamnosus* (OSU-PECh-69) was chosen to initiate the fermentation process due to its high proteolytic activity and the fermentation was carried out at 37°C for 5 days.

Results

Viability of *L. rhamnosus* was able to maintain at around 9 log CFU/ml while coliforms whose viable cell counts remained below the detection limit of 250 CFU/ml during the five-day fermentation period. In addition, the low acidity in the acid whey is favorable for the growth of lactic acid bacteria over other pathogens. The pH level continued to drop as the fermentation period went on which limited the growth of coliforms. A higher degree of hydrolysis was achieved in the fermentation mixture in treatment with the addition of *L. rhamnosus*. SDS-PAGE photos confirmed that large-molecule proteins were degraded into smaller molecules during fermentation with the blood-acid whey mixture inoculated with *L. rhamnosus*.

Conclusions

In this study, an alternative biotechnology of fermentation was able to overcome the ongoing problem of two nutrient-dense byproducts by valorizing the protein content through enzymatic hydrolysis. This work could be applied to the biological system in establishing usable and economically viable products as well as creating long-term sustainable processing solutions.