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PII: S0734-9750(15)30015-X
DOI: doi: 10.1016/j.biotechadv.2015.07.002
Reference: JBA 6954

To appear in: *Biotechnology Advances*

Received date: 11 December 2014
Revised date: 12 June 2015
Accepted date: 6 July 2015

Please cite this article as: Yadav Jay Shankar Singh, Yan Song, Pilli Sridhar, Kumar Lalit, Tyagi RD, Surampalli RY, Cheese whey: A potential resource to transform into bioprotein, functional/nutritional proteins and bioactive peptides, *Biotechnology Advances* (2015), doi: 10.1016/j.biotechadv.2015.07.002

Cheese whey: a potential resource to transform into bioprotein, functional/nutritional proteins and bioactive peptides

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Abstract

The byproduct of cheese-producing industries, cheese whey, is considered as an environmental pollutant due to its high BOD and COD concentrations. The high organic load of whey arises from the presence of residual milk nutrients. As demand for milk-derived products is increasing, it leads to increased production of whey, which poses a serious management problem. To overcome this problem, various technological approaches have been employed to convert whey into value-added products. These technological advancements have enhanced whey utilization and about 50% of the total produced whey is now transformed into value-added products such as whey powder, whey protein, whey permeate, bioethanol, biopolymers, hydrogen, methane, electricty bioprotein (single cell protein) and probiotics. Among various value-added products, the transformation of whey into proteinaceous products is attractive and demanding. The main important factor which is attractive for transformation of whey into proteinaceous products is the generally recognized as safe (GRAS) regulatory status of whey. Whey and whey permeate are biotransformed into proteinaceous feed and food-grade bioprotein/single cell protein through fermentation. On the other hand, whey can be directly processed to obtain whey protein concentrate, whey protein isolate, and individual whey proteins. Further, whey proteins are also transformed into bioactive peptides via enzymatic or fermentation processes. The proteinaceous products have applications as functional, nutritional and therapeutic commodities. Whey characteristics, and its transformation processes for proteinaceous products such as bioproteins, functional/nutritional protein and bioactive peptides are covered in this review.

***Keywords*:** Cheese whey; Fermentation; Transformation; Biotransformation; Bioprotein; Functional/Nutritional protein; Bioactive peptides.

1. Introduction

The food processing industries, such as dairy and cheese processing plants, generate large volumes of liquid waste including “cheese whey”. Whey is the liquid portion produced during cheese-making or during coagulation of the milk casein process as a byproduct. The current total worldwide production of whey is estimated at about 180 to 190 million tons/year (Mollea et al., 2013). The major share of whey production comes from the European Union and the USA (approximately 70% of the total world whey).