Effect of UV-C light irradiation on the structure and microbiological quality of whey from bovine milk

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Whey from bovine milk has mainly β-lactoglobulin (β-L) and α-lactoalbumin (α-L) proteins in its composition, being a food with elevated nutritional value. To be safely consumed, it is necessary to guarantee microbiological standards and maintain its quality through some process that eliminates pathogenic bacteria. UV-C light irradiation is a non-thermal food preservation process that maintains the nutritional and sensory characteristics of the food when compared to thermal processes, such as pasteurization and sterilization. Furthermore, UV-C light promotes a photoelectron transfer between intrachain disulfides which promotes secondary structural changes in the protein, modifying the proteins and giving the consumer a more digestible and safe product. This study aims to evaluate the structural changes in the whey proteins structure as it is treated with UV-C irradiation, as well as to guarantee the microbiological safety of the product. The freeze-dried whey from the production of industrial Minas fresh cheese was used. Analysis of free thiols accessible to 5,5'-dithio-bis-(2-nitrobenzoic acid) (DTNB) was performed based on the Ellman method to determine the necessary UV-C light dose. Control samples (untreated whey), UV-C treated whey for four hours (time determined by the analysis of thiols), and a pasteurized whey sample at 62-68°C for 30 min was analyzed regarding the total count of bacteria and *Enterobacteriaceae* according to ISO 4832:2006 method. In the control sample, the value of 23 µM of free sulfhydryl groups was obtained, while in the UV-C treated sample, the concentration almost doubled (42.9 µM). The UV-C irradiated sample did not show significant growth for the total count of bacteria and enterobacteria; on the other side, control and pasteurized samples showed a growth of these microorganisms around 10^2 CFU mL^{-1}. According to 60/2019 Regulation from ANVISA, pasteurized milk and whey powder must not have counts higher than 10 CFU (g^{-1} or mL^{-1}) of enterobacteria. Thus, only the UV-C treated whey was within the established standard, showing that this non-thermal process has the potential to be used instead of thermal processing, maintaining the microbiological safety of the product. The UV-C treatment in whey showed to be microbiologically efficient and the increase in free thiols in these conditions suggests that it is possible to obtain a dairy product with better digestibility.

Keywords: irradiation, microbiology, protein, digestibility.

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