DETECTION OF MILK ADULTERATION BY WHEY USING THE LAB-ON-A-CHIP ELECTROPHORESIS TECHNOLOGY

Marco Antônio M. Furtado[1]
Fabiano F. Costa[2]
Isabella S. B. Pinto[2]
Marta F. M. Guimarães[2]
Maria Aparecida V. Paiva e Brito[2]
and Marcone A. L. de Oliveira[1]

[1] Federal University of Juiz de Fora, Juiz de Fora, Brazil
[2] Embrapa Gado de Leite, Juiz de Fora, Brazil

Milk has often been subject to adulteration, either by addition of water and some chemical products or others liquids (mainly the whey) to enlarge the final volume of the product. The limit of detection of these more elaborated adulterations has been a challenge for scientific community. Because of its origin, the composition of whey is very similar to milk, which encourages their incorporation into milk. The detection and quantification of caseinomacropeptide (CMP) is the method recommended by Brazilian legislation for the detection of this adulteration. However, the validity of their results has been questioned in situations where the presence of CMP at high concentrations in milk does not originate in the fraud. Thermostable proteases produced by psychrotrophic bacteria can also be responsible for this phenomenon and this fact has being reported in several studies published in this country and abroad. The analytical resources currently employed to detect CMP often do not identify with precision the origin of it, making it impossible to conclude whether the milk was adulterated with cheese whey. Recently a new methodology for analysis of proteins, called microchip electrophoresis, or "lab-on-a-chip" is been applied, and specifically with regard to milk protein; this powerful analytical tool can be considered as a fast alternative to separate and quantify, having been shown its advantages compared to conventional electrophoresis in polyacrylamide gel and also capillary electrophoresis. However, it was not been tested for the specific purpose of detecting fraud in milk with added whey. In this study, samples of pasteurized milk and whey and their mixtures (5%, 10%, 15% and 25%) were prepared (in duplicate) in the laboratory. Also patterns of milk proteins purified purchased from Sigma-Aldrich (St. Louis, MO, USA) were used as reference. We used the equipment Agilent 2100 Bioanalyzer (Agilent Technologies, Waldbronn, Germany), and their kits for identification and quantification of protein (Protein 80 kit) and the methodology described by the manufacturer as well as an alternative protocol for sample preparation. According to the results obtained using the methodology described by the manufacturer, we observed variation between the electropherograms of milk and whey, notably the lack of casein in the whey, but there was no considerable variation between the values of concentration and percentage of added cheese whey in the samples. We also observed the presence of a characteristic peak of CMP in the whey and also in the samples with adulteration. The results obtained with the alternative protocol for sample preparation was more promising; since it was able to better separate the protein fractions of casein and whey proteins. These variations could be considered for the quantification of fraud in further studies.

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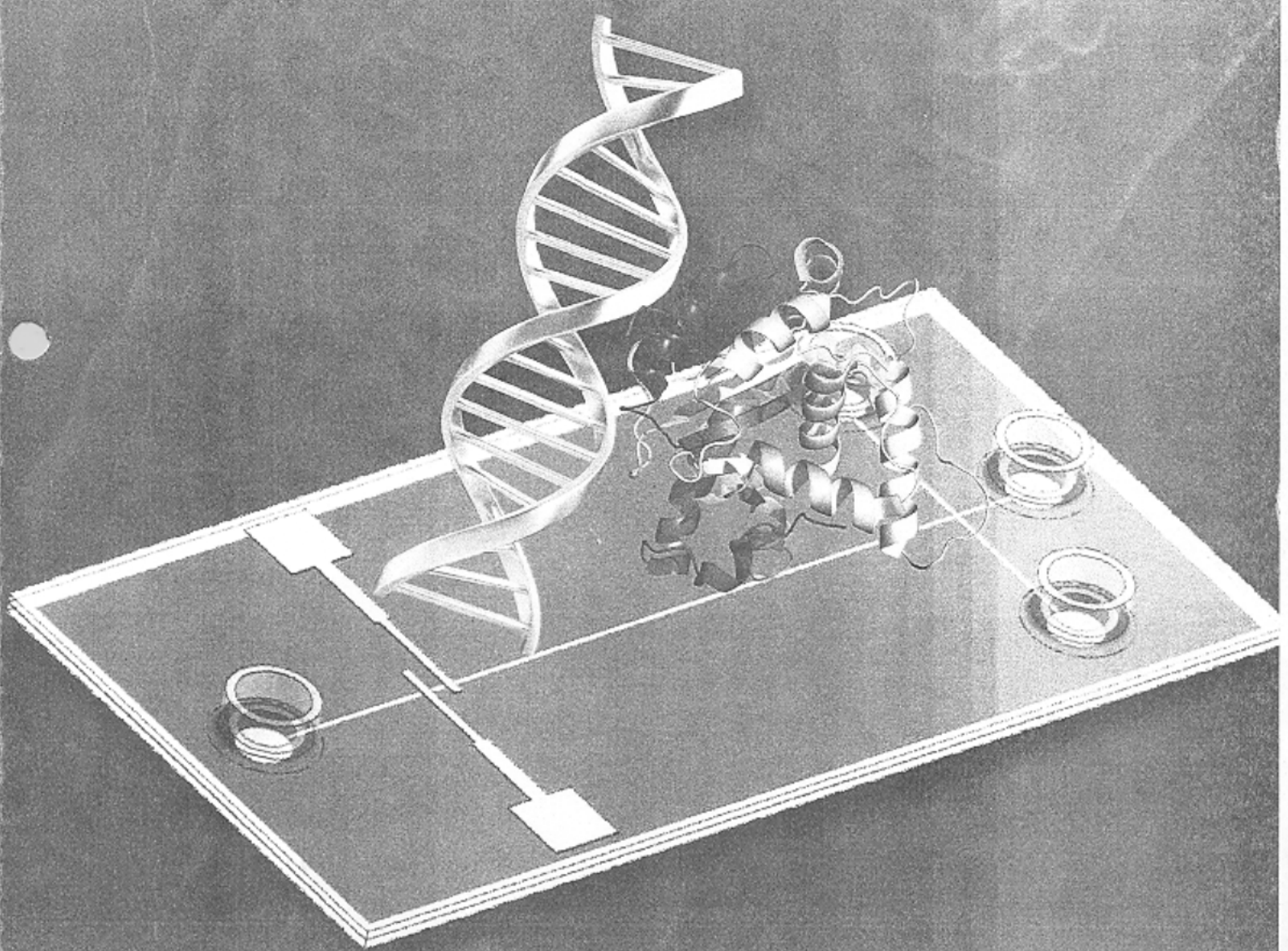

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