

## Investigation of nutraceutical properties in goat milk protein fractions: a preliminary study

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The interest in goat milk and its bio-medical properties is supported mainly by: the cure opportunity of food intolerance to cow and sheep milk and the use as alternative milk in “nutritional re-education” programs of undernourished children. Even though the principal proteins in goats' milk are the same as in the milk of other species, the relative proportion of the four major caseins in caprine milk varies widely between individual animals. In this preliminary study goat's milk was characterized for protein patterns and the impact of different caseins and beta-lactoglobulins was evaluated as causing factors of allergic manifestations in infants during their first year of life. Individual milk composition was the following, when going from the lowest to the highest electrophoretic mobility: minor whey proteins (lactoferrin, serum albumin, immunoglobulin G),  $\alpha$ -casein,  $\beta$ -casein,  $\kappa$ -casein,  $\gamma$ 1-casein,  $\beta$ -lactoglobulin,  $\alpha$ -lactoalbumin,  $\gamma$ 2-casein, and  $\gamma$ 3-casein. A significant effect of the pasteurization was recorded for the minor whey proteins fraction ( $P < 0.01$ ),  $\beta$ -casein, and  $\gamma$ 1-casein ( $P < 0.001$ ): raw milk displayed a higher percentage of minor whey protein,  $\gamma$ 1-casein, and a major hydrolysis of  $\beta$ -casein probably due to plasmin activity. Heating treatment could have inhibited plasmin activity so that a higher value of intact  $\beta$ -casein and lower value of  $\gamma$ -casein was recorded in pasteurized milk samples. More, the heating treatment could have induced coagulation of minor whey protein so that a lower amount of this fraction was found in pasteurized milk samples. No difference was reported for  $\alpha$ -casein,  $\kappa$ -casein,  $\beta$ -lactoglobulin,  $\alpha$ -lactoalbumin. As concerns casein fractions, raw milk samples showed at least two bands attributed to  $\alpha$ s<sub>1</sub>- e  $\alpha$ s<sub>2</sub>-casein. In pasteurized milk samples 2-3 bands were ascribed to  $\kappa$ -casein while only one band of this casein fraction was found in raw milk samples. The heating treatment could have therefore induced hydrolysis of the  $\kappa$ -casein fraction. The heating treatment led to an increased concentration of casein fraction as displayed in the SDS where a higher intensity of bands was detected in pasteurized milk samples patterns. Peripheral blood mononuclear cells (PBMCs) were obtained from infant with cow's milk allergy (CMA). Cutaneous, intestinal or respiratory symptoms were the major CMA feature. Cytokine production from PBMCs stimulated with pasteurized cow's and goat's milk was determined. Tumor necrosis factors  $\alpha$  (TNF- $\alpha$ ) and interleukin 10 (IL10) were measured as markers of milk allergy, these molecules being representative of inflammatory and regulatory cytokines. PBMCs were stimulated with whole milk, casein and  $\beta$ -lactoglobulin from cow and goat. PBMC produced significantly higher TNF- $\alpha$  levels after exposure to cow milk casein and  $\beta$ -lactoglobulin than after contact with goat milk proteins. Different IL10 productions were also observed after PBMC stimulation with cow and goat milk, and  $\beta$ -lactoglobulin. Preliminary data suggest that goat milk proteins lower the production of proinflammatory cytokines and enhance the release of antiinflammatory ones from PBMC of CMA infants. Further studies are required to assess the role played by small protein fragments from goat milk (bio-active peptides) on cytokine production in PBMC of CMA infants.