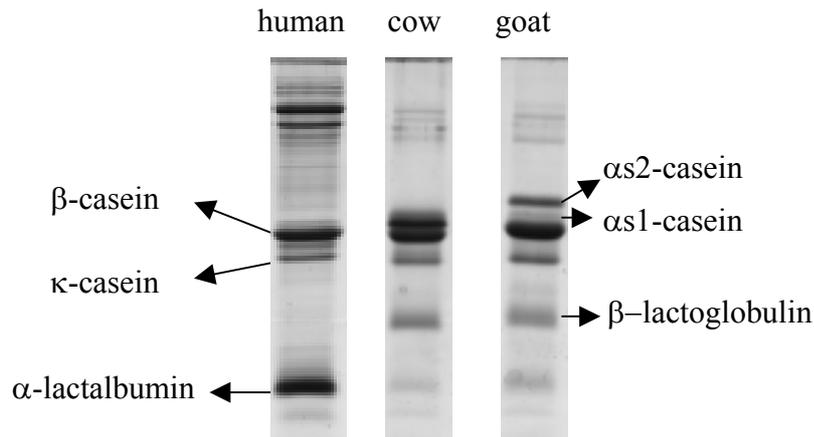


Casein composition of human milk and goat and cow milk powders

Summary paper prepared April 2003:

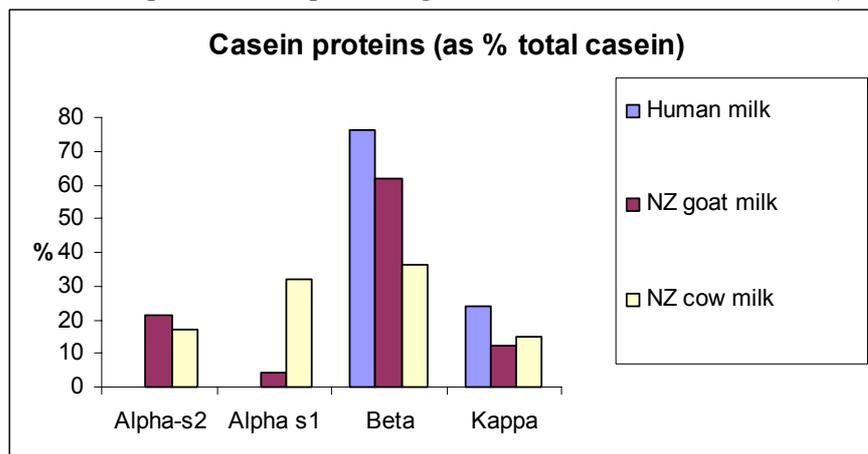
analysis results from compositional studies undertaken by AgResearch Ruakura Research Centre New, Zealand in 2002 for Dairy Goat Co-operative (N.Z.) Ltd.

The main proteins in human milk or cow and goat milk powders produced in New Zealand are shown in the figure below. Each band represents a different protein from milk.



Human milk contained only two major casein bands, β - and κ -casein. Goat and cow milk powders also contained these caseins and two additional casein bands corresponding to α 1- and α 2-casein. However, the relative levels of the casein differed in the two species, with goat milk having very little α 1-casein.

The individual caseins in human milk or milk powder from cow and goat were quantified and expressed as a percentage of total casein concentration (see figure below).



The predominant casein in human milk and goat milk powder was β -casein, comprising 76% and 63% of total casein, respectively. In contrast, cow milk powder contained almost half the amount of β -casein. In addition, cow milk powder, contained approximately 7 fold more α 1-casein than goat milk powder. Thus, the relative absence of α 1-casein and higher proportion of β -casein means the casein protein fraction of goat milk is much closer in composition to human milk than that of cow milk.

The proportions of caseins determined in this survey of New Zealand human milk and goat and cow milk powders were within the ranges quoted in following literature:

Human

Cuilliere ML, Tregoat V, Bene MC, Faure G, Montagne P (1999). Changes in the κ -casein and β -casein concentrations in human milk during lactation *Journal of Clinical laboratory Analysis* 13:213-218.

Montagne PM, Tregoat V, Cuilliere ML, Bene MC, Faure G (2000) Measurement of nine human milk proteins by nephelometric immunoassays: application to the determination of mature milk protein profile. *Clinical Biochemistry* 33:181-186.

Goat

Brown JR, Law AJ, Knight CH (1995) Changes in casein composition of goats' milk during the course of lactation: physiological inferences and technological implications. *Journal of Dairy Research*. 62:431-943.

Diaz E, Analla EDM, Munoz-Serrano A, Moraga A, Serradilla JM (1999) Variation of milk yield and contents of total casein and casein fractions in Murciano-Granadina goats. *Small Ruminant Research* 34:141-147.

Cow

Davies DT, Law AJR (1980) The content and composition of protein in creamery milks in south-west Scotland. *Journal of Dairy Research* 47:83-90.

Davies DT & Law AJR (1987) Quantitative fractionation of casein mixtures by fast protein liquid chromatography. *Journal of Dairy Research* 54:369-376.

Ng-Kwai-Hang KF, Hayes JF, Moxley JE, Monardes HG. (1987) Variation in milk protein concentrations associated with genetic polymorphism and environmental factors. *Journal of Dairy Science* 70:563-570.



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