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Digestion of Milk Proteins from Cow or Goat Milk Infant  
Formula

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Colin Prosser<sup>1</sup>  
 Rob McLaren<sup>1</sup>  
 Shane M Rutherford<sup>2</sup>  
 Alison J Darragh<sup>2</sup>  
 Wouter H Hendriks<sup>2</sup>  
 Dianne Lowry<sup>3</sup>



Contact:  
 colin.prosser@agresearch.co.nz

<sup>1</sup>AgResearch  
 Ruakura Research Centre  
 Hamilton, New Zealand

<sup>2</sup>Massey University  
 Palmerston North, New Zealand

<sup>3</sup>Dairy Goat Co-operative (N.Z.) Ltd  
 Hamilton, New Zealand



Dairy Goat Co-operative (N.Z.) Ltd

# Digestion of milk proteins from cow or goat milk infant formula

## Aims

To determine the protein profile of human milk and NZ cow and goat milks.

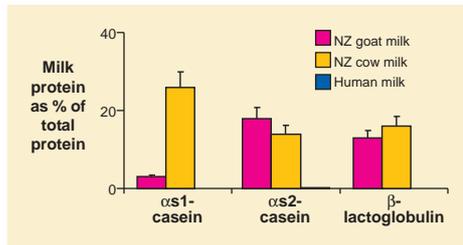
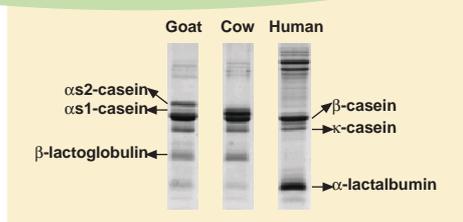
To compare the digestion of milk proteins in infant formulas from cow or goat milk.

## Introduction

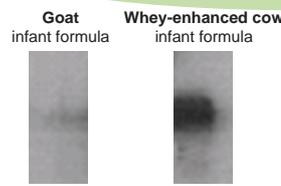
- Reports state goat milk may be better tolerated than cow milk in infants with allergy to milk proteins. (Savilahti and Kuitunen, 1992; Park, 1994; Belloni-Buscino *et al.*, 1999)
- Resistance to digestion is a key determinant of a protein's allergenicity and  $\beta$ -lactoglobulin is the most resistant milk protein. (Astwood, Leach and Fuchs, 1996)
- Goat milk, containing low levels of  $\alpha$ s1-casein, caused significantly less allergic reaction to  $\beta$ -lactoglobulin in a guinea pig model of allergy. (Bevilacqua *et al.*, 2001)

### Protein profile of human milk and NZ goat and cow milk powders are different

- The proteins in human milk and NZ goat and cow milk powders were compared by SDS-Page analysis and caseins quantified by densitometry.
- Human milk contains no  $\beta$ -lactoglobulin, and only a trace of  $\alpha$ -casein.
- NZ goat milk powder has similar levels of  $\beta$ -lactoglobulin, but very little  $\alpha$ s1-casein compared with cow milk powders.

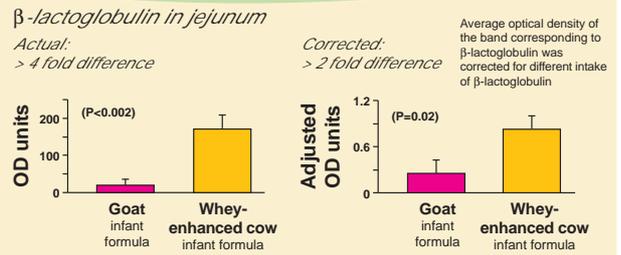


### The only intact milk protein present in jejunum was $\beta$ -lactoglobulin



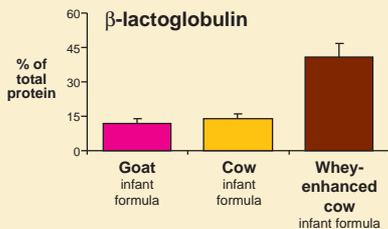
- In vivo study: 3-week old piglets were fed goat or whey-enhanced cow milk infant formula as their sole diet for 16 days and intact milk protein remaining in the jejunum measured by densitometry after separation by SDS-Page.

### More intact $\beta$ -lactoglobulin remained in piglets fed cow compared with goat formula



### $\beta$ -lactoglobulin is digested more efficiently in goat milk infant formula than cow milk infant formula

Three commercially available infant formula products were compared

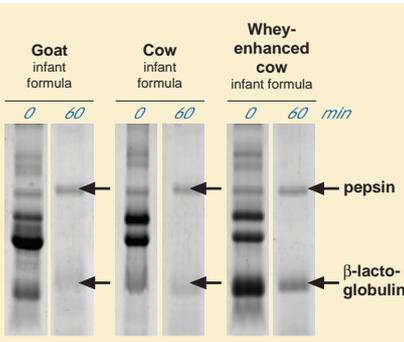


- In vitro pepsin digestion: hydrolysis of proteins from goat or cow milk infant formula was measured in vitro with 0.8 mg/ml pepsin in 0.03M NaCl at pH 1.2.

- The amount of intact protein after 60 min was measured by densitometry after separation by SDS-Page.

- All caseins were fully digested within 10 minutes, but some  $\beta$ -lactoglobulin remained intact even after 60 min digestion with pepsin.

- More  $\beta$ -lactoglobulin remained intact in cow milk compared with goat milk, particularly in the whey-enhanced cow milk infant formula.



## Conclusions

Goat milk has less than 5%  $\alpha$ s1-casein compared to more than 20% for cow milk.

Caseins were completely digested, but  $\beta$ -lactoglobulin was not.

$\beta$ -lactoglobulin from cow milk infant formula was more resistant to digestion than  $\beta$ -lactoglobulin from goat milk infant formula.

The relative absence of  $\alpha$ s1-casein and more efficient digestion of  $\beta$ -lactoglobulin in goat milk provides a possible explanation for observations that goat milk infant formula is sometimes less allergenic than cow milk infant formula.

The common practice of adding whey proteins to cow milk infant formulas may increase the allergenicity of these formulas due to more intact  $\beta$ -lactoglobulin remaining in the jejunum.

## References

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