

Hodgkinson 2006

Characterisation of the milk fat globule membrane proteins
from goat milk

Poster paper presented at the International Society for the Study of
Fatty Acids and Lipids (ISSFAL) Conference, Cairns, Australia, July
2006.

Characterisation of the milk fat globule membrane proteins from goat milk

AJ Hodgkinson
RD McLaren
GA Smolenski
TT Wheeler



Dairy Science & Technology,
 AgResearch,
 Ruakura Research Centre,
 Hamilton, New Zealand

CG Prosser
 Dairy Goat Cooperative (N.Z.) Ltd,
 Hamilton, New Zealand

ali.hodgkinson@agresearch.co.nz

Aim

- Identify the proteins associated with the milk fat globule membranes in goat milk.
- Compare MFGM proteins from goat milk and cow milk.

Introduction

- In milk, the fat globule is encapsulated by a thin membrane originating from the apical membrane of the secretory epithelial cell.
- Between two and six percent of the total milk proteins are associated with the milk fat globule membrane (MFGM). These proteins have important roles in various cell processes and provide anti-microbial defence in the gastrointestinal tract of the newborn.

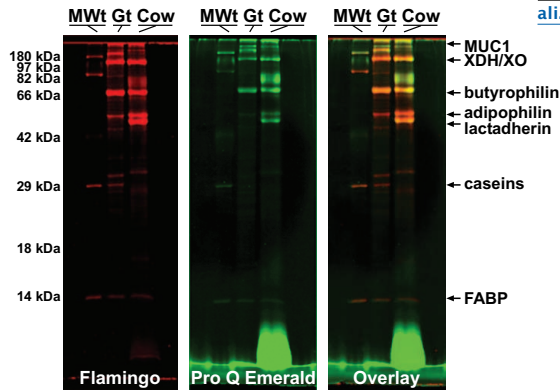
Methods

- MFGM bound proteins were extracted from the whole milk of healthy goats and cows based on the method of Kanno and Kim¹.
- Proteins were separated by one- and two-dimensional polyacrylamide-gel electrophoresis (1DE and 2DE).
- Glycoproteins were stained with Pro Q Emerald (Invitrogen, NZ) and total proteins were stained with Flamingo (Bio-Rad, NZ).
- From the 2DE gels, major protein spots were excised, trypsin digested and identified using MALDI-TOF mass spectrometry (MS) and MASCOT search engine software.

Results

- Similar profile of MFGM proteins in milk from goats and cows.
- Some proteins were expressed in different abundance or were present in only one species.
- Based on the migration and staining patterns², Xanthine dehydrogenase/oxidase and MUC1 were present in both species.
- MS confirmed the presence of the major MFGM proteins: butyrophilin; adipophilin and fatty acid binding protein (FABP), in both milk samples.
- Many proteins remain unidentified in goat milk.

1D electrophoresis Samples containing 25 µg MFGM proteins were separated by SDS polyacrylamide-gel (12.5%; 18 x 16 cm) electrophoresis, along with a glycoprotein molecular weight marker (Candycane™). Total proteins were stained with Flamingo and glycoproteins were stained with Pro Q Emerald. The two resultant images were over-layed.

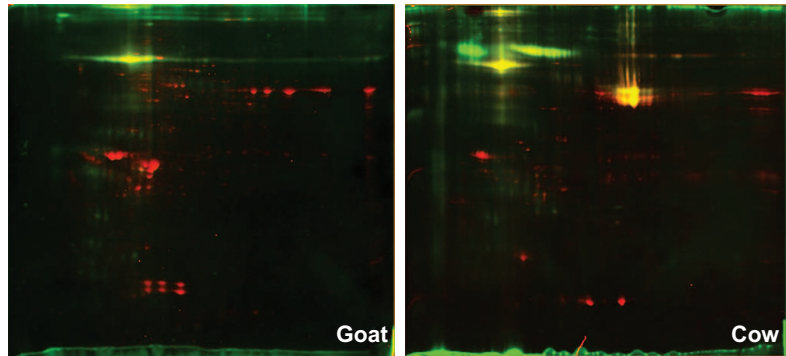


References

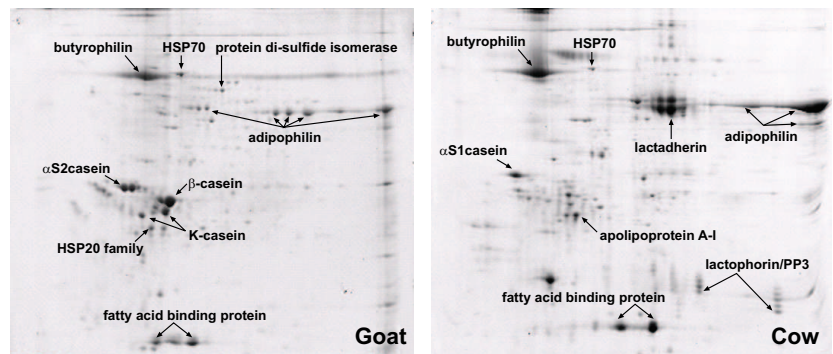
- Kanno C and Kim DH (1990) *Agric. and Biol. Chem.* 54: 2845-2854
- Mather IH (2000) *J Dairy Sci.* 83: 203-247

Acknowledgements
 To Foundation of Research, Science & Technology for funding.

2D electrophoresis Samples containing 250 µg MFGM proteins were separated on Immobiline™ DryStrip gels, pH 3-10L, 18 cm, followed by polyacrylamide-gel (12.5%; 18 x 16 cm) electrophoresis. Total proteins were stained with Flamingo and glycoproteins were stained with Pro Q Emerald. The two resultant images were over-layed.



2D electrophoresis Samples containing 250 µg MFGM proteins were separated on Immobiline™ DryStrip gels, pH 3-10L, 18 cm, followed by polyacrylamide-gel (12.5%; 18 x 16 cm) electrophoresis. Major protein spots stained by colloidal Coomassie blue were excised and identified by MS.



Summary

- Goat milk contains the established MFGM proteins found in the milk of other species.
- Preservation of milk fat in infant formula means that these important proteins and associated functionalities will also be retained.



Dairy Goat Cooperative (N.Z.) Ltd

agresearch

Farming, Food and Health. First

Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi