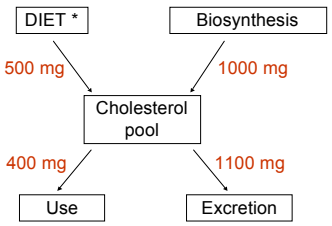
Milk and blood cholesterol levels during the lactating cycle

Viturro E, Schlamberger G, Wiedemann S, Kaske M, Meyer HHD

ZIEL Research Center for Nutrition and Food Sciences, Technische Universität München, Germany

Introduction

Mammalian organisms are able to maintain cholesterol levels in the organism constant despite wide fluctuations of this metabolite in their diets. This is achieved through a very complex homeostatic system, involving the regulation of many different factors such as synthesis enzymes, diet absorption transporters, excretion regulators and a wide range of transcription factors. Multiple studies have shown that cholesterol liver synthesis is crucial in this system, overtaking approximately two thirds of the required daily cholesterol input.

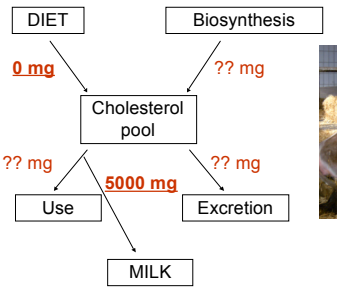


* Milk and dairy products are the 2nd principal source of cholesterol in human diet, especially among infants

This system presents two important differences in bovine organisms:

1) Bovine diet is hypothesized to be a cholesterol-free diet since this molecule appears only in aliments with animal origin.

2) Huge amounts of cholesterol are secreted in the milk. Taking into account a mean cholesterol content of 20 mg/dL and a mean milk yield of 25 L/day, the bovine organism has to dispose of additional 5000 mg cholesterol for the lactation.



Objectives

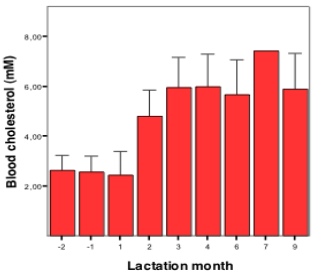
To study the variation of milk cholesterol concentration during the lactating cycle as well as the relationship of this parameter with blood cholesterol, milk fat content and milk fraction.

Materials and Methods

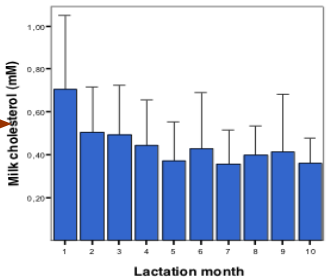
- 16 Brown Swiss cows
- Mean age: 4.6 years
- 2nd lactation or above

Results

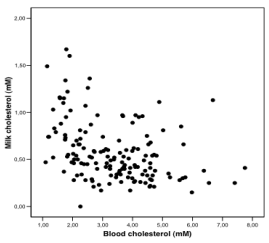
Blood cholesterol levels increase significantly during the lactating cycle, with the strongest variation during the second month after parturition



Milk cholesterol content decreases constantly during the whole lactating cycle. Its concentration range is on a 10-fold dilution rate in comparison to that of blood



No direct relationship between milk and blood cholesterol? Specific transport system?



Milk cholesterol concentration is also not related to milk fat (%):

Fraction	Fat (%)	Protein (%)	Lact.(%)	mg Chol/100 g Fat
25%	2.64 ± 0.45	3.59 ± 0.45	5.02 ± 0.07	**499.1 ± 23.9**
50%	3.69 ± 0.20	3.58 ± 0.24	4.98 ± 0.08	**447.6 ± 50.9**
75%	4.94 ± 0.72	3.54 ± 0.20	4.85 ± 0.10	**393.3 ± 51.2**
100%	6.01 ± 1.19	3.46 ± 0.22	4.65 ± 0.18	**421.6 ± 58.8**

Related literature from our workgroup:

- **Viturro E. et al 2006 J Dairy Sci 89:553.561**
- **Farke C. et al 2006 J Anim Sci 84:2887-2894**
- **Viturro E. et al 2009 J Steroid Biochem Mol Biol 115:62-67**
- **Viturro E. et al 2010 J Dairy Res 77:85-89**