

Mare's milk composition in two breeds during different stages of lactation

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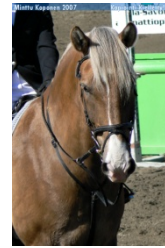


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Introduction I



- Newborn horse (*Equus caballus*) is dependent on own mammals milk. The consistency of mare milk resembles more human milk than cow's milk, due to lower protein content, higher amount of lactose and a greater water content
- Total daily quantity of the milk varies between 10-30 kg. The milk yield of mares used especially for milk production equals of those nursing their foals (Doreau and Boulot, 1984)

Introduction II

- Lactation period is the period of time when a mammal excretes milk from its mammary gland. Among wild horses, the lactation period in mare herds lasts approximately a year.
- Drainage and withdrawal occurs several weeks before the parturition of next foal.
- Mares that don't partire, or whose foals die young, might nurse the previous year's foals. Suckling foals up to 2-3 years have been found (Tyler, 1972; Feist and Mac Collough, 1976).

The average composition of Human-, Mare- and Bovine milk

Specie	FAT		PROTEIN		LACTOSE	SOLID
	Water		Casein	Whey		Ash
Human	87,1	4,5	0,4	0,5	7,1	0,2
Mare	88,8	1,9	1,3	1,2	6,2	0,5
Cow	87,3	3,9	2,6	0,6	4,6	0,7

Background

- When differences between the breeds have been examined, it has been discovered that more than the breed itself, the quality and quantity of milk is affected by the size of the horse (heavy breeds or ponies), fatness condition and live weight (Doreau and Boulot, 1989).
- Mare milk fat has over 30 times more linoleic acid than cow milk (Doreau and Boulot, 1989).
- Fatty acids have three physiological meanings in the human organism. They are components of phospholipids and glycolipids, their derivatives act as hormones and messengers inside the cell. In addition they serve as fuel.

Background

- In the summer of 1946 mare milk was discovered to be especially beneficial at the Helsinki's Academic Children's Hospital during infant's bowel epidemics, when human milk was not available.
- Mare milk is suited to treating diarrhoea problems appearing with infants early on (Kalliala ets., 1951).

Background

- These two necessary, unsaturated fatty acids the organism can not produce itself. The less there are them in eaten food, the less they can be found in blood, different tissues and human milk.
- Necessary fatty acids are mostly needed in the development phase of the brain and nerves. With adults necessary fatty acids are mainly related to preventing hearth- and vascular diseases (Mutanen, 1996).

Purpose

- The aim of the study was to determine the composition of Finn Horse (FH) and American Warm Blod Trotter (STB), the Fatty Acid composition and the amount of five minerals i.e. Calsium (Ca), Phosforus (P), Magnesium (Mg), Zink (Zn)and Iron (Fe)
- The comparison between the two breeds during the lactation stages was conducted
- The individual differences between mares: fatness, age and the number of lactations were studied

Materials and methods I

- Milk samples were collected from 22 and 12 Finn Horse (FH) mares in two consecutive years, respectively, and from 8 Standardbred trotters (STB).
- The age of the mares ranged from 5 to 21 yrs.
- Number of parturitions/mare ranged between two and 12, with an average of 5,6 births.
- The milk samples (100 ml) were hand-milked and frozen (-20°C) before analyses.

Materials and methods II

- The main consistency was determined infrared (IR) spectrophotometrically by Milco Scan 134 A/B IR-analysator (N. Foss. Electric, Denmark).
- The fat was measured from the C=O –bonds with wavelengths $\alpha_1=5,7\mu\text{m}$ and $\alpha_2=3,48\mu\text{m}$.
- The proteins in N-H –bonds with wavelength $\alpha=6,4\mu\text{m}$ and lactose C-OH –bonds with wavelength $\alpha=9,55\mu\text{m}$.

Materials and methods III

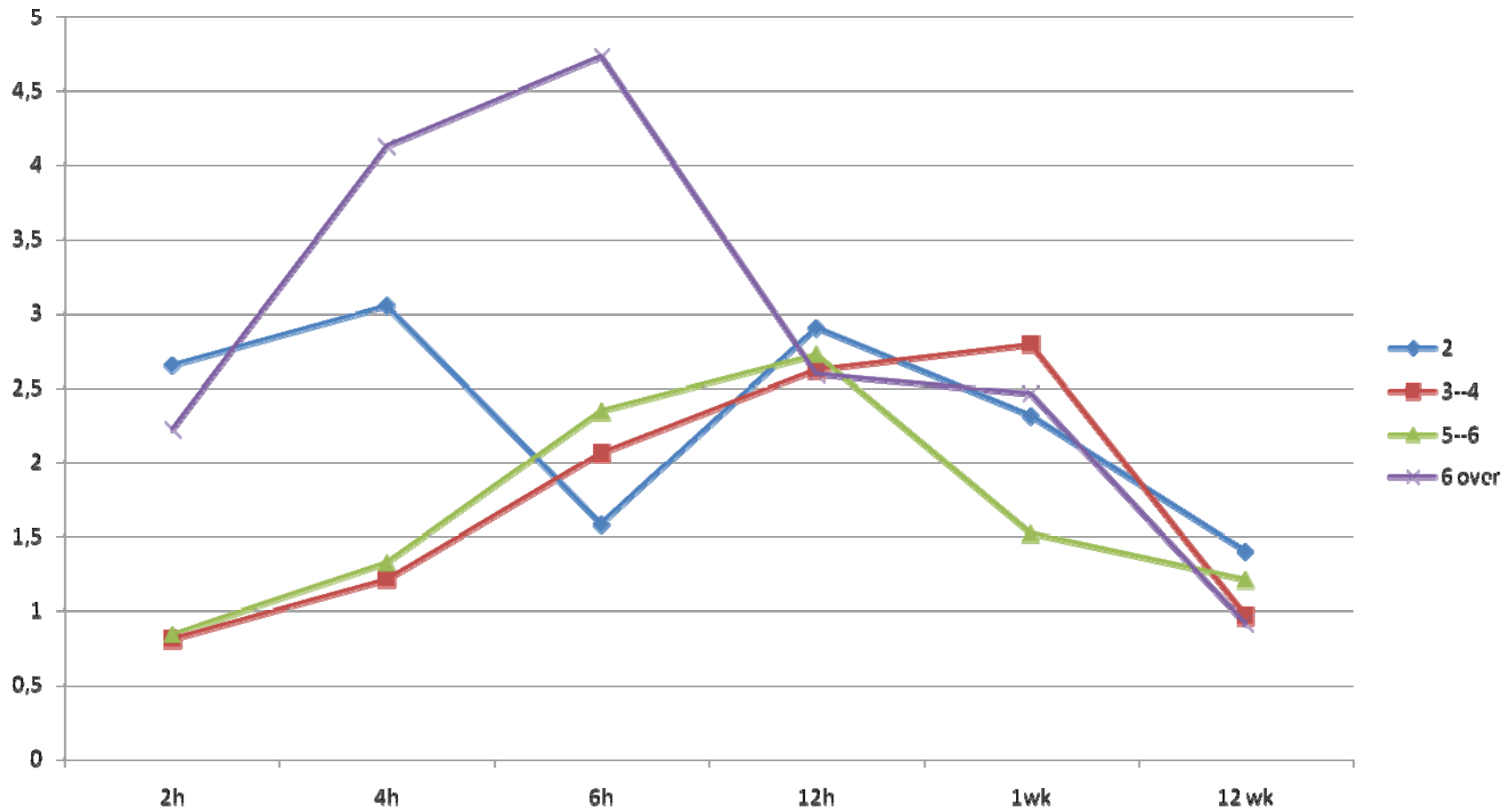
- Calcium, magnesium, zinc and iron were analysed by (AAS) atomic absorption spectrophotometry (according to VTT's instruction 4289-86), in which the milk sample is burned to ashes by dry burning in +550 °C.
- The phosphorus was determined spectrometrically using a molybdenum blue method (IDF 42B:1990) with Department of Food Technology's Perkin Elmerin machine (UV/VIS Spectrometer, Lambda 2).
- The fatty acid content was determined with a Mikromat gas chromatographer (GLC), into which a HRGC 412 integrator was attached.

Results I

- The breed, the stage of lactation and the parity had an impact on the mare's milk composition.
- The dry matter content was highest at foaling, especially due to its high protein content - then the content decreased, and increased again towards the end of the lactation.
- The ash/mineral content was highest at foaling, and after that it lowered evenly until the end of the lactation.

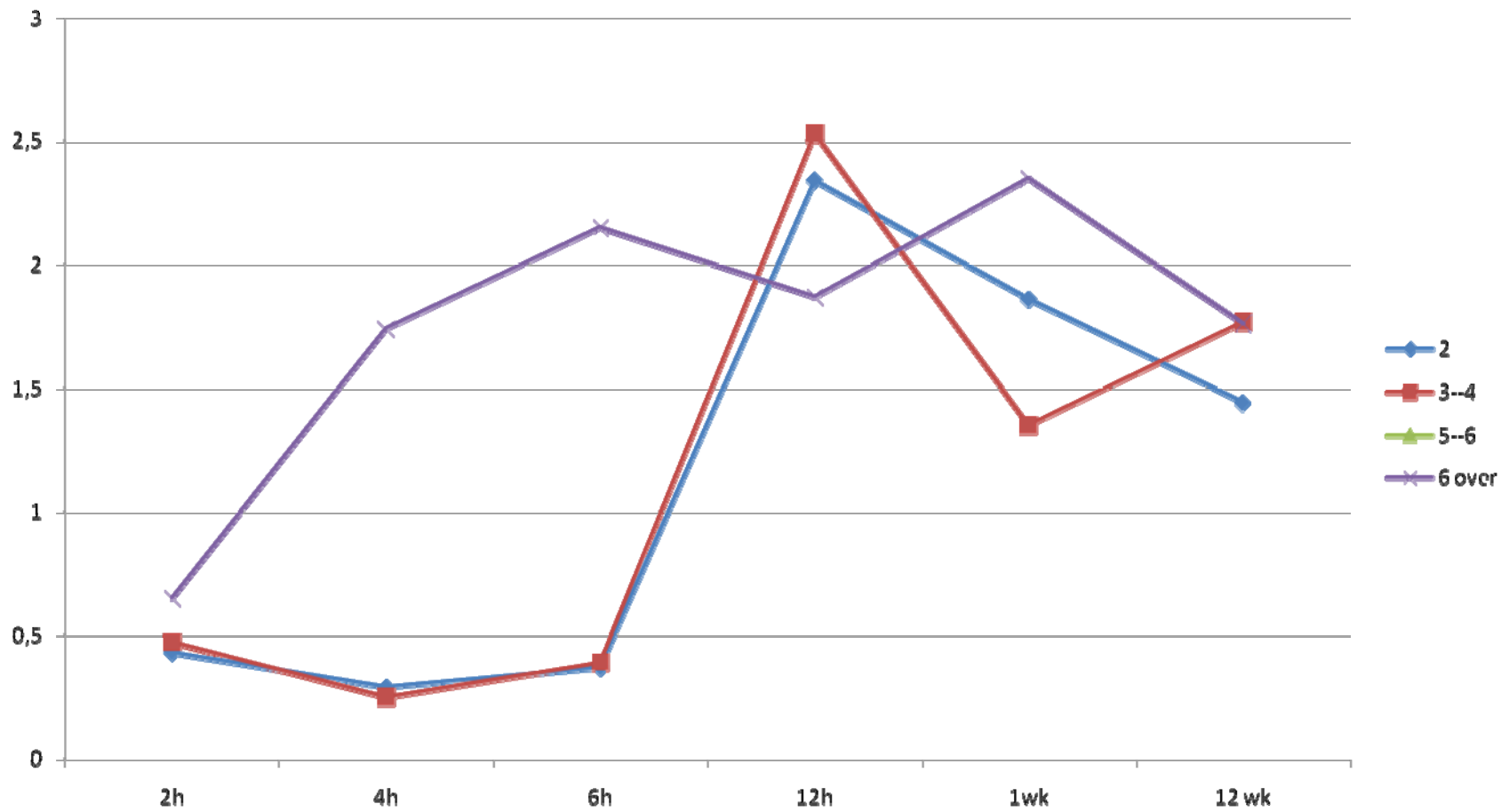
Results: Finn Mare Milk Fat%

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 W



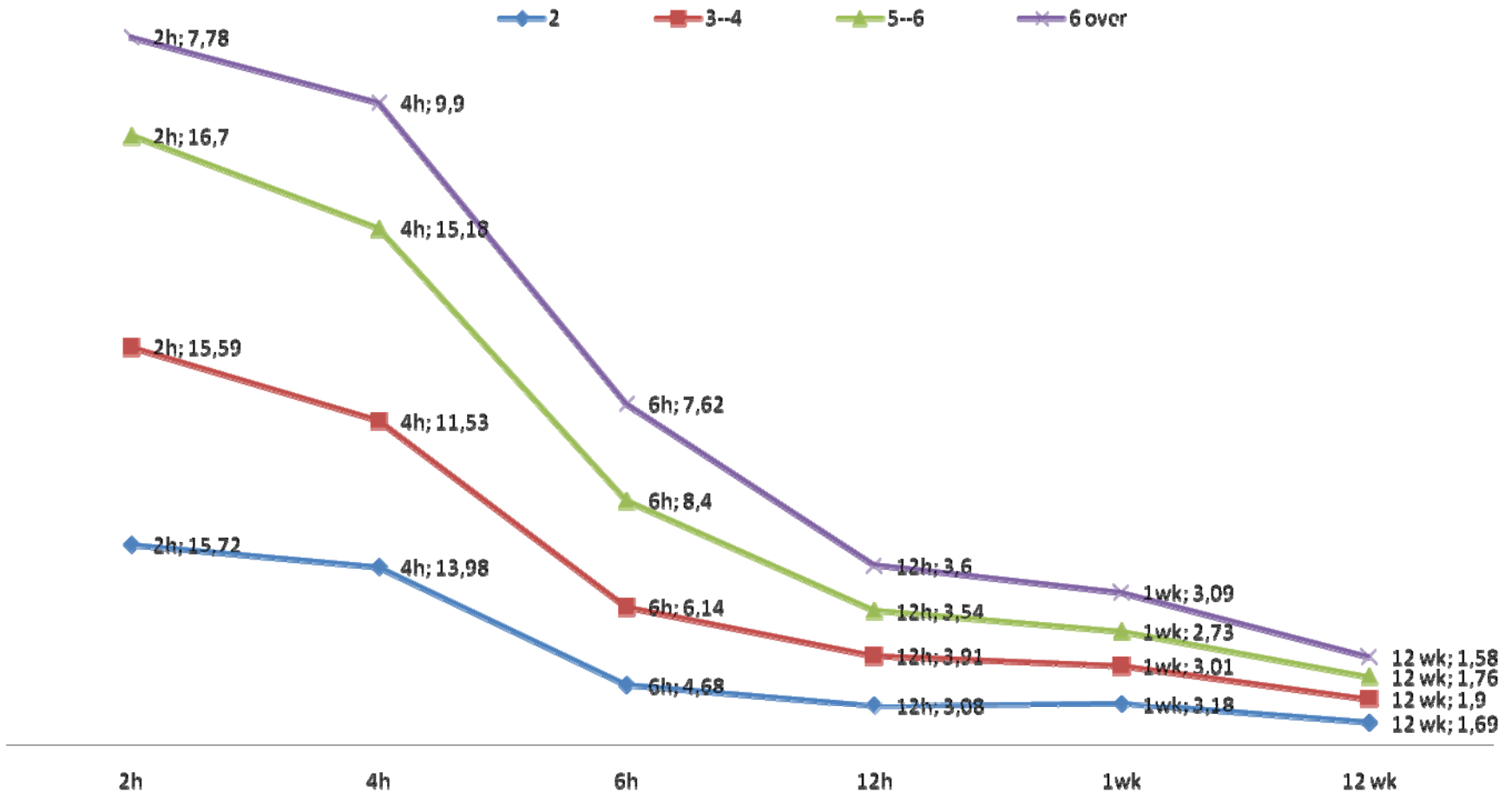
Results: American Warm Blood Fat%

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 W



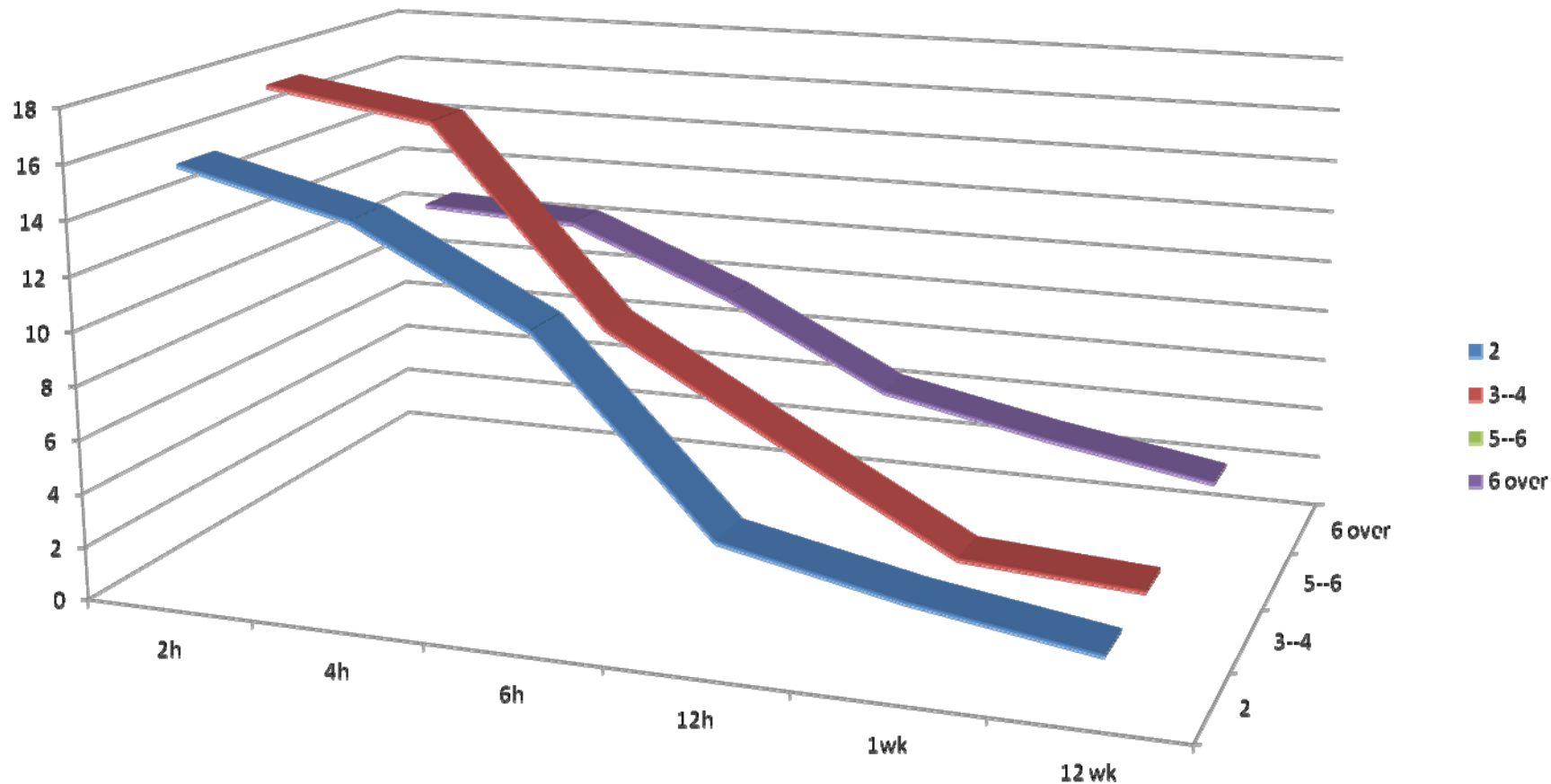
Results: Finn Mare Milk Protein %

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 WEEKS



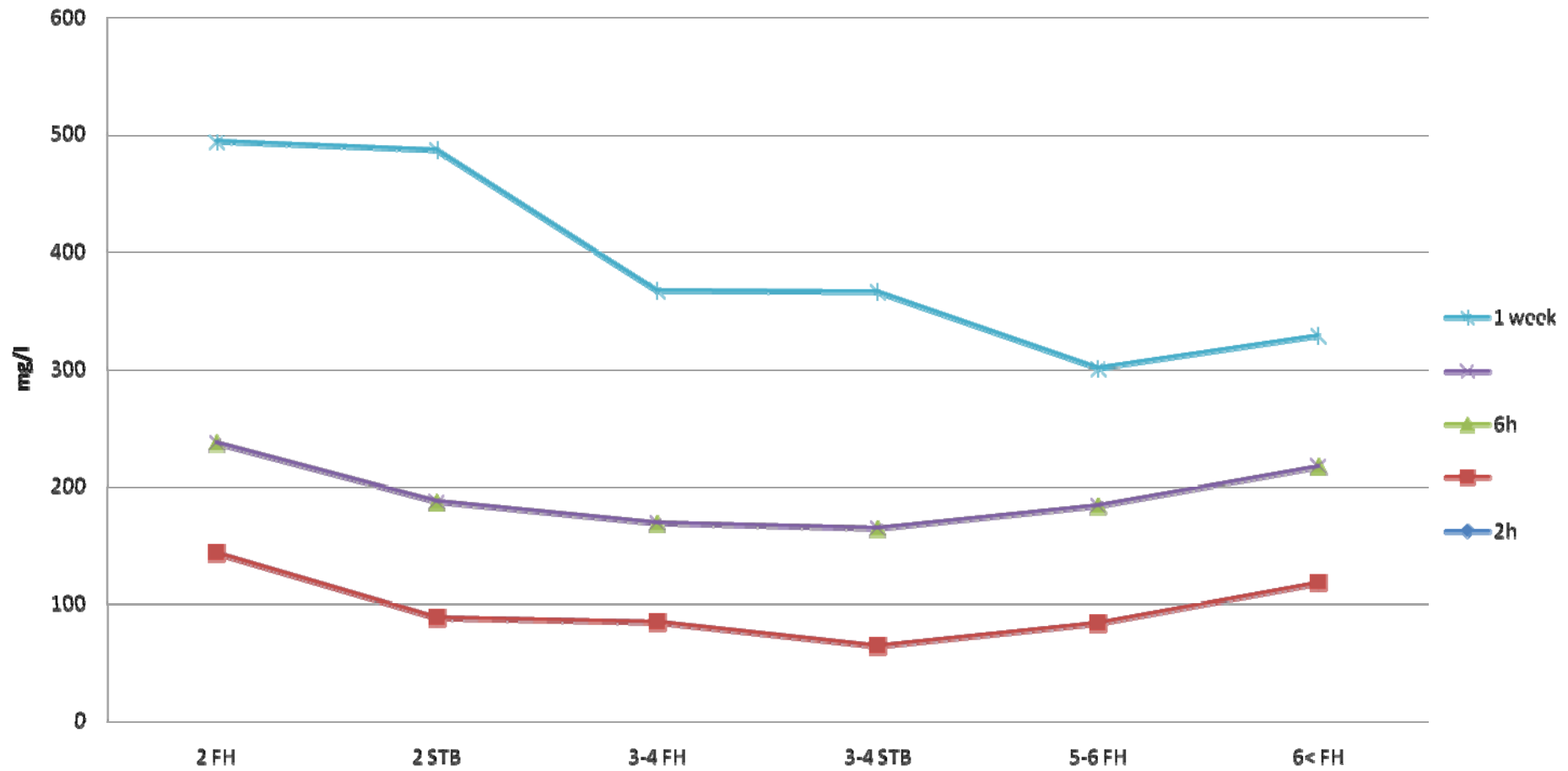
Results: American Warm Blood Protein %

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 WEEKS



Results: Calcium mg/l

FH=Finn Horse, STB=American Warm Blood

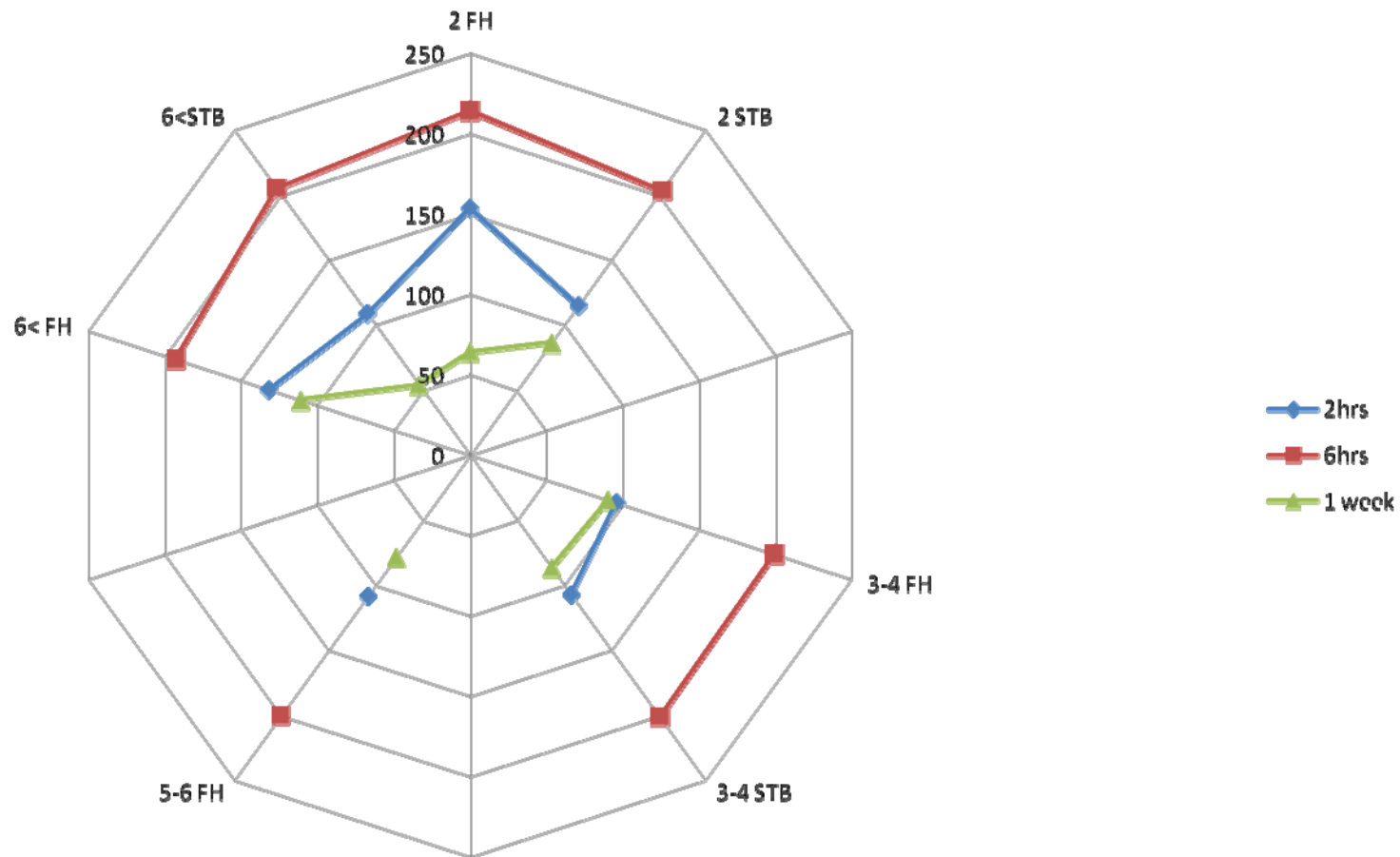


EAAP 2010, Heraklion (Gr), August 23th – 27th

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Results: Phosphorus mg/l (FH&STB)



Results II

- The percentages of palmitic- and the oleicacids and the total unsaturated fatty acids were directly related to mares' parity in both breeds.
- The fatty acid composition in mare's milk is comparable with human milk.
- Colostrum (2-12 hrs after foaling) turns out to be especially valuable & suitable for the newborn human and equine individuals

Results III

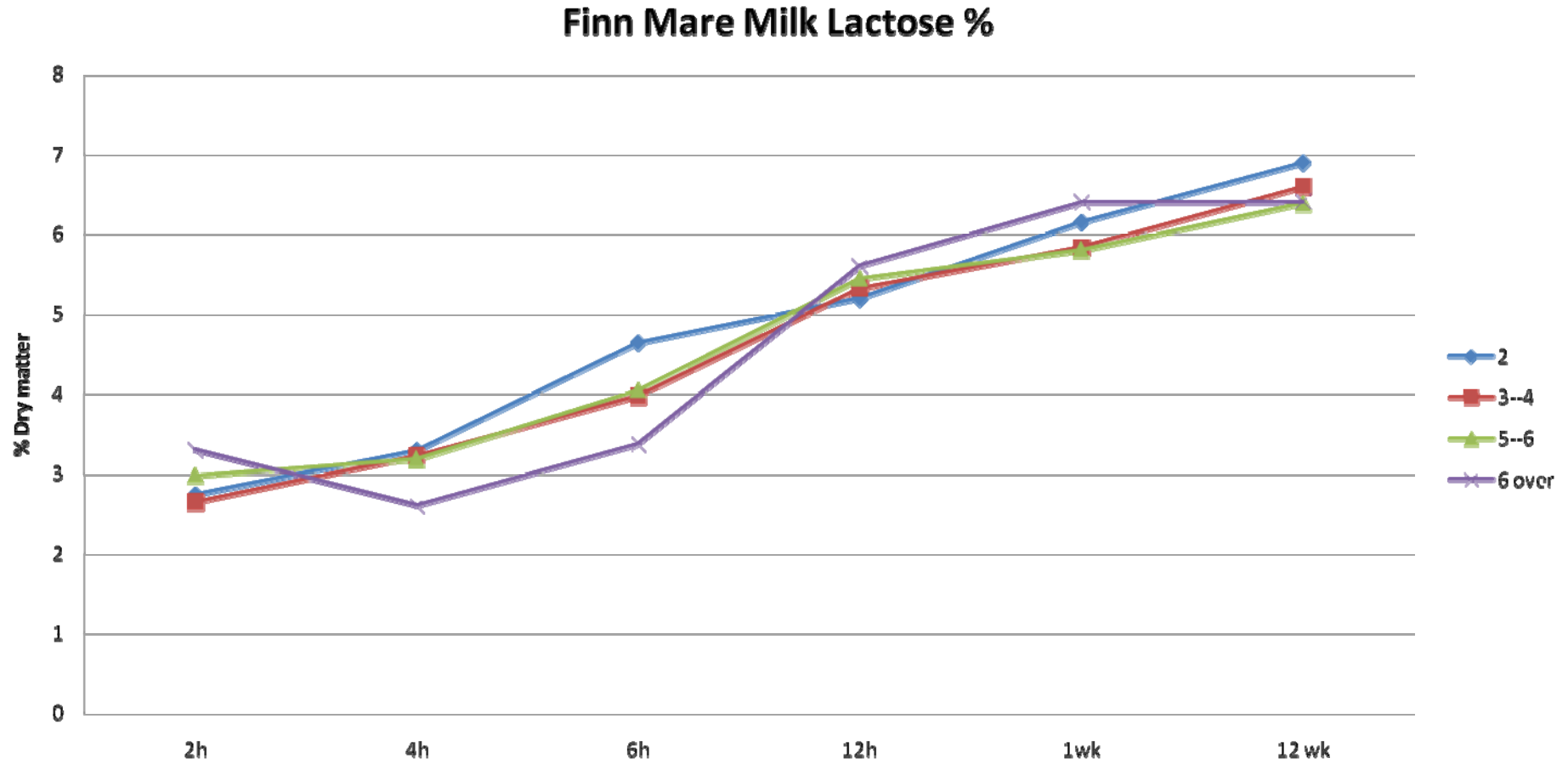
- The protein content of the STB mare's milk was higher during the first 12 hours compared to the FH milk.
- The total solids, fat and protein contents decreased as the number of lactations increased, where as the lactose and the ash contents did not vary or decreased only slightly.
- The effect of the lactation period on the milk composition was similar for both breeds.

Results IV

- The milk of the STB mares contained more unsaturated fatty acids (C18:1; C18:2; C18:3) compared to the FH milk.
- The percentages of palmitic- and the oleicacids and the total unsaturated fatty acids were directly related to mares' parity in both breeds.
- Mg & Zn decreased after foaling; Fe as well, but increased towards 12 weeks

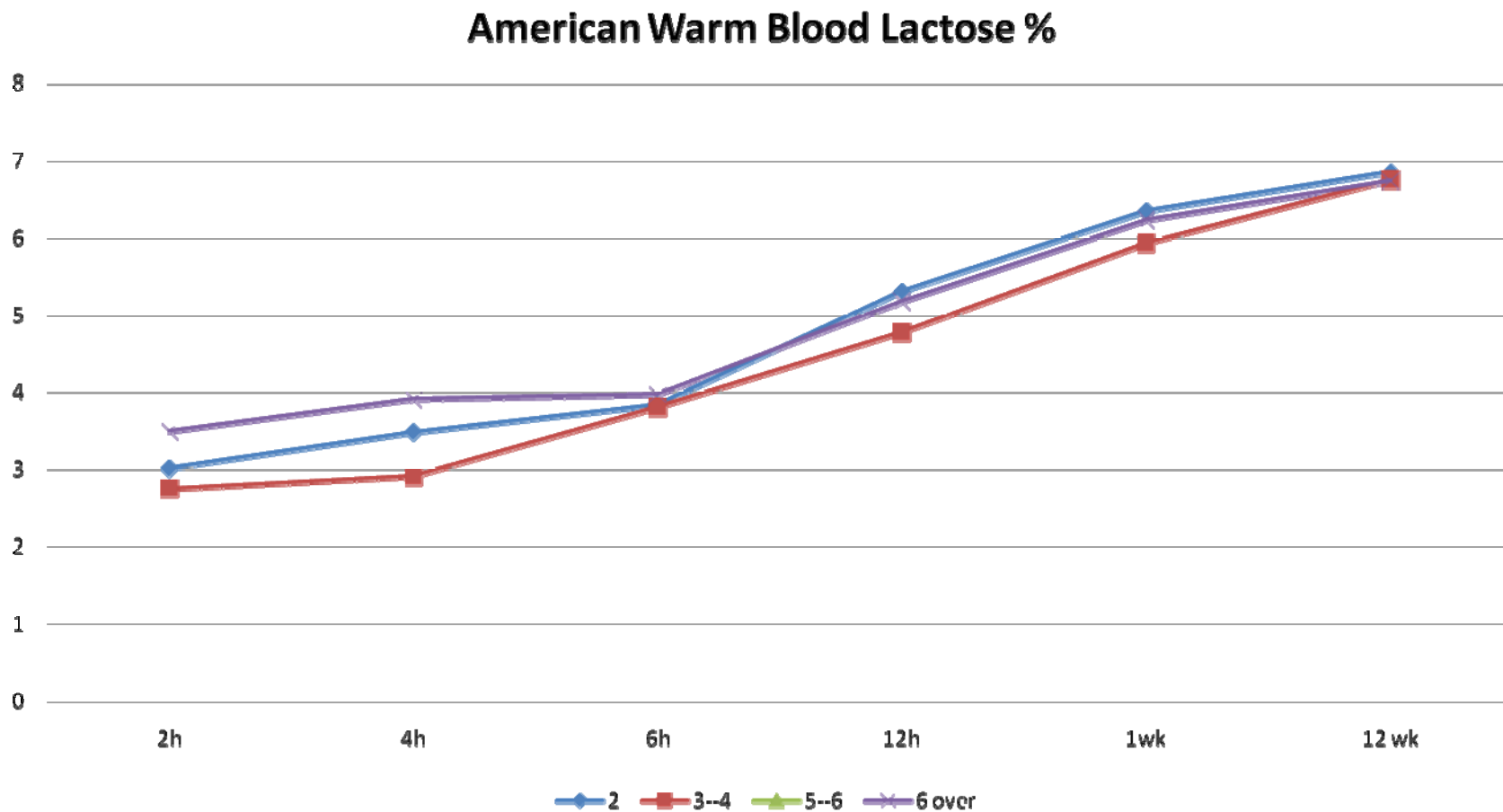
Results Finn Horse Lactose %

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 WEEKS



Results American Warm Blood Lactose %

LACTATION PERIOD FROM BIRTH 2, 4, 6, 12 HRS, 1 WEEK AND 12 WEEKS



Conclusions and suggestions

- According to our study, the lactation phase was similar for both breeds.
- The total solids, fat and protein contents decreased as the number of lactations increased, where as lactose and the ash contents did not vary, or decreased slightly.
- For the STB, their milk had lower fat content during the first lactation week compared to the FH.
- Due to its composition, mare's milk is suitable for infant nutrition when produced and handled in excellent hygiene conditions.

Thank You for your attention!



Questions?

