



INTERNATIONAL SYMPOSIUM "THE RISE OF CAMEL MILK MARKETING IN THE MEDITERRANEAN BASIN" BUSINESS OPPORTUNITIES AND SUSTAINABLE DEVELOPMENT PATHWAYS

Camel milk composition and its potential health effect

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Milk composition of some mammals

#	Species	Fat, %	Protein, %	Lactose, %	Ash, %	Total solids, %
1	Antelope	1,3	6,9	4	1,30	25,2
2	Donkey	1,2	1,7	6,9	0,45	10,2
3	Buffalo	10,4	5,9	4,3	0,80	21,5
4	Camel	4,9	3,7	5,1	0,70	14,4
5	Cow (Holstein)	3,5	3,1	4,9	0,70	12,2
6	Goat	3,5	3,1	4,6	0,79	12,0
7	Horse	1,6	2,7	6,1	0,51	11
8	Human	4,5	1,1	6,8	0,2	12,6
9	Kangaroo	2,1	6,2	Trace	1,2	9,5
10	Seal	53,2	11,2	2,6	0,7	67,7
11	Whale	34,8	13,6	1,8	1,6	51,2

THE GROSS COMPOSITION OF CAMEL MILK IN THE WORLD

References from 1905 to 2019 from Dromedary, Bactrian and hybrid camel of all the world

#	Parameter	Value
1	Fat	3,68 ± 1,0
2	Protein	3,28 ± 0,59
3	Lactose	4,47 ± 0,66
4	Ash	0,81 ± 0,19
5	Dry Matter	12,2 ± 1,62

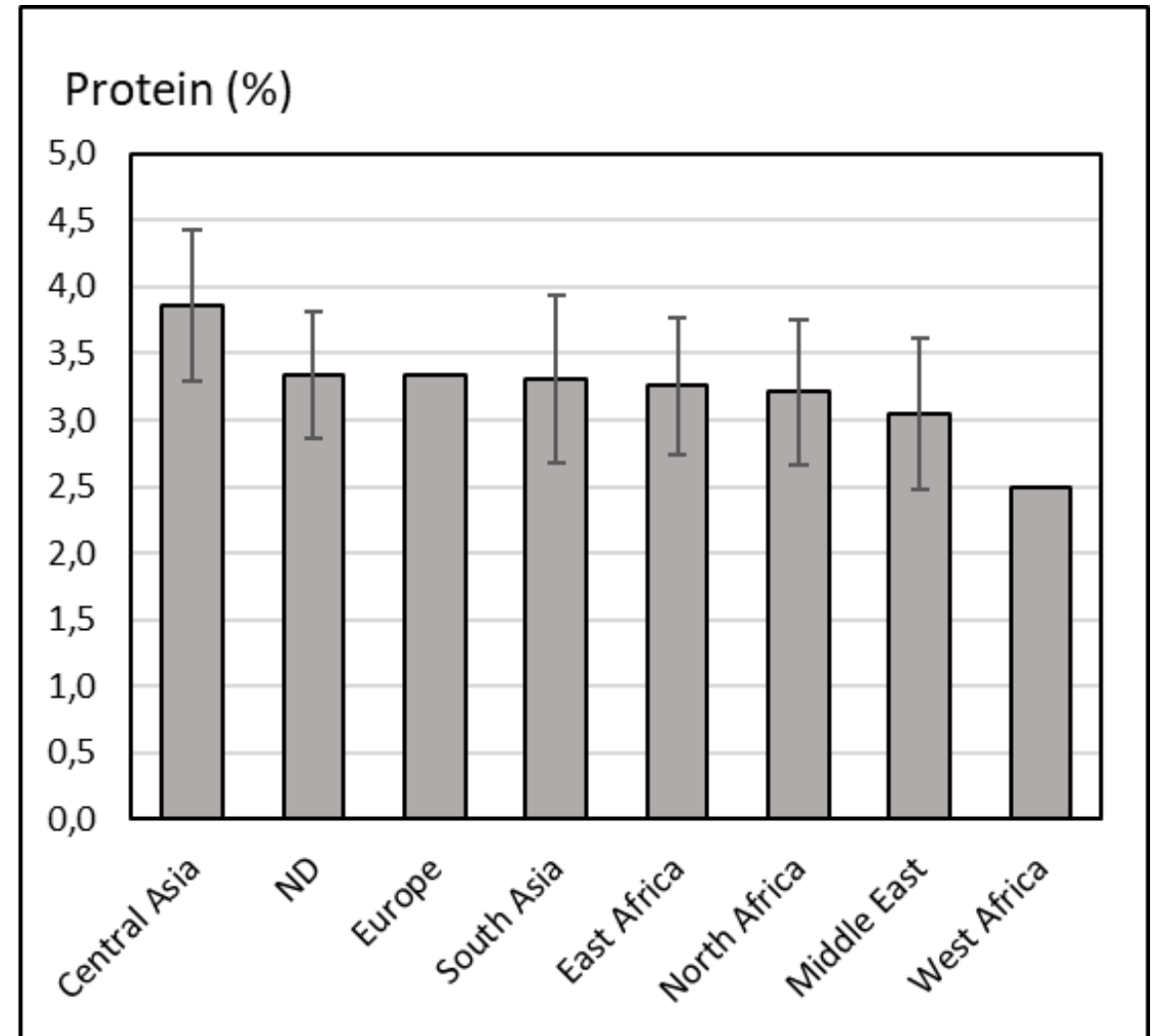
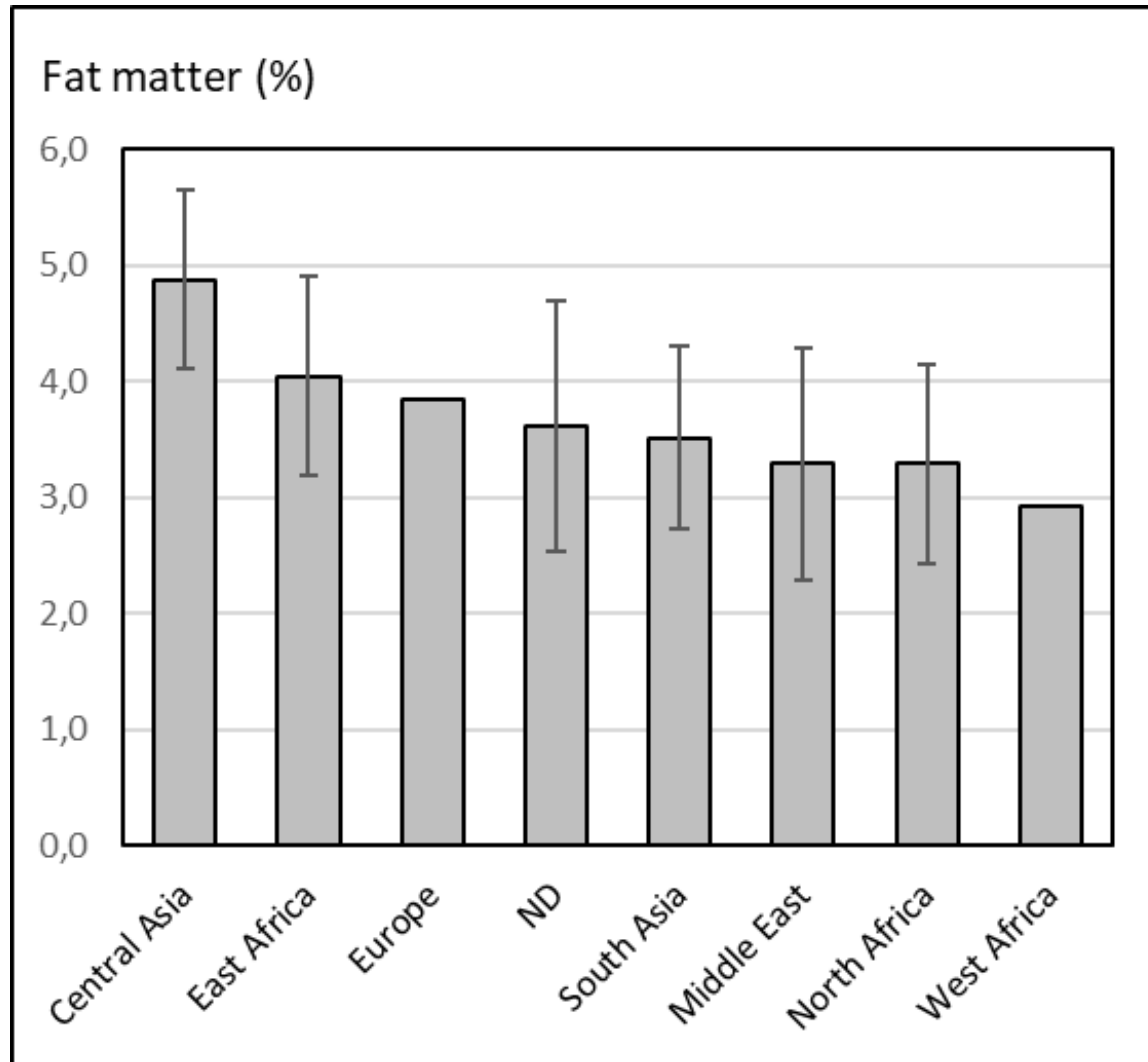
Chapter 2 Camel Milk Composition and Nutritional Value

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ABSTRACT

If gross composition of camel milk is roughly comparable to cow milk, fine composition shows significant differences explaining potential health benefit for regular consumers. The main particularities of camel milk are (1) better atherogenicity index thanks to its higher proportion of mono-unsaturated and polyunsaturated fatty acids compared to other milks, (2) different proportion of caseins than cow milk leading to difficult clotting, (3) lack of β -lactoglobulin, often responsible for cow milk allergy, (4) slightly higher concentration in antibacterial and immunity support proteins with higher bio-activity than in

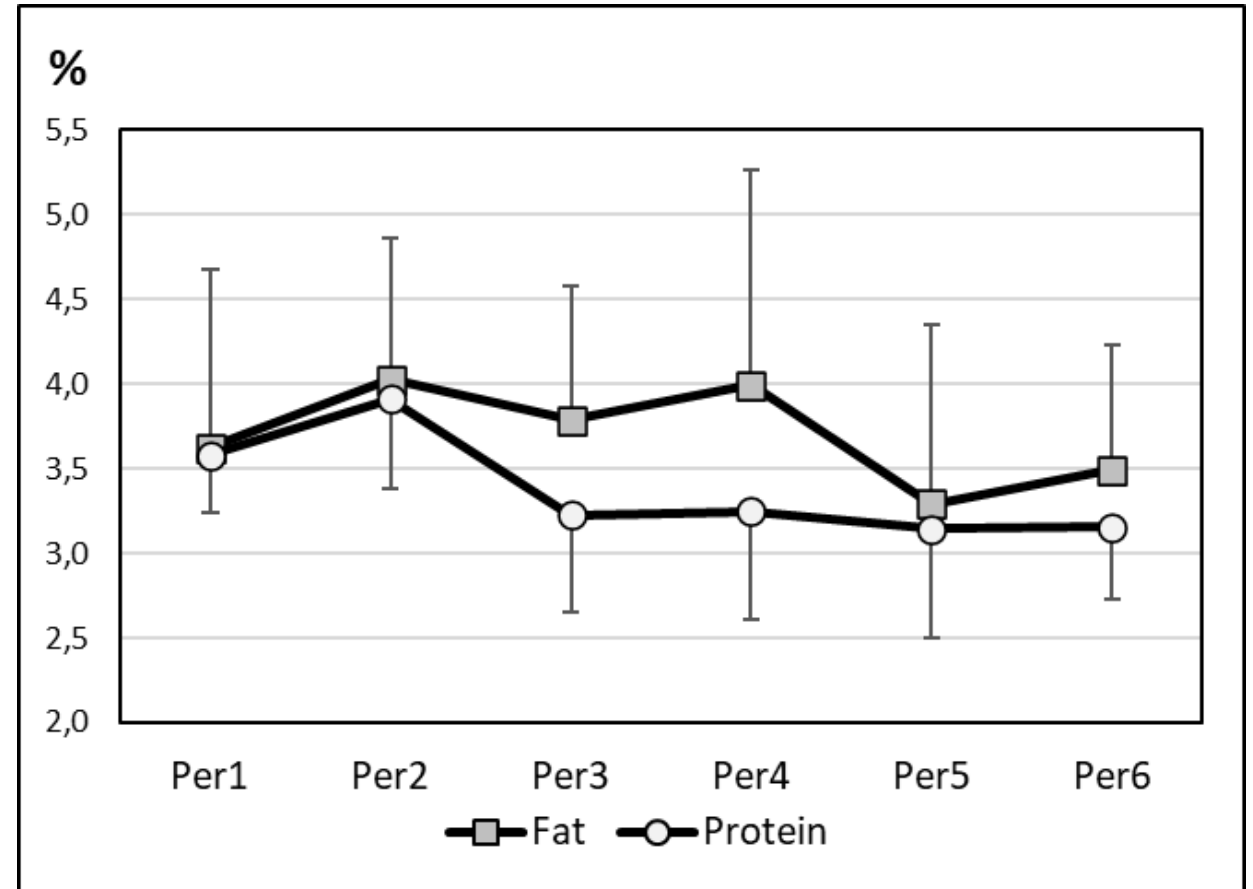
The composition according to different part of the world



Camel milk composition between 1905 to 2019

The 121 references were gathered into 6 periods:

- Period 1 (per1) – 1905-1960 with 6 references,
- Period 2 (per2) – 1961-1980 with 12 references,
- Period 3 (per3) – 1981-1990 with 23 references,
- Period 4 (per4) – 1991-2000 with 32 references,
- Period 5 (per5) – 2001-2010 with 18 references,
- Period 6 (per6) – 2011-2019 with 30 references.



MAIN VARIATION FACTORS OF GROSS COMPOSITION



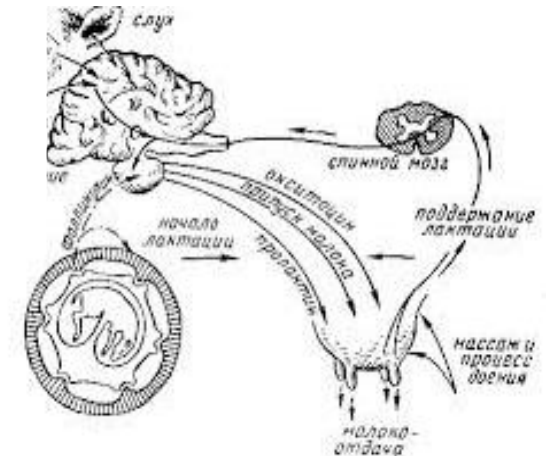
Comparison with Milk from Other Dairy Animals

Genetic Factors of Variation



Feeding and Management Effect

Physiological Stage

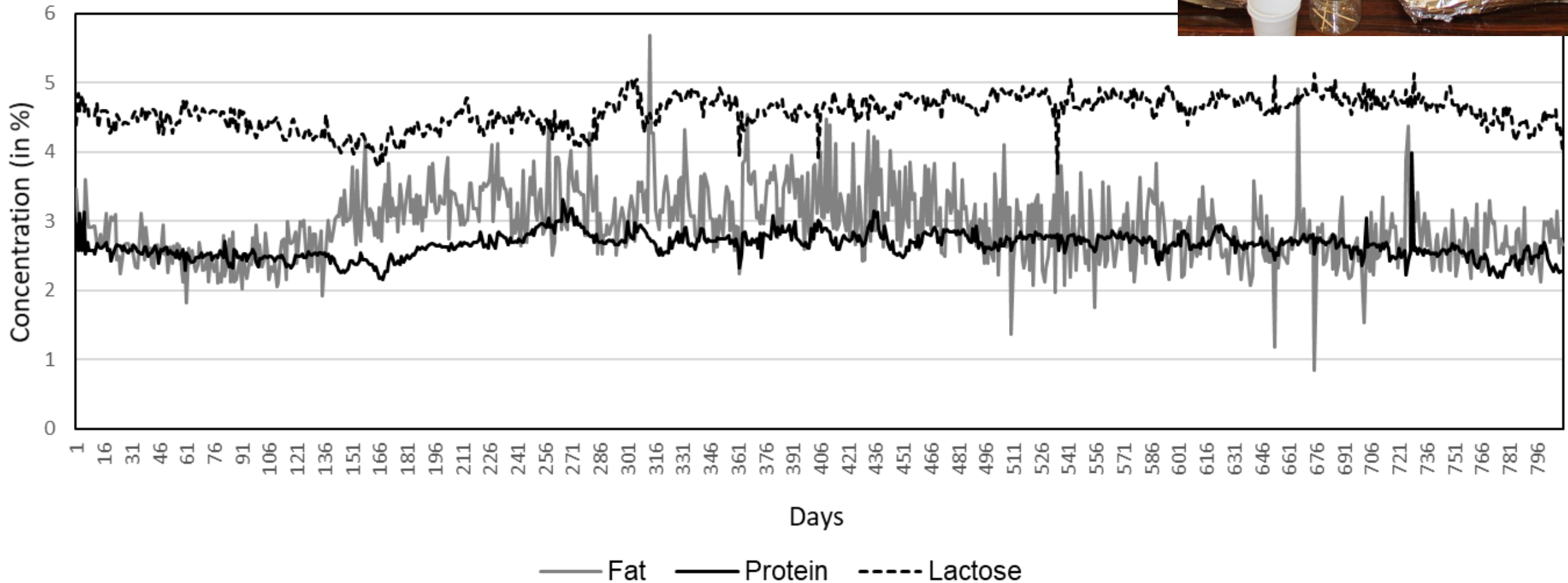


Kazakhstan case - differences in the gross composition of Bactrian, dromedary and hybrid milk in animals reared in the same farms

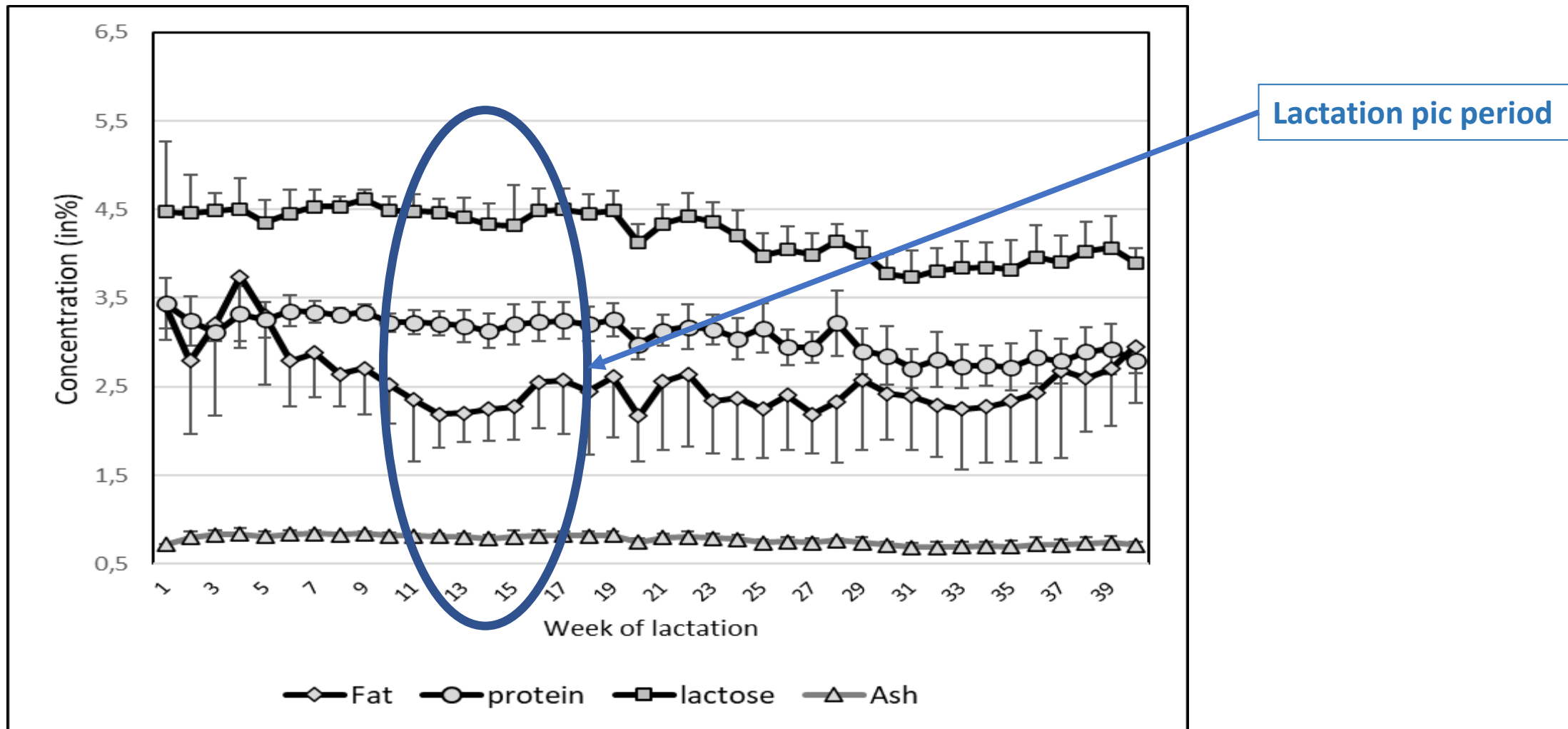


Parameters	Bactrian	Dromedary	Hybrid	<i>P</i> value
Fat	6.67 ± 2.93	5.94 ± 2.26	6.09 ± 1.81	0.04
Lactose	2.77 ± 0.96	3.12 ± 0.92	3.04 ± 0.60	0.45
Vit C (mg/l)	177 ± 109	152 ± 91	133 ± 133	<0.001
TP	5.23 ± 1.17	4.76 ± 1.13	5.15 ± 1.59	0.11
Ca (g/L)	1.303 ± 0.287	1.163 ± 0.273	1.257 ± 0.268	0.003
P (g/L)	1.075 ± 0.177	0.915 ± 0.190	1.067 ± 0.273	<0.001
Fe (mg/L)	2.11 ± 1.63	1.93 ± 1.06	2.01 ± 0.78	0.55

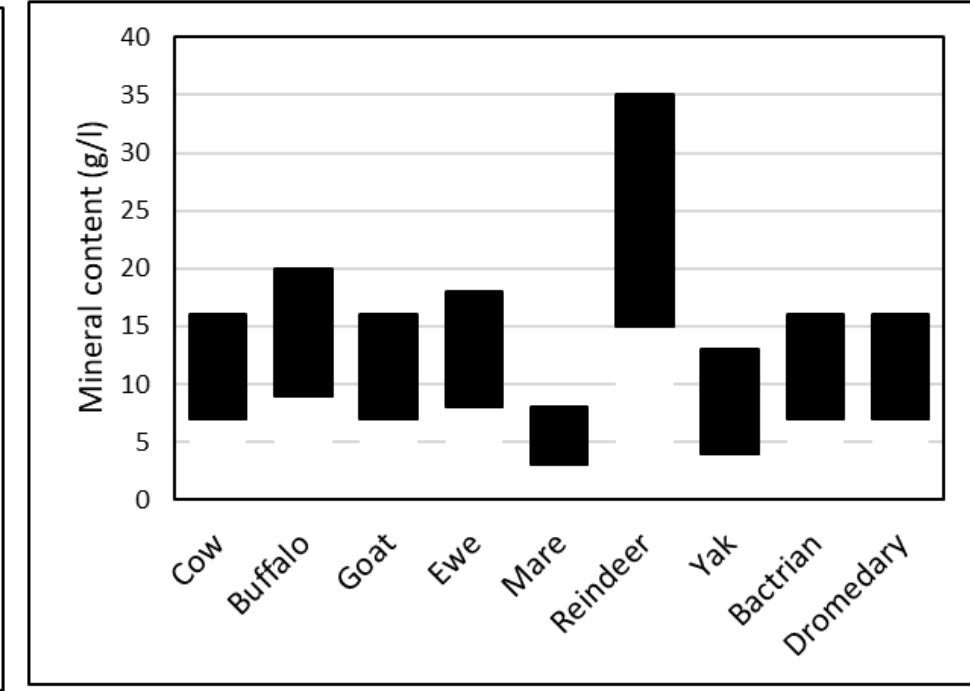
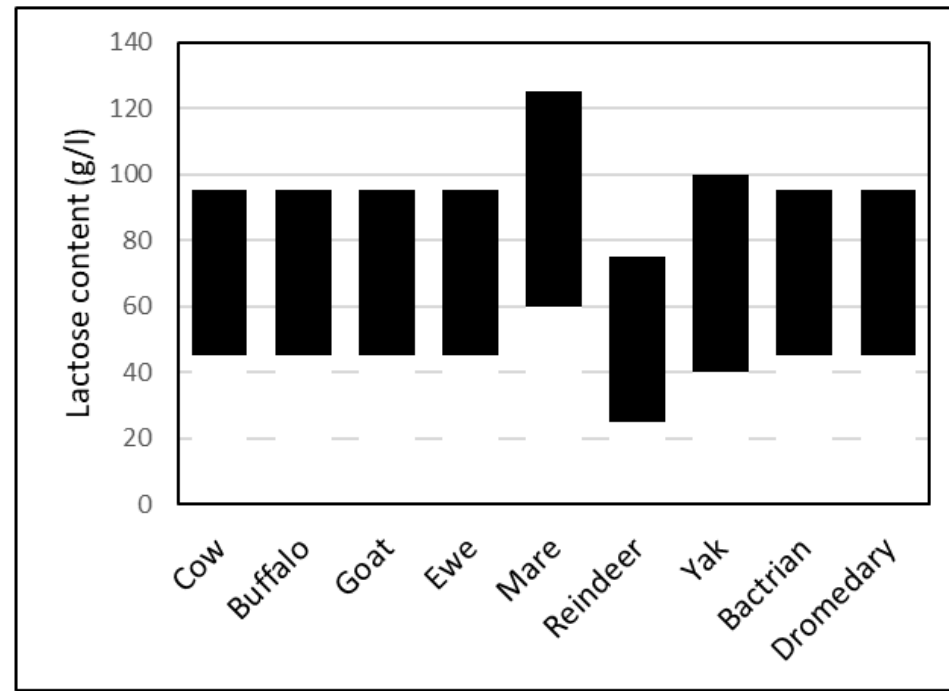
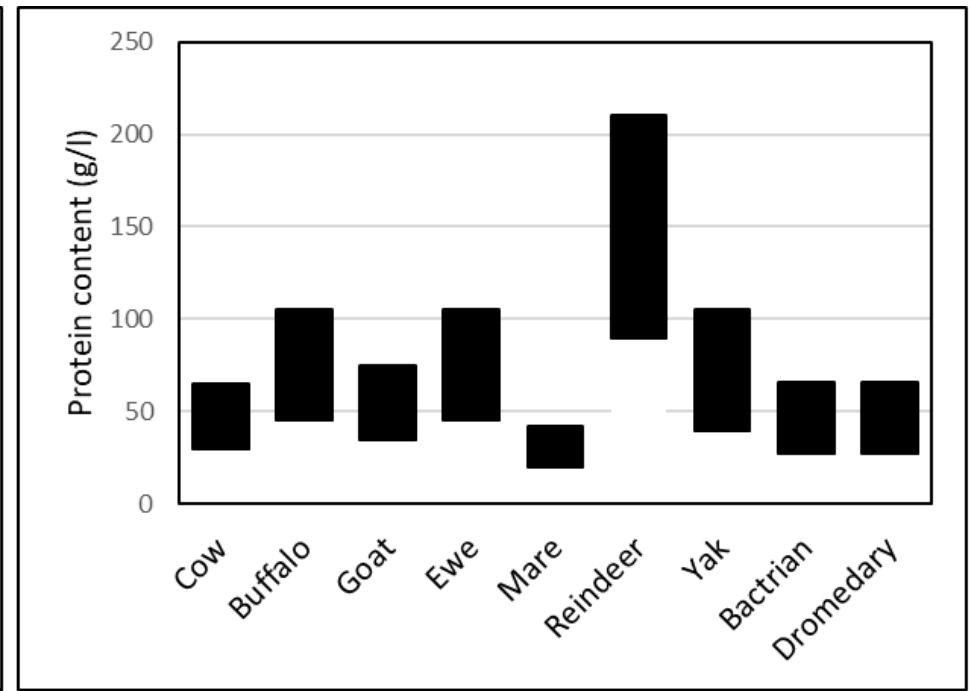
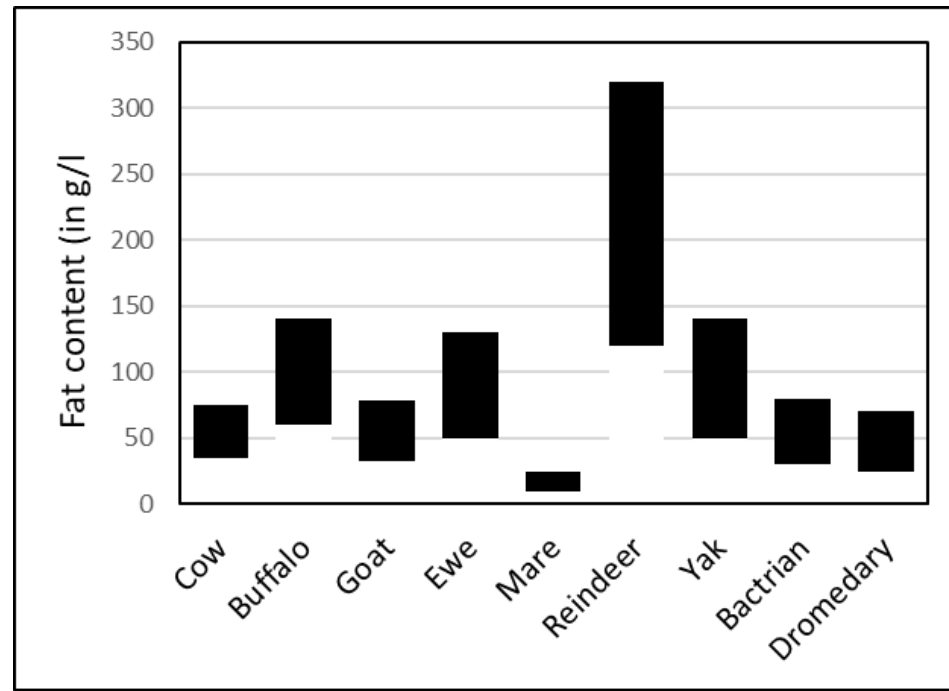
Saudi Arabian case – monitoring of dromedary milk fat, protein and lactose during lactation daily



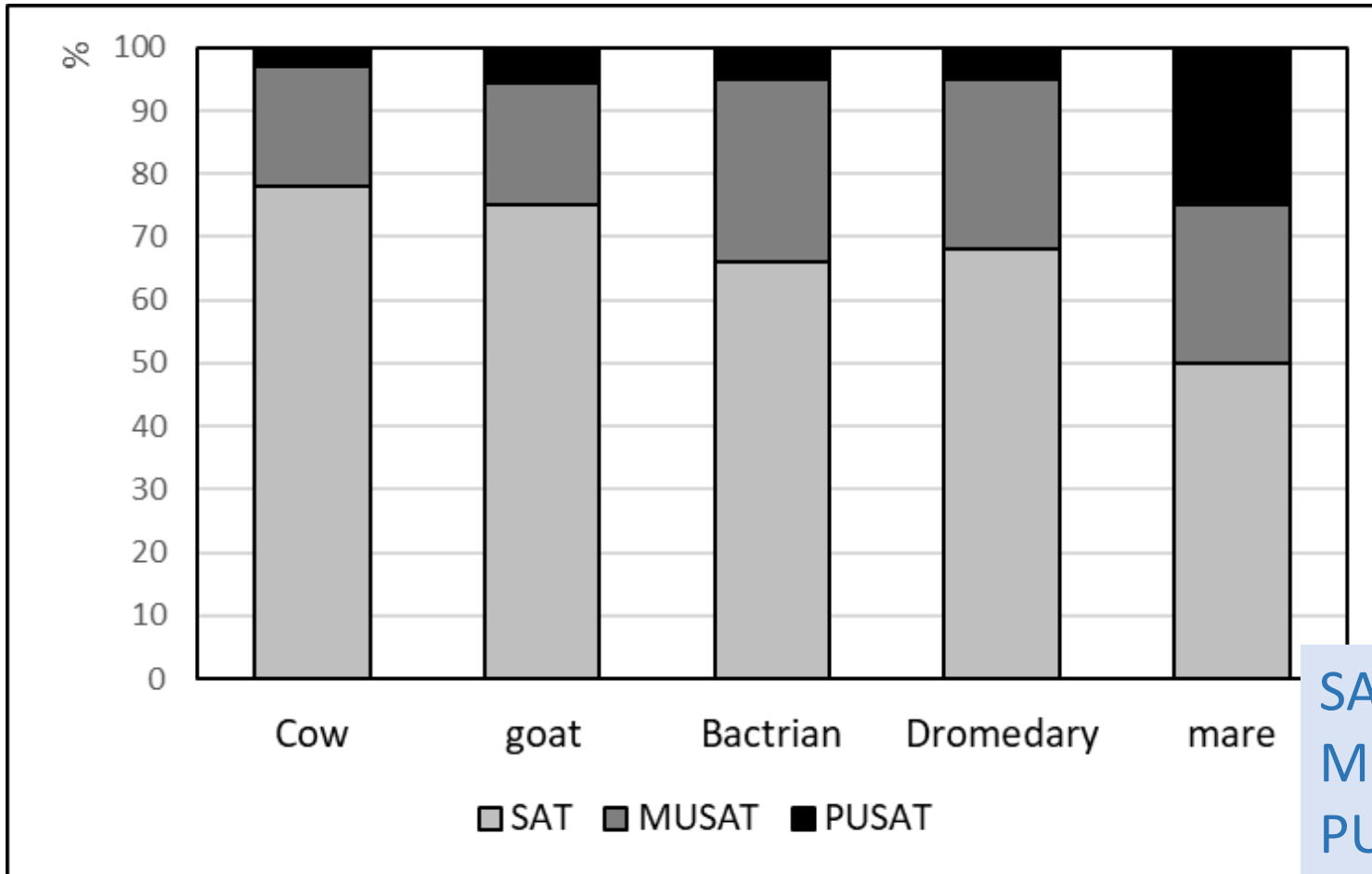
Saudi Arabian case – monitoring of dromedary milk composition during lactation weekly



Comparison with Milk from Other Dairy Animals



Deeper composition of camel milk – fatty acid profile



SAT – **Saturated** fatty acid
MUSAT – **Monounsaturated** fatty acid
PUSAT – **Polyunsaturated** fatty acid

Cholesterol content in camel milk

Controversy because 2 scientific opinion exist :

- According to Kamal and Salama, 2009; Raziq et al., 2008 poor level of cholesterol
- According to Gorban and Izzeldin, 1999; Konuspayeva et al., 2008 high level of cholesterol



So, truth or false?



Truth or False?



ORIGINAL ARTICLE

Comparative milk and serum cholesterol content in dairy cow and camel

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KEYWORDS

Milk;
Serum;
Camel;
Cow;
Cholesterol;
Fat

Abstract In order to compare cholesterol contents in cow and camel milk in similar farming conditions, milk and blood of seven cows and seven camels maintained at normal diet at the middle of lactation were sampled at morning and evening, then after two weeks of keeping them at low protein diet. The cholesterol content in camel milk (5.64 ± 3.18 mg/100 g, SD) was not significantly lower than in cow milk (8.51 ± 9.07 mg/100 g, SD). Fat contents in cow milk were higher. Cholesterol/fat ratios were similar in the two species (camel: 225 ± 125 mg/100 g fat; cow: 211 ± 142 mg/100 g fat). The serum cholesterol concentration was significantly higher in cow (227.8 ± 60.5 mg/100 ml) than in camel (106.4 ± 28.9 mg/100 ml). There was a significant difference between morning and evening milking in milk fat compositions and concentrations in cholesterol. Fat levels increased in cow after two-week low energy-protein diet.
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1. Introduction

Cholesterol is a sterol commonly present in milk and meat products intended for human consumers. As the nutritionists claimed, for a long time, a relationship exists between high

blood cholesterol concentration and heart failure (Hofvendahl, 1971), and many medical advices push to reduce the cholesterol intake, even if the effect of cholesterol on health is not completely clarified (Parodi, 2009; Alabdulkarim et al., 2012).

Camel meat is known for its low cholesterol content (Kadim et al., 2008) making it a commercial argument by the promotion of the healthy image of this product on the meat market. Although everyone agrees on the low cholesterol level of camel meat compared to other species, yet the situation is controversial for camel milk. Many workers argue that camel milk contains less cholesterol than cow milk (Kamal and Salama, 2009; Raziq et al., 2008) while others reported the

Non significant difference
in cholesterol content in
camel and cow milk

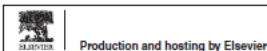
5.64 ± 3.18
mg/100 g, SD
camel

8.51 ± 9.07
mg/100 g, SD cow

Cholesterol/fat ratios
similar

camel: 225 ± 125
mg/100 g fat;

cow: 211 ± 142
mg/100 g fat).



<http://dx.doi.org/10.1016/j.jksu.2014.11.003>

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En fait, le taux de cholestérol dépend de la teneur en matière grasse du lait (Faye et al., 2015)

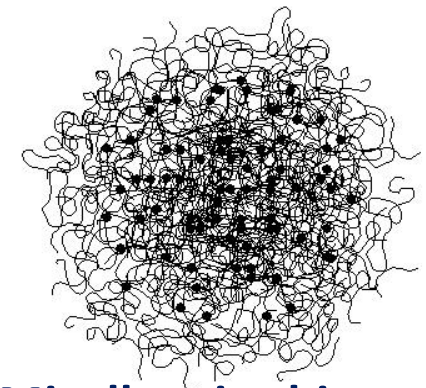
Le taux de cholestérol est faible quand la matière grasse est en faible concentration

Dans le lait de Bactriane, plus gras que le lait de dromadaire, le taux de cholestérol est élevé

Un cholestérol faible n'est pas une caractéristique de l'espèce: le rapport cholestérol/MG est semblable à celui des autres espèces.

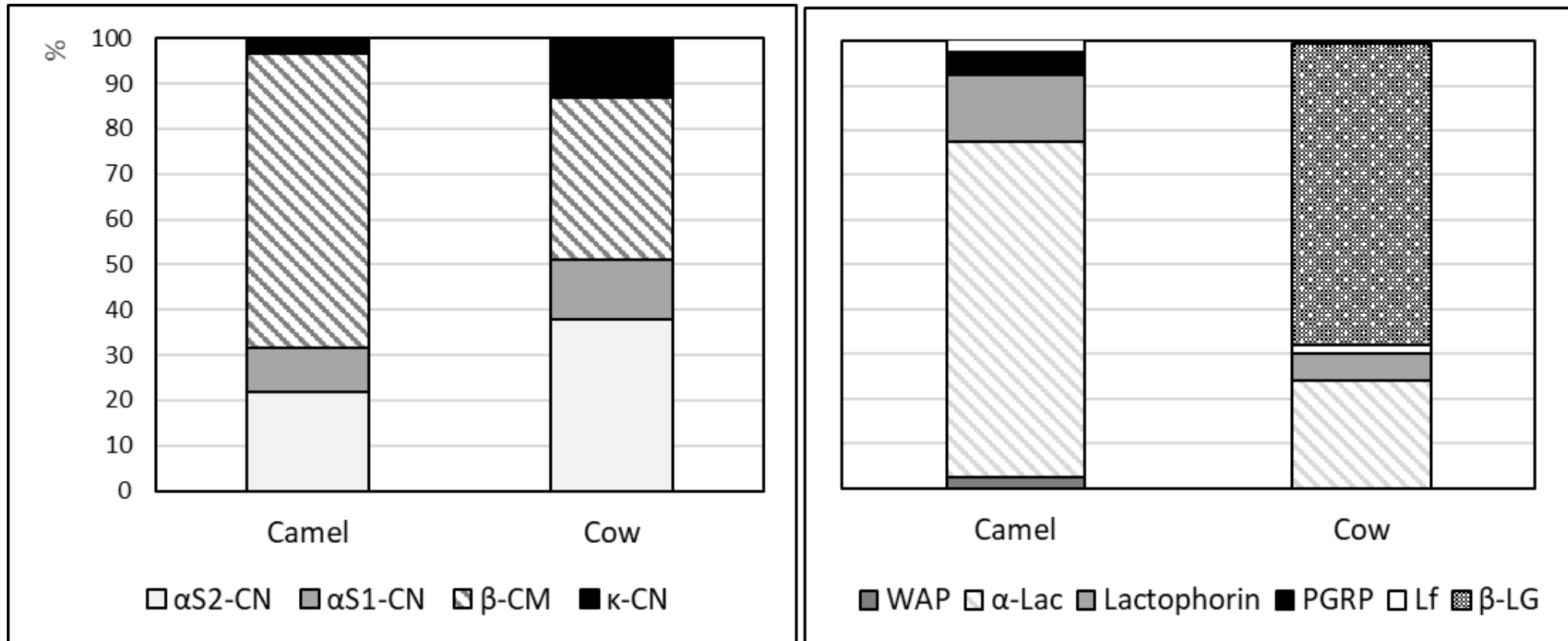


Deeper composition of camel milk – proteins profile



Micelles size biggest

Comparison with camel and cow milk for casein profile and for whey proteins



L'exemple d'un mythe: la lactoferrine, molécule miracle?

Lf est une glycoprotéine avec une forte affinité pour le fer, même dans les produits fermentés, d'où son effet antibactérien.

Lf joue plusieurs rôles biologiques reconnus.

- antibactérien (Vorland et al., 1999)
- antimicrobien (Farnaud and Evans, 2003)
- antiviral (Keda et al., 2000)
- antifongique, anti-inflammatoire (Britigan et al. 1994)
- antioxydant et immunomodulateur (Legrand et al., 2004)
- Utile dans diverses applications thérapeutiques (Massodi et al., 2009)
- Effet inhibiteur puissant du virus de l'hépatite C (Liao et al., 2012)



La lactoferrine cameline dans les articles scientifiques

- ❑ El-Agamy , 1992: Première mention de la Lf cameline
- ❑ El-Gawad et al., (1996): la première quantification (par HPLC): sa concentration dans le lait de chamelle cru est décrotée 10 plus élevée (2.48 mg/mL) que dans le lait de vache (0.07-0.28 mg/mL).
- ❑ Zhang et al., (2005): quantification par SDS-PAGE et densitométrie: 0.7 à 2.1 mg/mL dans le lait de Bactriane soit 10 fois les valeurs bovines.



Ces résultats ont été citées plusieurs fois dans des publications suivantes, concluant que le taux de Lf dans le lait de chamelle était à un très haut niveau expliquant ses vertus bénéfiques pour la santé.

Mais résultats controversés



Konuspayeva et al., 2007 par immunodiffusion radial: concentration entre 0.170 et 0.209 mg/mL

Utilisant la même méthode:

Elagamy (2000), El Hatmi et al., (2006), Kappeler et al., (1999): 0.140 and 0.220 mg/mL



Enfin, la quantité de Lf dans le lait de chamelle est comparable à celui du lait de vache



La lactoferrine cameline

- ❑ Lf cameline a la plus forte activité antibactérienne compare aux autres mammifères (Conesa et al., 2008): au moins 4 fois plus que la Lf humaine ou ovine et 2 fois la Lf caprine.
- ❑ Lf cameline est thermorésistante et présente un haut degré de saturation en fer (Levieux et al., 2006).



Deeper composition of camel milk – lactate case

- The content of total lactate in camel milk was comparable to cow milk (1.82 – 2.49 g/l)
- The quantity of L-Lactate was 100 times more in camel milk compared to cow milk
- 2.21% of the total lactate vs 0.02% in camel and cow milk, respectively

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CONCENTRATIONS IN D- AND L-LACTATE IN RAW COW AND CAMEL MILK

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ABSTRACT

The present study gives some preliminary result regarding the content of the D- and L-lactate in cow and camel milk. Twenty dromedary camel milk samples and 3 cow milk samples from Kazakhstan were analysed to determine the lactate forms in order to compare these two types of milk collected in similar conditions. The content of total lactate in camel milk was comparable to cow milk (1.82 – 2.49 g/l), but the quantity of L-Lactate was 100 times more in camel milk compared to cow milk - 2.21% of the total lactate vs 0.02% in camel and cow milk, respectively. Further analyses are necessary to understand the role of the microflora present in each specific milk.

Key words: Camel milk, cow milk, lactate, stereoisomer

Camel milk contains on average the same quantity of lactose than cow milk (Al-Haj and Kanhal, 2010), *i.e.* 4.46 ±1.03 g/100ml according to the compilation of published references on camel milk composition (Konuspayeva *et al*, 2009) whereas it was 4.5 to 5.0 g/100ml in cow milk (Gaucheron, 2011). Yet, camel milk is reputed to have less effect on lactose intolerance than cow milk, and seems more easily metabolised by consumers, even those having no lactase (Cardoso *et al*, 2010). An explanation advanced

is not yet mature. The enzyme responsible of the degradation of D-Lactate is lacking in new-born and the consecutive accumulation of lactate could provoke acidosis (Racinet *et al*, 2013).

In Kazakhstan, the consumption of fermented dairy products from non-conventional species is popular (Konuspayeva and Faye, 2011). So, it could be useful to compare the proportion of D-lactate and L-lactate in cow and camel milk. No data is available on the literature. Some preliminary results

All the explanations in its composition?

High proportion of monounsaturated fatty acids: **DIETARY EFFECT**

Different lactose metabolism (100 times more L-Lactate): **LOW LACTOSE INTOLERANCE**

absence of β -lactoglobulin: **HYPO-ALLERGIC EFFECT**

Higher level of Lactoferrin: **ANTI-TUMOR AND ANTI-INFECTIVE EFFECT**

Large amount of vitamin C: **TONIC EFFECT**

Large amount of vitamin D: **BETTER ABSORPTION OF DIETARY CALCIUM**

Insulin-like protein (?): **BLOOD SUGAR REGULATING EFFECT**

Thanks for
your attention
and let's
continue to
speak about
medicinal
properties...

