List of table

,.also the normal lactation period for she camel ranged between 11-12 month.
The result showed that the respondent producers said that water deprivation affected on camel milk production and the milking periods for she camel was two times per day. The results revealed that the Goffar is the most diseases (83.3%) existent in the area , 16.7% grub ,this in Tlodi , while about 70% of respondent said Goffar and 30% grub this in Kadogli , but about 80% of respondents said Grub and 20% said Goffar this in Eldalanj.
The results showed that 75% of respondents consumers said that the they used camel milk for mullah and 10% for Madida and 15% for Ghee, this in Tlodi, while about 70% of respondents said used in mullah, 25% for Madida and 5% for Salat this in Eldalanj, while about 75% for Mullah, 10% for Salat and 15% for Madida this in kadogli.
The results showed that that about 77.8% of respondents producers said that the war had affected on camel milk production ,5.6% said Drought and 16.7% said raids this in Tlodi ,while about 40% of respondents said epidemics diseases ,20% said high cost of feeding and medicines this in kadogli ,but about 50% of respondents said war ,30% raids ,10% harsh environmental conditions and 10% said epidemics diseases this in ELldalanj.

اجريت هزه الدراسة لتقييم كمية انتاج واستهلاك لبن الابل فى ولاية جنزب كردفان والدراسة شملت ثلاث مناطق (تلودى و كادقلى والدلنج)حيث تم تصميم استبيانات وتم توزيعها فى ثلاث مناطق:
هزه الاستبيانات خاصة بمعدل استهلاك لبن الابل (فى الدلنج 20فى كادقلى وكزلك 20 ,فى تلودى 20) فى تلودى 18فى الدلنج و 10 ,فى كادقلى 10)وكذلك تم توذيع عدد من الاسبيانات فى كل الثلاث مناطق وهزه خصة بمعدل انتا ج لبن الابل فى الثلاث مناطق(

و بعد التتوزيع والتحليل الاحصائى عن طريق استخدام نظام التحليل ةالاحصائى (SPSS)

و 1.888±0.323338 :اظهرت الدراسة بأن معدل انتاج لبن الابل للناقة فى جنوب كردفان كان باللتركان 0.31623 3 ±2.1و 2±.000

كادقلى و الدلنج على التوالى بينما معدل الاستهلاك اليومى للبن الابل في جنوب كردفان ,فى كل من تلودى 0.029742_+0.43و 0.234333 ±0.5 , 0.25131 ±0.55للففرد كان

الدلنج وكادقلى على التوالى ,فى كل من تلودى

20% , 15%كزلك اظهرت الدراسة بان الزين لايفضلون شرب لبن الابل فى الثلاث مناطق كانو بنسبة 30%و

و 70%الدلنج و كتدقلى على التوالى بينما نسبة الذين يفضلون شرب لبن الابل كانت ,فى كل من تلودى 85%و 80%

وايضا اوضحت الدراسة بأن مالكى الابل جاءو من ولايات شمال ,فى كل من كادقلى و الدلنج وتلودى من مالكى الابل من قبيلة الحمر 60%كردفان ودارفور وان حوال

من الشنابلة هذه فى كل من الدلنج 35%منهم من قبيلة الحمر و 65%بينما ,من الشنابلة فى تلودي 40%

كذلك اظهرت الدراسة بان كل مالكى الابل اثبتو بان فترة الحلب للناقة كانت بمدل مرتين فى اليوم .وكادقلى فى ثلاث مناطق

الى 11وايضا اوجدت الدراسة بأن كل المالكين لابل اللبن قالو بأن فترة الحمل للناقة تتراوح فى مدى مابين شهر 12بينما الفترة بين العجول كانت ,شهر 12

كذلك اظهرت الدراسة بأن كل مالكين ابل لابل قالو بان نقصان المياه اثر عاى انتاج لبن الابل فى ثلاث

من المالكين للابل قالو بان الجوفار من اكثر الامراض الموجودة 83.3%كذلك اظهرت النتائج بأن ,مناطق قالو الجرب 16.7%فى منقطة تلودى و

منهم 30%من المالكين للابل قالو بأن الجوفار الاكثر وجودا فى منطقة كادقلى وبينما 70%بينما حوالى من المالكين للابل قالو بأن الجرب هو المرض الاكثر وجودا فى منطقة 80%ولكن حوالى ,قالو الجرب

.منهم قالو الجوفار 20%الدلنج و حوالى

من المستهلكين للبن الابل فى منطقة تلودى قالو بانهم يستخدمون لبن الابل 75%اظهرت النتائج بان حوالى منهم فى منطقة الدلنج 70%لكن ,منهم قالو للسمن 15%منهم قالو فى المديدة و 10%بينما ,فى الملاح منهم في منطقة كادقلى قالو 75%وكذلك ,فى السطة 5%فى المديدة و 25%يستخدمونه فى الملاح و .فى المديدة 15%فى السلطة و 10%يستخدمونه فى الملاح و

من المنتجيين للبن ا لابل فى منطقة تلودى قالو بأن الحرب قد اثرت فى 77.8%كذلك اظهرت النتائج بأن منهم 40%وبينما ,منهم قالو الاصابابات والنهب 16.7%منهم قالو الجفاف و 5.6%بينما ,انتاج لبن الابل منهم قالو 20%و ,فى منطقة كادقلى قالو كل من الحرب والامراض الوبائية اثرت في انتاج لبن البل منهم في منطقة الدلنج قالو بأن الحرب اثرت في انتاج 50%الا ان حوالى ,التكاليف العالية للعليقة والادوية .قالو الامراض الوبائية 10%قالو الظروف البيئية القاسية و 10%الاصابات و 30% ,لبن الابل

Conclusion;

Based on the results of discussion the following conclusions were drawn:

- The high Average quantity of milk she camel produced pre day in three areas of south kordofan was over two liters this in Eldalanj, while is two liters this in kadogli and less than two liters in Tlodi.
- Also the high percentage quantity of camel milk consumed by respondents in three areas of south kordofan was over medium liters this in Tlodi, while is less than medium liters this in Eldalanj, but is quarter liter in kadogli.
- The most of respondent's consumers preferred camel milk was in Tlodi, Kadogli and Eldalanj, while the less of them were not preferred camel milk in three areas.
- The high percentage of respondents consumers said used camel milk as therapy for diabetes this in three areas ,while less percentage is jaundice in Tlodi and kadogli , but less is leshmaniasis this in Eldalanj
- The high percentage of respondents producers said the war affected in camel milk yield this in three areas ,the less said drought ,high cost of feeding and medicine and epidemic diseases this in Tlodi, kadogli and ELldalanj respectively .
- The study showed that all respondent producers said that the water deprivation affected on camel milk yield, and also founded that the intervals milking for she camel was twice per day, this in three areas.
- Most of respondents consumers said that of camel milk was used as food in the three areas, while less of respondents said used as therapy.

Degree of Master of Science (M.Sc.)

In Tropic Animal production

Submitted by:

Mohammed Eissa Abdelrhman Eissa

B.Sc. Honour (U .of Gezira, 2011)

Supervisor:

Prof. Dr. Omer Ibrahim Ahmed Hamid

November- 2015

بسم الله الرحمن الرحيم

قال تعالي :-

(وإن لكم في الانعام لعبرة نسقيكم مما في بطونه من بين فرثٍ ودمٍ لبناً خالصاً سائغاً للشاربين)

صدق الله العظيم

سورة النحل

الاية (66)

Abstract:

This study was carried out during period march-2014,to estimation the camel milk production and consumption in south kordofan state ,the study included three areas (TLodi , Tldalanj and kadogli.)by questionnaires were distributed in the three areas (10 in kadogli , 10 in Eldalanj and 18 in Tlodi .),this questonaires were specially for camel milk production ,

Also many of questionnaires were distributed specially for camel milk

consumption in three areas (20 in Tlodi, 20 in Eldalnj and 20 in kadogli.) After distributed and analyzed questionnaires, the study showed that the average of she camel milk produced was 1.888+_ 0.32338 liter per day was in tlodi , and 2+_ 000 was in kadogli and 2.1+_ 0.31623 liter was in eldalanj. And the average of camel milk consumed per individual was 0.55 + _ 0.2513 liter per day in Tlodi, 0.43+_ 0.029742 was in kadogli and 0.5+ _ 0.24333 liter per in eldalanj.

Also study showed that the respondents were not preferred camel milk were ,15%, 20% ,and30% inTlodi , Eldalanj and Kadogli respectively
While the respondent preferred camel milk were 70%,80% and 85% in kadogli ,Eldalanj and Tlodi respectively.
And then study showed that the owners of camel milk came from (60%Hammer in Tlodi and 40% shanabla the responant said that while in both Eldalanj and Kadogli 65%Hammar and 35%Shanabilla

And respondents said that the owners of camel milk were nomadic, they came from north kordofan and Darfur.

1/Camel milk consumption:

Raika community in Jodhpur district in India is commonly known for keeping camels and might have been consuming camel milk in their diet,the camel milk consumption may be responsible For reduction of the occurrence of Diabetes in the Raika community which is researchable issue. With this aim present study was conducted in Raika community comprising of 258 individuals from two villages viz. Mongra and Bhatinda of Jodhpur district, Rajasthan. The usage of camel milk and diabetes Nearly 27 percent of the Raika community kept she camel but consumption of camel milk by the Raika community was less (18.6 %) and consuming low quantity(Raj,2008)

Raj , K. (2008). Camel Milk Consumption Pattern and Its Association with Diabetes among Raika Community of Jodhpur District of Rajasthan. India J.of Ethno-Med., 2(2): 103-105**.**

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2/consumption

Camel's milk can be consumed by patients intolerant to lactose without undesirable reactions. Twenty-five patients with clinical and laboratorial diagnosis of lactose intolerance underwent provocation tests with growing amounts of cow's milk and subsequently with camel's milk. Results except for two patients, who had mild reactions to the maximum dosage of camel's milk (250 mL), the acceptance was excellent. Pasteurization of camel's milk did not affect tolerance. Also, most of the patients showed significant clinical reactions when drinking very low amounts of cow's milk (Cardoso *et al* ,2010).

J.Revista Alergia México
Volumen 57, Núm. 1, enero-febrero, 2010
26
Original article
Cardoso, R.R., Santos, R., Cardoso, C. and Carvalho, M. (2010).
Consumption of camel's milk by patients intolerant to lactose;
Revista Alergia México .57(1):26-32.
.

3/Consumption

Total of 138 households were interviewed on various aspects of camel milk and camel milk products using a single visit multiple subject diagnostic survey in Garisa, Wajir and Eastleigh the main urbanc entrées with high camel milk consumption,75% of the respondents generally take camel milk or milk products every day. Raw and sour milk are the most popular products. The most important purchasing criterion for raw camel milk was taste (19and18%) while packaging was more important for pasteurizedmilk (18, 18and 16%) for Wajir, Garisaand Eastleigh respectively. ForYoghurt, the most important purchasing criteria were taste (18%) and aroma (19%). The taste of sour milk is the most important attribute in both Garisa(30%) and Eastleigh (24%). To enhance marketing of camel milk, the Appropriate attributes demanded by customers needs to be seriously addressed. Promotion of camel milk and products to non conventional consumers
Should be done in order to increase their consumption.(Akweya et al,2012).

B. A. 1,C. G. 2*and M. W.
ctober
(, 2012)

Akweya, B.A., Gitao, C.G. and Okoth, M.W.(2012). The acceptability of camel milk andmilk products from north eastern province in some urban areas of Kenya. African Journal of Food Science Vol. 6(19) pp. 465-473

26 Revista Alergia México Volumen 57, Núm. 1, enero-febrero, 2010
Original article
Revista Alergia México 2010;57(1):26-32
Consumption of camel's milk by patients intolerant to lactose.
A preliminary study
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CRA, et al. Consumption of camel's milk by patients intolerant to lactose. A preliminary study. Rev Alerg Mex 2010;57:26-32.
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RESUMEN

Objetivo: determinar si la leche de camella, por no provocar síntomas, puede ser consumida por pacientes intolerantes a la lactosa.

Pacientes y método: 25 pacientes con diagnóstico clínico y de laboratorio de intolerancia a la lactosa se sometieron a pruebas de
provocación oral con cantidades crecientes de leche de vaca y de camella.

Resultados: con excepción de dos pacientes que tuvieron reacciones moderadas a la cantidad máxima de leche de camella (250
mL), la aceptación fue excelente. La pausterización de la leche de camella no afectó su tolerancia. Asimismo, todos los pacientes mostraron reacciones clínicas cuando bebieron leche de vaca.

Conclusión: la leche de camella es una opción para quienes no pueden ingerir leche de vaca debido a la intolerancia a la lactosa.

Palabras clave: leche de camella, leche de vaca, lactosa, lactasa.

ABSTRACT

Objective: To determine whether camel's milk can be consumed by patients intolerant to lactose without undesirable reactions.
Patients and method: Twenty-five patients with clinical and laboratorial diagnosis of lactose intolerance underwent provocation tests
with growing amounts of cow's milk and subsequently with camel's milk.
Results: Except for two patients, who had mild reactions to the maximum dosage of camel's milk (250 mL), the acceptance was excellent. Pasteurization of camel's milk did not affect tolerance. Also, most of the patients showed significant clinical reactions when
drinking very low amounts of cow's milk.
Conclusion: Camel's milk can be considered an option for the individuals intolerant to lactose who present symptoms when ingesting
cow's milk.
Key words: camel's milk, cow's milk, lactose, lactase.

The lactose molecule appeared around 100,000,000 years ago. It was discovered in the 17th century1 and synthesized in laboratory in the 1970's, when its chemical structure was determined.2 It is responsible for 50% of milk calories and only found in it.3

Animals began to be domesticated 10,000 years ago; 2,500 years later, goats, sheep, cows and camels began to be milked and their milk began to be used as food. In places such as Northwestern Europe, India, Asia, and North Africa, people developed an animal husbandry culture. To be adapted to this new situation, where being able to drink milk or not would make the difference between surviving with good health or being hungry, a genetic mutation took place with lactase becoming persistent. This enzyme hydrolyzes lactose in glucose and galactose. Its congenital absence is rare.4 Usually

it decreases or disappears when the beginning of the teething process goes on.5

Individuals can be lactase persistents, usually normodigestors, where lactase remains, or low lactasics or alactasics, usually maldigestors, where it does not exist or lowers after weaning. In the group of maldigestors, comprising around 70% of blacks, 45% to 69% of Caucasians and almost 100% of Asians,6 are those clini
cally intolerant to lactose, who, when ingesting it, have symptoms. The most frequent are diarrhea, vomiting, nausea, abdominal pain and prostration. This seems to be the result of the action of colonic bacteria on lactose not hydrolysed.

Camels are animals usually used for transportation and production of meat and milk. Anecdotally, at the places where the camel's milk is consumed by the population, although containing lactose, it is said it is well tolerated by the lactose-intolerant individuals.7 This fact is the core of our work. We followed patients with lactose intolerance drinking camel's and cow's milk, observed the reactions and compared the results.

This paper was approved by the Ethics Committee of the FACIPLAC (Faculdades Integradas do Planalto Central).

PATIENTS AND METHOD

Patients, or their caregivers, were informed of the procedures to be followed, and gave their signed consents.

Patients. Twenty-five, all Caucasians, six males, between 2 and 68 years old.

Medicamentous fast. From the thirtieth day preceding the challenge tests and during them, hypotensive drugs, hormonal contraceptives and occasional use of nonhormonal anti-inflammatory drugs were allowed.

Parallel illnesses. Patients with digestive disorders, in special the irritable bowel syndrome, characterized according to the standardized IBS (irritable bowel syndrome) questionnaire based on Rome II criteria,8 were not included, as well as diabetics, neuro or psychopaths, obese or bearers of illnesses that could interfere with the evaluation of the results.1,9-12

Alimentary restrictions. Since the thirtieth day preceding the challenge tests and until finishing the study, use of cow's milk and its derivatives, foods causing intestinal gas (broccoli, Brussels sprouts, cabbage, cauliflower, corn, cucumber, leek, lentils, onion, peas, green pepper, red pepper, radish, melon, watermelon and beans) and foods containing papain and fructose, substances which inhibit lactase activity,13 were abolished.

History of lactose intolerance. All the patients had a record of moderate or severe reaction when ingesting cow's milk or its derivatives, and for that reason they already avoided them. All the laboratory oral tests for lactose intolerance had produced abnormal results, with the presence of clinical symptoms during and after them.

Lactose tolerance test. The procedure followed was an alimentary fasting for eight hours, followed by ingestion of an aqueous solution of lactose (1g per kilogram of weight), not exceeding 50 grams. Blood glucose was dosed before, thirty and sixty minutes after lactose ingestion. Patients included in the study were those where the blood glucose values after ingestion of lactose did not exceed in 20 mg the baseline values and who presented clinical symptoms during this procedure.

YSS, female, 2 years old, was not tested for lactose tolerance, as she had a record of severe reactions in an earlier test.

Patients remained under observation during the eight

hours following the beginning of the challenges.
Allergy tests to cow's milk and camel's milk. Prick skin tests and serum IgE (RAST) determinations to cow's whole milk, casein, α-lactalbumin, β-lactoglobulin were performed. Allergens for the Prick tests were purchased from IPI ASAC Brazil Laboratory. For camel's milk only Prick tests were performed because other materials for tests are not available. A positive skin reaction or RAST was seen as exclusionary.
Other laboratory tests. Complete blood counts and total serum IgE determinations were in the limits of normality.
Types of milk used. Cow's milk: long life type, whole, Paracatu brand (Coopervap, Paracatu, Minas Gerais, Brazil), found in local commerce. Camel's milk supplied by Dromedunas, Natal, Rio Grande do Norte, Brazil, used *in natura*. Bacteriological tests proved absence of pathogens in the camel's milk. It was received frozen, in plastic two-liter bottles. After thawing, it was placed in a single container, mixed, separated in samples of 500 mL and frozen again. Stored at -8˚C until use.
Sanitary inspection. Camels are controlled by the Office of Health of the State of Rio Grande do Norte, Brazil.
Lactose dosage. Determined by CEPPA, Center for Research and Treatment of Food, Federal University of Parana, Brazil. The results were: camel's milk *in natura*, 3.32 g/dL; pasteurized camel's milk, 2.39 g/dL, cow's milk, 4.57 g/dL.

Pasteurization of camel's milk. We followed the same procedure used for cow's milk, since a specific method for camel's milk doesn't exist:14 the milk was heated to 63˚C for thirty minutes, cooled, and stored at -8˚C.
Provocation tests. Performed on consecutive days,

on an empty stomach. Simultaneous ingestion of other foods would increase the time of gastric emptying, and that could interfere with the results.5 We began with cow's milk and proceeded with camel's milk, according to the following methodology: on the first day, one drop; on the second day 5 mL, on the third day 10 mL, on the fourth day 50 mL and 250 mL on the fifth day. If any clinical symptoms arose, the test was suspended.

Clinical reactions. Diarrhea, flatulence, gases, abdominal pain, vomiting or nausea and prostration observed as a result of ingestion of milk were quantified as 0+, 1+, 2+ and 3+, according to the following criteria:

• diarrhea: absence = 0+; one liquid or semifluid evacuation = 1+; two liquid or semifluid evacuations = 2+; more than two liquid or semifluid evacuations = 3+.

• flatulence: no flatulence = 0+; mild sensation of flatulence = 1+; information that abdomen "bulged" a little = 2+; abdomen "bulged" and clothes got tight = 3+.

• intestinal gases: without increase = 0+; a little more flatus than usual = 1+; amount moderately increased of flatuses = 2+; intense elimination of flatuses = 3+.

• abdominal pain: absence = 0+; malaise, discomfort = 1+; continuous pain or low intensity colic = 2+; strong abdominal pain that required medication for control = 3+.

• vomiting/nausea: absence = 0+; nausea = 1+; one emetic episode = 2+; more than one emetic episode = 3+.

• prostration: absence = 0 +; mild discomfort which did not prevent performance of daily tasks = 1+; malaise that did not prevent performance of daily tasks but made it difficult = 2 +; prostration which

prevented performance of daily tasks = 3 +.

Statistical analysis

In order to make sure that patients represented a homogeneous population, the Bartlett's test was used to test whether individual reactions were different. Using software R, and considering any kind of symptom as a binary variable (0 - no reaction, 1 - reaction), a value of $p = 0.02029$ was found, with a significance of 98%. Thus we have evidence that patients did not represent a heterogeneous population and thus all the conclusions would be true enough for all the twenty-five individuals of the sample.

RESULTS

It was expected that all patients would react to ingesting cow's milk, as the experiment was conducted in subjects with a clinical record of a moderate to severe lactose intolerance with abnormal clinical symptoms during the lactose tolerance testing. Results associated with camel's milk were surprising because, in spite of presence of lactose in it, only two patients presented some kind of reaction, and nothing that could be considered severe. (Figure 1)

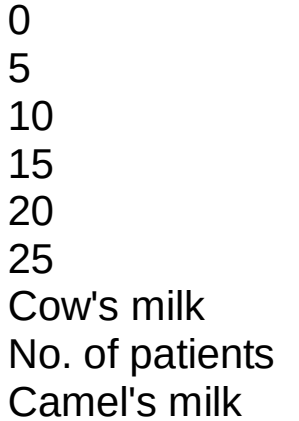


Figure 1. Frequency distribution according to the symptoms appearance.

Comparing reactions to the two kinds of milk, we noticed that those associated to camel's milk were milder,

almost negligible when compared to those associated with cow's milk (Table 1). No patient had nausea or vomiting during the experiment. These were included only because they are considered common symptoms. No patient showed any reaction to cow's milk in the first challenged day. Here it was used just one drop of milk which represented virtually 0.00 grams of lactose. From the second day on, reactions began to occur (5 mL = 0.20 grams of lactose). On the third (10 mL = 0.45

Figure 2. Frequency distribution according to the day of suspension
of the milks.

Table 1. Distribution of frequency of symptoms by type of milk

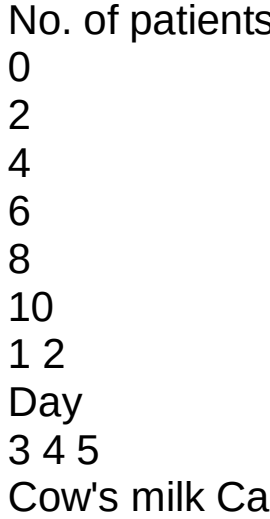
Symptoms	*Cow's milk*			*Camel's milk*		
Symptom level				*Symptom level*		
	1+	*2+*	*3+*	*1+*	*2+*	*3+*
Flatulence	6	5	1	.	.	
Flatus	5	5	.	1	.	
Vomiting/náusea	.	.	.	.	.	.
Diarrhea	2	10	6	.	.	.
Prostration	1	2	.	.	.	.
Abdominal pain	1	9	.	.	.	.

grams of lactose) and fourth days (50 mL of cow's milk = 2.28 grams of lactose) the frequency of reactions was higher and, when they occurred, the ingestion of cow's milk was suspended.

The distribution of frequencies according to the date on which milk was suspended is shown on Figure 2. We can see that, unlike in the case with cow's milk, where all patients presented reactions, with camel's milk only two patients had reactions, and even so only with the maximum amount of milk offered, i.e. 250 mL.

Only two patients took all doses of cow's milk, and

so they had reactions only on the fifth day (250 mL = 11.4 grams of lactose) [Figure 2]: MWSS, female, 36 years old, and GVCP, female, 62 years old. The reactions were: the first patient had flatulence 2+, and gases 2+; the second patient had diarrhea 3+. In both cases we could not compare, concerning the lactose amounts, the cow's milk volume ingested with camel's milk one, as the high-



est dose of camel's milk provided (250 mL) contained less lactose (8,30 grams) than the same volume of the cow's milk (11.4 grams). Then we asked them to drink 600 mL of camel's milk, which contains 19.92 grams of lactose, slightly less than twice the lactose found in 250 mL of cow's milk (22.8 grams) and, even with this increased volume of camel's milk, and consequently of lactose, we didn't notice any reaction.

It is popular belief that camel's milk changes its properties when physically or chemically manipulated. Therefore we offered 350 mL of pasteurized camel's milk (8.36 grams of lactose), the practically equivalent, in lactose, to 250 mL of camel's milk *in natura* (pasteurized camel's milk = 2.39 g/dL; camel's milk *in natura* = 3.32 g/dL) to four of the patients who hadn't had reactions to camel's milk and who had had reactions to cow's milk (MNN, male, 52 years old, gases 3+ and abdominal

pain 2+ on the third day, CSV, female, 27 years old, flatulence 3+, diarrhea 3+ and abdominal pain 2+ on the fourth day; LFXPB, male, 27 years old, flatulence 3+ and gases 2+ on the third day; HMM, female, 45 years old, diarrhea 2+ on the third day). We did not observe any reaction. This suggested that pasteurization did not modify tolerability to camel's milk.

DISCUSSION

People who participated in this experiment were moderately or severely intolerant to lactose, most of them reacting to even minimal amounts of lactose, such as approximately 0.2 grams (5 mL of cow's milk). Thus they had a record of reactions to the intake of small amounts of cow's milk and of abnormal results in lactose tolerance tests, with clinical reactions during and after such tests.

We limited the volume of milk to 250 mL, as it has been reported that, even for normodigestors, quantities of more than 9 grams of lactose can cause symptoms.15 This is a matter still open to debate. Some authors consider that reactions to less than 250 mL of cow's milk should be seen as anecdotal.16 This experiment, though, shows that this is not true.

The incidence of allergy to cow's milk is of 0.2%,17 increasing up to 13% for the lactose intolerant patients.1 This possibility was excluded by performing skin tests

and determination of specific IgE (RAST) with proteins of cow's milk and cow's whole milk. With camel's milk we performed only skin tests. All the results with cow's milk and camel's milk were negative.

We weren't able to make the taste of cow's milk and camel's milk unmistakable. Patients always would identify them. So it wasn't possible to do blind tests.

We didn’t dilute cow’s milk in order to have cow’s and camel’s milk with equal proportions of lactose, because we believed that could have subjective influence on the patients, distorting the results.
Other variables were impossible to avoid, such as those related to the lactose tolerance test itself, a test with specificity from 77% to 96% and sensitivity of 94%, and those dependents of the patient’s personal characteristics. The interpretation of the lactose tolerance test is not as simple as it might seem. As so, it is not unusual to see symptomatic individuals having normal blood glucose elevation, and others with a small elevation of blood glucose after drinking up to 1 liter of cow’s milk, the equivalent to approximately 50 grams of lactose, without any kind of symptoms.18 Often symptoms decrease if the milk is ingested mixed with other foods, and there are even those who, despite normal tolerance to lactose and other milk constituents, and not allergic to milk or its components, react with symptoms as if they were intolerant or allergic, with minimal amounts of milk, due to psychological aversion to it.19
We didn’t include obese or diabetic people, in order to minimize the variables that could interfere with clinical and laboratorial evaluation.20
How to explain our results? Could the good acceptance of camel’s milk have been due to its lower concentration of lactose, exposing it more to the action of lactase? Or was the desire to drink milk an important factor in the acceptability of camel’s milk? We could try to solve the first issue by adding lactose to camel’s milk. But we did not want to change it. As regards the second issue, we might try to answer it by saying that with the adults that could have happened, but not with the six children. These showed a pattern of reaction identical to that of the adults, not reacting to camel’s

milk but reacting to cow's milk. Other explanations would be that camel's milk is more easily metabolized than other kinds of milk7 or, because it produces less casomorphines than cow's milk, which would provoke less intestinal motility and would cause lactose to become more exposed to the action of lactase.21 These, however, are only hypotheses.

Oral provocation tests may cause changes in the intestinal mucous membrane. And this can happen quickly, even in 24 hours, with disappearance of intestinal villi. This could have facilitated the sprouting of reactions during the progress of the tests with camel's milk and increase the reactions with cow's milk.22 In order to avoid this variable we conducted the tests with camel's milk always after the provocation tests with cow's milk.

We offered 600 mL of camel's milk *in natura* (19.92 grams of lactose) to the two patients who had shown symptoms only after the intake of 250 mL of cow's milk (11.4 grams of lactose). And they did not have any reaction. This fact proved once more the excellent acceptance of the camel's milk by the intolerant lactose patients.

It is popular belief, among people who use camel's milk, that it is very "sensitive" and that its properties change if the milk is physically or chemically manipulated. What we observed was a reduction in the amount of lactose in pasteurized camel's milk. But pasteurization of camel's milk did not change it as regards its tolerability.

Good acceptance of camel's milk can be seen in Table 1 because, of the 25 patients, all of our study population, who had reactions to cow's milk, only two had reactions to camel's milk, and even so with the maximum amount used in the provocation tests.

In humans, unlike in rats,23 lactase is not an adaptive enzyme, unlike sucrase and maltase.2,16 In special

situations, such as pregnant maldigestors, lactase activity increases. With the progress of pregnancy, intestinal villi increase in size and intestinal transit is getting slower. These facts favor the increased contact of lactase with lactose.24 Also the β-galactosidasic activity increases when a regular intake of milk acts stimulating the colonic microflora to modify itself and to produce β-galactosidase.25 This increase in β-galactosidase by the colonic flora increases the production of lactic acid and lowers that of short-chain fatty acids, hydrogen and carbon dioxide, and this results in a reduction of symptoms intensity.26 These situations did not apply to us. We didn't have pregnant women in our population and the period of time, around 11 days, was insufficient to induce colonic microflora to modify itself changing our results.

Although the camel's milk samples for lactose dosage came from the same pool, we verified that the process of pasteurization reduced the amount of lactose in camel's milk from 3.32 g/dL to 2.39 g/dL.

Only two patients had clinical reactions to camel's milk: LBS, 17 years old, female, flatulence 1+, and ITO, 35 years old, male, with gases increased up to 2+, both on the fifth day (Table 1 and Figure 2).

The results that we observed lead us to believe that the use of camel's milk could contribute to the reduction of gastrointestinal disorders that occur in individuals intolerant to lactose. The same must be true concerning people allergic to cow's milk, as camel's milk, like human breast milk, doesn't contain β-lactoglobulin, the most important allergen of milk. This aspect was not the scope of this paper; this, besides other advantages such as its related use in type 1 diabetics,27 as camel's milk

contains high concentration of insulin, and even for patients with infectious diseases where the camel low molecular weight dimeric immunoglobulin repertoire would work better than the usual heavier tetrameric one.28

The importance of lactose should not be underestimated. It induces non-pathogenic intestinal flora and its intake increases the bioavailability of calcium by increasing the diffusional component of transport, leading to greater level of absorption in the small intestine.34 The absorption of calcium when children are fed formula without lactose is 36% compared to 60% of absorption when used whole milk.29

In conclusion, we can affirm that our results demonstrate that the use of camel's milk could be an option for patients intolerant to lactose and who, therefore, cannot take cow's milk. However, further studies should be conducted with an adequate number of patients in order to confirm the results presented here.

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Consumption of camel's milk by patients intolerant to lactose. A preliminary study
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The data in table (23) showed that 55% of respondents in Tlodi drink milk with sugar, 45% without sugar , in Eldalanj 50% with sugar and also 50% without sugar , while in kadogli 42.9% with sugar and 57.1% with sugar

The data in table (28) showed that 50% of respondents in Tlodi said milk of camel available in summer , 50% in winter , in Eldalanj 55% in summer and 45% winter while in Kadogli 45% in summer and 55% in winter.

The data in table (18) showed that 30% of respondents in Tlodi drink milk of camel as raw , 70% as heated , while in Eldalanj 45% as raw , 55%

heated , in Kadogli also same them. .

Pasteurized camel milk and gariss

The study showed that the mean total solid content of processed fermented camel milk incubated at 25 cent grad and 37 cent grade ,the total mean solid after 18 hrs were 8.63 + _ 0.035 + , 8.32 + _ 0.026 ,8.7 + _0.110 and 8.63 + _ 0.223% for pasteurized gariss at 25 cent grade ,pasteurized gariss at 37 cent grade ,unpasteurised gariss at 25 cent grade and un pasteurized at 37 cent grade respectively (Babiker et al,2007).

Factors facing camel milk yield

The study showed that the camel milk production affected many factors such as: farming system ,productivity traits ,season, stage of the lactation and parity on milk production and composition of camel kept under pastoral environment ,in central Punjab, Pakistan(khan et al , 2012).

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