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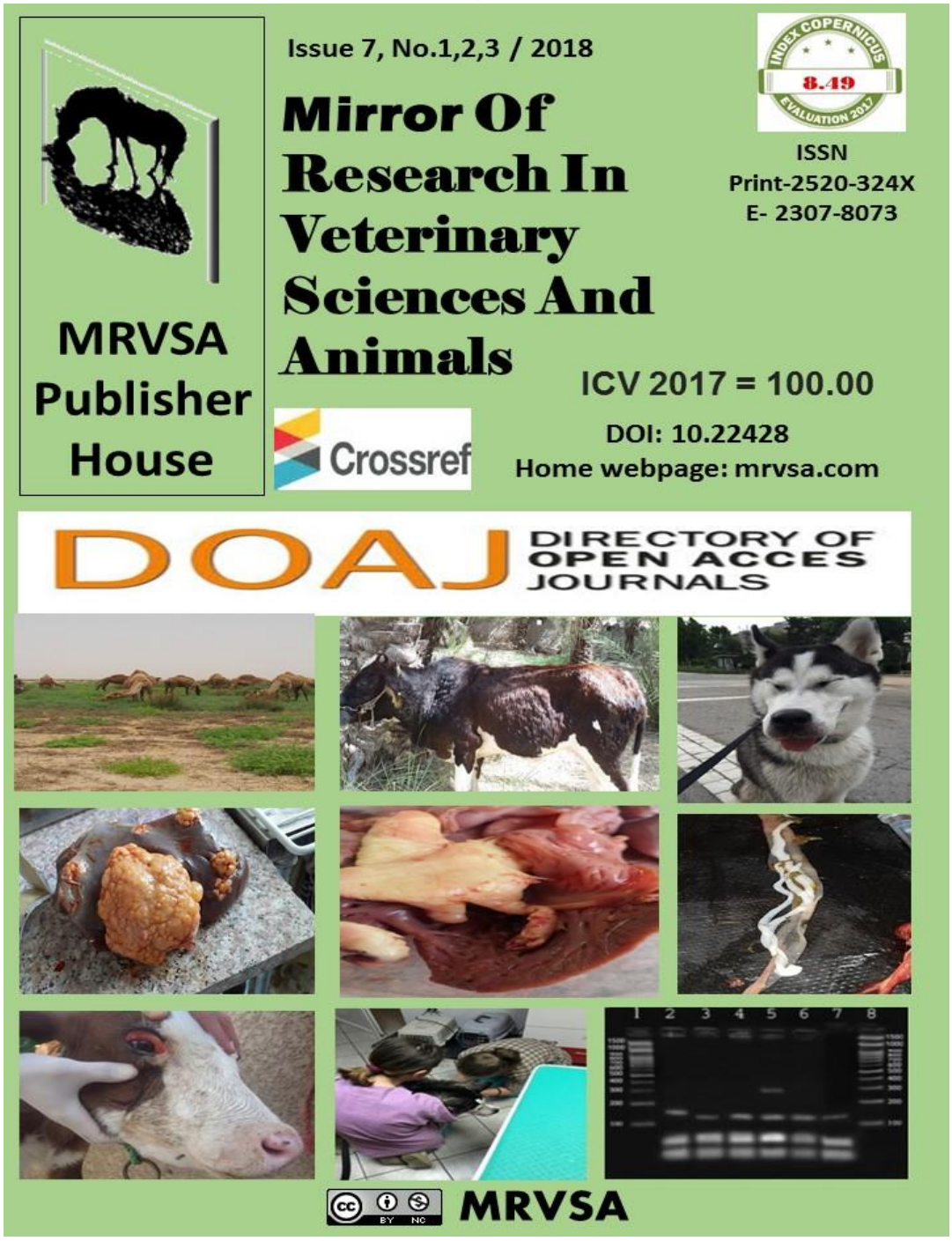

الملتقى العلمي الثاني لتربية وامراض الابل
Second Iraqi colloquium on camel diseases and breeding
SICCDB-2018

برعاية معالي وزير التعليم العالي والبحث العلمي
أ. د عبدالرزاق العيسى المحترم

و رئيس جامعة المثنى
أ.د حسن عودة الغانمي المحترم

وباشراف عميد كلية الطب البيطري
أ.م. د طارق جعفر فعل المحترم
وتحت شعار:
"الابل ثروة وطنية يجب الاعتناء بها"
تقيم كلية الطب البيطري
الملتقى العلمي الوطني الثاني و
الملتقى العالمي الاول لتربية وامراض الابل

يوم 28 \ اذار \ **2018**
وفي رحاب جامعة المثنى \ مدينة السماوة

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6. يقدم البحث والملخص بنسختين مطبوعتين على ورق A4 ونسخة واحدة على قرص مدمج اوترسل عن طريق البريد الالكتروني المرفق.
7. يجب ان يكون الخط على فونت(النص الاساسي Times New Roman وللغتين العربية والانكليزية.
8. حجم الخط 14 للعناوين الرئيسية و 12 للنصوص والعناوين الفرعية). مع ترك مسافة 2.5 سم على الجوانب الاربعة للصفحة.
9. **اخر موعد لاستلام الملخصات 10\03\2018 .وسيكون اخر موعد لاشعار الباحثين بقبول بحوثهم 15\ 03\2018.**
10. تخضع البحوث المقدمة الى المؤتمر الى التقييم العلمي.
11. سيتم نشر وقائع المؤتمر وبحوثه في مجلة

Journal of Camel Practice & Research
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1. اجور المشاركة كالاتي:

الحضور مع المشاركة ببحث مع الاقامة ليلة واحدة في فندق قصر الغدير 300.000 الف دينار عراقي
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الملتقى العلمي الثاني لتربية وامراض الابل

Second Iraqi colloquium on camel diseases and breeding

SICCDB-2018

وقائع الملتقى العلمي الاول لتربية وامراض الابل في العراق

28أذار 2018

برعاية السيد معالي وزير التعليم العالي والبحث العلمي

أ. د عبدالرزاق العيسى المحترم

والسيد رئيس جامعة المثنى

أ .د حسن عودة الغانمي المحترم

وبأشراف السيد عميد كلية الطب البيطري

أ.م. د طارق جعفر فعل المحترم

وتحت شعار

"الابل ثروة وطنية يجب الاعتناء بها"

تقيم كلية الطب البيطري

الملتقى العلمي الوطني الثاني

والملتقى العالمي الاول لتربية وامراض الابل

يوم 28 \ اذار \ 2018

الملتقى العلمي الثاني لتربية وامراض الابل

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المستشفى البيطري في محافظة المثنى لدعمهم وتشجيعهم لانجاز هذا النشاط العلمي

الملتقى العلمي الثاني لتربية وامراض الابل
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المحاور الرئيسية للملتقى **The main topics**

- الابل في العراق تربية مشروع تطوير
- الامراض المشتركة بين الابل والانسان
- امراض الابل
- فسلجه الابل وانتاجية الحليب
- تشريح وانسجة الابل
- التدخلات الجراحية في الابل

Colloquium key-note speakers

الجلسة المفتوحة **(Plenary sessions)**

- **الاستاذ الدكتور عصام توفيق كاظم المحترم \ قسم علوم الأحياء والكيمياء\ جامعة نزوى\ سلطنة عُمان (القيمة الغذائية والصحية للحوم الابل)**
- **الدكتورة كريمة عاكول الصالحي \ Al Muthanna University/ College of veterinary medicine (الامراض المشتركة بين الابل والانسان)**
- **محاضرة اللجنة التخصصية لمشروع تطوير واقع تربية الابل في العراق للأساتذة :**
  الاستاذ فارس فيصل ابراهيم المحترم \ مدير التلقيح الاصطناعي في العراق
  الدكتور محمد غازي عبدالكريم المحترم \ مدير قسم الانتاج الحيواني
  قيس امين عبدالرحمن المحترم \ مدير قسم التخطيط والمتابعة
  الدكتور الاستشاري مؤيد صبيح جميل المحترم

Abstracts

SICCDB/ 2018-1

تقيم التنوع الوراثي في سلالات الإبل العراقية باستخدام جين Cytochrome b

الزعلان، أيوب راضي يحيى، اسعد عايد البدران، عدنان عيسى

أجريت هذه الدراسة في مختبر الهندسة الوراثية، كلية الزراعة، جامعة البصرة. جمعت 80 عينة من عينات الدم عشوائيا من حيوانات لا توجد بينهم قرابة من مناطق مختلفة من العراق، إذ جمعت 50 عينة من سلالة الجودي بواقع 10 عينات كل من محافظة البصرة والمثنى والنجف وبابل وواسط وجمعت 15 عينة من سلالة الخوار من محافظة الأنبار و15 عينة من سلالة الحرة من محافظة ذي قار. استخلص DNA باستعمال عدة التشخيص Kit وبحسب الخطوات المرفقة مع عدة التشخيص. قيست كمية DNA لكل عينة بوساطة جهاز Nano drop. أجريت تجارب التفاعل السلسلي للبوليمريز Polymerase Chain Reaction- PCR لجين Cytb ثم اجري تنقية منتج التضخيم ثم أرسلت العينات الى شركة Macrogene الكورية لتحليل تسلسل DNA. وجرى اصطفاف Alignment التسلسلات ومحاذاتها مع التسلسلات التتابعي القياسية المنشورة في المركز الوطني لمعلومات التقانات الاحيائية NCBI باستخدام برنامج Bio Edit وحلل التشكل الوراثي والتنوع الوراثي وتنوع النيوكليوتيدات ببرنامج Arlequin ver. 3.5.1.2. ورسمت شبكة الأنماط الفردية استنادا إلى خوارزمية وسيط الارتباطات Median Joining (MJ) باستخدام برنامج Network 5.0.0.0 ورسمت شجرة النشوء والتطور بطريقة التجاور Neighbor-joining (NJT) باستخدام برنامج MEGA 7.0 يمكن تلخيص نتائج الدراسة الحالية لجين Cytb كما يأتي:

1. أظهر 16 تشكل وراثي توزع 13 تشكل في سلالة الجودي و6 تشكلات في سلالة الحرة في حين لم يوجد أي تشكل وراثي في سلالة الخوار. بلغ عدد الانتقالات والتحولات الكلية 10 و6 على التوالي وكان غني بمحتواه من القواعد النيتروجينية الأدنين A والسايتوسين C.
2. كانت قيم تنوع النمط الفردي (HD) وقيم تنوع النيوكليوتيدات (π) كانت متوسطة في السلالات المدروسة والتي بلغت 0.419 و0.00104 توزعت 0.453 و0.00109 في سلالة الجودي و0.648 و0.00175 في سلالة الحرة في حين القيم صفر في سلالة الخوار.
3. أظهرت نتائج شجرة النشوء والتطور بين السلالات العراقية وجود فرعين رئيسيين شمل الفرع الأول سلالة الحرة في حين شمل الفرع الثاني كل من سلالة الجودي والخوار.
4. بلغ عدد الأنماط الفردية 15 نمط فردي كان 10 في سلالة الجودي 11 في سلالة الخوار و6 في سلالة الحرة كان النمط الوراثي H-2 مشترك بين السلالات الثلاثة. اما بالمقارنة مع دول العالم كان عدد الأنماط الفردية الكلية 52 نمط فردي منها 15 نمط في العراق و18 نمط في السعودية و13 نمط في إيران و11 نمط في الامارات و7 أنماط في السودان و6 أنماط باكستان و5 أنماط في كل من إثيوبيا وكينيا و3 أنماط في كل من الأردن وأستراليا وعمان ونمطين في كل من النيجر وتونس.
5. اعطى ثلاثة مجاميع فردية Haplogroup الأولى شملت الإبل العراقية والثانية والثالثة شملت كل من الإبل السعودية والإيرانية والإماراتية والعمانية والتونسية والباكستانية والسودانية والكينية باستثناء الإبل النيجيرية والاثيوبية والأسترالية كانت بالمجموعة الثالثة.
6. المسافة الوراثية كانت متوسطة بين السلالات المدروسة والتي تراوحت (0.05442-0.10390) ومسافة وراثية كبيرة جدا مع الدول والتي تراوحت (0.3339-0.6553).
7. أظهرت نتائج تحليل التباين الجزيئي AMOVA بين وداخل سلالات الإبل العراقية 5.64٪ و94.36٪ على التوالي.
8. اما نتائج اختبار الحياد Neutrality Test لجين Cytb أظهرت ان سلالتي الجودي والحرة كانت لديهم قيم سلبية لكل Tajima's D و Fu's Fs وقد كانت اعلى القيم -1.00737 و-1.98591 في سلالة الحرة واقل القيم في سلالة الجودي -2.14737 و -6.59079 على التوالي. اما في سلالة الخوار كانت القيم صفر لكل من Tajima's D و Fu's Fs.

MRVSA (Special issue), 2nd Iraqi colloquium on camel diseases and management/ College of Veterinary Medicine/ Al Muthanna University 28 March, (2016),7 (2), Mirror of Research in Veterinary Sciences and Animals

SICCDB/ 2018-2

Application of Differential Interference Contrast microscope in studying of camelid skin

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Abstract

A significant species difference exists between the skins of the animals. The desert animals exposed to high levels of solar radiation and high temperatures, therefore, its skin structures have possessed a unique adaption to prevent damage to the tissue proteins. The camel is adapted to a desert lifestyle; its skin differs in the arrangement and morphology of the hair follicles from that of other domestic mammals. The application of light microscope is essential to perceiving the detail structures of the skin. Bright field microscope is one commonly utilized technique, but it is unable to recognize the more details of skin layers. Differential interference Contrast microscope (DICM) is related optics give a specimen a three-dimensional appearance that is not unlike the appearance of a sample in a scanning electron microscope. These methods enhance the depth of focus so that thicker specimens can be observed at higher magnifications. Consequently, this study was designed to dissect the microanatomy of camelid skin and to investigate the arrangement of its layers and structure by validating a differential interference contrast microscope in comparison to conventional bright field microscope. Skin samples were collected from five animals (*Camelus dromedaries*) that slaughtered at Al-Najaf abattoir/Republic of Iraq. The samples were kept in 10% neutral buffered formalin and processed routinely for histopathological sectioning and examined under DICM. The results of this study revealed clear structures and numbers of all layers and its cells of the camelids skin. Moreover, DICM showed the relationship between hair follicles, sweat, and sebaceous glands. In conclusion, this study approved the validity of DICM in the examination of camelids skin. The authors recommend to apply this tools in the examination of normal skin sections as well as validate this technique in the diagnosis of skin diseases.

Keywords: Camelids, DICM, Skin, sweat glands, sebaceous glands

SICCDB/ 2018-3

Retrospective study on the therapeutic effects of nutritional values of the camel milk

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Abstract

The milk of the camel is an excellent substitute for human milk and does not contain β-lacto globulin. This study intends to review the therapeutic effects of nutritional values of the camel milk in the treatment of different human diseases. MEDLINE from1946 to March 2016, EMBASE from1974 to March 2016, and Google Scholar were searched using the following

terms: milk, bodily secretions, camels, camelus, camelides, dromedary, bactrian camel, insulin and nano antibodies. The identified articles were reviewed, if the study was investigating the use of camel milk for the potential treatment of diseases that affecting humans. The result of this study approved that out of 430 studies, 24 were included after assessment. The identified studies highlighted the application of camel milk in the treatment of diseases, including diabetes, autism, cancer, various infections, heavy metal toxicity, colitis, and alcohol-induced toxicity. Although most studies using both the human and animal model, a clinical benefit with an intervention of the camel milk, showed variations and sometimes limitations, therefore, the observations of the reviewed studies must be taken into consideration. In conclusion, and based the evidences of the reviewed studies, the authors recommend to do more future studies on camel milk before consider it to replace the standard therapies for any human indication.
Keywords: Camel Milk, Therapeutic, Nutritional, dromedary.

SICCDB/ 2018-4

Morphological and Histological study of the cecum and colon in adult one humped camels *(Camelus dromedaries)*

Ahmed Adeeb Mohamed*, Khalid Hadi Kadhim and Diyar Mohammad Hussein*
***Dep. of Anat. and Hist./ Coll. of pharma./Uni. AL- Muthanna**

Abstract

The present study was designed to distinctive morphological and histological structures of the cecum and colon in adult indigenous one humped camel. Five specimens of the each from cecum and colon of healthy male camels aging (4-5) years, were utilized immediately after slaughtering, were used for each the morphological and histological study. For gross study the intestinal tract was separated and dissecting it away from it attachments to the dorsal abdominal wall , cecum was a smooth, cylindrical sac ,the mean total length, weight (weight after empty of the part) and thickness of wall of the cecum were (51.35 ± 6.40) cm. (72.5 ± 9.4) gm. (0.124 ± 0.07) cm. respectively, The colon was structured as one long continuous hollow tube, its externally smooth, without haustrae. The *colon* is divided into the ascending, transverse, and descending parts, the ascending colon had three ansae: the proximal ansa, the spiral ansa, and the distal ansa ,and mean total length, weight (weight after empty of the part) and thickness of wall of colon were (642.44 ± 34.12) cm. (863.6 ±32.4)gm. (0.158 ±0.06) cm respectively.

Histologically the cecum and colon wall was composed of the four tunicae (mucosa, submucosa, muscularis and serosa or adventitia).The tunica mucosa is the inner layer lined of the cecum and colon lumen, the mean thickness of these tunica in colon was more than that in cecum (487.9±26.6) μm , (366.7 ± 34.1) μm respectively , the tunica mucosa include three different layers were, lining epithelium, lamina propria with glands and muscularis mucosa. The colon epithelium has large number of crypts of Lieberkuhn and goblet cells (31 ± 4), (262 ± 11) respectively more than that in cecum (27 ± 5), (218 ± 12) respectively. The **submucosa** consist of irregular connective and adipose tissue, numerous blood vessels, the mean thickness of these tunica in cecum was more than that in colon (243.2 ± 44.3) μm and (124.8±16.6) μm respectively. Tunica muscularis was composed of inner circular and outer longitudinal smooth muscle layers ,the mean thickness of these tunica in colon was more than that in cecum (694.7 ± 37.4) μm and (513.9±46.3) μm respectively .The tunica serosa or adventitia was consist of

loose connective tissues ,the mean thickness of these tunica in colon was more than that in cecum (212.7 ± 14.1) µm and (187.9±17.6) µm respectively.

Keywords: Camel, cecum, colon ,morphology, Histology

SICCDB/ 2018-5

Overview of new concepts in induce ovulation triggers in dromedary she camels

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University of Kufa / Faculty of Veterinary Medicine / Department of Clinical Sciences

Abstract

The seminal plasma is consist of many components stimulate an ovulatory response. The abundance of an ovulation-inducing factor (OIF) in seminal plasma has wide implications questions about identification, sources, mechanism of action, role among species, and clinical application in infertility. The purpose of current review is focusing on the current understanding of physiological and biochemical properties of seminal plasma in camelids. llamas and alpaca Seminal plasma was used as agent of induced and spontaneous ovulators, respectively. An isolated part of the seminal plasma was defined by column chromatography as OIF by stimulating hormone secretion (LH) and ovulation in llamas. OIF in seminal plasma is β-NGF and that it is highly conserved. An endocrine route of action of NGF explains a previously unknown pathway for the direct influence of the male on the hypothalamo–pituitary–gonadal axis of the inseminated female.

Key words: Ovulation inducing-factor (OIF) , Seminal plasma, Llamas/alpacas , Ovulation, Gonadotropins, neurotrophins, NGF

SICCDB/ 2018-6

EFFECTS OF COLOSTRUM, VIRGIN AND MULTIPARA CAMEL MILK IN SPERM COUNT AND SPERM DEFORMITY OF DIABETIC RATS

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Abstract

The present study was conducted to investigate the effect of colostrums and camel milk treatment on sperm count and sperm deformity of alloxan induced diabetic rats. The present study was divided into three experiments according to period of treatment, first experiment undertaken to investigate the effect of colostrums through 7 days of treatment. The second experiment undertaken to investigate the effect of virgin and multipara camel milk through 30 days of treatment. Third experiment was undertaken to investigate the effect of virgin and multipara camel milk through 60 days of treatment. The results of experiments revealed that the

diabetic male rats in second group suffering from significant decrease at ($p \leq 0.05$) in sperm count and sperm deformity

Key words: Colostrums, camel milk, sperm count and diabetic rats.

SICCDB/ 2018-7

Clinical , Immunological , and Epidemiological Studies of Nasopharyngeal Myiasis in Camels slaughtered in Al-Muthanna Province

Tareq Jaffer faal Al-jindeel, Hussein Jabar Jasim *, Nawar Jasim Alsalih , Ali Mosa Rashid Al-Yasari

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Abstract

The aim of this study was to investigate the clinical signs related to infected camels by *C. titillator* larvae and to determine prevalence and incidence of C.titillator larvae in the camels and studied the relationship between infestation ratio with months of the year, ages and sex. The period of study was extended from 1st of September 2015 to 30th of August 2016. This study was conducted randomly on 864 camels slaughtered in the abattoir at Muthanna province, south of Iraq, with age range from 8 months to 7 years and of both sexes about 546 male and 318 female. The results of the current study revealed that clinical examination of camels infested by *C. titillator* larvae were showed clinical signs can be concluded by; fever, emaciation, appetite loss, congestion of mucous membrane, enlargement of lymph nodes, nasal discharge, neurological signs, increase respiratory rate, frequent sneezing and snoring during breathing. On the other hand, the results of epidemiological study revealed that only 352 out of 864 examined camels were infested by *C. titillator* larvae at infestation rate of (40.07%). Surprisingly, our data showed that there is a clear relationship between the climatic conditions such as humidity and temperature with the incidence of *C. titillator* larvae during the year. Also, this study showed that highest percentage (89.02%) was recorded in January. Nevertheless, the lowest infestation percentage (6.15%) was reported in July. Additionally, we found that highest percentage (70.1%) of infestation by *C. titillator* larvae was recorded in camels that are 4-7 years. However, the lowest percentage (29.8%) of infestation was found in age groups 8monthes to 2 years. Furthermore, this study shows that the gender of the infected camels played a role in the incidence of myiasis. The highest percentage (56.6%) of infection was recorded in females in comparison with the infection percentage that was recorded in males (37.36%). The mean concentrations of total protein (g/l).Serum total protein concentration was significantly higher ($P<0.01$) in infected compared to healthy camels. The concentrations of albumin (g/l) in infected were 25.55 ±2.40 and healthy camels 40±3.10, respectively was statistically significant ($P>0.05$). The mean concentrations (g/l) of α1-, α2-, β-, γ-globulins were 7.33.±0.14, 9.69 ±0.30, 29.92 ±0.80, and 24.05 ±0.53, respectively in infected camels and 4.33 ±0.22, 7.69±0.30, 22.06 ±0.30 and 13.05 ±0.20 respectively in healthy camels. The mean concentrations of γ-globulins were significantly higher ($P<0.01$) in infected camels compared to healthy camels. The mean concentrations of α1-, α2-, β-, were significantly higher ($P<0.01$) in infected camels compared to healthy camels.

Key words: Camels, Nasopharyngeal Myiasis, Clinical, Epidemiology

MRVSA (Special issue), 2nd Iraqi colloquium on camel diseases and management/ College of Veterinary Medicine/ Al Muthanna University 28 March, (2016),7 (2), Mirror of Research in Veterinary Sciences and Animals

SICCDB/ 2018-8

Diagnostic study of subclinical mastitis in camel of Al-hyadia district – Al-Najaf province

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Abstract

The study was carried out at Al- Hyadia arid distinct (32.053403, 44.018479) which located 38 km western to Al-Najaf were 82 she camels . According to bacterial isolation , the subclinical mastitis was detected in 24 out of 82 she camels in percentage rate 19.68%,the highest percentage of isolates was Coagulase –ve *staphylococci* followed by *Streptococcus spp*. (12.92%) while the percentage rate of *Staphylococcus aureus* , *E. coli* and *Micrococcus spp* were 10.2% , 8.16% and 4.08% respectively . Based to bacterial isolation as confirmed diagnosis of sub clinical mastitis , the milk samples with Coagulase –ve staphylococci , E. coli and Staphylococcus aureus revealed score 3 to CMT reaction with PH ranged 7.5-6.73 and electric conductivity 8.1-7.9 ms/cm , while these of *Streptococcus spp*. and *Micrococcus* showed score 2 to CMT reaction with PH ranged 6.89-6.44 and electric conductivity 7.81-7.68 ms/cm, table 2.

Keywords : subclinical mastitis , dromedary ,Iraq

MRVSA (Special issue), 2nd Iraqi colloquium on camel diseases and management/ College of Veterinary Medicine/ Al Muthanna University 28 March, (2016),7 (2), Mirror of Research in Veterinary Sciences and Animals

Full Articles

Camelids Zoonotic diseases: A Review of literatures

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Abstract

Zoonotic infections or diseases, those that can be naturally transferred from animals to human, with or without an arthropod intermediates. Some of these diseases can be transmitted from camels to humans. The current review article intends to focus on camelids zoonotic diseases and their control measurements. People are usually exposed to the bacterial, protozoa, fungi, viruses and parasites of camelids origin that cause zoonoses in a number of ways. Frequently, these diseases do not make the animal appear sick but can cause serious illness in humans. Persons with specific medical conditions such as a chronic illness, immunodeficiency and pregnancy may be at higher risk of developing diseases or complications from a zoonotic diseases and should not be in contact with these animals. The zoonotic diseases associated with camelids are divided into three groups including: significant diseases, diseases of which Camelids are potential pathogen carriers and minor or non-significant diseases. Therefore, anyone working with or handling camelids needs to know about zoonoses and the precautions must be taken to minimize their risk of infection.

Key words: brucellosis, camelids, camelpox, MERS- CoV, tuberculosis, ringworm, zoonotic diseases.

1. Introduction

Camel is considered as virtuous animal because of its sobriety, endurance, fidelity, longevity, milk with medical proprieties, a low cholesterol meat and quality wool and skin. Camel is the public term for big, humped, long-necked, even-toed ungulates including the mammalian genus *Camelus* of the *Camelidae* family. Globally, there are over 19 million camels according to FAO statistics 2008, of which: 4 million are found in Asia and 15 million in Africa. Camel is considered as one of the milk productive animals, although they are living in the harsh desert environmental conditions (Knoess, 1984; Abbas and Tilley, 1990; Schwartz, 1992). Camelids are considered not ruminants according to taxonomy and physiology or behavior. According to Fowler, (1996), camelids are a poly-gastric animal, but not a true ruminant. Commonly, camelids are rearing in the arid desert environments. The harshness of the desert environments predominantly during the extended dry seasons place the camels further down severe stress situations and make them prone to various diseases and illness (Abbas and Agab, 2002; Agab, 1993). In the past, and due to the scarceness of the studies that covered the camel's diseases, some scientists believed that camels are naturally resistant to many diseases causing pathogens and factors (Zaki, 1948; Dalling *et al.*, 1988). Conversely, the camels have confirmed as other animals, being at risk to the common

disease causing pathogens that affecting other animal species (Wilson, 1984; Abbas and Tilley, 1990; Abbas and Agab, 2002). Some of these diseases are zoonotic and can be distributed from camels to humans. Furthermore, the infected camelids are appeared healthy and don't express any clinical signs. However, these diseases can cause serious illness and complications in humans especially during pregnancy or in people that suffer from immunodeficiency and chronic illness. Extensive search for publications and websites revealed few documented reports concerning zoonotic diseases of the camelids origin, however no systematic review literature was found concerning zoonotic diseases in camelids. Therefore, this review article provides overview of the camelids zoonotic diseases particularly on their epidemiology, pathogenesis, biology, diagnostic approaches and control measurements.

2. Classification and importance of camelids zoonotic diseases

Several unexplained diseases with over mortalities occurred the last ten years as an emerging diseases in camelids populations. However, little is known about the pathogens that circulate in camel populations and how these pathogens interact with the camel. Furthermore, very few diagnostic tests are validated for use in camels, yet, it is not fully understood, how these animals are respond to vaccines. Likewise, camels accused to the source of the human disease 'Middle East Respiratory Syndrome (MERS)'. The questions about the validity of antibody tests for MERS in camels have highlighted the need to better understand disease dynamics in these animals. The most important challenge in the raising camel herds is the zoonotic associated diseases. Camelids zoonotic diseases are divided into three groups including: Significant diseases, Diseases of which Camelids are potential pathogen carriers and minor or non-significant diseases (Figure.1).

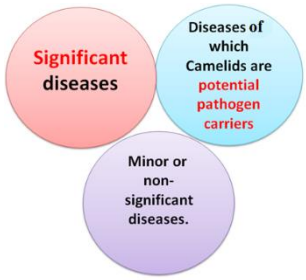

Figure. 1: The classification of zoonotic diseases in camelids

2.1 Significant diseases

2.1.1 Camelpox

Camelpox is considered as emerging public health problem during this decade due to increased reported cases and epidemics in camels. Camelpox is a contagious, often sporadic, and notifiable skin disease of camelids and it is socio-economically significant as it incurs considerable loss in terms of morbidity, mortality, loss of weight and reduction in milk yield and confined to camel rearing countries (Duraffour *et al.*, 2011).

Camelpox virus (CMLV) is a zoonotic agent and commonly host specific (Davies *et al.*, 1975), nonetheless, indications and evidences have been released from Somalia and India in smallpox unvaccinated persons and camel handlers or attendants (Jezek *et al.*, 1983; Kriz *et al.*, 1982; Bera *et al.*, 2011) respectively. The camelpox lesions were appeared as mild skin lesions (Coetzer *et al.*, 2004), and may perhaps be of public health impact. Furthermore, milk from camelpox - affected animals led to develop ulcers on the lips and in the mouth of individuals that drink it, however, no laboratory confirmation has been done (Davies *et al.*, 1975). Meanwhile, in certain

occasions, CMLV could be pathogenic particularly in immune-comprised individual. Because of the deficiency of the precise immunological analyses for camelpox antibodies (Marennikova, 1975) between unvaccinated herds, no systematic epidemiological studies have been done on the human cases (Azwai *et al.,* 1996). The earlier smallpox vaccination could be explain the self-limited nature of human infection with CMLV (Duraffour *et al.,* 2011). The first definite approve of camelpox zoonotic infections in unvaccinated smallpox human connected with epidemics in dromedarian camels has been reported in India by Bera *et al.,* (2011). They confirmed the zoonotic nature of camelpox for the first occasion by laboratory investigations. They described three human cases that suffered from papules, vesicles, ulceration and finally scabs over the fingers and hands (Figure.2). Molecular characterization of the causative agent accompanied with clinical, epidemiological and serological tests were the basis for confirmation CMLV zoonosis in human cases.

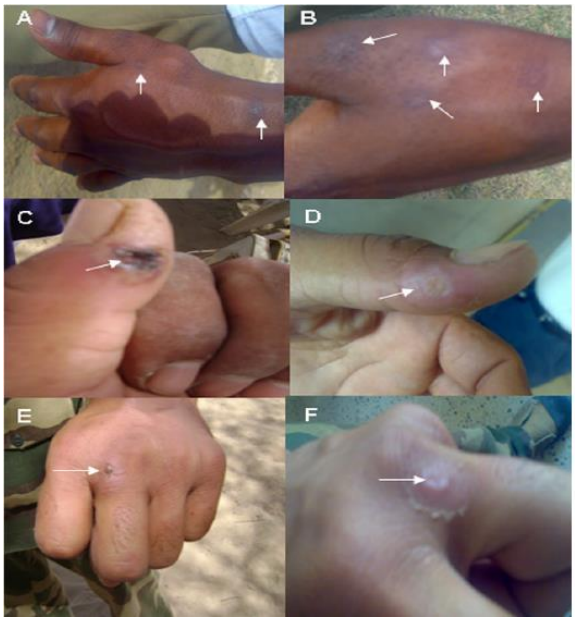

Figure.2: Skin lesions of camelpox in human cases. Case 1: (A&B) revealed disseminated cured scabs over the hand. Case 2: (C&D) Pock lesion displayed as ulcerated open wound with central necrosis that surrounded by a sharp hemorrhagic edge on the thumb. Case 3: (E&F) Typical pock-like lesions appeared as eruption at the base of the middle finger (Bera *et al.,* 2011).

Camelpox is one of the notifiable disease to OIE epizootics (World organization for animal health-WOAH). CALV is strictly related to the Variola virus the smallpox causative agent. The disease is restricted to camels but it is enzootic in almost every region, where camels are raised, however, Australia are free from the disease. The virus belongs to the genus *Orthopoxvirus* (OPV), of the subfamily *Chordopoxvirinae* of the family *Poxoviridae*. Numerous CMLV strains have been isolated from different epidemics in different parts of the camel rearing countries. During smallpox eradication campaign in early 1970s, identification of CMLV agent was an alarm because it is described as smallpox-like disease (Baxby, 1972). CMLV genome contains a single linear double-stranded DNA molecule ended by a hairpin loop that replicates in the cytoplasm. The virus carrying genes responsible for host immune evasion mechanisms owing to the threat posed by potential bio-warfare agents. Camelpox is contagious disease of the *Camelus dromedarius* and *Camelus bacterianus* (Old-World camelids) and the new-world camelids (Elliot *et al.,* 2008), and CMLV is considered to naturally infect merely the Old-World camelids. It is

occurred in camel breeding areas of Asia, Middle East, Africa and north of the equator. The disease is endemic in the Middle East countries (Iran, Iraq, King Saudi Arabia, United Arab Emirates, Oman, Yemen and recently in Syria (Al-Ziabi *et al.,* 2007), Africa (Sudan, Algeria, Egypt, Kenya, Mauretania, Niger, Somalia, Morocco and Ethiopia) and in Asia (India, Pakistan and Afghanistan) (Figure. 3).

The transmission of the CMLV occurs by indirect contact via a contaminated environment or direct in between infected and susceptible animals either by inhalation or through skin abrasion. However, the mechanical transmission may play a role. The infected camels may shed the virus through scab materials, milk, saliva, ocular and nasal discharges in the environment. There are also a suspicious about the role of an arthropod vector in the transmission of the disease. Moreover, the spreading of tick population especially *Hyalomma dromedarii* the most predominate species during the rainy season, is probable contributed in the spreading of the CMLV. The incubation period of the disease is range 9-13 days, followed by enlarged lymph nodes, skin lesions and prostration. There are variations in the clinical signs of camelpox from mild local to severe systemic disease depending on CMLV strains involved in the infection. The typical lesion/ a rash is going through all the stages of pox lesions development as papules on labia, macules, papules, pustules, vesicles and scabs.

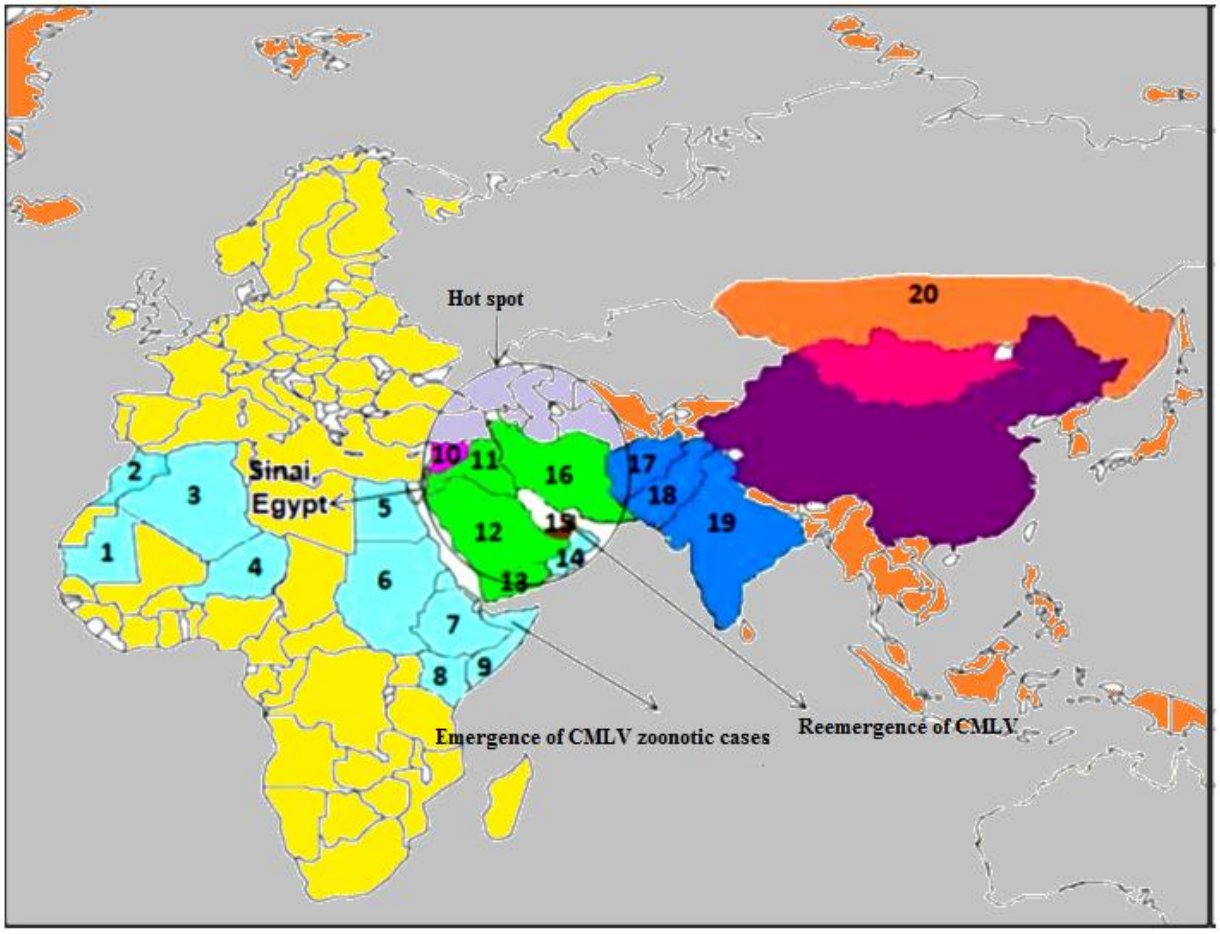

Figure.3: Shows the geographical distribution of camelpox in the world

1.Mauritania	6. Sudan	11. Iraq	17. Iran
2.Morocco	7. Ethiopia	12.Saudi Arabia	18. Afghanistan
3.Algeria	8. Kenya	13. Yemen	19. Pakistan
4.Niger	9. Somalia	14. Oman	20. India
5.Egypt (Sinai)	10. Syria	15. United Ara Emirates	21. Sothern parts of former Sovi Union (Russia)

In conversely, the generalized form lesions may spread over the body, particularly on the head and the limbs with sometime swellings on the neck and abdomen and even multiple pox-like lesions can be found on the mucous membrane of the mouth, respiratory and digestive tracts and the significances is more likely fatal (Figure. 4). The infected camels may show salivation, anorexia, lacrimation, mucopurulent nasal discharge and diarrhea. Abortion may occurred in the pregnant animals due to septicemia that caused by secondary bacterial infection like *Staphylococcus aureus* (Wernery and Kaaden, 2002). The diagnosis of camelpox infection is depended on clinical signs in affected animals. Moreover, tissue samples from the skin lesions or organ biopsies are the most useful to recognized the infectious agent. It is very important to use different diagnostic approach to make confirmatory diagnosis. Few complementary tools might be recommended for camelpox diagnosis like transmission electron microscope, virus isolation using cell culture, standard PCR assays, immune-histochemistry and demonstration of neutralizing antibodies (Bhanuprakash *et al.*, 2010). There are few information concerning Camelpox treatment, however, application of antibiotics and administration of supportive medication are important to reduce the severity of the disease. The use of antiviral drugs/ agents may be of choice especially in young camels as an alternative treatment. Since, CMLV resembles Variola in its dependence on a single host, the disease could potentially be eliminated through combination of surveillance, vaccination and quarantine (Duraffour *et al.*, 2011). Moreover, to contain the distribution of camelpox in enzootic countries, prophylactic methods have been developed. Vaccination against camelpox revealed little information in the literature. The foundation of camelpox virus vaccine is from former Soviet Union (Borisovich, 1973). Moreover, the facts of camelpox vaccine efficacy originates from field investigation using of commercialized CMLV- based vaccines. Traditionally, Bedouin in Arab countries are using the lactotherapy as vaccination method in prevention the uninfected camels during outbreak. This method of vaccination used the scarification of a mixture of milk and camelpox infected crust. However, some countries apply attenuated prepared vaccine like in Saudi Arabia, the intradermal or subcutaneous injection of the passage level 78 of CMLV (Jouf -78strain) that propagated in camel kidney cell cultures are found to be safe and effective at 10^{3} $TCID_{50}$ (Hafez, 1992). Globally, Camelpox is considered as one of the serious zoonotic disease, consequently, application of skills, knowledge and veterinary public health resource are required to maintain public heath from pathogens zoonotic infections. Besides, the control procedures for emerging and reemerging pathogens are demanding as there is population. The application of new molecular genomic and proteomic tools besides the traditional diagnostic techniques are needed in the identification of the CMLV, thus the prophylactic, therapeutic and prevention processes would be applied early enough.

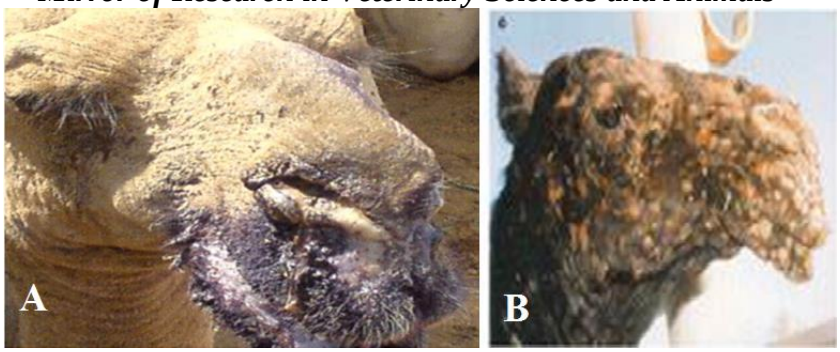

Figure. 4: Shows the clinical signs of camelpox A. Nasal discharge, B. Severe skin lesions on the head and face of the infected camel.

2.1.2 Rabies in camels

Rabies is a serious deadly viral infection. It is encephalitic disease widespread in many areas of the world. Similar all other mammals, camelids are prone to rabies. The rabies virus belongs to family *Rhabdoviridae*, which includes the genus *Lyssavirus* and the *Vesiculo-virus*. This virus has been studies widely because of its zoonotic feature and its high mortality rate after appearance of clinical signs (Wernery and Kaaden , 2002; Alan, 2003).

Rabies virus is spread by bites and mucus membrane exposure from an infected rabid animals. The virus has been found in saliva and other body excretions, but it cannot enter the non-injured skin. Rabies in camels has been observed in many African and Asian countries (Richard, 1980) as Morocco (Chevrier, 1959), Somalia (Arush, 1982), Niger (Bloch and Diallo,1995), Mauritania (Bah *et al.*, 1981), Oman (Ata *et al.*, 1993; Body *et al.*, 2015), the U. A. E (Wernery and Kumar, 1993) and Iraq. Domestic animals can be infected from interaction with wildlife such as bats, skunks, and raccoons that act as reservoir host according to geographical location. In USA, rabies is controlled in dog and cats by vaccination, but wild species serve as a reservoir. Twenty alpacas were bitten by a rabid dog from a herd of 160 heads in Peru (Franco, 1968). In this occasion, the incubation period was short and thirteen of these animals were died six to eight days after the progress of clinical signs. Rabies has been recorded in dromedary camels in all dromedary raising countries. Meanwhile, the reservoir host and transmitting host are not always known, but are assumed to be the dog and red fox (*Vulpes vulpes*) in United Arab Emirates (Wemery and Kumar,1993). The camelids are often display neurological symptoms and unusual behavior. However, lameness, ataxia and posterior paresis are the initial signs of rabies in camelids. Initial signs are followed by either an aggressive syndrome (furious rabies) or a paralytic syndrome (dumb rabies) (Peck, 1966; Perl *et al.*, 1996; Higgins, 1986; Fowler, 2010 & 1998; Mustaph, 1980). In the aggressive form, no fever usually occurred until the animal becomes aggressive and there is increased in the muscular activity. Moreover, the most important signs in this form are attacks on people, offspring, house mates and even themselves or objects. Other signs of this stage are the vocalization changes including alarm cries without cause. The characteristic features of terminal stages of rabies in camel are yawn (Figure.5), moreover, other signs are bloat, pruritus, muscle tremors, aimless running, sexual hyperactivity, later on recumbence, convulsions , coma, and death occur within four days. The camelids paralytic rabies is characterized by anorexia, depression head droop, ptosis, tenesmus, salivation, circling, facial paralysis, mild fever, flaccidity of facem anusm bladder muscles and pharyngeal / laryngeal paralysis (Afzal *et al.*, 1993; Kumar and Jindal, 1997).

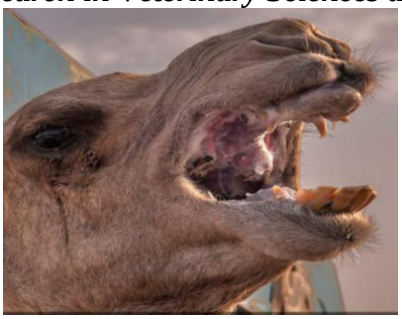

Figure. 5: The terminal stages of rabies in camel, prior to death, the dromedary attempts to yawn continuously.

It is important to make an accurate diagnosis to camelids rabies and consequently, a prevention. The rabies virus causes a non-suppurative encephalitis with perivascular cuffing by mononuclear cells. The presence of Negri bodies can be confirmed by immunofluorescence which is a characteristic for rabies in a camelids (Wernery and Kaaden, 2002) (Figure.6). In all examined rabid dromedaries, massive numbers of rabies virus particles of varying sizes were seen in the brain. Active immunization is possible with inactivated vaccines. The data shows that one cattle dose of inactivated rabies vaccine induces good but short term serological conversion in dromedary camels. Therefore a booster dose of vaccine is necessary 6 to 8 months after primary vaccination.

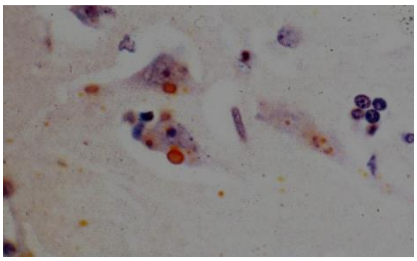

Figure. 6: shows the Negri bodies that confirmed by immunofluorescence (Wernery and Kaaden , 2002).

2.2 Diseases for which Camelids are potential pathogen carriers

2.2.1 Middle East respiratory syndrome coronavirus (MERS-CoV)

In March 2012 people are confirmed to be suffered from Middle East Respiratory Syndrome coronavirus (MERS-CoV) infection and approximately 330 of these infection have been fatal (Gary *et al.*, 2015; Gossner *et al.*, 2014). The dromedary camels are the unique animal species for which there is considerable proof that it is a host species for MERS-CoV and henceforth a potential source of human infections. Middle East respiratory syndrome coronavirus (MERS-CoV) is a viral respiratory infection caused by a new (novel) coronavirus (Middle East respiratory syndrome coronavirus (MERS-CoV) that was initial recognized in Saudi Arabia in 2012 (Gary *et al.*, 2015). Coronaviruses are big family of viruses that can cause diseases ranging from the common cold to severe acute respiratory syndrome (SARS) (Zaki *et al.*, 2012). The typical MERS symptoms include fever, cough and rapidity of breath. Pneumonia is most common, but not always existence. Gastrointestinal symptoms, including diarrhea, have also been recorded (Zaki *et al.*, 2012). It has been approved by some investigators that cases of MERS-CoV infection are appeared as asymptomatic, and do not have any clinical symptoms. The majority of asymptomatic cases have been determined following aggressive contact tracing of a laboratory-confirmed case. About 35% of recorded affected patients with MERS have died. Even though the majority of

human cases of MERS have been contributed to human-to-human infections in health care setting, current scientific evidence suggest that dromedary camels area a major reservoir host for MERS-CoV and an animal source of MERS infection in humans (Gary *et al.*, 2015; Gossner *et al.*, 2014). Nevertheless, the exact role of dromedaries in spread of the virus and the exact rout(s) of spreading are unknown. The virus does not seem to pass easily from person to person except there is a close contact, like that occurs when providing uncovered carefulness to patient. It is worth to mention that health care related occurrences have happened in several countries, and high epidemic appeared in Saudi Arabia, United Arab Emirates and Korea (Gary *et al.*, 2015). The clinical signs of MERS-CoV in humans varies from asymptomatic (no signs) or mild respiratory symptoms to severe acute disease and death. The typical presentation of MERS-CoV started with fever, coughing, short breathing, development of pneumonia and gastrointestinal symptoms including diarrhea. Respiratory failure occurs with severe illness and in this case the patients need hospitalization in an intensive care units and mechanical ventilation. Older people, immunosuppressed individual, people suffering from chronic diseases, chronic lung diseases and diabetes are more susceptible to the virus and developed graving diseases. MERS-CoV is a zoonotic virus, that means the virus transmitted to human from animal's reservoir. The studies revealed that people are infected through direct or indirect contact with infected dromedaries' camelids (Figure. 7) (Gossner *et al.*, 2014).

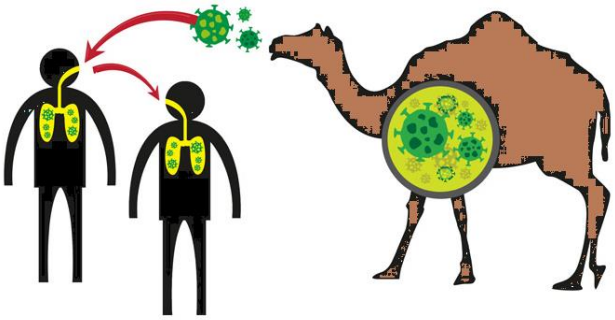

Figure.7: method of transmission of MERS-COV from camel to human

The virus of the disease has been identified in several countries rearing camelids including Saudi Arabia, Qatar, Oman and Egypt, moreover, MERS-CoV specific antibodies have been identified in dromedaries in the Middle East and Africa and South Asia and this indicated that the camels have previously exposed or infected by the virus (Figure.8).

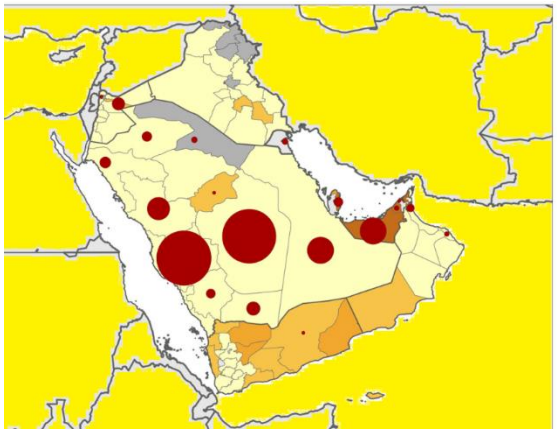

Figure.8: Shows the distribution of the Camelidae in Middle East and MERS-CoV human cases between 2 March 2012 to 23 July 2014 (n = (*695 .Cases for which probable region of infection is available. The map was created using data from: World Health Organization for Animal Health. World Animal Health Information Database (WAHID), Animal population, Camelidae, 2011–2013). Available from *http://www.oie.int/wahis_2/public/wahid.php/Countryinformation/Animalpopulation. ECDC line listing: data compiled from WHO and Ministries of Health websites around the world.

Indeed, the source of the virus are not fully understood, nonetheless according to the analysis of different virus genomes, it is assumed that it may have originated in bats and was transmitted to camelids long time ago in the past, however, the evidences are weak and unconvincing (Ithete et al., 2013; Memish et al., 2013).

In dromedaries, the MERS-CoV infection are either asymptomatic or cause a mild respiratory symptoms ((Hemida et al., 2014; Nowotny and Kolodziejek, 2014). This assuming that epidemics in camel herd are likely to go undiagnosed. Previous studies in several countries on sheep, goats and cattle in Jordan and Saudi Arabia didn't find approve of previous infection (Reusken et al., 2013; Alagaili et al., 2014). Moreover, in United Arab Emirates, the examination of stored sera collected in 2005 also revealed negative for MERS-CoV antibodies (Alexandersen et al., 2014). In contrast, the serological investigations, in Jordan, Oman, Qatar, Saudia Arabia and UAE revealed high antibodies rate against MERS-CoV (Reusken et al., 2013; Alagaili et al., 2014; Meyer et al., 2014), these pointed to wide-distribution of the virus in the Arabian peninsula. Moreover, Egypt, Ethiopia, Kenya, Nigeria, Sudan, south Sudan, Tunisia and the Canary Islands were also revealed a titers of antibodies against MERS-CoV in dromedaries camelids (Perera et al., 2013; Reusken et al., 2013 ; Corman et al., 2014). It was also approved that MERS-CoV was moving in dromedaries camels earlier in 1992 in Saudi Arabia (Alagaili et al., 2014), and 2003 in UAE (Meyer et al., 2014) and the new MERS-CoV ancestor was a samples from humans in 2011 (Rambaut, 2013). To control zoonotic implication of MRES-CoV from dromedaries' camelids, control measures implemented in different Arabian Peninsula. These processes appeared to be effective and successful as the number of reported cases was decreased significantly.

2.2.2 Rift Valley fever (RVF) in Dromedary camels

It is an acute, arthropod borne fever causing viral disease of domestic animals as cattle, buffalo, sheep, goats and camels. Moreover, it is zoonotic disease predominantly affect humans act together with the infected materials (Hoogstraal, 1979). RVF in human causes hemorrhagic fever, Encephalitis, blindness, and severe liver damage. RVF outbreaks cause severe economic damage to animal owners through the lacks in the production and fatalities, intensified by the 100% abortion rate at all stages of pregnancy. The weather paly important role in the development of RVF epidemic. It was reported that all outbreaks occurred after heavy rainy seasons probably, referring a huge number of insect population as a vector requirements (Huebschle, 1983). Meanwhile, RVF doesn't occur in very arid areas. The RVF virus belongs to *Phlebovirus* genus of the family Bunyaviridae. It is a sphere-shaped, 80 to 120 µm in diameter, and have a host cell derived, Bililipid layer envelope where virus-coded glycoprotein spikes project. RVF virus strains have been revealed no significant antigenic differences, however, variations have been demonstrated in virulence. The first description of this disease was in Kenya in the early 1900s among livestock (Scott *et al.,* 1963). Then, the disease was reported in Egypt , Sudan, Tunisia,

Kenya, Mauritania and Nigeria as reported by Imam *et al.*, (1978), Eisa, (1981), Slama, (1984), Davies *et al.*, (1985), Saluzzo *et al.*, (1987), and Olaleye *et al.*, (1996) respectively .The diseases occurred in eastern and southern Africa and endemic in indigenous forests because the availability of mosquito vectors after heavy rains. The virus was first recognized in animals in a farm located in Rift Valley of Kenya . Later on, the virus circulated in sub-Saharan Africa with outbreaks in West Africa. It has also distributed into Egypt. RVF antibodies have been found in 45% of the examined dromedaries during outbreaks with a drastically increased in abortion (Scott *et al.*, 1963). High abortion rate were also reported in dromedaries in Egypt during RVF epizootic. Most recently, unusual RVF outbreak was reported in Mauritania at a northern latitude and in an extremely arid region with high mortality rates and severe clinical signs that observed among dromedaries. (Ahmed *et al.*, 2011) (Figure.9). According to WHO, a high mortality rate in camels reported during this RVF outbreaks.

Meanwhile, camelpox or parapox (*Ecthyma contagiosum*) had been suggestive as the cause of high mortality and morbidity accompanied with ballooning of head and upper neck, swollen eyes and huge mucoid membrane sloughs in the mouth covering some ulcers. Extremely, all RVF outbreaks in camelids characterized by fever, abortion and sometimes early neonatal death and jaundice.

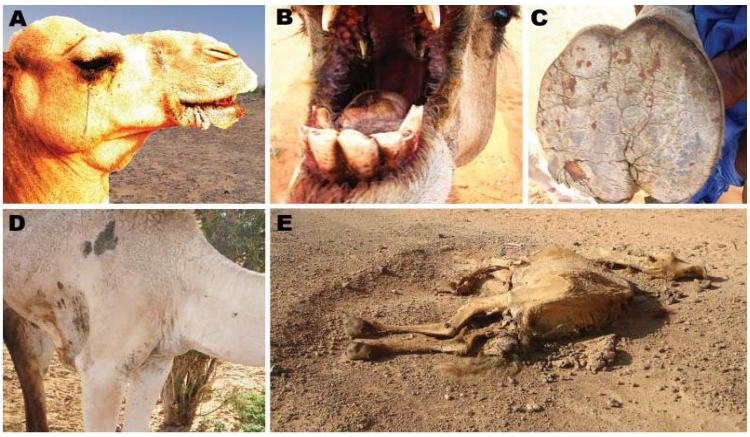

Figure. 9: Shows the clinical signs of RVF outbreaks in camels in Mauritania. A. Conjunctivitis, B. Hemorrhage of Gums, C. Foot lesions , (cracks in the sole) with secondary myasis, D. edema at the base of the neck, E. dead camel with sign of abortion, convulsions and arching of the neck(Ahmed *et al.*, 2011).

The definitive diagnosis of RVF depends on virological and serological investigations. Specimens for laboratory confirmation included heparinized blood, liver, spleen, kidney, lymph nodes and brain from aborted fetuses are collected for virus isolation on Vero and BHK21 cells or suckling and weaned mice. Complement fixation test, Agar gel diffusion test and ELISA can be used to demonstrate antibodies of RVF. Impression smears from infected tissue can also detected by immunofluorescence. Immunization of susceptible animals are the best and effective method to protect livestock against RVF since chemical control of vectors is not practical method to confinement of animals to mosquito-proof stables (Ahmed *et al.*, 2011).

2.3 Minor or non-significant diseases

2.3.1 Brucellosis

Brucellosis is a global infectious zoonotic disease affecting animals including camels, as well as human. It is caused by Gram negative bacteria of genus *Brucella* that are facultative intracellular.

This bacteria can persist in the host cell causing a chronic disease and may stay throughout the life time of the infected animal. Brucellosis is considered as highly serious disease and can transmit to people and effects on public health (Al-Salihi, 2013). The disease has been got a special consideration from researcher, scientist, government. Albeit, brucellosis in camel is yet not well investigated. In 1931, camel brucellosis was reported (Solonitsuin, 1949). Afterward, the disease has been recorded from all camel-keeping countries (Gwida *et al.,* 2012). There are many factors that make camel prone to brucellosis, the most important factor is the raising camels with other animal's species such as sheep and goats. Camelids are susceptible to both *Brucella abortus* and *Brucella melitensis* (Cooper, 1991), although, camel is not the primary hosts of Brucella. Subsequently, the incidence be influenced by the infection rate in primary hosts being in contact with them. In the meantime, *brucella* species isolated from camels, drinking of milk and eating meat have led to a high number of human brucellosis cases accordingly, serious public health concern has aroused (Kiel and Khan, 1989). Greatest farmers from nomadic areas have faith in that camel milk is a healer for various diseases. They drink raw camel milk, and they do not believe that non-pasteurized milk can cause disease. In Mogadishu/ Somalia, researcher found the existence of camels brucellosis using various serological tests, in addition, mRBPT was the sensitive like SAT and c ELISA tool. Moreover, they found that RBPT is very sensitive test validated and its antigen consistent for bovine brucellosis (Ahmed *et al.,* 2017). Merely, scarce publications have been done concerning camel brucellosis in Iraq (Al-Ani *et al.,* 1998). Additionally, the percentage of positive camels to brucellosis was 6,73% between 104 serum samples collected from different age groups according to serological study using Rose Bengal test (Rodhan *et al.,* 2006). There are many complications that stand up in diagnosis of camel brucellosis, as this disease displays only insufficient clinical signs in parallel to its clinical appearance in cattle (Mousa *et al.,* 1987), in addition to, camel herds usually rear in a remote area synchronizes with missing infrastructure. Brucellosis in camel needs more attention and research in all camel raising countries. It is very essential to isolates and identify the causative agents in camels in order to plan the proper vaccination program. Educational program and brochure to aware the Bedouin about brucellosis risk disease will reduce the human infection percentage.

2.3.2 Tuberculosis

It is a contagious, granulomatous chronic disease caused by mycobacterial species, a member of *Mycobacterium tuberculosis complex* (MTC) (Thoen *et al,* 2006). Primarily, the disease affects lungs and lymph nodes of many vertebrate animals and human. Previously, the camels are not reflected highly susceptible to TB (Mason, 1917; Fowler, 2010), nonetheless some later publications has approved the importance of TB in New World Camelids (NWCs) , especially llamas and alpacas, in few countries (South America as well as non their native) that reared. In United Kingdom, a severe emerging diseases is gradually increasing in NWC population (Twomey *et al.,* 2010; Oevermann *et al.,* 2004). Furthermore, tuberculosis has also affected Old World Camelids (OWCs) comprising dromedaries and Bactrian camels (Mustafa, 1987; Mustafa, 1980). The causative agents of camelids tuberculosis are the genus *Mycobacterium* a member of the family *Mycobaceriaceae.* It is non-motile and non-spore forming acid-fast rods of different lengths. *M. tuberculosis*, *M. bovis*, *M. caprae* and *M. microti* belongs to MTC have been isolated from camelids (Barlow *et al.,* 1999; Bush *et al.,* 1990; Dinkla *et al.,* 1991; Elmossalami *et al.,* 1971; García-Bocanegra *et al.,* 2010; Lyashchenko *et al.,* 2007; Lyashchenko *et al.,* 2000; Ryan *et al.,* 2008; Twomey *et al.,* 2007; Waters *et al.,* 2006; OIE, 2008). Moreover, *M. kansasii* a member of Atypical mycobacteria (non-MTC) have also been isolated from classical TB lesions

(Johnson *et al.,* 1993). In Iraq, Tb has been approved in *camelus dromedaries* using PCR tools (Al Salihi, 2016). Tuberculosis is one of the top ten cause of death globally. According to WHO, in 2016, 10.4 million people fell ill with TB and 1.7 millon died from disease comprising 0.4 million among people with HIV (http://www.who.int/news-room/fact-sheets/detail/tuberculosis). Low- and middle- income countries are constituted over 95% of TB death. The disease is zoonotic and the causative agent continuously developing resistance (Multi –resistant tuberculosis (MDR-TB) to rifampicin- the most effective first-line drug. Al though *M. tuberculosis* is responsible for most human cases, bovine TB, caused by *M. bovis*, is an important zoonosis that can transmit to people through ingestion of non-pasteurized milk and dairy products and also inhalation of infectious droplets (Thoen *et al.,* 2006). Epidemics of bovine TB are consequently of considerable concern to public health particularly people working in zoos and private herds (Pate *et al.,* 2006; Bush *et al.,* 1990; Dekker, 1962; Dinkla *et al.,* 1991; Moser *et al.,* 2008; Twomey *et al.,* 2010). The number of *M. bovis*- related human TB cases has dropped significantly in developing countries as a result of eradication programs and pasteurization of milk (Thoen *et al.,* 2006). However, the zoonotic hazard of *M. bovis* is still occurred for people who are in close contact with infected animals. In Russia, *M. bovis* has been isolated from pooled of camels milk and this indicated that camel milk has also a potential source of infection because it is consumed without boiling. A diagnosis of TB in camelids can be made only at postmortem examination and found the typical gross lesions, followed by typical histopathological features. In addition, the bacterial culture is necessary for confirmation the slow-growing organisms that require a special selective media, such as Lowenstein- Jensen (Figure. 10). Recently, PCR technique has been used as a rapid confirmatory diagnosis (Taylor *et al.,* 2007; Thomson, 2006). The diagnosis of TB in living camels is one of the a mysteries due to absences of characteristic signs. Therefore, additional tests required to reach a diagnosis such as traditional tuberculin skin test (Figure. 11) and serological tests. According to World Organization for animal health (OIE), testing of camelids should follow the OIE guideline (Wernery *et al.,* 2007).

Figure. 10: shows the colonies of Mycobacterial on Lowenstaein-Jensen medium

Figure. 11: shows measuring skin thickness during Intradermal tuberculin test at axilla area of a dromedary

Tuberculosis is an intercontinental diseases and control regulations required with culling of infected animals. Treatment of infected animals is not applicable, even though there are some treatment attempts for captive wild animals with anti-TB drugs (Thoen *et al.,* 2009). An effort was done for to prophylaxis a remaining *Bactrian* camels after the diagnosis of TB in two of these camels, using isoniazid combined into pelleted feed at a dose of 2.4 mg\ kg, fed ad libitum

(Bush *et al.*, 1990), even though bone marrow suppression occurred due to isoniazid toxicity that led to death of several camels. Each country should have a national control program based on intradermal tuberculin testing combined with ante-mortem assays in case of camelids, moreover removal of the infected animals and prevention of further introduction of infected animals into the herd. Nonetheless, TB will not be eradicated until infection is controlled in reservoir hosts, such as in wildlife (Thoen *et al.,* 2006). Vaccination are not hitherto available for camelids.

3. Other causative zoonosis of camelids

There are also some other causative agent associated with camelids and have a potential zoonosis risk as orf, ringworm, Q fever, chlamydiosis, leptospirosis, campylobacterosis, salmonellosis, yersiniosis, listeriosis, pathogenic *E. coli* infections, cryptosporidiosis and giardiasis. Orf or contagious ecthyma is a viral infection that causes red raised skin lesions around the face and mouth of young animals and the udder on nursing females. People can be infected and develop similar pox-like lesions if they come into direct contact with an animal's lesions (Abu Elzein *et al.,* 1998). Dermatophytosis is a fungal skin infection commonly known as "ringworm" seen in both animals and people as scaly round areas of hair loss. Ringworm and ORF are transmitted by direct contact with an infected animal (Al-Ani *et al.*,1995). Q fever, *Chlamydophila psittaci* and *Chlamydophila abortus* are agents accompanying with abortion in pregnant camelids but may be also carried by normal animals. There is an particularly high concentration of these agents at the time that the animals give birth, so certain care needs to be used in handling new born animals, placental tissues and birth fluids. These agents can be acquired by exposure to placental membranes and fetuses from infected animals and by atomizer. *Chlamydophila* infections in pregnant women are related with infectious abortion or miscarriage (Zaher *et al.,* 2017). Leptospirosis causes reproductive failure, liver and kidney disease in animals and is typically shed in the urine of infected animals. Human get the infection by oral ingestion and contact with contaminated urine, placenta, and fetal tissues. The organism can infect through abraded skin. Salmonellosis, campylobacterosis, listeriosis, pathogenic *E. coli* infections, yersiniosis, cryptosporidiosis and giardiasis are acquired by contact and oral ingestion of fecal material from infected animals. Animals infected with these diseases typically have diarrhea but some animals may show no symptoms of disease. Any animal with diarrhea should be doubtful of having a zoonotic disease. Individuals with contact to animals and animal atmospheres may progress allergic reactions to animal proteins (allergens) and lead to asthma. Human may be expose to allergens through breathing and contact with skin, eyes and mucous membranes. Animal allergens may be found in animal dander, hair, wool, skin, urine, saliva, serum and any contaminated feed or bedding materials. Risk factors for developing an allergic reaction include history of previous allergies to animals. The signs and symptoms of an allergic reaction are nasal discharge and congestion, conjunctivitis, tearing and eye itching, skin redness, rash or hives and lower airway symptoms (coughing, wheezing and shortness of breath).

In conclusion this review is focused on camelids zoonosis pathogens and conditions that develop primarily via contact with camelids as contaminated bedding or materials, oral ingestion or inhalation of aerosolized fluids. Different health safety precautions should be taken to avoid the risk of exposure, developing and complications of animal specifically camelids origin pathogens (zoonotic disease).

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Health Aspects of Camel Meat: A review of literature

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Introduction

The world has witnessed substantial changes in the global meat market with increasing demand for healthy meat products (Menkhaus *et al.*,1993).Health is the main factor influencing consumer demand for meat products. A result of interest from the preference shift of consumers is that the health meat products such as camel meat Products should be stimulated. It is now recognized by researchers and consumers that There is a good match between camel meat and their preferences for lower risk and more healthy products (Kadim *et al.*,2014). Camel meat is an excellent source of protein with many medicinal benefits for human health. The culinary and cooking practices as well as the palate form eat in several countries have been evolved to prefer camel meat to other meat animal species due to health benefits. Dromedary camel meat has other medical qualities including protecting against cancerous tumors because it contains unsaturated fatty acids like linoleic. Camel meat can also be used as a cure for exhaustion and fatigue because it contains energy (glycogen) needed by body cells. Glycogen is easily absorbed and metabolized in the body, and is converted to glucose which activates nerve as well as other cells. Camel meat has been used since the late sixteenth century in traditional Chinese medicine. It has been used to improve resistance to disease, to strengthen the muscles and bones, to moisten the skin and to relieve internal pain (Khan *et al.*, 2016)Camel meat can be used in many food industries such as sausage, corned meat and shawarma.

Bioactive compounds

Several bioactive compounds are nutritionally important and can potentially be useful in marketing dromedary camel meat. Carnosine(β-alanyl -L-histidine) is important dipeptides and function as antioxidants and putative neurotransmitters in the brain. Dromedary camel meat has 164.9 mg carnosine/100g and 236.9 mg anserine/100g fresh weight. Carnosine has been proven to scavenge reactive oxygen species as well as alpha-beta unsaturated aldehydes formed from peroxidation of cell membrane fatty acids during oxidative stress. Carnosine can increase the Hay flick limit in human fibroblasts, as well as appearing to reduce the telomere-shortening rate. L-carnitine Plays an important physiological role in producing energy during exercise through transporting long-chain fatty acids across the inner mitochondrial membranes. It is Clear that dromedary camel meat could potentially be one of the best sources of taurine L-carnitine (12.6 μmol /g fresh weight).Taurine has many fundamental biological roles, such as conjugation of bile acids, anti-oxidation, osmoregulation, membrane stabilization, and modulation of calcium signaling. It is essential for cardiovascular function, and development and function of skeletal muscle, the retina,and the central nervous system.

Health Aspect

Meat in general is considered afunctional food for cures of many ailments and for improved performance in many cultures around the world (Migdal and Živković, 2007) Camel meat is believed to have medicinal effects (Bin Saeed *et al.,* 2005). Kadim *et al.,* (2014) indicated that camel meat has traditionally been used to cure the following ailments: (1) seasonal fever, sciatica and shoulder pain, as well as for removing freckles; (2) camel meat soup was used to cure corneal opacity and to strengthen eyesight; (3) Camel fat was used to ease hemorrhoid pains and the hump fat was used to remove tape worm; and (4) dried camel lungs used to be prescribed as a cure for asthma, especially if taken with honey. Traditionally in countries rearing camels, their meats were used as remedy for the hyper acidity, hypertension, pneumonia, respiratory disease and aphrodisiac. Studies have shown that camel meat can be used as a cure for cold and sciatica, stroke, cancer,and infections, especially among older people because this meat can safeguard muscle health (Kadim *et al.*,2014).

Angiotensin I- Converting Enzyme Inhibitory(ACE)

ACE is a central component of the renin-angiotensin in system to control blood pressure by regulating the volume of fluids in the body. It converts the hormone angiotensin-I to the active vasoconstrictor angiotensin II. Therefore, ACE indirectly increases blood pressure by causing blood vessels to constrict. The ACE inhibitor concentrations in Bactrian meat are ranged from 65.1-72.5%), which can effectively reduce systemic vascular resistance in patients with hypertension, heart failure or chronic renal disease through decrease production of angiotensin II. ACE Inhibitors also increase blood flow, and can protect your kidneys from the effects of hypertension and diabetes.

Conclusions

The dromedary camel meat has a favorable nutritional profile for human. The camel meat is also an important source of healthy compounds and can be competitively marketed alongside of other meats. It is important to encourage the consumption of dromedary meat and to devise a national plan to raise awareness among the public due to its health benefits and uses at a time when the demand for healthy food is greater than ever.

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Assessment of genetic diversity in Iraqi camel breeds using Cytochrome b

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Abstract

This study aimed to investigate the genetic diversity, population structure, and demographic history of Iraq camel breeds. Eighty blood samples were randomly collected from unrelated animals from different parts of Iraq. Fifty samples of the Joudi breed were collected from Basrah, Al-Muthanna, Najaf, Babylon, and Wasit (10 samples each). As well as 15 samples of the Khawar breed from Anbar and 15 samples of the Hurra breed from DhiQar. The analysis of molecular variance (AMOVA) was employed in order to determine the genetic variability within and among populations of this camel breeds. The neutrality tests and mismatch distribution analysis were also applied to assess the neutrality and demographic expansion of the populations, respectively. The results revealed a total of 16 different haplotypes with high haplotype diversity (0.648) and low-nucleotide diversity (0.00109). The haplotypes of the Cytb gene were 15 haplotypes, 10 of which were in the Joudi breed, 6 in the Hurra breed and one haplotype in the Khwar breed. The haplotype H-2 was common to the three breeds. The variations within and among populations accounted for 94.36 and 5.64% of the total variation, respectively. The results of the neutrality test for Cytb showed that the Joudi and Hurra breeds had negative values for both Tajima's D and Fu's Fs. The highest values were -1.00737 and -

1.98591 for the Hurra breed and the lowest values were for the Joudi breed (-2.14737 and -6.59079 respectively). In the Khwar breed, the values were zero for Tajima's D and Fu's Fs and the obtained result conforms to the model of population expansion ($t > 0$ and $\theta_1 > \theta_0$) for Joudi and Hurra breeds.

Key words: Dromedary camel; Iraq camel breed; Cytochrome b gene (Cytb); Haplotype; Phylogenetic tree

Introduction

Camels are pseudo-rumen chorionic mammals, and are classified as mammals with double fingers and lined feet belonging to the family of Camelidae. Which include Dromedary, Bactrian camels, Lama, Alpaca, Vicuna and Guanaco (Franklin, 2011). The total number of camels in the world is about 25.89 million heads, 89% of which are Dromedary camels, and the remaining (11%) is a Bactrian camel (in the cold deserts of Asia). More than 80% of the world's camels are found in Africa (FAO, 2013). Although large camels contribute to food security in arid and semi-arid regions as compared to other farm animals, studies on camel production systems, phenotypic and genetic are rare (Yohannes *et al.*, 2007).

Mitochondrial DNA (mtDNA) is a powerful tool that can be used to determine evolutionary relationships, population composition and biology of many species due to its low molecular weight properties, simple structure, low recombination rate and rapid evolution rate (Curole and Kocher, 1999; Wan *et al.*, 2004; Arif and Khan, 2009; Patwardhan *et al.*, 2014; Hussain *et al.*, 2015). The present study was undertaken to evaluate genetic diversity and the relationships between Iraqi camel breeds and other breeds of camels in the world.

Materials and methods

Blood samples and genomic DNA extraction

Blood samples were collected from 80 camels that did not have close relatives from different parts of Iraq. Fifty samples of the Joudi breed were collected from Basrah, Al-Muthanna, Najaf, Babylon, and Wasit (10 samples each). As well as 15 samples of the Khawar breed from Anbar and 15 samples of the Hurra breed from DhiQar. DNA was extracted using Kit from Geneaid Company (Taiwan) following the manufacturer's protocols.

Polymerase chain reaction (PCR) amplification of mtDNA Cytb gene

A fragment (867 bp) of the mtDNA Cytb located between nucleotide positions 15,112 and 15,978 in the reference camel dromedaries mitochondrial genome NC009849.1 was amplified using two primers: Forward primer: 5- AGTCAATGCCTGTTTTGAGTACT-3 and Reverse primer: 50- TTGATTTGACTGCGACGGGG-3. The PCR amplifications were conducted in a 50 µL volume containing 20 ng genomic DNA, 25 µl of MasterMix, 2 µl each primer, 15 µl free water. The amplification conditions were as follows: initial denaturation at 94 C for 2 min followed by 35 cycles of denaturation at 94 C for 30 sec, annealing at 60 C for 30 sec, and extension at 72 C for 30 sec, and then the final extension at 72 C for 5 min. The PCR products were electrophoresed on 2% agarose gel stained with ethidium bromide to test the amplification success. The amplified products were purified with a DNA purification kit (SSufine) according to the manufacturer's instructions to remove residual primers and dNTPs. Sequencing was performed in Macrogen Incorporation (Seoul, South Korea).

Data analysis

Cytochrome b sequences were aligned using the BioEdit software (Hall, 1999). Haplotype diversity and nucleotide diversity were analyzed using DnaSP v5.10 software (Librado and Rozas, 2009). Genetic distance, molecular variation (AMOVA) and neutrality test were

analyzed using Arlequin 3.5.1.2 software (Excoffier and Lischer, 2010). The haplotypes network was drawn using Network 5.0.0.0 software (Bandelt *et al.,* 1999).

Neighbor-joining (NJ) tree for tested camel breed sequences and the phylogenetic tree between our camels and other camel breeds in the world were constructed using Mega version 7.0 software (Kumar and Tamura, 2016). The sequences of our camel cytochrome b were aligned with reference sequences for *Camelus dromedaries*: JX946217.1-JX946272.1, KU605062.1, KU605061.1, KU605072.1, - KU605080.1, KX554932.1, KX554934.1, and KX554933.1. *Camelus bactrianus*: EF212038.2, EU195442.1

Results and discussion

Sequence variation and genetic diversity

The results showed that the length of the PCR products was 867 nucleotides were determined in Cytb gene sequences of all 80 samples. The average contents of C, T, A, and G were 27.22, 26.77, 27.06, and 18.89%, respectively, which shows that the GC content (46.11%) was less than the AT content (53.53%). Nucleotide substitutions were only determined among other types of mutations. Among the 15 different haplotypes identified from the 80 sequences, sixteen of them were polymorphic (10 transitions and 6 transversions) (Table.1). The current results were higher than those obtained by Babar *et al.,* (2015), who found four polymorphic in Pakistani camels. These results were also higher than that of Othman *et al.,* (2017), who found only two genotypes in six strains of Egyptian camels. Abdussamad *et al.* (2015) also found less (14) polymorphic in Nigerian camel. However, the present results come slightly below the results of Ming *et al.,* (2016a), who found 17 polymorphic in Bactrian camel breeds of Mongolia, Russia, and China

Genetic diversity of the Cytb gene showed that the values of haplotype diversity (HD) and nucleotide diversity values (π) were moderate, which were 0.419 and 0.00104, respectively. These parameters were 0.453 and 0.00109 for the Joudi breed and 0.648 and 0.00175 for the Hurra breed while the values were zero for the Khwar breed (Table 1). Our results were less than the results of Ming *et al*., (2016b) in his study 11 breeds of domestic camel in China, Mongolia, Russia and a group of two-hump wild camels of Mongolia which ranged from 0.456 and 0.0011 to 0.900 and 0.0032 respectively. As well as Abdussamad *et al.,* (2015) found higher variability (0.751 and 0.002 respectively) in Nigerian camel, Babar *et al.,* (2015) found 0.833 and 0.00187, respectively, in Pakistani camels. The results were higher than those of Othman *et al.,* (2017), who found 0.241 and 0.00150, respectively in six Egyptian camel breeds. As for the Khwar breed, the value of haplotype diversity and nucleotide diversity was zero this was identical to those of Maghrabi, Fallahi and Baladi breeds in Egypt (Othman *et al.,* 2017). This may be due to the absence of polymorphic in the Khwar breed.

Table.1: Sampling population, sample size, population genetic diversity measure, the standard deviation for each population

Breed	N.	NH	H	HD	π	N. transitions	N. transversions
Joudi	50	13	10	0.453	0.00109	10	3
Khawr	15	0	10	0.000	0.0000	0	0
Hurra	15	6	6	0.648	0.00175	3	3
Total	80	16	15	0.419	0.00104	10	6

N: Sample size; H: Haplotype; NH: Number of polymorphic; HD: Haplotype diversity π: Nucleotide diversity.

Haplotype network and phylogenetic tree

The haplotypes of the Cytb gene were 15 haplotypes, 10 of which were in the Joudi breed, 6 in the Hurra breed and one haplotype in the Khwar breed (Table 1). The haplotype H-2 was common to the three breeds, and haplotypes from H-1 to H-10 were found except for H-2 in the Joudi breeds and haplotypes of H-11 to H-15 in the Hurra breed (Figure. 1). The starburst haplotype network indicated a demographic expansion in the Iraqi camel breeds except for the Khwar breed (Bubac and Spellman, 2016).

When construction of haplotypes network included Iraqi camel breeds and other countries breeds using Cytb gene, three haplogroups were found (Figure. 2). The Iraqi camels were in one haplogroup (yellow color) and others in two different haplogroups. These results suggest that Iraqi camel breeds evolve differently than other studied breeds in other countries. Similar results were demonstrated by Ming et al (2016 b), who found two haplogroups for domestic and wild Bactrian camel.

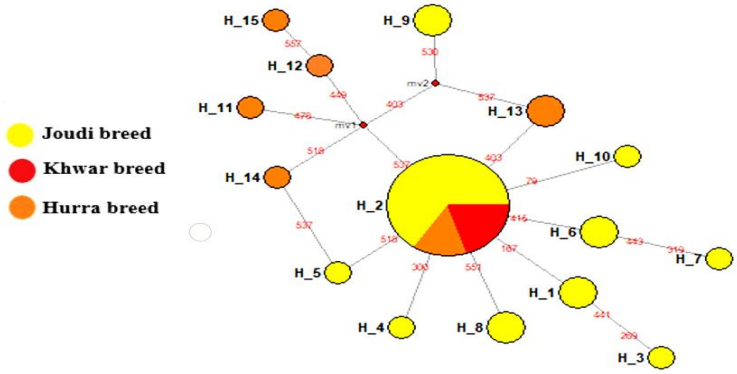

Figure.1: Median-joining networks constructed of the tested Iraq camel breed Joudi, Khawr, and Hurra.

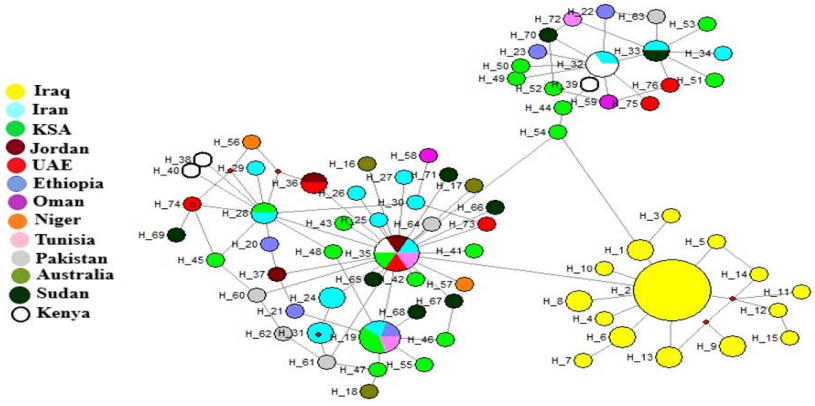

Figure. 2: Median-joining networks constructed of Iraq camels and reference sequences

The results of the phylogenetic tree of Cytb among the Iraqi breeds showed that there were two main branches. The first branch included the Joudi breed, while the second branch included both the Hurra and the Khwar breeds (Figure. 3).

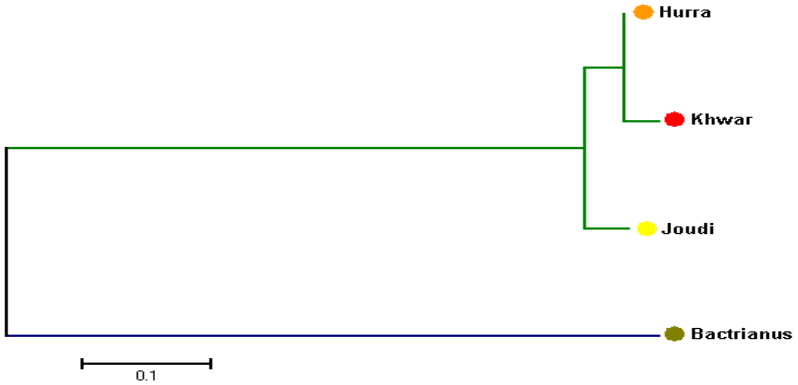

Figure. 3:Neighbor-joining (NJ) tree of the tested Iraq camel breed Joudi, Khawr and Hurra.

In comparison with some countries, the results showed that Cytb has two main branches: the first branch includes the Iraqi camels and the second branch branche divided into two branches. The first secondray branch included Saudi Arabia, Oman, Kenya and Ethiopia, and the second branch included Tunisia, Jordan, Australia, Niger, Sudan, Iran, Pakistan and the Emirates (Figure. 4). This results are similar with a network of haplotypes that included three Haplogroups.

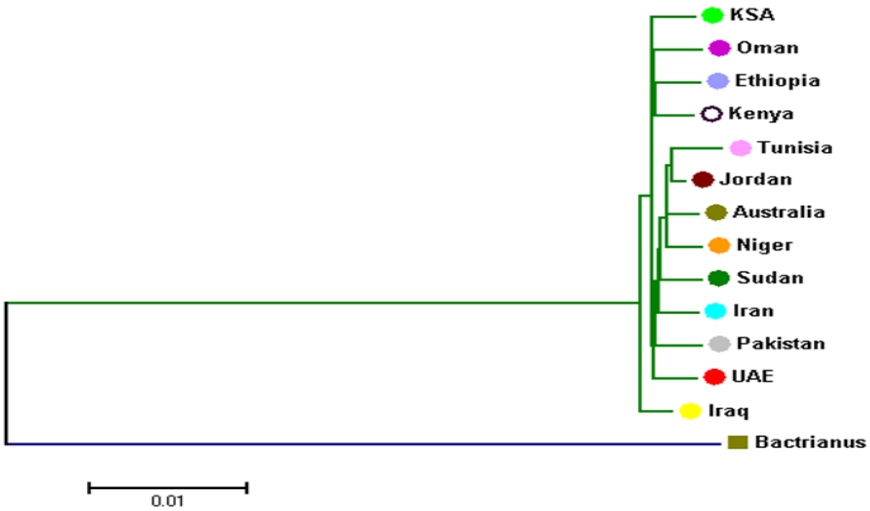

Figure. 4: Neighbor-joining (NJ) tree of Iraq camels and reference sequences

Analysis of molecular variance (AMOVA)

The results of the analysis of the molecular variation (AMOVA) for Cytb gene between and within the Iraqi camel breeds showed that the genetic variance among breeds was 5.64% and the variation within populations was 94.36% (Table. 3). The above results showd that the genetic variability within the breeds was much greater than the genetic variation among the breeds. This may be because the Iraqi camel breeds have the same mother origin (Moradi *et al.*, 2017). Our findings have been agreed with studies of other animal species such as goats (Silva *et al.*, 2017), cattle (Ozsensoy and Kurar, 2014) and sheep (Rodríguez-Rodríguez *et al.*, 2015). All studies found that the genetic variation within breeds was much greater than the genetic variation between the breeds. Our results were not consistent with the results of Silbermayr *et al.*, (2010), who found in their study both wild and domesticated camels that most genetic

variation between and within the breeds was 95.64% and 4.36% respectively. Ming *et al.*, (2016b) also found that between breed variance was 90.14% and within breed was 9.86% in their studies of wild and domesticated camels. Evolution of domesticated and wild camels was in the form of two distinct chains might be the reason behind these finding, and it is suggested that they do not have the same origins (Silbermayr *et al.*, 2010).

Table 3: Analysis of molecular variance of Iraq camel breeds

SOV	DF	SS	Variance components	% variation
Among populations	2	0.929	0.01213	5.64
Within populations	77	15.633	0.20303	94.36
Total	79	16.562	0.21516	

SOV=Source of variation; DF. =degree of freedom; SS=Sum of squares

Demographic expansion

The results of the neutrality test for Cytb showed that the Joudi and Hurra breeds had negative values for both Tajima's D and Fu's Fs. The highest values were -1.00737 and -1.98591 ($P < 0.05$) in the Hurra breed and lowest values in the Joudi breed -2.14737 and -6.59079 ($P < 0.05$) respectively. In the Khwar breed, the values were zero for Tajima's D and Fu's Fs and the obtained result conforms to the model of population expansion ($t > 0$ and $\theta_1 > \theta_0$) for Joudi and Hurra breeds (Table. 3).

A neutrality test such as Tajima's D and Fu's Fs is used to measure the probability that the population has experienced demographic events such as genetic drift or expansion of the clan size. The results indicate that the Tajima's D and Fu's Fs, which indicate the expansion of the Iraqi breeds (Fu, 1997), often interpret the molecular signals of sudden expansion as population growth or spread within the region across a wider geographical range (Bruford *et al.*, 2003). Excluding dendritic strain in the Ctyb gene gave a zero value and may be due to the absence of individual patterns. Our results were agreed with that of Abdussamad *et al.*, (2015), who found negative values for Tajima's D and Fu's Fs in Nigerian camel.

The results of the mismatch distribution in the studied camels of Cytb showed a unimodal distribution and Raggedness (R) values ranged from 0.0 to 0.178 indicating the expansion of Iraqi camel breeds (Table 4, Figure. 5). The values was close to 0.0 indicating that the populations are in the case of population expansion (Hudson and Slatkin, 1991; Rogers and Harpending, 1992; Jobling *et al.*, 2004). This is confirmed by a test of neutrality such as Tajima's D and Fu's Fs that the Iraqi camels have seen an expansion in the breeds' size (Schneider and Excoffier, 1999).

Table. 4: Demographic expansion indices of Iraq camel breeds

breed	T	t	θ_0	θ_1	D	F	r	SD
Joudi	3285	1.97	0.590	3658.260	-2.14737	-6.59079	0.1520	1.232
Khawr	0	0.00	0.00	0.000000	0.00000	0.00000	0.0000	0.000
Hurra	2612	2.41	0.00	2.44896	-1.00737	-1.98591	0.1635	0.780
Mean								

T: time of expansion; t: tau; θ0 and θ1: mutation parameters; D: Tajima's neutrality test; F: Fu's neutrality test; r: Harpending's raggedness index; SD: Mean Pairwise Difference.

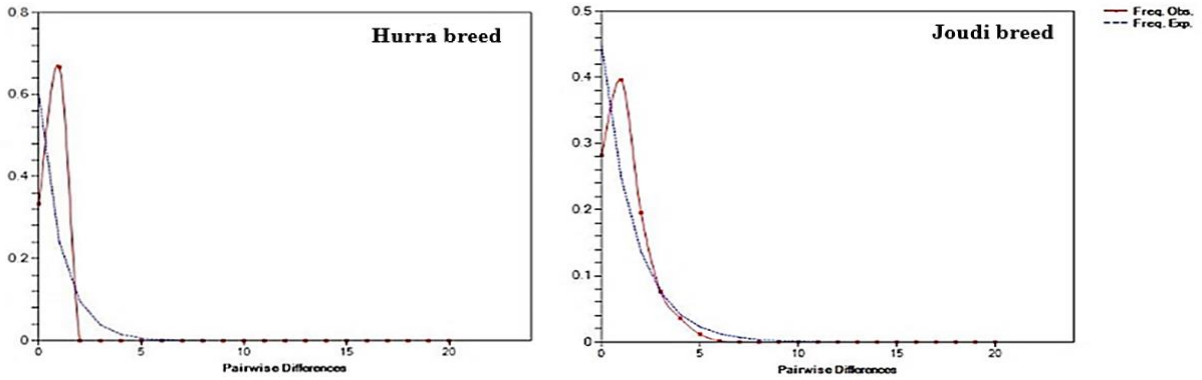

Figure. 5: Mismatch distribution of Iraq camels breed

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Diagnostic study of she camel subclinical mastitis in Al-hyadia district – Al-Najaf province

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Abstract
This study was carried out at Al- Hyadia arid area / Al-Najaf on 82 she camels. According to bacterial isolation , the subclinical mastitis was detected in 24 out of 82 she camels at percentage rate 19.68%. The highest percentages of isolates were 17.68 and 12.92 for Coagulase –ve *staphylococci* followed by *Streptococcus spp*. respectively. While the percentages rate of *Staphylococcus aureus* , E. *coli* and *Micrococcus spp* were 10.2% , 8.16% and 4.08% respectively . Based to bacterial isolation as confirmed diagnosis of subclinical mastitis, the milk samples with Coagulase –ve *staphylococci*, *E. coli* and *Staphylococcus aureus* revealed score 3 to California mastitis test (CMT) reaction with PH ranged 7.5-6.73 and electric conductivity 8.1-7.9 ms/cm , while in *Streptococcus spp*. and *Micrococcus* revealed score 2 to CMT reaction with PH ranged 6.89-6.44 and electric conductivity 7.81-7.68 ms/cm. In conclusion the results of the present study approved investigation of subclinical mastitis in She camel and its causative agents. Moreover, California mastitis test was approved as fast and effective but less sensitive in diagnosis of subclinical mastitis.
Keywords : CMT, *Camelus dromedaries*, Iraq subclinical mastitis.

Introduction

There are a great demand for the milk and dairy products in the past decades, however the needs has been increased because the huge demand due to growing of populations worldwide (Tiwari *et al*., 2013). Camel breeding plays an important role in the life of the desert inhabitants . Camel milk is an important source of protein and energy and some vitamins such as vitamin C, which is difficult for the Bedouin to get them from other sources (Saleh and Faye, 2011). Mastitis is the main problem facing milk production in dairy animals , moreover it has zoonotic and economic importance (Tibary and Anouassi, 2000).The cornerstone in the prevention of mastitis in milk animals is the early treatment of sub-clinical mastitis, which depends mainly on the diagnosis of this disease as soon as possible through early detection methods (Abdulrahman,1995). Many methods have been advised for rapid diagnosis of subclinical mastitis in dairy animals which based mainly on inflammation products such as California mastitis test (CMT), somatic cell count (SCC), pH estimation and electrical conductivity (Salah and Faye, 2011; Viguier *et al.*, 2009 ; younan *et al.*, 2001). The present study conducted to assess subclinical mastitis in Arabian camels in Al-Najaf province.

Materials and Methods

Study area and animals

The study was carried out at Al- Hyadia arid district which located 38 km western to Al-Najaf were 82 she camels (at various lactation stages). Clinical examination was done for all animas with particular attention to udders.

Milk sampling

After stimulation of milking by camel calf , each udder quarter was washed and disinfected with 70% ethanol. The first few drops were discarded and 10 ml of milk placed in aseptic plain tube . All samples were kept in ice box ($4C^{o}$) and transported immediately to laboratory for examination.

Bacteriological examination

Bacteriological examinations were carried out following standard methods according to methods described by Quinn *et al.,* (1994) and Sears *et al.*,(1993). Briefly, a loopful of milk was streaked on 5% sheep blood agar ,and incubated aerobically at 37 ^{0}C for 24-48 hours. Identification of bacterial isolates was based on colonies morphology, Gram's stain reaction, hemolytic characteristics on blood agar and catalase test. *Staphylococci* and *Micrococci* were identified by growth on manitol salt agar, coagulase production, catalase and oxidase tests. Gram's stain negative isolates were sub-cultured on MacConcky agar and further tested using triple sugar Iron TSI agar ,Indol, methyl red ,voges-proskauer, citrate utilization test, urea and oxidase reaction.

California mastitis test (CMT)

CMT was carried out according to method mentioned by Jilo *et al.,* (2017), briefly by adding equal parts (5 ML) of milk and CMT reagent in each paddle wells according to arrangement of quarters with slight rotation movement of paddle. The reactions were interpreted according to gel formation as score 0:no gel formation ; score 1 slight (slim) gel formation which disappeared with movement ;score 2 distinctive slim formation ; score 3 gel formation as mass to bottom of paddle.

Somatic cell count (SCC)

The direct microscopic somatic cell counting method was carried out by spreading of 1 µ L of thoroughly mixed milk from each samples over 1 cm^2 area on a glass slides, air drying and were stained by Newman-Lampert stain as described by Ali *et al.,* (2016).

Electric conductivity and PH

Each milk samples were examined by milk electrical conductivity meter (Dramaniski)after calibration of device with standard buffer solutions. Milk Ph was measured by pH-meter.

Results

According to bacterial isolation , the subclinical mastitis was detected in 24 out of 82 She camels in percentage rate 19.68%. The Coagulase –ve *staphylococci* revealed the highest percentage 17.68 % of isolates followed by *Streptococcus spp*. (12.92%) , while the percentage rate of *Staphylococcus aureus* , *E. coli* and Micrococcus were 10.2% , 8.16% and 4.08% respectively (Table.1).

Table. 1: Reveals percentages of the isolates

Isolate	No. isolates	%
Coagulase –ve *staphyloocci*	26	17.68
Streptococcus spp.	19	12.92
Staphylococcus aureus	15	10.2
E. coli	12	8.16
Micrococcus spp.	6	4.08

Subclinical mastitis was diagnosed based to bacterial isolation from the milk samples accompanied with California mastitis test and the relation was made between the isolated bacteria and CMT score. score 3 CMT score 3 was seen with Coagulase –ve *staphylococci* , *E. coli* and *Staphylococcus aureus* with PH ranged 7.5-6.73 and electric conductivity 8.1-7.9 ms/cm. While, CMT score 2 was observed with *Streptococcus spp*. and *Micrococcus* isolates with PH ranged 6.89-6.44 and electric conductivity 7.81-7.68 ms/cm (Table. 2).

Discussion

The results of bacteriological isolations revealed that Coagulase –ve *staphylococci* and *Streptococcus spp* were the main causative agents with percentages of 17.68% and 12.92 % respectively. These results are in agreements with previous reported studies (Al Salihi *et al.*, 2017; Al-Juboori *et al*., 2013). Other researchers also recorded that these organisms are major mastitis causative agents in she-camels (Yagoob & Sanaa 2005). The entrance of infection is the teat canal, through teat the infection reaches the mammary gland. There are two sources of infective agent- the udder- where many bacteria like *Streptococcus agalactia* and *Staphylococcus aureus* may be present as normal inhabitant and the environment- where causative agents like *E.coli* persist as recorded by Seifu and Tafesse, (2010).

Table. 2: Reveals the relationship between isolates ,SCC ,CMT ,PH and electric conductivity

Isolates	SCC 10^3	CMT	PH	Electric conductivity ms/cm
Coagulase –ve staphyloocci	300	3	7.5	8.1
E. coli	260	3	7.43	7.93
Staphylococcus aureus	180	3	6.73	7.9
Streptococcus spp.	120	2	6.89	7.81
Micrococcus	110	2	6.44	7.68
No isolate	36	0	6.31	6.13

The skin surface of the camel have many microorganisms as inhabitant population and from where the organisms may have the chance to invade through contamination by the handlers. Spread of infection is possible through bedding ground by discharges of affected gland, this results are agreement with Abdurahman, (1996). In conclusion, this study found that bacteriological isolation were accurate method to determine the causative agents of mastitis. In addition, the measurement of EC is an inexpensive, simple and rapid method when compared to SCC. Moreover, this study found that the electrical conductivity (EC) test can be done on site and California mastitis test (CMT) was fast , cost effective but with low sensitivity.

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Application of Differential Interference Contrast microscope in studying of *Camelus dromedaries* skin

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Abstract

A significant species differences are existed between the skins of the animals according to their lifestyle. The camel is clearly adapted for a desert, and its skin differs in the arrangement and morphology of the hair follicles from that of other domestic mammals. Differential interference Contrast microscope (DICM) is related optics give a specimen a three dimensional appearance that enhance depth of focus so that thicker specimens can be observed at higher magnifications. Consequently, this study was designed to dissect the microanatomy of camelid skin and to investigate the arrangement of its layers and structure with special emphasis on sweat glands by validating a differential interference contrast microscope. Skin sample were collected from different regions of five animals (*Camelus dromedaries*) that slaughtered at Al-Najaf abattoir/Republic of Iraq. The samples were kept in 10% neutral buffered formalin and processed

routinely for histopathological sectioning and examined under DICM. The results of this study revealed a clear structures of all layers and its cells of the camelids skin. Moreover, DICM revealed the distribution and structure of sweat and sebaceous glands together with the organization of hairs and their follicles that vary from other mammals. In conclusion, this study approved the validity of DICM in the examination of camelids skin. The authors recommend to apply this tool in examination of normal skin sections as well as validate this technique in diagnosis of skin diseases.

Keywords: Camelids, DICM, Skin, sweat glands, sebaceous glands.

Introduction

A significant species difference are existed between the skin of the animals. The desert animals exposed to high levels of solar radiation and high temperatures, therefore, its skin structures have possessed a special adaption to prevent damage of the tissue proteins. The camel is clearly adapted for a desert lifestyle, its skin differs in the arrangement and morphology of the hair follicles from that of other domestic mammals (Fowller, 1998; Bhakat & Sahani, 2005) . The skin of camel is unique among domestic animals (Fowller, 1998). It has similar epidermis and dermis layers to that of other hairy mammals. But, it differs in the arrangement of the hairs and the morphology of the hair follicles from that of other domestic mammals (Bhakat & Sahani, 2005). In addition, the distribution and morphology of sebaceous glands is similar to other animals, however, each branch of the compound follicles has their individual ring of sebaceous glands (Taha, 1988). Information about the microanatomy of the skin has been the subject of only few studies in camel (Donald *et al.,* 1962; Quasem *et al.,* 1992; Mahdi, 1979). Previously, researcher stated that the skin of the camel has no sweat glands (Leonard, 1894). However, the scientists approved that sweat glands are present in the camel skin (Leese, 1927; Curasson, 1942;Droandi, 1936; Lee and Schmidt-Nielsen, 1962). Sweat glands has been found to be distributed over the general body surface, one in association with each and cover hair. A special manner attachment is occurred between epidermis and dermis layers in the camel (Simon, 1951). In addition, differences are found in the structure and distribution of skin glands and the arrangement of hairs and their follicles in some respects from that described for other domestic mammals. Camel skin sweat glands were seen to be simple, coiled, tubular glands that appeared over all body areas except of the upper lip, external nares and perianal region (Dowling and Nay, 1962; Gbolagunte, 1983). The rigidity and hardness of skin of the camel is one of the obstacles that make the difficulties in reaching thin histological sections. The thickness of most specimens prevents all parts from coming into focus all at once and limiting the usefulness of higher magnification lenses (Al Salihi *et al*., 2018).

The application of light microscope is an essential to perceiving the detail structures of the skin. Bright field microscope is one commonly utilized technique, but it is unable to recognise the more details of skin layers especially in skin of the camel. Differential interference Contrast microscope (DICM) is related optics give a specimen a three dimensional appearance that is not unlike the appearance of a specimen in a scanning electron microscope. These methods enhance depth of focus so that thicker specimens

can be observed at higher magnifications (Nomarski, 1955; Francon, 1961). DIC microscopy utilizes the interference between two polarized beams of light that pass through slightly different areas (amount of the shear: D) of a specimen. It visualizes the optical path difference between the beams of light as a differential. DICM and related optics give a specimen a three dimensional appearance that is not unlike the appearance of a specimen in a scanning electron microscope. These methods enhance depth of focus so that thicker specimens can be observed at higher magnifications. DICM requires several optical components, therefore it can be very expensive to set up. Light from an incandescent source is passed through a polarizer, so that all of the light getting through must vibrate in a single plane. The beam is then passed through a prism separates it into components that are separated by a very small distance - equal to the resolution of the objective lens (Figure.1). The beams pass through the condenser, then the specimen. To date, most previous studies on camelid's skin have been based on conventional light and transmission electron microscopy. As a result, comprehension of three-dimensional (3D) relationship between structures is difficult. A differential interference contrast (DIC) microscopy is a potent tool for obtaining 3D images without any preparation of the specimen. (Khalaf and Bainbridge, 1981; Sciorra and Eckert, 1974). Review of literature revealed no publications concerning application of DICM in examination skin of the camel. Consequently, this study designed to use DICM technique in studying normal microstructure of the skin of the camel with emphasising on sweat glands.

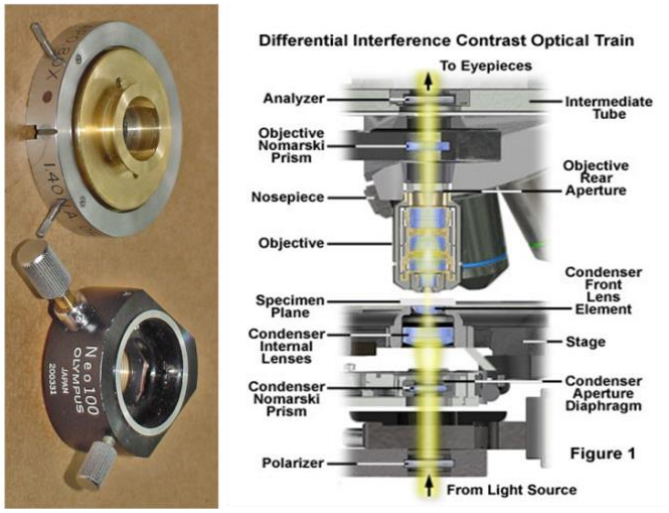

Figure.1: Shows the DIC optical path

Materials and Methods

Skin sample were collected from different regions of five animals (*Camelus dromedaries*) that slaughtered at Al-Najaf abattoir/Republic of Iraq. The samples were kept in 10% neutral buffered formalin and processed routinely for histological sectioning. Later on, tissues were embedded in paraffin, sectioned into 5-6 µm

thickness, and stained with H&E. Slides were examined under DICM and images captured with digital camera connected to microscope (Leica/ Germany) .

Results

Examining normal skin sections of the Camel under DICM revealed a clear epidermis and dermis layers with all their structures and its cells (Figure.2). Under DICM, the epidermis appeared to comprises of keratinized stratified squamous epithelium involves of several sublayers (from most superficial layer to the deepest), these are stratum corneum, stratum lucidum , stratum granulosum, stratum spinosum and stratum basale (germinativum) (Figure. 3). The Stratum corneum (horny layer) appeared as the outermost layer and primarily consisted of dying and dead skin cell filled with mature keratin. This layer appeared to occupy ½ -3/4 of the total epidermal thickness and showed a fully keratinized cells pushed up from basal layers. The Stratum lucidum appeared as a dense eosinophilic layer beneath and very close to the stratum corneum. Stratum granulosum (granular layer) appeared as a single layer of cells in some areas and discontinuous in others. Its nuclei was pycnotic, almost of the cytoplasm has been replaced with keratin; Stratum spinosum (prickle layer) was reduced in thickness but revealed daughter cells of the basal layer and was 1-3 cells thick. These cells appeared as a viable and nucleated and actively synthesize keratin. Stratum germinatium (stratum basale) appeared as the deepest layer of cuboidal or columnar cells, most of which was keratinocytes with a few melanocytes.

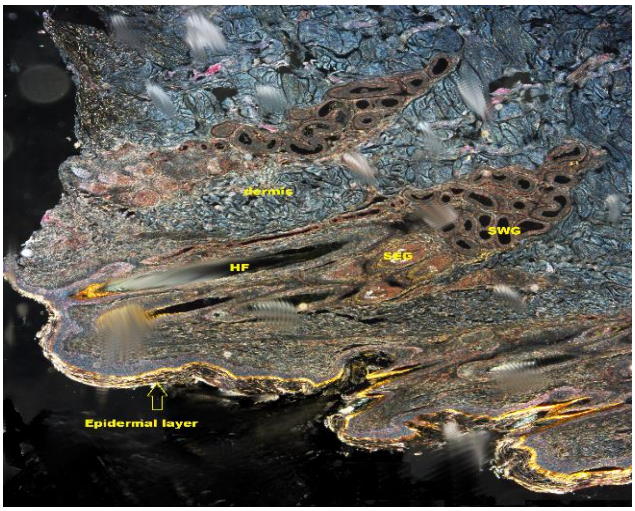

Figure.2: Shows DICM image of the skin of the camel revealing all layers of the skin (X10). HF: Hair follicle; SWG: Sweat glands; SEG: Sebaceous gland

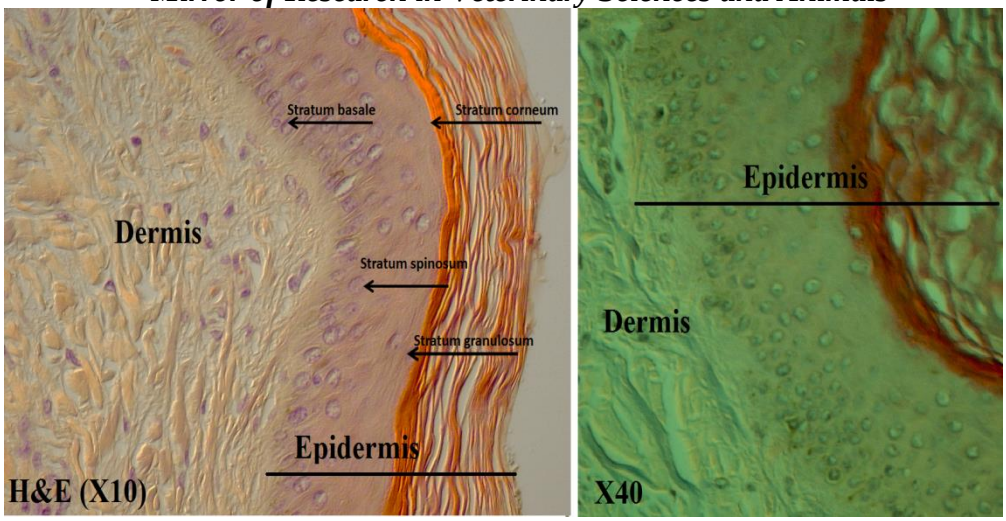

Figure.3: Shows the epidermis layers under DICM (X20)

The dermis appeared as thick inner compartment of the skin. Variations were recognized in the thickness between different parts of the body skin and revealed a superficial layer composed of loose connective tissue interdigitating with undulations in the epidermis and deep dermis, which was composed of connective tissue rich in elastic and collagen fibers in its subepithelial layer, while reticular fiber predominate deep in the compartment. Moreover, an area with thick fibers (stratum reticular) was seen. The dermis contains hair follicles, blood and lymph vessels, nerves, and sebaceous and sweat glands. The mid-dermis is characterized by a proliferation of blood vessels, in contrast to that in other domestic animals (Figure.4). Vessel walls are hyalinized. The dermal fibres, its fibroblasts and the dermal ground substance were very clear in all examined sections (Figure. 5). Myoepithelial cells surrounding the glands are also seen in the dermis. Hair follicles were observed to be in various stages (anagen, catagen, telogen). The majority of hair shafts showed a small discontinuous medulla. Most primary hairs, especially the giant guard hairs, contain a prominent eosinophilic medulla, while the secondary hairs have variable modulation (Figure. 6). The sweat glands were found in all examined sections from the body areas. The glands were always associated with the large cover hair, clustered around the hair bulb in the reticular layer of the dermis with variation in the secretory tubules . The secretory tubules are lined with tall columnar, cuboidal or flat epithelium that differ greatly in size (Figure. 7). The sebaceous glands appeared as simple and branched alveolar and associated with hair follicles. The glands consist of cuboidal cells form sebum and their ducts lined by stratified squamous epithelium.

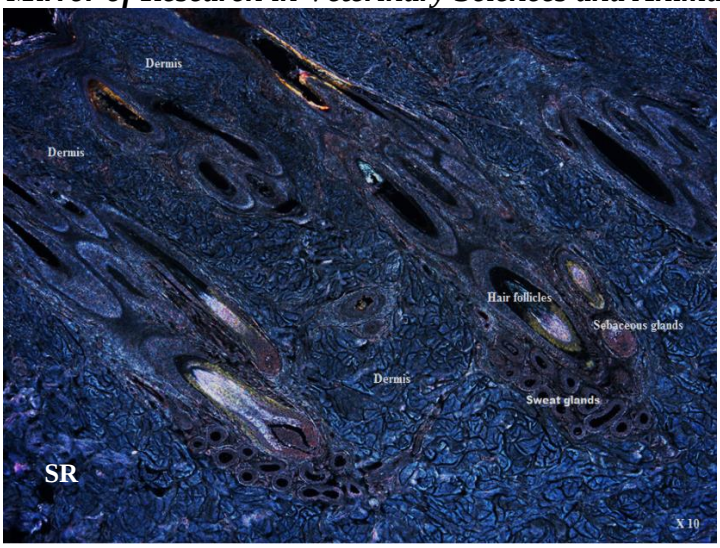

Figure. 4: Shows DICM image of the dermis layer , SR: Stratum reticular (X10)

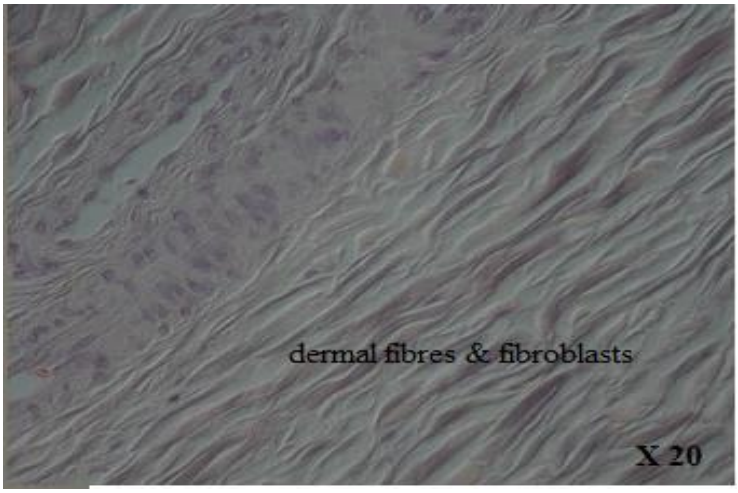

Figure. 5: Shows DICM image of the dermal fibres & fibroblasts

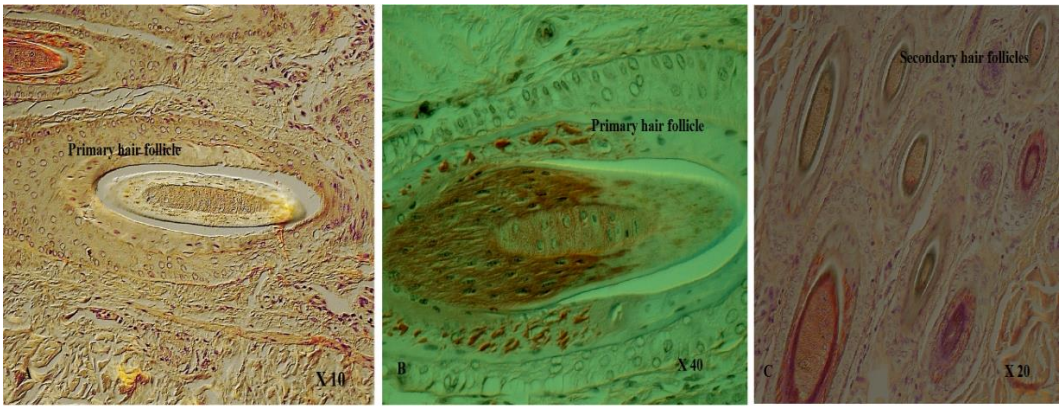

Figure. 6: Shows DICM image of primary hair follicle (A. X 10; B. X 40)

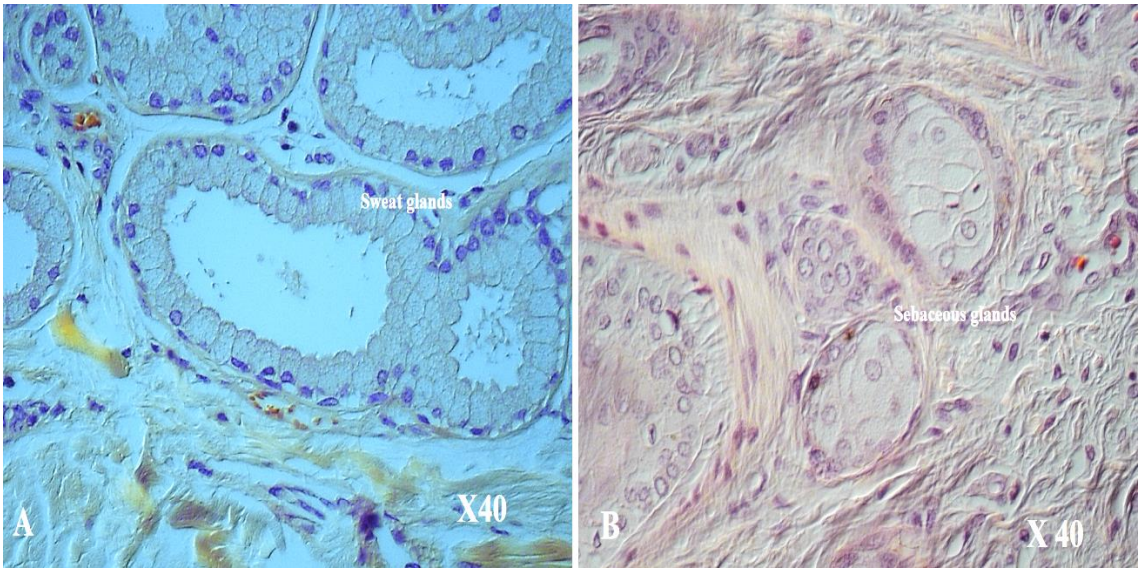

Figure. 7: Shows DICM image of A. sweat glands (X 40); B. Sebaceous glands (X 40)

Discussion

Differential interference microscope also called Nomarski microscope gets benefits of alterations in the light bending by diverse parts of transparent specimens and living cells and enable them to become visible during microscopic evaluation (Francon, 1961; Inoue and Spring, 1997; Inoue 1994). DIC microscope is a light microscope that is used widely to investigate details of structures, organelles and motion in unstained living cells (Murphy, 2002). Moreover, a DIC microscope own high sensitivity in determining sample information and offer horizontal resolution. It is a very attractive microscope for medical and biological research, due to it easiness in use and emergency of commercially available microscope. In the current study, DICM was used in the investigation the microanatomy of the *Camelus dromedaries* skin. The results of the current study appeared as a good visualization tool for both epidermis and dermis layers of the examined thick skin sections of the camels. Furthermore, DICM was also distinguished between different epidermis sublayers. It was also exposed the dermis structures such as connective tissue, deep various dermal fibres, blood and lymph vessels and hair follicles that appeared in various stage, in addition to fine details structures of sweat and sebaceous glands. Albeit , light microscope is used widely in biological sciences especially for histological investigation, disadvantages occurred such as the blurring image due to the thickness and toughness of camelids skin. DICM used in this study showed its succeed to overcome light microscope disadvantages and clear images were captured from examination of skin of the camel. For the authors knowledge this is the first study that used DICM in examination of

normal skin of the camels. In conclusion, the results of the current study approved the capturing of impressive high resolution and high contrast images for skin of the camel by using DICM. It also approved the successfulness in identifying the different layers of thick sections of camelids skin and its sublayers and structures. The authors approved that DICM is a technique that deserves broader applications in life sciences. This technique has to be explore from researchers especially in studying the normal histological structures and most modern research level microscope, could be updated to carry out DIC observation, in many cases with just adding of DIC prisms and sliders.

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Morphological and Histological study of the cecum and colon in adult local *Camelus dromedarius*

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Abstract

The present study was designed to describe the morphological and histological structures of the cecum and colon in adult local one humped camel in Iraq. Specimens of cecum and colon were collected from five healthy male camels between 4-5 years old. The samples were collected immediately after slaughtering and transferred to the laboratory of anatomy/ College of veterinary medicine for further processing. For gross study, the intestinal tract was separated and dissecting it away from it attachments to the dorsal abdomen wall. The cecum appeared as smooth cylindrical sac and its measuring were (51.35± 6.40) cm. (72.5± 9.4) gm. (0.124 ± 0.07) cm for mean total length, weight (weight after empty of the part) and wall thickness respectively. The colon was appeared as one long continuous hollow tube with externally smooth and divided into ascending, transverse and descending parts. Histologically, the cecum and colon wall was composed of the four tunicae (mucosa, submucosa, muscularis and serosa or adventitia). The tunica mucosa was the inner layer lined of the cecum and colon lumen. The mean thickness of these tunica in colon was more than that in cecum (487.9±26.6) μm, (366.7±34.1) μm respectively. The tunica mucosa revealed three different layers including: lining epithelium, lamina propria with glands and

muscularis mucosa. The colon epithelium revealed large number of Lieberkuhn crypts and goblet cells reached (31 ± 4), (262 ± 11) respectively, more than that in cecum (27 ± 5), (218 ± 12) respectively. The submucosa consist of irregular connective tissue and adipose tissue, numerous blood vessels. The mean thickness of these tunica in cecum was more than that in colon (243.2±44.3) µm and (124.8±16.6) µm respectively. Tunica muscularis was composed of inner circular and outer longitudinal smooth muscle layers with mean thickness of these tunica in colon was more than that in cecum (694.7±37.4) µm and (513.9±46.3) µm respectively. The tunica serosa or adventitia was consist of loose connective tissues with mean thickness of these tunica in colon was more than that in cecum (212.7±14.1) µm and (187.9±17.6) µm respectively. In conclusion, this study identified the morphological and histological features of *adult Camelus dromedaries* colon and cecum.

Keywords: *Camelus dromedaries*, cecum, colon, morphology, Histology

Introduction

Camels belong to the taxonomic order *Artiodactyla* (even toed Ungulates), sub-order *Tylopoda* (Pad-footed), of the family *Camelidae*. The *Camelidae* is a relatively small family of two genera: *Camelus* (Old world camels) and *Lama* (New world camels). The genus *Camelus* consists of *Camelus dromedarius*, commonly known as the dromedary, one-humped or Arabian camels and *Camelus bactrianus, the* Bactrian or two-humped camels (Burton *et al.,* 1969; Burton, 1972; Wilson, 1984). The one-humped Dromedary is the largest mammalian species. It is adapted to the desert where thorny plants with rough and hard stems grow and with its high temperatures and extreme desiccation (Bello *et al.,* 2012). Dromedary camel is widely distributed in the desert of the Arabian countries. It is characterized by its ability to tolerate greater than 30% water loss, which is generally impossible for other mammals.(Rizk *et al.,* 2017). One- humped Camel is an important multi-purpose animal in arid and semi-arid areas of the world. There are about 20 million camels in the world (FAO, 1992). They are kept for a variety of purposes e.g. transportation, racing (Osuebeni *et al.,* 1999), and as source of human food (Dorman, 1986). The digestive anatomy and physiology of dromedarian camel at embryonic level is least understood when compared to Llama, Guanaco, Cattle, Sheep, Goat and Pig (Cummings *et al.,* 1972 and Bustinza, 1979). The description of dromedarian camel is usually made as if it is identical with Llama species (Cummings *et al.,* 1972). Though, they are pseudo-ruminants that possess a three-chambered stomach, lacking the omasum that is part of the four-chambered stomach of the order Ruminantia (Bustinza, 1979 and Wilson, 1995). The true camels (*Camelus dromedarius and Camelus bacterianus*) are closely related anatomically to the South American Camelids (Franco *et al.*, 2004). The large intestine, consists of different parts (segments) with various functions. The segments of these parts are: the transverse colon, ascending colon, appendix (when present), descending colon, rectum and anus (Dyce *et al.,* 2010).

In the process, fecal balls are formed, which can be passed through the rectum and are expelled out the anus (Cummings., *et al*., 1972). Review of literature revealed scarce information concerning colon and cecum micro and macro anatomy of local Iraqi camel. Consequently, this study designed to describe the gross and microscopic features of the cecum and colon of the one-humped Dromedary (*Camelus dromedarius*).

Materials and methods

Specimens were collected from five healthy local one humped camel males *(Camelus dromedarius)*, between 4 to 5 years old that slaughtered at AL-Muthanna abattoir. All collected specimens were free from gross pathological changes. For gross study the intestinal tract was separated and dissecting it away from it attachments to the dorsal abdominal wall, the total length, thickness of wall and weight of the cecum and colon (weight after empty of the parts) (Perez, 2016) measured by digital electronic verinia, measurement tape and ruler. The cecum was taken from the apex border to the caeco-colic junction. The length of the colon was taken from the ileo-caeco-colic junction to the beginning of the sacculation at colo-rectal junction. For histological study one centimeter of different segments of cecum and the colon (proximal anza, centripetal, centrifugal, and distal anza) were fixed in 10% formalin for 48 hours at room temperature. The tissues were processed following standard histological procedure (dehydration with an ascending grade of alcohol, clearing in xylene and impregnation (embedding) in liquid paraffin wax) was performed. Immediately after embedding, the specimens were processed for histology using standard histological techniques. The tissues were sectioned at 5 μm thickness and stained with hematoxylin and eosin (H&E) (Luna, 1968). The slides were then dipped in xylene and mounted with cover slip using DPX mounting medium. The slides were examined under light microscope and images were captured by connected digital camera. The following layers were examined and measured:

1- Thickness of the tunica mucosa (epithelium, lamina propria and muscularis mucosa), tunica submucosa, tunica muscularis (circular and longitudinal layers) and tunica serosa.

2- Crypts of Lieberkuhn and goblet cells counts, ten sections from each part , in each section the crypts and cells in ten microscopic fields were counted. (Longitudinal sections used only).

The mean (X-) and the standard error (S.E) were calculated for 5 slides for each part of the examined tissue (Al-Rawi and Kalaf-Allah, 1980).

Results

The cecum was appeared as a blind-ending piece of gut that arises at the junction of the ileum and colon and attached to mesentery at the right side of abdomen (Figure.1). The cecum mean length, weight after removed of the contents and mesenteries and thickness of wall were (51.35± 6.40) cm , (72.5± 9.4) gm and

(0.124 ± 0.07) cm respectively (Table. 1). The colon appeared as one long continuous hollow tube (Figure.1)**,** and its mean length, weight after removed of the contents and mesenteries and wall thickness were (642.44±34.12) cm. (863.6±32.4)gm and (0.158±0.06) cm respectively (Table1).

Table (1): Measurement of length(cm), weight(gm) and thickness of the wall(cm), of the cecum and colon (X± S.E).

Measure / Part	Length (cm)	Weight(gm)	Thickness(cm)
Cecum	51.35 ± 6.40	72.5 ± 9.4	0.124 ± 0.07
Colon	642.44 ± 34.12	863.6 ± 32.4	0.158 ± 0.06

Macroscopically, the colon was divided into ascending, transverse and descending parts. The ascending colon had three ansa: the proximal ansa, the spiral ansa and the distal ansa. The ascending colon was the most developed portion of the colon and located in the abdomen left side(Figure.2).

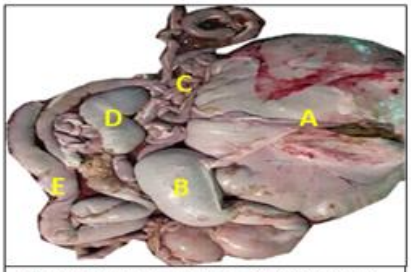

Fig.(1):Gross appearance of GIT Showing: A- Rumen B- Abomasum C- Small intestine D- Cecum E-Colon

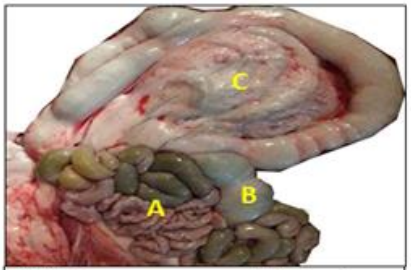

Fig.(2):Gross appearance of GIT Showing: A- Small intestine B- Cecum C-Colon

The cecum and colon wall was composed of the four tunicae (mucosa, submucosa, muscularis externa and serosa or adventitia). The tunica mucosa or the inner layer lined of the cecum and colon lumen without villi or plicae circulares. Colon mucosa and the submucosa exhibited temporary folds (Figure.3&4). The mean thickness of these tunica in colon was more than that in cecum (487.9±26.6) µm and (366.7 ± 34.1) µm respectively (Table. 2). The tunica mucosa were included three different layers; the lining simple columnar epithelium, the lamina proparia composed of loose connective tissue and several crypts of Lieberkuhn; and smooth muscle of the muscularis mucosa (Figure. 5& 6). The colon epithelium has large number of goblet cells. Goblet cells appeared as globular shaped unicellular mucous that dispersed among the columnar cells of the epithelium and lined of crypts of Lieberkuhn in tunica mucosa of the whole cecum and colon (Figure. 5&6&7).

Table (2): Measurement of thickness of the wall layers of the cecum and colon (µm) (X± S.E).

Measure / Part	Mucosa	Submucosa	Muscularis externia	Serosa or adventitia
Cecum	366.7 ± 34.1	243.2 ± 44.3	513.9±46.3	187.9±17.6
Colon	487.9±26.6	124.8±16.6	694.7 ± 37.4	212.7 ± 14.1

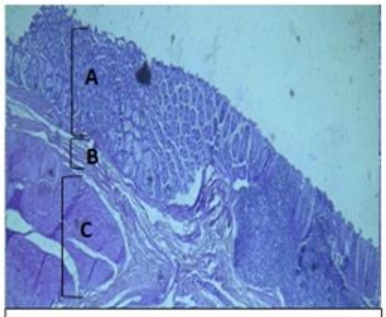

Fig.(3):Histological section of cecum Showing: A- Mucosa B- Submucosa C- Muscularis Externia H&E 40X

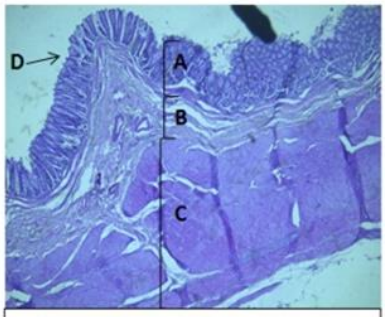

Fig.(4):Histological section of colon Showing: A- Mucosa B- Submucosa C- Muscularis Externia D- Folded H&E 40X

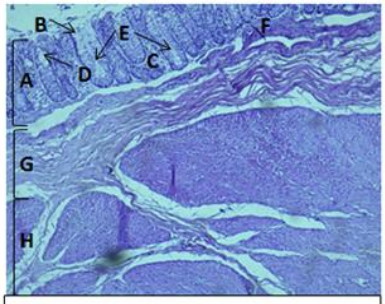

Fig.(5):Histological section of cecum Showing: A- Mucosa B- Epithelium C- Lamina proparia D- Goblet cell E- Crypts of lieberkuhn F- Muscularis mucosa G- Submucosa H- Muscularis Externia H&E 100X

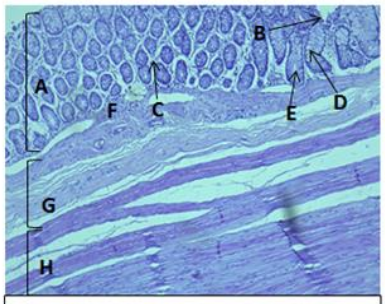

Fig.(6):Histological section of colon Showing: A- Mucosa B- Epithelium C- Lamina proparia D- Goblet cell E- Crypts of lieberkuhn F- Muscularis mucosa G- Submucosa H- Muscularis Externia H&E 100X

The colon revealed large number of crypts of Lieberkuhn and goblet cells (31 ± 4) and (262 ± 11) respectively more than that in cecum (27 ± 5) and (218 ± 12) respectively (Table. 3). The cecum and colon submucosa showed dense connective tissue that revealed absence of glands and aggregates of lymphatic nodules(Figure. 5). The mean thickness of cecum submucosa was more than that in colon (243.2±44.3) µm and (124.8±16.6) µm respectively (Table. 2). The smooth muscle layers of muscularis externia revealed inner circular muscle layer in colon, however it was randomly oriented in cecum and its modified thickenings of the outer longitudinal muscle of the colon called taenia coli. The mean thickness of these tunica in colon was more than that in cecum (694.7±37.4) µm and (513.9±46.3) µm respectively. The colon and cecum revealed also both adventitia and serosa loose connective tissues with mesothelium, the mean thickness of these

tunica in colon was more than that in cecum (212.7±14.1) µm and (187.9±17.6) µm respectively.

Table (3): The number of crypts of Lieberkuhn and goblet cells per microscopic field (40X) in cecum and colon (µm) (X± S.E).

Measure / Part	Crypts of Lieberkuhn	Goblet cells
Cecum	27 ± 5	218 ± 12
Colon	31 ± 4	262 ± 11

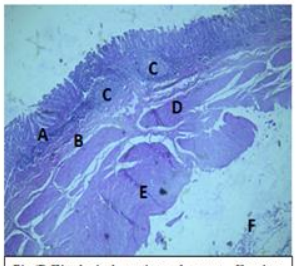

Fig.(7):Histological section of cecum Showing: A- Mucosa B- Submucosa C-Lymphatic nodules D-Inner layer of muscularis Externia E- Outer longitudinal layer of muscularis Externia F- Serosa H&E 40X

Fig.(8):Histological section of colon Showing: A- Mucosa B- Submucosa C- Inner circular layer of muscularis Externia D- Outer longitudinal layer of muscularis Externia (taenia coli) E- Serosa H&E 40X

Discussion

Digestive system of camelids is somehow alike to ruminants in several aspects, including regurgitation of ingesta and active microbial fermentation in the stomach (Frandson *et al*., 2003). The small and large intestine of the *Llama* and the *Alpaca* occupy most of the space caudally and caudodorsal to the abomasum, particularly in the right paralumbar fossa (Cebra *et al*., 2002). However, it lie almost entirely to the right of the midline, packed mainly into the dorsal part of the abdomen, partially in the hypochondriac sub region, in ruminants (Dyce *et al.*, 2010). Both caecum and colon were smooth externally and had no sacculations or bands. Colon is larger in its part and coiled in manner similar to that of the pig (Dyce *et al.*, 2010). The gross anatomy of this study showed that ascending colon of the camel had three ansae (proximal, spiral and distal) and this results are in agreement with observations described previously for bovine, ovine and caprine (Franco *et al.*, 1993) and *Myocastor coypus* (Perez *et al.*, 2008). The main function of the cecum and colon as parts of the large intestine is to reclaim excess moisture and return it to the body (Franco *et al.*, 1993). Fecal balls are formed and passed through the rectum and are expelled out the anus (cumming, 1972). One of the function of the colon is to absorption of vitamins B and K, some electrolytes (Na+ and Cl−), and most of the remaining water, to form stools, and to eliminate it (Maloiy *et al.*, 1980). The proximal half of the colon absorbs salts (e.g., sodium

chloride), water, and vitamins produced by bacteria. Storage, however the distal half of the colon holds feces until it is eliminated(Perez, 2016).

In the present study the cecum appeared as a blind-ending piece of gut that arises at the junction of the ileum and colon. Moreover, its attached to mesentery and the colon was structured as one long continuous hollow tube. Simultaneously, the colon was divided into ascending, transverse and descending parts. The ascending colon had three ansa: the proximal ansa, the spiral ansa and the distal ansa. The ascending colon was the most developed portion of the colon that located in left side of abdomen. These observations are in agreement with previous reported findings in the alpaca, dromedary and Giraffe (Pérez, *et al.,* 2016 and Pérez *et al.*, 2009).

The cecum and colon wall was composed of the four tunicae (mucosa, submucosa, muscularis externa and serosa or adventitia). The tunica mucosa is the inner layer that lined the cecum and colon lumen and didn't revealed villi. This result is in agreement with observations reported previously in ruminants and camelid (Dellmann and Brown, 1987;Althnaian *et al.,* 2013). The tunica mucosa of cecum and colon was included three different layers; the lining simple columnar epithelium with large number of goblet cells, the lamina proparia composed of loose connective tissue and several crypts of Lieberkuhn and smooth muscle of the muscularis mucosa. However, the submucosa of cecum and colon revealed dense connective tissue and no gland and aggregates of lymphatic nodules extending to the mucosa. The smooth muscle layers of muscularis externia revealed inner circular muscle layer in colon and were slightly and randomly oriented in cecum with modified thickenings of the outer longitudinal muscle of the colon that called taenia coli. These findings are compatible with previous observations reported for the one humped camel colon (Al hussany *et al.,* 2013).

The lining epithelium of the entire colon is simple columnar with large number of goblet cells. The glands appeared as simple straight tubular with large number of goblet cells and thin muscularis mucosa that was always present below the glands separating the lamina propria from the tunica submucosa. In few regions of the tunica submucosa, a small aggregation of lymphoid tissues was observed. The tunica submucosa was composed of regular connective tissue with blood vessels, and lymphatics scattered within it. Submucosal nerve plexus and ganglia were present inside the tunica submucosa. The tunica muscularis appeared to consist of relatively thick inner circular layer and much smaller outer longitudinal cell layers. Inner circular layer appeared to consist of two layers of almost equal sizes separated by thin intermuscular connective tissue and the cecum of the camel likely cecum of the Giraffe, which was smooth externally and had no sacculations or bands (Perez *et al.,* 2009). These observations are unlikely to previous reported results of equine cecum and in cattle, sheep and goat (Kadam *et al.,* 2011). In conclusion, this study described the macro and microscopical observations on the camel and cecum and colon. The authors recommend more studies on the different parts of the camelids digestive system and compare it with others ruminants.

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Overview of new concepts in induce ovulation triggers in dromedary camels

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Abstract

The seminal plasma is consist of many components stimulate the ovulation process. The great quantity of an ovulation-inducing factor (OIF) in seminal plasma has wide implication questions about identification, sources, mechanism of action, role among species and clinical applications in the infertility. The purpose of the current review is to focus on the current understanding of physiological and biochemical properties of seminal plasma in camelids. llamas and alpaca seminal plasma was used as agent of induced and spontaneous ovulators. Column chromatography was used to identify the ovulation-inducing factor as part of seminal plasma that stimulating hormone secretion (LH) and ovulation in llamas. OIF is β-NGF that is highly conserved. An endocrine route of action of NGF explains a previously unknown pathway for the direct influence of the male on the hypothalamo–pituitary–gonadal axis of the inseminated female.

Key words: Ovulation inducing-factor (OIF) , Seminal plasma, Llamas/alpacas , Ovulation, Gonadotropins, neurotrophins, NGF

Introduction

hypothalamus have pulsatile release of GnRH into the hypophyseal portal system with subsequent release of LH from the anterior pituitary into systemic circulation for inducing ovulation in mammals. The broad classification of species as either spontaneous or induced ovulators is based on the type of stimulus responsible for eliciting GnRH release from the hypothalamus(Adam *et al*., 2005). In spontaneously ovulating species (such as human, sheep, cattle, horse and pigs), the releasing of GnRH from the hypothalamus is triggered in the absence of progesterone and systemic estradiol concentrations exceed a threshold. In the induced ovulators (such as rabbits, ferrets, cats and camelids) the releasing of GnRH is contingent upon copulatory stimuli; hence, the ovulation is not a regular cyclic event (Bakker and Baum, 2000; Adam *et al*., 2005). Since a classic 1970 Peruvian study, dogma has maintained that physical stimulation of the genitalia during copulation is the primary trigger for inducing ovulation in alpacas and llamas. It is inaccurate to apply the term "oestrous cycle" in camels due to the pattern of ovulation in these animals, in contrast in spontaneous ovulators such as the cow and the mare (Bravo *et al.*, 1990; Bravo *et al.*, 1991).

Camels are seasonally polyestrous animals with estrous cycle differed from that in other farm animals. The estrous cycle in camel is characterized by three phases lasting 24-28 days with absence of the luteal phase. These phases are including follicular growth, existence of mature follicles (estrous period) and follicular atresia. The estrous period is longer up to 8 days (Shalash, 1980; Shalash, 1987 ; Skidmore *et al.*, 1996 ; Skidmore *et al.*, 2009).

Ovulation in the camel as in cat and rabbit occurs normally after the coitus. In these animals the neuroendocrine reflex involving the initiation of luteinising hormone release is delayed until coitus occurs (Jöchle, 1975). Manual stimulation of the cervix for 15 minutes in the camel did not induce ovulation but cause only partial luteinisation of the Graafian follicle, ovulation occurs 32 to 40 hours after copulation under the influence of luteinising hormone (LH) (Musa & Abu Sineina, 197 b; Wilson, 1984; Yagil, 1985).

Ovulation induced factor (OIF) : Discovery and role

Semen consists of seminal plasma, which is act as a fluid medium for swimming of spermatozoa . Seminal plasma is a complex fluid portion and mediates the chemical function of the ejaculate. Its pH varies with species, and it is Slightly acidic in bulls and rams and slightly alkaline in camelids (Mann , 1964). Rete testis, epididymis, and accessory sex glands of the male reproductive tract considered as a source of biochemical components of SP (Mann and Lutwak-Mann, 1981). Accessory glands known as seminal vesicle, prostate, and bulbo-urethral glands contribute most of the volume of the ejaculate. The seminal vesicle secretion constitutes the major portion of seminal plasma (in most ruminants except camelids, in which it is absent) at ejaculation (Badawy and Youssef, 1982; Metafora *et al*, 1989).

The new detection of OIF in Bactrian camels fundamentally unnoticed for 20 years, its first established in llamas and alpaca where in the ovulatory effect of seminal plasma was startlingly clear. It appears that OIF in seminal plasma is conserved among both induced and spontaneously ovulating species (Adams *et al*., 2005; Ratto *et al*., 2005) .

Recent findings explain the additional role of seminal plasma as an inducer of ovulation. The first direct sign of an ovulation-inducing factor (OIF) in semen came from workers in China, who reported that ovulation occurred after intravaginal or intramuscular administration of Bactrian seminal plasma to female Bactrian camels (Adams *et al.*, 2005, England *et al*., 1969, Fernandez-Baca *et al*., 1970). The existence of the supposed OIF has gained little scientific attention for 20 years, until it has been confirmed in a series of studies involving Llamas and Alpacas (Ratto *et al*., 2005). Many reported documents described many OIF functions of the seminal plasma of alpacas, llamas and koalas (induced ovulators). It is also acted as a potent stimulator of LH secretion, and has a dose-dependent effect on ovulation rate and CL form and function. Moreover, it acts via a systemic rather than a local pathway, at physiologically relevant doses [Ratto *et al*., 2005;Chen *et al*., 1985; Sokol *et al*., 1985; Izumi *et al*., 1985; Paolicchi *et al* 1999].

Many observations revealed that the ovulation occurs after intravaginal and intramuscular administration of bacterian seminal plasma to female bacterian camels. The OIF in semen was recorded its existence for the first time in seminal plasma of llama and alpaca (Chen *et al*., 1985; Xu *et al*., 1985).

The OIF of camelids act as induced ovulators. It is an effective stimulator of luteinizing hormone (LH) secretion and it effects on ovulation, forming and function of the corpus luteum and acts via a systemic rather than a local pathway at physiologically relevant doses (Ratto *et al*., 2006; Fernandez-Baca *et al*., 1970; Jöchle , 1975 ; Chen *et al*., 1985). Although the discovery of OIF in seminal plasma of species and categorized as induced ovulators (camel , cat and rabbit), the recent studies support the hypothesis that the OIF in seminal plasma isolated from other species which considered as spontaneous ovulators (cattle horse) (Bogle *et al*., 2011; Tanco *et al*., 2012, Ratto *et al*., 2011).

In llama, OIF of seminal plasma is a protein molecule that has a molecular mass of 30 kd. Despite, there are progressive results on the identification of OIF in SP, but its origin is not clear (Ratto *et al*., 2010). Pan *et al*., (2001) proposed that the synthesis OIF might be from hypothalamus or pituitary gland because they could not observe ovulation in female camels after vaginal deposition of AG fluids.

Comparative approach of the OIF effects versus GnRH effects

Many studies indicated that OIF and GnRH are two different molecules because OIF effect is more important than that of GnRH and their effect on pituitary LH release differently. The effect of OIF appears similar to that of GnRH used for the regulation of reproduction in camelids (Tibary and Anouassi, 1997; Skidmore, 2005. Adams ***et al***. (2005) mentioned that intramuscular injection of seminal plasma in female llama showed a higher ovulation inducing rate (93%) than GnRH (83%). Moreover, higher level of plasma LH observed in seminal plasma treated female was faster but more extended as compared to the ones treated by GnRH, a significant increase in plasma LH concentration was seen 15 min after treatment with seminal plasma and 75 min after injection of GnRH. The maximum level was reached after 2 h with seminal plasma as compared to 1 h with GnRH, and as a final point, the decrease was delayed by 2.5 h in the seminal plasma treated group. In addition, the corpus luteum showed a greater diameter, regressed later, and produced more than two times progesterone in seminal plasma treated group as compared to the GnRH injected group. Although, the pattern of seminal

induced LH flow is very similar to that described in response to natural mating (Adams *et al*. (2005 ; Bravo *et al*., 1990 , Bravo *et al*., 1991). The progesterone secretion subsequent to ovulation is prolonged in OIF-treated group as compared to GnRH analog group (Fatnassi *et al*., 2017). Moreover, in female camel the luteotrophic activity of OIF is more important than that of GnRH. The OIF shows a dose–response effect on circulating concentration of LH and the incidence of ovulation in llamas and alpaca. However, GnRH purified OIF showed a dose–response relationship for the CL diameter and plasma progesterone concentrations. This indicates a possible luteotrophic effect of OIF, which is independent of the mechanisms involved by GnRH (Tanco *et al* ., 2011; Ulloa-Leal *et al*., 2014 ; Stuart *et al*., 2015).

New concept of OIF:NGF BETA

The intramuscular or intrauterine administration of seminal plasma in camelids was revealed inducing the pre-ovulatory luteinizing hormone (LH) flow and after ovulation and formation of corpus luteum. Ratto *et al*., (2011) has been identified OIF from SP as a neurotrophin, moreover the β subunit of nerve growth factor (β-NGF). β-NGF is well known as promoting neuron survival and growth, nonetheless in this case, it appears to induce ovulation through an endocrine mode of action. In fact, β-NGF may be absorbed through the endometrium to be conveyed, via the blood stream, to the central structures regulating the LH pre-ovulatory surge. Ratto *et al*., (2005) suggested that OIF in seminal plasma induces ovulation by a systemic rather than a local route, although disagreement remains in one study in which the investigator observed ovulation after intravaginal deposition of alpaca semen in female alpacas and llamas (Sumar, 1994). Consequently, the recognized ovulation-inducing factor in SP is absolutely different from the native LH, human chorionic gonadotropin, pregnant mare serum gonadotropin, and prostaglandin-2a and possesses gonadotropin releasing hormone-like activity (Ratto *et al*., 2005). Surprisingly, its effects in the female were not identified earlier, given the profusion of NGF in seminal plasma. These observations are explaining the existence of the elaborate male accessory gland system as more than an evolutionary residues among species. The nerve growth factor is maintained significantly, and the identification of OIF as NGF shows recent discoveries of the effects of sperm plasma on the release of gonads and ovarian function in a variety of species. The purification product of β-NGF, from llama seminal plasma is high, and purification of large quantities allowed the discovery that NGF from the ejaculate has an important role in regulating gonadotropin release and ovarian function. The idea of an endocrine route of action of NGF on reproductive function is exclusive and explain a direct pathway for the influence of the male on the hypothalamo–pituitary–gonadal axis of the female (Figure. 1) (Dissen *et al*., 1996; Barboni *et al*., 2002; Li *et al*., 2010; El Allali *et al*., 2017).

Determination of OIF as NGF in the seminal plasma llamas represents a unique sequence of the Camelidae and NGF derived from the only seminal plasma to be isolated, characterized, and fully sequenced in any species. Crystallographic study of purified OIF from seminal plasma provided the chance to determine the structure of natural NGF described previously only in the mouse, human, and cow. The purification of the mature and preforms of the protein in quantity from seminal plasma will permit in vivo study of the role of NGF in reproductive and neurologic health and disease (Abir *et al*., 2005; Julio-Pieper *et al*.,2006) .

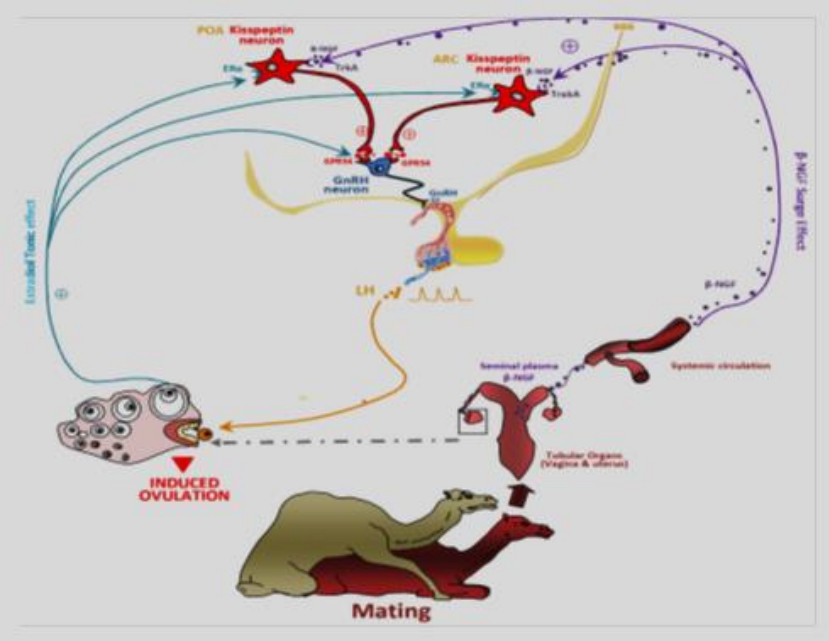

Figure.1: Reveals the role of NGF in induction of ovulation (El-Allali *et al* ., 2017)

Isolation and purification of OIF

The OIF in camel seminal plasma was isolated and purified by several attempts using a combination of anion exchange and hydrophobic chromatography (Li and Zhao, 2004; Pan *et al*., 2001; Xilong and Zhao, 2004; Zhao *et al*., 2001), however interpretation of the results is limited because of the lack of a validated bioassay to quantitatively test the effects of various fractions. Pan *et al*., (2001) suggested that OIF consists of a large folded complex of glycoprotein layers with bioactive forms composed of different molecules ranging from 16 to 54 kDav.

Effect and routs of administration of OIF

Series of experiments in alpacas and llamas were investigate to show the effect of rout of administration of OIF in seminal plasma on ovulation in female of the same species and to determine the route of action; i.e., local versus systemic (intramuscular and intrauterine administration) (Adams *et al*., 2005). In all experiments, OIF was given when a growing follicle ≥ 8 mm was detected and ovulatory capability existed. More than 4 separate experiments, intramuscular administration of seminal plasma (equivalent to <1/4 of an ejaculate) resulted in ovulation in 33/35 (94%) females compared to 0/35 (0%) given saline. However, Intrauterine administration of seminal plasma resulted in ovulation 17/44 (39%) females compared to 0/42 (0%) females given saline (Wabersk *et al*., 1995).

Dose response and mechanism of action

The dose of purified OIF from llama seminal plasma required to stimulate an ovulatory response has been determined previously (Tanco *et al.*, 2011) and it was physiologically acceptable in terms of the proportion present in a normal ejaculate. The female llamas were given a single intramuscular dose of 500 _g, 250 _g, 125 _g, or 60 _g of purified OIF (representative of the amount present in 1/25 th to 1/200 th of a normal ejaculate). A clear dose–response relationship was observed in circulating LH concentration , additionally the incidence of ovulation, maximum CL diameter, and day-to-day profiles of CL diameter and plasma progesterone concentrations. All the experiments reach to the conclusion that seminal plasma OIF has a dose-dependent effect on ovulation, CL form and function, and that the biological effect of OIF is obvious at physiologically relevant doses. The native idea, ovulation in mammals involves pulsatile secretion of gonadotropin-releasing hormone (GnRH) from the medio-basal nuclei of the hypothalamus into the hypophyseal portal system, followed by the release of LH from the anterior pituitary into systemic circulation (Karsch, 1987; Johnstonn *et al*., 2004). The elevated circulating concentrations of LH exist a flow of events within the mature follicle resulting in follicle wall rupture and evacuation of its fluid and cellular contents (Richards *et al*., 2002). While it is clear that the OIF in seminal plasma is effects on the ovulation by mediated through a surge release of LH into circulation. it is unapparent whether the site of action is at the level of the pituitary, hypothalamus, or both. Bogle *et al*., (2012) designed study to test the hypothesis that OIF stimulate LH secretion directly at the level of the pituitary. The cells from the anterior pituitary of llamas were cultured in vitro and LH concentration was measured in the culture medium after treatment. Treatment with OIF and GnRH induced more LH secretion than untreated controls, and LH concentrations were greater in wells treated with higher doses of OIF or GnRH compared to wells treated with a lower dose. This is agree with the dose–depending effect of OIF observed in vivo (Tanco *et al*., 2011), and an previous study in which alpaca SP stimulated LH secretion from rat anterior pituitary cells in vitro (Paolicchi *et al*., 1999). Although these results do not keep out a possible effect of hypothalamus level, they confirmed that OIF has a direct effect on pituitary gonadotrophs independent of hypothalamic input GnRH (Silva *et al*., 2011).

Role of OIF among species

The OIF induce ovulation in induced ovulators animals and it is also influenced ovarian function in species considered to be spontaneous ovulators. OIF induced ovulation in a prepubertal mouse model (Xu *et al*., 1985), besides it altered ovarian follicular wave dynamics in cows (Zhao *et al*., 2001). The effect of seminal plasma in induction of ovulation is limited. In some earlier studies, it was documented that the sterile copulation with vasectomized males was related with improved LH secretion and a higher ovulation rate in spontaneous ovulators like cattle and sheep (Marion, 1950). Other authors also revealed that ovulation occurred after intravaginal or intramuscular/intrauterine administration (Chen *et al*., 1985; Pan *et al*., 1992) of Bactrian SP to female Bactrian camels. lately, Adams *et al*., (2005) have documented the existence of ovulation-inducing factor (OIF) in seminal plasma of alpacas and llamas that could stimulate a surge in circulation. OIF is considered not to be species specific because bull seminal plasma can induce ovulation in she Bactrian camels (Chen *et al*., 1985), llama, and alpaca (Ratto *et al*., 2006). Though, the ovulation rate was lower with bull seminal plasma than with species-

specific SP, the OIF might be a preserved molecule in seminal plasma among all mammals. Many studies supported hypothesis that OIF in SP is conserved among species, including those considered to be induced ovulators as (camel and cat) as well as spontaneous ovulators (bovine, equine and porcine) (Johnston *et al*., 2004; Ratto *et al*., 2006b; Bogle *et al*., 2011). OIF is based on the type of stimulus responsible for eliciting GnRH release from the hypothalamus (Bakker and Baum, 2000). In spontaneously ovulating species (human, sheep, goats, cattle, horse, pigs), the releasing of GnRH from the hypothalamus is triggered in the absence of progesterone and exceeding the systemic estradiol concentrations the certain threshold (Jaffe and Keys, 1974; Chenault *et al*., 1975; Knobil, 1980; Kelly *et al*., 1988; Turzillo and Nett, 1999). Consequence, regular luteolysis is occurring that lead to development of one or more estrogen-producing follicles and a pre-ovulatory surge in circulating concentrations of LH at regular intervals. In induced ovulators (rabbits, ferrets, cats, camelids), the neural signals from copulatory stimulation trigger GnRH secretion from the hypothalamus that followed by the preovulatory release of LH from the pituitary (Bakker and Baum, 2000). The existence of OIF has also recently been documented in horses and pigs SP (Bogle *et al*., 2011), but the incidence of ovulation was lower in llamas treated with seminal plasma from stallions and boars similar to bull seminal plasma. This observation is concluded that OIF in the seminal plasma of these species is in lower concentration or it is different and perhaps species-specific isoform. Interestingly, seminal plasma of rabbits (also an induced ovulator) induced ovulation in llamas, but not in rabbits (Silva *et al*., 2011a). Treatment of rabbit with seminal plasma was associated with a significant increase in the total number of antral follicles and hemorrhagic of the ovulatory follicles that detected at laparotomy (Silva *et al*., 2011a).

In conclusion, this review article focused on the ovulation-inducing factor (OIF) in llama and alpaca seminal plasma that is composed of a protein molecule and resistant to heat and enzymatic digestion with proteinase K. OIF has a molecular mass of approximately equal or higher than 30 k Da. The ovulation in mammalian females are classified into spontaneous and induced ovulators based on the mechanism stimulating ovulation. Ovulation in spontaneous species (human, sheep, cattle, horse, most rodents) occurs at standard intervals and depends upon the circulating estradiol. However, in induced ovulators (rabbits, ferrets, cats, and camelids), ovulation is associated with coitus. There are different factors lead to trigger ovulation, including auditory, visual, olfactory, and mechanic stimuli. Moreover, other studies have identified a biochemical component in the semen of induced ovulators responsible for the induction of ovulation and named accordingly ovulation-inducing factor (OIF). In camelids, intramuscular or intrauterine administration of seminal plasma was shown to induce the pre-ovulatory luteinizing hormone surge followed by ovulation and formation of corpus luteum. The OIF has been identified from seminal plasma as a neurotrophin, the β subunit of nerve growth factor (β-NGF). β-NGF is well known as promoting neuron survival and growth and it acts to induce ovulation through an endocrine mode of action. Indeed, β-NGF may be absorbed through the endometrium to be transfer *via* the blood stream and to the central structures regulating the LH pre-ovulatory surge.

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Clinical, Immunological, and Epidemiological Studies of Nasopharyngeal Myiasis in Camels slaughtered in Al-Muthanna Province

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Introduction

The aim of this study was to investigate the clinical signs related to infected camels by C. titillator larvae and to determine prevalence and incidence of C.titillator larvae in the camels. This study was conducted on 864 camels slaughtered at Al Muthanna abattoir during the period extended from 1st September 2015 to 30th August 2016. Fever, emaciation, loos of appetite loss, congestion of mucous membrane, enlargement of lymph nodes, nasal discharge, neurological signs, increase respiratory rate, frequent sneezing and snoring during breathing were the most common clinical signs of C. titillator infection. The numbers of infested camels by C. titillator larvae were 352(40.07%) out of 864. There were a relationship between the climatic conditions and the incidence of C. titillator larvae with a highest (89.02%) and lower (6.15%) percentages in January and July respectively. Additionally, the highest (70.1%) and the lowest (29.8%) infestation percentages were recorded in 4-7 years, and 8 months to 2 years old camels respectively. According to sex, infestation percentages were (56.6%) and (37.36%) for female and male respectively. This study was also showed variations in the mean concentrations of total protein (g/l), albumin, β-, γ-globulins between the infected and healthy camels. In conclusion, this study approved incidence of C. titillator infection in camelids with variation in the incidence that depend on the climate and age and sex of the animals recommend to do more

studies in another provinces in Iraq to determine the epidemiological map of this parasites in camelids.

Keywords: Camels, Nasopharyngeal Myiasis, Clinical, Epidemiology.

Introduction

Recently, the number of studies on camelids families in term of science and research has greatly increased. Camel is physiologically and anatomically adapted to survive
harsh conditions and play an important role in human's life how lived in desert and semi-desert and even in irrigate land. Camels like other domestics animals are also exposed to various pathogenic, infectious agents and disease (Borji *et al.*, 2010).The herd growth and productivity of camels are restricted by various infectious agents such as parasites, which lead to mortality and high morbidity (Bekele, 2010). There are different types of ectoparasites that can affect the health of camels such as; sarcoptic mange, tick, and fly infestations (Oryan *et al.*, 2008). Nasopharyngeal myiasis is one of the most important problems of camels due to their responsibility for significant economic losses due to the presence of the larvae of Cephalopina titillator, which is a common obligate parasite of the Oestridea family that attacks only camels (Abd El-Rahman, 2010). In Iraq, camels were firstly infested with myiasis in 1977 (Abdul-Hab and Al-Affass, 1977). The adult fly is widely distributed in areas where camels are found (Hussein *et al.*, 1982; Higgins, 1985). During part of its life cycle, the female fly darts towards the nostrils and deposits its larvae directly into the nasal cavity. The larval stages are sometimes known as `al-naghaf ' in Arabic, loosely translatable as' nose worm'. The larvae crawl up to the nasopharyngeal and sometimes reach the paranasal sinuses and molt twice while attached to the nasopharyngeal and paranasal mucous membranes and remain attached to the mucous membrane of these organs for up to 11 months. During this time, they feed and cause extensive irritation and tissue damage (Bekele, 2001; Shakerian *et al.*, 2011).Nasopharyngeal myiasis of camels causes severe economic losses such as; reduction of milk production, destroy host tissues and decrease body weight, fertility. Furthermore, myiasis has the ability to reduce host physiological functions, show difficulty in breathing, sneeze, extensive irritation, and tissue damage that has been reported in infested camels (Otranto, 2001; Razi Jalali *et al.*, 2016).The severity of clinical signs depends on the damage caused by migrating larvae (Otranto, 2001). In acute cases, the infected camels may die from meningitis caused by secondary bacterial or viral infections (Musa *et al.*, 1989). In addition, (Morsy *et al.*, 1998) mentioned that the mechanical damages such as penetrating the ethmoid bone by the larvae may assist in the introduction of bacteria and viruses to the cerebrospinal canal. Although considerable numbers of camels are reared in semi-arid areas of Iraq and they have important role in livelihood of people, very few studies have been done on clinical and epidemiological aspects of parasitic infestations, especially myiasis as a serious threat for camel health. The aim of this study was to determine the prevalence rate and the influence of seasonal variation, age and gender on the prevalence of the infestation. Moreover, the clinical signs associated with *C. titillator* larvae infection in camels are also described. The results of this study may provide a rationale starting point for treatment planning and controlling measurements against the fly and the larvae and may even shed the light on some aspects of the life cycle pattern and ecology of the parasite.

Materials and methods

Study Area and Animals

This study was carried out randomly on 864 camels slaughtered from the slaughterhouse of Alkider, Rumathia and Samawah in Muthanna province, south of Iraq during the period from September 2015 to August 2016.The number of camels slaughtered varied from 4 to 6 a day. The slaughterhouse was visited three days a week. The examined camel were arranged into three age groups; 8 monthes-2 years old, 2-4 years old and 4-7 years old. Samples were collected from slaughtered camels with different sexes about 546 male and 318 female. Their age was determined on the basis of dental formula. Furthermore, general clinical examination was performed on all camels in the slaughterhouse and includes general condition examination (hump structure), body temperature and external shape such as the nature of the camels' lint and weaknesses, respiratory rate, heart rate and examination of superficial lymph node. The signs of Myiasis were observed and recorded.

Samples Collection and Diagnosis

After slaughtering, the heads of the slaughtered infested camels were separated from the rest of the body. The head was split longitudinally to expose the different regions of nasal cavity, nasopharyngeal area, frontal sinuses and turbinate bones. Then, careful gross examination was performed to detect the presence of the first, second and third instars of *Cephalopina titillater* larvae and the possible gross abnormalities
accompanied with the presence of the larval infestation. The cross damage to the site of attachment was describe and recorded. The recovered larvae from each camel were carefully collected, washed in physiological saline solution (NaCl 0.9%) and preserved in a separate container for each carcass with 70% alcohol. All samples were labeled (characteristics include sex and age of the animal and history) and transferred to parasitology laboratory of College of Veterinary Medicine/Al- Muthanna University. Subsequently, diagnosis of *Cephalopina titillater* larvae was done according to specification of posterior spiracles as described by (Zumpt, 1965). This study was conducted on 30 samples collected from infected and control camels with age range 8 month-7 years, 10 samples from males 10 from females and 10 of apparently healthy camels . Blood samples (5 ml) for the analyses were collected from the jugular vein by vacationer tubes without anticoagulant. To evaluate total serum protein concentration and protein fractions, the blood serum was separated by centrifugation at 2,500 rpm for 10 min, Serum protein fractions were separated using electrophoresis on cellulose acetate plate in barbital buffer, pH 8.6, at 180 V, 4 mA, for 15 min according to manufacturer's instructions (Helena Biosciences, UK). After separation, the protein bands were stained with Ponceau S for 10 min, then destained with 5% acetic acid for 2 min and dehydrated in methanol for 2 min, and cleared with clearing solution (30% glacial acetic acid, 70% absolute methanol, and 4% clear aid) for 10 min, Finally, after drying at 50-60°C for 15 min, the relative levels of separated proteins were scanned using a densitometer at 525 nm. Protein fractions were identified and quantified by a computer software (Zamani Ahmadmahmudi *et al.*, 2012). Albumin to globulin (A/G) ratio was then calculated from the electrophoretic scan. Data were analyzed using SAS software package (ver 9.1.3). The normal distribution of the data was

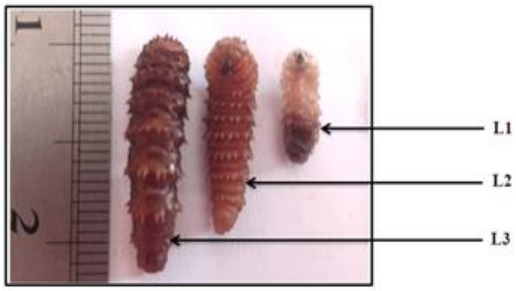
evaluated using Kolmogorov and Smirnov test. A two-sample t-test was used to compare the means between groups, and a $P \leq 0.05$ was considered to be significant.

Results

The total numbers of clinically examined camels are 864 of various age and sex. Clinical examinations of camels subjected to the study were showed a varied clinical signs as revealed in table (1) In this table, the most clinical signs were observed in infected camels include frequent sneezing, snoring during breathing and congestion of mucous membranes in 38.7%, 36.6 % and 35.9 % respectively. While the less common signs were observed in infected camels are the enlargement of lymph node, increase heart rate and neurological signs (head shaking and trying to rubbing the nose of other animals or walls) in 1.8%, 9.2% and 14% respectively. Additionally, the current study revealed the three phases of larvae of *C. titillator* of camels infested (Fig.1). The larval phase of *C. titillator* is mainly passed in the third stage. The first larvae stage (L1) is only about 2-4mm in length and up to 15 mm in the second stage. While, the mature white or grey third-stage larvae grow up to 15-23 mm (Figure-1). The gross examination of carcass of *C. titillator* infested camels after slaughtering was restricted to the nasal cavity, nasopharyngeal area, frontal sinuses and turbinate bones. The present study revealed that the most larvae were found and attached to the mucosa of the Nasopharynx, while a rare were found in the nasal cavity. Larvae were also observed in the frontal sinuses and turbinate bones. The nasal cavities of *C. titillator* infested camel were congested and obstructed by thick, dark-colored mucus, sever inflammation and degeneration changes., Some larvae remain active and moving nearly freely, but others larvae were attached firmly to the pharyngeal mucosa by their hooks and when removed, firm reddish nodules marked the sites of attachment. Whereas,the mucous membrane of nasopharyngeal region of infested camels by myiasis was congested, swollen, hemorrhagic, edematous with abundant mucous secretion. Furthermore, many nodules were observed in other parts of the nasopharyngeal area and these nodules were hard in consistency and contained calcareous material at sites of larvae attachment. The damage of *C. titillator* infested camel greatly depends on the number of migratory larvae. (Figures2and 3). The results of epidemiological study revealed that only 352 out of 864 examined camels were infected by *C. titillator* larvae during the study period from September 2015 to August 2016 at infestation rate of (40.07%). As is revealed in (Table-2), the percentage of infestation with *C. titillator* larvae was associated with specific seasons. The examination showed highest percentage of infestation with *C. titillator larvae* which occurs in January 89.02%, followed by February 68.35%. Whilst, the lower percentage of infestation with *C. titillator* larvae occurs in July 6.15% followed by June 9.45 with significant differences ($P<0.01$) (Figure-4). Table-3) showed the prevalence rates and differences among the different age groups and sexes. In this table, the highest percentage of infestation with *C. titillator* larvae was recorded in females in 56.6%. Whereas, the lower percentage of infestation with *C. titillator* larvae were recorded in male (37.36%). and showed significant differences ($P<0.01$) (Figure-5). Furthermore, this table showed the highest percentage of infestation with *C. titillator* larvae that occurs in age group between 4 to 7 years in 65.61 %, followed by age group between 2 to 4 years in 35.58%. While , the present study showed that lower percentage of infestation were recorded in camels with age group between 8 months to 2 years old in 22.95% ($P<0.0001$).

Table 1: Shows Important Clinical Signs Related to Infected Camels by C. titillator larvae.

Percentage of infection %	Numbers of animals	Clinical singes
33.5	290	Emaciation
18.28	158	Fever
25.46	220	Loss of appetite
35.9	311	Congestion of mucous membranes
35.3	305	Nasal discharge (Sticky)
23.14	200	Increase Respiratory rate
9.2	80	Increase heart rate
1.8	16	Enlargement of lymph node
14	121	Neurological signs (shaking of the head)
38.7	335	Frequent sneezing
36.6	317	Snoring during breathing



Fig(1).Shows the three phases of larvae of C. titillator from camels infested (L1,L2 and L3).

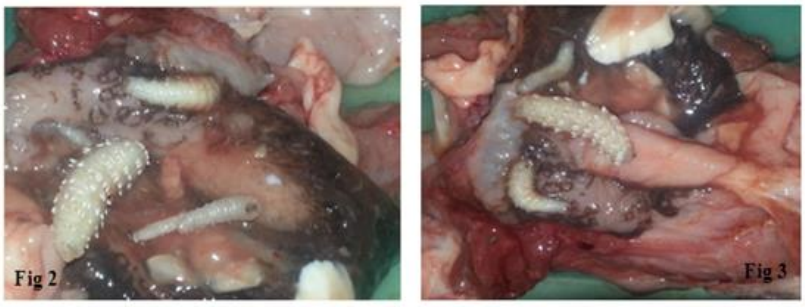


Fig (2,3).The nasopharyngeal region of infested camel by C. titillator larvae showing Congested (dark color) , Hemorrhagic , Swollen and Edematous mucosa

Table (2): Shows the percentages of infested camels by *C. titillator* larvae according to months of years.

Months of year	No. of camels examined	No of infested camels	Percentage of infestation %
September	66	21	31.81
October	70	29	41.42
November	78	40	51.28
December 2015	74	47	63.51
January 2016	82	73	89.02
February	79	54	68.35
March	72	41	56.94
April	65	16	24.61
May	70	11	15.71
June	74	7	9.45
July	65	4	6.15
August	69	9	13.04
Total	864	352	40.07

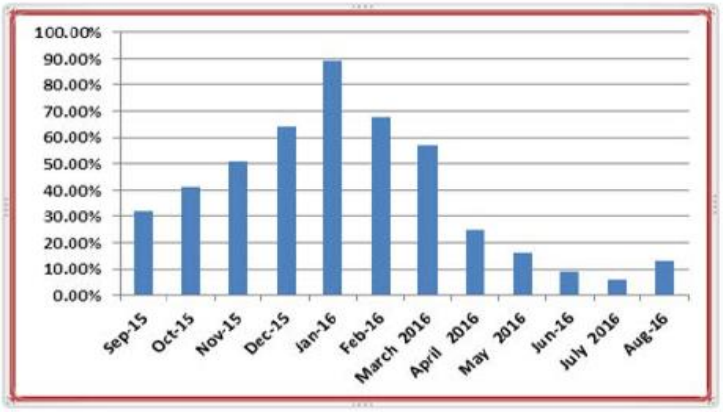


Figure 4: Show the percentage of infested camels by *C. titillator* larvae according to months of years.

Table 3: Shows the percentage of infested camels by *C. titillator* larvae based on age (year) and sex.

Age	Male			Female					
	Inspected	Infected	Percentage %	Inspected	Infected	Percentage %	Inspected	Infected	Percentage %
8 monthes-2 years	244	56	22.95	140	25	17.8	104	31	29.8
2-4 years	399	142	35.58	282	93	32.9	117	49	41.8
4-7 years	221	154	65.61	124	86	60.5	97	68	70.1
Total	864	352	40.74	546	204	37.36	318	148	56.6

Table 4: Show serum protein electrophoresis concentration measured to Infected Camels by *C. titillator* larvae.

Index	Band	Ref. Area %	Conc. g/ Lmean ± SD	Range g/L
1	Albumin	25.55%	25.00 ±2.40	35.00-50.00
2	Alpha 1	7.56%	7.33 ±0.14	1.00-4.00
3	Alpha2	10.12%	9.69 ±0.30	6.00-12.00
4	Beta	31.25%	29.92 ±0.80	6.00-12.00
5	Gamma	25.12%	24.05 ±0.53	7.00-15.55
Total			96.00	
Ratio		0.28		

Table 5: Show serum protein electrophoresis concentration measured to healthy Camels by *C. titillator* larvae.

Index	Band	Ref. Area %	Conc. g/ Lmean ± SD	Range g/L
1	Albumin	45.55 %	40.00 ±0.22	35.00-50.00
2	Alpha 1	3.56%	4.33±0.30	1.00-4.00
3	Alpha2	8.12%	7.69 ±0.30	6.00-12.00
4	Beta	10.25%	22.6 ±0.20	6.00-12.00
5	Gamma	12.12%	13.55 ±0.20	7.00-15.55
Total			87.97	
Ratio		0.28		

Nasopharyngeal myiasis, *Cephalopina titillator* larvae is one of the most non-ignorable problems of the livestock industry in many camel-producing areas of the world due to their responsibilities for significant economic loss to the camel industry. The results of the present study revealed that the local camels were infected with *C. titillator larvae* and this fact confirms that the Myiasis is widespread in areas where camels are found in Iraq. There are few studies that have described the clinical signs in camels infested by *C. titillator* larvae. The present study revealed that *C. titillator* larvae infected camels showed similar clinical signs and came in line with (Hussein *et al.,* 1982, Atiyah *et al.,* 2011). Moreover, the results showed that the camels infected by *C. titillator* larvae clinically showed fever, emaciation, appetite loss, congestion of mucous membrane, enlargement of lymph nodes, nasal discharge,
neurological signs, difficulty in breathing, frequent sneezing and snoring during breathing, all these signs were agreed with those reported (Zumpt, 1965; Otranto, 2001). The increase in body temperature occurs due to the stimulation of thermoregulatory center in the hypothalamus or result from hyperthermia, this stimulation occurs because of the release of endogenous pyrogens due to cellular lysis during the infestation (Zumpt, 1965). Furthermore, infestation with *C. titillator* larvae led to lose their appetite, could be attributed to present fever (Zumpt, 1965; Radstitis, 2000). Also, In heavy infection, the breathing in the camels Infested by *C. titillator* larvae is greatly impaired, frequent sneeze and snort during breating was explained as a result to blockage of the nasopharynx by larvae and/ or muco-fibrinous secretions (Zumpt, 1965; Hussein *et al.,* 1982).The congestion of mucous membranes was showed on conjunctivae and 3rd eye lid during the examination refer to hemostasis disturbances which may occur due to the thrombocytopenia and the disturbance of other clotting factors the as a result of increasing in

the clotting time (Smith,1996). While, the other clinical signs such as; neurological signs and irritations may occur due to the larvae may reach the cranial cavity causing meningitis or some of the larvae penetrating the ethmoid bone may assist in the
Introduction of bacteria and viruses to the cerebrospinal canal (Hussein *et al.*, 1982).
The overall rate of infestation among 864 examined camel heads was 40.7%.These results were agreed with (AbulHab, *et al.,* 1977; Atiyah *et al.,* 2011). This study showed that the highest percentage of infection with *C. titillator* larvae was occurred in winter (January and February) with prevalence of infection 89.02%% and 68.35 % respectively. Whereas, lower percentage of infection with *C. titillator* larvae that were occurs in summer, July followed by with prevalence of infection 6.15 % and 9.45 %respectively. These results were consistent with several previous studies which show that climate plays an important role in the prevalence of *C. titillator* larvae in the camels in different places of Iraq by Atiyah *et al.,* (2011) in Al-Qadissiya province 42.43% and Abul-Hab and Al-Affass, (1977) in central Iraq was 46.7%. Also agreement with studies in other parts of the world conducted by Alahmed, (2002) in Saudi Arabia41%; Ramadan, (1997) in Egypt 37%; Al- Ani and Zuhair, (2016), Jordan 46.39. In our study, the results revealed that infestation rate with *C. titillator* larvae in cold weather were higher than it was in the warm season. Moreover, all three stages of larvae were found in each month of the year. This indicates that the flies may be found in all seasons, but in various level of abundance. In comparison with our results, previous studies have shown that camel bot fly is more prevalent in cold season (Fatani and Hilali, 1994; Oryan *et al.,* 2008; Atiyah *et al.,* 2011). The flies hatch out mainly during the rainy and moist season but infection during other times of the year could not be excluded. According to the life cycle, it seems the small size of the first stage larvae that may be overlooked can be the reason for the low prevalence in warm seasons (Fatani and Hilali, 1994). Perhaps, the larvae migrate from their predilection site towards the nasal passage during the warm dry season ready to be expelled and pupate in the ground (Razi Jalali *et al.,* 2016).
Furthermore, the present study showed that level of infestation with *C. titillator* larvae in females (56.6%) is higher than males 37.36%, these results indicate that the sex is a significant factor that affecting the prevalence of infestation with *C. titillator* larvae and agreed with several studies (Bekele, 2001and Atiyah *et al.,* 2011), and disagreement with (Oryan *et al.,* 2008) who reported that the percentage of infection is occurred in males 65 % is higher than in females 45.6%. The different susceptibility of *C. titillator* larvae between males and females may be due to the levels of sex hormones (Roberts *et al*., 2001 and Atiyah et al., 2011). The breeding system may play an important role in the exposure variation of males and females because of most of the females used for the purpose of pregnancy and reproduction which could decrease resistance in females besides the lactation period, which are associated with hormonal and immunological changes. Whereas most of the males used for hard work and racing in many countries (Bekele, 2001; Kassa, 1995 and bassiony *et al*., 2005).

In addition, the present study showed that the high percentage of infection with *C. titillator* larvae occurs in age group 4- 7 years in 65.61%. Whereas, lower percentage of infection is occurred in age group 8 months to 2 years old in 22.95%.The results were in agreement with many previous studies (Abul-Hab, *et al*., 1977; Bekele, 2001 and Oryan, *et al.,* 2008**).** The difference in the distribution of infection with *C. titillator* larvae among age groups of study are explained by the camels of the group less than 2 years old were younger than a year and it is possible that they were born after the active season of the flies and were not exposed to infestation up to that time (Oryan, *et al*., 2008**)**. Furthermore, the continuous exposure of these

camels to the adult flyled to make the old camels more susceptible to be infested with *C. titillator* larvae than younger camels. All of that resulted in slowing down its movement and then their inability to put the first larvae that is newly developed by the adult fly through Sneezing or because of immunosuppression caused by progressive age (Atiyah *et al.*, 2011). Serum protein electrophoresis test has alow specificity in the diagnosis, measuring the normal serum protein electrophoresis patterns in all domestic animals and the correct interpretation of their results is very useful for the clinician in diagnosing healthy and infected animals (Lutz *et al.*, 2009). The results of our study indicate that levels of α1-globulins, α2-globulins, β-globulins and γ-globulins were statistically significant increase in camels suffering from parasitic infection comprised to healthy. The results were in agreement with many studies (Alberghina *et al.*, 2010, Piccione *et al.*, 2011 and Tóthová *et al.*, 2013).). Serum protein electrophoresis standard method for fractionation and quantification of serum proteins is electrophoresis in clinical biochemistry. In conclusion, camels play an important role in the epidemiology of parasitic diseases under the three aspects of animal health, transmission to other livestock and zoonoses. Parasitic infections of camels may cause reduced milk and meat production, impaired fertility and decreased calving rates. They may also lower the working efficiency or even result in death and consequently high economic losses. The present work reflects the current state of knowledge on the parasitic fauna of camels in clinical, immunological and epidemiological studies on the parasites of camels in Al-muthanna province. serum protein electrophoresis and determination of absolute values of serum protein fractions in dromedary camels by cellulose acetate electrophoresis is very useful for clinicians to diagnose and evaluate various pathological conditions. The results presented in this study showed a significant effect of parasitic infection on the concentrations of some of the serum protein fractions in camels.

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The role of sex chromatin figures on some biochemical constituents of blood and milk in local she-camels (*Camelus dromedaries*)

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Abstract

This study was designed to determine the roles of sex chromatin in relation to some blood and milk constitutes of she camel (*Camelus dromedaries*). Blood and milk samples were collected from 30 adult dairy, 5-10 years old she camel at Al Muthanna province during the period from August 2017 to February 2018. The samples were send to the laboratory of college of veterinary medicine/ Kerbala university for analysis. The percentages of sex chromatin types including Drum stick, Sessile nodule, small club and Tear drop were 59.95%, 25.20%, 8.53%, and 6.31% respectively. The means of horizontal and vertical dimension and sex chromatin areas were 1.150 ± 0.04 µm, 1.115 ± 0.04 µm and 0.986 ± 0.07 µm^2 respectively. While, the average ± standard error of horizontal and vertical dimension and nucleus area were 11.55 ± 0.29 µm, 11.12 ± 0.30 µm and 101.40 ± 4.76 µm^2 respectively. Moreover, the sexual chromatin area / nucleus area and the number of lobes in the nucleus were 1.061 ± 0.07% and 3.82 ± 0.14

respectively. The blood glucose, total protein, total cholesterol, and total triglyceride means were118.89 ± 2.74 mg / dL, 7. 61 ± 0.18 g / dL and 70.80 ± 2.14 mg / dl and 55.28 ± 1.27 mg / dl respectively. However, the lipid, protein, lactose and non-lipid solid materials means of the milk were 3.40 ± 0.11 and 3.60 ± 0.10 and 4.8 ± 0.12 and 11. 25 ± 0.17% respectively. A significant variations were appeared between different parameters of blood and milk constituents in relation to the types of sex chromatin. In conclusion, this study approved the possibility for using sex chromatin in rapid selection programs to improve the genetic properties in the local Iraqi camels population.

Key words: camelids, Sex chromatin, blood , milk

Introduction

Camel are among the animals that mentioned in the Quran as a God miracle (Deuraseh, 2005). Arabian camels are the important component of arid and semiarid ecosystem. Camels have economic importance for the Bedouins and also are considered as a source of milk, hid and meat (Yagil, 2000). The scientist give attention to the camel breeding, moreover they implemented a new technologies to improve the camelids breeding and its genetic characteristic and to overcome the cases of non-fertilization (Zeidan *et al.*, 2011). Globally, there are approximately 23.9 million head according to the statistics of the World Food and Agriculture Organization. Camels belongs to *Camelus* species that are classified into two genus the *Camelus dromedaries* and *Camelus bactrianus* (Wardeh, 2004). Chromosomes are genetic structures within the cell nucleus that are responsible for transmitting genes from parents to offspring in the form of genes, the basic unit of one sex chromatin (Al-Issawi *et al.* 2013). The presence of chromatin materials in some body cells of females and absence it in the body cells of males, open the way for researchers to use this feature in the field genetic selection. This is called the sex chromatin or Bar bodies (Ali *et al.*, 2008 and Dyer, 2009). Review of literature revealed scarce publications concerning the types of sex chromatin and its relation to blood biochemical substances in the local Iraqi camelids. Therefore, this study was designed to show the roles of different types of sex chromatin of polymorphonuclear white blood cells (neutrophil) and its relation to some biochemical features, in addition to know the best parameters that can be used as a guide for breeding selections.

Materials and methods

The study was carried out on 30, adult dairy, 5-10 years old she camel during the period from August 2017 to February 2018, at Al-Rehab/ Samawa district / Al Muthanna province. Moreover, all data and information regarding each animal were recorded. Blood samples were collected from milk vein using 10 mL vacuum tubes without and with anticoagulant (EDTA) and kept in cool box (Young, 2000). The samples were transferred immediately to the laboratory/ College of Veterinary Medicine / University of Kerbala. Then, 8 blood smears were prepared from each blood sample (totally 240 blood smears). All blood smears were stained with freshly prepared Giemsa stain after fixation with alcohol. After ten minutes the slides were washed with water and air dried. Drops of Canada balsam were placed on each slide to fix the covered slides (Coles, 1986). All prepared blood smears were examined under light microscopy

using oil immersion lens (X100) magnification lens multiply by (X10) optical lens. Serum samples were collected from blood samples after centrifugation for 5 minutes (Centerfuge -T-30 Germany) at 5000 RPM / minutes and kept at -5 ° C until analysis. Serum samples were analyzed to estimate metabolic material (glucose, total protein, cholesterol and triglycerides) using appropriate commercial kits and measured by Spectrophotometer (PD303- Germany) using different wavelength. Glucose and cholesterol; total protein and triglyceride were measured using Agappe Kit (USA) (Tietz, 1999), Spinreact Kit (Spain) (Young, 1995) and Cromatest Kit (Spain) (Young, 2000) respectively, using wavelength 505 and 500 nm; 540 nm and 500 nm respectively.

Statistical analysis

Statistical analysis was done using SAS program, specifically the general linear method to study the effect of sex chromatin types in some biochemical constitutions (SAS, 2010). However, the chi-square test was used to compare the relative distribution of the different types of sex chromatin in the studied traits.

Results and discussion

The number of sex chromatin and its distribution percentages in neutrophil (polymorphonuclear WBCs) in blood samples of she camels are presented in table. (1). Different type of sex chromatin were seen as Drum stick (Figure. 1), Sessile nodule (Figure. 2), small club (Figure. 3) and Tear drop (Figure. 4).

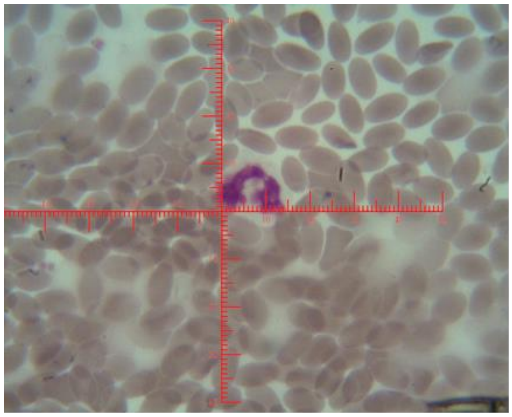

Figure. (1): Shows sex chromatin types; small club, the horizontal and vertical dimension measurements in the nucleus of the neutrophils (x1000)

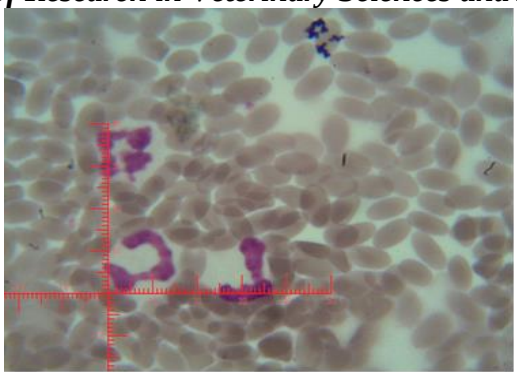

Figure. (2): Shows Sex chromatin type Sessile nodule, the horizontal and vertical dimension measurements in the nucleus of the neutrophils (x1000)

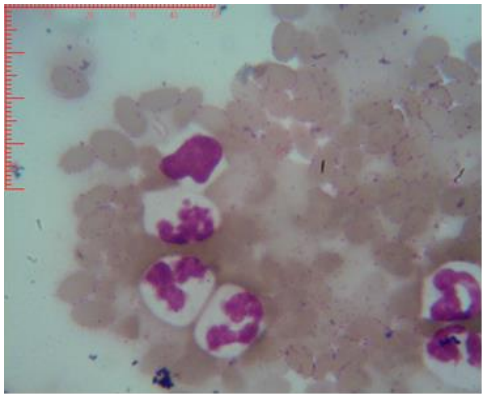

Figure. (3): Shows Sex chromatin type tear drop, the horizontal and vertical dimension measurements in the nucleus of the neutrophils (x1000)

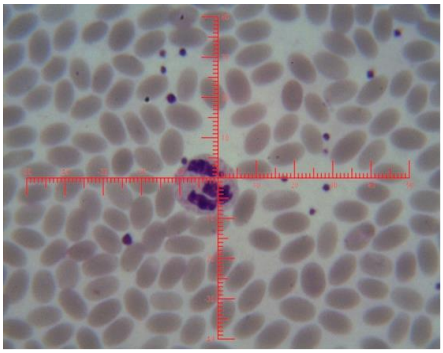

Figure. (4): Shows Sex chromatin type tear drop, the horizontal and vertical dimension measurements in the nucleus of the neutrophils (x1000)

A high significant ($P < 0.01$) result were observed for the drum stick type in compare to the other types of sex chromatin. The percentages of sex chromatin types including, Drum stick, Sessile nodule, small club and Tear drop were 59.95%, 25.20%, 8.53%, and 6.31% respectively. This results are compatible with previous results reported in cows (Al- Janabi and Al-Essawi, 2010),

however, this results are disagreed with previous studies on sheep (Raoof *et al.*, 2017), who reported the different sex chromatin percentages as 60.22 %, 23.37 %, 8.54 % and 7.87 % for sessile nodule drum stick, small club and Tear drop respectively. Meanwhile, the results of the current study is compatible with (Al Anbari and Al Khazragi, 2012) specifically in low percentages of small club and tear drop with 1.89% and 9.25% respectively, but disagreed with (AL-Jebori, 2013) with percentages of 29.35 & 14.30% respectively, and (Abbas, 2016) with 52.00%, 34.7%, 12.57% and 0.72% for sessile nodule, small club, drum stick and tear drop respectively.

Table 1. Shows the sex chromatin numbers and percentages of distribution sexual white blood cells (neutrophils) in local Iraqi camel.

No	Number of animals	Types of chromatin	Number of appearance	Number of sex chromatin	Percentage (%)
1	30	Drum stick	6000	3594	59.90
2	30	Sessile nodule	6000	1515	25.25
3	30	Small club	6000	511.2	8.52
4	30	Tear drop	6000	379.6	6.32
Total					100%
Chi square (χ^2)					11.407 (P<0.01

The means ± SE of sex chromatin dimensions and nucleus measurements are represented in Table 2. The horizontal and vertical dimensions and sex chromatin area were 1.110 ± 0.05 µm and 1.124 ± 0.05 µm 986.0 ± 0.07 µm^2 respectively. While, the horizontal and vertical dimensions and the area of the nucleus means were 11.55 ± 0.29 µm, 11.12 ± 0.30 µm and 101.40 ± 4.76 µm^2 respectively. Meanwhile, the average percentage of the sex chromatin area to the nucleus area was 1.064 ± 0.07%. In addition, the average number of lobes in the nucleus was 3.82 ± 0.14. The results of the current study are compatible with the previous study in sheep (Khazraji and Al-Nabari, 2012), who showed similar measurements 1.30 µm, 1.02 µm and 1.041 µm for horizontal dimension, the vertical dimension and sex chromatin area respectively. Meanwhile, the horizontal, vertical dimension, nucleus area and sex chromatin area / nucleus area and number of lobes were 11.56µm, 11.33µm, 102.82µm^2, 1.01% and 3.95 lobes respectively. Khazraji and Al-Nabari, (2012) showed that the horizontal and vertical length of the nucleus and nucleus area were 14.73 ± 0.29 µm, 14.36 ± 0.34 µm and 166.05 ± 5.66 µm^2 respectively. While, the horizontal and vertical dimension and the area of sex chromatin were 1.096 ± 0.04 µm, 1.110 ± 0.03 µm and 986.0 ± 0.04 µm^2 respectively. Moreover, the mean of sex chromatin area / nucleus area and number of lobes in the nucleus were 0.632 ± 0.04% and 4.30 ± 0.10 in cows (Al- Janabi and Al-Essawi, 2010). The results of the current study is compatible to previous study (Raoof *et al.*,2017) who found that the horizontal and vertical dimension, sex chromatin area and the number of lobes were 1.32 µm, 1.26 µm, 0.943 µm^2 and 4.18 respectively. However, AL-Jebori, (2013) studied these features found that the horizontal and vertical dimension, the area of sex chromatin and the number of lobes were 1.02 µm, 0.761µm, 2.50µm^2 and 3.43µm respectively in female Shami goats. While, the horizontal and vertical dimension and the nucleus and sex chromatin areas / nucleus area and number of lobes

were 8.12 µm, 7.76 µm, 64.73 µm^2, 4.36%, and 3.43 respectively, however, the horizontal and vertical dimension and sex chromatin area were 1.02 µm, 0.96 µm and 2.37 µm respectively in local goats. Furthermore, the horizontal dimension, nucleus area and chromatin area/nucleus area and number of lobes were 7.87µm, 7.91 µm, 57.42 µm, 5.00% and 3.62 µm respectively. These results demonstrated that the sex chromatin area was almost constant in most farm animals, although there was a slight difference between them. And, if the slight differences were observed, they are due to differences in the size of the chromatin x (John *et al.*, 2003 and Bhatia and Shanker, 1982). Moreover, the difference in the nucleus area is also due to the difference in the size of the white blood cells (neutrophils) among animals (Khazraji and Al-Nabari, 2012).

Table 2. Shows the sex chromatin characteristics and nucleus measurements in the local Iraqi she camels (mean ± SE).

No.	Sex chromatin & Nucleus features	Number of appearance	Mean± SE
1.	Horizontal dimension of sex chromatin (µm)	6000	1.110 ±0.05
2.	Vertical dimension of sex chromatin(µm)	6000	1.124 ± 0.05
3.	Sex chromatin area (µm^2)	6000	0.986 ± 0.07
4.	Nucleus horizontal dimension (µm)	6000	11.55 ± 0.29
5.	Nucleus vertical dimension (µm)	6000	11.12 ± 0.30
6.	Nucleus area (µm^2)	6000	101.40 ± 4.76
7.	Sex chromatin area(µm^2)	6000	1.064 ± 0.07
8.	Lobes numbers	6000	3.82 ± 0.14

The overall mean ± SE for the tested milk samples from local Iraqi camels are presented in table. 3. The mean ± SE of glucose, total protein, total cholesterol and triglycerides were 118.89 ± 2.74 mg / dL, 7.61 ± 0.18 g / dL, 70.80 ± 2.14 mg / dl and 55.28 ± 1.27 mg / dl respectively. The results of this study are compatible with previous study done on camel (Zeidan *et al.*, 2011), who found that total protein and cholesterol concentration were 7.02 g / dl and 88.65 mg / dl respectively. Moreover, the results of the current study are also in agreement with previous researchers, who found that the total protein, glucose, cholesterol and triglyceride concentration in camels were 7.18 g / dl, 98.12, 114.23, and 36.17 mg / dL respectively (Ohri and Joshi,1961), and (6.16 g / dl) , (110.04 mg / dL) , (38.30 mg / dL) and , (34.30 mg /dL respectivel (Albomohsen, 2011; Ali *et al.*, 2008). However, the results of this study are disagreed with another study in camel (Raghvendar *et al.*,2004). These differences in concentrations of biochemical parameters may be due to differences in animal strain, food and health status of the herd, sample size and geographic location. The mean ± standard error of fat , protein, lactose, and non-lipid solids content in milk are presented in table.(3) and were 3.46 ± 0.11, 3.52 ± 0.10, 4.14 ± 0.12 and 11.05 ± 0.17% respectively. This results are compatible with previous study (Ohri and Joshi,1961), who found that the averages of fat, protein, lactose and non-lipid content were 4, 3.46, 4.86 and 12.2% respectively. Meanwhile, the results of the current study are disagreed with (Al-Rubaie *et al.*, 2013), who found that fat , protein, lactose, and non-lipid solids content percentage were 3.13, 3.7, 4.67 and 11.29% , and also with (Raghvendar *et al.*, 2004) with percentage of 5.5, 4.5, 5.8 and 13.95% for fat, protein and lactose respectively. These

differences may be occurred due to the variations of the breed of animal, the health status of the herd and the type of nutrition and geographical location.

Table 3. Biochemical parameters and milk recipes studied in the local Iraqi market (general mean ± standard error)

Studied Traits		Number of the animals	mean ± SE
Blood Biochemical parameters	Glucose(mg/dl)	30	118.89 ± 2.74
	Total protein(gm / dl)	30	7.61 ± 0.18
	Cholesterol (mg/dl)	30	70.80 ± 2.14
	Triglycerides (mg/dl)	30	55.28 ± 1.27
Milk properties	Fat %	30	3.40 ± 0.11
	Protein%	30	3.60 ± 0.10
	Lactose %	30	4.8 ± 0.12
	Non-lipid solid material	30	11.25± 0.17

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Study the effects of follicular size on some biochemical follicular fluid composition in She camel (*Camelus dromedarius*)

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Abstract

This study was designed to estimate the biochemical composition of ovary follicular fluid in relation to its size variations in local Iraqi She camels (*Camelus dromedarius*). Hundred ovary were collected from 50 adult she camel, 4 to 10 years old that slaughtered at Al Najaf abattoir during the breeding season of camelids. The ovaries were transferred immediately to the laboratory in a cold box. Later on, the follicular fluid was collected separately from small and large size follicles, (3-9 mm) and (10-19 mm) respectively. The fluid was kept at -4 ^{0}C for further analysis. The follicular fluid samples were analyzed to estimate the metabolic composition (cholesterol, glucose and total protein), and the ionic compositions (calcium, sodium and potassium). The results of this study revealed significant ($P< 0.05$) increase in the glucose and cholesterol concentration, while there were significant decrease in the total protein in large size follicles. Meanwhile, significant increase was seen in the concentration of Na+ and Ca+2 in relation to the size of the follicles. However, significant decrease was occurred in the concentrations of K with increasing follicle size. In conclusion, the results of this study revealed a significant variations in the concentration of the follicular fluid metabolic and the ionic compositions with the variations of its size.

Key words: Biochemical, *Camelus dromedaries*, Ionic composition, follicular fluid, follicular size.

Introduction

Camel is the unique animal that can live for several weeks without water. Camels are providing milk, hid and meat though a harsh and severe conditions. Moreover, it is used in racing and competition. There are two species of camel included in the genus *Camelus*. The first species is *Camelus dromedaries*, the dromedary or one-humped camel, the world population of which is estimated to be 15,368,000, with approximately 80% in Africa and 20% in Asia. The second species is *C. Bactrians*, the bactrian or two-humped camel, of which there are 1.7 million in their natural habitat in Asia (Al Salihi, 2016; Wardeh, 2004). The breeding of the local camelids is seasonal that start at autumn and increase drastically until the end of winter, meanwhile, it

decrease significantly at spring and summer (El-Harairy *et al.*, 2010). The follicular wave is a term replace the estrous cycle. It reflex the physiological, structural and behavior changes that occur during identified period between one ovulation and another because camels are induced ovulation. Besides, the ovulatory activities are only limited during the follicular changes (Padalino *et al.* 2016). The formation of follicular fluid is starting inside the ovary follicle earlier during its development (Bodhaganahalli *et al.*, 2015). It produces from local substances produce locally, and part of this fluid is filtrated from blood serum that related with the metabolic activities of follicular cell (Gerard *et al.*, 2002). Therefore, the compositions of follicular fluid are alike but not identical to blood plasma (Nishimoto *et al.*, 2009). The ovary cells produce soluble substance like steroids hormone, growth factors (Fortune *et al.*, 2004) inhibition factors (Arunakumari *et al.* 2007), ionic and fat substances (Nandi *et al.*, 2008), as well as some of minerals and salts (Sharma and Vasta,1998). All these substances play important role in the metabolic activities of the ovary cells. Consequently, the functional status of the follicles and the follicular fluid has an important vital role on the ovary cells that referred to the functional status of the follicle (Abdoon, 2001). The follicular fluid has biological activities, it is providing the internal environment for growing of ova and granular cells and protect the ova from the external condition. It is a good media and contains fat, steroids, amino acid and different protein and minerals. This substance provide an environment that provide fat, steroids and amino acids and different protein that provide a good environment for maturation of ova and effect on the conception (El-Shahat *et al.*,2013). The follicular fluid has the ability to keep the Meiosis of the egg in silent stage and protect the released egg from analysis during fertilization (Chang *et al.*,2005), and raising the attractiveness, movement and hat reaction of the sperm (Somfai *et al.*,2012). Follicular fluid is also played a big role in auto-organization (Autocrine) and (Paracrine) of follicular cells, moreover it regulates the maturity of the cytoplasm and nucleus (Cytoplasm) of the egg and ovulation (Campbell, 2009). Knowledge of the follicular fluid components can give information about the needs of the growth and maturity of the follicles and eggs, moreover it is used as a guide to configure an active complement culture medium for maturity and identify the requirements of egg development (Zeidan *et al.*, 2011). The study of follicular fluid in she camels is benefited the improving of in vitro maturation of the egg (IVM) (El-Hassanein *et al.*,2010). The metabolic activities and characteristic of follicular cell wall during its growth and development are changeable, and variations in its biochemical compositions and size are expected (Ali *et al.*, 2011). Consequently, this study was designed to estimate the concentrations of metabolic and ionic constituents including cholesterol, glucose, total protein and Calcium, Sodium and Potassium of the follicular fluid and its relation to the follicular size of she camels.

Materials and Methods

1. Collection of follicular fluid

The study was conducted in the laboratories in the Faculty of Veterinary Medicine/ University of Kerbala during the period extended from 1/10/2017 until 31/12/2017. Hundred ovaries were collected from 50 adult, (4-10) years old she camels that slaughtered at Al Najaf province abattoir during the breeding season. All these animals were in good healthy with a normal genital tract according to post-slaughter examination. The ovaries collected and placed in a

plastic bag containing the normal phosphate buffered saline (PBS) (0.9%). Then, the bag was placed in a cool box and immediately transferred to the laboratory within two hours. In the laboratory, all ovaries were washed twice with PBS and placed on the filter sheets to absorb the excess water (Nandi *et al.*,2007). Subsequently, the follicles were removed from each other. The follicles of each ovary were measured by the Vernier calipers (Nichi-Japan) and were classified according to these measurements into two categories, the small and large groups with (3-9 mm) and (10-19mm) in diameter respectively. The follicular fluids were collected separately from each animal in each groups and placed in sterilized plastic tube and kept at -4 ^{0}C for further analysis.

2. Biochemical analysis of follicular fluid

The samples of the follicular fluid were analyzed to measure the concentration of the metabolic and ionic components in both groups. A commercial kit from RANDOX-kit-England was used to estimate the concentration of glucose and total protein using spectrophotometer-PD303-Germany the optical method that read at 546 nanometers wavelength. A commercial kit, Cromatest-kit-Spain was used to estimate the cholesterol concentration using optical spectrometer and 500 nanometers wavelength. The Biomaghreb-kit-Tunisia was used to determine the ions concentration using the optical spectrometer that read at 500 nm, 550 nm and 578 nm wave length for sodium, calcium and potassium ions respectively.

3. Statistical analysis

Complete randomized design was used to investigate the effect of the follicular size on the metabolic and ionic components concentration level. The mean differences between the averages using a multiplicity test (Duncan, 1955) to compare the differences between the averages. Statistical analysis of data was done according to SAS program (SAS, 2004).

Results and discussion

A significant increase ($P < 0.05$) in the concentration of cholesterol of the follicular fluid was appeared with increase in the follicular size (Table. 1). Its concentrations in the small and large follicles were 5.22 ± 0.40 mg / dL and in 7.54 ± 0.03 mg / dL respectively. The follicular cholesterol is derived from two sources, the acetate in the follicular granular cells and from the lipo-proteins of the blood plasma (Nandi *et al.*, 2007). Cholesterol is considered as the primary substance for the building of the lipid hormones, besides the follicular fluid contains only high-density lipoproteins (HDL). Therefore, the follicular granular cells are depended on the cholesterol derived from these plasma-derived fats by crossing the basement membrane of its cells (Mishra *et al.*, 2003). The low-density lipoproteins(LDL) molecules was lack of in the follicular fluid because its own a large size molecules that cant cross the blood vessel- follicular wall barriers (Clarke *et al.*, 2006). The granular cells need cholesterol during its growth and multiplication. Therefore, it is withdraw from follicular fluid that led to decrease its concentration in the small size follicle. Nonetheless, when the size of follicle enlarged , its cells multiplication are decreased and lead to release cholesterol into the follicular fluid that use in the formation of lipid hormones (Su *et al.*, 2008). The results of the current study are agreed with previous studies in she camel, buffalo and sheep that done by Albomohsen *et al*.(2011);

Arshad *et al*.(2005)and Nandi *et al.*(2007)respectively. Meanwhile, the results of the current study are incompatible with previous reports in she camel, buffalo and goats that done by Rahman *et al*.,(2008) and AbdEllah *et al*.(2010)and Deshpande and Pathak (2010)respectively. A significant increase ($P<0.05$) was appeared in the concentration of the follicular glucose in relation with increasing of follicular size. Its concentrations were 43.64 ± 4.76 mg / dl and 71.32 ± 10.08 mg / dL in small follicles and large follicles respectively. Glucose plays an important role for the ovarian metabolism because it acts as an important energy source for the ovary via anaerobic metabolism pathway that leads to formation of lactate (Boland *et al.*,1994 and Rabiee *et al.*,1999). In small follicle, the significant increase in the glucose concentration may be due to lack of its metabolism and consumption by the few numbers of granular cells in compare to large follicles (Nandi *et al.*,2007 and Leroy *et al.*,2004). However, other researcher found that high permeability of blood vessel- follicle wall barriers during the follicular growth led to filtrate more glucose from blood plasma into follicular fluid (Ying *et al.*, 2011 and Nishimoto *et al.*, 2006). Moreover, Nishimoto *et al.* (2006) described the importance of glucose concentration in the growth media necessary for in vitro development and maturity of eggs. These observations are indicating to the harmful effects of decreasing and increasing glucose concentration on the growth and maturity of the egg and lead to incomplete maturation cell's nucleus. The results of the current study are compatible with previous study in camels (Padalino *et al.*, 2016) and disagreed with (Rahman *et al.*, 2008) , who mentioned that the level of glucose was relatively high in the small follicles in compare to the large follicles in *camelus dromedaries* she camel. This variations may be occurred due species differences in different countries and even in the same country (Khanna *et al.*, 2004). The results of this study are also in agreement with results in another species of animals as buffalo (Arshad *et al.*, 2005) , cattle (Leroy *et al.*, 2004) , sheep (Nandi *et al.*, 2007) and goats (Herrick *et al.*, 2006).

A significant decrease ($P<0.05$) in the total protein concentration with the increase in the size of the follicle is also appeared in Table.1. Its concentrations in follicular fluid was 6.14 ± 0.19 g / dL in small follicle, while its concentration decreased to 4.63 ± 0.13 g / dL in large follicle. The follicle needs a protein at the beginning of its formation to build up the multiple layers of granular cells and the cells surrounding the egg. Therefore, this process make the follicle needs a lot of protein that will draw from the blood serum and excreted in the follicle and led to increase its concentrations in the small follicles (Chang *et al.*, 2005). The lipoprotein are secreted from follicular granular cells and are involved in the new follicular formation and its blood vessels, and linear division of egg before ovulation. Therefore, it will increase at the beginning of the formation of the small follicle, thus increase in its follicular fluid (Hunter *et al.*, 2004). However, the decreasing of protein concentration in the large size follicle was the increasing in the production of lipid hormones, that need binding proteins, therefore its consume is decrease in large follicles (Kiker *et al.*, 2005). Moreover, the results of the current study are in agreement with previous studies in camels (Rahman *et al.*, 2008 and Albomohsen *et al.*,2011), nevertheless it is incompatible with (Bodhaganahalli *et al.*,2015)in camels. Meanwhile, these results are agreed with the results reported in buffalo (Thangavel and Nayeem,(2004),cows (Leroy *et al.*,2004) and goats (Singh *et al.*,1999) differ with (Arshad *et al.*,2005), but are disagreed with (Nandi *et al.*,2007) in sheep and buffalo (Arshad *et al.*, 2005).

Table.(1) : shows the concentration of metabolic components in follicular fluid of small and large follicles of the local camels

Composition (Metabolites)	**Small follicle (3-9 mm)**	**Large follicle (10-19 mm)**
Cholesterol (mg/dl)	5.22 ± 0.40 (B)	7.54 ± 0.03 (A)
Glucose (mg/dl)	43.64 ± 4.76(C)	71.32 ± 10.08 (A)
Total protein (g/dl)	6.14 ± 0.19 (A)	4.63 ± 0.13 (B)

Values with different letters within the same row are significantly different (P <0.05)

The level of calcium ion concentration are significantly (P <0.05) affected by the follicular size. Its concentration was increased with the increase of follicular size. The calcium concentrations were 2.25 ± 0.96 mmol / L. and 3.45 ± 1.09mmol / L. in the follicular fluid of the small and large follicles respectively. Calcium plays an important role in the production of lipid hormones of the developing follicles and it regulates the secretion of breeding hormones necessary for ovaries and ovulation (Iwata *et al.,* 2004). Moreover, calcium ions is involved in the formations of estrogen. The level of this hormone is increased during follicular development and consequently, require large quantities of calcium ions that withdraw from blood inside the follicular fluid, then raising its calcium concentration (Nandi *et al.,* 2007). The results of the current study are agreed with previous studies in camels (AlFattah *et al.,* 2012), buffalo (Kaur *et al.*, 1997), sheep (Nandi *et al.*, 2007) and goats (Sava, *et al.*,2005), while it is incompatible with (Arsha *et al.*, 2005) in sheep.

The concentration of sodium ion was affected significantly (P <0.05) with variations of the follicular size. Its concentrations was 93.33 ± 4.75 mmol / L in small follicle size. Meanwhile, it was increased with increasing of follicular size that reached 145.96 ± 4.26 mmol / L. Sodium ion has a relation with vitality of the follicle and its activities in the production of estrogen that has the ability in retained sodium inside the cells (Nandi *et al.*, 2007). The size of follicle was increased with its growth continuity because the movement of water from blood into follicular fluid. However, this process requires osmosis process across cell wall that increase with the elevation of sodium ions in the large follicle (Sharma *et al.*,1995). The results of the present study are agreed with previous studies in camels (AlFattah *et al.,* 2012), cattle (Iwata *et al.*, 2004) , buffalo (Kaur *et al.*,1997) , goats (Bordoloi *et al.*,2001) and sheep (Nandi *et al.*,2007). While, these results are incompatible with (Rabiee *et al.*,,1999) in cattle and (Arshad *et al.*,2005) in buffalo.

The concentration of potassium ions was significantly reduced (P <0.05) with the increase of follicular size. Its concentration was 12.96 ± 0.68 mmol / L in the fluid of small follicular size. However, its concentration was significantly decreased in to 6.12 ± 0.57 mmol / L in the fluid of large follicular size. The decreasing of the potassium ion concentration is related with the follicle development that lead to increase glucose consumption. This process lead to move potassium ions from extracellular spaces to intracellular space and thus reduces its concentration in the follicular fluid when follicular size enlarge. The concentration of potassium ions in the follicular fluid revealed high significance in compare to its concentration in the serum accompanied with missing a correlation between them indicated that Potassium ion may be excreted locally in the follicular fluid (Leroy *et al.,* 2004 and AlFattah *et al.,* 2012). These results are in agreement with (AlFattah *et al.,* 2012) in camels and (Arshad *et al.,* 2005) in buffalo and (Leroy *et al.,* 2004) in cattle and (Nandi *et al.,* 2007) in sheep.

Table (2): Shows the concentration of ionic components small and large follicular fluid of local camels

Composition (Ions mmol/L)	**Small follicle (3-9 mm)**	**Large follicle (10-19 mm)**
Calcium	2.25 ± 0.96 (B)	3.45 ± 1.09 (A)
Sodium	93.33 ± 4.75 (C)	145.96 ± 4.26 (A)
Potassium	12.96 ± 0.68 (A)	6.12 ± 0.57 (B)

Values with different letters within the same row are significantly different (P <0.05)

In conclusion, this study approved the variations in the concentration of metabolic and ionic components of follicular fluids in relation to the follicular size and its development stage. The results of this study can be consider in the formulation of egg culture media use in the in vitro fertilization.

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Epidemiology of ticks fauna of camels in Samawah desert

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Abstract

Ticks are between the crucial significant vectors of pathogens distressing animals, and also cause health problems like tick paralysis, dermatitis, anemia and secondary infections. This study designed to investigate tick species that infest camels in Al Muthanna province/ Iraq. This study was conducted as a survey of the hard ticks (Acari, Ixodidae) during February 2017-February 2018 on four camels populations (*Camelus dromedarius*) in different areas in Al Muthanna province. On each occasion, all the visible ticks were collected form the body of each animal. Later on, ticks were transferred to the laboratory, processed and identified microscopically. A total, 455 ticks were collected during the study period. The overall incidence of the ticks infestation was 97.1 %. The highest infestation percentage was 98.48 % in female, while it was 75% in male. Ticks were found on different site on the body (legs, chest, axillary, udder, testes, anus, inguinal, ear and face) with more severe lesions on the udder. *Hylomma spp*. and *Boophilus spp*. were the most abundant species of ticks found on the camels. In conclusion, this study approved heavy ticks infestation between the camels population variations in the severity of the clinical signs. The authors recommend a future study that contribute to the understanding the species and distribution of ticks that infest camelids in Iraq in order to prevent the implications of ticks infestation and possible prevention measures for diseases transmitted by ticks.

Key words: *Boophilus spp* , Camel, Fauna, *Hylomma spp*. ticks

Introduction

Al Muthanna Province is protected with desert plants and sporadic pastures of varied concentrations (Al Salihi *et al.,* 2017). This severe state is the proper to camels and for this cause they are one of the most important animal resource in Al Muthanna governorate. Merely, the Arabian camels (*Camelus dromedarius*) are reared in Al Muthanna and they show a very important role in the life of people (as Arabian), they are used as meat, dairy and transportation animals ,beside using as deposited wealth for the forthcoming severe times. Indeed, camels similar other animals are affected with a number of diseases and parasites (Al- Zubaidy, 1995). The external parasites of camels include ticks, mites, and different diseases including parasitic arthropods e.g. myiasis flies (Al-Zubaidy,1995; Soulsby, 1986). Ticks are a main limit on the world's livestock production (Zeleke and Bekele, 2004). It employs a major interference to enhance animal production in the tropical and subtropical regions of the world by spreading overwhelming and often deadly livestock diseases, causing blood loss, damage to hides and udder, and paralysis (Dalgliesh *et al.,* 1990). There are two families of ticks, the hard and soft ticks or the Ixodidae and Argasidae families respectively (Soulsby, 1986; Urquhart *et al.,* 1987). The most common ticks harbor camels is the family Ixodidae, moreover, it is also approved as the most common external parasites that affecting all livestock in Iraq and other countries in the Middle East (Al-Khalifa *et. al.,* 2007; Al- Zubaidy; 1995; Banaja and Roshdy, 1978; Hoogstraal *et al.,* 1981). The ticks are used the mechanically or biologically to transmit the pathogens to the host, moreover, some microbial agents need to goes via different kinds of growth and evolution within the vector. The microorganisms can be spread either transstadially (Stage to stage, usually happen in three- host ticks) or transovarially (from female to offspring via egg and mostly in one host ticks). Significant mortality and morbidity rates have been reported in camels and other farm animals due to heavy ticks infestation (Zeleke and Bekele, 2004). *Theileria spp., Babesia spp*. and *Anaplasma spp.* are most important blood parasite that can be transmitted by ticks. Additionally, *Anaplasma marginale* and *Theileria camelus* parasites were reported to be found in camels (Soulsby, 1986). Diverse ticks can be infested camels. The legs, head and the underbelly are the common body parts that invaded with ticks. Ticks infestation result in Swellings and small wounds in the skin from the bites. Poisons from some ticks affect the nervous system and muscles and hinder the animal movement (paralysis), which can lead to death. The camel suddenly shows signs of paralysis and its body temperature will drop (Mukasa-Mugerwa, 1981).

According to a study performed by Hussein and AL- Fatlawi (2009), it was found that hard ticks of *Boophilus* Spp and *Hyalomma* Spp. were the most abundant species infesting Iraqi dromedaries (83%) in Al-Qadisiya province. However, the ticks infestation ratio was 24.7% and 75.3% of male and female respectively. In Saudi Arabia, 13 species and subspecies were reported to infest camels and among other livestock (Al-Khalifa *et al.,* 2007; Banaja and roshdy,1978; Banaja *et. al.*,1980 ; Banaja and Ghandour, 1994 ; Hoogstraal *et, al.,*1981) . Indeed, these ticks are well modified to harsh desert conditions (Morel, 1989). Another studies were also approved the incidence of ticks of *H. dromedarii* and other *H. species* as the most common species infesting camels in Egypt.

Review of literature revealed scarce reports concerning ticks infestation in camels population in Al Muthhanna governorate. Consequently, this is a preliminary study that intends to

investigate the camel tick's fauna infestation in the camel population in Al Muthanna governorate.

Materials and Methods

This study was performed on four camel herds in Badiat Al Samawah / Al Muthanna governorate 280 kilometers of southeast of Baghdad. it has a dry desert weather. This area is sandy with ridges, and a high populations of the *Camelus dromedarius* are living there. The area is covered with desert plants of diverse concentrations. (Figure. 1). The areas were surveyed during the period from February 2017 till February 2018. A total of 350 Camels were examined for the presence of hard ticks.

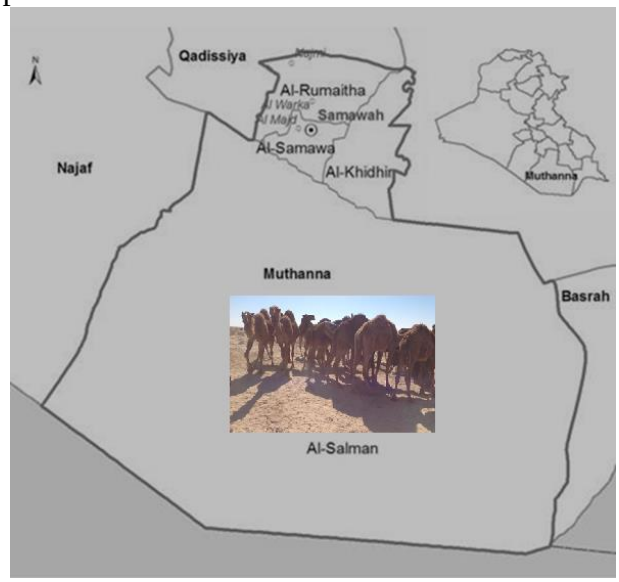

Figure.1: Al Muthanna governorate 280 kilometers of southeast of Baghdad

A- Ticks collection

The ticks were collected during 15 visits to four camel herds in Bediat AL Samawah. On each occasion, all the visible ticks were collected from the body of each animal. Collected ticks were put in plastic vials with Isopropyl Alcohol for disinfection and fixing the samples .Ticks collected form each animal were put alone. Later on, ticks were transferred to the clinical pathology laboratory/ College of veterinary medicine /Al Muthanna university. After that the ticks were counted and then prepared for identification. Each tick was processed and identified microscopically according to the keys of hard ticks mentioned previously. (Hoogstraal, 1956; Hoogsraal *et al.*, 1981; Soulsby, 1986).

B- Preparation of ticks microscopic slides

Specimens of ticks containing host tissue in their mouth are cleaned then placed in 10% KOH for softening, small specimens required 2 days in 35°C, while large specimens required 2 weeks in 35°C. The larva and nymph required one day only in 35°C. Later on , the samples were mounted on glass slide using Canada balsam and simple modified technique using a small rounded wall of artificial mud to raise the cover slides from the mounted tick (Figure. 2). The prepared samples were examined using simple inverted microscope. All information concerning

number and genus of ticks was recorded during examination of each samples. The number of male, female and the immature stages of ticks were also recorded.

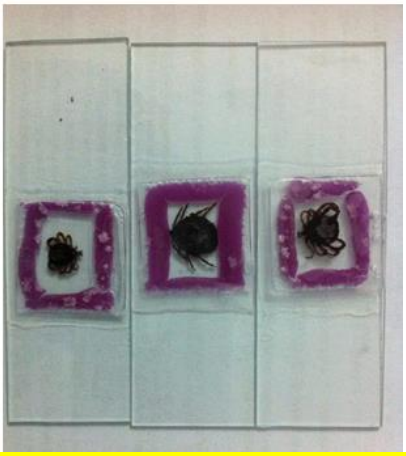

Figure. 2: shows the mounted tick specimens

Results

A total, 455 ticks were collected during the study period (Figure.3).

Figure. 3: shows samples of collected ticks from camels.

The overall prevalence of the ticks infestation was 97.1. % (340 out of 350). The highest infestation rate was 98.48 % (325/ 330) in female, while, the male percentage was 75% (15/20). Meanwhile, the ticks infestation percentages out of the total number (350) examined camels

were 92.85% (325 out of 350) and 4.28% (15 out of 350) for female and male respectively (Table. 1).

Table. 1: Shows the overall and sex wise infestation in camel

Criteria	**No. and the percentages of female and male**	**No. of infested animal**	**Percentages of infestation % to the total number of examined camels**	**Percentages of infestation % to the total number of the specific species (female or male)**
Female	330 (94.28%)	325	92.85% (325 out of 350	98.48 % (325 out of 330)
Male	20 (5.71%)	15	4.28% (15 out of 350)	75 % (15 out of 20)
Total number	350	340	97.14 %	

The skin lesions appeared on the ticks infested camels were classified as mild , moderate and severe lesions depending on the degree of the damage in the infested area. Moreover, the majority of the examined animals expressed severe lesions particularly on the udder (Figure. 4).

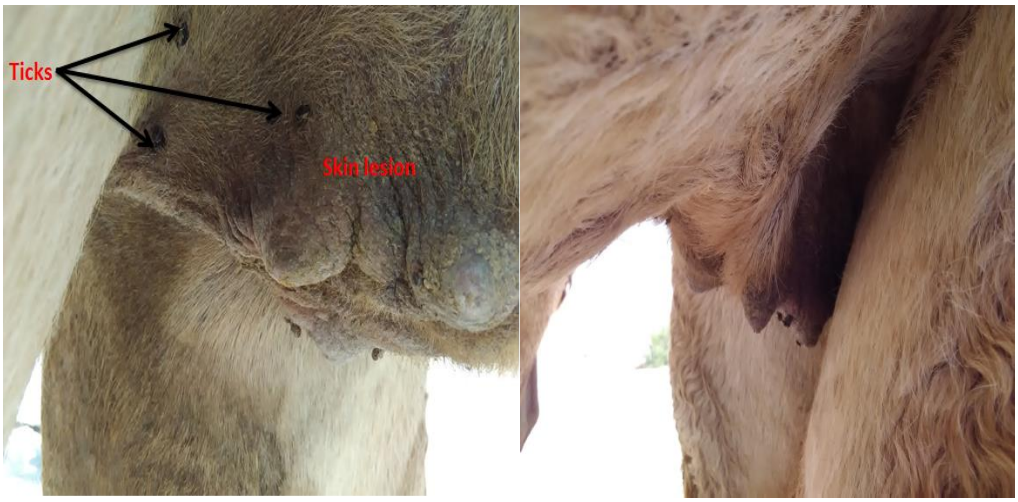

Figure. 4: shows the severe udder lesions due to ticks infestation

Nevertheless, in regard to the number of infested ticks per each individual camel, the severity of ticks infestation were categorized as low, medium and high with 15-60, 61- 200 and above 201 ticks per animal respectively (Table. 2). The percentages of mild, medium and high infestation were 22.94%, 27.94% and 49.11% respectively.

Table.2: Shows the classification of the severity of tick infestation

Criteria	**Number of animal**	**Percentage %**
Low (15-60 ticks per animal)	78	22.94 %
Medium (61- 200 ticks per animal)	95	27.94 %
High (above 201 ticks per animal)	167	49.11%
Total number of infested animals	340	100%

The ticks were found on different site on the body (legs, chest, axillary, udder, testes, anus, inguinal, ear and face). The heavy infestation was found beneath the tail, udder, chest and inguinal area. The most abundant species of ticks found on the camels at these study areas were *Hylomma dromedarii* (Figure. 5) and *Boophilus spp.* (Figure. 6).Ticks were found as larvae, nymph and adult stages (Figure. 7).

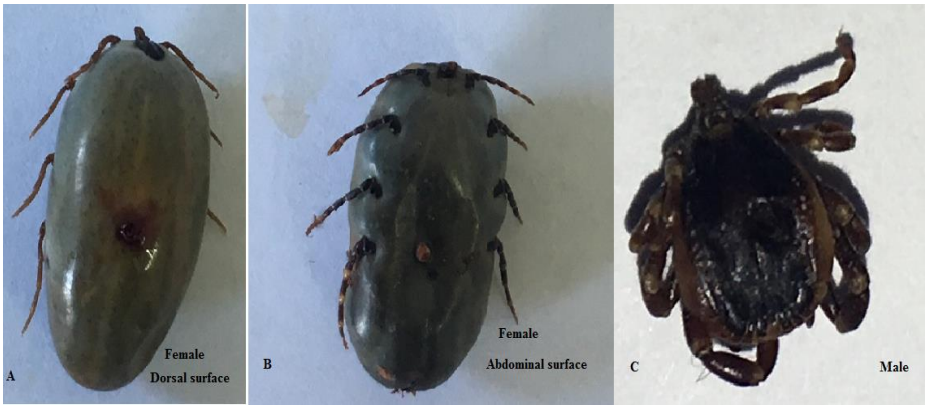

Figure. 5: Shows *Hylomma dromedarii*

Figure. 6: Shows adult *Boophilus spp*.

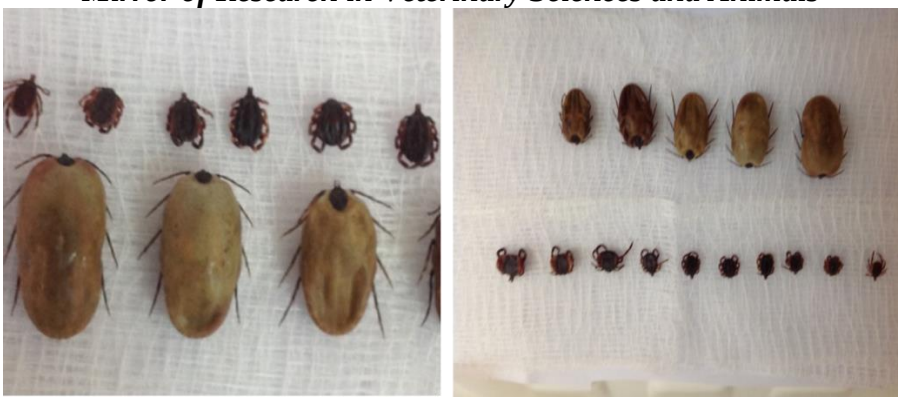

Figure. 7: shows the infested ticks (larvae, nymph and adult stages)

Discussion

Ticks are the supreme important between the factors distressing camels health in spreading different diseases causing agents and casue blood loss, damage to hide and udder (Teka *et al.,* 2017; Al Salihi *et al.,* 2017; Walker *et al.,* 2003; Higgins, 1983). Ticks are caused a significant economic loss in a camel productivity (Zeleke and Bekele, 2004). The results of the present study revealed that the Camelus dromedarius in Badiat Al Samawah harbour considerable level of numerous species of ticks. The occurrence of ticks in the present study has been likewise reported by different authors in another gorernorates in Iraq, albeit there is variation in the level of infestation in such reports (Hussein and AL- Fatlawi ,2009; Mohammad, 2015; Shubber, 2014: Shubber *et al.,* 2014). The results of the present study revealed very high infestation rates between examined camels with an overall infestation percentage 97.14 % (340 out of 350). This result is compatible with previous reports (Mohammad, 2015; Hussein and AL- Fatlawi ,2009), meanwhile, it is disagreed with Shubber *et al.,* (2014), who reported lower infestation percentage (65.77 %) in camels. The totally high infestation percentage (97.14%) reported in the present study pointing that the camel obtains extra parasitic burden of ticks because the lifestyle practiced by its owners. It is worthwhile to mentioned that Bedouins rear large number of camels and looking on various ecosystems of the study area including border of the cities, villages, semi-desert and desert enabling the camels collect high number of ecto-parasites especially various ticks species. Furthermore, the high ticks infestation percentage reported in the present study are in agreement with previous percentages reported elsewhere in the world as, 85.5%, 78.6 % and 83% in Iran (Champour *et al.,* 2013), Eastern Ethiopia (Teka *et al.,* 2017) and Pakistan (Javaid *et al.,* 2013) respectively. However, this result is incompatible with Abdurahman, (2006), who reported 49.1% tick infestation on the camels because the examination of the udder region only. Moreover, it is also disagreed with Hegazy *et al.,* (2004), who reported ticks infestation on eyelids of 12 out of 488 examined camels in Egypt, and this low infection probably due to the examination of eyelids only.

The result of the present study revealed that The highest infestation rate was 98.48 % (325/ 330) in female, while, the male percentage was 75% (15/20). This result is compatible with previous researcher who revealed heavy infestation of ticks in female (Yakhchali, 2006 ; Lees and Miline, 1951). The high reported infestation percentage in female might be due to the large number of the examined female (330) in compare to male (20) as always there is low proporation of the male rear to the female in the camel herds because of its ferocity. Two genus of hard ticks (*Hylomma dromedarii* and *Boophilus spp*) were determined in the present study

and this result is in agreement with Hussein and AL- Fatlawi, (2009) who also reported the same two species in Al-Qadisiya province. These results are also endorsed by the previous studies elsewhere in the world (Javaid *et al.,* 2013; Kady, 1998), who mentioned that *Hylomma dromedarii* was the common species infested camels. Some species of ticks had been isolated including *Hyalomma spp. Amblyomma and Ripicephalus* from *Camelus dromedarius* in Africa and Asia (Mukasa-Mugerwa, 1981). Addionally, Begum *et al.*,(1970) invesitaged *Hyalomma dromedaries* and Javaid *et al.,* (2013) found *Hyalomma dromedarii, H.an.excavatum, H. impeltatum, H. an.anatolicum, H. marginatum* and *H. schulzei* in Pakistan. Furthermore, *Hyalomma, Boophilus and Ripicephalus spp.*was invesitaged in Iran (Yakhchali, 2006). Howerver, some factors including variation of the climate, seasons and age of the animal are palying important role in the presence of the species of the tick.

The results of this study showed that the ticks were found on different site on the body (legs, chest, axillary, udder, testes, anus, inguinal, ear and face). The heavy infestation was found beneath the tail, udder, chest and inguinal area. This result is in agreement with the results reported previously in Iraq (Hussein and AL- Fatlawi, 2009) and Iran (Yakhchali, 2006). The distribution of the ticks overall parts of the body lead to develop skin lesion and mastitis, if severe infestation occurred on the udder (Al Salihi *et al.,* 2017). The neglected treatment of ticks infestation is contributing in the continuity of the ticks irritation and their life cycle that lead to heavy tick burden infestation for the animals.

The results of the current study also reported the number of infested ticks per each camel , and the tick infestation burden percentages were 22.94%, 27.94% and 49.11% for mild, medium and high respectively. This results are compatible with results reported previously by Van and Jongejan (2000) and Javaid *et al.,* (2013), who found a relatively heavy mean tick burden with very braod range in the number of ticks per camel (6-173 tick).

In conclusion, this study approved the heavy ticks infestation between the camels populations in Al Muthanna governorate. Consequently, ticks infestation lead to develop variation in severity of the clinical signs. The authors recommend another future studies that contribute to the understanding the role of ticks infestation in the transmission of serious diseases in camelids in Iraq. Moreover, education and awarness of the farmer and owner should be essential about the tick borne diseases and threats produce by the ticks to the animals. Planning of ticks eradication programs, facilities and drugs should be provide by the governmental veterinary authorities to control spreading ticks between livestockes.

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Retrospective study on the therapeutic effects and nutritional values of camel's milk

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Abstract

Camel milk is an excellent substitute for human milk and does not contain β-lacto globulin. This study intends to review the therapeutic effects of nutritional values of the camel milk in the treatment of different human diseases. MEDLINE from1946 to March 2016, EMBASE from1974 to March 2016, and Google Scholar were searched using the following terms: milk, bodily secretions, camels, camelus, camelides, dromedary, bactrian camel, insulin and nano antibodies. The identified articles were reviewed, if the study was investigating the use of camel milk for the potential treatment of diseases that affecting humans. Accordingly, 24 out of 430 studies were included after assessment. The identified studies highlighted the application of camel milk in the treatment of diseases, including diabetes, autism, cancer, various infections, heavy metal toxicity, colitis, and alcohol-induced toxicity. Although most studies using both the human and animal model, a clinical benefit with an intervention of the camel milk, showed variations and sometimes limitations, therefore, the observations of the reviewed studies must be taken into consideration. In conclusion, and based on the evidences of the reviewed studies, the authors recommend to do more future studies on camel milk before consider it to replace the standard therapies for any human diseases.

Keywords: Camel Milk, Therapeutic, Nutritional, dromedary.

Introduction

camel's milk is widely used in various populations for its healing properties and disease prevention mechanisms (Yagil, 2013). Some of the most common indications associated with its applications included diabetes, allergies, immune disorders and cancer (Clutton-Brock *et al.,* 1999). Although camel milk is used traditionally in the Middle East, Africa and Asia, the initiation of online pharmacies and awareness of natural health products have increased the availability of camel milk for animals that are allergic or intolerant to cow's milk protein (Ehlayel *et al.*, 2011), like in North America and Europe. As a result, clinicians need to be aware of its properties, reported claims, and clinical data when meeting with patients and developing treatment plans. There are two distinct types of camels: *Camels dromedaries* one hump camel) and *Camels Bactrians* (chapman's or two-humped camels). Bactrians are present in the cold desert regions of Central Asia, while dromedaries are native to the hot deserts of North Africa and West Asia (Clutton-Brock *et al.,* 1999). The milk of both types of camels is composed of high minerals and vitamins. High unsaturated fats and the scientific reasons behind the use of camel milk as a natural health product come mainly from its so-called antioxidant **(**Konuspayeva *et al.,* 2009). immunomodulatory, anti-inflammatory, insulin mimetic and anti-apoptotic properties. **(**Konuspayeva *et al.,* 2009; Korashy *et al.,* 2012). These properties have been largely determined by in vitro studies and therefore provide only hypothetical mechanisms of benefit. The clinical efficacy and value of camel's milk as a therapeutic agent is currently unclear. Although there are studies on animal and human populations, most of them are small and evaluate a wide variety of indications and populations. However, patient beliefs may push the use of this agent as a therapeutic alternative or health product that complements modern medical practice (Furnham and Kirkcaldy, 1996). Therefore, a critical review is needed to provide clinicians with a strong history of efficacy data regarding camel's milk as a health product. Consequently, this systematic review was designed to summarize and evaluate the literature regarding the therapeutic efficacy and safety of camel's milk as a therapeutic and natural agent.

2.1. Nutritional value

2.1.1 Protein of milk

The main component of milk, which has a major impact on its nutritional value and technological relevance, is protein. Milk proteins are a heterogeneous group of compounds that have different composition and properties. They are divided into casein complexes and whey protein fractions. Casein is the most important protein in milk, while the proportion of whey protein is relatively low (Guo *et al.,* 2007). Currently, there are four main fractions of casein: αs1-, αs2-, β- and κ. their proportion is diverse and the polymorphism of these proteins has been demonstrated in most animal species (Barłowska, 2007). Human casein does not contain the αs1 fraction which is the predominant factor causing allergies to milk proteins. However; it is rich in β-fraction (Zicarelli, 2004). Milk protein allergy (MPA) is an allergic reaction to proteins commonly found in cow's milk. It is caused by the immune system that reacts to milk proteins because they pose a threat to the body. An activated immune system reacts as if it were a foreign

virus or a toxin. Several studies have shown that the majority of children allergic to cow's milk protein (CMPA) synthesize antibodies mainly against α-casein and β-lactoglobulin (Lara *et al.*, 2005). Camel milk is a suitable replace for breast milk because it does not contain β-lactoglobulin, a characteristic of ruminant milk proteins. Another critical anti-allergenic factor is that the functional components of camel milk include immunoglobulins similar to those of human milk, which are known to reduce children's allergic reactions and enhance their future food response (Shabo *et al.*, 2005). El- Hatmi *et al.*, (2007) reported that camel milk contains higher amounts of antibacterial substances (eg, lysozyme, lactoferrin and immunoglobulins) compared to cow's milk and buffalo milk.

2.1.2 Milk Lipids

Fat is the main substance that defines as the energy value of milk and makes a major contribution to the nutritional properties of milk and its technological adequacy. Milk fat globules have a mean diameter of less than 0.1 μm to about 18 μm (El-Zeini, 2006) and consist of a triglyceride nucleus surrounded by a natural biological membrane. The milk fat globule membrane contains components typical of any biological membrane such as cholesterol, enzymes, glycoproteins and glycolipids (Fauquant *et al.*, 2007). Mansson, (2008) stated that lipids build 30% of the membrane and can be subdivided into the following groups: phospholipids (25%), cerebrosides (3%) and cholesterol (2%). The remaining 70% of the membrane consists of proteins. Fat globules with the largest average diameter are found in buffalo milk (8.7 μm), the smallest in camel milk (2.99 μm) and goat milk (3.19 μm). A high degree of dispersion of the milk fat has a positive influence on the access of lipolytic enzymes to small fat globules (SFG). Therefore, goat or camel milk is more digestible for humans (D'Urso *et al.*, 2008). Cholesterol is present in the milk fat globule membrane (MFGM) and accounts for 95% of the sterols in milk fat. SFGs are characterized by a larger area of MFGM per unit fat. As a result, a greater share of SFG is linked to a relatively higher concentration of cholesterol in milk. Camel milk, which has the highest dispersion state of milk fat, contains the most cholesterol (animal species studied) (31.3 to 37.1 mg / 100 g of milk). Camel's milk is also unique in terms of its fatty acid profile. It contains 6-8 times less short-chain fatty acids than milk from cows, goats, sheep and buffaloes (Ceballos *et al.*, 2009).

2.1.3 Milk Mineral Components

Milk is significant origin of mineral substances, especially calcium, phosphorus, sodium, potassium, chloride, iodine, magnesium and small amounts of iron. The main mineral compounds in milk are calcium and phosphorus, which are important for bone growth and healthy development of newborns. The great bioavailability of these minerals influences the unique nutritional value of milk. Camel milk is the richest in these minerals (Al-Wabel, 2008). Mean values of Na (29.70 mEqL-1), K (50.74 mEqL-1), Ca (94.06 mg%), P (41.68 mg%) and Mg (11.82 mg%) present in the milk of camels at the beginning of lactation. At the end of lactation, the corresponding levels were 35.49 ± 0.89 mEqL-1, 71.86 ± 1.43 mEqL-1, 97.32 ± 0.51 mg%, 47.14 ± 0.52 mg % and 13.58 ± 0.31 mg%, respectively (Mal *et al.*, 2007). Differences in macro-mineral levels reported by various research groups may be due to race differences or environmental conditions such as food and soil. The variation races of camels have different abilities to deposit minerals into their milk (Wangoh *et al.*, 1998). The concentration of Fe, Zn and Cu was 1.00012, 2.00002, 0.44004 mg / dl, respectively. The values of trace elements namely. Fe, Zn and Cu were significantly higher in camel's milk than in cow's milk (Singh *et al.*, 2006).

2.1.4 Milk Vitamins

camel's milk is a kind of exception because of its high concentration of vitamin C. It contains 30 times more vitamin C than cow's milk, and 6 times more than breast milk. This is very important in desert areas, where fruits and vegetables are scarce. As a result, camel milk is often the only source of vitamin C in the diet of people living in these areas (Haddadin *et al.,* 2008). Vitamin A, E and B1 levels were low in camel's milk compared to cow's milk. The concentration of vitamin C in camel's milk at the beginning and end of lactation was 5.26 ± 0.47 and 4.84 ± 0.20 mg%, respectively. Moreover, its Vitamin C content is two to three times higher in than in cow's milk. Levels of vitamin A, E and B1 were higher in camel colostrum than in adult camel's milk. However, the vitamin C content remains higher in mature she camel. The higher vitamin C content can be attributed to the more synthetic activity in breast tissue during the early lactation phase, which decreased as lactation progressed (Stahl *et al.,* 2006). The low pH due to the vitamin C content stabilizes the milk and can be stored relatively longer periods. Camel's milk is of significant nutritional importance because vitamin C has a powerful antioxidant action availability of a relatively higher amount of vitamin C in raw (Mal *et al.,* 2007).

2.2. Medicinal properties of camel milk

2.2.1 Anti-diabetic property

There is a traditional belief in the Middle East that regular consumption of camel milk help in the prevention and control of diabetes . Recently it has been reported that camel milk may have such properties. The literature review mentions the following advantages: (i) the insulin present in camel milk has particular properties that make absorption into the circulation easier than insulin from other sources; (ii) camel insulin is envelope in nanoparticles (lipid vesicles) that allow it to enter the stomach and enter the circulation; (iii) some other elements of camel milk make it anti-diabetic (Ajamaluddin *et al.,* 2012). The long-term study was managed up on time to evaluate the efficacy, safety and acceptability of camel milk as an adjunct to insulin therapy in type 1 diabetics. Camel's milk can be said to be safe and effective in improving long-term glucose control, with an important decrease in insulin doses in patients with type 1 diabetes (Amjad *et al.,* 2013). The insulin in milk is proven by the many researches that follow Camel's milk contains high concentrations of insulin at 150 U/ml. Although human, cow and goat milk contains insulin, it degrades in the acid environment of the stomach. This does not happen with camel milk that does not react with acid and no coagulum is formed (Zagorski *et al* .,1998).

2.2.2 Antibacterial activity

Camel's milk includes different protective proteins mainly enzymes that exert antibacterial and immunological property. The presence of these proteins help makes clear some of the natural healing properties of the milk (Farah, 1993). According to Conesa *et al.*, 2008; Ueda *et al.*, 1997 and Kiselev, 1998, the camel milk contains protective proteins, and its immune system: Lysozymes; participate in the basic immune system, which is based on targeting common structures for the causes of invasive disease. The immune protects the body against infections

is Lactoferrin: Iron-saturated lactoferrin (which begins at the second week of lactation) inhibits the growth of microbes in the gut and participates in the initial immune system, which depends on the targeting of common patterns of causes of invasive disease. It gives to the host's non-immune defense system, extend bactericidal activity (mainly on gram-negative bacteria), and has growth activity, antitumor activity and close relationship (71%) with the human thyroid peroxidase involved in iodization and coupling in the formation of thyroid hormones. The highest concentrations of this enzyme are in camel milk, have been found in camel,s milk, have an apparent effect, on breast cancer by controlling metastases, stimulate the immune response of the host (Hoelzer *et al.*,1998).

2.2.3 Treatment for allergies

The fact that camel milk lacks β-lactoglobulin and a "new" β-casein (Makinen-kijunen and Palosne, 1992),the two potent allergens in cow's milk, makes milk good-looking to children with milk allergies. Camel's milk has a positive effect in children with severe food allergies. Children with severe food allergies quickly improved with camel milk. The reactions are fast and lasting. Much research still needs to be done on the curative effects of milk (Restani *et al.*,1999). Another relevant fact is that the constituents of camel milk include immunoglobulins similar to those of breast milk, which reduce children's allergic reactions and reinforce their future response to food (Makinen-kijunen and Palosne, 1992).

In conclusions, this review is focused on the camel's milk properties and its therapeutic effects and the nutritional values in the treatment of various human diseases .

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Herd report: Outbreak of mixed dermatophilosis and pox infection in camels (*Camelus dromedarius*) in south Iraq.

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Abstract:
This report describes for the first time, an outbreak of dermatophilosis that occurred simultaneously with pox infection in pastoralist camel herd heavily infested with tick in south of Iraq in April to May 2017. The infected animals were examined clinically and the outbreak was reported as mixed infection of camel pox and dermatophilosis. Hair matting particularly on the head, neck, and abdomen was the common skin lesion that observed on the on the infected animals. Lesions showed hairless brownish crusts with irregular sizes and pus exudation that left irregular border crusted lesions. In addition, evaluated camels were infected with pox papules that distributed over all parts of the body accompanied with fever and enlargement of lymph node. Some of the affected camels revealed systemic form of the camel pox. The lesions appeared on the mucous membranes of the mouth and respiratory tract and some case fatality recorded. However, dermatophilosis in camels has not previously been reported in Iraq. In conclusion this report focused on mixed infection of camel pox and dermatophilosis in herd of the local Iraqi camel. The author recommends to do a future study on these diseases, as dermatophilosis is reported for the first time in Iraq and need more investigation to understand its epidemiology because camel herds are moving continuously, and also veterinary service are not consulted for diagnosis and treatment.

Keyword: Dermatophilosis , camels , pox, ticks.

Introduction

Dermatophilus congolensis infection is an acute, subacute or chronic skin disorder (Zaria *et al*., 1993). Dermatophilosis affects wide host range including cattle, sheep and horse (Awad *et al*., 2008) and usually Camel (Gitao,1992; Gitao *et al*., 1990) and cats (Kaya *et al.*, 2000).

Dermatophilosis worldwide and can be epizootic in tropical and subtropical areas of the world (Zaria *et al*., 1993; Radostits *et al*. , 2007). Clinical findings are extensive skin matting with dark brown scabs or crusts over the abdomen and hind limbs on flanks, shoulders, and neck (Khodakaram-Tafti *et al*., 2012). The hair were matting together into small tufts forming a characteristic "paint brush" effect in the early lesions (Gitao *et al*., 1990). Most of the skin may be covered by powdery crust with varying degree of alopecia and young camels tend to be more severely affected (Gitao *et al*., 1998b), under the effect of stress and skin damage, tick infestation and increment in humidity and rainfall(Radostits *et al*.,2007) and malnutrition (Sanders *et al*.,1990) . Dermatophilosis can be treated using long acting oxytetracycline, 2 doses for 3 days apart, in addition to oral administration of potassium iodide 10 gram daily for 10 days gave 100% cure rate also, vitamin A and mineral supplementation is necessary to obtain fast cure rate (Osman,2014). Dermatophilosis can be affect people causing lesion appear as eczemoid cells, numerous pustules, or even furuncles on the hands and forearms. In most cases, the lesions heal spontaneously within two to three weeks(Krauss *et al*.,2003).The disease is acquired by direct contact between sick animals, but It can also be spread indirectly through the bite of flies and ticks or from of infected animals, as it has been proven that the bacteria can remain viable in scabs for long periods of time(Zaria *et al*., 1993).It has been reported in people with relevant contact (Harman *et al*.,2001) and without relevant contact(Dickson *et al*.,2010).
In Iraq there is no information available about the disease(OIE,2005). This study describes a skin disease of high prevalence was observed among herd of camels in a region of al-Muthanna province in south Iraq .

Herd report:

A pastoralist herd about 200 camel (*Camelus dromedarius*) in al- Muthanna desert province of Iraq which known as (badiyah al-samawah) has been reported with an outbreak of mixed infection of pox and dermatophilosis in April to May 2017.it was moved from al-Muthanna desert to al-Najaf desert in the southwest of Iraq. Clinically, infected camels with pox were affected with papules distributed over all parts of the body ,fever and enlargement of lymph node. Also ,there was systemic form of the disease, pox lesions appeared on the mucous membranes of the mouth and respiratory tract and some case fatality recorded.
The herd had been observed by the veterinarian and evaluated without treatment (Karima Al-Salihi, personal communication).In addition to pox infection there was another skin lesions affected the herd; Clinically ,lesion appeared as hair matting particularly on the head, neck, and abdomen as in figures (1&2). Lesions show hairless brownish crusts with irregular sizes and pus exudation as in figure (3). The female were the most affected than male .The herd moved to al-Najaf desert without treatment .it had been observed a scab formation with coarse powdery texture of lesions in some animals after healing spontaneously as in figure(1). Another observation made during physical examination of the animals where, camels had very high tick infestations. The disease was diagnosed as dermatophilosis according the clinical findings and case history.

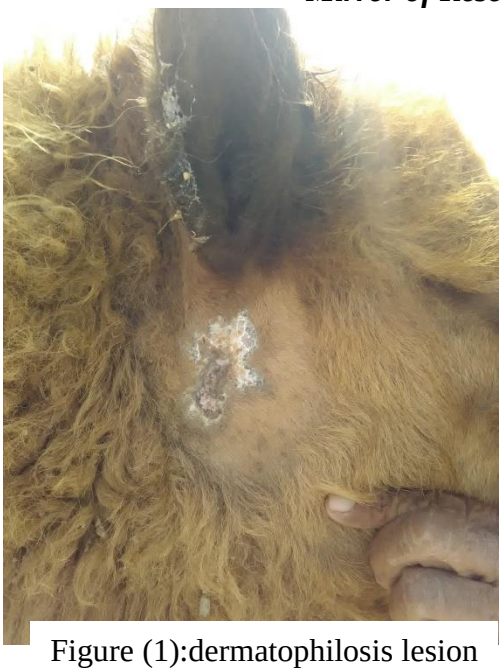

Figure (1):dermatophilosis lesion after healing on the head.

Figure (2): dermatophilosis lesion on the abdomen.

figure (3): dermatophilosis lesion in abdomen Lesions show hairless brownish crusts with irregular sizes and pus exudation.

Discussion:

Dermatophilus congolensis infection in camels has been reported in Saudi Arabia (Gitao *et al*., 1998b), Sudan(Gito *et al*.,1998) and Iran (Khodakaram-Tafti *et al*., 2012). There is no report about dermatophilosis in Iraq. Camelpox is an important contagious skin disease of camels characterized by mild local skin infection and severe systemic infections. It causes economic loss in results of morbidity, mortality, loss of weight and reduction in milk produce (Bhanuprakash *et al*.,2010) .camel pox infection has been reported previously in Iraq in 1977 (Al Falluji *et al*.,1979).However, no mixed infection involving both *D. congolensis*en and camel pox has been reported in Iraq to yet.

Clinically, both infections found in pastoralist camel herd in Al-Muthanna desert where dermatophilosis lesion characterized by hair matting , exudative dermatitis and brown scab formation which agreed with clinical findings in Sudan(Gito *et al*.,1998) , Saudi Arabia (Gitao et al., 1998b) and Iran (Khodakaram-Tafti *et al*., 2012). While Camelpox characterized with mild skin lesion to sever systemic form with fever ,lymphadenopathy and death which is characteristic of camelpox (Abu Elzein *et al*.,1999). In this case, camels also affected with heavily tick infestation which it may play an important role in the pathogenesis of dermatophilosis in the camels(Khodakaram-Tafti *et al*., 2012;Gitao, 1993). Tick infestation of camels has been evaluated in al-Muthanna province in Iraq ;the results were anemia ,Skin inflammation ,secondary infection of the skin were the main effects of tick infestation in addition to reduce animal production efficiency and reduce the market value of the skin and hides(Wajid, 2017).

Clinically, mixed infection of dermatophilosis with Microsporum gypseum have been recorded in camels (Gitao *et al*., 1998b). Complications due to bacterial Secondary infection to dermatophilosis has also been documented in camels (Dalis *et al*.,2010) .Also, an infection of dermatophilosis concurrently mixed with caseous lymphadenitis was reported in Jordan (Tarazi & Al-Ani, 2016). Dermatophilosis may be induced due to the stress of an infections and immune efforts .

However, Various levels of immunity to dermatophilosis occur in spite of it is not highly pathogenic and infection is most important in immunocompromised hosts by skin injury and tick infestation where cattle can be resistant to ticks or immune against ticks effects. Immune defenses might contribute to recovery from infection by isolating layers of infected keratinocytes, but they are also involved in the development of chronic lesions(Ambrose *et al.*, 1999) .vitamin deficiency and tick infestation thought to be produce sever skin lesion of camel dermatophilosis(Gitao, 1993) .

It has been reported that the disease was more prevalent in semi-arid areas in the wet season compared with its prevalence in the dry season(Gitao, 1993;Gitao *et al*., 1990) while the climate in al-Muthanna desert is dry , high temperature degrees from May to October with low humidity and rainfall.

In Conclusion; there is a need for more research on camel dermatophilosis in Iraq, with focus on epidemiology, diagnosis and treatment with respect that the pastoralist conditions of camel herd are a major challenge in supply of the veterinary service.

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Author contributions
The clinical examination of camels and taking pictures was done at the camel herd owner's place by dr. Karima al-Salihi, near al-Samawah city, south of Iraq. The laboratory tests for identification of the causative agents of the outbreak were not achieved due to difficulties in detection of dermatophilus and moving of the herd from al-Muthanna desert to al-Najaf desert . The author only one was writing, revising, and approving the article.

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Serological study on *Chlamydophila abortus* in *Camelus dramedarius* using Elisa

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Abstract

Serological surveys for *Chlamydophila abortus* antibodies in *Camelus dramedies* were done on 60 blood samples collected from both sex (38 female and 22 male) aged 5 to 12 years of age. The study were extended from June 2015 to September 2016. IDEXX Enzyme Linked Immunosorbent assay was done on all serum samples using an ELISA kit (IDEXX Switzerland). All male camel's serum samples were negative for presence of *Chlamydophila abortus* antibodies, whereas 18 out 38 female samples were expressed positive in a percentage of 47.36%. In conclusion, this preliminary study approved presence

of *Chlamydophila abortus* antibodies in she- camels. The authors recommend another studies in different provinces of Iraq to investigate the sero-prevalence of this disease.

Key Words: *Chlamydophila abortus*, Serology, IDEXX.

Introduction

Chlamydia is an obligate intercellular Gram negative coccobacilli bacteria (Radostits et al., 2007). *Chlamydia abortus* is one of the main reasons of abortion in livestock including camelids (Ali et al., 2012). The bacteria are non-spore-forming, but its elementary bodies act like spores when released into the host (Aljumaah and Hussein, 2012). Chlamydia is one of the important pathogens of animals, birds and humans (Elzlitne, and Elhafi, 2016). It constitutes nine species – *C. trachomatis*, *C. muridarum*, *C. suis*, *C. psittaci*, *C. pecorum*, *C. abortus*, *C. caveae*, *C. felis* and *C. pneumoniae*, eight of which can infect animals and cause disease (Samkange et al., 2010). Chlamydial species may cause several diseases such as enteritis, pneumonia, encephalitis, polyarthritis, abortion, mastitis, other urogenital tract infection and conjunctivitis (Swelum et al., 2014; Hussein et al., 2008). Chlamydiae infects male genital organs of ruminants, as well as it could cause prostatitis and epididymitis in men (Wagenlehner et al., 2006). Review of literatures revealed scarce information concerning sero-prevalence of chlamydiosis in Iraqi camelids. Consequently, this study intended to investigate the sero-prevalence of natural infection of chlamydiosis in *Camelus dromedarius* in Iraq and its effect on some hematological and biochemical parameters.

Material and methods

Samples collection

Sixty (60) blood samples were collected from both sex (38 female and 22 male) aged 5 to 12 years of age that slaughtered in the abattoirs during a period extended from June 2015 to September 2016.Twenty milliliters blood sample was collected from each animals and placed into test tubes (with and without anticoagulant). Blood samples were transported in a cold box to a laboratory. Serum samples were collected after centrifugation of blood at test tubes without anticoagulant at 3000 rpm for 5 minutes. The sera were kept in Eppendorf tubes at -20 ºC until used for detection of *C. abortus* antibodies using an indirect enzyme-linked immunosorbent assay (ELISA) and other serological examination. Plasma samples were isolated from blood samples with anticoagulant used for detection of alkaline phosphatase, creatinine kinas, glucose, chloride and zinc. Moreover, neutrophils percentage and other hematological investigation including Hb, MCV, MCHC were also done.

ELISA test

IDEXX Enzyme Linked Immunosorbent assay using an ELISA kit (IDEXX Swizerland) were done for all serum samples according to the instruction of the manufacturing.

Results

Total examined serum samples were 6o that constituted 22 and 38 for male and female respectively. All male samples (22 out of 22) of were negative in IDEXX ELISA. While,

18 out of 38 female serum samples in percentage of (47.36%) revealed positive results for *Chlamydophila abortus* antibodies in IDEXX ELISA. The total percentage of positive samples was 30% (18 out of 60) (Table. 1).

Table.1: shows the positive and negative results of examined serum samples using IDEXX ELISA

	Samples No.	Positive	Percentage
Female	38	18	47. 36%
Male	22	Zero	-
Total	60	18	30%

The IDEXX ELISA positive she- camels were also revealed changes in the hematological and biochemical tests. The levels of total hemoglobin concentration, hematocrit, mean corpuscular volume (MCV), and neutrophils were (16% gm/dL), (37%), mean (39% U) and (74%) respectively. Moreover, levels of alkaline phosphatase, creatinine kinase and aspartate aminotransferase were (70% IU/I), (1.89.00% IU/I) and (69 IU/I) that revealed significant result statistically. A reduction in levels of glucose (40 mg/dL), chloride (105mmol/L), and zinc (40 ug/dL) were also observed in the affected camels (Table. 2 & 3).

Table. (2) Hematological parameters in ELISA Negative camels and ELISA she-positive camels for *chlamydia* (Mean ± SE)

Parameters	Normal	In ELISA she-positive camel
total hemoglobin concentration (g/dL)	11.34 ± 0.95	16 ± 0.75
Packed cell volume (PCV hematocrit)	32.83 ± 3.76	37 ± 3.11
mean corpuscular volume (MCV) %	17.80 ± 2.21	39 ± 2.22
Neutrophils %	43.60 ± 1.30	74 ± 1.41

Table. (3): Biochemical parameters in ELISA Negative camels and ELISA she-positive camels for *chlamydia* (Mean ± SE)

	In ELISA Negative camels	In ELISA she-positive camels
Zn	9 ± 3.66	8 ± 8.45
Alkaline phosphatase (IU/I)	196 ± 27.5	197 ± 78.6
Creatinine kinase (mg/dL)	0.95 ± 0.18	1.24 ± 0.10
Glucose (mg\dL)	74.6 ± 9.11	60.42 ± 9.66
Choloride (mg/dL)	2.36 ± 0.53	1.95 ± 0.90

Discussion

Camel is one of the important Iraqi livestock that plays vital role in the social and economic life of Bedouins in several provinces. In Iraq, camel breeding still suffering from poor veterinary service and lack of facilities that help in raising camel accompanied with the changing of environment due to global warming and decreased of water resources (Al Salihi, 2016; Mudhar

et al., 2016). One of the most important causes of infectious abortion in animals and human is chlamydiosis (Radostits et al., 2007). It is responsible on great economic loss due to abortion and death of fetus. *Chlamydophila abortus* is a causative agent, it is a Gram negative intracellular bacteria. Abortion is the important symptom that occur at late pregnancy in 20 - 50% of infected sheep and accompanied with stillbirths, infertility, polyarthritis, pneumonia, enteritis, mastitis, encephalitis and conjunctivitis (Aitken, 2008; Aljummah and Hussein, 2012). According to OIE, (2012) placentitis, necrotic changes in cotyledons and decrease in milk production may also occur. an In this study, 30 % (18/60) camels were infected with *C. abortus* we agree with Elzlitne and Elhafi, (2016) reported an overall 12.25% prevalence of antibodies against chlamydiosis in the Libyan dromedary camel, which was lower than that of this study . Both female and male can infected with *C. abortus* and male get infection via coitus with infected female. The results of the current study detected the presence of anti-chlamydial antibodies only in serum of the female 47. 36% (18/38) with total percentage 30% (18/ 60), while all male serum were negative. This result is compatible with previous study in Egypt and Tunisia that revealed 11% and 7.6 % positive results of the examined camel's serum respectively (Hussein et al., 2008; Burgemeister et al., 1975). Moreover, the result of the current study is in agreement with Wernery and Wernery, (1990), who detected *C. abortus* antibodies in the serum of racing and breeding camels in the UAE, with respective prevalence rates of 15 and 24%, respectively. In Saudi Arabia, the sero-prevalence of chlamydiosis was 19.4% with a lower prevalence in male than female (Hussein et al., 2008). The examined male camel's serum were negative in the present study that are in agreement with Hussein et al., (2008). However, Teankum et al., (2007) reported that male camels may be incriminated in transmitting the chlamydial infection. The results of the current study also revealed a significant increase in hemoglobin concentration, Mean corpuscular volume (MCV), Neutrophils percentages, Alkaline phosphatase Creatinine kinase, these results are in agreement with Elzlitne and Elhafi, (2016). These alterations occurred due to *C. abortus* infection and could be attributed to stimulation of bone marrow stem cells due to Chlamydial infection (Ismael et al., 2016). Moreover, there were significant decrease in Chloride, Zinc, Glucose levels, these results are compatible with Zaher et al., (2017). In conclusion, this study is the first preliminary study on sero-prevalence of *C. abortus* in Iraqi camel (*Camelus dromedarius*). She- camels were positive in a percentage of 30 %, while all male were negative. Moreover, all seropositive animals were revealed changes in the hematological and biochemical parameters. The authors recommend more other seroprevalnace future studies on *Chlamidya abortus* in the camel (*Camelus dromedarius*) in Iraq, accompanied with molecular studies (PCR) to investigate the occurrence of chlamydophilosis in camelids.

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Conflict of interest
The authors have not declared any conflict of interests for the third party.

Authors Contribution
All authors are Contributed equally.

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Studying and Evaluation the reality of camelids breeding in Al Muthanna Province

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Abstract

The camel is one of the animals that specifically live in a dry environment such as AL Muthanna Governorate, where a desert is occupied about 90.7% of the total area and it is called Badiat al-Salman. Review of literature revealed absence of a specific project that deal with the development of the camelids in Iraq generally and in Al Muthanna province specifically. Therefore, this study is designed to highlight the reality of camel breeding in the province and to describe the varieties of camels, their types in Iraq, the features of the study areas. Moreover, to show the most important diseases that affecting the camels and facing their breeding. The study was based on the field visit and analytical and statistical methods. The results of this study showed that Al Muthanna province inhabitant are one of the first who domesticated the camels in Iraq. The statistics of the Ministry of Agriculture/ Department of Planning 2008 revealed that the total numbers of camels in Iraq and in Al Muthanna province were (58293) and (7205) heads respectively. Out of the total camels in Iraq, Al Muthanna province occupied the third location in camels breeding with a percentage of camel population reached 12.4% after Nineveh and Dhi Qar provinces. The latest statistics 2016-2017 revealed an increase in the numbers of camels in Al Muthanna (17500) head. The breeding of camels approved to deal with a great economic interest and wealthy. The author recommends to promote the breeding of camels in all Iraqi

provinces as well as in Muthanna province in particular as this animal consider as the animal of the future.

Key words: Al Muthanna province, Camel, economic, future, reality

Introduction

Camels are considered as the oldest domestic animals that man used in travels and carrying goods. One of the oldest discoveries indicates that the camel was domesticated in Iraq about the fourth millennium BC. The archaeologists found a statuette of camel carrying a passenger on the back in the remnants of Halfa Hill in Iraq that belong to the period between 3,000 and 2900 BC. These finding were also supported by the inscription of ancient city of Jil in Lebanon proving that the camel was domesticated in that period (Al Hiti, 1990) . In Iraq, the percentages of camelids are (51%), (47%) and (2%) distributed in Al Jazira, Northern and southern Badia respectively. The camels are raised by different Iraqi tribes living and moving in between different Badia, moreover they are crossing the desert to reach another countries like Shamar, Dulaim tribes in the Al Jazira and Northern Badia that cross and reach east Syria. Meanwhile, Anza tribe is living in most western part of the northern badia (Al Nekiab and AlRutba) until reach Deir al-Zour, while in the territory of Saudi Arabia they are located in Al Shabaka area. They are called themselves Al Dhamsha, a branch of Anza and the tribe of Dafir that live in the southern Badia in the areas of Al Haya, Johaim, Ayn Assaf and Abtia. Moreover, branches of Shamar are also located in the north of the southern Badia (Burger , 2016) . Besides of Bedouin tribes, there are semi-nomadic tribes that seasonally go to grazing in the different areas of the countryside and return back in summer to its homeland in Mesopotamia in Karbala, Qadisiyah, Muthanna and Basra provinces. Among them are semi-stable tribes that called Al-Fatamah and they migrate with their animals during the autumn, winter and spring seasons to the opposite places to the west and south. Each tribe is distinguished its camels by its own decorations and branches. Each tribe travels within its agreed boundaries according to customs and traditions, but these borders sometimes overlap, especially in the seasons of drought.

Classification of Camelids

The camel belongs to the whole family Camelidae according to its feet features and belongs to the animal kingdom. (Fowler, 1998) (Figure. 1). The family Camelidae are comprised the following genera:

- The genus *Camelus* that includes two species, the *C. Dromedarius* (one humped camel) and the *C. Bactrianus* (two humped camel).
- The genus *Lama* comprises *Lama glama* (the llama), *Lama pacos* (the alpaca) and *Lama guanicoe* (guanaco).
- The *Vicugna vicugna* (vicuña), *Vicugna vicugna mensalis* (Peruvian) and *Vicugna vicugna vicugna* (Argentinean).

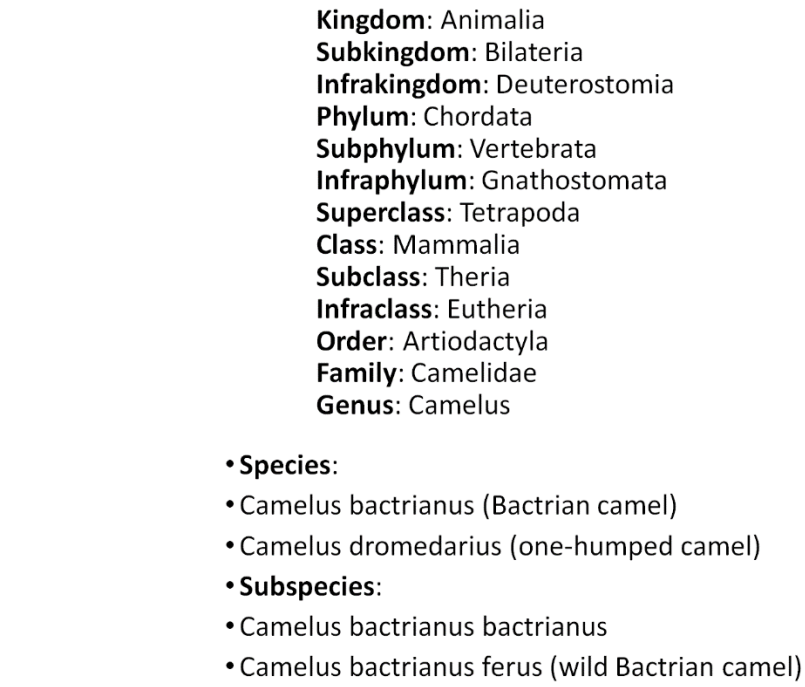

Figure. 1: Shows the classification of camelids according to Fowler, (1998)

In Iraq, *Camelus dromedaries* is the dominant one that domesticated because it is suitable for this geographical area and resists its severe desert weather, moreover it is also distributed in other surrounding countries (Al Salihi, 2016; Mudhar *et al.*, 2016).

Camel breeds in Iraq and Al Muthanna province

Several varieties of camels are branched from camel species that divided into different breeds according to the environment and nature. There are two breeds raised in Iraq, these are including:

1. Al Khawar camels: These camels are distributed in Northern and Al Jizera Badia between Iraq and Syria. They are characterized by the large to medium body size with small head, long legs, short and thin tail, bright colors and highly milk production.
2. Al Jody camels: These camels are distributed in the southern badia between Iraq and Saudia Arabia (it is extended in Al Muthanna and Basra Badia in Iraq and Najad Badia in Saudia Arabia). They are characterized by large body bones and body and use for transportation and loading stuffs (Al Jubouri, 2017).

   According to FAO Census in 1978, the number of Iraqi camels is 330 thousand head, but these decreased to 93 thousand head due to several factors in referred to the report of the Iraqi planning department in 1979. Meanwhile, the estimated private possess of camels is about 70 head for each family within the tribe (Al Salihi, 2016).

   There are various names of camel used in Iraq according to its color and use. According to color, the names of camels are Magater (bright color), Magahem (dark color), Alwedha (the yellow color), Maleha (Sahba), Alhajela (brown color) and Shealah (

for integrated white and black color). Meanwhile, the pure white color camels are owned by Dafar and Aneza tribe. Besides, different names also apply for camels according to its use the camels like Thelol (camel use for transportation), Zemal (camel use for loading stuffs and Al fater (camel prepared for slaughtering) (Mudhar *et al.*, 2016).

There are also a camel prepared to be ride of men especially, which it speed up to 16 kilometers per hour and can achieve 120-200km/ day. These camels have a thick eyelashes that protect eyes and a narrow-edged nose to prevent entering of sand. Moreover, camel blood cells are elliptical in shape in compare to human and other animal's blood cells that help in making more room for oxygen transporting hemoglobin. The average weight of male camel is about 665 kilograms and the female up to 540 kilograms and in rare cases the camel weighs reach about 750 -800 kg (Abdul Samad, 2004). The camels able to work at 5 years, the age of maturity and very strong and carrying a heavy work and continuous until 20 years of age. The reproduction of camels is started at 4-5 years and the female can be fertilized at age 3 or 4 years of age. The pregnancy period is 12 months and in some cases 13 months. The camel has the ability to store the fat in their body. The milk of the camel is wealthy with albumin and lactose and contain Vitamins A, B1, B2, C, E. In one study on camel milk, researcher mentioned that the physical properties of camel milk, especially Ph did not change during the study period that extended for almost 10 months because it contains antibodies that prevent the growing of microorganisms. Moreover, they were also observed slowly increasing in its acidity that remain intact for 12 days. It was more effective to prevent microbial growth and its efficiency was associated with the presence of the lysozyme (Burger, 2016). Camel milk also contains many proteins and immune casein, lacto Ferin,antibodies and other proteins.

Diseases affecting the camel in Al Muthanna province

There are many disease that reported in camelids in Al Muthanna province including:

- Parasites , which infect the stomach and intestines, blood parasites (Surra)
- Skin diseases including scabies, contagious echtyma, herpes and Ringworm.
- Diseases of a variety causes such as diarrhea, which generally affects young camels and respiratory diseases (Respiratory syndrome).
- Zoonotic diseases that transmitted from camels to humans as *Brucella*, Rift Valley fever, rabies and tuberculosis, camelpox and Middle East syndrome (Mers-CoV) the more serious viral disease.

According to statistical data reported by ministry of agriculture, the numbers of infected camels during 12 months in 2008 were 53, 3, 81 and 967 of FMD, Brucella, enteric poisoning and other diseases respectively. Moreover, the percentage of living births was 99%, while the number of died camels during the year were 11, 66 and 123 for males, females and young males and females. The total number of aborted camels was 297 and the total number of infected camel with different diseases was about 1104 cases during that year alone (Ministry of Agriculture statistic, 2010).

The reality of camel breeding in Muthanna province and its distribution

The camel breeding in Al Muthanna province, has revealed an increasing in numbers because of the natural increase of the fertility. However, in some years it has fluctuated and decreased for various reasons, but in general it did not affect its natural increasing rate. In 2001, the total number of camels in Al Muthanna province was (3424) head in a percentage of (14.6%) from the total number of camels in Iraq, even though this number decreased from the previous number in 1971, which was (7868) head. This may be due to environmental and health conditions. In 2008, the numbers of non-adult male and female were 332 and 1000 head respectively, while the numbers of adult male and female were 252 and 5621 respectively. Moreover, the total number of all camels was 7205 in a percentage of 12.4% from the total numbers of camels in Iraq according to the National Livestock Survey (Data of the Directorate of Al Muthanna Agriculture, 2018). In 2010, the total numbers of camels were increased to (11262) thousand heads. The number of non-adult males and females were (657) and (2171) heads respectively. While the numbers of adult females and male were (7146) and (1288) respectively (Table. 1 and Figure. 2).

In 2011, and according to the statistics of providing food for the animal in Al Muthanna veterinary hospital, the number of camels covered by feed processing for the year 2011 were (12500) head. The report was also indicated that the numbers of camels have increased in 2016 - 2017 to (17500) head. The camels are distributed according to the availability of natural plants that feed on them. They are found in Al Mamlaha, Ghadari and in the Sawa Lake surrounding areas (Figure. 3) accompanied with the availability of camelids preferred small species of a shrub called *Salsola imbricate*, that also grow in Al Nagmi and different areas of Basiya, which is located in the Al Salman district. Moreover, the number of camelids are increased in Al Salman because of the availability of Haloxylon shrubs that belonging to the plant family *Amaranthaceae*, the preferred feed of camelids. Camels are also distributed in the desert valleys because of the presence of large number of natural plants, as *Artemisia* and *Astragalus spinosus* especially in Wadi Kharaza and Al Ashaly and Al Arad valleys in Al Muthanna province. The camel is considered as multi-variance grazing animals that is feeding on different types of plants more than the other animals. The more preferred plants for camels in AlMuthanna province are including *Atriplex Iaucelada* , *Achillea, Anabasis setiferea alopecuroides* , *Anthophora* , *Artemizia herba alba, Anviller graeini, Astragalus, Avena barbata, Anthemis L, Arnabia dewnbens* and *Calligonom commosum* (Figure.4&5) (Data of the Directorate of Muthanna Agriculture) .

Table. 1: Shows the numbers of different categories of camels in Al Muthanna province

No.	District	Non-adult male	Non-adult female	Adult male	Adult female	Total
1.	Samawah	322	1100	610	3900	5932
2.	Al Warkah	101	170	110	550	931
3.	Al Majed	7	11	12	45	75
4.	Al Nagmi	106	759	420	1900	3186

5.	Al Rumiatha	3	10	6	31	50
6.	Al Kader	118	130	130	720	1088
7.	Total	657	2171	1288	7146	11262

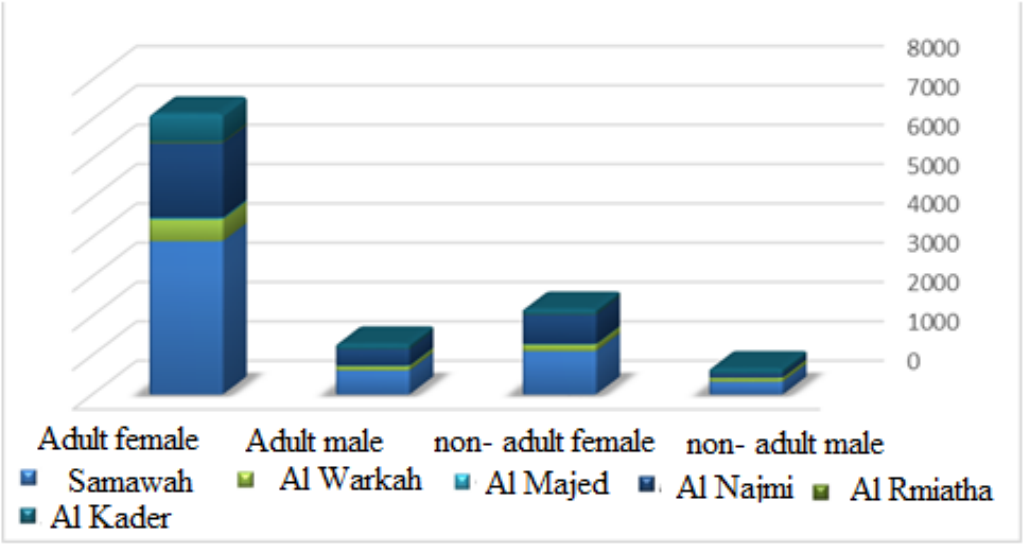

Figure. 2: The numbers of camels in different areas in Al Muthanna province.

Problems and obstacles facing camels breeding in Iraq

Despite, the fact that camels do not compete other animals on pasture because they are highly resistant to diseases and drought conditions. However, In last decades, the global warming, climate changes, drought and scarcity of rainfall in Iraq in general and in Al Muthanna province in specific, reflect on the growth of natural desert plants. These factors affect on the feeding and grazing of the camelids moreover, the poor eduction of the camels owner to provide the alternative fodder for their animals led to reduce the milk and and meat production especial in the last two years. Moreover, the absence of governorate support for the camels owner led to affect negatively on the breeding of the camel because of the fluctuating of food availability in Al Muthanna province. Meanwhile, in some years, the local province government are provided breeders with 20 -25 kilos per head / year depending on the availability of the appropriate quantity.

Figure. 3: Shows the herd of camels in Sawa Lake surrounding areas

Figure. 4

Figure. 5

Figure. 4: Shows the herd of camels in Wadi Kharaza
Figure. 5: Shows the natural desert plants and herd of camels

In 2008, the problem of animal food shortage in Al Muthanna province reached about 60%, according to the report of the National Survey of livestock in Iraq, which led some camelids owners with their families to migrate and moved long distances randomly to other Iraqi provinces, Where there were grasses and fodder shrubs. Lack of natural plants and shrubs is one of the most important problem, which represents the main obstacle facing camel farming, however, this does not mean that there are no other problems, but they are lighter, such as decrease of water avialibilty , price instability and lack of veterinary services and treatment of animals. All these problem waiting for appropriate solutions to improve the situation of these areas that majorities (54%) of their inhabitants are villagers. Nonetheless, the camel farming sector are also facing a

lack of interest due the lack of projects from government to develop this national wealth. According to the reports issued by the Directorate of Al Muthanna Agriculture (2018), there are no projects that concern the development of camelids, besides the support only limited to other projects such as fish, calves & cattle fields, sheep & goats and poultry breeding. In spite of the fact that Al Muthanna province are among the most suitable places to raise camels because of its dry desert environment, the preferred of the camelids. It is worth to say that the camels are the most domesticated animals that need minmium requirement in compare to other livestock with high production of both milk and useful healthy meat that contains a lot of vitamins and minerals. The other problems facing also camels breeding is the lack of veterinary services and treatment of diseases compare to other animals in the province especially because the camels are living in the deserts. The owners are always far from the veterinary hospital in the province and neither able to bring diseased camels to the veterianary hospital niether the veterinarian can go to them.

Conclusions and recommendations

In conclusion, this study approved that Al Muthanna province is the suitable area both in area and nature in raising camelids, and it is ranked as the third in the number of camels after Nineveh and Dhi Qar provinces. Severe and drought Iraq weather due to global warming led to lack in natural desert plants. Consequently, there is searching and immigrating of camels owner to another Iraqi provinces and decreasing of its number. Moreover, there are obvious lack of attention and absence of governmental projects to develop camels in the province in compare to other livestock considering that camels are highly reproductive, economically and the animal of the future. Therefore, the author recommends to focus on the camelids and its breeding in Al Muthanna province considering its suitability of this province for this animal. Moreover, the local and central government and ministry of agriculture have to give more attention and care for this animal because of its ability to survive and its high productivity even with severe and drought weather. More future studies recommend to do on camelids to solve the problems facing breeding this animal in Al Muthanna province. In addition, camelids diseases need to be control and treat by providing a mobile clinic and vaccination program.

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The Camel, the desert ship is on its way to extinction in Iraq Report on Slaughtered Camels in Iraq

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Abstract

The numbers of camels in Iraq are decreasing year after year due to many causes, one of these are the continuous slaughtering. This report is highlighted the numbers of slaughtered camels in Iraq and the solution to overcome this phenomena.

Introduction

In recent years, there has been a growing interest in the breeding and production of camels in many Arab countries because of their economic value and their distinctive characteristics in facing the difficult environmental conditions. There is no animal resembling the camels by adapting to the desert atmosphere. It can live, reproduce and work under harsh environmental conditions. It is the only animal that consumes less food resources in the Arabian Desert to produce abundant quantities of meat, milk and other products. That is why God mentioned it in the Quran in Surat Al-Ghashiyah: "Do not they look at the camel how it was created?" And also Prophet Mohammed (The Messenger of Allah) said (The camel is camel Almighty to her family).

Iraq is considered as one of the most Arab countries with the presence of numbers of camels, but these numbers are decreasing in a way that need be investigate to find the reasons and solutions and to prevent this animal from reaching the point of extinction. No previous

publication have been found in literatures concerning slaughtering of camels in Iraq. Therefore, this study was designed to focus on the situation and number of slaughtered camels in Iraq.

Data collection

The total numbers of animals in Iraq during the period between 1965 and 1970 is presented in table. (1), according to statistic data collected by ministry of agriculture.

Table. 1: Shows the Total number of animals in Iraq in years 1965 and 1970 including camel.

Species of animals	Year 1965	Year 1970
Sheep	11040205	13099792
Goat	1145488	2300935
Cow	1454922	1689384
Buffalo	224622	224622
Camel	210839	266143

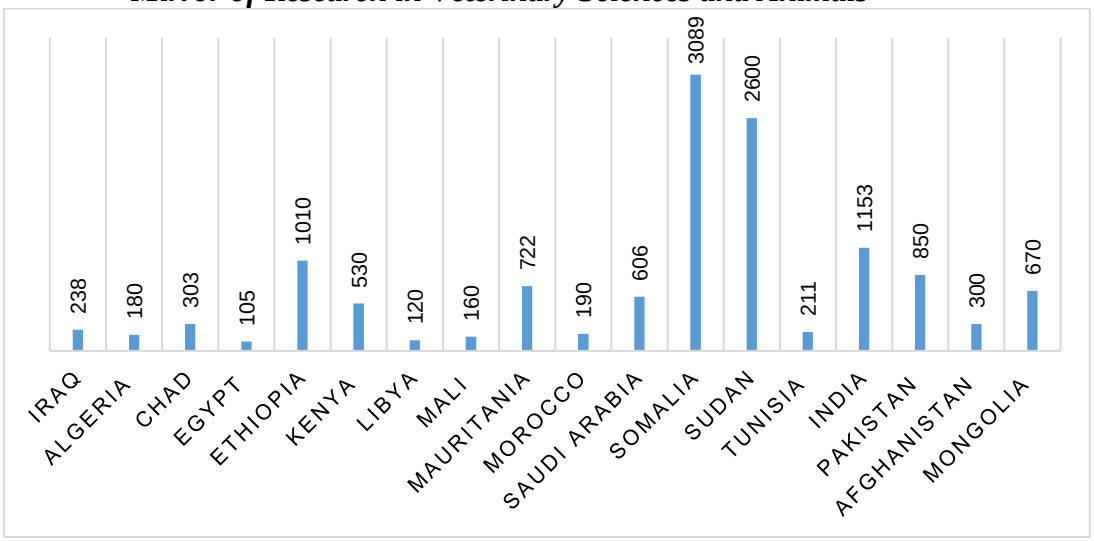
Ministry of agriculture/ Department of Statistics for the year 1969

Moreover, the countries and the numbers of camel are represented in table (2) and. In 1975, Iraq owned 238000 heads of camel in compare to other countries Figure (1).

Table. 2 : Shows the numbers of camel in each country(X 1000)

Country	Numbers
Iraq	238
Algeria	180
Chad	303
Egypt	105
Ethiopia	1010
Kenya	530
Libya	120
Mali	160
Mauritania	722
Morocco	190
Saudi Arabia	606
Somalia	3089
Sudan	2600
Tunisia	211
India	1153
Pakistan	850
Afghanistan	300
Mongolia	670

Statistics of FAO at 1976



Statistics of the Food and Agriculture Organization of the United Nations (FAO), 1976

Figure. 1: Shows the total number of camels in Iraq and in other camels breeder countries in 1975 (X 1000)

The camels population was revealed variability in during the years (1975 to 1984) that is presented in table (3).

Meat of the Camel

Studies indicate that meat of the camel calf is similar in its composition and taste to beef meat (Knoes, 1977; Shereha, 1990). The rate of body weight, growth and the characteristics of the of meat production in camels under the natural pastures from many regions are presented in table (4).

Table. 3: Shows the variability in camels population in Iraq during years 1975 to 1984

Year	Numbers of camels	Observations
1975	338000	(1)Statistics of the Central Organization for Statistics Organization of FAO and the Arab Organization for Agricultural Development AOAD
(1) 1976	52352	
1978	69700	
1982	80000	
1983	80000	
1984	70000	

(2) 2008	58000	(2) Report of the National Survey of Livestock in Iraq for the year 2008

Table.4: shows the rates of body weight/ Kg in camels for both sex male and female

Character	Rate of body weight / kg	
	Male	Female
Weight at birth	39.2	35.8
Weight at 6 months	174.6	172.1
Weight at 12 months	274.0	262.0
Weight at 24 months	401.1	377.6
Weight at 5 years	523.0	493.0

In camel, the average daily weight gain in the first period of birth until the age of six months was 758 g. The rate decreased from 6 months to one year. The weight of male and female was 512 and 476 respectively with a refinement rate (54%), which are better than meat of the local cattle in properties, qualities and rate production. In addition, camel meat is characterized by good taste and softness, especially in two years of age.

Number of slaughtered camels in Iraq

According to the available data, for example, in 1975, a total of 6,367 heads were slaughtered in the Baghdad abattoir only (abattoir report in 1975) and 635 heads in 1989 in Baghdad also for the month of January (Al Ani, 1999).
The slaughtered camels was reached about 24151 head in Iraqi provinces according to survey report (2008) of the national Iraqi livestock (Table.5 & Figure. 2).

Table. 5: Shows the number of slaughtered camel during 12 months of year 2008

Governorate	**Numbers of slaughtered camel during 12 months of 2008**
Dohuk	-
Nineveh	9575
Sulaymaniyah	-
Kirkuk	-
Erbil	-
Daialya	156
Anbar	153
Baghdad	-
Babel	235
Karbala	56
Wassit	2080
Salah Eldin	250
Najaf	362
Al Qadissya	1344

Al Muthanna	1140
Dhi Qar	1648
Mayssan	3045
Basra	4107
Total number	**24151**

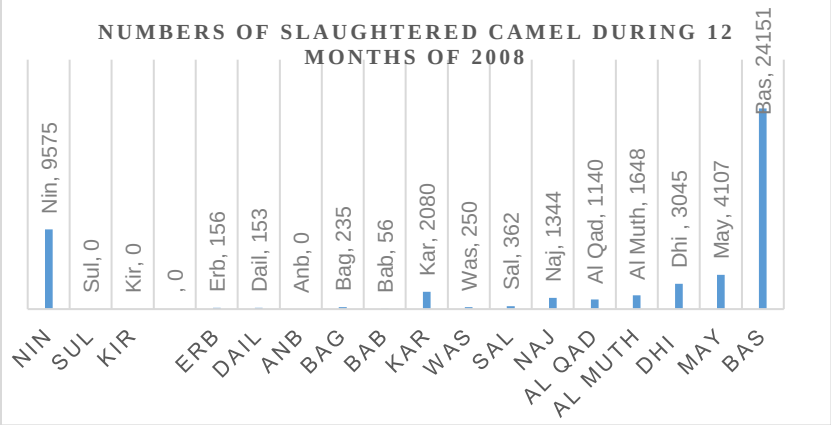


Figure. 2: Shows the number of slaughtered camel in Iraqi governorate during 12 months of year 2008 (Doh=Dohuk, Nin=Nineveh, Sul=Sulaymaniya, Kir=Kirkuk, Erb=Erbil, Dai=Daialya, Anb= Anbar, Bag=Baghdad, Bab=Babel, Kar= Karbala,Was=Wassit, Sal=Salah Eldin, Naj=Najaf, Al Qad=Al Qadissya, AlMuth=Al Muthanna, DHi=Dhi Qar, May=Mayssan, Bas=Basra, Tot No= Total number).

The recent data on the number of slaughtered camel in Iraq was also collected for the last 5 years in between 2013 to 2107 (Table. 6). The total number of the slaughtered camels in Iraq was 33767 head of camels last five years. These are huge numbers if compare to the total number 58293 that released at year 2008 for camelids in Iraq at a percentage of 58%. Despite the breeding and proliferation of camels, and if the slaughtering process is continued, the camelids are at risk if no policy and actions taken to limit this procedure.

Table. 6: Shows the total numbers of slaughtered camels in Iraqi governorates during the years 2013 to 2017.

Governorate	2013	2014	2015	2016	2017
Baghdad	0	1	0	0	0
Nineveh	0	5	81	0	0
Basra	0	0	0	0	0
Babel	64	122	114	0	12
Karbala	253	42	94	125	27

Najaf	2598	3259	3421	3353	2288
Al Qadissya	2019	2534	2929	2502	2286
Dhi Qar	225	225	294	274	268
Mayssan	143	166	191	78	69
Wassit	0	0	24	0	0
Daialya	0	0	0	0	0
Salah Eldin	87	1	0	0	0
Kirkuk	0	2	1	15	18
Anbar	17	0	0	0	0
Al Muthanna	555	610	812	881	562
Total	**5961**	**7067**	**7991**	**7216**	**5532**

Directory Veterinary Service procedures to protect camelid from slaughtering

The veterinary department observed the danger of continuous slaughtering of camels and issued instructions to prevent non equilibrium slaughtering and circulated to all Iraqi governorates veterinary hospitals. These instructions are including the following points:

1. The slaughtering of camels should be strict and according to law and regulations previously issued regarding slaughtering of animals in abattoirs. A new emphasis official letters were issued from Veterinary Department's number 15708 on 9/11/2015 and No. 16650 on 20/10/2016 regarding the necessity of preventing slaughtering of camels complying with the Law of Organizing the Slaughter of Animals No. (22) of 1972 and the Instructions No. (2) for the year 1990 statement ″animals not to be slaughter until confirming and certified by the veterinary hospital proving that the animal old or sick is not fit for breeding″.
2. Prevent slaughtering of camels in general and she camels in particular with a veterinary health certificate shows that this animals is not suitable for breeding and reproduction for any reason (The report should be written from a committee members of veterinarians in the veterinary hospital.
3. Training and education should provide camel breeders from the Bedouins to prevent slaughtering and give more care for their camels because they are one of the national t is important economic wealth in Iraq.
4. Provide a pastures, especially in the low rainfall seasons, and renting land for them and Diging of artesian water wells for planting field crops.
5. Provide camel's breeder with concentrated feed.
6. Prevent smuggling and force them to use plastic counting tag to prevent this phenomenon.

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Effects of virgin and multipara camel milk in sperm count and sperm deformity of diabetic rats

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Absract

The present study was conducted to investigate the effect of colostrums and camel milk treatment on sperm count and sperm deformity of alloxan induced diabetic rats , The study were divided into tow experiments according to period of treatment , The first experiment undertaken to investigate the effect of virgin and multipara camel milk through 30 days of treatment, second experiment undertaken to investigate the effect of virgin and multipara camel milk through60 days of treatment. The results of experiments revealed that the diabetic male rats in second group suffering from significant decrease at ($p \leq 0.05$) in sperm count and sperm deformity**.**

Introduction

Diabetes mellitus is a chronic systemic disease characterized by an increased blood glucose concentration. The word diabetes is derived from the Greek word "diabainein"and means "to pass through",referring to the large volume of urine, while mellitus comes from the Latin term "mel", which means honey and refers to the sweetness of the urine from patients with untreated diabetes (WHO,2006) . Diabetes is caused by either decreased production of insulin from the pancreatic β-cells or decreased effect of insulin on target tissues or by a combination of these two. Diabetes not only causes disturbances in carbohydrate metabolism(WHO,2011), but also affects lipid and protein metabolisms he two major categories of diabetes are type 1 and type 2 diabetes, previously also called "insulin-dependent" (IDDM) and "non-insulin-dependent" (NIDDM), or "juvenile" and "adult-onset" diabetes, respectively. Type 1

diabetes is characterized by an autoimmune reaction that leads to a total loss of function of the insulin-secreting β-cells of the islets of Langerhans in the pancreas, resulting in absolute insulin deficiency. Type 2 diabetes is the consequence of decreased insulin sensitivity (primarily in skeletal muscles, adipose tissue, and liver) and/or decreased insulin secretion from β-cells, it is the most common form of diabetes and is increasing in epidemic proportions worldwide. Considerable overlap exists between the two conditions, and type 1 and type 2 diabetes have been proposed to be different forms of the same disease, the main difference being the absence of an immune response in patients with type 2 diabetes, leading to a slower rate of β -cell loss(Wilkin,2001) .

On the other hand, the clear lack of evidence for similar genetic factors predisposing to type 1and type 2 diabetes supports the notion of two separate diseases. It is predicted that about 366 million people worldwide will be diabetic by the year 2030. There are 2 types of diabetes; T1D and Type2 Diabetes (T2D). T1D is a heterogeneous disorder associated with the destruction of pancreatic beta cells, with the resultant effect of absolute insulin deficiency. Type2 diabetes on the other hand is characterized by resistance to insulin action and suboptimal insulin secretary response. Causes of diabetes ranges from autoimmune- mediated destruction of beta cells and idiopathic destruction or failure of beta cells . About 5-10% of the total cases of diabetes worldwide are due to T1D. T1D is the most common type of diabetes in children and adolescents while Type2 Diabetes (T2D) is common among young adults . Type1 Diabetes (T1D) has been increasing by 2% to 5% worldwide(kumar *et al*.,2012).

Material and methods

The study includes tow experiments and one hundred twenty male rats have been used.

Experiment one : Effect of the treatment with virgin and multipara milk for 30 days . Fourty tow male rats were divided equally and randomly in to seven groups.

Group (1) - standard normal control group consists of (6) males rats treated orally with 2 ml of normal saline for 30 days .

Group (2) - diabetic control group consists of (6) males rats that were injected intra peritoneal(I.P.) with (150mg/kg) dissolved in 1/2 ml of alloxan for induction diabetes.

Group (3) - diabetic – insulin group consists of (6 induced diabetic rats)treated with i.p injection of (6 units /kg/day) insulin.

Group (4) - diabetic – virgin camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the virgin camel milk for 30 days.

Group (5)- diabetic – multipara camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the multipara camel milk for 30 days.

Group (6) - virgin camel milk group consists of (6 rats) treated orally with 2 ml/day from the virgin camel milk for 30 days.

Group (5)- multipara camel milk group consists of (6 rats) treated orally with 2 ml/day from the multipara camel milk for 30 days.

Experiment tow : Effect of the treatment with virgin and multipara camel milk for 60 days . Fifty four male rats were divided equally and randomly in to eight groups.

Group (1) - standard normal control group consists of (6) males rats treated orally with 2 ml of normal saline for 60 days .

Group (2) - diabetic control group consists of (6) males rats that were injected intra peritoneal(I.P.) with (150mg/kg) dissolved in 1/2 ml of alloxan for induction diabetes.
Group (3) - diabetic – insulin group consists of (6 induced diabetic rats)treated with i.p injection of (6 units /kg/day) insulin.
Group (4) - diabetic – virgin camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the virgin camel milk for 60 days.
Group (5)- diabetic – multipara camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the multipara camel milk for 60 days.
Group (6) - diabetic – virgin camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the virgin camel milk for 60 days , killed after 30 days from stopping treatment .
Group (7)- diabetic – multipara camel milk group consists of (6 induced diabetic rats) treated orally with 2 ml/day from the multipara camel milk for 60 days , killed after 30 days from stopping treatment .
Group (8) - virgin camel milk group consists of (6 rats) treated orally with 2 ml/day from the virgin camel milk for 60 days.
Group (9)- multipara camel milk group consists of (6 rats) treated orally with 2 ml/day from the multipara camel milk for 60 days.

Seminal Analysis

1.Sperm Concentration

The sperms were counted by using Neubauer hemocytometer chamber which use for RBC and WBC count according to method of Robb et al., (1978).

Procedure:

- The epididymis were put in a petry dish contained 5 ml of 0.9 % normal saline.
- The epididymis was cut into 6 – 10 pieces by using sharp scalpel.
- The suspension resulted from the previous step was filtered by clean piece of gauze into a test tube.
- One drop from the filtrate was dropped on the Neubauer chamber which covered previously with cover slid.
- The sperms found on the five squares that use for counting the RBCS by using the objective lens (40 x).

The sperms were calculated in one mm3 as following

$$\text{Sperms/cmm} = n \times 10000$$

n = number of sperm in 5 squires.

.2.Percentage of Abnormal Spermatozoa

The estimation of the percentage abnormal spermatozoa was done by using same slide that was used in the measurement of the dead and live spermatozoa ,tow handered sperms were counted under the light microscope using 100 X power (Filler ,1993).

3.Statistical Analysis

The statistical analysis was used the software SPSS version 19.0; the results was expressed as mean ± standard error (mean ± SE). One way ANOVA was used to compare parameters in different studied groups. P-values ($P<0.05$) were considered statistically significant.`

Result

1.1. Effect of virgin and multipara she camel milk treatment other sperm count and sperm a abnormality after 30 days of treatment .

As seen in Table (2) the sperm count revealed a significant decrease in 2nd and 3rd groups compared to other groups and they showed non significant differences between them . On the other hand the 4th and 6th group record a significant increase compared to other groups , while 5th and 7th group increase non significantly compared to normal control

Depending on the results listed in Table (2) ,there were a significant increase at ($p < 0.05$) in sperm a abnormality in diabetic group compared to all other groups, while 6th and 7th group showed non significant difference compared to normal control and decrease significantly compared to other groups. There were non significant difference between the 4th and 5th groups

Groups	Sperm count Mean± S.D	Sperm abnormalities Mean± S.D
Normal control group treated with 2 ml DW\day (30 days)	**59.66 ± 3.66**	**21.00 ± 1.41**
Diabetic control group (30 days)	**33.50 ± 1.04**	**65.5 ± 3.14**
Diabetic group treated with insulin (30 days)	**31.50 ± 1.37**	**41.00 ± 3.52**
Diabetic group treated with virgin she camel milk (30 days)	**134.16 ± 48.37**	**31.50 ± 2.42**
Diabetic group treated with multipara she camel milk (30 days)	**83.00 ± 9.33**	**33.66 ± 2.25**
Standard control group treated with virgin she camel milk (30 days)	**117.33 ± 24.70**	**21.33 ± 1.21**
Standard control group treated with multipara she camel milk (30 days)	**90.66 ± 3.38**	**23.66 ± 1.366**
LSD	**26.16**	**3.00**

, while there were a significant decrease in 4th and 5th groups in comparison to the 3rd group.

Table (2) Effect of 30 days treatment of virgin and multipara she camel milk on sperm count and sperm deformity of control and experimental groups of male rats.

2.1. Effect of virgin and multipara she camel milk treatment on the sperm count and sperm a abnormality during 30 days of treatment .

The result in the Table (3) indicate that the diabetic group and 2nd group showed a significant decrease (p <0,05) in sperm count compared to other group but there were no any significantly between them , while 4th , 5th , 6th and 9th group in crease significantly compared to normal control and there were non significant difference between them , where as 7th group revealed non significant difference in comparison with 7st group On the other hand the 8th group showed a significant increase compared to other all groups.

The Table (3) clarified the sperm a abnormalities after 60 days of treatment , diabetic group showed significant increase in sperm abnormality in comparison with other groups .while there were no significant difference between the 4th , 8th and 9th group compared to normal group and between them . on the other hand the 3rd and 6th group decrease significantly at (p < 0.05) compared to 2nd group , but there were non significant difference between then . whereas the 7th group increase significantly compared to other group while decrease significantly compared to diabetic group .

Groups	**Sperm count Mean± S.D**	**Sperm abnormalities Mean± S.D**
Normal control group treated with 2 ml DW\day (60 days)	59.33 ± 3.66	**21.83 ± 1.60**
Diabetic control group (60 days)	29.50 ± 1.04	**62.00 ± 4.42**
Diabetic group treated with insulin (60 days)	32.50 ± 1.37	**35.66 ± 3.38**
Diabetic group treated with virgin she camel milk (60 days)	91.50 ± 9.56	**23.33 ± 3.38**
Diabetic group treated with multipara she camel milk (60 days)	81.00 ± 4.89	**31.66 ± 1.36**
Diabetic group after one month form stopping 60 days treatment with virgin she camel milk	73.33 ± 5.35	**38.33 ± 2.25**
Diabetic group after one month form stopping 60 days treatment with multipara she camel milk	64.50 ± 3.33	**44.00 ± 2.28**
Standard control group treated with virgin she camel milk (60 days)	117.33 ±	**21.33 ±**

	24.70	**1.21**
Standard control group treated with mulipara she camel milk (60 days)	90.66 ± 3.38	**23.66 ± 1.36**
LSD	14.00	**4.00**

Table (.3) Effect of 60 days treatment of virgin and multipara she camel milk on sperm count and sperm deformity of control and experimental groups of male rats

Discussion

Effect of colostrum and CM on some reproductive ability indicator .

The rats treated with alloxan to induced diabetes show a significant decrease in the number of sperm compared with central group as a result of testicular tissue changes result from the high level of oxidative stress , thus , causes lipid peroxidation of fat intesticalar tissue result from increase formation of free radicals (Emanuelle etal., 1991 ; Husain and somani,1997) . sex hormon and disruption result in imbalance in the endocrine and this will lead to a decline in the number of spermatogonia (Kim etal ., 2014 ; Jelodar etal ., 2009).

The increased lipid per oxidation lead to increase the alteration of sperm membrane function impair development of sperm and reduced it is motility and also oxidative damage to sperm DNA (Aitken *etal* .,1989 , Julie ,2003).

Rates treated with CM show improve in semen characteristics properties because they contains several antioxidant vitamins in high concentration like vitamin C ,E ,B2 and A and highly rich in trace elements e.g., zinc and magnesium (Yousef ,2006) .

Vitamin E act as free radical scavenger and anti oxidant molecules beside it is necessary for normal activity of oxidative enzyme . vit C scavengers superoxide , H2O2 and hydroxyl radicals so it prevent sperm agglutination , and as well as prevent lipid per oxidation and protect against DNA damage induced by H2O2 radical (Gu rney et al ., 1996 ; Veldink,2007) , while magnesium helps in the absorption and metabolism of different vit (E ,B ,C) (Barbagallo et al ., 2009) . Zinc found in large quantity in camel milk (Ozdemir and Inanc, 2005 ;yonsef , 2006) , that can block cellular deterioration by antioxidant system activation (Zhiguo etal.,2012). Sperm cell are metabolically active and generate large number of free radicals during their development neutralize by zinc , Thereby improving sperm quality (Haas , 2006 , colagar et al ., 2009)

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