

VARIATIONS IN MILK COMPOSITION OF SOME FARM ANIMALS RESULTED BY SUB-CLINICAL MASTITIS IN AL-DIWANIA PROVINCE.

Hassan, H.J.

Department of Public health ,College of Veterinary Medicine, University of AL-Qadissia

Key words: Milk composition, Sheep,, Goats.

(Received 26 May 2013, Accepted 28 July 2013)

ABSTRACT

This study was carried out to evaluate the effect of sub-clinical mastitis and sex of birth on physico chemical composition of milk for some species of farm animals (Cows, Sheep and Goats) in Al-Diwania province during a period from March to August 2012. A total of (120) samples of raw milk includes (40) samples for cows, (35) samples for sheep and (45) samples for goats were used in this study. The results of this study revealed that there was a significantly difference ($P < 0.05$) in fat and lactose percentages for milk of sheep and goats. Fat percentages were (3.36 ± 0.24) and (3.33 ± 0.16) for milk of infected sheep and goats with sub clinical mastitis respectively as compared to (5.04 ± 0.14) and (4.20 ± 0.02) for milk of uninfected animals while, the percentages of lactose were (4.27 ± 0.02) and (4.30 ± 0.01) for milk of uninfected sheep and goats respectively as compared to (3.91 ± 0.13) and (4.06 ± 0.11) for milk of infected of the same animals. The results also showed a significantly ($P < 0.05$) higher in the solid not fat (SNF) percentage for milk of infected cows. The percentage of SNF was (9.12 ± 0.12) for milk of uninfected cows as compared to (8.78 ± 0.08) for milk of infected cows . Protein percentages was a significantly ($P < 0.05$) higher in milk of uninfected cows and sheep , in which was (3.85 ± 0.11) and (5.75 ± 0.11) in both species respectively. The results of this study showed that there was a significantly ($P < 0.05$) higher in PH values of milk for infected of three studied species as compared with milk of uninfected of the same species animals in which was (6.94 ± 0.06) , (6.71 ± 0.04) and (6.73 ± 0.01) for the three species respectively. The results also demonstrated a significantly ($P < 0.05$) effect of sex of birth on fat and SNF percentages for milk of goats and a significantly ($P < 0.05$) higher of protein percentage in milk for sheep which born male as compared to that born female (5.21 ± 0.35) and (3.89 ± 0.33) respectively.

INTRODUCTION

Milk is an important part of the diet of human beings. It contains wide range of dietary components of vital importance like water, proteins, lactose , minerals and vitamins (1). The exact composition of milk varies with the breed, species, feeding regimes and udder health (2). Quality of milk is deteriorated by the presence of sub-clinical mastitis and reduces milk production . Sub-clinical mastitis is the most important diseases of dairy animals through out the world (3), it causes change in the milk composition and any change in its percentage in turn affect the suitability of milk processing and the quality of its products (4,5) , degree of these changes depends on the

infecting agent and the inflammatory response . It causes lowers of the hygienic value of milk, reduces milk production, lower lamb performance in addition to treatment cost (6,7). This disease doesn't lead to visible changes in the milk or udder and is more important economically than clinical mastitis due to its higher prevalence (8,9,10).It is causing health hazards to the public, when milk of dairy animals with sub-clinical mastitis recognized no visible changes is accidentally mixed in to bulk milk it enters food chain and can be dangerous to humans because milk of infected animals is the main source of enterotoxigenic from causative organisms and some strains produce heat resistant as well as enterotoxins causing food poisoning outbreaks (11). The common technique in Diagnosis that can be used California mastitis test (CMT) which is easy and inexpensive (12). The aim of this study was to clarify the relationship between a set of physico- chemical parameters of milk from sub-clinical mastitis animals (cows, sheep and goats).

MATERIALS AND METHODS

This study was carried out in Al-Diwania province during a period from March to August 2012, To evaluate the effect of sub-clinical mastitis and sex of birth on milk composition of some farm animals. A total of 120 raw milk samples were collected from apparently healthy animals distributed as follow (40) samples for cows , (35) samples for sheep and(45) samples for goats. Milk samples were collected from animals which born male as compared to that born female. Milk samples were collected in 20 ml clean sterilized plastic bottles, Prior to collection milk the udder was washed directly with water and cleaning teats with cotton soaked in 70% ethyl alcohol .The samples were kept in ice box at 4°C and transport directly to the laboratory for California mastitis test (CMT) for detection of the disease according to (13), each milk samples were analysis by using ultra-sonic milk analyzer to determine the components of milk such as : fat , proteins, lactose , solid non fat and PH in nutrition lab of veterinary medicine college of public health department in university of Al-Qadisiya.

Statistical analysis: -

Data were analyzed by SPSS (14) . T-test was used to find the significant differences between means the results of sub clinical mastitis and non mastitis milk.

RESULTS AND DISCUSSION

In the present study sub-clinical mastitis causes many changes in milk composition (Table 1) . Where fat percentage in cows decreased from (4.09±0.06) in milk from uninfected cows to (3.81±0.17) in milk from infected cows these results were in agreement with (15,16) but disagree with (17) , while in sheep and goat the results of statistical analysis were revealed that a significant differences ($p<0.05$) lower in fat percentage for milk from infected animals, The means were (3.36±0.24, 3.33 ±0.16) respectively, these results are in a accordance with (18,19) but disagreement with (20,21,22) , milk from infected animals with sub- clinical mastitis had very high increase in the activity enzyme called lipase that cause milk fat breakdown and release free fatty acids that produce off-flavors in milk and cause great loss to dairy industry (23,24). In

cows and sheep milk protein content were significantly ($p<0.05$) lower in milk from infected animals than in uninfected animals and were (3.36 ± 0.04) and (4.55 ± 0.28) respectively, but in goats the data indicated to decrease in total protein from (3.93 ± 0.08) in milk from uninfected animals to (3.79 ± 0.91) in milk from infected animals, these results were agreement with (15) and in contrast to (16) in cows, in sheep and goats results are agree with the results obtained by (22,25) while disagree with (21), in this study showed decrease in protein content in milk from infected animals milk due to high increase in the activity a proteolytic enzyme (plasmin) that cause extensive destroyed for milk protein in the udder before milk removal (26). Also this study appeared that solid non fat (SNF) were significantly ($p<0.05$) lower in milk from cows infected with sub clinical mastitis as compared with milk from uninfected cows the percentage of SNF were (8.78 ± 0.08) , (9.12 ± 0.12) respectively, while in ewes and goats doesn't show significant difference between infected animals and uninfected animals $(9.11\pm0.10$, 9.94 ± 0.49) and $(10.17 \pm 0.30$, $10.80 \pm 0.26)$ respectively, decrease in SNF in infected cows milk depend on the destroyed that occur by invasion of pathogens to the mammary tissue cause decrease in synthetic activity of mammary gland (27) , the results are in accordance with finding of (28 , 29) in cows while the results of ewes and goats coincide with the results reported by (30,31) but disagreement with (20). Lactose content record slight decrease in infected milk of cows from (5.00 ± 0.08) to (4.83 ± 0.04) while in ewes and goats the data show significantly ($p<0.05$) lower in infected animals than uninfected (3.91 ± 0.13) , (4.06 ± 0.11) respectively , lower lactose in cows was agreement with(28) and disagree with (32), while in ewes and goats the results were closed from (22,31) and disagreement (19,33) ,lactose is synthesized in the gland cells of the udder from glucose and galactose during inflammatory reduced secretory activity at that mammary cells due to destruction of the epithelial cells by the leukocytes (34) ,these changes were linked with many factors such as breed, feeding , environmental conditions and age. The PH was significantly ($p<0.05$) higher in the infected animals milk (cows ,ewes and goats) than uninfected animals milk $(6.94\pm 0.06$, 6.71 ± 0.04 , 6.73 ± 0.01) respectively, the results were in agreement with (28,35) and disagreement (36) that he shows increase PH in infected milk but not significantly. These changes were linked to the increase permeability of the mammary epithelium cell lead to the transfer of components from blood to milk such as citrates ,bicarbonates that cause elevated PH levels (37). The data presented in(Table 2) showed that there was no significant effect of sex of birth on some composition of milk from infected animals with sub-clinical mastitis (cows, sheep and goats) except effect of it on fat and SNF percentage in goats demonstrated significantly ($p<0.05$) affect and was record (3.79 ± 0.26) in milk where dam born male compared to(2.88 ± 0.02) for dam that born female and (10.89 ± 0.48) for dams born male and (9.47 ± 0.21) for dams born female respectively ,while protein percentage recorded significantly ($p<0.05$) differences between milk from infected ewes that born male (5.21 ± 0.35) as compared with ewes born female (3.89 ± 0.33) .

Table (1) Effect of sub-clinical mastitis on some components of milk of cows ,sheep and goats

component (%)	Cows		Sheep		Goats	
	Uninfected	Infected	Uninfected	Infected	Uninfected	Infected
	Mean±SE No.=20	Mean±SE No.=20	Mean±SE No.=17	Mean±SE No.=18	Mean±SE No.=23	Mean±SE No.=22
Fat	4.09±0.06N.S	3.81±0.17	5.04±0.14*	3.36±0.24	4.20±0.02*	3.33±0.16
SNF	9.12±0.12*	8.78±0.08	9.94±0.49N.S	9.11±0.10	10.80±0.26N.S	10.17±0.30
Protein	3.85±0.11*	3.36±0.04	5.75±0.11*	4.55±0.28	3.93±0.08N.S	3.79±0.91
Lactose	5.00±0.08N.S	4.83±0.04	3.91±0.13*	4.27±0.02	4.30±0.01*	4.06±0.11
PH	6.62±0.02*	6.94±0.06	6.50±0.01*	6.71±0.04	6.60± 0.00	6.73±0.01*

* Significantly (P<0.05) different from respective values.

N.S: Non- significantly (P<0.05) different from respective values.

Table (2) Effect of sex of birth on some components of infected animals milk with sub-clinical mastitis

component (%)	Cows		Sheep		Goats	
	Male Mean±SE No.=12	Female Mean±SE No.=8	Male Mean±SE No.=10	Female Mean±SE No.=8	Male Mean±SE No.=12	Female Mean±SE No.=10
Fat	3.6 ± 0.26	3.8 ± 0.17*	3.72 ± 0.28	3.0± 0.39	3.79± 0.26*	2.88 ± 0.02
SNF	8.77± 0.08N.S	9.04± 0.18	9.97 ± 0.83N.S	9.90 ± 0.58	10.87±0.48*	9.47± 0.21
Protein	3.31±0.03N.S	3.56 ± 0.08	5.21 ± 0.35*	3.89 ± 0.33	4.63± 0.25N.S	4.15± 0.22
Lactose	4.81± 0.05N.S	4.94± 0.10	4.49 ± 0.07N.S	4.44±0.03	4.26±0.07N.S	4.41±0.02
PH	6.65±0.03N.S	6.81±0.11	6.76 ± 0.07N.S	6.65 ± 0.05	6.74±0.03N.S	6.72±0.02

* Significantly (P<0.05) different from respective values.

N.S: Non- significantly (P<0.05) different from respective values.

التغيرات في تركيب الحليب لبعض انواع حيوانات المزرعة نتيجة الإصابة بالتهاب الضرع تحت السريري في مدينة الديوانية

هيفاء جمعة حسن

فرع الصحة العامة، كلية الطب البيطري، جامعة القادسية، القادسية، العراق.

الخلاصة

أجريت هذه الدراسة لتقييم تأثير التهاب الضرع تحت السريري وجنس المولود في التركيب الكيميائي والفيزيائي لحليب بعض أنواع حيوانات المزرعة (الأبقار، الأغنام والماعز) في مدينة الديوانية للفترة من الشهر الثالث إلى الثامن لسنة 2012. استخدم في هذه الدراسة (120) عينة حليب خام موزعة بواقع (40) عينة حليب للأبقار، (35) عينة حليب أغنام و(45) عينة حليب ماعز. أظهرت نتائج الدراسة الحالية وجود اختلاف معنوي في نسبة الدهن واللاكتوز لحليب الأغنام والماعز حيث بلغت نسبة الدهن (0.14 ± 5.04) و (0.02 ± 4.20) في حليب الأغنام والماعز غير المصابة مقارنة مع (0.24 ± 3.36) و (0.16 ± 3.33) لحليب نفس الحيوانات المصابة. أما اللاكتوز فكانت نسبته (0.02 ± 4.27) و (0.01 ± 4.30) في حليب الأغنام والماعز غير المصابة مقارنة مع (0.13 ± 3.91) و (0.11 ± 4.06) لحليب الحيوانات المصابة. كما بينت النتائج إن نسبة المواد الصلبة اللاذهنية قد ارتفعت معنويًا في حليب الأبقار غير المصابة حيث بلغت (0.12 ± 9.12) مقارنة مع (0.08 ± 8.78) في حليب الأبقار المصابة أما نسبة البروتين فقد ارتفعت معنويًا في حليب الأبقار والأغنام غير المصابة إذ بلغت (0.11 ± 3.85) و (0.11 ± 5.75) على التوالي. وقد أشارت النتائج إلى وجود ارتفاع معنوي في الأس الهيدروجيني لحليب الحيوانات المصابة للأنواع الثلاثة المدروسة مقارنة مع حليب الحيوانات غير المصابة حيث بلغ (0.06 ± 6.94) ، (0.04 ± 6.71) و (0.01 ± 6.73) على التوالي. كذلك وجد تأثير معنوي لجنس المولود على نسبة الدهن والمواد الصلبة اللاذهنية في حليب الماعز وارتفاع معنوي في نسبة البروتين في حليب الأغنام التي ولدت ذكور مقارنة مع تلك التي ولدت إناث (0.35 ± 5.21) و (0.33 ± 3.89) على التوالي.

REFERENCES

- 1-Kittivachra,R.;Sanguandekut,R.;Phosngphance,P and Srisomboon,J. (2006).
Determination of essential nutrients in raw milk. J. Sci.Technol.28:115-120.
- 2- Bilal , M. Q. and Ahmad, A .(2004). Dairy hygiene and disease prevention . Pakistan Vet.J.13:1-7.
- 3- Bachaya, H .; AMA Raza, Murtaz, S. and IUR Akbar , (2011).
Subclinical bovine mastitis in Muzaffar Garh district of Punjab (Pakistan).J.Anim.Plant Sci.21:16-19.
- 4- Vivar- Quintana, A.M. ; Beneitez Delamano, E. and Revilla, I.(2006).
Relationship between somatic cell count and the properties yoghurt made from ewes milk. International Dairy J.16:262- 267.
- 5- Sharif, A. and Muhammad, G. (2009). Mastitis control in dairy animals . Pak.Vet. J.29:145-148.

- 6- AL- Majali, A. M. and Jawabreh, S. (2003). Period prevalence and etiology of sub clinical mastitis in Awassi sheep in southern Jordan. Small Ruminant Res.47:243-248.
- 7- Dogruer, G.;Saribay, K.M. ; Ergun, Y.; Aslantas, O.; Demir,C. and Ates, C .T. (2010). Treatment of sub clinical mastitis in Damascus goats during lactation. Small Rumin.Res.90:153-155.
- 8- Balqees, A.A. and Zangana, I.K. (2008). Prevalence of sub clinical mastitis in cows in Duhok Governorate- Kurdistan region, Iraq. J.of Duhok University, 11(2):155-158.
- 9- Balqees, A.Ail.(2012). Occurrence of sub clinical mastitis in dairy does in Duhok, Iraq. Res. Opin.Anim.Vet.Sci.2(2):69-71.
- 10- Rahim, B.; Jala, S .; Behrad, E.; Jamshid ,G .and Naser, M. (2010). Prevalence and etiology of sub clinical mastitis in Ewes of the Tabriz Region, Iran.Global Vet.4(3):299-302.
- 11- Abera,M.; Demie, B.; Regassa, F. and Regassa,A. (2010). Isolation and Identification of Staphylococcus aureus from bovine mastitis milk and their drug resistance patterns in Adama Town, Ethiopia. J. Vet. Med. Anim. Health .2:29-34.
- 12- Roy, JP.; D. Tremblay; L. DesCoteaux; S. Messier; D .Scholl and E. Bouchard, (2009) . Evaluation of the California Mastitis Test as a precalving treatment selection tool for Holstein heifers. Vet. Microbiol, 134: 136-142.
- 13- Coles, E.H. (1986). Veterinary clinical pathology.3rd (ed).W.B. Saunders Company. Philadelphia London.Toronto.
- 14-Spss.(1988). Spss base 8.0 application guide. Copyright by spss inc.USA.
- 15- Jones,G.M.(2006) .Understanding the basics of mastitis. Virginia cooperative Extension. Publication No.404-233.Virginia State University,USA,pp:1-7.
- 16- Sonea,C.; Colceri, D.and Bacila,V .(2009). Research on sub-clinical mastitis effect on milk quality.Zootehnie Biotehnologii,vol.42(2).
- 17- Bruckmaier,R.M. ; Ontsouka ,C.E. and Blum,J.W .(2004). Fractionized milk composition in dairy cows with sub clinical mastitis.Vet. Med.- zech,49,8:283-290.
- 18- Souza, G.; Birto ,JRF. ;Aparecida ,M. ;Brito ,VP. ;Lange, C.;Faria , C. .;Moraes ,L .;Fonseca,RG. and Sliva,Y.(2009).Composition and bulk somatic cell counts

- of milk from dairy goat herds in Southeastern Brazil. *Braz.J.Vet. Res. Anim . Sci.*46:19-24.
- 19-Kifaró ,G.C.;Moshi,NG.and Minga,UM.(2009). Effect of subclinical mastitis on milk yield and composition of dairy goats in Tanzania. *Tanzania J.Agric.Sci.*Vol.9 No.1.
- 20-Leitner, G.; Merin,U. and Silanikove,N.(2004a). Changes in milk composition as affected by sub clinical mastitis in goats. *J. Dairy Sci.* 87: 1719- 1726.
- 21-Min,B.R.;Tomita, G.;Hart,S.P.(2007). Effect of subclinical intramammary infection on somatic cell count and chemical composition of goats milk.*J.Dairy Res.*74:204-210.
- 22- Merin,U. ; Silanikove,N. ; Shapiro,F. ; Bernstein,S. and Leitner, G.(2004). Change in milk composition as affected by sub clinical mastitis in sheep and goats.
- 23- Nagwa, M .Morsi, Yousry Saleh, Hayam EL-Gazzar and Ashraf Hanafi.(2000). Effect of mastitis on milk fat content.*Pak.J.of Bio.Sci.*3(2):196-200
- 24-Uallah, S.; Ahmad ,T.; Bilal,M. Q. ;Rahman,Zia-ur. ;Muhammad, G. and Rahman, S.U.(2005). The effect of severity of mastitis on protein and fat contents of buffalo milk. *Pakistan Vet. J.*,25(1).
- 25- Ying ,CW. ;Wang ,HT. and Hsu,JT. (2002). Relationship of somatic cell count, physical ,chemical and enzymatic properties to the bacterial standard plate count in dairy goat milk.*livest Prod.Sci.*74:63-77.
- 26- Khan,M.Z. and Khan,A.(2006). Basic facts of mastitis in dairy animals.*Pakis.Vet.J.*26(4):204-208.
- 27-BenChedly, H.; Boutinaud,M. ; Bernier-Dodier,P.; Marnet,P.G. and Lacasse,p. (2009). Disruption of cell junctions induces apoptosis and reduces synthetic activity in lactating goat mammary gland. *J. Dairy Sci.* 93: 2938–2951.
- 28- Riaz Hussain; Muhammad Tariq Javed and Ahrar Khan.(2012). Changes in Some Biochemical Parameters and Somatic Cell Counts in the Milk of Buffalo and Cattle Suffering from Mastitis. *Pak. Vet. J.*, 32(3): 418-421.
- 29- Ahmad,T.; Bilal,M.; Uallah,S.;Rahman,Z.U. and Muhammad,G.(2007). Impact of Mastitis severity on mineral contents of buffalo milk.*Pak.J.Agric Sci.*44:176-178.
- 30- Chen,S.X.; Wang,J.S.;Van Kessel,F.Z.and Zeng,S.S.(2010). Effect of somati cell count in goat milk on yield ,sensory quality and fatty acid profile of semisoft cheese. *J. Dairy Sci.*93:1345-1354.
- 31- Rulan, Shangguan , (2010). Effect of sub clinical mastitis and stage of lactation

on somatic cell count, milk composition and plasmin activity in goats milk.
.M .Sc . Thesis, Dept.Vet. Clini Medi and Surg, Oklahoma state university.

- 32- Dhillon, A.; Gupta and Khanna,S. (2000). Enhanced production purification and characterization of a novel cellulase poor thermostable ,alkali- tolerant xylanase from Bacillus circulans AB16 . Process Biochem,35:849-856.
- 33- Moroni,P. ;Pisoni ,G.; Antonini ,M.; Ruffo,G. ;Carli,S.; Varisco, G .and Boettcher ,P.(2005). Subclinical mastitis and antimicrobial susceptibility of Staphylococcus caprae and Staphylococcus epidermidis isolated from two Italian goat herds. J.Dairy Sci 88:1694-1704.
- 34- Coulon JB, Gasqui P, Barnouin J, Ollier A, Pradel P,and Pomiès, D.(2002). Effect of mastitis and related - germ on milk yield and composition during naturally - occurring udder infections in dairy cows. Anim Res. 2002;51:383–393.
- 35- Batavani RA, Asri,S. and Naebzadeh,H. (2007). The effect of subclinical mastitis on milk composition in dairy cows. Iran J. Vet. Res., 8: 205-211
- 36 -Ogola, H.; Shitandi,A. and Nanua ,J.(2007) . Effect of mastitis on raw milk compositional quality. J. Vet. Sci. 8: 237–242.
- 37- Harmon,R.J.(1994).Physiology of mastitis and factors affecting somatic cell count. J.Dairy Sci. 77:2103-21120 .