

## A COMPARISON OF CAMEL AND CATTLE AMNIOTIC FLUID COMPOSITION AT THE SAME FETAL AGE

A. A. Al-Garawi, N. Abo-Heakal and H. M. Mousa

Dept. Vet. Med. College of Agriculture and Vet. Med. King Saud University,

P. O. Box 1182, Buraydah, Al-Qassim, Saudi Arabia

### ABSTRACT

Camel and cattle amniotic fluid samples were collected from 20 pregnant animals of the same fetal age, about two month for cattle fetus while the age of the camel fetus was determined by CVR 5 Cm. The aim of the present investigation was to compare the biochemical and physiological composition of the amniotic fluid of the two species. Samples were analyzed for sodium, potassium, glucose, total proteins, urea, uric acid, bilirubin, cholesterol and total lipids. The activities of the enzymes amylase and lactate dehydrogenase were also determined in the two amniotic fluids. The results indicated that there were no significant differences in the levels of potassium, glucose, bilirubin, and uric acid in the amniotic fluids of the two species studied. However, a significant higher values ( $p < 0.01$ ) were recorded in the levels of sodium, urea, total proteins, cholesterol, total lipids and lactate dehydrogenase in the amniotic fluid of cattle when compared with that of camel. Only the enzyme amylase activity was found to be significantly higher in the amniotic fluid of camel when compared with that of cattle. Judging from the composition of the amniotic fluid in the two species, it can be concluded that, in early pregnancy and at the same fetal age, the development of cattle fetus is quicker than that of the camel fetus.

### INTRODUCTION

The study of various biochemical constituents and physiological effects of fetal fluids could serve as an index of fetal health even ante-partum. Fetal membranes are present between the uterus and the fetus during pregnancy. They are the chorion, allantois, amnion and the epidermal membrane. The amnion surrounds the fetus and the amniotic fluid. Several studies have been conducted on composition of the fetal fluids in normal foaling and dystocia in mare (Kochhar et al., 1997) and during normal pregnancy in human, and ovine (Albuquerque et al., 1999). Amniotic fluid contain varying amounts of enzymes, sugars, phospholipids, and ions

which are produced by the fetus (Elshamed and Noakacs 1985 et al., 1997; Laurence et al., 2001).

Camelides have less amniotic fluid and abdominal space than other species especially during late gestation. Also it has a different composition than in human, ovine, cow and mare (Garry et al., 1996; Albuquerque et al., 1999; Jauniaux et al., 2000). Amniotic fluid is derived from skin, mucous, amniotic epithelium, fetal saliva and naso-pharyngeal secretions in mare fetus, it is viscous and mucoid (Kochhar et al., 1997), while the amniotic fluid of camelides remains watery towards the end of gestation (Abou-Ahmed et al., 1987).

The present investigation was planned to compare the vital biochemical constituents of fetal fluids of camel and cow fetus and also to study the activity of enzymes during the first two months of gestation period, which may reflect physiological, metabolic and developmental differences during fetal growth.

## MATERIAL AND METHODS

### Animals and sampling :

In the present investigation, 10 pregnant she-camels and 10 pregnant cows were used for collection of their fetal fluid at about the second month of gestation. Amniotic fluid was aspirated from the amniotic sac of fetal placenta, immediately after animal slaughter. The fluid was transferred to a sterile brown tube to prevent effect of photodegradation of any bilirubin present then the samples were transported to the laboratory in ice container. The amniotic fluid samples were centrifuged at 3000 rpm for 15 minutes and frozen at -20°C to be assayed within 3 to 5 days.

### Biochemical assays :

Amniotic fluid samples were analyzed for sodium and potassium using digital flame analyzer. Glucose, total proteins, urea, uric acid and total bilirubin were assayed using commercial kits supplied by Biomerieux (France). On the other hand, cholesterol and total lipids were measured using the available commercial kits according to the manufacturer instructions (Axiom and Nubenco Diagnostic, USA, respectively). The activities of amylase and lactic dehydrogenase enzymes were also evaluated using the kits supplied by Biomerieux (France).

### Statistical analysis:

The significance of the obtained values was evaluated using the standard student (t) test ( $P < 0.01$ ).

## RESULTS

The results, expressed as means  $\pm$  S.E., are shown in tables (1, 2 and 3). It is indicated that there are no significant differences in the levels of potassium, glucose, bilirubin and uric acid in the amniotic fluids of the two species studied. However, significant higher values ( $p < 0.01$ ) were recorded in the levels of sodium ( $149.41 \pm 1.8$  mEq/L), urea ( $0.707 \pm 0.03$ g/L), total proteins ( $4.61 \pm 0.17$ g/dl), cholesterol ( $238.64 \pm 4.14$  mg/dl) and total lipids ( $362 \pm 7.96$ mg/dl) in amniotic fetal fluid of cattle as compared with the same parameters in amniotic fluid of camel fetus. The activity of lactate dehydrogenase enzyme (LDH) was found to be significantly higher ( $108.62 \pm 2.0$  U/L) in the amniotic fluid of cattle fetus than that of the camel fetus ( $49.38 \pm 2.27$  U/L). In contrast, the amylase enzyme activity was found to be significantly higher ( $114.46 \pm 7.02$  U/L) in amniotic fluid of camel as compared with that of cattle fetus.

## DISCUSSION

Amniotic fluid provides a medium in which a fetus can readily move. It cushions the fetus against possible injury and helps maintain a constant temperature. The fetoplacental unit is a dynamic system with a constant exchange between fetal fluid compartments and maternal circulation (Baetz et al., 1976). A variation in the concentration of various biochemical components of amniotic fluid could have a significant relation to the fetal growth and may indicate certain fetal diseases (Szabo et al., 1990). Studies on the biochemical constituents and physiological aspects of the fetal fluid in camels have been very rare. The present investigation was planned to compare the concentration of various biochemical constituents of amniotic fluid of camel fetus with that of cattle fetus. This was to establish a relation between the measured parameters and the fetal development and growth of fetal organs at the same fetal age. The obtained results indicated that there were no significant differences in the levels of potassium, glucose, bilirubin and uric acid in the amniotic fluids of the two species studied. Amniotic fluid contains varying amounts of enzymes, phospholipids, sugars and ions, which are produced by the fetus (Mohamed and Noakes 1985). In the present investigation, in spite of species differences, there were no significant changes in the level of glucose metabolized as a source of energy for fetal growth at the same age. However, it has been established that the maternal blood glucose in camel is higher than that of cattle. It is reported that glucose from maternal circulation is the main energy source for the fetus during normal pregnancy in ovines (Alexander et al., 1970; Koehhar et al., 1997). Moreover, the increased glucose concentration in amniotic fluid has also been taken as an index of infectious state in pre-term labor in women (Romero et al., 1990). Absence of any significant differences in the fetal amniotic glucose levels between cattle and

camel suggests that the fetal fluid was free from infections. Concerning bilirubin, there was no significant variation in its amniotic fetal level in the two species. Concentration of bilirubin, a product of bile is indicative for the liver health of animals. It was reported that an increase in bilirubin level in amniotic fluid of dystocia-suffering mares as compared with normal foaling (Kochhar et al., 1997). In woman, it has been reported that amniotic fluid bilirubin concentration become more than that of maternal serum after 34 weeks of pregnancy due to decreased excretory ability of maternal liver (Benzle et al., 1974). Also, there were no significant changes in potassium level in the two species studied, but there was a significant higher concentration of sodium in the amniotic fluid of cattle compared with that of camel fetus. Potassium ions differ in biological activity from sodium, as they cannot undergo passive transfer across cell membrane (Kleffn et al., 1980). In ovine, amnion is highly vascularized, facilitating intra-membranous exchange of water and solutes between the amniotic and fetal plasma, this is contributed to higher sodium and potassium in ovine fetal fluid as compared with human fetal fluid (Albuquerque et al., 1999). Regarding the decrease in sodium level in amniotic fluid of camel fetus when compared with that of cattle fetus may be attributed to the maternal or fetal aldosterone hormone level. Bell et al. (1985) reported that there was a significant increase in maternal blood aldosterone in ovine with significant increase in fetal blood aldosterone, the increase was accounted for by transfer of aldosterone across the placenta from the mother. Also, a significant decrease was recorded in fetal urinary sodium concentration and sodium excretion, which was consistent with the level of sodium in amniotic fluid of camel fetus. Adult camels are able to concentrate urine and decrease sodium excretion (MacFarlane, 1963). Reduced birth weight has been observed in offsprings of the spontaneously hypertensive rats and in human hypertension. Amniotic fluid sodium concentration was found to be relatively constant over the period of 15-22 days of pregnancy, but amniotic fluid potassium concentration was significantly lower near term (Erkadius et al., 1995). In contrast, Thomsen (1976) has reported that variation in magnesium, sodium, and potassium do not provide a reliable correlation with fetal age in bovine. Schreyer et al. (1990) indicated that maternal dehydration may have marked effects on maternal fetal amniotic fluid dynamic, possibly contributing to the development of oligohydramnios in ovine.

The result of total proteins, urea, total lipids and cholesterol assays were highly significant in cattle fetus as compared with that of camel fetus and this may be attributed to metabolic effects of growth hormone and amniotic IGF1 which improve fetal growth (Frank et al., 2002). Also, it may be due to maternal transport of immunoglobulin G to the fetus (Renkin et al., 1993). In women fetal amniotic total proteins level was higher than its level in nuchal and hygroma fluid (Jauniaux et al., 1998). It has been established that fetal renal excretion is the probable origin of free fatty acid in amniotic fluids of women (Hagenfeldt and Hagenfeldt 1976). The cholest-

rol represents one third of total lipid profile in amniotic fluid (Biezenski et al., 1968). Amniotic protein level may provide an indication about the health of fetus especially near the term, whereas in dystocia the amniotic protein values were relatively lower than normal (Baetz et al, 1976). Many studies correlated enzyme activities with fetal maturity, fetal bone formation and kidney functions (Szabo et al., 1990; Williams et al., 1993). Regarding lactate dehydrogenase enzyme (LDH) in cattle fetal amniotic fluid, its level was higher than that of camel. LDH is contributed by all types of cells including exfoliative cells (Williams et al., 1993). Moreover, this increase may be attributed to the fetal growth, as its rise has been reported with advance in fetal age and fetal death (Mohamed and Noakaes 1985 ; Garry et al., 1996). Amylase enzyme activity in the camel fetal amniotic fluid was significantly higher than that of cattle, this may be attributed to salivary secretion and development of salivary gland. Also, absence of salivary amylase in cattle saliva may explain the decrease of amylase enzyme in cattle amniotic fluid. Laurence et al. (2001) reported that the physiological and diagnostic value of five enzymes throughout gestation, amylase enzyme assay can help to confirm echographic evidence of bowel disorders.

Judging of the composition of the amniotic fluid in the two species, it can be concluded that, in early pregnancy and at the same fetal age, growth and development of cattle fetus is quicker than that of camel fetus. This may be due to physiological differences in placental type and length of gestation period.

**Table (1): Levels of glucose, sodium, potassium and bilirubin in amniotic fluid of camel and cattle feti**

Parameter	Camel fetus	Cattle fetus
Glucose (mg/dl)	68.69 ± 1.9	69.58 ± 0.9
Sodium (mEq/L)	135.2 ± 1.05	149.41 ± 1.8*
Potassium (mEq/L)	4.08 ± 0.15	4.26 ± 0.17
Bilirubin (mg/dl)	0.726 ± 0.04	0.699 ± 0.02

\*Values = mean ± S.E. (P < 0.01).

**Table (2): Levels of cholesterol, total lipids, total proteins, urea and uric acid in the amniotic fluid of camel and cattle feti**

Parameter	Camel fetus	Cattle fetus
Cholesterol (mg/dl)	187.8 ± 5.26	238.64 ± 4.14*
Total lipids (mg/dl)	272.2 ± 3.2	362 ± 7.96*
Total proteins (g/dl)	2.44 ± 0.07	4.61 ± 0.17*
Urea (g/L)	0.234 ± 0.01	0.707 ± 0.03*
Uric acid (mg/L)	76.27 ± 4.2	81.39 ± 4.4

\*Values = mean ± S.E. (P < 0.01)

**Table (3): The activities of lactate dehydrogenase (LDH) and amylase enzymes in the amniotic fluid of camel and cattle feti (U/L)**

Parameter	Camel fetus	Cattle fetus
Lactate dehydrogenase (LDH)	49.38 ± 2.27	108.62 ± 2.0*
Amylase	114.46 ± 7.02	53.44 ± 3.78*

\*Values = mean ± S.E. (P < 0.01).

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## الملخص العربي

مقارنة تركيب السائل الأمنيوتي "السلوى" فى أجنة النوق والأبقار  
عند نفس العمر الجنينى

## المشركون فى البحث

على عبدالله القرعارى نبيل أبوهيكل سيد أحمد حسن ميرغنى موسى

كلية الزراعة والطب البيطرى - قسم الطب البيطرى - جامعة الملك سعود - بريدة - ص. ب. ١٤٨٢

القصيم - المملكة العربية السعودية

فى هذه الدراسة تم إستخدام عدد ٢٠ من إناث النوق والأبقار العشار عند عمر جنينى حوالى شهرين من الحمل وتم جمع السائل السلوى منها بعد الذبح ونقل السائل فى أوعية مبردة وحفظه مجمد لمدة ٣-٥ يوم، ثم تحليل ودراسة الخصائص الكيميائية والفسيرولوجية له، وتم تقدير ومقارنة مستوى كل من الصوديوم والبروتين والجلوكوز والبروتين الكلى واليوريا وحمض اليوريك وصبغة الصفراء والكولسترول والدهون الكلية وأيضاً دراسة نشاط إنزيم الأميليز واللاكتيت دى هيدروجينز (LDH)، وقد أظهرت نتائج الدراسة عدم وجود فروق معنوية بين مستوى البوتاسيوم والجلوكوز وصبغة الصفراء وحمض اليوريك فى السائل السلوى لكل من أجنة النوق والأبقار عند نفس العمر، ولكن حدثت زيادة معنوية فى مستوى الصوديوم والبروتين واليوريا والكولسترول والدهون الكلية وكذلك نشاط إنزيم اللاكتيت دى هيدروجينز فى السائل الجنينى فى الأبقار عنه فى النوق، ووجد أن نشاط إنزيم الأميليز فى السائل السلوى لأجنة النوق يزداد زيادة معنوية عن نشاط هذا الإنزيم فى السائل السلوى لأجنة الأبقار، ومن هنا يمكن الحكم بأن تركيب السائل السلوى لأجنة الأبقار يختلف فى نسب ومستويات بعض العناصر عن السائل السلوى فى النوق مما يدل على زيادة نشاط وفم الأجهزة الحيوية لأجنة الأبقار عنه فى النوق، وعلى النقيض من ذلك فإن معدل فم وإفراز الغدد اللعابية فى أجنة النوق أسرع منه عند أجنة الأبقار.