

Some serum enzyme levels during pregnancy and postpartum in single and twin-bearing Akkaraman sheep

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Summary

The study was conducted to determine the changes in the blood serum ADA, AST, ALT, AP, LDH, CK, CKM and GGT values at 60, 100 and 150 days of pregnancy and day 45 of postpartum in single and twin-bearing Akkaraman sheep. Significant gradual decreases were determined for ADA ($P<0.001$) and GGT ($P<0.05$) enzymes during pregnancy in both groups while ADA ($P<0.001$) and GGT ($P<0.05$) values increased significantly on day 45 of postpartum. Significant increases ($P<0.01$) were found for ALT and AST enzymes during pregnancy in both groups while ALT and AST levels decreased insignificantly on day 45 of postpartum. Serum AP, LDH, CK and CKM levels increased insignificantly during pregnancy and then decreased insignificantly on day 45 of postpartum. Serum ADA enzyme levels were lower ($P<0.01$) during pregnancy in single-bearing ewes, compared with twin-bearing sheep.

Keywords: sheep, pregnancy

During pregnancy period, a readily reversible reaction called transamination takes place in which some enzymes, especially including aspartate aminotransferase (AST) and alanine aminotransferase (ALT) play a key role (3). A wide range of values for adenosine deaminase (ADA), ALT, AST, alkaline phosphatase (AP), creatine kinase (CK), lactate dehydrogenase (LDH), and gamma-glutamyl transferase (GGT) activities are available in the literature. Higher AST, ALT, LDH, CK and AP values in pregnant animals compared to non-pregnant animals have been reported (6). However, season and stage of pregnancy and lactation have been claimed to have not any significant effect on enzyme activities (5). A gradual decrease was reported for ADA enzyme during pregnancy (8, 23). The pregnant animals had significantly lower levels of serum GGT as compared to the respective levels in non-pregnant animals (16). Moreover, information about the enzymological profiles of sheep at the single and twin pregnancy of sheep is hard available. Therefore, the present study was carried out to monitor the enzymological profiles at 60, 100, 150 days of pregnancy and at 45 day of postpartum and to investigate the changes for enzymological values between single and twin pregnancy.

Material and methods

Animals. A total of 30 healthy pregnant Akkaraman sheep (15 single-bearing ewes and 15 twin-bearing ewes),

aged 3-5 years and weighing 40-50 kg were used. The experiment was conducted between October and March. Between 5 and 10 day after natural oestrus, each ewe was treated with two intramuscular injections of PGF 2α (5 mg), 4 hours apart, to synchronize oestrus. Ewes were observed for oestrus every 12 days and two different rams feundated those exhibiting oestrus. Both groups of animals were fed a constant diet composed of mineral and vitamin premixes, wheat straw and a concentrate feed containing of 14% crude protein, 15% fibre and 3% fat, to secure intake of nutrients required for maintenance in accordance with NRC (18). About 0.5 kg/animal of concentrate was offered twice a day in addition to 2 kg wheat straw. Water was available *ad libitum* in the shed. Thirty days after mating, pregnancy and number of fetuses were determined by transabdominal ultrasonography using a B mode ultrasound (Scanner 200 Vet) console fitted with a five MHz transducer, and sheep were assigned to two groups: single or twin-bearing ewes (15).

Serum and assay procedures. Blood samples were collected in vacuum tubes Venoject® (Sterile Terumo Europe, Leuven, Belgium) from the jugular vein on days 60, 100 and 150 of pregnancy and 45 d postpartum. Blood samples were allowed to clot; the serum was removed, and then stored in single test tubes at -30°C until assayed. The samples were analysed for ADA, AST, ALT, AP, LDH, CK, CKM and GGT levels.

Serum samples were thawed at room temperature, and AST, ALT, AP, LDH, CK, CKM and GGT levels were determined using an Olympus AU 600 model atomic ab-

sorption spectrophotometer with commercially available kits (Randox Laboratories Ltd., U.K.). Serum ADA levels were analysed by the colorimetric method of Martinek with Bertholet's reaction (10).

Data analysis. At the each time intervals, data were analyzed by One-way analysis of variance (ANOVA) (22). T-test was used to compare serum enzymes levels between single and twin-bearing ewes (22).

Results and discussion

The mean levels with standard error of serum ADA, AST, ALT, AP, LDH, GGT and CK levels of single and twin pregnant sheep and interactions between evaluated parameters are given in tab. 1.

We stated significant gradual decreases for ADA enzyme ($P < 0.001$) during pregnancy in both groups. But there was a significant increase for ADA level ($P < 0.001$) at 45 day of postpartum. When compared with twin pregnant group, serum ADA enzyme level was lower ($P < 0.01$) in single pregnant group. Our results for ADA levels are in agreement with the findings of many authors (1, 8, 17, 23). These decreases for ADA level during pregnancy may be related with the growing of foetus and high levels of adenosine used in energy storing by the cause of a decrease in ADA level which breaks adenosine (1). Also, the decrease in ADA level may be a symptom of a depression in cellular immunity in pregnancy (14).

AST and ALT activity increased significantly ($P < 0.01$) at days 100 and 150, compared with day 60 of pregnancy. However AST and ALT levels were found to be lower at day 45 postpartum than at day 150 in pregnancy. In a study with goats, an increase was found in AST in early pregnancy (13), while Sarma and Ray (21) stated that ALT peaked between 10 days prepartum and day 10 postpartum. The highest overall mean values for serum AST and ALT were observed after mid-pregnancy but values dropped significantly shortly before parturition and in the post-partum period (19). In pregnant sheep, AST and ALT showed early significant increase, from the 2nd week of pregnancy (9). Activities of these enzymes are associated with implantation, embryo survival, growth, uterine carbohydrate metabolism and glycogen deposition. Increased serum enzymes were observed during formation of the structural components of the body of the foetus as synthesis of these enzymes are more rapid at

Tab. 1. Blood serum concentrations of some enzymes levels at 60, 100 and 150 days of pregnancy and 45 days postpartum in single and twin-bearing sheep ($n = 15$; $\bar{x} \pm SE$)

Parameters	Groups	Days of pregnancy			Postpartum
		60	100	150	45
ADA (IU/L)	Single	3.9 ± 0.32 ^a	2.7 ± 0.25 ^b	1.9 ± 0.22 ^c	8.6 ± 0.43 ^d
	Twin	3.4 ± 0.16 ^a	2.2 ± 0.19 ^b	1.4 ± 1.45 ^c	8.4 ± 0.38 ^d
	Single vs Twin	+	++	++	
AST (IU/L)	Single	97.2 ± 4.33 ^a	114.6 ± 4.85 ^b	121.0 ± 4.40 ^b	115.5 ± 4.09 ^b
	Twin	102.6 ± 3.78 ^a	118.6 ± 4.87 ^b	124.4 ± 4.45 ^b	116.5 ± 2.39 ^b
	Single vs Twin				
ALT (IU/L)	Single	24.2 ± 1.97 ^a	29.0 ± 2.50 ^{ab}	35.0 ± 2.27 ^b	33.7 ± 2.58 ^b
	Twin	24.4 ± 1.79 ^a	28.8 ± 2.29 ^{ab}	34.2 ± 2.26 ^b	32.5 ± 1.97 ^b
	Single vs Twin				
AP (IU/L)	Single	71.0 ± 7.87	78.4 ± 9.93	88.1 ± 10.44	84.5 ± 10.06
	Twin	83.4 ± 7.95	89.4 ± 7.61	96.9 ± 7.77	93.9 ± 7.79
	Single vs Twin				
GGT (IU/L)	Single	56.6 ± 2.82 ^a	51.2 ± 2.83 ^{ab}	45.6 ± 2.69 ^b	57.2 ± 2.73 ^a
	Twin	51.8 ± 3.44 ^a	47.3 ± 3.43 ^{ab}	41.5 ± 3.39 ^b	52.9 ± 3.21 ^a
	Single vs Twin				
LDH (IU/L)	Single	1372.3 ± 58.64	1481.4 ± 56.72	1597.8 ± 55.14	1549.3 ± 57.92
	Twin	1417.4 ± 64.12	1508.2 ± 70.19	1583.3 ± 67.27	1580.6 ± 66.35
	Single vs Twin				
CK (IU/L)	Single	171.3 ± 15.31	178.4 ± 15.67	192.4 ± 15.96	177.2 ± 15.63
	Twin	188.2 ± 19.22	201.2 ± 21.18	213.6 ± 20.37	198.1 ± 20.73
	Single vs Twin				
CKM (IU/L)	Single	135.4 ± 8.99	142.8 ± 9.69	148.6 ± 10.03	145.8 ± 9.07
	Twin	157.0 ± 9.05	166.0 ± 9.08	171.1 ± 8.98	171.7 ± 7.73
	Single vs Twin				

Explanations: Means in the same row and within variable with different superscripts differ ($P < 0.05$). For single vs twin: + $P < 0.05$, ++ $P < 0.01$

this stage (20). The increase in transaminases might indicate impairment in some muscle and liver cells due to rapid gluconeogenesis associated with pregnancy. AST was proved to increase under the effect of glucocorticoids (7) which are released more during pregnancy (4).

In the present study, a significant decrease in serum GGT at day 150, compared with day 60 and a significant increase at day 45 postpartum, compared with day 150 of pregnancy were observed in both groups. In a study, the pregnant animals had significantly lower levels of serum GGT as compared to the respective levels in non-pregnant camels (16). Also Bacq et al. (2) and Goldberg (11) have reported a lower activity for GGT in the second and third trimesters. The decrease in serum GGT level may be related with the inhibition of hepatic synthesis of GGT by hormone secretion during pregnancy (2).

Serum AP, LDH, CK and CKM levels tended to increase insignificantly during pregnancy and then decreased insignificantly at day 45 postpartum. Serum LDH values between the groups differed significantly in Gir cows and crossbred cows. The LDH activity was higher during estrus, then decreased at early gestation and then it increased up to parturition and again decreased in early lactation period (12). It was reported that season and stage of pregnancy and lactation did not have any significant effect on enzyme ac-

tivities (5). The growth of fetus during gestation and initiation of lactation on the day of parturition might be responsible for the increased LDH activity (24).

It can be concluded that the number of fetuses significantly influences some of the enzyme profiles during pregnancy. The changes in enzyme profiles were attributed to normal physiological responses to pregnancy or lactation. Increases in AST and ALT and decreases in GGT and ADA during pregnancy in twin and single-bearing ewes should be taken into account and necessitate further evaluation.

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POLLOCK P. J., PRENDERGAST M., SCHUMACHER J., BELLENGER C. R.: Wpływ zabiegów chirurgicznych na odpowiedź ostrej fazy u zdrowych i chorych koni. (Effects of surgery on the acute phase response in clinically normal and diseased horses). Vet. Rec. 156, 538-542, 2005 (17)

Stres i zapalenie wywołują zmiany w parametrach fizjologicznych, biochemicznych oraz zachowaniu ludzi i zwierząt. Zmiany w poziomie parametrów zapalenia w płazmie łącznie ze zmianami parametrów hematologicznych i biochemicznych są wykorzystywane w rozpoznawaniu, monitoringu i prognozowaniu zejścia choroby. W tych procesach ważne znaczenie odgrywiają białka ostrej fazy. Określono wpływ zabiegów chirurgicznych u koni z zapaleniem (zabiegi elektywne, zabiegi planowane) i bez zapalenia (zabiegi chirurgiczne nieelektywne, zabiegi nieplanowane) na poziom surowcowego amyloidu (SAA), haptoglobiny (HP) i fibrynogenu pod koniec zabiegu i po 12, 24, 48 i 72 godz. po operacji. Szybki i statystycznie istotny wzrost stężenia SAA wystąpił po obydwu typach zabiegów chirurgicznych i wynosił u źrebiąt 0,02-0,2 µg/ml, młodych koni 0,02-0,3 µg/ml, starszych koni 0,04-0,2 µg/ml. Po 24 godz. po elektywnym zabiegu chirurgicznym SAA osiągnął maksymalny poziom 16,4 µg/ml, a po nieelektywnym zabiegu 27,3 µg/ml. Maksymalne stężenie HP w surowicy wystąpiło po 48 godz i wynosiło w przypadku zabiegu elektywnego 2,5 mg/ml, nieelektywnego 2,8 mg/ml. Poziom fibrynogenu wynosił odpowiednio 4,7 g/l i 4,0 g/l.

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CVETNIC Z., SPICIC S., CURIC S., JUKIC B., LOJKIC M., ALBERT D., THIÉBAUD M., GARIN-BASTUJI B.: Izolacja *Brucella suis* biovar 3 od koni w Chorwacji. (Isolation of *Brucella suis* biovar 3 from horses in Croatia). Vet. Rec. 156, 584-585, 2005 (18)

W 2001-2002 r. zbadano w Chorwacji 6015 koni pochodzących z 5 regionów kraju w kierunku niedokrwiistości zakaźnej koni i brucelozy. Wiek zwierząt wahał się od 7 miesięcy do 27 lat, 95,1% stanowiły samice. Badanie w kierunku brucelozy wykonano przy użyciu testu z czerwienią bengalską (RBT), odczynem wiązania dopełniacza (CF) i testem pośrednim ELISA stosując białko G. Tylko dwa konie rasy posavac (0,03% badanej populacji) reagowały dodatnio w kierunku brucelozy. Obydwa zwierzęta, klacz w wieku 2 i 11 lat reagowały pozytywnie w trzech użytych testach diagnostycznych. Nie występowały u nich objawy miejscowe i ogólne brucelozy. Po eutanazji wykonano posiewy bakteriologiczne, sekcję i badania histologiczne. Badanie makroskopowe wykazało obecność drobnych ropni w podśluzówce oraz pod błoną surowicza jelit cienkich i grubych. Badanie mikroskopowe wykazało nacieki komórek jednojądrzastych w ropniach, rozsiałą martwicę hepatocytów, spadek ilości komórek limfoidalnych w śledzionie oraz w zuchwowych, łopatkowych i pachwinowych węzłach chłonnych. *Brucella suis* biovar 3 wyizolowano z wątroby, śledziony i zmian w okolicy jednej klaczy oraz z treści żołądka płodu drugiej klaczy.

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