H 2313

DTW

DEUTSCHE TIERÄRZTLICHE WOCHENSCHRIFT

Verlag M. & H. Schaper
Postfach 16 42 · D-31046 Alfeld

Heft 1
Januar 1998, 105. Jahrgang

Wissenschaftliche Zeitschrift für die Veterinärmedizin

Antifutterstreuer

Lipide und Lipoproteine bei Ziegen – β-Blocker – Hämostasestörungen beim Hund – Kälbertransport – Kalzinogene Pflanzen – BVD in Zellkultur – Immunsystem beim Rind, östrogener Einfluß – Pharmakokinetik Ciprofloxacin

Plasma Concentrations of lipids and lipoproteins in newborn kids and female Baladi goats during late pregnancy and onset of lactation

By S. A. HUSSEIN* and M. E. AZAB**

*Department of Physiology, Biochemistry and Pharmacology, Faculty of Veterinary Medicine, Moshtohor (Benha Branch), **Zagazig University, Egypt

HUSSEIN, S. A. and M. E. AZAB (1998): **Plasma contrations of lipids and lipoproteins in newborn kids and female Baladi goats during late pregnancy and onset of lactation.**
Dtsch. tierärztl. Wschr. **105**, 6–9

Summary

Concentrations of blood lipids and some lipoproteins were investigated in normal female Baladi goats during late pregnancy, parturition and onset of lactation as well as in their newborn kids during the first two weeks of life. A total number of 60 herparinized blood samples was collected from does at 4, 3, 2 and 1 weeks pre-partum, day of parturition and at 1, 2, 3 and 4 weeks post-partum. In addition, blood samples were also collected from their newborn kids during the first two weeks of life (day of birth, 1 and 2 weeks of age). Plasma was separated and analyzed for concentration of total lipid, total cholesterol, triacylglycerols, phospholipids, non esterified fatty acids (NEFA) and some lipoproteins as high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C).

The obtained results revealed that there was a significant decrease in plasma level of total lipids at one week after parturition. Plasma level of triaclyglycerols was significantly higher at 4, 3 and 2 weeks before parturition. This increase became very highly significant at one week before parturition. Meanwhile, plasma phospholipid concentrations showed a significant decrease at 3 weeks before parturition, followed by an significant increase at 2 and 3 weeks after parturition and highly significant increase at 4 weeks after parturition. The concentration of plasma NEFA showed a significant increase at 4 weeks before parturition followed by a very highly significant increase at 2 and 1 week before parturition. On the other hand plasma NEFA was non detected at 2, 3 and 4 weeks post-partum when compared with the value reported at day of parturition. Regarding plasma lipoprotein concentrations the obtained results showed that there was a significant increase in plasma HDL-C level at 2 and 3 weeks after parturition, followed by a very highly significant decrease at the fourth week post-partum. However, plasma LDL-C level showed a significant decrease at 3, 2 and 1 weeks before parturition, followed by a further highly significant decrease at 1 and 2 weeks post-partum.

In newborn kids plasma concentrations of total lipids, total cholesterol, phospholipids, HDL-C and LDL-C were very markedly increased at 1 and 2 weeks of age. However, plasma triacylglycerol concentrations showed a highly significant decrease at 1 and 2 weeks of age. The concentration of plasma NEFA showed a very highly significant decrease at 2 weeks of age, whereas, at one week of age plasma NEFA were not detected in comparison with first day of life.

HUSSEIN, S. A. und M. E. AZAB (1998): **Plasma-Konzentrationen von Lipiden und Lipoproteinen bei Neugeborenen und weiblichen Baladi-Ziegen während der Hochträchtigkeit und des Einsetzens der Laktation.**
Dtsch. tierärztl. Wschr. **105**, 6–9

Zusammenfassung

Bei gesunden weiblichen Baladi-Ziegen wurden während der Trächtigkeit, der Geburt und zum Beginn der Laktation und bei den Neugeborenen während der ersten beiden Lebenswochen die Konzentrationen von Lipiden und Lipoproteinen im Blutplasma gemessen. 60 heparinisierte Blutproben wurden 4, 3, 2 und 1 Wochen vor der Geburt, am Tage der Geburt und 1, 2, 3 und 4 Wochen danach entnommen, ebenso von den Lämmern am Tage der Geburt sowie im Alter von 1 und 2 Wochen. Plasma wurde isoliert und auf seinen Gehalt an Gesamtlipiden, Cholesterol, Triglyceriden, Phospholipiden, nicht veresterten Fettsäuren und einigen Lipoproteinen wie HDL- und LDL-Cholesterol untersucht.

Eine Woche nach der Geburt fallen die Gesamtlipide ab. 4, 3 und 2 Wochen und vor allem 1 Woche vor der Geburt sind sie signifikant höher. Die Phospholipid-Konzentrationen im Plasma sind 3 Wochen vor der Geburt verniedrigt, nach der Geburt aber zunehmend erhöht. 4 Wochen vor der Geburt sind die unversterten Fettsäuren erhöht mit dem Maximum 1 Woche vor der Geburt. 2, 3 und 4 Wochen später werden keine weiteren Änderungen der freien Fettsäuren festgestellt. 2 und 3 und besonders 4 Wochen nach der Geburt steigen die HDL-Cholesterolspiegel. Die Werte für LDL-Cholesterol sinken 3, 2 und 1 Woche vor der Geburt und erreichen 1 und 2 Wochen post partum ihr Minimum.

Bei neugeborenen Lämmern steigen alle gemessenen Parameter 1 und 2 Wochen nach der Geburt an, mit Ausnahme der Triacylglycerol-Konzentration, die zu dieser Zeit hochsignifikant abfällt. Die Konzentrationen der freien Fettsäuren im Plasma nehmen im Alter von 1 und 2 Wochen ab.

Blood lipid levels and their changes especially during pregnancy and lactation have been poorly investigated in goats. Generally three factors can alter lipid metabolism and blood lipids in ruminants which are well documented in reviews about cows: diet, pregnancy-lactation (HERDT, 1988) and ketosis (ANDERSSON, 1988).

Diet-induced changes in lipid metabolism and particularly noticeable in newborn kids, which are not yet ruminating and ingest milk or replacers (UN, 1986). In 1-month-old kids fed a replacer, supplementation with various types of fat demonstrated an increase of plasma cholesterol from about 3 to more than 7 mmol/l over 2 weeks. In those animals, aortic atherosclerotic lesions were observed and it was suggested that young goats could be a useful model for the study of therogenesis (DIERSONSCHADE et al., 1984). This increase was mainly carried by LDL (low density lipoproteins) and VLDL (very low density lipoproteins), while normally cholesterol was almost equally distributed between LDL and HDL (high density lipoproteins).

Ketosis in cows is a consequence to exaggerated lipomobilisation resulting from hypoglycemia in highly producing cows (KRONFELD, 1982). It results in a decrease to about two-thirds of the plasma triacylglycerols, cholesterol and phospholipids, while non-esterified fatty acids are greatly elevated (YAMDAGNI and SCHULTZ, 1970). Pregnancy toxemia occurs in does during last few weeks of pregnancy (BRADFORD, 1990; SALMI and EASSA, 1992), resulted from either undernutrition or overnutrition (SMITH and SHERMAN, 1994).

Plasma lipoproteins are lipid-protein complexes that function in the stabilization and vascular transport of lipids as well as in the exchange of lipids between tissues (CHAPMAN and FORGEZ, 1985). Five main groups of lipoproteins have been defined according to the density range that permits their isolation during ultra-centrifugation: Chylomicrons, very low density lipoproteins (LDL), high density lipoprotein (HDL) and very high density lipoprotein (VHDL). The VHDL fraction plays an important role in promoting lipoprotein lipase (LL) and lecithin cholesterol acyltransferase (LCAT) activities (COLEMAN, 1973).

Moreover, attention has been focused on bovine triglycerid-rich lipoprotein as a major source of milk fat (PALMQUIST and MATTOS, 1978). Mammary alveolar cells synthesize the major portion of the short chain fatty acids (C4 to C16) for milk triacylglycerols. However long chain fatty acids (C16 to C18) appear to be derived to a significant extent from the lipolysis of bovine lipoproteins as they circulate through capillaries in the mammary glands (PATTON and JENSON, 1976).

Accordingly, this work was planned to estimate blood lipids and lipoproteins in late gestation and early lactation in normal female Baladi goats and determine whether parturition and onset of lactation had effects similar to those reported in cows or ewes. Moreover, concentrations of blood lipids were scantily reported in newborn kids. Thus, as milk contains high level of lipids, it is also valuable to elucidate the effect of colostrum and milk ingestion on the changes of blood lipids and lipoproteins in newborn kids for the first two weeks of life.

Materials and Methods

The present study was carried out in a private farm at Fakuse, Sharkia Governorate. Five apparantly healthy female Baladi goats, 2 to 4 years old and their newborn kids were used in this study. The animals were clinically normal and proved to be free from any external, blood and internal parasites. During the period of the experiment all animals were kept at constant environmental and nutritional conditions and water was supplied ad libitum.

Animals were fed a constant diet which was composed of green ration as berseem (Trifolium alexandrinum) and pelted concentrate mixture was also provided which consisted in the following ingredients: bran 33 %, corn 22 %, cotton seed cake 35 %, calcium carbonate 2 %, sodium chloride 1 %. It contained crude protein 14 %, fibres 15 %, and fat 3 %. About 0.5 kg of concentrate was distributed twice a day. The does were exposed to a fertile buck and the date of mating of each doe was recorded.

Does were sampled at 4, 3, 2 and 1 weeks before parturition, day of parturition, and 1, 2, 3 and 4 weeks after parturition, while the newborn kids were sampled at the day of birth just after suckling, as well as at 1 and 2 weeks of age. Newborn kids were left to naturally suckling their dams.

Blood samples were collected from the jugular vein into clean centrifuge tubes containing heparin

(20 IU/ml blood), the samples were taken at 7 a. m. before feeding. Blood was centrifuged and plasma was separated and stored frozen at –20 °C until analyzed.

Plasma total lipids, total cholesterol, triacylglycerols, phospholipids and non esterified fatty acids were assayed colorimeterically according to the methods described by FRINGS and DUNN (1970), MEIATTINI et al. (1978), BUCOLO and DAVID (1973), ZILVERSMIT and DAVIS (1950), and DUNCOMBE (1964), respectively. Moreover, plasma high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) were estimated by the methods described by FINLEY et al. (1978) and FRIEDEWALD et al. (1972), respectively.

The data obtained were statistically analyzed and the significant difference between two given results were evaluated by the non-parametric Mann and Whitney's test as explained by SNEDECOR and COCHRAN, 1969.

Table 1: **Changes of lipid and some lipoprotein concentrations in plasma of female Baladi goats during late pregnancy, parturition and onset of lactation (mg/dl).**

Parameters / Statement	Total lipids	Total cholesterol	Triacylglycerols	Phospholipids	non-esterified fatty acids	HDL-Cholesterol	LDL-Cholesterol
4 weeks before parturition	287.10±12.27	73.13±3.63	22.86±2.75*	123.08±5.02	5.82±0.78*	40.70±4.01	21.77±1.75
3 weeks before parturition	257.14±17.44	70.00±5.58	31.43±3.86*	109.23±5.03*	5.23±0.63	47.21±4.83	15.92±1.17*
2 weeks before parturition	274.29±13.33	70.00±3.98	26.33±4.75*	128.40±7.98	16.91±1.63***	47.97±3.93	17.43±0.80*
1 weeks before parturition	277.71±17.75	73.50±5.63	35.54±3.08***	124.95±7.16	9.13±0.94***	49.82±4.75	16.50±1.63*
Day of parturition	297.03±12.14	72.75±5.53	15.93±0.31	130.77±6.99	2.74±0.65	45.83±1.12	23.80±2.41
1 week after parturition	246.86±16.93*	70.80±5.53	15.32±1.09	144.23±6.08	0.47±0.44	56.69±5.26	10.87±1.04***
2 weeks after parturition	288.00±5.74	69.00±5.26	13.75±0.55	162.63±4.45*	ND	59.07±4.84*	8.41±0.89***
3 weeks after parturition	291.74±4.85	85.33±4.71	12.00±0.90	134.32±5.59*	ND	61.70±3.76***	10.58±2.12
4 weeks after parturition	262.09±11.76	84.47±4.96	15.02±1.15	168.91±8.70**	ND	53.91±2.44*	15.05±1.79

Results are presented as mean ± SE.
Comparisons to the day of parturition by Mann and Whitney's test (* P < 0.05; ** P < 0.01; *** P < 0.001.)
ND: not detected, HDL: High Density Lipoproteins, LDL: Low Density Lipoproteins.

Results

The obtained data table 1 and figure 1 indicated that in normal female Baladi goats plasma total lipid concentrations were not significantly decreased around parturition (at 4, 3, 2 and 1 weeks before parturition). On the other hand, plasma level of total lipids at one week after parturition was significantly decreased and remained lower but not significantly at 2, 3 and 4 weeks after parturition in comparison with the value reported at day of birth.

The mean value of total cholesterol concentration in plasma at 4 and 1 weeks before parturition showed a non significant increase, followed by a non significant decrease at 3 and 2 weeks before parturition. Furthermore, plasma level of total cholesterol showed a non significant decrease at 1 and 2 weeks after parturition followed by a non significant increase at 3 and 4 weeks after parturition.

Plasma concentration of triacylglycerols revealed a significant increase at 4, 3 and 2 weeks before parturition, followed by a very highly significant increase at one week before parturition. On the other hand, after parturition the mean value of triacylglycerol concentrations in plasma was non significantly decreased at 2 weeks after parturition and slightly at 1, 3 and 4 weeks after parturition.

A non significant decrease of phospholipid concentration in plasma was reported at 4, 2 and 1 weeks before parturition, this decrease became significant at 3 weeks before parturition. On the other hand, a non significant increase in plasma level of phospholipids was noticed at one week after parturition, and this increase became significant at 2 and 3 weeks after parturition, followed by a highly significant increase at 4 weeks after parturition.

Plasma level of non esterified fatty acids (NEFA) revealed a significant increase at 4 weeks before parturition, followed by a very highly significant increase at 2 and 1 weeks before parturition. On the other hand, at 3 weeks before parturition a non significant increase in plasma NEFA was observed. At one week after parturition plasma NEFA was non significantly increased, whereas at 2, 3 and 4 weeks after parturition plasma NEFA was not detected.

A non significant decrease in plasma HDL-C (high density lipoprotein-cholesterol) was recorded at 4 weeks before parturition, followed by a non significant increase at 3, 2 and 1 weeks before parturition. Furthermore, HDL-C concentration in plasma was non significantly increased at 1 week after parturition. This increase became highly significant at 2 and 4 weeks after parturition.

A non significant increase in plasma concentration of LDL-C (low density lipoprotein-cholesterol) was observed at 4 weeks before parturition. However, a significant decrease was noticed at 3, 2 and 1 weeks before parturition. Furthermore, a non significant decrease in plasma level of LDL-C was recorded at 3 weeks after parturition. This decrease became very highly significant at 1 and 2 weeks after parturition, followed by a non significant increase at 4 weeks after parturition.

The obtained data table 2 and figure 2 indicated that in newborn kids during the first two weeks of life the mean value of total lipids, total cholesterol, low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C) and phospholipid concentrations in plasma were markedly increased at 1 and 2 weeks of age. On the other hand, plasma concentration of triacylglycerols was highly significantly lowered at one and two weeks of age. Furthermore, plasma NEFA level was not detected at one week of age whereas at 2 weeks age plasma NEFA revealed a very highly significant decrease in comparison with the value observed at day of birth.

Discussion

Blood lipids in female goats

The obtained data revealed that in female Baladi goats plasma total lipid concentrations remained low around parturition but were not statistically different from the value reported at day of parturition. Such decrease of plasma total lipids became significantly at one week post-partum. The results were nearly similar to those of RAPHAEL et al. (1973) who observed that serum lipid concentrations in Holstein-Friesian cows were lower during early lactation and non-lactating pregnancy than during peak of lactation and lactating pregnancy. On the contrary, PRAKASH and TANDON (1979) found that condentration of blood serum lipids fell gradually as parturition approached and rose steeply after parturition. Also HUSSEIN et al. (1995) reported that plasma level of total lipids decreased during late pregnancy, followed by an increase after calving in female buffaloes. The lowering of total lipid concentrations in plasma during late pregnancy may be attributed to the onset of lactogenesis I (production of precolostrum), that occurs at mid-gastation in goats, whereas in cows at 10 days before calving (RUCKEBUSCH et al., 1991). The lowering of total lipid concentrations in plasma during early lactation may be due to the onset of lactogenesis II (first release of colostrum that begins during the last 2 to 7 days of gestation) that is associated with copious synthesis and secretion of fat, protein and carbohydrates. Moreover, colostrum contains about 50% more fat than normal milk.

Regarding plasma triacylglycerol concentrations the obtained results demonstrated a significant increase at 4, 3 and 2 weeks before

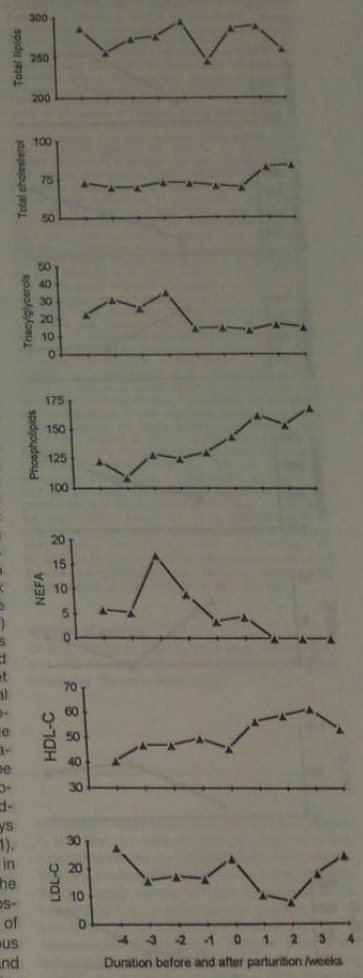

Fig. 1: Mean values of plasma lipid and lipoprotein concentrations (mg/dl) in female Baladi goats during late pregnancy and onset of lactation.

Table 2: **Changes of lipid and some lipoprotein concentrations in plasma of newborn kids during the first two weeks of life (mg/dl).**

Parameters	Total lipids	Total cholesterol	Triacylglycerols	Phospholipids	non esterified fatty acids	HDL-Cholesterol	LDL-Cholesterol
Age							
8-day	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One week old	[illegible]	[illegible]	[illegible]	[illegible]	ND	[illegible]	[illegible]
Two weeks old	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Results are presented as mean ±SE.
Comparisons to the day of birth by Mann and Whitney's rest (* P < 0.05; ** P < 0.01; *** P < 0.001)
ND: not detected, HDL: High Density Lipoproteins, LDL: Low Density Lipoproteins

parturition, followed by a marked decrease at 1 week pre-partum. On the other hand, plasma triacylglycerol levels were markedly decreased at the onset of lactation. These results were nearly similar to the previous observation in Saanen goats (BENNIS et al., 1992), Egyptian Baladi goats (ABDOU, 1995), in cows (TAINTURIER et al., 1984; MAZUR et al., 1988) and also in pregnant ponies (WATSON et al., 1993). They attributed the increased plasma triacylglycerol levels at late pregnancy to increased hepatic triacylglycerol synthesis and very low density lipoprotein (VLDL) secretion because the activities of lipoprotein lipase and hepatic lipase. After parturition the concentration of triacylglycerols decreased because of increased lipoprotein lipase activity consistent with the induction of the enzyme in mammary tissue by prolactin for milk fat synthesis. The obtained results were also confirmed by WEBB et al. (1987) who reported that triacylglycerols are removed in large quantities by the lactating mammary gland and are believed to be a principal source of long chain fatty acids in milk fat.

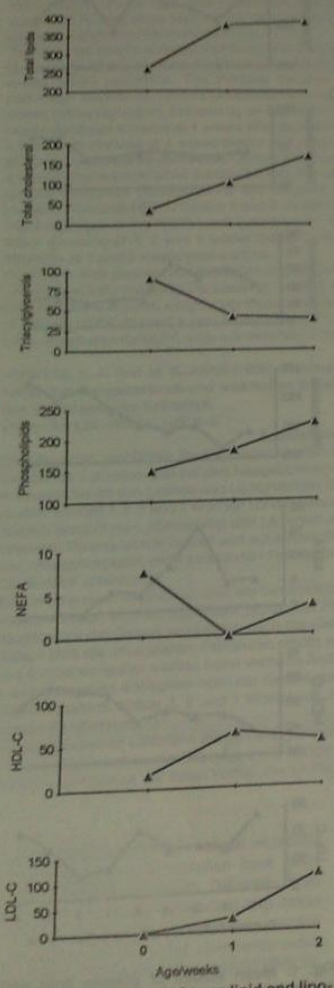

Fig. 2: Mean values of plasma lipid and lipoprotein concentrations (mg/dl) in newborn kids.

It is evident from the present study that, plasma phospholipid concentrations showed a significant decrease at 3 weeks before parturition, followed by a significant increase during lactation (at 2, 3 and 4 weeks post-partum). The remarkable decrease in plasma phospholipid concentration at 3 weeks pre-partum might be attributed to the great exchange of phospholipids into the mammary glands to be utilized in milk fat synthesis (YANG et al., 1978), whereas the higher concentrations of plasma phospholipids during lactation (at 2, 3 and 4 weeks post-partum) may result from extraction of very low density lipoprotein (VLDL)-bound triacylglycerols by the udder for milk fat synthesis (GLASCOCK and WELCH, 1974; PALMQUIST and MATTOS, 1978), subsequently the plasma phospholipids and cholesterol increase which remain in blood plasma, while lipomobilization and increased hepatic synthesis occur to balance the loss of triacylglycerols (BENNIS et al., 1992). These consistent changes in plasma lipid levels during lactation are considered as physiological adaptation of the organism to milk fat secretion.

Concerning plasma concentration of non esterified fatty acids (NEFA) the present study demonstrated a significant increase at 4 weeks before parturition, followed by markedly decrease at 2 and 1 week before parturition. However, during lactation (at 2, 3 and 4 weeks after parturition) non esterified fatty acids were not detected in plasma. The increased plasma NEFA during late pregnancy may arise from the excessive mobilization of fatty acids from adipose tissue in response to a negative energy balance (NAYLOR et al., 1980) resulting from increased demands placed on maternal energy supplies by fetal growth and milk production which could induce adipose lipolysis leading to a greater flux of NEFA to the liver for increased hepatic triglyceride synthesis (JEFFCOTT and FIELD, 1985). In addition, this response may be exacerbated in late gestation by development of peripheral insensitivity to the action of insulin (FOWDEN et al., 1984). On the other hand, NEFA were not detected in the plasma at 2, 3 and 4 weeks after parturition. On the contrary, plasma NEFA increased during lactation as observed in sheep (LEAT, 1974), cow (STÖBER and DIRKSEN, 1983) and ponies (WATSON et al., 1993). This difference between goats and other species may be attributed to variation of synthesis and metabolism of fatty acids especially during lactation. As confirmed by WEBB et al. (1987) who reported that in goats the milk fatty acids must have been synthesized to large extent within the udder from small molecules and not transferred as such from the blood. Also, SCOW and CHERNICK (1987) reported that prolactin causes induction of the enzymes of mammary tissue to provide the mechanism by which NEFA are channelled via VLDL-triacylglycerols to mammary gland for milk fat synthesis.

Moreover, the disappearance of plasma NEFA during lactation may be attributed to inhibition of hormone-sensitive lipase by insulin (the hormone of the fed state) due to increase of food intake during lactation (SWENSON and REECE, 1993). On the other hand, the previous observation showed increased NEFA in the blood of lactating cows (YAMDAGNI and SCHULTZ, 1970) resulting from excessive lipolysis (KRONFELD, 1982), thereby high producing dairy cows are more susceptable for metabolic disorders such as ketosis (KRONFELD, 1982). Meanwhile, goats could be more susceptable for metabolic disorders during late pregnancy than during lactation.

Regarding plasma lipoprotein concentrations the obtained results revealed that a significant increase in plasma high density lipoprotein cholesterol (HDL-C) concentration was recorded during 3 weeks after parturition, followed by a marked decrease in the fourth week post-partum. However, plasma low-density lipoprotein cholesterol (LDL-C) concentrations showed a significant decrease at 3, 2 and 1 weeks before parturition. In the same aspect, BENNIS et al. (1992) observed that HDL fraction ist predominant during late pregnancy and lactation in Saanen goats. It was also observed in cows (MAZUR and RAYSSIGUIER, 1988; JENKINS et al., 1988), and in pregnant and lactating ponies (WATSON et al., 1993). The latters attributed the increased HDL concentration to increased hepatic HDL synthesis for transport of cholesterol to steroidogenic tissues during these periods.

Blood lipids in newborn kids

The obtained results showed that plasma total lipids, total cholesterol, phospholipids, low density lipoprotein (LDL-C) and high density lipoprotein (HDL-C) concentrations were markedly increased during the first two weeks of life. On the other hand, plasma concentration of triacylglycerols decreased gradually. These results are nearly similar to those observed by BENNIS et al. (1992) in newborn kids of Saanen goats. The authors attributed these changes in blood lipids after birth to colostrum and milk ingestion.

In goats, milk contains from 30-70 g total fat/l, 0.4 g/l phospholipids and 0.1 to 0.2 g/l cholesterol (PARKASH and JENNESS, 1968; JENNESS, 1980; SIMOS et al., 1991). Thus, these molecules are absorbed immediately after birth from colostrum, which contains about 50 % more fat than normal milk. Meanwhile, the further decrease in triacylglycerols may result from better liver maturation and improved capacity to metabolize lipids and from the rapid increase of body fat in lambs (NOBLE, 1981).

Concerning to lipoproteins in plasma, high density lipoprotein (HDL-C) concentration was predominant at day of birth (HDL, 16.04 mg/dl, LDL, 1.73 mg/dl) and at 1 week of age (HDL, 63.41 mg/dl, LDL 28.33 mg/dl). These results

are in accordance with data of JENKINS et al. (1988), who reported that the bulk of lipoproteins in 3 day old calves is HDL (50.6% of total lipoproteins, whereas LDL is 18.0%). On the other hand, at 2 weeks of age the LDL-C was predominant. This result attributed to the marked increase in plasma total cholesterol level at this age. This suggestion is confirmed by BENNIS et al. (1992) who reported that the marked increase of plasma cholesterol is mainly carried by LDL and VLDL. The marked increase in plasma total cholesterol concentration in 2 weeks old kids in this study is similar to previously reported in 1 month old (DIERSON-SCHADE et al., 1984) and 15 days old Saanen kids (BENNIS et al., 1992). For this reason some authors (DIERSON-SCHADE et al., 1984) suggested that young goats could be a useful model for the study of atherogenesis.

The obtained results showed that plasma concentrations of non esterified fatty acids (NEFA) were 7.60+/-0.45 mg/dl at the day of birth, then markedly decreased to 3.59+/-0.58 mg/dl at 2 weeks of age. However, at 1 week of age plasma NEFA were not detected. The observed increase in the concentration of NEFA at day of birth in newborn kids may be resulted from colostrum ingestion. Meanwhile, the disappearance of NEFA from the blood of 1 week old kids with the observed decrease of plasma triacylglycerols at this age may be resulted from extensive build up of adipose tissue in the newborn kids (JENKINS et al., 1988). Because adipose tissue of the newborn animals is immature adipose tissue it contains virtually no triacylglycerols, but the percentage of lipid rises during the growth and development of adipose tissue (LAURENCE, 1980). Moreover, adipose tissue is the major site of de novo fatty acid synthesis in goats, cattle, sheep, whereas the liver is the major site in human and birds (SWENSON and REECE, 1993).

From the obtained results it could be concluded that, there are noticeable changes in plasma concentrations of lipids and lipoproteins during late pregnancy and lactation. These changes are nearly similar to those previously recorded in cows and ewes with exception of non esterified fatty acid levels in plasma during lactation. Subsequently does are more susceptible to metabolic disorders during late pregnancy than in the course of lactation. In addition, colostrum and milk ingestion is causing marked changes in all blood lipids and lipoproteins in newborn kids.

References

ABDOU, T. A. (1995): Studies on pregnancy toxemia in goats using isotopes. Ph. D. Thesis, Dept. of Int. Medicine, infectious disease and fish, Cairo University – ANDERSSON, L. (1988): Subclinical ketosis in dairy cows. Vet. Clin. North Am. Fd. Anim. Pract. **4,** 233–251. – BENNIS, A., F. de la FARGE, P. VALDIGUIE, A. G. RICO, J. P. BRAUN (1992): Effect of age of newborn and delivery by female goats on plasma lipids and lipoproteins. Small Ruminant Research **9,** 243–253. – BRADFORD, P. S. (1990): Large Animal Internal Medicine. The C. V. Mosby Company – BUCOLO, G. and H. DAVID (1973): Quantitative determination of serum triglycerides by use of enzymes. Clin. Chem. **19,** 475–482. – CHAPMAN, M. J. and P. FORGEZ (1985): Lipid transport system: some recent aspects in swine, cattle and trout during development. Reprod. Nutr. Dev. **25,** 217. – COLEMAN, R. (1973): Phospholipids and the hepatoportal system. Form and function of phospholipids. G. B. Ansell, J. N. Hawthorne and R. M. C. Dawson, ed. Elsevier SG. Publ. Co., Amsterdam, Neth. – DIERSON-SCHADE, D. A.; M. J. RICHARD and N. L. JACOBSON (1984): Effect of dietary calcium and fat on cholesterol in tissues and feces of young goats. J. Nutr. **114,** 2292–2300. – DUNCOMBE, W. G. (1964): The colorimeteric microdetermination of non-esterified fatty acids in plasma. Clin. Chem. Acta. **9,** 122–125. – FINLEY, P. R.; R. B. SCHIFMOU, R. J. WILLIAMS and D. A. LICHTI (1978): Cholesterol in high density lipoproteins: use of mg2+/dextran sulfate in its enzymatic measurement. Clin. Chem. **24,** 931–933. – FOWDEN, A. L., R. S. COMLINE and M. SILVER (1984): Insulin secretion and carbohydrate metabolism during pregnancy in the mare. Equine Vet. J. **16,** 239–246. – FRIEDEWALD, W. T.; R. I. LEVY and D. S. FREDRICKSON (1972): Estimation of concentration of LDL-cholesterol in plasma, without use of preparative ultracentrifuge. Clin. Chem. **18,** 499–502. – FRINGS, C. S. and R. J. DUNN (1970): Colorimeteric method for determination of total serum lipids based on the sulfophospho-vanilin reaction. Amer. J. Clin. Path. **53,** 89–91. – GLASCOCK, R. F. and V. A. WELCH (1974): Contribution of the fatty acids of three low density serum lipoproteins to bovine milk fat. J. Dairy Sci. **57,** 1364–1370. – HERDT, T. H. (1988): Fuel homeostasis in the ruminant. Vet. Clin. North Am. Fd. Anim. Pract. **4,** 213–231. – HUSSEIN, S. A.; M. T. NASR; A. I. EL-AZAB and K. M. EL-SABBAGH (1995): Biochemical analysis of some blood constituents in female buffaloes during late pregnancy and puerperium. The Egyptian Journal of Biochem. **13,** 95–103. – JEFFCOTT, L. B. and J. R. FIELS (1985): Current concepts of hyperlipaemia in horses and ponies. Veterinary Record **116,** 461–466. – JENKINS, K. J.; G. GRIFFITH and J. K. G. KRAMER (1988): Plasma lipoprotein in neonatal, preruminant and weaned calf. J. Dairy Sci. **71,** 3003–3012. – JENNESS, R. (1980): Composition and characteristics of goat milk: review 1968–1979. J. Dairy Sci. **63,** 1605–1630. – KRONFELD, D. S. (1982): Major metabolic determinants of milk volume, mammary efficiency and spontaneous ketosis in dairy cows. J. Dairy Sci. **65,** 2204–2212. – LAURENCE, T. L. J. (1980): Growth in Animals, Fundamental aspects of adipose tissue growth, pp. 169, Batterworths, London, Boston. – LEAT, WMF (1974): Variation in plasma glucose and free fatty acids concentrations in sheep associated with season, pregnancy and lactation. J. Agric. Sci. **82,** 181–184. – MAZUR, A. and Y. RAYSSIGUIER (1988): Profil lipoprotéique de la vache laitière (lipoproteine profile of the lactating cow) Ann. Rech. Vet. **19,** 53–58. – MAZUR, A.; E. GUEUX; Y. CHILLIARD and Y. RAYSSIGUIER (1988): Changes in plasma lipoproteins and liver fat content in dairy cows during lactation. J. Anim. Physiol. Anim. Nutr. **59,** 233–237. – MEIATTINI, F.; L. PRENCIPE; F. BARDELLI and P. TARILL (1978): The 4-hydroxbenzoate 14-amino phenazone chromogenic system used in the enzymatic determination of serum cholesterol. Clin. Chem. **24,** 2161–2165. – NAYLOR, J. M.; D. S. KRONFELD and H. ACLAND (1980): Hyperlipemia in horses: effects of undernutrition and disease. American Journal of Vet. Res. **41,** 859–509. – NOBLE, R. C. (1981): Lipid metabolism in the neonatal ruminant. In: lipid Metabolism in Ruminant Animals. Pergamon Press, Oxford, 411–448. – PALMQUIST, D. L. and W. MATTOS (1978): Turnover of lipoproteins and transfer to milk fat of dietary (1-Carbon-14) linoleic in lactating cows. J. dairy Sci. **61,** 561. – PARKASH, S. and R. JENNESS (1968): The composition and characteristics of goat's milk: a review. Dairy Sci. (Abstr.) **30,** 67–87. – PATTON, S. and R. G. JENSON (1976): Biomedical aspects of lactation. Pergamon Press, New York, N. Y. – PRAKASH, B. D. and R. N. TANDON (1979): A note on the effect of late pregnancy and early lactation on blood serum cholesterol and total lipids of Holstein x Tharpakar first lactation cows. Indian J. Anim. Sci. **49,** 308–309. – RAPHAEL, B. C.; P. S. DIMICK and D. L. PUPPIONE (1973): Lipid characterization of bovine serum lipoprotein throughout gestation and lactation. J. Dairy Sci. **56,** 1025–1031. – RUCKEBUSCH, Y.; L. PHANEUF and R. DUNLOP (1991): Physiology of Small and Large Animals, Lactation, pp. 616, B. C. Decker, Inc., Philadelphia, Hamilton. – SALMI, A. and A. EASSA (1992): Clinical and biochemical investigations on pregnancy toxemia in goats. Alex. J. Vet. Med. Sci. **8,** 24–32 – SCOW, R. O. and S. S. CHERNICK (1987): Role of lipoprotein lipase during lactation. In lipoprotein lipase, pp. 149–185, Ed. J. Borensztajn. Evener Publishers, Chicago. – SIMOS, E.; L. P. VOUTSINAS and C. P. PAPAS (1991): Composition of milk of native Greek goats in the region of Metsivo. Small Ruimin. Res. **4,** 47–60. – SMITH, M. C. and D. M. SHERMAN (1994): Goat Medicine, Lea and Febiger, Philadelphia, London. – SNEDECOR, G. W. and W. G. COCHRAN (1969): „Statistical methods" 6th ed. The Iowa State Univ. Press, Aries. Iowa, USA. – STÖBER, M. and G. DIRKSEN (1983): Lipomobilization syndrome (fatty degeneration syndrome) in dairy cow. The bovine pract. **18,** 152–154. – SWENSON, M. J. and W. O. REECE (1993): Dukes' physiology of Domestic Animals, 7th. Ed., The mammary gland and lactation, Comstock Publishing Associates a division of Cornell University Press, Ithaca and London. – TAINTURIER, D.; J. P. BRAUN; A. G. RICO and J. P. THOUVENOT (1984): Variation in blood composition in dairy cows during pregnancy and after calving. Res. Vet. Sci. **37,** 129–131. – UN, R. (1986): Contribution à l'etude des variations des constituants serques du chevreau nouveau-né. (Contribution to the study of variations of serum parameters in newborn kids) These Doct. Vét., Toulouse, France, 33P. – WATSON, T. D. G.; L. BURNS; G. J. PACKARD and J. SHEPERD (1993): Effect of pregnancy and lactation on plasma lipid and lipoprotein concentrations, lipoprotein composition and post-heparin lipase activities in Shetland pony mares. Journal of reproduction and fertility **97,** 563–568. – WEBB, B. H.; A. H. JOHNSON and J. A. ALFORD (1987): Fundamentals of Dairy Chemistry, 2nd. Ed.; The lipids of milk, pp. 134–135, CBC Publishers and Distributors. – YAMDAGNI, S. and L. H. SCHULTZ (1970): Fatty acid composition of blood plasma lipids of normal and ketotic cows. J. Dairy Sci. **53,** 1046–1050. – YANG, Y T.; J. M. ROHDE and R. L. BALDWIN (1978): Dietary lipid metabolism in lactating dairy cows. J. Dairy Sci. **61,** 1400. – ZILVERSMIT, D. B. and A. K. DAVIS (1950): Microdetermination of plasma phospholipids by trichloro acetic acid precepitation. J. Lab. Clin. Med. **35,** 155–160.

Address of authors

Dr. S. A. HUSSEIN, Dept. of Physiology, Biochemistry and Pharmacology, Faculty of Veterinary Medicine, Moshtohor (Benha Branch) Egypt.

Neue Bücher

Hans ULLSTEIN jun.: **Natürliche Pferdehaltung**. 1996, 168 Seiten, 82 Farb-, 53 sw-Abbildungen, 12 Illustrationen. DM 49,80. Müller Rüschlikon Verlags AG, CH-6330 Cham. ISBN 3-275-01209-6.

Die allgemein praktizierte Unterkunft und Verpflegung der Reitpferde ist in vielen Fällen Ursache für Erkrankungen unterschiedlicher Organe. Würde alle Pferdebesitzer die Haltung ihrer Pferde optimieren, wäre mit einer deutlich reduzierten Zahl mancher Krankheiten zu rechnen. Das vorliegende Buch gibt eine Vielzahl von Anregungen, wie die Bedürfnisse des Besitzers mit denen des Pferdes in Einklang zu bringen sind. Im ersten Teil des Buches soll zunächst nachdenklich gemacht werden. Im Kapitel über Wesen, Bedürfnisse und Verhaltensweisen wird mit vielen Vorurteilen und unbewiesenen Postulaten aufgeräumt. Hier wie auch im weiteren Fortgang des Buches werden textbezogene Zusatzinformationen in kleinen grauen Randkästen gegeben. Diese leicht lesbaren „Randinformationen" wecken besonders Interesse, sich mit dem Haupttext zu beschäftigen. Nach den einleitenden Betrachtungen, die besonders die persönlichen Ansichten und Erfahrungen des Autors widerspiegeln, werden unterschiedliche Haltungssysteme und deren Vor- und Nachteile beschrieben. Die Qualität der fotographischen und zeichnerischen Abbildungen fällt dabei besonders angenehm ins Auge. Es wird jedoch auch deutlich, daß die Begriffe „natürlich" und „Pferdehaltung", abgesehen von der ganzjährigen Weidehaltung mit natürlichem Witterungsschutz, schon widersprüchlich in sich sind. Im weiteren geht der Autor auf Fütterungssysteme und die Beschaffenheit von Ausläufen, Weiden und Koppeln ein. In einem kurzen abschließenden Kapitel werden hilfreiche Anregungen zur Arbeitstechnik und zu Arbeitsgeräten gegeben. Daß die beschriebenen Methoden der Pferdehaltung nicht nur theoretischen Überlegungen sondern auch praktischen Erfahrungen entstammen, belegt der Anhang, in dem der Autor sich als Pächter eines Musterbetriebes vorstellt. Das vorliegende Buch sei jedem nahegelegt, der einen Schritt zu artgerechter Pferdehaltung gehen will.

OHNESORGE, Hannover