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RESEARCH ARTICLE

Blood biochemical parameters, electrolytes and hormones in the dam and her calf after parturition of Egyptian buffalo.

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Abstract

The aim of this study was to characterize the physiological changes in plasma calf during the first month of life compared to changes in their mothers. Results indicated that, the concentrations of plasma glucose were decreased with time from the moment of birth until the end of the first month after birth in both dam and her calf. The concentrations of plasma urea, total protein, cholesterol and triglyceride were increased in both dam and calf from zero time to four weeks, while plasma creatinine was decrease. There were a drop in calcium, potassium and phosphorous levels in dam while in the plasma of calf calcium and phosphorus levels were increase while potassium level was decrease. The concentrations of plasma sodium were increased in both dam and calf from zero time to four weeks. Chloride concentrations varied in both dam and calf. The concentrations of plasma IGF-1 in dam were decrease from zero time to four weeks, while the level in calf was increase, the opposite trend recorded in leptin levels. The concentrations of plasma T_3 were decrease in dam and her calf, The T_4 concentrations show high concentrations of thyroid hormones, particularly in the first week of age, with their subsequent decreasing.

INTRODUCTION

The knowledge about normal values of biochemical variables in blood plasma and other physiological variables is important for assessment of damage of organs and tissues in different diseases and for assessment of development from the welfare aspect (Steinhardt and Thilescher, 2000). The values of biochemical variables in calf's plasma differ from the values in adult animals. Different authors ascertained that there are deficient data available about physiological values of biochemical variables in calves and that results of various studies differ (Knowles et al., 2000 Mohri et al., 2007). The majority of data available is for the calves in the first days after birth, and for the calves of few weeks or months of age there is very few data available. In all animal species, the interval from birth to 30 days of age, known as the neonatal period, represents a delicate phase during which the metabolically profile, the serum and biochemical characteristics undergo a differentiation (Piccione et al., 2006; Mohri et al., 2007; Piccione et al., 2008 and Piccione et al.,2011). The metabolic responses that occur during the transition from a fetal to neonatal life represent a transition phase from an unstable to a more stable status (Piccione et al., 2006). The newborn becomes engaged in a series of profound metabolic and morphological changes that are known as the adaptive period (Piccione et al., 2007). In fact, it is recognized as the most vulnerable period in the life of animals because of the high mortality and morbidity, which are more relevant during the first days of life (Piccione et al., 2008; Piccione et al., 2009; Piccione et al., 2010). The concentration of urea in blood depends from nutrition, diagnostically is important also at diseases of kidneys (Kraft and Dürr, 1999). Increased concentration of urea in calves' serum indicates increased catabolism of proteins and appears at long lasting diarrhoeas (Jazbec, 1990). The colostrum intake did not influence the urea concentration (Steinhardt et al., 1993). In calves the urea concentration slightly decreased from birth to the age of 60 days when it was 2.7 mmol/L (Steinhardt and Thielscher, 2000). Mohri et al. (2007) indicated that, the concentration of **creatinine** in Holstein calves decreased from 1st to the 70th day of age. The concentration of **total protein** (TP) and proportion between albumin and globulin is changing with age. Usually the calves have lower concentration of TP (50-70 g/L) as adult animals (60-80 g/L) (Kraft and Dürr, 1999). In calves after birth the (TP) concentration is almost for a half lower than in cows (45.8 g/L), after colostrum intake the concentration increases (54.5 g/L), but is still lower than in adult animals. Triiodothyronine (T3) and thyroxin (T4) are important mediators of energy expenditure, growth, and thermogenesis. The prohormone T4 is converted to the biologically active form, T3. Relationships between concentrations of T3 and T4 in cows and their offspring have not been defined. There are fewer findings with regard **to assessing the relationship between serum thyroid hormones, cholesterol, triglyceride, and lipoproteins in camels especially in the l**ast trimester of pregnancy. There are contradictory findings regarding the relation between serum thyroid hormones and cholesterol and triglycerides in various conditions. Serum cholesterol was consistently negatively correlated with serum thyroid hormone levels in several species (Kaneko et al. 2008; Mohebbi-Fani et al. 2009; Rizos et al. 2011; Tajik et al. 2012; Sheerer et al. 2013).All animals require minerals such as calcium (Ca), magnesium (Mg), and phosphorus (P) for growth, reproduction and lactation, which often affect specific requirements, and serve as catalytic components of enzymes or regulate several mechanism involved just in pregnancy and lactation (Samardzija et al., 2011; Tanritanir et al., 2009). Especially at the beginning of lactation, Ca homeostatic mechanisms have to react to a tremendous increase in demand for Ca (Liesegang, 2008). Mobilization of Ca from bone and increased absorption from the gastrointestinal tract are required to re-establish homeostasis (Liesegang, 2008). So, if it is well known that cows need, especially for the high milk yield, more nutrients and energy supply than other animals (Lohrenz et al., 2010), little information is available about how this need affects the physiological phase. During the last years, the average milk production increased, and conversely, due to the negative energy balance, the reproducibility decreased (De Garis et al., 2010).Normal plasma concentration of inorganic phosphorous (iP) in calves should be 1.3-1.9 mmol/L and 1.0-1.5 mmol/L in adult cattle (Underwood and Suttle, 2001). Kraft (1999) claimed slightly higher values in calf's serum namely; at the age until 2 months 2.6- 3.5 mmol/L, from 2 to 6 months it should be 2.5-3.1 mmol/L and from 12 to 18 months the concentrations are on the level of adult animals (1.6-2.3 mmol/L). The colostrum intake did not influence the **inorganic phosphorous (**iP**)** concentration in calves' serum (Steinhardt et al., 1993). In newborn calves after colostrum intake the Na concentration increased what was attributed to absorption from the colostrum (Steinhardt et al., 1993). But Maach et al. (1991) established higher concentration of Na before colostrum intake when it was 145.7 ± 3.7 mmol/L as then after (137.8 ± 6.8 mmol/L), later it almost did not change. The concentration of Na did not change a lot in the first three months, it was about 145 mmol/L, and at the age of 6 months it was slightly lower, about 136.6 ± 5.1 mmol/L (Bouda and Jagoš, 1984). The colostrum intake influence on increase of K concentration in calves' serum, what is most likely, the consequence of higher amount of this mineral in the colostrum (Steinhardt et al., 1993). In the age from 1 week to 2-3 months the K concentration in calves' serum almost did not change and was around 5 mmol/L (Maach et al. 1991). Bouda and Jagoš (1984) measured slightly higher values, around 5.4 ± 0.4 mmol/L, at the age of 6 month K concentration slightly decreased to 4.7 ± 0.4 mmol/L. Reece (1980) Established a decrease of K concentration from the 1st week of age when it was 7.2 mmol/L to the age of 15 weeks when it fell to 4.4 mmol/L. In calves immediately after birth higher concentration of **Chloride** was established (107.3 ± 12.3 mmol/L), then it decreased to the 7th day of age to 95.9 ± 6.6 mmol/L, later it increased slightly to 102.3 ± 6.2 mmol/L at the age of 2 months (Maach et al., 1991).

Materials and Methods

This study was carried out at Mehlet Moussa Experimental Station, which belongs to Animal Production Research Institute, north part of the Nile Delta, Egypt. Investigations were carried out on **eight** buffalo cows and her calf after parturition. The experimental animals were kept under normal feeding and management conditions applied on the farm. Blood samples (6 mL) were collected from the jugular vein of dam and her calf into heparin zed tubes at birth day (zero time), at two weeks and **at** four weeks. Blood samples were centrifuged at 3000 rpm for 20 minutes to separate plasma which was used for measuring glucose which determined by using enzymatic colorimetric method using Bio-Diagnostic® kit delivered from Dokki, Giza, Egypt according to Trinder (1996). Total protein was determined colorimetrically by using Bio-Diagnostic® kit delivered from Dokki, Giza, Egypt according to Gornal et al (1949). Cholesterol concentration in plasma was determined quantitively (Colormetric Method Liquzyme) by using (STAT LAB SZSL60-SPECTRUM) according to (Finely *et al*, 1978). Estimation of Triglycerides content in plasma was quantity (Colormetric Method Liquzyme) determined by using (STAT LAB SZSL60-SPECTRUM). according to (Fassati and Prencipe 1982). Urea and **creatinine** contents were determined with commercial kits by using Bio-Diagnostic® delivered from Dokki, Giza, Egypt and finally measured using stat lab szl60-spetrum. .Minerals including calcium (Ca) , inorganic phosphorus (p) ,potassium (k), sodium (Na), and **chloride** (Cl) concentrations determined by using Turbidimetric method using special kits delivered from Bio-Diagnostic®, Dokki, Giza, Egypt. Insulin like growth factor-1(IGF-1) was assessed by radioimmunoassay technique (RIA) using ready-made kits (Immunotech SAS -130 av. kit, France). The standard curve was between 0 and 1200 ng/ml. The analytical sensitivity was reported to be 2 ng/ml. The cross reaction of the antibody with other hormones was found to be extremely low. The samples were determined in one run and the intra-assay variation coefficient was 6.3%. While leptin concentration was determined by ELISA reader (BIO TEK ELX808), using Leptin ELISA kit sandwich (DRG Instruments GmbH, Germany) according to the manufacturer's guidelines. The standard curve was between 0 and 100 ng/ml. The sensitivity of the curve was reported to be 1.0 ng/ml. **direct** radioimmunoassay technique was performed for assessment of plasma triiodothyronine and thyroxin, T_4 concentrations by using special kits delivered from Immunotech radiova, Czech Republic.

Statistical analysis of data was carried out applying SAS, package (2000). Differences among means were checked according to Duncan (1955).

Results:

1- Blood biochemical parameters

Plasma glucose

Data in **table** 1 indicated that, the concentrations of plasma glucose were decreased with time from the moment of birth until the end of the first month after birth in both dam and her calf.

Urea

Results in **table** 1 indicated that, the concentrations of plasma urea were increased in both dam and calf from zero time to four weeks.

Cholesterol and Triglyceride

Table 1 shows that, the concentrations of plasma cholesterol and triglyceride were increased in both dam and calf from zero time to four weeks.

Creatinine

Data in **table** 1 indicated that, the concentrations of plasma creatinine were decrease in dam from zero time (**1.72±0.29) to (1.30±0.27** mg/dl) at four weeks, the same trend recorded in calf (**1.40 ± 0.13 V.S 1.18 ± 0.07** mg/dl).

Total protein

Results in **table** 1 indicated that, the concentrations of plasma total protein were increase in dam from zero time(**6.77±0.34) to (8.09±0.16**g/dl) at four weeks, the same trend recorded in calf (**4.20 ±0.12V.S 6.02±0.11**g/dl). Usually the calf **has** lower concentration of total protein than adult animal.

2-blood electrolytes

Calcium level

Results in **table** 2 indicated that there was a drop in calcium level in dam at zero (**4.97±0.33**) than at four weeks (**4.00±0.25**mg/dl), the opposite trend recorded in calf (**9.40±0.4 V.S 9.95±0.39** mg/dl).

Phosphorus level

Results in **table** 2 indicated that, the concentrations of plasma phosphorous were decrease in dam from zero time (**4.03±0.42) to (3.84± 0.48** mg/dl) at four weeks, the opposite trend recorded in calf (**4.87±0.20 V.S 5.01±0.25**mg/dl).

Sodium level

Data in **table** 2 indicated that, the concentrations of plasma sodium were increased in both dam and calf from zero time to four weeks. The values were slightly higher in calf **plasma** than level of adult animals (dam).

Potassium level Data in Table 2 indicated that the highest mean concentration of potassium was observed in post-partum stage in dam at zero time, which was **4.58±0.21**mg/dl. On the other hand, the lowest mean value of potassium was observed at four weeks, which was **4.07±0.14** mg/dl, the same trend recorded in calf (**5.22±0.15** V.S **4.48±0.18** mg/dl).

Chloride level

Results in **table** 2 indicated that, chloride concentrations varied from zero time to four weeks in both dam and calf (112.05, 98.84and 127.49 in dam at zero time, two weeks and four weeks V.S. 110.13, 105.35 and 100.57m mol/l in calf).

3-blood hormones

IGF-1

Data in table 3 indicated that, the concentrations of plasma IGF-1 in dam were decrease from zero time to four weeks, while the level in calf was increase.

Leptin

Data in **table** 3 indicated that, the concentrations of plasma leptin in dam were **increase** from zero time to four weeks while the level in calf was decrease.

Thyroid hormones

Results in **table** 3 indicated that, the concentrations of plasma T_3 were decrease in dam and her calf from birth to four weeks. The T_4 concentrations show high concentrations of thyroid hormones, particularly in the first week of age in calf with their subsequent decreasing.

Table 1. Blood biochemical parameters in the dam and her calf after parturition of Egyptian buffalo.

Parameter	Dam			calf		
	Zero Time	**After two weeks**	**After four weeks**	**Zero Time**	**After two weeks**	**After four weeks**
Glucose (mg/dl)	**81.44±4.49**^{ab}	**80.77±10.52** ^{ab}	**75.10±8.09** ^{ab}	**81.63±2.36**^{ab}	**79.38±2.26**^{ab}	**77.12±2.34**^{ab}
Urea (mg/dl)	**45.78±4.30**^{ab}	**47.99±1.86** ^{ab}	**49.36±0.71** ^{ab}	**56.65±6.35** ^{ab}	**60.46±7.05**^{ab}	**61.58±6.98**^{ab}
Cholesterol (mg/dl)	**63.50±6.76** ^{a}	**81.33±10.66** ^{a}	**111.50±8.43** ^{a}	**26.80±2.70** ^{b}	**83.29±5.98** ^{b}	**100.60±5.90** ^{b}
Triglyceride mg/dl	**111.00±15.8**^{a}	**125.75±0.75** ^{a}	**127.25±16.26** ^{a}	**87.6±2.52**^{b}	**88.36±1.76**^{b}	**89.12±3.33**^{b}
Creatinine (mg/dl)	**1.72±0.29** ^{a}	**1.52±0.55** ^{a}	**1.30±0.27** ^{a}	**1.40 ± 0.13** ^{a}	**1.40 ± 0.10** ^{a}	**1.18 ± 0.07** ^{a}
Total proteins (g/dl)	**6.77±0.34** ^{a}	**7.98±0.25** ^{a}	**8.09±0.16** ^{a}	**4.00±0.12**^{a}	**5.96±0.06**^{a}	**6.02±0.11**^{a}

[a,b] Means within the same row with different superscript differ significantly ($p<0.05$).

Table 2 Blood electrolytes concentration in the dam and her calf after parturition of Egyptian buffalo

Parameter	Dam			calf		
	Zero Time	**After two weeks**	**After four weeks**	**Zero Time**	**After two weeks**	**After four weeks**
Ca (mg/dl)	**4.97±0.33** ^{a}	**4.59±0.33** ^{a}	**4.00±0.25** ^{a}	**9.40±0.4**^{a}	**9.98±0.38**^{a}	**9.95±0.39**^{a}
P (mg/dl)	**4.03±0.42** ^{ab}	**4.30±0.38** ^{ab}	**3.84± 0.48** ^{ab}	**4.87±0.20**^{b}	**4.94±0.07**^{b}	**5.01±0.25**^{b}
Na (mEq/dl)	**140.02±0.95** ^{a}	**142.29±1.65** ^{a}	**141.26±0.29**^{a}	**148.50±3.60**^{b}	**149.50±1.00**^{b}	**150.50±4.00**^{b}
potassium (mmol/l)	**4.58±0.21** ^{ab}	**4.14±0.16** ^{ab}	**4.07±0.14** ^{ab}	**5.22±0.15**^{a}	**5.35±0.13**^{a}	**4.48±0.18**^{a}

Cl (mmol/l)	**112.05±22.55[a]**	**98.84±12.62 [a]**	**127.49±15.7[a]**	**110.13.50[a]**	**105.35±4.79[a]**	**100.57±4.80[a]**

[a,b] Means within the same row with different superscript differ significantly ($p<0.05$).

Table3.Blood hormones concentration in the dam and her calf after parturition of Egyptian buffalo

Parameter	Dam			calf		
	Zero Time	**After two weeks**	**After four weeks**	**Zero Time**	**After two weeks**	**After four weeks**
IGF_1 (ng/ml)	**182.0±3.1 [ab]**	**152.4±1.24[ab]**	**158.8±2.54[ab]**	**70.14±8.00[ab]**	**73.01±2.87[ab]**	**75.87±7.53[ab]**
Leptin (ng/ml)	**5.80±0.06 [ab]**	**6.10±0.16 [ab]**	**8.45±0.17 [ab]**	**1.67±0.12[b]**	1.62±**0.06[b]**	1.56±**0.03[b]**
T3 (nm/L)	**8.14±1.80 [a]**	**7.45±1.79 [a]**	**6.77±1.86 [a]**	**4.22±0.59[a]**	**3.76±0.46a**	**3.29±0.40[ab]**
T4 (nmol/l)	**33.00±0.51 [a]**	**39.38±0.49 [a]**	**40.41±0.38 [a]**	**118.65±12.21[a]**	**109.39±9.29[a]**	**100.14±12.46[a]**

[a,b] Means within the same row with different superscript differ significantly ($p<0.05$).

Discussion:

1- Blood biochemical parameters

Plasma glucose

The concentration of glucose decreases in the first and second week of lactation. A temporary fall in the level of glucose in the first weeks of lactation is a consequence of increased synthesis of lactose, and decreased gluconeogenesis (Doepel et al., 2002), what conforms to this study. During peripartum period, hormonal changes primarily regulate parturition, initiate lactation and adapt metabolism (Adewuyiet et al., 2005). These changes provoke hypoglycaemia postpartum (Ingvartsen, 2006), however, it is possible that some animals show gluconeogenetic effect of adrenaline and cortisol due to stress induced by calving. A period of early lactation is followed by a negative energy balance which is a consequence of insufficient food intake and increased needs for milk production. The organism has a capacity to decrease existing energy misbalance by the process of mobilisation of fats from body deposits, but these compensatory mechanisms can lead to disturbance in metabolic balance (Šamanc et al., 2000). However, (Mallard et al, 1998) state that compensative mechanisms depress mostly from 3 weeks prepartum to 3 weeks postpartum. It can be observed that the glucose concentration in calf started at a high level at the beginning of the experiment then decreased progressively by the advancing of age of calf. The decrease of glucose concentration in calf probably due to the influence of higher thyroid status the newborn mobilizes its resources to derive more energy which is possible due to high blood glucose levels and peak basal metabolic rate value at birth, (Ingole et al, 2012). At birth, there is a shift from IGF-II predominance to IGF-I predominance. IGF-I production then becomes GH-dependent, resetting the mechanisms regulating growth to ensure appropriate postnatal growth in the new nutritional environment (Gicquel and Le, 2006). Generally in new born ruminants, glucose and insulin levels very low. However, it is not fully know whether the endocrine hormones **really** after birth and during suckling period are affected by late gestational undernutrition.

Urea

Hanschke and Schulz (1982) established higher values of urea in the age 31-60 days in calves in subtropical climate, where the concentration of urea was 5.14 mmol/L. In calves with diarrhoea at the age 4-15 days twice as high mean urea concentration (7.98 mmol/L) in plasma was established as in healthy calves of the same age (3.89 mmol/L) (Maach et al., 1992).In dam, Several workers have reported that, serum urea in buffaloes is influenced by the days in milk, (Maria et al, 2011, Campanile et al, 1997 and, Grasso et al, 2007). These reports support the hypothesis that changes in blood urea content during lactation could depend on milk synthesis(El-sherif and Assad, 2001) .It is probably associated with the use of urea for protein synthesis on rumeno-hepatic pathway due to compensation of the low protein uptake during the dry period(Yokus et al,2006).

Cholesterol and Triglyceride

Total cholesterol and triglycerides, in the current study, affected by the physiological status, in fact, both showed substantial increases during the lactation. Probably because, during the puerperal period, there is an increase in the demands for regulatory mechanism, responsible for all the processes involved with milking (Krajnicakova et al., 2003). At this purpose, characteristic changes in lipid metabolism were found during pregnancy and lactation in most mammals (Roche et al., 2009). Endocrine profiles change and lipolisis and lipogenesis are regulated to increase lipid reserve during pregnancy, and, subsequently, these reserves are utilized following parturition and the initiation of lactation (Roche et al., 2009; Nazifi et al., 2002). Similar results, however, were found by other researchers, demonstrating that concentrations of total lipid and triglycerides increased at **p**arturition, despite the kind of fed administered (Douglas et al., 2004). **In** calf, the cholesterol concentration increased transiently with age, but triglycerides showed no consistent change (Hugi and Blum, 1997). Age had a significant effect on the serum concentration of cholesterol, triglyceride, total lipid, the HDL cholesterol, LDL cholesterol and VLDL cholesterol of Turkmen horses, with the values being higher in older animals (Nazifi *et al*., 2003). Age also had a significant effect on the serum triglyceride and VLDL-cholesterol of the male goats and the values were lower in older animals (Nazifi *et al*., 2002).

Creatinine

In calves after birth very high serum concentration of **creatinine** was established (256 ± 106 μmol/L), the value normalised to the 4th day of age (108 ± 28 μmol/L) (Klee, 1985). Similar was established by Maach et al. (1991), and after 15th day of age they observed increase of **creatinine** concentration to the age of 60 days when it was 146.7 ± 23.9 μmol/L.

Total protein

In calves, which received colostrum, higher concentration of total Protein was established, as in calves which received only milk replacer, what is associated with immunoglobulin absorption in the first ones (Muri et al., 2005). Numerous studies found correlation between total **p**rotein and concentration of immunoglobulin in calves' serum. Measuring of total Protein concentration in the 1st week of age can be used as indirect indicator of colostrum supply (Tyler et al., 1998, 1999).

2-blood electrolytes

Calcium level

Plasma Ca concentrations are reduced in early postpartum cows because of increased demand of Ca for synthesis of milk coupled with the relatively slow response in up-regulating Ca absorption from the intestinal tract. The postpartum depression in plasma and ionized Ca is greater in older cows than in primiparous cows (Kincaid, 2008). In newborn calves the mean serum concentration of Ca was 3.35 ± 0.27 mmol/L. Six hours after birth the Ca level decreased to 2.41 ± 0.18 mmol/L and in the next days and weeks almost did not change (Bostedt and Schramel, 1982). Kurz and Willett (1991) observed decrease of Ca concentration in the first 24 hours of life. In the first two months of life the concentration of Ca was around 2.7 mmol/L and did not change a lot. After the 3rd month the Ca concentration started to decrease and at the age of 6 months it was 2.53 ± 0.10 mmol/L (Bouda and Jagoš, 1984). Similar study in calves which were fed with milk replacer, only they have slightly higher Ca concentration at the age of 5 days (3.02 ± 0.2 mmol/L) and from the age of 15 days to 2 months it was 2.8 ± 0.1 mmol/L (Steinhardt and Thielscher, 2000). In sucker calves of Simmental breed the decrease of Ca concentration from birth to the age of 28 days was established (2.6 mmol/L), later the concentration almost did not change to the age of 84 days (Egli and Blum, 1998). Mohri et al. (2007) established a decrease of Ca concentration in the first two weeks of life, later the Ca concentration slowly increased

Phosphorus level

Kurz and Willett (1991) established decrease of **inorganic phosphorous** concentration in first 24 hours of age. In sucker calves the increase of iP concentration in the first 14 days was established later it remained stable. The values were all the time higher as in adult animals (Egli and Blum, 1998). At the age of 60 days the concentration of iP in calves' serum was 2.6 mmol/L (Steinhardt and Thielscher, 2000).

Potassium level

The colostrum intake influence on increase of K concentration in calves' serum, what is most likely, the consequence of higher amount of this mineral in the colostrum (Steinhardt et al., 1993). In the age from 1 week to 2-3 months the K concentration in calves' serum almost did not change and was around 5 mmol/L (Maach et al. 1991). Bouda and Jagoš (1984) measured slightly higher values, around 5.4 ± 0.4 mmol/L, at the age of 6 month K concentration slightly decreased to 4.7 ± 0.4 mmol/L. Reece (1980, 1984) **e**stablished a decrease of K concentration from the 1st week of age when it was 7.2 mmol/L to the age of 15 weeks when it fell to 4.4 mmol/L.

Sodium level

In newborn calves after colostrum intake the Na concentration increased what was attributed to absorption from the colostrum (Steinhardt et al., 1993). But Maach et al. (1991) established higher concentration of Na before colostrum intake when it was 145.7 ± 3.7 mmol/L as then after (137.8 ± 6.8 mmol/L), later it almost did not change. The concentration of Na did not change a lot in the first three months, it was about 145 mmol/L, and at the age of 6 months it was slightly lower, about 136.6 ± 5.1 mmol/L (Bouda and Jagoš, 1984). Reece (1980) established higher concentration of Na in serum of calves which received milk replacer in comparison to the calves which were fed with milk.

Chloride level

In calves immediately after birth higher concentration of Cl was established (107.3 ± 12.3 mmol/L), then it decreased to the 7th day of age to 95.9 ± 6.6 mmol/L, later it increased slightly to 102.3 ± 6.2 mmol/L at the age of 2 months (Maach et al., 1991). In suckler calves the concentration of Cl increased with age from 98.0 mmol/L in the 1st week of age to 102.4 mmol/L at the age of 14 weeks (Reece, 1984). In calves which were fed with limited amounts of milk the increase of Cl concentration was established to the age of 5 weeks, later it decreased slightly and oscillated between 97.7 and 99.3 mmol/L (Reece, 1980).

3-blood hormones

IGF-1

Endocrine hormones such as insulin, insulin-like growth **factor -1** (IGF-I) and leptin plays important roles in fetal growth and regulation of interrelationships between mother and her fetus (*Fowden et al. 2006*). Additionally there are relations among this hormones in fetus for instance, insulin positively regulates IGF-I levels (Fowden and Forhead, 2004) probably by increasing glucose uptake and the cellular availability of glucose. Accordingly, endocrine milieu changes after birth is critical both to enhance glucose level in the blood and most importantly to commence feeding. For instance in humans, leptin concentrations of newborns after birth reduced rapidly and **were** extremely low by approximately 6 days of life (Matsuda *et al.* 1999). Increasing IGF-1 concentration with advanced age in calf probably due to enhanced feeding stimulates IGF-I status in growing calf (Bork *et al.*, 2000)**.**

Leptin

The decline in the circulating concentrations of leptin after birth may be of physiological advantage to preterm and term newborns by limiting their body energy expenditure and conserving nutritional reverses for subsequent growth and development. In dam, Lactation in many species is associated with marked loss energy through the milk, which can not be fully compensated by food intake (Macajova et al, 2004). During pregnancy, particularly in later pregnancy, plasma leptin levels were increased (Tamura et al 1998), and decreased sharply after delivery. This is in accordance with some trials with lactating cows (Block et al, 2001) when plasma leptin concentration were reduced by 50% after parturition.

Thyroid hormones

In dam ,lower blood T_3 concentration could reduce the rate of oxidation and the rate of continuous breakdown and formation of protein and fat in the most ,if not all mammary tissue (Riis and Madsen,1985). (Paulikov et al,2011)When comparing blood serum concentrations of thyroid hormones of various age categories of cattle, **they** found significant differences in T4 and T3 values with the highest levels in heifers ($p<0.05$). This could be probably related to lower metabolic load in heifers, which is indicated also by their lowest TSH values, although the differences were insignificant. Similarly, newborn calves show high concentrations of thyroid hormones, particularly in the first week of age, with their subsequent decreasing (Leirer and Dreschner, 1983). **Tancin (1991)** investigated concentrations of thyroid hormones in calves within the first six months of age. During the studied period the average concentration of T4 in the blood serum of calves ranged from 18.753 (1st day) up to 4.782 µg.dl-1 (63rd day) with the highest concentration of T4 the first day of life. Similarly, the average concentration of T3 ranged from 9.237 (1st day) up to 0.904 ng.ml-1 (118th day). In another study with newborn calves, Egli and Blum (1998) reported typically high levels of thyroid hormones at birth, which first rapidly and then more slowly decreased from day 0 to day 28.

Conclusion

We can affirm that although blood biochemical parameters , electrolytes and hormones concentrations are rarely influenced by age in the adult animals, in the neonate these are strictly dependent on days of life. Therefore, it is essential that the normal of each species be determined in neonates because this reflects response to changes in homeostasis or disease.

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