

## **NON-SPECIFIC RESISTANCE AND ADAPTIVE CAPABILITIES OF NEW-BORN CALVES, BORN BY COWS BREED AT DIFFERENT TECHNOLOGICAL REGIMES**

**Yanislav Iliev**

*University of Forestry, Faculty of Veterinary medicine, Sofia, Bulgaria  
E-mail: pankaj.chakraborty@cvasu.ac.bd*

### **ABSTRACT**

The dynamics of ACTH, cortisol, protein fractions and lysozyme activity of blood were studied from calves during the first 30 days of their postnatal life, their adaptability and natural resistance are determined by the functional state of the mother's organism during pregnancy and lactation in connection with the technologies of management. It was found, that the hormonal status, natural resistance and adaptability of the new-born calves is different related to the technological regime with the cows during pregnancy period.

**Key words:** non-specific resistance, newborn calves, hormonal activity, adaptive capabilities.

### **Introduction**

The new technologies applied in animal production are characterized by various technological factors: some of them are normal physiological stimuli and other are stress factors (Dobson at al., 2000; Arnold at al., 2007; Iliev at. al. 2008; Broucek, 2014; Gudev at al., 2014). The organism reacts by operated on the neurohumoral regulatory mechanisms which are responsible for their homeostasis and immunological state. In a number of case the effect of the technology on the mother's organism during pregnancy and parturition affects to a high extent the physiological status of the fetus, growth and development of the new-born, its resistance, morbidity and death rate (Tomov, 1986, Blum at al., 2000).

### **Materials and methods**

The experience was carried out with 28 new-born calves, born by cows of the Black and White breed, in their 2-nd lactation, reared at two different regimen: I<sup>st</sup> group - tied in stalls and II<sup>nd</sup> group - free in boxes, were carried out by the principle of the analogs. All calves stayed with the mother's for 24 hours after birth. Then they were moved in separate boxes placed in an open yard (individual-box system in the open) fed with total colostrum.

The hormonal status of calves was investigated by determining the plasma concentration o the ACTH and cortisol, content with radio immunological test: ACTH by Ria Mat, cortisol by STERON-K-1257.

The dynamics of the lysozyme activity in blood serum and colostrums (milk) from mother's and the protein fractions of blood, from calves were recorded from the moment of birth to the 30<sup>th</sup> day.

### **Results**

The quantitative results for ACTH, cortisol, lysozyme and protein fractions of blood are shown on figures 1 and 2, as and Table 1.

ACTH level on the day of birth was higher in the calves born by cows kept tied in stalls – 1<sup>st</sup> group, (32,9 +2,5 pg/ml) and significantly lower in the 2<sup>nd</sup> group (19,6+6,5 pg/ml).

The difference between I<sup>st</sup> and II<sup>nd</sup> group of calves up to the 5<sup>th</sup> day p.p. is significant ( $P > 0,99$ ).

From the 12<sup>th</sup> day on this difference is not significant ( $P > 0,95$ ). This index becomes stable in aspect of age in the two groups (14,7±1,9pg/ml 1<sup>st</sup> group, and 14,6±2,5 pg/ml 2<sup>nd</sup> group). This tendency is observed up to the 30<sup>th</sup> day p.p.

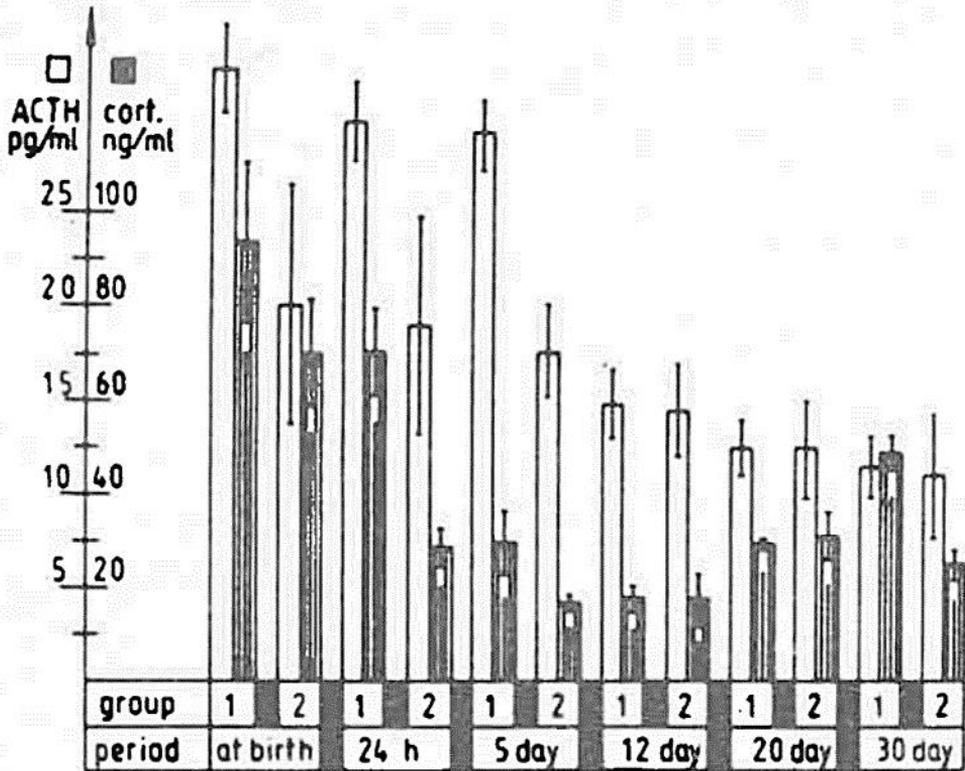


Figure 1: ACTH (pg/ml) and cortisol (ng/ml) content of calf blood plasma.

The cortisol concentration values change different, in the two groups of calves. At birth the cortisol values in calves born by cows kept tied in stalls and free in boxes are respectively 94,0±17,9 ng/ml and 69,6±12 ng/ml. This difference is most evident on the 24<sup>th</sup> and 5<sup>th</sup> day p.p. and is statistically significant ( $P > 0,99$ ). Significant reduction in the cortisol values is observed up to the 12<sup>th</sup> day p.p. and after the 20<sup>th</sup> day – a small increase explained by age dependent factors.

The data for the age dependent dynamics of protein fractions of blood show that after birth most significant change are observed in globulins and albumins. After first intake of colostrums an increase in the different globulin fractions, especially the  $\gamma$ -globulins is observed. Its values reach their maximum at the 24<sup>th</sup> hour p.p. followed by reduction which remains almost unchanged until the end of the study period (Tabl. 1).

Table1: Protein fractions (%) in blood serum of calves

Induces	At birth	24 <sup>h</sup> h	5 <sup>th</sup> day	12 day	20 <sup>th</sup> day	30 <sup>th</sup> day
	$\bar{x} \pm S \bar{x}$					
<b>I group</b>						
Alb.	46,11*±2,10	33,27*±2,70	31,15*±1,30	37,75*±1,60	40,30*±1,10	44,90*±2,05
$\alpha$ -glob.	28,07*±1,27	20,40*±1,65	20,90*±1,15	22,10*±1,20	21,90*±1,20	22,70*±1,70
$\beta$ -glob.	19,47*±0,70	21,10*±1,20	23,50*±1,90	21,60*±1,70	18,90*±1,30	16,30*±1,10
$\gamma$ -glob.	4,55*±0,90	26,30*±2,10	24,40*±1,50	19,30*±0,90	18,40*±0,70	17,80*±1,25
<b>II group</b>						
Alb.	42,95*±2,90	30,64*±1,80	26,70**±1,15	30,84**±1,60	35,75*±1,70	39,80*±2,30
$\alpha$ -glob.	27,30*±1,6	19,50*±1,70	17,35*±1,40	18,45*±1,50	17,90*±2,15	18,85*±1,50
$\beta$ -glob.	21,70*±1,95	2,40*±1,70	26,80*±2,10	18,4*5±1,50	17,90**±2,15	18,85**±1,50
$\gamma$ -glob.	5,8*3±0,80	28,20*±2,40	27,9*5±2,10	24,50*±1,90	22,30**±1,30	21,40**±1,65

$P < 0,05^*$ ;  $P < 0,01^{**}$ .

Lowest values of the lysozyme activity are recorded on the day of birth in the two groups, before the first intake of colostrum. At the 24<sup>th</sup> hour increase in lysozyme values is determined in the two groups of calves respectively with 50% and 95%. In the following experimental period the tendency towards increasing the values of serum lysozyme keeps permanent but it is more significant in the II<sup>nd</sup> group ( $P > 0,99$ ), where on the 30<sup>th</sup> day its value reach of  $0,12 \pm 0,01 \mu\text{g/ml}$  (Fig. 2). Highest value of lysozyme in colostrum of cows kept by different technology regime were recording on the day of birth and during the first 24 hours after birth –  $0,180 \pm 0,02 \mu\text{g/ml}$  (I<sup>st</sup> group) and  $0,220 \pm 0,02 \mu\text{g/ml}$  (II<sup>nd</sup> group) followed by on obvious decrease with 31–32% in the two groups at the end of the colostrum period (5<sup>th</sup> day).

day p.p.

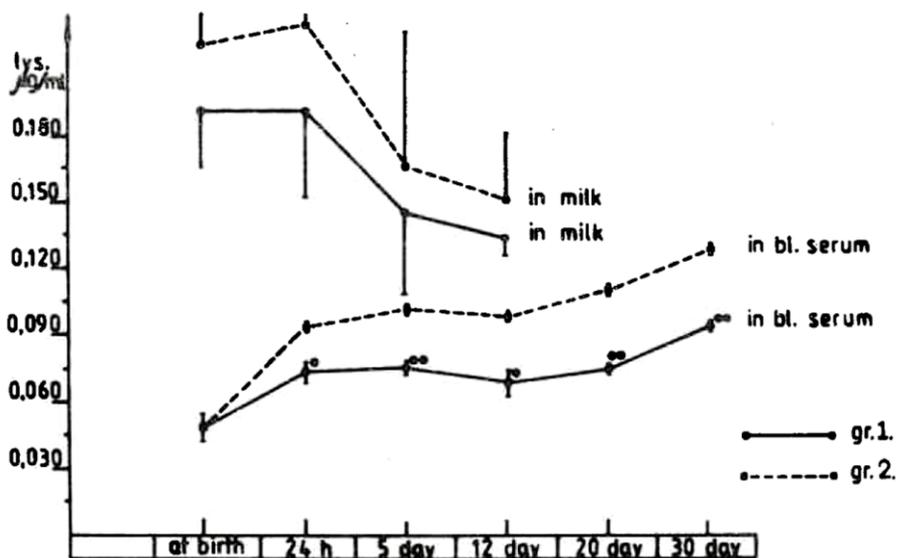


Figure 2: Lysazym activity in colostrum (milk) from cows ( $\mu\text{g/ml}$ ) and in calf blood serum.

At the end of the experiment (12<sup>th</sup> day) the activity of lysozyme in milk reaches  $0,130 \pm 0,01$   $\mu\text{g/ml}$  (I<sup>st</sup> group of cows), and  $115 \pm 0,03$   $\mu\text{g/ml}$  (II<sup>nd</sup> group of cows), which values characterize the later part of lactation period.

### Discussion

The observed differences in the natural (non-specific) resistance during the first 30<sup>th</sup> days of the post-natal development of the both groups of calves should be connected with the functional interrelation between the factors of the natural resistance and the adaptability of the organism evaluated on the basis values of steroid hormones variations. The higher ACTH and cortisol concentration in calves from I<sup>st</sup> group during the first 5 day p.p. is the probable reason for the lower  $\gamma$ -globulin content and lysozymic activity of blood (Stott, 1980). The new born calves are characterized with decreased immunobiological activity which is expressed in a lack or insignificant action of the natural defensive mechanisms. It is suggested that the observed differences are a result mainly from the biological qualities of the mother's colostrum – content of some biologically active substances (immunoglobulins, lysozyme, vitamin A, C etc) (Antonius at al., 2000, Rauprich at al., 2000; Georgiev, 2005; Blum, 2006).

The determined increased ACTH and cortisol concentrations in blood plasma from I<sup>st</sup> group calves compared to the II<sup>nd</sup> group in the first days after birth, probably are result not only from the parturition stress but also from the saturation of the mother's organism with hormones at the end of pregnancy and during parturition, when the possibilities for penetration of the steroid hormones through the placental barrier increase as well as a result of the intake from the new-born calves with the colostrums.(Mallard at al., 1998, Sangild, 2003, Tomov at al., 2007).

### Conclusion

By analysis of the obtained quantitative and qualitative data can be concluded that:

The hormonal status of the new-born calves is different related to the technological regime with that of the cows during pregnancy. Calves borne by cow's with low mobile activity, possess higher ACTH and cortisol contents in the blood, compare to these born by stall-free kept mother's.

The natural resistance and adaptability of the new-born calves ( $\beta$  and  $\gamma$ -globulins and lysozyme activity) are in a direct functional relationship to the technological regime of rearing, as well as the biological qualities of colostrum (milk).

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