AGGREGATION OFBASIC REGULAR BLOOD ELEMENTS IN

CALVES OFMILK FEEDING

ABSTRACT

Aim - to find out aggregation activity of regular blood elements of calves during the phase of milk feeding. There was formed a group of calves of black-many coloured breed which were examined five times at the age between the 11th and the 30th days of life with the usage of biochemical, hematological and statistical methods of investigation. The farm "Kolos" of Fatezh district in Kursk region, Russia, spring of 2014. The work was conducted with the help of 39 calves of black-many coloured breed, taken into investigation on the 11th day of life. Examination was made on the 11th, 15th, 20th, 25th and 30th days of calves' life. We estimated the intensity of lipids' peroxidation in plasma, aggregation of erythrocytes, platelets and neutrophils. During the phase of milk feeding the calves were noted to have a tendency to the increase ofspontaneous aggregation of erythrocytes. It could be judged by a light tendency to the increase of summary quantity of erythrocytes in an aggregate, quantity rise of aggregates themselves and number lowering of disaggregated erythrocytes. All the calves during milk feeding were noted to have a tendency to strengthening of platelets' aggregation. So, on the 11th day of life their period of AP development under collagen impact was equal to 30.7±0.12s, decreasing to some extent during investigation. Analogical AP state of healthy animals was noted for ADP (to the

22   end of the phase 38.1±0.15s) and rhystomicin (to the end of the phase

23   46.2±0.17s). In later period there developed thrombin and adrenalin AP, also

24   having a tendency to light acceleration during investigation and being equal to

25   its end to 51.3±0.18s and 98.0±0.34s, correspondingly. During the phase of milk

26   feeding the calves were also noted to have a little tendency to strengthening of

27   neutrophils' aggregation. So, their neutrophils' aggregation during investigation

28   rose with lectin on 4.6%, with concanavalinA - on 6.4%, with

29   phytogemagglutinin - on 3.2%. During the phase of milk feeding the calves

30   were noted to have a little tendency to strengthening of lipids' peroxidation in

31   plasma. The calves of the age of 11-30 days of life were found to have little

32   strengthening of regular blood elements' aggregation.

35   **1. INTRODUCTION**

36   In a living body blood, consisting of regular elements and plasma, continuously

37   circulates along vessels [1]. It provides gas exchange and delivery of nutrients

38   and biologically active substances to tissues [2,3], and also removal of

39   metabolic products out of them [4,5]. The efficiency of hemocirculation,

40   especially in microcirculation system, mostly depends on regular blood

41   elements' aggregation [6,7]. Its evidence is under constant control from a

42   vascular wall [8,9]. It was noted that surplus aggregation of erythrocytes,

43   platelets and leucocytes can break metabolic processes in a body [10,11]. In this

44 connection we find to be very urgent the estimation of the degree of regular

45 blood elements' aggregation in calves at the beginning of their ontogenesis - in

46 the phase of milk feeding [12]. Given investigations are important for both

47 fundamental science and practice as abnormalities in the processes of

48 aggregation and disaggregation in blood play essential role in pathogenesis of

49 many diseases [13,14]. Both physiology of animals and veterinary science need

50 precisely adjusted normative indices of basic regular blood elements'

51 aggregation [15]. These norms are necessary for the estimation of dynamics of

52 cattle state, including calves of milk feeding in case of application of various

53 impacts on their bodies [16].

54

55 The following aim was put in our investigation - to find out aggregation activity

56 of regular blood elements in calves during the phase of milk feeding.

57 **2. MATERIALS AND METHODS**

58 The work was conducted with the help of 39 calves of black-many coloured

59 breed, taken into investigation on the 11th day of life. Examination was made

60 five times during the phase of milk feeding - on the 11th, 15th, 20th, 25th and

61 30th days of life.

62

63 The activity of the processes of lipids' peroxidation (LPO) in plasma was

64 estimatedby the content of thiobarbituric acid (TBA)-active products with the

help of a set "Agat-Med" and acylhydroperoxides (AHP). Antioxidant potential

of liquid part of blood was defined by its antioxidant activity (AOA) [17].

The evidence of erythrocytes' aggregation was defined with the help of a light

microscope in Gorjaev's box. We registered the quantity of erythrocytes'

aggregates, the number of aggregated and disaggregated erythrocytes [18].

Platelets' aggregation (AP) was estimated with the help of visual micromethod

of AP estimation [19] with the usage of ADP (0.5×10^{-4} M), collagen (dilution

1:2 of basic suspension), thrombin (0.125 un/ml), rhystomicin (0.8 mg/ml) and

adrenalin (5.0×10^{-6} M) in rich in platelets plasma with standardized platelets'

quantity 200×10^{9} tr. Activity of neutrophils' aggregation was estimated with the

help of a photoelectrocolorimeter. As inductors we used lectin of wheat foetus

in a dose of 32 mkg/ml, concanavalinA - 32 mkg/ml and phytogemagglutinin -

32 mkg/ml. Statistical processing of received results was made by Student's t-

criterion.

3. RESULTS AND DISCUSSION

Examined calves were noted to have small LPO activity of plasma with alight

tendency to strengthening during the period of investigation - the content of

AHP in it rose from 1.44 ± 0.17 D_{233}/1ml to 1.47 ± 0.25 D_{233}/1ml, TBA-active

products - from 3.59 ± 0.15 umol/lto 3.64 ± 0.28 umol/l. It was accompanied by a

87   tendency to some weakening of plasma AOA from 33.5±0.38% on the 11th day

88   of life to 33.0±0.34% on the 30th day of calves' life.

89

90   During the phase of milk feeding the calves were noted to have unexpressed

91   tendency to the rise of spontaneous erythrocytes' aggregation. It could be judged

92   by a light tendency to the increase of summary erythrocytes' quantity in an

93   aggregate (on 1.9%), quantity rise of aggregates themselves (on 2.4%) and

94   number lowering of disaggregated erythrocytes (on 2.2%) (table).

95

96   All the calves during milk feeding were noted to have a tendency to

97   strengthening of platelets' aggregation. So, on the 11th day of life their period of

98   AP development under the impact of collagen was equal to 30.7±0.12s,

99   decreasing to some extent during investigation. Analogical AP state of healthy

100   animals was noted for ADP (to the end of the phase - 38.1±0.15s) and

101   rhystomicin (to the end of the phase - 46.2±0.17s). In later period there

102   developed thrombin and adrenalin AP, having also a tendency to light

103   acceleration during investigation and being equal to its end to 51.3±0.18s and

104   98.0±0.34s, correspondingly (table).

105   During the phase of milk feeding the calves were also noted to have a small

106   tendency to strengthening of neutrophils' aggregation. So, during investigation

107   their neutrophils' aggregation rose with lectin on 4.6%, with concanavalinA - on

108   6.4%, with phytogemagglutinin - on 3.2% (table).

109   The consumption of milk and beef by the population of the planet increases, and

110   it dictates the necessity of constant development of this agricultural branch. It

111   can be achieved in the result of continuation of active scientific investigations of

112   cattle physiology [15]. In this connection special significance is given to

113   investigations of calves' blood physiology at the beginning of ontogenesis [20].

114   So, great attention is devoted to investigations of calves preparing for the

115   beginning of vegetable feeds' consumption. In our work the calves were noted

116   to have gradual strengthening of plasma AOA at the age between the 11th and

117   30th days of life which was accompanied by gradual weakening of LPO

118   activity. Found facts were supported by the results of earlier investigations [21].

119   It is known that intensity of freely-radical processes in plasma influences

120   significantly the morphofunctional state of erythrocytes, platelets and

121   leucocytes [22,23]. It can explain found in calves at milk feeding small ability

122   to aggregation of basic regular blood elements.

123

124   It is evident that in the basis of small activity of erythrocytes' aggregation in

125   calves at milk feeding mostly lies the great quantityof electronegative proteins

126   on the surface of erythrocytes [24]. High control over generation of oxygen

127   active forms in calves provides minimization of oxidative damages of

128   membrane erythrocyte proteins and globular plasma proteins, participating in

129   aggregation [25]. In this connection we can consider that the phase of milk

feeding of calves is characterized by optimum of metabolic and receptor processes in erythrocytes.

Noted in calves during the phase of milk feeding tendency to strengthening of platelets' aggregative activity is connected with activity increase of their receptors and postreceptor mechanisms of aggregation. Evidently, in calves' blood at the age of 11-30 days gradually rises concentration of Willybrand's factor - cofactor of platelets' adhesion. It is accompanied by weak number increase of receptors to it - (GPIb) on platelets' surface. It was pointed in calves by a tendency to decrease of AP period in response to rhystomicin. Found AP dynamics in response to strong and weak agonists of aggregation can be explained by physiologically approved activity changes of platelet phospholipase A_2 and C. They provide functioning of thromboxan and phosphoinositol ways of platelets' activation [26,27].

A tendency to growth of neutrophils' aggregation at calves' age of 11-30 days was, evidently, connected with the rise of sensitivity and density of leucocytes' glycoprotein receptors. It happens simultaneously with changing of their composition. Gradual strengthening of lectin - and concanavalin A - induced neutrophils' aggregation in experimental calves was provided by expression increase of adhesion receptors on their surface and by some growth of areas containing N-acetyl-D-glucosamine, N-acetyl-neuraminic acid and mannose.

152   Strengthening increase of aggregation induced by phytogemagglutinin in calves

153   between the 11th and the 30th days of life was provided by a tendency to the

154   rise of areas of glycoproteins, containing bD-galactose [11[, in their neutrophils'

155   receptors.

156

157   Noted strengthening of aggregative activity of erythrocytes, platelets and

158   neutrophils in calves during the phase of milk feeding was mostly caused by

159   processes of growth and strengthening of environmental impacts on their

160   background [21]. Sufficient activity of adaptive mechanisms in these conditions

161   keeps the balance of aggregation and disaggregation in calves' blood on the

162   level necessary for optimum of blood supply of internal organs [25].

163

164   **4. CONCLUSION**

165   During the phase of milk feeding the calves were noted to have a small

166   tendency to strengthening of lipids' peroxidation in plasma. The calves at the

167   age of 11-30 days were found to have little strengthening of regular blood

168   elements' aggregation.

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258 **Table. Aggregation of blood elements in calves of dairy nutrition**
259

Registrated parameters	Age of calves (n=39, M±m)				
	11 days	15days	20 days	25 days	30 days
sum of all the erythrocytes in an aggregate	40.1±0.19	40.2±0.24	40.4±0.29	40.6±0.25	40.9±0.32
quantity of aggregates	8.2±0.12	8.2±0.10	8.3±0.16	8.4±0.19	8.4±0.11
quantity of free erythrocytes	245.7±2.19	244.2±2.25	241.8±2.01	242.0±1.90	240.4±2.46
AP with ADP, s	39.2±0.16	39.0±0.12	38.7±0.13	38.4±0.10	38.1±0.15
AP with collagen, s	30.7±0.12	30.5±0.10	30.3±0.09	30.1±0.11	29.7±0.14
APwiththrombin, s	52.7±0.15	52.6±0.10	52.2±0.16	51.7±0.10	51.3±0.18
APwithristomycin, s	47.5±0.12	47.2±0.16	46.9±0.22	46.6±0.26	46.2±0.17
APwithepinephrine, s	97.8±0.42	97.4±0.36	97.1±0.32	98.5±0.45	98.0±0.34
Aggregation neutrophilswithlectin, %	14.5±0.16	14.5±0.17	14.7±0.15	14.9±0.26	15.2±0.22
Aggregation neutrophilswithconcanavalin A, %	14.5±0.10	14.6±0.12	14.9±0.16	15.1±0.11	15.5±0.13
Aggregationneutrophils withphytohemagglutinin, %	27.1±0.19	27.2±0.23	27.4±0.14	27.8±0.26	28.0±0.21

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