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Physiological Features Of Hemo-coagulation In Sows During Sucking.

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ABSTRACT

The natural course of processes of ontogenesis in the conditions of the available medium is inevitably associated with a physiologically conditioned dynamics of the state of all life processes in the body, including coagulation hemostasis. It is now recognized that ontogenetic changes in the functional characteristics of the blood coagulation system in living organisms are one of the very important physiological mechanisms of maintaining homeostasis and ensuring the adaptation of their organism to the external environment throughout life. Considering the serious scientific and practical significance of revealing aspects of age dynamics of coagulation hemostasis functionality in suckling sows and the scarcity of information about it in the literature, the present study was planned and conducted. The aim of the study is to evaluate the dynamics of blood plasma coagulation activity in sows during the sow. It was found out that the sows gradually increase antioxidant protection of the plasma in the course of the physiologically flowing suction, and the quantity of products of lipid peroxidation decreases in it. At the same time, weakening of the activity of all clotting factors occurs in sapling sows. This leads to the exit of both ways of hemocoagulation to a lower level of functioning than at the time of farrowing, ensuring the transition of their homeostasis to the level necessary for this stage of ontogeny. Thus, for healthy suckling sows, the gradual weakening of the clotting factor increased at the moment of farrowing and the inhibition of hemocoagulation in general coagulation tests are typical, which can be considered as an important element of their adaptation to this stage of ontogeny.

Keywords: blood, blood clotting, sows, suction, physiology.

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INTRODUCTION

The system of hemostasis is a complex system that provides a liquid state of blood in the lumen of the vessel, and if it is damaged, its rapid folding to stop bleeding [1, 2]. Of great importance in this system are the mechanisms of hemocoagulation [3, 4], which supplement the physiologically significant aggregation of the cellular elements of the blood [5,6,7], especially the platelets [8, 9] and their haemostatic reactions [10, 11]. The natural course of processes of ontogenesis in the existing environmental conditions is inevitably associated with a physiologically conditioned dynamics of the state of all life processes in the body, including coagulation hemostasis [12, 13]. It is now recognized that ontogenetic changes in the functional characteristics of the blood coagulation system in living organisms are one of the important physiological mechanisms for maintaining homeostasis and ensuring the adaptation of their organism to the environment throughout life [14, 15]. Considering the serious scientific and practical significance of revealing aspects of age dynamics of coagulation hemostasis functionality in suckling sows and the scarcity of information about it in the literature, the present study was planned and conducted.

The aim of the study is to evaluate the dynamics of blood plasma coagulation activity in sows during the sow.

MATERIALS AND METHODS

The research was conducted in strict accordance with ethical principles established by the European Convent on protection of the vertebrata used for experimental and other scientific purposes (adopted in Strasbourg in March, 18th, 1986, and confirmed in Strasbourg in June, 15th, 2006), approved by the Local Ethics Committee of K. I. Skryabin Moscow State Academy of Veterenary Medicine and Biotechnology (record №14, dated December, 1st, 2015), the Local Ethics Committee of Russian State Social University (record №11, dated December, 4th, 2015), the Local Ethics Committee of Peoples Friendship University of Russia (record №11, dated December, 4th, 2015) and the Local Ethics Committee of All-Russian Scientific Research Institute of Physiology, Biochemistry and Animals' Nutrition (record №11, dated December, 4th, 2015).

The study included 40 healthy large white sows, examined at the time of farrowing after 2-3 pregnancies and on the 6th, 12th, 18th and 26th day of the suckling. In animals, the activity of lipid peroxidation (LPO) of plasma on the level of acyl hydroperoxides and thiobarbituric acid-active products was estimated by the Agat-Med (Russia) production kit [16]. All animals evaluated the antioxidant activity of the liquid part of the blood [16]. The functional activity of a number of clotting factors (I, II, V, VII, VIII, IX, X, XI, XII), the duration of activated partial thromboplastin time, prothrombin and thrombin time was revealed [17]. Statistical processing of the results was carried out by Student's t-test.

RESULTS OF INVESTIGATION AND THEIR DISCUSSION

From the time of farrowing to the end of lactation, the sows noted a tendency to increase the antioxidant activity of plasma from 43.8% to 0.19% to 45.8% to 0.07%. This was accompanied by a decrease in the activity of plasma lipid peroxidation. Thus, the concentration of its primary products -acyl hydroperoxides decreased from $1,28 \pm 0,07$ D₂₃₃/1ml to $1,14 \pm 0,03$ D₂₃₃/1ml, and the level of its secondary products - thiobarbituric acid-active compounds decreased from $2.65 \pm 0,05$ umol/l to 2.43 ± 0.08 umol/l.

In the case of suckling sows, a gradual decrease in the activity of all detectable clotting factors (Table) was found, reaching a minimum at the end of the observation.

The state of coagulation tests revealed in the animals observed was a reflection of the dynamics of the activity of individual coagulation factors in them during the observation period (Table). Thus, the duration of activated partial thromboplastin time began to slow down already from 6 days of suckling (25.8 ± 0.06 s) and was 28.6 ± 0.04 s before weaning. At the same time, prothrombin time in the animals included in the study also experienced inhibition, reaching a level of 12.6 ± 0.03 s by the day of 26 days. The duration of thrombin time, reflecting the intensity of the transition of fibrinogen to fibrin, in sows increased from the farrowing period on the 26th day of the suction to 13.0 ± 0.02 s.

Table: Activity of hemocoagulation in sows during the sow

Indicators of hemocoagulation	Pump sows, n=40, M±m				
	farrow	6 days of suction	12 days of suction	18 days of suction	26 days of suction
Coagulation factor I, g/l	4.5±0.05	4.4±0.03	4.2±0.07 p<0.05	4.0±0.02 p<0.05	3.8±0.05 p<0.05
Coagulation factor II, %	84.6±0.10	82.2±0.14	81.0±0.07	79.9±0.09 p<0.05	78.8±0.03 p<0.05
Coagulation factor V, %	107.8±0.19	105.2±0.26	103.4±0.10 p<0.05	100.1±0.06 p<0.05	98.2±0.07 p<0.05
Coagulation factor VII, %	86,3±0,05	85,8±0,19	84,7±0,15	83,7±0,08	82,8±0,10 p<0,05
Coagulation factor VIII, %	126.3±0.07	123.5±0.02	121.3±0.04	119.8±0.05 p<0.05	117.6±0.03 p<0.05
Coagulation factor IX, %	105.2±0.19	104.1±0.16	102.8±0.22	101.0±0.17 p<0.05	99.1±0.23 p<0.05
Coagulation factor X, %	80.6±0.16	79.0±0.10	77.6±0.03	74.3±0.10 p<0.05	72.4±0.04 p<0.05
Coagulation factor XI, %	109.9±0.12	108.3±0.10	106.4±0.05 p<0.05	105.1±0.16 p<0.05	104.9±0.24 p<0.05
Coagulation factor XII, %	111.7±0.19	109.1±0.20	107.3±0.13	105.2±0.24 p<0.05	103.6±0.30 p<0.05
Activated partial thromboplastin time, s	25.1±0.12	25.8±0.06	26.8±0.06	27.5±0.07 p<0.05	28.6±0.04 p<0.05
Prothrombin time, s	10.2±0.07	10.7±0.07	11.3±0.08	11.9±0.04	12.6±0.03
Thrombin time, s	10.0±0.12	10.7±0.06	11.6±0.05	12.1±0.04 p<0.05	13.0±0.02 p<0.05

Legend: p - reliability of the dynamics of the measured indicators during the observation in comparison with the farrowing day.

It was found that for suckling healthy sows, some increase in the antioxidant activity of plasma is characteristic, causing a gradual weakening of lipid peroxidation in it. Apparently, this is one of the mechanisms for restoring their body after farrowing and adaptation to sucking. These changes help maintain optimal metabolism in the walls of blood vessels and liver tissue [18,19] and favorably affect the level of synthetic processes in all internal organs of the animal [20,21]. The found dynamics of the clotting system is a consequence of the influence on the animal organism of internal physiological mechanisms and available environmental factors [22-25]. The slowing of prothrombin time in sows reflected the weakening of the mechanisms of initiation of plasma hemostasis along the external pathway. This was due to a decrease in the intensity of formation and activity in the lactating sows, which triggers the coagulation of thromboplastin [26-32]. The physiological processes under consideration in many respects provide for sucking sows the level of fluid properties of blood necessary for this stage of their ontogenesis and the intensity of perfusion of internal organs. Achieved in these conditions, the optimality of metabolism in the tissues of the uterus and mammary glands of the animal contributes to the preparation of the animal for a new pregnancy. The revealed slowing of the activated partial thromboplastin time reflected a decrease in activity in the sows of the mechanisms of the internal coagulation pathway. The gradual increase in the activity of the first and second factors of coagulation inevitably led to the acceleration of thrombin time, which was an additional physiological mechanism for ensuring the adequate functioning of the system of coagulation and maintenance of homeostasis in the sow organism [33-35].

CONCLUSION

The increase in the antioxidant protection of the liquid portion of blood in sows during the suction reduces the intensity of lipid peroxidation processes in their plasma. For suckling sows, the gradual weakening of the functional activity of coagulation hemostasis is typical. The weakening of the intensity of coagulation hemostasis found in sows during lactation is undoubtedly part of the overall adaptation process in their body at this stage of ontogeny.

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