
Content of amino acids in blood serum in sows with idiopathic hipogalaxy

Viorica GURDIS

State Agrarian University of Moldova

www.victoria@mail.ru

Abstract

Hipogalaxy is the result of some pathological processes occurred in gestation which are manifested by hormonal deviation and deviation of some metabolic processes. A particular content of amino acids is necessary for a normal vital activity of the body and an adequate metabolism. By this experiment it was observed the influence of amino acids over the lactation. The results of amino acids screening in sows attest that their values in hypogalactic sows are different from those of the animals with a normal lactation by the reduced content of cysteine and tryptophan in the serum and the content of tyrosine significantly increased. The achieved results can be indicated for the precocious diagnosis of hipogalaxy.

Key words: *hipogalaxy, tryptophan, cysteine, tyrosine, postpartum, lactation.*

Introduction

From the physiological point of view the hipogalaxy represents the final result of some pathological processes during the gestation which are manifested by the hormonal deviation of hypothalamic-pituitary axis and of some metabolic processes. Keeping a particular balance of amino acids in the body represents the necessary condition which ensures both the metabolic balance and the optimal galactopoiesis. That is why keeping the functional stability of metabolic processes in the body represents the basis without which any complex therapy cannot bring positive results [5,7,8]

For a normal vital activity of the body and an adequate metabolism it is necessary a particular qualitative and quantitative content of amino acids. Amino acids in the body constitute the main layer which ensures the synthesis of proteins, enzymes, purines and pyrimidines, biologically active compounds of peptide origin and other compounds. If necessary, the amino acids can serve as the energy source by the oxidation of their carbonic components [9,10].

A special interest in the regulation of vital processes represents the tyrosine which is a semi-essential amino acid which forms by the hydroxylation of phenylalanine. From the tyrosine there are synthesized thyroid hormones, it can constitute the glucose source or fatty acids and melanin.

Cysteine, whose predecessor is methionine, participates to the formation of adrenocorticotrophic hormone, insulin and glutathione. Recently it was found that from the cysteine there is formed cysteamine which has a protective role against the ionized radiation. At its turn, the cysteine is the precursor of oxytocin hormone which stimulates the contraction of myoepithelial cells of mammary glands increasing the pressure in the galactofore channels and in this way facilitates the elimination of milk.

Tryptophan represents an amino acid which serves as the predecessor of serotonin, nicotinic acid and melatonin. The tryptophan is in the composition of α – lactoalbumin which is in the cells of mammary glands and participate to the synthesis of lactose as a component (B Protein) of the enzymatic system which is specific for the lactogenic mammary glands. The insufficiency of tryptophan is manifested by anemia, female and male sterility and in young people affects the nervous system in the situation of hereditary disorders their metabolism [9,11].

Metabolic spectrum of amino acids is in direct connection with the functional condition of cells and it can fully characterize the balance. Our attention was focused on several amino acids which also influence the lactation.

Materials and methods

The researches were made in a farm of pigs where the incidence of hypogalaxy was of 4 %. In the experiment there were include 10 parturient sows (5 sows with normal lactation and 5 hypogalactic sows) in the 2nd and the 3rd lactation. The animals were classified in two equal groups: with normal lactation (I group) and hypogalactic sows (II group). The sows were kept in closed premises and they were fed with feed of complete value according to the technology of 3 phases. It was performed the clinical examination and there were taken blood samples for biochemical analyses for broadcasting, diagnosing and treatment of hypogalaxy which can have success only if the indicators of metabolism are investigated in sows with normal lactation and in hypogalactic sows.

The animals were fed three times a day, water was distributed through the automate trough, the food was in correspondence with the condition and physiological need but there were situations of technological non-compliance (lack of food, feeding with non-correspondent food etc.).

The zoo-hygienic conditions for keeping corresponded to the species and physiological condition of animals.

Results and discutions

Clinical examination provides complex data, aims for the examination of health condition of animals. According to the opinion of some researchers for finding the hypogalaxy syndrome in sows and monitoring the efficacy of the administrated treatment there can also be used successfully the routine clinical indicators which in direct way reflect multiple processes.

General conditions of sows with normal lactation and hypogalactic sows was satisfactory and it was confirmed by the normal values of clinical indicators (T, B, P) which varied within the reference limits, but at the same time in hypogalactic sows it was observed the reduction of appetite, reduced maternal instinct and no interest towards progeny.

Table 1. Clinical indicators

Groups	n	T(°C)	P (contr./minute)	B (movements/min)
		M ± m	M ± m	M ± m
I Sows with normal lactation	10	38,2 ± 0,17	96,3 ± 1,32	26 ± 0,4
II Hypogalactic sows	65	38,5 ± 0,2	94,24 ± 0,92	25 ± 0,8

The values of body temperature, frequency of heart contractions and breath rate are represented in Chart no. 1. Animals which were under supervision, as it was mentioned above were in satisfactory general condition. Body temperature of sows with normal lactation and of hypogalactic sows in average was bigger with 0,3° C in comparison with those with normal lactation. We mention that the values of body temperature registered by us for the investigated sows correspond fully with the information from the literature (1,2).

It is well known the fact that the examination of heart contraction frequency and breath rate is very important in establishing health condition and body reactivity in different extreme conditions. In chart no. 1 it is also seen that the value of heart contraction frequency in both groups

was within the physiological limits. It was a small difference in the limits of calculation error. The heart frequency in researched animals of both groups corresponds to the limits established by other (2, 4).

Respiratory movements in sows of the 1st group were of mixt type, costo – abdominal, rhythmic, symmetric. The frequency of respiratory movements of these animals on the average, per group corresponded to the physiological limits and constituted 26 breaths per minute. The frequency of breath in hypogalactic sows was 25 breaths per minute and it corresponded to the reference limits. Figures shown in chart no. 1 and the indicators of clinical examination show that the hypogalaxy does not influence negatively the general condition of animals, values of body temperature, frequency of heart contractions and breath rate.

The mammary gland in hypogalactic sows had a different aspect. In some sows the mammary glands were rigid, congested, but with flaccid teat. In others, on the contrary they had normal sizes and consistence and were sensible, warm when palpated, skin of purple color. When suckled, pigs suckled actively producing sounds for a long period of time. Often they were trying repeatedly to suckle in more frequent intervals and after suckling they had not become silent. As the consequence of the effort to suckle the teats were traumatized. When milking only some milk drops with normal aspect could be obtained or nothing could be obtained. As the energetic reserves of pigs were decreasing their attempts to suckle also were decreasing and often they migrated to the warmer portions of the box. In comparison with hypogalactic sows, the mammary gland of sows with normal lactation was well developed, turgid condition, slightly sensitive to palpation and when milked there were obtained 1-2 ml of milk.

The average quantity of milk eliminated after a suckling in sows with normal lactation constituted on average 216,5 ml. Gravimetry made to hypogalactic sows show that these animals were secreting and eliminating milk after a suckling on average of 80,67 ml or 2,4 times less in comparison with sows with normal lactation. The quantity of milk which was eliminated by the sows with normal lactation during a suckling varied from 182 g to 240 g, and in hypogalactic sows from 54 g to 119 g.

A special role have the biochemical investigations in appreciating health condition, in this context we established the goal to investigate the level of some amino acids in blood serum of the sows from those two groups. Data in chart no. 2 shows that in hypogalaxy the level of cysteine decreases significantly, being 2 times lower in comparison with the sows with a normal lactation ($21,0 \pm 2,3 \mu\text{mol/l}$ in comparison with $42,7 \pm 3,4 \mu\text{mol/l}$, $P < 0,001$). In all appearances, in hypogalaxy normal processes of transforming methionine are disturbed and as a consequence the synthesis of cysteine is reduced and this fact reduces the synthesis of prolactin and respectively the lactogenesis decreases.

Table 2. Content of cysteine, tyrosine and tryptophan in sows' blood

Indicators	Sows with normal lactation	Hypogalactic sows	P
	M ± m/ lim	M ± m/ lim	
Cysteine ($\mu\text{mol/l}$)	42,7 ± 3,4 (37 -48)	21,0 ± 2,3 (19 – 25)	< 0,001
Tyrosine ($\mu\text{mol/l}$)	52,8 ± 3,2 (46 – 63)	80,3 ± 4,1 (73 – 86)	< 0,001
Tryptophan ($\mu\text{mol/l}$)	39,8 ± 2,6 (36 – 46)	24,5 ± 2,7 (10 – 50)	< 0,001

The content of tyrosine in blood (chart no. 2) in hypogalactic sows (group II) exceeds with 52 % the value registered in sows with normal lactation (group I). It results that in hypogalaxy the synthesis speed of thyroid hormones and dopamine who predecessor is tyrosine is significantly reduced.

A significant place in the nitrogen metabolism is occupied by the content of tryptophan. The data achieved after our investigations (chart no. 1) show that the level of tryptophan in blood of hypogalactic sows is with 15,3 $\mu\text{mol/l}$ lower in comparison with those from the I group with a normal lactation. Thus, we find in hypogalactic sows the absence of correlation between the dynamics of the tyrosine and tryptophan level in blood, fact which eventually can lead to the reduction of prolactin secretion in anterior pituitary gland.

Conclusions

1. General condition of hypogalactic sows was apparently satisfactory but at the same time it was found the reduction of appetite, reduced maternal instinct and no interest towards the progeny.
2. The result of the screening of amino acids in sows show that their values in hypogalactic sows are different from those with a normal lactation by: the content of cysteine and tryptophan in serum is significantly reduced ($P < 0,05$) and the content of tyrosine is significantly increased ($P < 0,05$);
3. Screening of amino acids can be indicated for the precocious diagnosis of hypogalaxy.

Bibliography

1. Бобрик Д.И. Распространение и ранняя диагностика синдрома метрит-мастит агалактия у свиноматок, Ученые записки УО ВГАВМ, т.53 вып.1 2017г
2. Бобрик Д.И., Разуванов С.А. Профилактик синдрома метрит - мастит- агалактия путем проведения коррекции родового акта у свиноматок, Ученые записки УО ВГАВМ, т.53 вып.1 2017г
3. Glock X. T., Bilkei G., The effect of postparturient urogenital diseases on the lifetime , 2005.
4. Гречухин, А. Н. Синдром метрит – мастит – агалактия у свиноматок, Ветеринария, 2009.–No 5.–С.12–14.
5. Krieter, J.; Presuhn, U., Genetic variation for MMA treatment. Züchtungskunde 81, 149-154., 2009.
6. Păcală N., Petroman I., Petroman C., Bencsik I., Dronca D., Nistor E., Cean A., Marin D., Pandur I., Observations on uterine infection frequency, during the puerperium period, in sows. Porc Res 2(1):19-22., 2012.
7. Perle Boyer, DVM; Glen W., Postpartum dysgalactia syndrome in sows Last full review/revision October 2014 by.
8. Preißler, R., Tetens, J., Reiners, K., Looft, H., Kemper, N., Biological pathway analysis for postpartum dysgalactia syndrome in sows via a genome-wide association study. Institute of Animal Breeding and Husbandry, Christian-Albrechts-University, Kiel, Germany., 2014.
9. Trotter N., Easter R. Dietary and plasma branched-chain aminoacids in relation to tryptophan: effect on voluntary feed intake and lactation metabolism in the primiparous sow// Journal of Animal Science.- 1995. V.73.-N. 4.-p. 1086 – 1092.
10. Mavromichalis I, Parr TM, Gabert VM, Baker DH True ileal digestibility of amino acids in sow's milk for 17- day-old pigs. J Anim Sci. 2001 Mar;79(3):707-13.
11. Pozzi, P.S.1 and Alborali, G.L. Reproductive diseases in sows (*Sus scrofa domestica*): A Review 2Israel Journal of Veterinary Medicine Vol. 67 (1) March 2012