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DISSEMINATION, ETIOLOGY, PATHOGENESIS AND TREATMENT OF COWS PUERPERAL METRITIS

У статті відзначено вивчені закономірності гормональних показників в організмі корів, хворих на гострий післяродовий метрит. Встановлена залежність кількості прогестерону і естрадіолу від стану яєчників. Проведене оцінювання різних методів лікування хворих тварин, що включає використання ізатизону, новокаїну, АСД-Ф-2, іхтіолу, естрофану, сурфагону, ФСГ і фолікуліну. Встановлено, що застосовані препарати призводять до позитивних змін біохімічних і морфологічних показників крові, сприяють швидкому одужанню тварин і знижують розміри неплідності.

Ключові слова: прогестерон, естрадіол, метрит, ізатизон, гормони, заплідненість

Statement of the problem. Puerperal metritis is a common pathology of postpartum cows. It causes symptomatic infertility, decreased milk production, premature culling and significant economic losses [1–3].

Analysis of recent research and publications. Domestic science and production practice developed and recommended many treatments methods for cows with puerperal metritis. Most of them are based on the application of local antimicrobial drugs [9]. But genital inflammation in cows often develops due to metabolic nervous or endocrine disorders that have to be taken into account while developing treatments options [10–12].

So, the problem of metritis in cows is not new, but many questions about the etiology and pathogenesis of the disease have not been studied. It makes it difficult to establish early diagnosis and to tamely elaborate treatment and prevention options.

The main purpose of research is to study the spread, etiology and pathogenesis of acute postpartum metritis in cows and to evaluate the complex treatment methods that are used at this pathology.

Materials and methods of the study. The studies were conducted at four farms in the Kiev region. There were used the cows of black-and-white breed, 3 to 10 years old with an average yearly milk production 3200–6500 kg. There were conducted clinical studies and 73 blood samples of healthy and diseased cows with metritis were analyzed.

The blood was analyzed for total protein content – refractometrically by the Rice method; the total amount of immunoglobulins – fotoelectrokalorimetrically (the reaction with 18 % sodium sulfite); total calcium – trilonometric method with murexide; the inorganic phosphorus – the method of Doucet; carotene – spectrometric method A. Besseya modified by A.A. Anisova; hormones – by ALISA. White blood cell counts were determined in a chamber with a Gorjaev's grid and leykogramma – on the smears stained with Romanovsky-Giemsa.

Results and discussion. There was found that acute postpartum metritis strike from 10,2 to 72,1 % of the animals. Seasonality was one of the factors that influenced the expansion of metritis in cows. Thus, in winter time 21,4 % of cows were affected, in spring time – 37,8 %, in the summer and fall times the number of metritis cases was significantly reduced to 6,1 and 5,4 %, respectively.

There was found a direct connection between the frequencies of the metritis and the course of the calving. After pathological births in the second stage (removal of the fetus), inflammation of the lining of the uterus was diagnosed in 72,3 % of the animals: after the retained of the placenta – in 80,6%. During the normal calving the metritis was developed in 7,2 % of the cows. In 58,1 % of metritis cases the uterus subinvolution arosed as a complication of the disease.

Inflammation of the uterus mostly(in 88,5 %) was diagnosed on 5–15 day after calving, in 6.3 % of the cows – in the first four days post-partum period, and 5,2 % – after the 15 day.

On rectal examination of cows with acute postpartum metritis, there was found a reduction in the rigidity of the uterus in the form of hypotension and atony. It was established that the metritis develops at a different states of ovarian cycle. Corpora lutea were recorded in 61,0 %, the follicles – in 10,6 %, ovarian hypofunction – in 28,4 % of infected animals.

There was established a decreased amount of total calcium (8,6 %), inorganic phosphorus (17,3 %) and a tendency to lower level of total protein in cows with acute puerperal metritis. In addition, there was recorded a significantly reduced amount of immunoglobulin in the serum of the sick cows, which is indicative of inhibition of humoral factors of nonspecific resistance in the cows. In 32,5 % of patients there was observed hypocarotinemias, which may lead to reduced synthesis of vitamin A and dysfunction of mucosal epithelium of genitals and endocrine glands. The number of leukocytes in the blood of sick cows increased slightly. In the leukogram there was observed simple (regenerative) nuclei shift and increased absolute number of white blood cells.

The results of the immunological studies of blood plasma in healthy animals and cows with acute postpartum metritis indicate significant changes in the state of steroidogenesis (table 1).

Table 1 – **Endocrine indexes of blood plasma in cows**

| Hormones, units | Clinically healthy (n=25) | Patients with metritis (n=18) | p≤ |
|----------------------|---------------------------|-------------------------------|-------|
| Testosterone, pg/l | 424,97±82,180 | 833,20±99,750 | 0,01 |
| Estradiol, nmol/l | 2,38±0,181 | 1,18±0,255 | 0,001 |
| Progesterone, nmol/l | 4,30±0,250 | 5,88±0,320 | 0,001 |
| Cortisol, nmol/l | 7,50±1,200 | 14,20±3,400 | 0,1 |
| Thyroxine, nmol/l | 25,90±1,600 | 32,30±3,100 | 0,1 |
| Insulin, nmol/l | 39,70±10,400 | 17,9±2,600 | 0,05 |

There was found an increased plasma levels of testosterone (up to 96,1 %) and progesterone (up to 36,7 %) in cows with acute form of metritis. At the same time there was a trend to increased concentrations of thyroxine and cortisole while the amount of insulin and estradiol were significantly reduced (p<0,05 and 0,001).

In normal postpartum period P:E ratio was 1,8:1 while during the metritis course – 5:1, which is 2,8 times higher.

It was also found that the amount of the ovarian steroid hormones and their ratio in the plasma of cows with metritis depends on the condition of the ovaries (table 2).

Table 2 – Contents of hormones in the blood plasma of cows with metritis depending on the condition of the ovaries (n = 12)

| State of ovarian | Contents, nmol/l | | P:E |
|------------------|------------------|------------|--------|
| | progesterone | estradiol | |
| Corpus luteum | 5,99±0,560 | 0,58±0,148 | 10,3:1 |
| Follicles | 5,31±0,510 | 1,85±0,402 | 2,9:1 |
| Hypofunction | 4,04±1,080 | 1,79±0,384 | 2,2:1 |

Note: P:E – the ratio of progesterone to estradiol

The progesterone to estradiol ratio in blood plasma of cows with acute puerperal metritis with the corpus luteum in the ovary was the highest (10,3:1). That is 4,7 times more than in cows with ovarian hypofunction and 3,5 times more than in cows that have follicles in their ovaries ($p < 0,001$).

Given the nature of the pathogenesis and clinical manifestations of postpartum metritis in cattle there have been tested various methods of treatment with the use of izatizone, novocaine, ASD-F-2, ichtiole, estrofane, surfagone, FSH and folliculin. The scheme are shown in table 3.

Table 3 – The scheme of the experiment to determine the treatment effectiveness for cows with acute puerperal metritis

| Groups of animals | Number of animals in group | Preparation, method of administration and dose | | |
|-------------------|----------------------------|--|---|-------------------|
| | | intraperitoneally | intrauterine | intramuscularly |
| 1 | 31 | 10 % solution novocaine – 10 ml | izatizone – 50 мл | – |
| 2 | 33 | 10 % solution novocaine – 10 ml | 5 % aqueous solution ASD-F-2 – 150 ml | – |
| 3 | 15 | 10 % solution novocaine – 10 ml | 10 % aqueous solution ichtiole – 150 ml | estrofane – 2 ml |
| 4 | 15 | 10 % solution novocaine – 10 ml | 10 % aqueous solution ichtiole – 150 ml | surfagone – 10 ml |

| | | | | |
|-------------|----|---------------------------------|---|----------------------|
| | | ml | | |
| 5 | 15 | 10 % solution novocaine – 10 ml | 10 % aqueous solution ichtiole – 150 ml | FSH – 50 ml |
| 6 | 15 | 10 % solution novocaine – 10 ml | 10 % aqueous solution ichtiole – 150 ml | folliculin – 4000 IU |
| The control | 17 | 10 % solution novocaine – 10 ml | 10 % aqueous solution ichtiole – 150 ml | – |

Intraperitoneal and intrauterine administration of drugs were performed every 48 hours until recovery of animals. Hormones were administered once, on the first day of treatment.

It was found that in the control group 82,3 % of the animals recovered. The average duration of treatment was $10,7 \pm 0,7$ days, and the multiplicity of therapeutic procedures is 5,2. Insemination rate in cows on the 90 days of the trial was 82,3 %. Duration of infertility per animal in average was $48,3 \pm 11,1$ days.

The effectiveness of cows treatment of the first experimental group was the highest. There were inseminated and recovered 93,5 % of the animals. The average number of therapeutic procedures was 3,5 and the duration of treatment – $6,7 \pm 0,3$ days. Duration of infertility time per cow was $26,5 \pm 5,2$ hours. In the blood of the recovered animals there was found the increasing amount of total protein, total calcium, inorganic phosphorus, immunoglobulins. The red and white cell blood count returned to normal values.

In the second group there were inseminated and recovered 84,9 % of the cows. There were applied 4,7 therapeutic procedures, treatment duration was $9,3 \pm 0,3$ hours. The duration of infertility time per cow was $45,5 \pm 5,5$ days.

High therapeutic effect was obtained in the third experimental group as well. Insemination rate went up to 93,3 % . The average duration of treatment was $7,6 \pm 0,3$ days, and the multiplicity of therapeutic procedures is 3,3. The duration of infertility time per cow was $41,1 \pm 10,6$ days. Improved treatment results in this group of cows was due to lyuteolitic action of estrofan, which lead to resorption of

the corpus luteum, lower P:E ratio, quicker reduction of myometrium and more rapid removal of exudate.

In the fourth group 86,6 % of the animals recovered. The treatment duration time was $9,3 \pm 0,4$ days with an average therapeutic procedure frequency – 4,0. Insemination rate reached 80,0 % and duration of infertility time per cow was $41,5 \pm 8,6$ days.

In the fifth experimental group 93,3 % of the animals recovered. The average number of therapeutic procedures was 4,5 and the duration of treatment – $9,0 \pm 0,4$ days. Insemination rate reached 80,0 %.

Treatment efficiency in the sixth group was the lowest. Insemination rate reached 53,0 % and the duration of infertility time per cow was $45,6 \pm 8,4$ days.

The effectiveness of treatments has confirmed the feasibility of the complex therapy of the cows with acute postpartum metritis. The treatment has to provide an antimicrobial effect, increase the cow's resistance, reduces the level of P:E ratio. The above effect is most clearly seen after the application izatizone in combination with novocaine. This combination lead to a high therapeutic effect and positive changes in the reproductive organs of cows. Full sexual cycles and high fertility rate were recovered in 93,5 % of the animals. In the presence of the corpus luteum in the ovaries of cows with metritis treatment should be supplemented with prostaglandin F_{2α} preparations. It helps to speed up healing, to pronounce the manifestation of initiation stage of the sexual cycle, to restore performance and shorten the infertility time.

Conclusions and prospect of further research.: 1. The prevalence of acute postpartum metritis in cattle ranges from 10,2 to 72,1 % depending on the season, the flow of labor and uterus involution. The second stage of uterus inflammation was registered in 72,3% of the animals after pathological delivery, in 80,6 % – after retained placenta, in 7,2 % – after normal delivery. Subinvolution of the uterus was accompanied by acute metritis in 58,1 % of the cows .

2. There were established the features of steroidogenesis disorders at acute postpartum metritis in cows. The concentration of testosterone in blood plasma

increased by 96,1 % ($p < 0,01$), insulin content decreased by 54,9 % ($p < 0,05$) and the concentration of thyroxine and cortisole tended to increase.

3. Intraperitoneal administration of 10 % novocaine solution in a dose of 10 ml and intrauterine carry in 50 ml of izatizone has provided a good result. During 90 days observation period the efficacy of treatment reached 90,3 %, and fertility rate – 93,5 %.

In the future we plan to continue to study the therapeutic efficacy of different treatments schemes for cows with metritis and to elaborate measures of prevention of this disease.

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Распространение, причины, патогенез и лечение при послеродовом метрите в коров

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В статье отмечены изученные закономерности гормональных показателей в организме коров, больных острым послеродовым метритом. Установлена зависимость количества прогестерона и эстрадиола от состояния яичников. Разработана эффективная методика лечения больных животных, включающая применение препаратов изатизона,

новокаина, АСД-Ф-2, ихтиола, эстрофана, сурфагона, ФСГ и фолликулина. Установлено, что используемые препараты приводят к положительным изменениям биохимических и морфологических показателей крови, способствуют быстрому выздоровлению животных и снижению размеров бесплодия.

Ключевые слова: прогестерон, эстрадиол, метрит, иззатизон, гормоны, оплодотворяемость