

A New Method for Treatment of Retained Placenta in Cows

Aleksander Mephodyevich Semivolos, Aleksey Vyacheslavovich Molchanov, Andrey Sergeevich Rykhlov, Dmitry Valentinovich Krivenko, Alla Vladimirovna Egunova

Saratov State Vavilov Agrarian University, 410012, Russia, Saratov, Teatralnaya ploschad, 1

Abstract

There has been developed a small-size electrical uterine muscles stimulator for cows ("Elegant"). The device is inserted into the uterus by hand, it switches on/off and generates the impulse of current automatically according to the specified program without the veterinarian's participation. The device has no current-carrying wires with electrodes protruding from the genitals and it does not need to be fixed on the animal body or next to it, as it is fully located in the uterine cavity. When the current power supply is finished, the electronic placenta separator is easily removed from the uterus by hand or with the silk thread.

The electrical stimulation of the uterus muscles with the device "Elegant" has hastened the expulsion of the retained placenta in 93.75% of animals in the experimental group which is 71.88% higher than those stimulated with the electro-stimulator "EP-2" and 50% higher than those treated with oxytocin. The time of the expulsion of the retained placenta after the use of the electro-stimulator "EP-2" comprised 3.12 ± 0.62 hours, after the hormone medication (oxytocin) therapy – 4.22 ± 0.27 hours, and after the use of the electro-stimulator "Elegant" – 2.62 ± 0.38 hours. The use of operational (surgical) method to expel the placenta took 0.84 ± 0.08 hours.

After the correction of the uterus contractile function with the electro-stimulator "Elegant", the efficiency of animals insemination was 15.62%; higher than after the use of the electro-stimulator "EP-2", 12.5% after the treatment with oxytocin, and 21.87% after the surgical method of placenta expulsion.

The technical characteristics of the device "Elegant" allow not only to increase, but also to restore the natural reflex contractile uterus function as well as to coordinate the contraction of the uterus muscle fibers in the rhythm specified by the program of the device. 2-3 current impulses of 0.1 sec. duration with 4-5 minute intervals are enough to restore the contractile uterus function.

Keywords: uterus contractile function, electro-stimulator, uterus muscles, placenta, retained placenta, fertility, hydro-sensor, positive and negative electrodes.

Highlights

- The device for retained placenta expulsion in cows is developed.
- The device is inserted into the uterus by hand.
- The device works in automatic regime.
- A short impulse of current restores the uterus contractile function.
- The therapeutic effect of the retained placenta expulsion in cows is high.

INTRODUCTION

Retained placenta in cows is one of the most common diseases after parturition. According to some authors placenta retention is registered in 11-18% of cows. [1; 2; 3].

Clinical observation has shown that the retained placenta is most frequent in young cows (44.73%) after the first calf delivery, after the second and third calf delivery it comprises 10-13% and after the fourth and fifth calf delivery it is 10-21.05%. [4] explicitly report that the number of calf deliveries has a negative correlation with the frequency of retained placenta incidents.

This disease causes significant economic loss to the cattle-breeding which comprises the death of animals, the decrease in milk production, treatment costs, and multiple inseminations [5; 6; 7; 8].

Some authors report that placenta retention in 1-1.5% of cases is followed by the death of the animals. The average economic damage per animal is \$ 206, and with every 100 calf deliveries reaches \$ 3090 per year. In Russia retained placenta (afterbirth) is registered in 15 - 50% of cows after the calf delivery [9]. Moreover, the afterbirth (placenta) is considered retained after more than 6 hours since the fetus delivery.

THE MAIN CAUSES OF RETAINED PLACENTA

It is considered that the main causes of placenta retention are a strong tie of placentas, weak contractile uterus function, difficult parturition: twins, large fetus. [10].

The deficiency of nutrients in feed, the deficiency of minerals, vitamins, especially vitamin E, carotene, the misbalance of calcium and phosphorus may cause the retained placenta [4; 11].

The more intensely the placenta is infiltrated with the blood cells, the longer the time of placenta retention is likely to be [12].

The presence of microflora in the uterine cavity can cause endometritis, as well as reduce milk production, fertility, and in some cases causes the death of animals [7; 13; 14; 15].

Many methods are suggested for the treatment of this disease. The majority of these methods boils down to the use of the drugs that enhance the contraction of uterine muscles.

The use of oxytocin for the retained placenta expulsion is most often recommended [16; 17; 18].

Other authors [19] suggest affecting certain biologically active points of animals which leads to the increase of bioelectric potential, concentration of sex hormones and enhances the contractility of the uterine muscles.

For a long time, veterinarians from different countries used the surgical method of the retained placenta expulsion. What is more, H. Gock [20] introduced radical changes into the operational method of retained placenta expulsion if placenta is not expelled within 15-20 hours; the author suggests tearing off the caruncles having preliminary seized them with two fingers. Placenta is removed from the uterus together with caruncles. This facilitates the contraction of muscles and reduces the bleeding. The caruncles are removed without bleeding in about 20-25% of animals and severe bleeding is observed in only 10% of cows.

However, most scientists and veterinary practitioners believe that the surgical method in contrast to the conservative ways of treatment more frequently causes the uterine diseases of an inflammatory nature requiring a long-term treatment. This method can also result in infecting veterinarians with occupational diseases, and can cause a serious injury of the reproductive organs of animals [20; 21].

We have developed the electronic device "Elegant" in order to find out the effective ways of the retained placenta expulsion after the calf delivery.

The ability of myometrium to respond with contraction to electric impulses has become the methodological basis for the choice of the technical solution.

RESEARCH METHODOLOGY

The study of the treatment efficiency to correct the contractile uterus function in order to expel the retained afterbirth using hormone medication and various models of electro-stimulators has been performed on 92 animals. The research data was collected from the cows whose placenta was partially or completely retained. They were selected according to the analogy principle and were divided into 4 experimental groups.

The cows of the first experimental group have been undergoing the treatment of the uterine muscles contractility with the electro-separator of the retained placenta (EP-2) designed by professor M.P. Ryazansky. The device was fixed on the wall of the livestock building and earthed; the negative electrode was inserted by hand into the cavity of the uterine horn between its wall and the chorion. The positive electrode was fixed to the protruding part of the retained placenta (afterbirth).

The retained placenta in cows of the second experimental group was expelled with the help of the electronic stimulator "Elegant" of our own design. The device was inserted into the uterine cavity (between the wall of the uterine horn and the placenta) by hand.

Oxytocin was used to enhance the uterine contractility in cows of the third experimental group. The medication was administered intramuscularly dosing 8 IU per 100 kg of body weight.

The retained placenta expulsion in cows of the fourth group was performed surgically. The therapy observation of the animals have been carried out for 90 days. The cows were inseminated artificially with the semen stored in liquid nitrogen.

The results of the therapeutic and economic efficiency of various methods of retained placenta expulsion in cows have been taken into account.

RESULTS OF TREATMENT OF THE RETAINED PLACENTA IN COWS

The clinical observation and the study have shown that only 20% of cows whose uterine contractile function was treated with the EP-2 device expelled the retained placenta.

Additionally, the use of the EP-2 device in conditions of livestock buildings is dangerous to the lives of animals and veterinarians because the device requires an electric current of high voltage (220 V).

In the experimental group of cows treated with oxytocin, retained placenta expulsion was observed in 43.75 % of cows.

The electrical stimulation of the uterus muscles with the device "Elegant" has hastened the expulsion of the retained placenta in 93.75% of animals of the experimental group which is 71.88% higher than those stimulated with the electro-stimulator "EP-2" and 50% higher than those treated with oxytocin. (see Table 1).

Table 1: Results of the retained placenta treatment in cows (n = 32)

Method of treatment	Placenta is separated		Time of retained placenta expulsion(hours)
	cows	%	
EP-2	7	21.87	3.12±0.62
"Elegant"	30	93.75	2.62±0.38
Oxytocin	14	43.75	4.22±0.27
Surgical	32	100	0.84±0.08

The application of electrical stimulator "Elegant" does not adversely affect the body of cows. All major hematological and biochemical parameters of blood in cows, whose contractile uterine function was stimulated by the "Elegant" device, were within physiological norms.

The absence of current-carrying wires in "Elegant" is of principal importance. There is no need to fix it on the animal body or next to it. All of the electrodes: positive, negative and hydro-sensor are located in the device case which allows inserting it into the uterine cavity. Having been inserted into the uterine horn, the device is switched on and supplies current impulses in the automatic mode according to the specified program. Having supplied 7 current impulses, it turns off and then can be removed from the genitals by hand or with the silk thread attached to the device (Figure 1).



Fig. 1: The electro-stimulator for uterine contractions in cows "Elegant". General view.

Such a design significantly facilitates the device use for treatment of the retained placenta in cows (Table 2).

Table 2: Technical characteristics of the "Elegant" device

Power supply	battery of "Krona" type accumulator 7D-0. 115 - VI.1.
Voltage	9 V
Number of impulses	7
Duration of impulses	0.1 sec.
Impulse repetition period	300 sec.
Weight	0.15 kg.
Maximum dimensions	0.04x0.12 m ²
Method of inserting the device into the uterus	by hand
The method of removal	by hand, with the silk thread
On-off	automatic, hydro sensor
Performance indication	light

The "Elegant" device has the maximum size and weight which are 50-60 times less than the electro-stimulator "EP-2" (Figure 2).



Fig. 2: Electro-stimulators for uterine contractions in cows: EP-2 and "Elegant".

The "Elegant" device supplies the current impulses of 0.1 second duration at voltage up to 9V and within a repetition period of 5 minutes, which always causes simultaneous contractile waves and birth pangs in cows. At a lower voltage, the stimulating effect on the uterus motor activity is preserved, but there are no birth pangs.

It is important that after 2-3 current impulses the reflex of the uterus muscle contraction in cows is restored. The device can be removed and used to treat other cows with the retained placenta.

The insemination efficiency of the animals whose uterine contractile function has been corrected with the electro-stimulator "Elegant" is 93.75 %, which is 15.62% higher than of those treated from the retained placenta with the "EP-2" stimulator, 12.5% treated with oxytocin, and 21.87% treated surgically (Table 3).

Table 3: The results of fertility of cows undergone various methods of the retained placenta treatment (n = 32)

Methods of treatment	Sexual Periodicity						Were inseminated in total	
	first		second		third		cows	%
	cows	%	cows	%	Cows	%		
EP-2	12	37,5	7	21,87	3	9,37	22	68,75
"Elegant"	18	56,25	8	25,0	1	3,12	27	84,37
Oxytocin	14	43,75	6	18,75	3	9,37	23	71,87
Surgical	11	34,75	5	15,62	4	12,5	20	62,5

The clinical observation has demonstrated that the use of short current impulses of weak force and the voltage up to 9 V lasting 0.1 second can cause reflex contractions not only of uterine muscles but also of the walls of abdomen of cows in the rhythm specified by the electronic device.

Such birth contractions and birth pangs can be considered induced and the mechanism of their production seems to be explained through the realization of the automaticity phenomenon of smooth muscle cells contractile ability as a response to adequate stimulation by electric current.

The economic performance of the use of the "Elegant" device proved to be 1.65 times more effective in comparison with the surgical method of retained placenta expulsion, 1.92 times comparing with the "EP-2" stimulator, and 1.42 times comparing with the use of oxytocin.

CONCLUSION

Based on the research analysis, it can be concluded that the use of the electro-stimulator "Elegant" is the most promising treatment of the retained placenta in cows.

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