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THE RESULTS OF THE EMBRYO TRANSFER TO HEIFERS FROM THE AYRSHIRE BREED

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Abstract. Dairy cattle's breeding is an important industry, since it is providing milk and meat to population. Modern cows are significantly different from their ancestors in biology, behavior and in productivity. The scientific approach to feeding, condition of content and formation of focused heredity contributed to increasing the cows' productivity. During the mammary gland formation and sexual cycles manifestation, puberty occurs, which makes it possible to obtain offspring and secretion of milk for feeding calves. The modern cows are capable of producing milk for their calves and for feeding people. The appearance of record cows, giving about 100 kg per day, and during lactation more than 32 tons of milk serves as an example for achieving such indicators of production. There are negative effects in reproduction biology, which takes place in modern cattle breeding. In order to breed highly productive cows, it is important to increase their livestock by intensive selection. Modernity is such that fertility is reduced due to cows' reproductive functions inhibition. Modern practice shows that it is possible to introduce methods of obtaining several calves from one cow. It is generally accepted for this purpose use new reproduction methods, for example transplantation of embryos with high genetic potential. This technique is widely used in biotechnology of cows breeding. We have tested the method of preparing and conducting embryo transfer to heifers from 13 to 16 months old in the Kuban Agro-Association.

The article presents indicators of heifer. It was revealed that not all animals reacted positively to superstimulation. Embryo transplantation showed that 35.1% of embryos survived after embryo transfer. Economic calculations have shown that for the rapid formation of a highly productive herd on the farm, it is advisable to use Ayrshire breed heifers capable of raising embryos and giving birth to healthy calves as recipients.

Key words: heifer, recipient, hormones, stimulation, embryo, transplantation, embryo survival, calf

INTRODUCTION

A significant increase in milk production of cows affects the formation of lactation dominant, which suppresses the intensity of the manifestation of the reproductive functions and fertility of animals [1]. The inverse relationship between the physiology of cows and heifers between the production of calves and the increase in milk productivity is caused by the development of biotechnology, which allows for the rapid reproduction of highly productive herds of cows [2]. The beginning of the biotechnology was developed in the UK, methods for obtaining and freezing mouse embryos, and then from

40 species of mammals [3, 4]. The cattle embryo transplantation technique developed in the past is now widely used in many countries. This allowed us to quickly create whole herds of highly productive cows.

Currently, in some farms of the Krasnodar region, for reproduction of highly productive cows, they have mastered and are implementing methods for embryo transplantation, the highest Holstein cattle breed in the world, and heifers were used as recipients [4, 5].

The purpose of our research was to study and master the method of embryo transfer and analyze the results of their survival rate in Ayrshire heifers.

MATERIAL AND METHODS

We have carried out studies on dairy farms ‘AgroAssociation’. For our research, Ayrshire heifer breeds selected on farms were used for farming, taking into account their breed, origin and level of productivity of the cows, as well as health and reproductive functions.

The general purpose of research is studying and mastering the methods of selection, preparation of recipients and transplantation of embryos to Ayrshire calves. To carry out the scientific experience, 2 groups of Ayrshire breed were formed: 1st control group that includes animals without hormonal stimulation and 2nd experimental group of heifers, which have been stimulated for superovulation (Table 1).

Table 1

Scheme of experiment

№№ experimental groups	Experimental animals Ayrshire breed	The number of animals, heads	Hormonal stimulation
I control	heifers	20	without stimulation
II experimental	heifers	17	hormone stimulation

Recipients were selected in 2 stages. At the first stage, Ayrshire breed heifers were selected according to age from 14th to 16th months, at the second stage by external exterior features, level of health, physiological condition of the animal.

The criterion for the selection of recipients heifers were taken into account the requirements for mothers’ milk production less than 6,000 kg for 305 days of lactation; with strong constitution, an exterior of the milk-like animal, a live weight around 400 kg or more, the metabolic activity of potential recipients, a positive reaction to hormonal scheme, maternal insemination index 1.5 and at his 3rd sexual cycles or more. The recipient must be a physiologically healthy animal: the uterus is located in the pelvic cavity, the cervix is clearly expressed, the length of the horns of the uterus is 20—35 cm, without adhesions and tumors, an active corpus luteum of the ovary, measuring 1—1.5 cm. We did not use heifers as recipients when there were both a corpus luteum and a follicle. Clinically healthy animals: score body — 2.75—3.50 points, without lameness and gastrointestinal tract, and the respiratory and digestive organs lesions. The first group of the control group did not perform hormonal stimulation until embryo transfer at the 16th day. Animals of the experimental group from the first to 16th days were carried out according to the superovulation program, and 1 ml of Fertagyl was administered to the animals of the control group before embryos transplantation (Table 2).

Table 2

Scheme of stimulation of Ayrshire breed recipients for embryo grafting

Drug administration time	Groups of recipients who received drugs	
	1 control group (heifers)	2 experimental (heifers)
1 st day 7 ⁰⁰	not stimulated	Fertagyl + CIDR
7 th day 7 ⁰⁰	not stimulated	remove CIDR + Dinolytic — 5 ml
9 th day 7 ⁰⁰	not stimulated	Fertagyl — 1 ml
16 th day 7 ⁰⁰	Fertagyl 1 ml + embryo transplantation	Fertagyl 1 ml + embryo transplantation

Embryo transfer to recipients was performed only to animals that responded positively to the introduction of hormones. The process of embryo transplantation was performed together with inseminator specialists and fresh embryos were used.

RESULTS OF RESEARCH**Characteristics of Ayrshire calves (recipients)**

For embryo transplantation, 37 animals of the Ayrshire breed were selected. The selected heifers — recipients were 12.9—15.6 months old. The heifers of both experimental groups had well-defined status characteristic of highly dairy animals: the head and neck were light, the neck had of medium length, gradually turning into shoulders, deep, but moderately wide chest, flat, straight back, well developed body muscles, strong legs and straight limbs.

We studied the survival rate of embryos in recipient heifers of 1st and 2nd groups. An important step in the transplantation process is the selection, assessment of the state of health and timely introduction of embryos to recipients. In order to determine the optimization of the transplantation technique, we first carried out the embryo transfer of the heifers that have not received the hormonal stimulation (1st control group), and then we transferred the embryos using the same technique to the recipients, who had hormonal treatment in order to prepare them for the embryo transplantation (2nd experimental group). After embryo transfer, recipients of both groups were constantly monitored to evaluate embryonic survival and development stage of embryos. Pregnancy status was determined for the first time by ultrasound, 31 days after embryo transplantation, and by transrectal palpation of the uterus 60 days after embryo transplantation.

A trans-rectal examination of the uterus for pregnancy diagnosis allowed confirming or not the status and stage of pregnancy, check the viability of the fetus, and confirm the normal topography of the uterus to diagnose various pathologies of pregnancy. Rectal examination distinguished the characteristic features of the uterus: fluctuation of pregnancy, palpation of embryonic membranes, palpation of the embryo and fetus, palpation of the cotyledon and uterine artery. Ultrasound diagnosis of pregnancy allowed us to visualize the front and back of the embryo on the 31st day of pregnancy. After 60 days of pregnancy, we considered the development of the spinal column of the orbital cavity of the fetus, the formation of the bones of the head, mouth and skull. According to statistics, the early definition of pregnancy in heifers — recipients was evaluated at 46.1% of animals.

As a result of research, the survival rates of embryos in recipients were determined. A total of 37 embryos were transplanted to 37 heifers — recipients of Ayrshire breed. Survival rate of embryos in females that have not undergone superovulation (1st group) was 20.0%. In heifers that exposed to hormonal stimulation before embryo transfer, the survival rate was higher by 32.9% (Table 3).

The results allow us to conclude that it is not advisable to use heifers as recipients without hormonal stimulation, as proved that only 4 heifers (20.0%) were pregnant in the control group, between 14 and 15.8 months old (the average was 14.95 months). In the heifers of the experimental group — from 13.3 — 16.5 months old (on average — 15.53 months) — 9 embryos survived (52.9% of pregnancy).

Table 3

Results of embryonic survival in heifers Ayrshire breed

Animal groups	Indicators		
	transferred embryos, nbr.	pregnant recipients, heads	embryonic survival rate, %
1 control, heifer recipients without stimulation	20	4	20.0
2 experimental, heifers — recipients, with hormon stimulation	17	9	52.9
Total	37	13	35.1

It is important to note that recipient heifers must be physically developed. Analysis showed that animal body weight of group control ranged from 416 to 469 kg, with an average of 448.5 kg, while the recipient heifers from experimental group varied from 437 to 470 kg (average — 452.3 kg).

Cost-effectiveness of embryo transfer to heifers — Ayrshire breed recipients

The use of embryo transfer techniques in dairy cattle breeding allowed to increase significantly and quickly the milk yield of cows on all continents. In terms of the number of transplanted embryos in dairy cattle breeding, the countries of Europe and North America are leaders (151,257 collected and 111,575 embryos transplanted). The cost of selling semen bioproducts and embryos from outstanding animals in genetics is very high. In Russia, embryo transfer in cattle breeding is being introduced in farms with high production efficiency, as this is an economically costly technique.

We have evaluated the economic efficiency of embryo transplantation in the Kuban Agricultural Association. The costs of the embryo transplantation process consist of the costs of a hormonal scheme — stimulation of ovulation in recipients and processing of embryos transfer. The cost of the calf embryo will depend on the reproductive functions of the recipients, their preparation, as well as on the professionalism of embryo transplantation specialists. Total costs for embryo transfer are higher in the experimental group due to the high cost (3600 rub/head) of hormonal stimulation. The total costs per recipient of the control group amounted to — 8,000 rubles (without stimulation),

in the experimental group — 11,600 rubles. Evaluation of embryo survival in recipients showed that in the control group (without hormonal stimulation) 20.0% of the recipients were pregnant, and in the experimental group (hormonally stimulated) — 52.9%. The difference in survival rate of embryos was 2.6 times higher in hormone-stimulated heifers, compared with non-stimulated ones.

Calves from heifers that did not receive stimulation are more expensive in comparison with heifers stimulated by hormones due to high rate of pregnancy and calving from them. However, an economic assessment show that for larger quantities of embryos obtained from animals have more highly advisable to use hormonal stimulation of the heifers — recipients before embryo transfer by the proposed method.

CONCLUSIONS

Based on the data obtained as a result of research, the following conclusions can be made:

The farm breeds cattle of Holstein and Ayrshire. Prolonged use of Holstein bulls with high genetic potential of milk production: milk yield from 13,692 to 14,925 kg of milk, fat content from 3.73 to 4.55%, protein from 3.10—3.23% in milk made it possible to achieve milk production in cows Holstein breed more than 10,000 kg of milk, 3.79% fat and 3.57% protein;

It is known that the increase in milk productivity of cows reduces the ability of animals to reproduce, and also reduces productive longevity in the current technological conditions. For the purpose of rapid reproduction of the livestock of highly productive livestock in the farm, a decision was made to introduce the method of embryo transplantation from highly productive animals. In 2014, a laboratory was set up and equipped to prepare donors and recipients, and a method was tested for obtaining embryos from donors and transfer them to recipients. With it, the solutions are: to use Holstein heifers as donors, and Ayrshire heifers as recipients.

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РЕЗУЛЬТАТЫ ТРАНСПЛАНТАЦИИ ТЕЛКАМ ЭМБРИОНОВ, ПОЛУЧЕННЫХ ОТ АЙРШИРСКОЙ ПОРОДЫ

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Аннотация. Молочное скотоводство — важная отрасль, так как ее основная задача — обеспечить молоком и мясом население. Методически в процессе длительного использования коров человек научился ухаживать, кормить и получать потомство от них. Современные коровы существ-

венно отличаются от своих предков, не только по биологии, поведением, но и продуктивностью. Научный подход к кормлению, условиям содержания и целенаправленному формированию наследственности способствовали повышению продуктивности коров. При формировании молочной железы у молодых телок и проявлении половых циклов наступает половое созревание, которое дает возможность получения потомства и секрецию молока для выкармливания телят. Коровы современной генетики способны давать молоко не только для своих телят, но и для питания людей. Появление коров-рекордисток, дающих в сутки около 100 кг, а за лактацию более 32 т молока, служит примером для достижения таких показателей в условиях производства. Достичь рекордных удоев сложно, не возможно. При этом проявляются негатив в биологии размножения, что имеет место в современном скотоводстве. С целью разведения высокопродуктивных коров важно увеличить их поголовье, для интенсивного отбора и подбора животных. Современность такова, что снижается плодовитость за счет угнетения воспроизводительных функций коров при высокой лактации. Современные походы науки и практики свидетельствуют о том, что возможен для внедрения в производство способ получения нескольких телят от одной коровы. Общепринято для этого применять новые биотехнологии методы воспроизводства, например трансплантацию эмбрионов с высокой генетикой.

Такая методика достаточно широко используется в биотехнологии размножения коров путем трансплантации эмбрионов. Нами апробирована методика подготовки и проведения трансплантации эмбрионов телкам-реципиентам в возрасте от 13 до 16 месяцев в предприятии «Агрообъединение Кубань». В статье представлены показатели генотипа телок-реципиентов. Выявлено, что в процессе подготовки реципиентов не все животные положительно отреагировали на гормональную стимуляцию овуляции. Трансплантация эмбрионов показала, что прижились эмбрионы у 35,1% телок-реципиентов. Экономические расчеты показали, что для быстрого формирования высокопродуктивного стада в хозяйстве целесообразно использовать в качестве реципиентов телок айрширской породы, способных вырастить эмбрионы и родить здоровых телят.

Ключевые слова: телка, реципиент, гормоны, стимуляция, эмбрион, трансплантация, приживаемость, теленок

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