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POSSIBILITIES FOR IMPROVING REPRODUCTIVE TRAITS IN COW-CALF SYSTEM

Perišić P.[1]*,Maletić M.[2], Mekić C.[1]

Abstract

This paper describes production and reproductive parameters determined in some previous studies which were conducted in cow-calf system breeding stocks. The importance of meat production in cow-calf system is highlighted, particularly in the context of current tendencies in cattle production both in EU countries and in our own country.

A success in cow-calf production system depends mostly on the fertility achieved in a breeding stock. An ideal fertility in a cow-calf system is one calving a year, i.e. the length of a calving interval of about 365 days. The most important factors which impact bovine female fertility are indicated in this paper as well as a possibility for improving fertility traits in cows raised in cow-calf system.

Besides application of certain zootechnical procedures which could improve fertility, the application of hormones for the purpose of induction and synchronization of estrus in cows is essential. The protocols which are most often used for induction and estrus synchronization in cows are presented.

Keywords: cow-calf system, fertility, induction and estrus synchronization, meat production

Introduction

Cow-calf system is a major system used in beef production systems in many countries. This production is organized in different variants and levels of extensive production systems. The pastures are most commonly used since they provide for the most profitable cattle fattening. In regions where seasonal changes are more distinctive, cattle are kept on pastures in the summer season, while in the winter they are kept in stables with a free range system and nutrition based on forage feeds and by-products of feed industry.

The most important factor which the success of production in cow-calf system depends on is a good fertility. The ideal fertility in beef breeds, raised in cow-calf system means one calving a year, i.e. the interval between calvings being about 365 days. However, in real production the situation is often far from optimal and regular cow fertility is primarily impaired what can directly influence the production success.

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In order to improve beef production various activities are being applied (improved nutrition, suckling restrictions, hormonal treatments in breeding females) directed mostly to improving bovine female fertility. Thus the induction and estrus synchronization is being often applied in cows for the purpose of obtaining shorter possible duration of service-period as well as of performing synchronized cow calving what seems to be important from the organizational aspect.

Trends in beef production in EU countries

In EU countries there is a trend to reduce the number of households which raise the breeding stocks of dairy cows but at the same time there is an increased number of cows per households engaged in dairy production. Besides enlarging the households engaged in dairy production a trend of reducing a total number of cows is observed as well. Additional reasons which can impact reducing the number of cows can be a still present trend to increase dairy production per cow and current milk reserves (Popović, 2008; Perišić et al. 2012).

In a meat production sector a decrease in totally produced quantities of beef meat is observed as a consequence of reduction of total number of cattle primarily due to reduced number in dairy cattle. There appears a negative net balance (between 200 000 and 400 000 tons of beef meat annually), on the market what gives space for further increase in the volume of meat production in the EU member countries.

A decrease in the number of cattle per average rate of 2-3 % annually is observed in Serbia in the last decade followed accordingly by all negative tendencies in meat production. Having in mind free markets for beef meat (in EU countries, and in other countries outside EU) Serbia should begin to strategically organize the production of beef meat meant for export (Perišić et al. 2012).

Production results in cow-calf system

In cow-calf production system different breeds and their cross-breds can be used. Thus in eastern Germany, Deblitz et al. (1992) studied the effects of extensive keeping of 221 herds of purebred nursing cows and cross-breds of Galloway, Montafon, Limousine, German Red Pied, German Angus, Aberdin-Angus, Charolais and Simmental nursing cows on reproductive results and production of calves. The animals were kept outside during the winter in 40% herds. Number of calves weaned per cow ranged from 0.87 for the breeds with more robust constitution and up to 0.91 for large breeds (Charolais and Simmental) but there were no significant differences between the breeds in body mass of calves produced at 100 kg of cow body mass. Nutrition costs were by 15% higher for the cows which spent the winter outside in comparison with the cows kept in stable. It was concluded that, under the conditions which prevail in Germany, extensive keeping of smaller format cattle breeds has certain advantages.

Cundiff and Gregory (1999) reported results of the trial conducted by the U.S. Meat Animal Research Center (Nebraska, SAD) with the aim of determining the differences

between breeds in growth rate, reproductive results, characteristics of carcass and meat for possible use in production of composite herds. Continental breeds (Chianina, Charolais, Limousine, Salers, Maine-Anjou, Gelbvieh, Holstein, Simmental and Dark-Brown) had larger body mass in comparison with British breeds (Hereford, Shorthorn, South Devon, Devon, Aberdin-Angus) which had high levels of marbling, but also excess fat. The 50:50 ratio between British and continental heritage gave optimal body mass, dressing percentage and level of marbling. Belgian Blue and Piedmontese cattle had high slaughter dressing percentages but low evaluation of carcass. The descendants of Tuli bulls had low average daily gains. Cattle with Tuli or Boran heritage matured earlier than cattle with Brahman heritage. Offspring body masses at weaning were larger in cattle with Nellore or Brahman heritage than in those with Boran or Tuli heritage.

Mazurovsky and Litovchenko (2000) presented the results on creating a new meat type of Simmental cattle in the region of Orenburg (Russia). During creating a Simmental purebred meat type the best performance during the first phase of creating had animals produced by the bulls of German and Canadian selection. During introductory cross-breeding the utilization of Limousin breed produced some good effects. During the first phase an average gain in fattening was 1300-1400 g per day.

In Poland Choroszy B. and Choroszy Z. (2001) conducted a trial for the purpose of using the ecological pastures for fattening the Simmental, Red and White cattle and cross-breds of fattening heifers for slaughter. A period of five-month pasture had a positive effect on daily gains which ranged from 601 to 734 g. The analysis of slaughter traits showed that the highest dressing percentage and best composition of carcass tissues were realized by cross-breds fattening heifers. Heifer carcasses were well covered by muscles (76.79%) and moderately covered by fat (5.42%) regardless the breed. Quality of heifers meat corresponded to the requirements for the quality of young beef meat (a large part under muscles, light color and required softness). The results obtained confirmed the possibility of using ecological pastures for fattening the young cattle for slaughter.

Tschumperlin et al. (2001) compared production efficiency of dual-purpose medium size Simmental cows and Aberdin-Angus bovine female breed. A whole herd was mated with Angus bulls. Bullcalves cross-breds of Simmental x Aberdin-Angus had higher live weight gains and net mass gain compared to purebred Angus bull calves. Simmental x Angus bull calves had higher yield and better quality of meat compared to Angus bull calves (difference of 0.6% and 1.0%, respectively). Superiority of dual-purpose type of cows in relation to specialized meat type in this system of meat production was caused mostly by higher milk yield produced by Simmental cows.

As a maternal base Simmental breed is often used in specialized systems of meat production ("cow-calf" system), where crossbreeding with terminal fattening breeds (Charolais, Limousine, Belgian Blond-White) is often organized. Research on production traits (fattening and slaughter) of Simmental breed and its cross-breds with beef breeds was done by a number of researchers in a previous period. Thus Čobić et al. (1990) studied fattening abilities of male F_1 generation cross-breds of Charolais and Limousine breed with Simmental. Main conclusions drawn suggested that the gain of cross-breds with Charolais was significantly higher than the gain of crossbreds of Limousine and Simmental breeds. Consumption of net energy per kilogram of gain was by 16.79% lower in crossbreds with Charolais in comparison with Simmental breed, digestible crude

protein by 14.52 %, while crossbreds with Limousine breed had slightly lower consumption of net energy (2.04%) and digestible crude protein (9.91%) in relation to Simmental breed. Bullcalves of Simmental breed had relatively heavier head, skin and some internal organs, what affected carcass lower dressing percentage in relation to cross-breds while differences in dressing percentages between cross-breds were insignificant.

Medić et al. (1991) studied fattening and slaughter qualities of cross-breds obtained by crossbreeding of combined and dairy production cows with bulls of beef breeds. They reported that the largest mass at birth was obtained in crossbreds with Charolais and Limousine breeds and on the basis of this knowledge by the use of crossbreeding between these two breeds in larger production systems higher frequency of difficult calvings and loss of calves and cows may be expected. Bulls of Blonde d`Aquitaine breed had no effect on increasing the mass of calves at birth. The best fattening results were obtained by crossbreds with Charolais and Blonde d`Aquitaine breeds (1288 g/day, 1263 g/day). As for slaughter traits the advantage was given to Limosine and Blonde d`Aquitaine breeds due to increased slaughter dressing percentage (63.7% and 65.4%), as well as larger yield of the best quality meat parts (ham and back).

Čepon et al. (2001) studied carcass traits of the bull calves meat of Simmental, Brown and Holstein-Friesian breeds and crossbreds between Brown and Belgian Blue, Holstein and Belgian Blue and Holstein and Piedmontese. Among these 3 pure breeds Simmental breed showed best carcass quality followed by Brown and Holstein breeds. As for meat properties there was no significant differences between these 3 breeds. Crossbreds with Belgian Blue had higher dressing percentage, higher content of lean meat and lower content of carcass fat. In meat properties differences were less pronounced. Crossbred bulls had lower intramuscular fat compared to purebred bulls and better subjectively evaluated softness of meat in comparison with Simmental bulls. Crossbreds between Holstein and Piedmontese had better dressing percentage, conformation and carcass composition and better softness of meat than Holstein bulls.

Perišić (2007) states the results which justify the use of crossbreeding between Simmental breed and terminal beef breeds (Charolais and Limousine) when meat production is organized in cow-calf system.

Reproductive parameters in cow-calf system

In free range keeping of cattle in cow-calf system the contact between the breeder and the animals is done at longer distance so it is harder for farmer to observe all changes in animals regarding health state, occurrence of estrus and alike. For these reasons parameters of fertility in cows and therefore production in general in indirect way, depend strongly on breeders, particularly if they apply insemination in cow herds instead of mating.

Reproductive parameters for Simmental breed, cross-breds of beef breeds with Simmental and beef breeds and cross-breds in majority of studies differ from the optimum expected for ”cow-calf” production system. For a number of European countries and also for Serbia, Simmental breed has a great importance. This breed can be equally well directed towards combined production (milk-meat) and towards specialized meat

production (cow-calf system) according to the reports of Perišić et al. (2008) and Perišić et al. (2009).

Fiss and Wilton (1989) studied the effect of system of keeping Hereford and Simmental breed, as their crossbreds obtained in rotation crossbreeding and which were of different format and production purpose (fattening, dual-purpose). Simmental heifers were of the oldest age at first calving and had longest duration of first service-period, while the best reproductive parameters had Hereford breeding females and small format crossbreds (fattening and dual-purpose). Increased body mass of adult animals had no significant effect on bovine females reproductive results. It was confirmed that higher daily yield of milk by 1 kg in first-calf heifers can influence the increase of the number of servings per pregnancy by 0.017 times and longer duration of the first service-period by 1.08 days.

According to the results of Veselinović et al. (1991) during studying hormonal preparations in estrus synchronization in heifers, besides recommendations given for using a specified preparation it was concluded that the application of vitamin preparations in combination with hormones can have positive effects as well.

For the purpose of shortening the duration of service-period, the effect of postpartum improved nutrition is also applied what can influence better milk yield and therefore calves live weight gain as well. For earlier possible occurrence of estrus postpartum certain restrictive methods can be applied such as inserting the nose rings to calves in order to prevent their excessive suckling by which we can influence the maintenance of cow condition. Morris et al**.** (1993) in New Zealand investigated reproductive and maternal performances of purebred cows and crossbred cows meant for meat production. In experiment were used cows of Aberdin-Angus breed and Hereford which were mated with the bulls of 11 breeds (Aberdin-Angus, Holstein, Hereford, Jersey, Blonde d'Aquitaine, Charolais, Chianina, Limousine, Maine-Anjou, Simmental and South Devon). They studied reproductive and maternal performances of purebred and crossbred cows during first 4 calvings with the first serving in the age of 14-16 months. They analyzed in total 7575 records on mating obtained from 2109 cows. Differences between the animals per locations at which they were raised were more distinctive for the traits of reproduction than for the traits of growth and resulted in interaction of genotype and environment. At all the locations Friesian crossbreds were weaned at largest body mass per animal but they were equalized or surpassed by crossbreds of Jersey breed regarding an efficiency of production of bull calves. Majority of European crossbreds had relatively much higher productivity obtained in the most favorable conditions what was especially expressed in Simental crossbreds. Heterosis effect in crossbreds in relation to average values obtained by pure breeds were as follows for the rate of pregnancy (0.12), productivity (0.21) and the rate of production efficiency (0.16). Heritabilities for body mass and age in puberty were 0.34 for both traits. Repeatability and heritability for cow reproductive traits were low (0.0-0.10), but the values were higher for body mass of bull calves up to weaning taken as bovine female traits (0.09-0.38). Generally speaking, large European breeds which distinguished themselves regarding growth and carcass production produced female offspring which reached puberty at older age, had poorer reproductive performance (especially in less favorable conditions) and larger body mass at mature age.

Silva et al. (1994) monitored the effects of restrictive procedure (inserting the nose rings) in calves suckling period on reproductive parameters of cows in cow-calf system. Reproductive results were registered in first-calf–dual breed crossbreds of Hereford x Friesian and Simmental x Friesian breeds. The effects before and after suckling restriction were monitored. Cows were distributed on 2 pastures during day. Suckling was suppressed or stopped throughout 7 days by inserting nose rings to 46 day old animals in the group on restrictive suckling (RS), while the second group was on continued (control) normal suckling (NS). The cows on restrictive suckling had shorter interval from calving to conception than the cows which suckled normally NS (76.0±5 days, 84.1±6 days, $P<0.05$). The cow breed and nutritional regime had no effect on interval from calving to conception. However, a useful effect of suckling restriction on the days from calving to conception was observed only in cows fed ample grass rations in the middle of gestation. Bullcalves with restrictive suckling (RS) spent more time on pastures during the period when they had nose rings inserted and differences in behavior remained also in the next 5 days after the nose rings were removed (62.4±7 minutes, 38.6±7 minutes on pasture; $P<0.001$), and were lighter at weaning (146.7±3 kg, 162.4±3 kg; $P<0.01$). In spite of lower body mass of bull calves at weaning they came to the conclusion that suckling manipulation by inserting nose rings to bull calves can be used in order to stimulate at an earlier time repeated pregnancy.

Sinclair et al. (1998) studied metabolic status and reproductive parameters in four groups of cattle meant for meat production such as follows: Aberdin-Angus cattle (small size cattle with low dairy potential), Welsh Black breed (small size cattle with high dairy production potential), Charolais breed (large format and body mass cattle with low milk potential) and Simmental breed (large cattle, high milk potential). Over two years the heifers were placed in stable and fed rations made in such a way so as to represent energy intakes from hilly or small hills pastures (Aberdin-Angus and Welsh Black), or from small hills or lowland pastures (Charolais and Simmental) in Great Britain. Average daily intakes were equivalent to 705 and 820 kJ M 0.75 for every breed. For both offered levels of ration energy intake, Welsh Black and Charolais breeds had relatively high rates of weight gain and longest duration of postpartum anovulatory periods. Charolais cows also had the lowest rate of conception in relation to all other breeds. Average interval from calving up to the first ovulation differed significantly among breeds (56.9, 72.7, 73.1 and 52.7 days for Aberdin-Angus, Welsh Black, Charolais and Simmental, $P<0.001$). Postpartum anovulatory period showed tendency of shorter duration from the first up to the second calving in cows with low milk potential while the same anovulatory period showed tendency of increase in cows with high milk potential. Cows with average score for body condition in the value of 2.5 units during calving were sensitive regarding duration of anovulatory period, up to the loss of body mass during early postpartum period, especially when levels of glucose in blood were low, while cows with score for body status in the value higher than 2.5 units were not sensitive during calving.

Goonewardene et al. (1999) analyzed the records for 3 synthetic lines of cattle from a cattle farm in Canada (Kinsella, Canada) obtained during 11 year period. The first line consisted of 60% dairy breeds (Holstein, American Brown and Simmental) and 40% meat type breeds; second line consisted of 33% Aberdin-Angus, 33% Charolais, 20% Galloway and 14% other meat type breeds; third line consisted of 60% Hereford and 40% other meat type breeds. Reproductive traits and the traits of growth of genetically horned and hornless cattle were compared. Number of observations varied from 2663 to 4263

depending on the trait observed. No differences were observed between horned and hornless cattle in all lines for rate of pregnancy, calving and weaning, body mass of calves at birth and body mass at weaning, average daily live weight gains of calves before weaning, frequency of incidence of difficult calvings, results for body mass of cows and body condition of cows during birth of calves and weaning of bull calves. Regardless the absence of significant differences hornless cattle were given an advantage for using in breeding stock.

Correa et al. (2001) analyzed reproductive performance of cows raised within Brazilian Agricultural Research Corporation (Embrapa cattle). The average rate of pregnancy, calculated on the basis of all breeding females (2-3 years old heifers and cows) was 75.9%. Average rate of conception for first-calf heifers was 62.1%. The average rates of total mortality and mortality until weaning were 2.2 and 6%. Mortality rate in bull calves was 53.7% out of total mortality rate in the herd and the sex had a significant effect ($P<0.01$) on rate of mortality in bull calves, the mortality of male animals being higher than mortality of female animals. Average interval between calvings was 463.45 days (15.2 months) and it was influenced significantly ($P<0.05$) by the year of cow birth. The authors suggested further research with the aim of solving higher rate of mortality in males whose commercial value is deemed higher than that of females.

Possibilities of improving the fertility traits in cow-calf system

Fertility traits in cows represent a common problem in all production systems and directions. Improvement in the production technology, in the first place, by proper balancing of rations in some bovine production phases does not seem to be sufficient for obtaining optimal bovine females fertility at an annual level.

A positive effect of improved nutrition on the occurrence of estrous is well-known in breeding females of all kinds of domestic animals. The results of research reported by Morris et al**.** (1993) can confirm this. The results of other authors (McClure, 1961., Staples et al., 1990., Beam and Butler, 1998), cited by Vuković et al. (2011) show that fertility disorders can occur as a consequence of poor nutrition (especially energy deficient rations) and that there is an effect of negative energy balance and high milk yield postpartum on the state of cow fertility and the occurrence of ovarian cysts. Glucose contained in ration is necessary both for milk synthesis and for normal functioning of central nervous system (CNS-a) including hypothalamus and hypophysis where GnRH, that is, FSH and LH are being synthetized. Meeting the needs for milk synthesis, particularly postpartum, has a priority in relation to other needs what results in a state of sexual inactivity (Lotthammer 1985).

The occurrence of estrous in cows, after uterus involution, depends a good deal on cow body condition. Besides nutrition the state of cow condition in cow-calf system is highly influenced by cow milk yield in the first months postpartum as well as by daily length of suckling. The cows with higher milk yield will certainly have an effect on higher gains in calves in suckling period but a body condition of those cows will at the same time be worse in comparison with the cows with lower milk yield if they are compared in the same breeding conditions.

As they grow up, calves needs for food intake are greater so milk as nutrient is not sufficient for meeting their daily needs in nutritional materials. Because of that older calves try to follow the cows and suckle the cow`s milk constantly in order to satisfy their needs and that has a significant harmful effect on cow condition. In practice the inserting of nose rings to calves proved justified in order to prevent excessive suckling. Silva et al. (1994) monitored the effects of restrictive procedure (inserting nose rings) in calves suckling period after the age of 46 days on cow reproductive parameters. Cows with restrictive suckling had shorter service period compared to cows which suckled normally (76.0±5 days, 84.1±6 days, $P<0.05$).

In the conditions of intensive cattle production, like milk production, the success is mostly dependent on good fertility in breeding stock. However, in cow-calf system which is in its nature either semi-intensive or extensive, the success in production can even depend more on normal fertility in cows. Taking into account that one calf obtained per cow is the only annual income, besides manure, it seems to be imposed as an aim to have interval between consecutive calving of 365 days what would be considered as an optimal fertility in cow-calf system.

Realization of mentioned aim in cow fertility, meaning a length of interval between calvings of 365 days is today almost impossible to obtain without induction and estrus synchronization by means of hormonal preparations. In our climate conditions the induction and estrus synchronization in cows in cow-calf system should be coordinated with the season as well. The aim is to obtain calves (calving) in the period of a year with best conditions , primarily regarding nutrition and reduction in fattening cost and that is at the start of spring.

Preparations of prostaglandin and its analogues in several different protocols are used in induction and estrus synchronization, while for the synchronization of preovulatory follicle development and induction of ovulation we use preparations based on GnRH and progestin in combination with prostaglandin.

Prostaglandin $PgF_2\alpha$ and its synthetic analogues are used in regulation of estrous cycle in cows. As reported by Vakanjac and Maletić (2013) the effect of prostaglandin depends on the stage of cycle in which it is applied, i.e. the phase of development of corpus luteum. Corpus luteum reacts on treatment with prostaglandin from 5^{th} (heifers), i.e. 7^{th} day (cows) of estrous cycle to 17^{th} day when spontaneous luteolysis by endogenous prostaglandins originating from endometrium begins. For these reasons it seems unjustified to apply hormone in the period before 5^{th} day and after 17^{th} day of cycle. The occurrence of estrus after application of prostaglandin or its analogues depends on the stage of development of dominant follicle in the moment of hormone application. If the preparation is applied in the time of growth of dominant follicle of the first follicular wave we can expect the occurrence of ovulation in 2-3 days. If the preparation is applied in later phase when follicle has lost its dominance the ovulation can be expected only in 4-5 days when dominant follicle, which is going to ovulate, separates from the second follicular wave.

DeJarnette et al. (2001), as well as Dogan et al. (2008) report the results of hormonal treatments on the incidence of estrous, that is, application of various protocols in induction and estrus synchronization in cows.

Vakanjac and Maletić (2013), citing the results of other authors state following protocols for induction and estrus synchronization by applying prostaglandin preparations:

Prostaglandin administered once: This method means administration of hormones to only those cows on whose ovaries, by clinical examination or by ultrasonography, as well as by measuring concentration of progesterone in milk (> 2 ng/ml) or in blood (> 5ng/ml) functional corpus luteum was confirmed. Advantages of this method are reflexed in its economical aspect and a number of breeding females that in 5-7 days after intensive monitoring enter estrous and become inseminated. The authors state that 30% breeding females do not enter expected estrous after hormone application.

Prostaglandin administered twice: In this method the breeding females in which estrus was not observed after the first application of prostaglandin get another application of the second dose in the interval of 11 to 14 days. All the cows that have normal duration of cycle, should, within 3 to 5 days after the second application of prostaglandin, show the signs of estrous regardless the phase of estrous cycle in which they were after the first dose of prostaglandin. There is also a variant of this method in which prostaglandin is administered twice to breeding females which do not show signs of estrous and at the same time do not become pregnant 60 or more days after calving. They get two doses of prostaglandin applied ($PgF_2\alpha$) in the interval of 11 to 14 days even regardless whether there are or there are no visible signs of estrous and insemination is being performed 72 to 96 hours after the second application of prostaglandin.

Several times given prostaglandin: In this method $PgF_2\alpha$ is administered three times in the intervals of 11 to 14 days during which the animals are being controlled between the application of hormones and breeding females that enter estrous gets inseminated. Breeding females which do not show the signs of estrous even after the third dose of $PgF_2\alpha$ are subjected to fixed-time artificial insemination 70 to 80 hours after administration of the third dose.

The results of fertility during cow insemination after the application of prostaglandin for purposes of estrous induction are by 20-30% lower compared to common way of discovering estrous in breeding stock. It happens because prostaglandin can induce estrous but leads to no synchronization of the growth of follicles and LH peak what reduces the fertility.

Therefore if the synchronization of ovulation is the aim we can use prostaglandin ($PGF_{2\alpha}$) and gonadotropin-releasing hormone (GnRH) in exactly determined time, i.e. so-called "Ovsynch" program. There are several modifications of "Ovsynch" program, such as Co-Synch, Pre-Synch, Select-Synch, Hybrid- Synch. Details regarding each modified "Ovsynch" program can be read in the paper by Vakanjac and Maletić (2013) as well as in the papers of some other authors. In addition, the same authors state the application of progestagene in bovine estrus synchronization - CRESTAR and CIDR program. CIDR (controlled internal drug release) technology means using the progesterone impregnated vaginal sponges (1.38 gr) where via vaginal mucus the progesterone is being resorbed. In this way luteal phase of estrous cycle is being prolonged, the occurrence of estrous prevented and all treated breeding females brought into the same phase of estrous cycle.

Conclusion

On the basis of the results reported in previous research papers on production and reproductive traits of cows raised in cow-calf system it can be concluded that reproduction, that is, poorer expressed traits of fertility in cows can be a limiting factor in cow-calf production system.

In order to improve fertility traits various improvements and modifications of production technology are recommended. The application of hormones for the induction and estrous synchronization in cows with the aim of increasing production economy seems to be essential nowadays. Besides all protocols used for induction and estrous synchronization in cows a special emphasis was given to the importance of the application of prostaglandin ($PGF_{2\alpha}$) which is most widely used today both in dairy cows breeding stocks and in cow-calf system.

Regarding tendencies in beef industry in majority of European countries (surplus of produced milk quantities and unsolved placement of milk, reduction in the number of dairy cattle, reduction in total produced quantities of beef meat as a consequence of reduction in total number of cattle, primarily, reduction in the number of dairy cattle) a cow-calf system should certainly be an alternative and one of the ways to solving current problems and negative tendencies.

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