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Embryo transfer has proved to be a powerful technology in genetic improvement of farm animals, primarily to propagate the genes of females of superior pedigree.. In cattle, particularly in the dairy industry, breeding programs have been developed to promote genetic progress by strategic use of.

DRESSER Director of Research, Cincinnati Wildlife Research Federation, Cincinnati, Ohio As a prelude to this discussion of the ex situ technology that is or could be available to maintain biological diversity in conservation programs, we must first explore why we should be interested in this technology at all. The greatest threat to the preservation of genetic diversity of wild animals comes from the destruction and degradation of their habitats Croner, Continued destruction of tropical rain forests, the most species-rich land environment on Earth, may result in mass extinctions that would permanently impoverish the planet see Part 3 of this book: Other threats to species come from the destruction of animals and plants for food and trade. The Global Report to the President of the United States Barney, states that the extinctions projected for the coming decades will be largely generated by humans and on a scale that renders the gradual process of natural extinction trivial by comparison. Each species forms a genetic reservoir genome that may be of value in agriculture, medicine, or industry Daniel, Forty percent of our present-day medicines are derived from wild plants and animals Wolkomir, ; see also Farnsworth, Chapter 9 of this volume. It is impossible to know what other additional resources lay waiting to be tapped. Animal and plant germplasm should not be preserved merely for altruistic reasons but also for reasons that are of direct benefit to mankind. It is not known which plants and animals may prove useful in the future. It is known, however, that certain animals have proven invaluable to our knowledge of diseases and human health. For example, armadillos Dasypus novemcinctus have taught us much about leprosy as they are the only animal model to acquire this disease when injected with Mycobacterium leprae experimentally Storrs et al. The small cotton-top tamarins Saguinus oedipus from South America have the highest incidence of colon cancer of any animal and have proven to be an excellent species for the study of this fatal disease Lushbaugh et al. Studies of spontaneous diabetes mellitus in the South African hamster Mystromys albicaudatus Stuhlman, and AIDS acquired immunodeficiency syndrome in the macaque Macaca cyclopis, M. Hepatitis B virus was discovered in a group of North American woodchucks Marmota monax by a zoo pathologist at the Penrose Research Laboratories in Philadelphia Snyder et al. The study of the livers of these animals has given human medicine the greatest insight into the etiology of this often seen liver tumor. There are many more examples. Because of the diversity of species, there can be and, in fact, is a broader base of general medical knowledge that is benefiting mankind. One bright spot in the otherwise gloomy picture of animal extinction is the new interest that has been generated in the field of wildlife reproduction. Fueled by the groundwork laid by the agricultural industry, zoo researchers have begun to study the reproductive processes of wild animals and to use technology such as embryo transfer and artificial insemination to help improve the reproductive potential of wild animals. Zoos worldwide have begun to pursue newfound roles as conservators rather than merely displayers of wildlife. This is particularly true with species whose numbers have been so depleted that they cause a genetic bottleneck. For example, the douc langur Pygathrix nemaeus , a primate from Southeast Asia, is now virtually extinct in the wild, and there are not enough in captivity to ensure the genetic diversity necessary to keep the species alive Gorman, With no new blood, so to speak, they can pass only a limited array of genes to their offspring, and as a result, they gradually become genetic carbon copies lacking the built-in adaptability to environmental change that would otherwise occur through natural selection in a genetically diverse group. Genetic diversity is a key to species survival. A species must have enough variation within its genome to enable it to adapt to environmental changes. Inbreeding has taken its toll in the zoo world, resulting in problems such as decreased fertility, high juvenile mortality known as inbreeding depression , and birth defects. ISIS computers catalog animal information from nearly zoological institutions worldwide, including genealogy information for individual animals. One of the best functions of ISIS is that of a computerized matchmaker for participating zoos who wish to swap bloodlines. As zoo animal sperm and embryo banks become a reality, it is hoped that frozen embryo and semen samples can also be cataloged in the ISIS computer as an aid to zoos interested in transporting germplasm rather than animals themselves for the introduction of new bloodlines. In consideration of the above concerns, this chapter discusses reproductive technology as it applies to the long-term preservation of animal germplasm and maintenance of biological diversity. Most ongoing wild animal research is directed toward the improvement of genetic and species diversity. Scientists have realized that the development of advanced reproductive technology, such as embryo transfer, gamete cryopreservation, and artificial insemination, may represent the real key to the future for many species who are currently threatened by extinction. They have also realized that this technology will do a great deal to improve and maintain the genetic diversity within captive populations. However, much of the application of this technology to wild species is still in its infancy. Embryo Transfer Embryo transfer is a technique by which fertilized ova and early embryos are recovered from the reproductive tract of a donor female, the genetic mother, and are transferred into the tract of a recipient female, the foster mother, in whom the embryos develop into full-term fetuses and live young. The first successful transfer of mammalian embryos was performed in the rabbit by Heape in His observations stimulated relatively little further research until about Since then, there has been an explosion of research in this area. Numerous published reviews and textbooks describe both the methods and the fundamental principles on which the technique of embryo transfer rests [see reviews by Betteridge , Mapletoft , Seidel , and Sreenan , and texts by Adams , Cole and Cupps , and Daniel]. Although the specifics of the methods depend upon the species used, the general principles are the same whether performed in laboratory animals such as mice and rabbits, in large domestic animals such as horses and cattle, or in wild species such as baboons and antelope. Embryo transfer in two species, mice and cattle, has become absolutely routine. It is not an exaggeration to state that tens of thousands of living mice and cattle have been produced by embryo transfer. In general terms, the transfer of embryos of other species has been modeled on techniques devised for these two species. Although there are fewer live young, probably thousands of live rabbits, pigs, and horses have been produced by embryo transfer. The application of embryo transfer to wild species is a relatively recent event. Its history can be highlighted as follows: These bongo antelope embryos were brought from Los Angeles to Cincinnati and transferred fresh, 12 hours after collection Dresser et al. Embryos from a wild species had never before been transported long distances. Mehren, Metro Toronto Zoo, personal communication, Synchronization of the donor and recipient animals in embryo transfer can be accomplished through precisely timed injections of prostaglandins, such as Lutalyse and Estrumate. These hormone analogs serve to stimulate the ovaries to begin a new cycle. Superovulation of the donor is accomplished through the injection of fertility hormones such as follicle-stimulating hormone FSH. Superovulation has been fairly successful with the ungulates, but optimal drugs and dosages have yet to be refined for most other species. As many as 31 embryos have been collected from one FSH-stimulated eland cow Dresser, Clearly, the hormone regimen that produces the optimal superovulation response within a given species seems to be fairly individualized and much work is needed in this particular area. In felines, the superovulation of donors and the synchronization of donors and recipients is complicated by the fact that most cats are induced or reflex ovulators, meaning that they ordinarily do not ovulate without the stimulation of copulation. Human chorionic gonadotropin HCG has been administered to domestic cats to cause ovulation to occur sometimes in conjunction with stimulation by a vasectomized male Bowen, Researchers in several institutions have been working on embryo transfer in domestic cats with limited success Dresser et al. It is hoped that domestic cats may be able to serve as surrogates for incubating embryos from small endangered wild cats such as the black-footed cat Felis nigripes. This was the first nonsurgical interspecies embryo transfer between an endangered species and a domestic species. The development of embryo transfer techniques is essential if genetic diversity within captive populations is to be maximized. The ability to introduce new bloodlines into a captive population through the transfer of nonlocal embryos into surrogates would be far preferable to the transport of adult animals for breeding purposes, or to the depletion of wild herds to add new breeding stock to captive populations. In addition, it is a goal of many zoo researchers to develop interspecies embryo transfers to the point at which embryos can be collected from endangered species and transferred to surrogates of a more common species, thereby greatly increasing the reproductive potential of the donor species. Other important benefits result from embryo transfer. For example, it has been found that disease transmission between different populations can be dramatically reduced by embryo transfer see Hare, , for review. This happens because the intact embryo collected from a diseased mother is almost always free of the microbial or viral disease agent and does not transmit the disease to the foster mother. Alternatively, the surrogate mother may confer passive immunity to her offspring that develop from transferred embryos. This may occur either through the placental blood supply or via the colostrum, the first milk. That is, it has been found that cattle of a given breed may quickly succumb to local diseases when imported into a new location. However, live calves produced by transfer of embryos from a foreign breed into another native or endemic domestic breed will usually be as disease-resistant as this domestic breed. This accident of biology should have important consequences for the transplant of both domestic and wild species from one location to another. Interspecies embryo transfer has enjoyed limited success in wild animals, but much more research needs to be done in this area. It seems that most embryos can develop to the early blastocyst stage in the oviducts of unrelated species Daniel, , but further development requires a much closer relationship between donor and recipient and similarity in time and type of implantation, placenta formation, rate of ovum transport, length of gestation, birth weight, and both neonatal and maternal postpartum behavior. Recently, a domestic horse mare gave birth to a donkey foal after she had been injected with donkey white blood cells Antczak, Prior to this treatment, all other donkey embryo transfers into domestic horses had failed. It is not yet clear why the procedure was successful. Although various attempts have been made to collect embryos from nonhuman primates at various zoos and primate centers over the years, very few of these procedures have been reported in the scientific literature. For a review of the existing literature on superovulation and ova collection attempts in the more common nonhuman primates, see Bavister et al. There has been dramatic progress in embryo micromanipulation in little over 6 years, especially as it applies to domestic animals. The research of Willadsen , and Willadsen et al. In the most important application of micromanipulation to exotic animals, an embryo is microsurgically bisected into two or more pieces, thereby producing genetically identical twins or triplets. This technique, although not yet successful with exotic species, could help to quickly increase the numbers of endangered or rare animals. Another result of micromanipulation has been the production of chimeras, which are embryos that are a product of combining two embryos at a relatively early stage of development. It is possible to prevent the surrogate uterus from recognizing the foreign embryo by combining different blastomeres. The younger cells tend to form the trophoblast that gives rise to the placenta, and the older cells tend to form the inner cell mass that will form the fetus. Chimeric embryos can be constructed so that the cells that constitute the trophoblast belong to the surrogate species and the cells of the inner cell mass belong to the donor species. Interspecies embryo transfer and inner cell mass transfer should not be confused with hybridization of species. Offspring contain only genetic material of the original species. Many people now recognize that the method of chimera production might be utilized to rescue endangered species. It might be possible to construct chimeras consisting of an embryo from an endangered species plus an embryo of a common, but related species. The common species might then carry the fetus of the endangered species to term. In summary, then, embryo transfer has become a widely used technique to produce live young animals, especially of domestic species. Although it is as yet still a novel procedure in wild species, continued research will inevitably make transfer of wild animal embryos as successful as the transfer of domestic animal embryos. Cryopreservation of Embryos The first successful freezing of mammalian embryos was reported in Whittingham et al. Since those reports, more than articles and abstracts have been published on this one subject. There have also been three full meetings Ciba Foundation, ; Muhlbock, ; Zeilmaker, and numerous symposia devoted exclusively to the freezing of mammalian embryos. Numerous reviews have also been published Lehn-Jensen, ; Leibo, , ; Maurer, ; Rall et al. Freezing of mouse, rabbit, and bovine embryos has now become a routine procedure.

Chapter 2 : Embryo transfer technology:applications | Speedy deletion Wiki | FANDOM powered by Wikia

Embryo transfer (ET) is a dairy technology that entails collecting embryos from a donor cow and transferring them to a synchronised recipient to complete the gestation period.

English Pocket K No. Biotechnology for the Livestock Industry Meat and milk from farmed animals including livestock cattle, goat and buffalo and poultry are sources of high quality protein and essential amino acids, minerals, fats and fatty acids, readily available vitamins, small quantities of carbohydrates and other bioactive components. The average global per capita meat consumption is Milk on the other hand is consumed in various forms: Some poor countries may not be able to sustain these levels of meat and milk requirement, leading to malnutrition. Demand for meat and milk production is also expected to double in in developing countries, where population is expected to double. Thus, increasing production and the safe processing and marketing of meat and milk, and their products are big challenges for livestock producers. Biotechnology is being harnessed in various aspects of the livestock industry to hasten breed development for improved animal health and welfare, enhanced reproduction, and improved nutritional quality and safety of animal-derived foods. Reproductive Animal Biotechnology Various biotechnology methods are used in improving the breeding stock of animals. These include artificial insemination AI , embryo transfer ET , in-vitro fertilization IVF , somatic cell nuclear transfer, and the emerging technology on somatic cell nuclear transfer. One of the earliest perfected technology is artificial insemination AI where new breeds of animals are produced through the introduction of the male sperm from one superior male to the female reproductive tract without mating. AI reduces transmission of venereal disease, lessens the need of farms to maintain breeding males, facilitates more accurate recording of pedigrees, and minimizes the cost of introducing improved genetics. In case other artificial reproductive techniques fail due to difficulties such as blocked reproductive systems, non-responsive ovaries in the females, marginal semen quality and quantity in the male, and presence of disease, in vitro fertilization IVF is used. To date, successful IVFs have been conducted in various animal species due to advances in embryo production and cryopreservation of reproductive cells. Embryo transfer ET from one mother to a surrogate mother makes it possible to produce several livestock progenies from a superior female. Selected females are induced to superovulate hormonally and inseminated at an appropriate time relative to ovulation depending on the species and breed. ET increases reproductive rate of selected females, reduces disease transfer, and facilitates the development of rare and economically important genetic stocks as well as the production of several closely related and genetically similar individuals that are important in livestock breeding research. The International Embryo Transfer Society IETS estimated that a total of approximately , in vivo derived bovine embryos, 68, sheep embryos, 1, goat embryos were transferred worldwide in Somatic cell nuclear transfer NF is a technique in which the nucleus DNA of a somatic cell is transferred into a female egg cell or oocyte in which the nucleus has been removed to generate a new individual, genetically identical to the somatic cell donor. Problems on high rate of pregnancy loss, survival of newborn and increased incidence of abnormal development due to incorrect reprogramming of nuclear DNA epigenetic inference and unusual conditions during in-vitro processes make this a pre-commercial technology. Genomics and Marker-Assisted Selection MAS Applications The discovery and identification of DNA sequences or molecular markers associated with important animal traits has various applications that include trait improvement, heritability determination, and product traceability. Molecular marker-assisted introgression MAI. Markers are used to guide livestock breeders in selecting individuals expressing the introgressed gene. A series of backcrossing to the recipient parent is usually done in conventional breeding. With the use of molecular markers, the time and number of backcrossing cycles incurred in selection and identification of the desired individual are reduced. Today, molecular markers are being used in various livestock trait improvement activities such as growth, meat quality, wool quality, milk production and quality, and disease resistance. Molecular markers are reliable tools used by regulatory bodies to ensure product quality and food safety. A similar DNA-based technology has also been developed to detect the presence of around bp fragments to facilitate testing of very small meat samples from the supermarket. Genetic diseases and physical defects can be traced and documented in livestock animals using molecular markers. The Future of DNA-based Technology in Livestock Improvement Currently, complete genomic sequencies of important farm animals such as that of chicken11 and bovine12 have been released, and genomic sequences of pig, goat, and sheep are now in progress. With advances in sequencing farm animal genome, the continuing progress in molecular marker technology, and the use of reproductive biotechnology, windows of research opportunities will be opened to improve and revolutionize the livestock industry. In the future, it will be possible to obtain information on the genetic constitution of the animals that will allow a prediction of the production potential of an animal at birth, or perhaps even as a fetus, as well as the selection of animals best suited to a specific production environment. Viable offspring derived from fetal and adult mammalian cells. Fertilization of rabbit ova in vitro. Significant increases in transfers of both in vivo derived and in vitro produced embryos in cattle and contrasted trends in other species In IETS Newsletter [Cloning animals by somatic cell nuclear transfer-biological factors. Scie Tech Off Int Epiz, 20 2 Advances in livestock genomics: Genome Research 15, International Chicken Genome Sequencing Consortium. Sequence and comparative analysis of the chicken genome provide unique perspectives on vertebrate evolution. Bovine Genome Sequencing and Analysis Consortium. The genome sequence of taurine cattle: April 24;

Chapter 3 : Embryo Transfer in Cattle

Embryo transfer refers to a step in the process of assisted reproduction in which embryos are placed into the uterus of a female with the intent to establish a pregnancy.

This article needs more links to other articles to help integrate it into the encyclopedia. Please help improve this article by adding links that are relevant to the context within the existing text. May Introduction In the present century when the secret of genetic sequences through generations of a population was unfolded, all biological sciences advanced rapidly and the application of which helped mankind to increase production from various species of animals and plants. Among them artificial insemination can be ascribed as the greatest development in agriculture of the century as its contribution towards production enhancement is the highest in the world. The technique of artificial insemination in cattle is based on a biological fact that the males generally produce large quantities of semen, which can be extended and preserved. With the introduction of artificial insemination technology there has been revolutionary changes in the animal production industry. The artificial insemination technology takes advantage of the capability of male animals to produce multiples of millions of male gametes, each of which represents half of the genetic constitution of its producer. Therefore a male highly selected for a desired genetic constitution through artificial insemination can satisfactorily change the genetic characters of the population. A reproductively sound cow may not usually produce more than eight calves in her lifetime, despite her ovarian potential to produce many thousands of gametes. With the application of Embryo Transfer Technology, higher rate of multiplication of highly selected female germplasm is possible, which can further revolutionize the cattle industry. Even though the first successful ET was done in in rabbit, [1] it took another sixty years for the first successful ET pregnancy in [2] and first successful ET calf in [3] in cattle. Again it took around 20 years to apply this technique in commercial line in the western countries. The potential of this technique is yet to be exploited in many countries. We can multiply our own source of high quality germplasm by bio-technological tools like embryo transfer and micromanipulation of embryos including cloning. A superior cow inseminated with superior bull semen will have best chance to produce a superior calf. The progress of genetic improvement of a population is limited through low rate female reproduction. Normally a cow can produce a maximum of one calf per year. But through multiple ovulation and embryo transfer MOET a superior female can produce calves per year without affecting her reproductive efficiency. Embryo transfer technology can be very well utilized to support the breeding bull production in cost effective way. The genetic material exotic to a country and desirable are now made available through semen or by import of animals. With the availability of frozen embryos, any combination of bull and cow living anywhere could be imported. In this advantage are various like, very low risk of disease transmission, less expensive, simple transportation procedures, passive immunity from native dam etc. The embryos of such species can be collected and preserved under frozen state in large numbers instead of rearing such animals for long time, which can be very expensive. Exploitation of other state-of art technologies such as IVF, bisection, cloning by nuclear transplantation, sexing. Production of transgenic animals etc. Embryo transfer technology can be used to circumvent infertility in certain extends as a diagnostic as well as treatment tool. Preliminary note on the transplantation of mammalian ova within a uterine foster mother. Super ovulation and ovum transfer in cattle. Non-surgical embryo transfer in cattle. Successful transplantationof afertilized bovine ovum. Please help out by adding categories to it so that it can be listed with similar articles. May This article uses material from the Wikipedia article Embryo transfer technology:

Chapter 4 : Agriculture for Impact Embryo Transfer

The use of sexed semen in embryo transfer programs is considered economically viable, especially if attention is given to inseminate donor cows with sperm numbers comparable to those used in artificial inseminations with conventional nonsorted semen.

Such characteristics of embryos as protection by the zona pellucida, minute size, exposure only to a very circumscribed environment, and lack of body systems to host pathogens e. In addition, it is possible to wash, treat, and physically examine the individual embryo, which provides additional, very effective safeguards. Thus, importation of genetic material in the form of embryos is innately safer than importation of post-natal animals or semen Stringfellow, ; Hare and Seidel, Regulatory officials recognize this fact and are drafting realistic conditions for importation that are less time-consuming than those required for post-natal animals. Health regulations pertaining to the collection and processing of the semen used to produce embryos intended for export, however, may still apply. The decreased risk of compromising the health of national herds in itself makes embryo transfer the method of choice for importing breeding stock in many cases. Other advantages are that the offspring will be percent of the desired genotype and will adapt more readily to the new environment because of passive immunity acquired from the recipient. There is still a potential for problems of unthriftiness and disappointing production if the type of cow is inappropriate for the new environment, as for example, a high-producing North American dairy cow would be for an extensive management system based on range foraging. Costs of importing embryos are often lower than importing post-natal animals, and it is possible to change the breed of a herd within a single generation. Nevertheless, costs are still a great deal higher than importing semen, and conventional embryo transfer remains a less potent tool for genetic progress than artificial insemination programmes based on intensive selection. Most MOET schemes require one or a few large nucleus herds. The resulting genetic improvement would be disseminated to the general population by embryo transfer, artificial insemination, or more practically by young bulls to be used in natural breeding. MOET procedures rely on advanced technology, which at first seems inappropriate for less developed countries. However, nearly all of the advanced technical procedures would be carried out at one or a few central sites, which may be especially appropriate for some applications in many less developed countries. To appreciate why MOET procedures are effective, it is necessary to consider briefly conventional animal breeding procedures. Improved animals result from the following practices. Identify genetically valuable animals accurately so that the best can be used as parents of the next generation. This can be done by performance testing, progeny testing and pedigree analysis. Performance testing measures the animal itself, e. Because there is some genetic component to such performance, a partial measure of genetic value is obtained. Advantages of performance testing include low cost, rapid availability of data and ability to test many or all of the animals in the population. Disadvantages are low accuracy in many cases one measurement per animal , confusion by environmental factors in some cases deliberate manipulation in order to make certain animals look good and sex limitations, e. Progeny testing measures traits in offspring of animals and in many respects is the converse of performance testing. It is not sex limited and can be done over a variety of environments in ways that are not likely to be misleading. However, it is expensive, data are not available until the next generation and only limited numbers of animals can be progeny tested. Accurate progeny testing is difficult with cows because of limited numbers of offspring. In many cases a performance test is used to pre-select animals for progeny testing. Pedigree analysis simply uses information available on relatives, for example, the genetic value of parents or siblings. Use high selection intensity so that only the best animals genetically are selected as parents. Genetically superior cattle are propagated selectively by artificial insemination and embryo transfer, by keeping offspring from only the best cows and by using only the few best bulls in natural breeding systems. Because of low reproductive rates of cows, most genetic progress is made by selecting bulls and obtaining many progeny per bull. Minimize the generation interval. If selection steps can be made every three years, genetic progress will be nearly twice what it would be with selection every six years. Progeny testing lengthens the generation interval because data are not available until the next generation, which often dissipates the advantages of the increased accuracy. The main objective of MOET is to select on the basis of performance tests and pedigree analysis in order to reduce the generation interval, in comparison to progeny testing procedures used currently. Selection intensity is increased on the female side with superovulation and embryo transfer. In MOET schemes, genetic progress increases slightly if embryos are split so that more accurate assessments of genetic value are obtained. This occurs because two phenotypic measurements are made on the same genotype. Furthermore, reliability of measurements is increased because all animals are kept in one or a few herds under controlled conditions, and thus can be compared to each other accurately without bias. MOET procedures should be especially useful for improving milk production Nicholas and Smith, therefore this discussion is based on dairy cattle. However, MOET can also be used for beef cattle. Populations of the order of 1 animals donors, calves, recipients are required to make MOET procedures work optimally without increasing inbreeding more than 0. To begin such a herd, the best females available are gathered, superovulated and bred to the best bulls available. The embryos are then collected and bisected to maximize production or, in the future, cloned by nuclear transplantation so that many identical females result per embryo. Sexing of sperm or embryos would further improve this system. The progeny are then compared for such traits as milk production and milk composition, and the best sets are used to become parents of the next generation. Embryos may also be collected from heifers and then frozen, so that embryos are available as soon as selection has occurred in the fourth or fifth month of the first lactation. These procedures are repeated continually with each generation. After several generations, the average genetic value of selected animals in these nucleus herds will exceed the average genetic value of selected animals from outside the herd, even most progeny-tested bulls. Thus, bulls that are siblings of the best females in the nucleus herd are selected as sires for the next MOET generation and for the general population because they are genetically superior on the average to bulls available elsewhere, even though they are not progeny tested. A variation on MOET that may be an option in the future is to use cloning in another context. Some embryos of a clone would be frozen so that if a particular clone proved to be valuable, many cloned embryos would be made by serial nuclear transplantation. These embryos could then be disseminated to the population, thus greatly increasing the genetic value of the population. For genetic progress to continue, females of the best clones would be mated to the best bulls to obtain even better clones in the long run. It is likely to be some years before such a scheme becomes feasible, even in developed countries. However, MOET schemes are potentially very useful without cloning at all, and may be especially valuable in the absence of contemporaneous genetic improvement schemes, which require sophisticated data gathering systems. Such systems for cattle populations are frequently unavailable in less-developed countries. Beef production is inherently inefficient biologically. Since about 70 percent of nutrients consumed by dams are for body maintenance and the other 30 percent go to producing the foetus and milk to feed the calf Seidel, b , it should theoretically be possible to produce twice as many calves with only 30 percent more nutrients if cattle had twins. Probably a 60 percent increase in feed costs is more realistic due to higher morbidity and mortality and slower growth rates with twins. In practice, one would probably decrease cow numbers and increase calf numbers due to twins so that the amount of nutrients used per farm would remain constant. There is a great advantage to twinning if nutrients are limited and management capabilities are high. There are dozens of studies for example, Anderson, demonstrating that twinning can be successful, both in terms of calf survival and high fertility with acceptable intervals between parturition and conception while cows are suckling twins. However, most of these studies were conducted by highly motivated researchers with considerable resources. In routine cattle management programmes, farmers universally show an aversion to twinning, because the calves often die or do poorly, and there is a higher incidence among cows of death, retained placenta, decreased milk production and lower fertility after parturition. The majority of these problems are attributable to the fact that the farmers were not expecting twins to be born, and therefore, did not adjust management procedures accordingly. Many studies have involved the production of twins by embryo transfer Anderson, To date, other methods, for example administering low doses of gonadotrophins to cause twin ovulations, have not been efficacious, while twinning by embryo transfer has proved too complex and expensive to be profitable. The schemes that have worked at all for farmers have been heavily subsidized. However, in some situations, it may be profitable to obtain oocytes from slaughterhouse ovaries, mature and fertilize them in vitro, culture them to the early blastocyst stage and freeze them for twinning purposes Lu et al. Such an enterprise would have to rely on huge volumes of embryo production, and delivery of embryo transfer services very inexpensively, for example by systems similar to artificial insemination programmes. At the time of writing, a huge effort is under way in several countries in the European Economic Community to exploit twinning by embryo transfer because of a marked shortage of calves to grow for beef purposes. The shortage and consequent high value of calves was caused by surplus numbers of dairy cows being used for milk production, whereas traditionally they produced most of the calves for beef. This shortage of calves is likely to moderate as more farmers switch to production of beef calves, but mean while considerable progress in technology of oocyte maturation and in vitro fertilization for commercial purposes is likely. Undoubtedly, there will be other situations in various countries in which twinning cattle will be profitable. However, due to the complex management requirements, such programmes will be appropriate only in very special situations, at least for the rest of this century. Detection of carriers of undesirable Mendelian recessive traits via embryo transfer is very effective for both cows and bulls. For certain traits like syndactyly and dwarfism, there is a shortage of homozygous, fertile females to use as mates for suspected carrier bulls. Embryo transfer is an obvious means of amplifying gamete and embryo production of such females so that bulls can be tested for carrier status. Embryo transfer also provides a method of testing daughters of carrier bulls to determine which half does not have the deleterious allele. Since at least seven defect-free calves are required to be 99 percent certain that a given animal is not a carrier, it would normally take longer than the average reproductive lifespan of a cow to test this; furthermore, all the calves produced during the test would be carriers because of using semen from a double recessive bull. With superovulation and embryo transfer, one or two courses of superovulation will provide enough embryos to test most cows; moreover, recipients can be twinned and the foetuses examined at about two months of gestation to diagnose many of these defects. Thus, with embryo transfer a quick answer is possible to a problem that is otherwise intractable. Exploitation of other technologies that require manipulating the oocyte or embryo in vitro depends on good embryo transfer techniques for success. Such technologies include in vitro fertilization, sexing, production of transgenic animals, bisection of embryos and cloning by nuclear transplantation. From the standpoint of research, embryo transfer is a powerful tool for separating foetal and maternal effects. For example, is declining reproductive efficiency with age due to an aged ovum or an aged reproductive tract? Applications in research are considered in detail by Kuzan and Seidel As is described in Chapter 10, production of identical twin animals by transfer of bisected embryos for use as experimental animals greatly reduces research costs since much smaller treatment groups are needed to obtain statistically significant results.

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Chapter 5 : Embryo transfer - Wikipedia

But the actual transfer of an embryo is only one step in a series of embryo transfer technology was develÂ- Embryo transfer in food animals began in the s.

For the mathematical concept, see E-set. The technique of selecting only one embryo to transfer to the woman is called elective-single embryo transfer e-SET or, when embryos are at the blastocyst stage, it can also be called elective single blastocyst transfer eSBT. Access to public funding for ART, availability of good cryopreservation facilities, effective education about the risks of multiple pregnancy, and legislation appear to be the most important factors for regional usage of single embryo transfer. A Cochrane review in of randomized studies came to the result that there generally is insufficient evidence to support the use of one intervention in preference to another, but with some evidence that in cycles where the endometrium is artificially prepared by estrogen or progesterone, it is beneficial to administer an additional drug that suppresses hormone production by the ovaries such as continuous administration of a gonadotropin releasing hormone agonist GnRHa. There are significantly improved outcomes when women are exposed to seminal plasma around the time of embryo transfer, with statistical significance for clinical pregnancy , but not for ongoing pregnancy or live birth rates with the limited data available. While daily intramuscular injections of progesterone-in-oil PIO have been the standard route of administration, PIO injections are not FDA-approved for use in pregnancy. A recent meta-analysis showed that the intravaginal route with an appropriate dose and dosing frequency is equivalent to daily intramuscular injections. Pregnancy testing is done typically two weeks after egg retrieval. Third-party reproduction[edit] It is not necessary that the embryo transfer be performed on the female who provided the eggs. Thus another female whose uterus is appropriately prepared can receive the embryo and become pregnant. Embryo transfer may be used where a woman who has eggs but no uterus and wants to have a biological baby; she would require the help of a gestational carrier or surrogate to carry the pregnancy. Also, a woman who has no eggs but a uterus may utilize egg donor IVF, in which case another woman would provide eggs for fertilization and the resulting embryos are placed into the uterus of the patient. Embryos may be specifically created by using eggs and sperm from donors and these can then be transferred into the uterus of another woman. Third party reproduction is controversial and regulated in many countries. Persons entering gestational surrogacy arrangements must make sense of an entirely new type of relationship that does not fit any of the traditional scripts we use to categorize relations as kinship, friendship, romantic partnership or market relations. This can lead to new conceptualizations of body and self. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. February Learn how and when to remove this template message The first transfer of an embryo from one human to another resulting in pregnancy was reported in July and subsequently led to the announcement of the first human birth 3 February In the procedure, an embryo that was just beginning to develop was transferred from one woman in whom it had been conceived by artificial insemination to another woman who gave birth to the infant 38 weeks later. The sperm used in the artificial insemination came from the husband of the woman who bore the baby. Prior to this, thousands of women who were infertile , had adoption as the only path to parenthood. This set the stage to allow open and candid discussion of embryo donation and transfer. This breakthrough has given way to the donation of human embryos as a common practice similar to other donations such as blood and major organ donations. This work established the technical foundation and legal-ethical framework surrounding the clinical use of human oocyte and embryo donation , a mainstream clinical practice, which has evolved over the past 25 years. It showed a small improvement in live birth rate per couple for blastocyst transfers. Embryo transfer techniques allow top quality female livestock to have a greater influence on the genetic advancement of a herd or flock in much the same way that artificial insemination has allowed greater use of superior sires. The general epidemiological aspects of embryo transfer indicates that the transfer of embryos provides the opportunity to introduce genetic material into populations of livestock while greatly reducing the risk for transmission of infectious diseases. Recent developments in the sexing of embryos before transfer and implanting has great potential in the dairy and other livestock industries. For example, embryos of genetically modified strains that are difficult to breed or expensive to maintain may be stored frozen, and only thawed and implanted into a pseudopregnant dam when needed. Frozen embryo transfer in animals[edit] The development of various methods of cryopreservation of bovine embryos [41] [42] improved embryo transfer technique considerably efficient technology, no longer depending on the immediate readiness of suitable recipients. Pregnancy rates are just slightly less than those achieved with fresh embryos. Binoy Sebastian Vettical of Kerala Livestock Development Board Ltd has produced the embryo stored frozen in Ethylene Glycol freeze media by slow programmable freezing SPF technique and transferred directly to recipient cattle immediately after thawing the frozen straw in water for the birth of this calf. In a study, in vivo produced crossbred bovine embryos stored frozen in ethylene glycol freeze media were transferred directly to recipients under tropical conditions and achieved a pregnancy rate of 50 percent. Archived from the original on 6 December Retrieved 22 September The Cochrane Database of Systematic Reviews A systematic review and meta-analysis".

Chapter 6 : Training manual for embryo transfer in cattle

Preface Embryo transfer technology has become one of the prominent high businesses worldwide in human and animal reproduction.

Embryo Transfer ET is an effective method of increasing the reproduction rate of individuals or groups of animals. All female animals are capable of producing far more eggs than they ever need over their lifetime. Multiple eggs can then be fertilised inside the cow and collected non-surgically, usually 7 days after mating or artificial insemination. These embryos can be transferred into surrogate mothers recipients who are at the same stage of their cycle but have not been mated. Many of these embryos are accepted by the recipients and a normal pregnancy occurs. Alternatively, embryos can be frozen for sale or later transfer. Drugs Used Other than the FSH injections, it is necessary to synchronise animals so that they cycle at the correct time. Pregnecol , GnRH e. Receptal and prostaglandin eg Estrumate or Estroplan injection. The ET procedure can be divided into 4 areas. Donors require treating with FSH, which needs to be given by injection, twice a day for four days. Recipients also need injecting with Prostaglandin. All injections are to be given into muscle i. Are fed well prior to and after calving â€" they may need preferential management Have a sufficient interval after calving â€" 6 weeks prior to start of program is minimum Have cycled Have been vet checked to ensure they are clean Heat detection Where cows are artificially inseminated it is essential that heats are accurately recorded. Heat detection aids will assist greatly. Embryo Collection On collection day donors and recipients need to be handy to the yards, which need to be secure, preferably with a covered race. The donor cow is given an epidural injection to relax her bowel. Her rear end is washed and sterilised. An inflatable cuff on the catheter is filled with air to hold the catheter in place and fluid is run into the uterine horn. When the horn is filled with fluid it is run back through the catheter and through a very fine filter. This catches the embryos. After repeating this process several times the catheter is transferred to the other horn of the uterus and the process is repeated. After collection, the cow is released to go back to her paddock. She needs to be given a Prostaglandin injection 3 days after to get her cycling and to remove any embryos that may have been left behind. Once found, the embryos are counted, graded and washed. The embryos can now be loaded into transfer guns similar to long AI pistolettes and transferred into recipients, or frozen. Freezing takes about 2 hours with the embryos held in straws of antifreeze solution and slowly cooled to â€" They are then plunged into liquid nitrogen and stored indefinitely at â€" degrees C. The ovaries are felt to check that the animals have cycled successfully. As with flushing, the transfer gun is inserted into the vagina, passed through the cervix and up one of the uterine horns where the embryo is deposited. Facilities Basic yards are needed with a covered race where cows can be securely held for programming and flushing. For embryology, a clean, warm room with power and a bench is required. This need not be at the yards. We have a van equipped as a mobile embryology lab, which we can use where there is no suitable room or power.