

Review Article

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Interspecies Cloning-A Step towards Conservation of Endangered Species: A Review

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ABSTRACT

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Interspecies cloning has a prudent and promising role to be played in future for conservation of endangered species. Many ex-situ conservation programs employed till date are not enough to tackle the problem of conservation of endangered species. These programs need to be supplemented with other innovation techniques like interspecies cloning which can make the task more productive and fruitful. Though various international projects have been successful in interspecies cloning of various endangered animals but it has to be operated at larger global extent. The technique is at lag phase and we have to bring it on log phase by doing ample research in field so that it could be standardized at optimum levels in species of interest that are under focus of conservation.

Introduction

Innovations being the raw material for new development and technology have not only served mankind but also other animals which are rare and whom which humans want to have an intimate desire for harmonious coexistence. There are several species of mammals, fishes and birds which are at the verge of extinction. According to reports 25% of mammals, 34% of fish species and 11% of bird species are at the verge of extinction (1).

The efforts to maintain biodiversity via habitat and wildlife conservation are not ample enough for conservation programs and still chances for extinction of rare and

endangered vertebrate species remain prudent (3). A series of captive propagation programs are being currently employed in captive animals which are endangered for preserving their genetic diversity. However, these programs have their own drawbacks which include problems with animal husbandry, reproductive failure of animals and restricted physical space (9). With the advancement in assisted reproductive techniques such as artificial insemination, *in vitro* fertilization, intracytoplasmic sperm injection (ICSI), cryogenics of gametes, oocytes, embryos and embryo transfer have opened new ways for further propagation of endangered species.

Interspecies Cloning

Interspecies cloning involves the transfer of a nucleus or cell from one species into the cytoplasm of an enucleated oocyte from another related specie. Once activated, reconstructed oocytes can be cultured *in vitro* to blastocyst and then transferred in oocyte-recipient specie. There are two interspecies cloning technique:

Interspecies somatic cell nuclear transfer (iSCNT)

Interspecies handmade cloning (iHMC)

The aim of both of these techniques is to generate cytoplasts from related specie and then fuse it with the somatic cells of animal which is to be cloned. The difference between these two techniques lies in the generation of oocyte-cytoplasm reconstructs. In iSCNT, the cytoplasm is generated by enucleation with the help of enucleation pipette on micromanipulator keeping zonapellucida intact. In iHMC, the cytoplasm of recipient specie is generated by cutting the protrusion cone of IVM oocyte after dissolving the zonapellucida layer.

Many mammalian species have been successfully cloned by iSCNT considering that iSCNT will serve as a pivotal technique in cloning for conservation of endangered mammalian species. The different wild animals which have been cloned by iSCNT are gaur (8), mouflon (10), banteng (12), female gray wolf (7) and male gray wolf (11).

Many studies have shown that it is possible to produce embryos from endangered species by interspecies or intergeneric SCNT. However, in reports few live cloned wild mammals have been produced and embryos of these animals were produced by reconstructing them with donor oocyte of the same specie (8; 10; 5; 6;

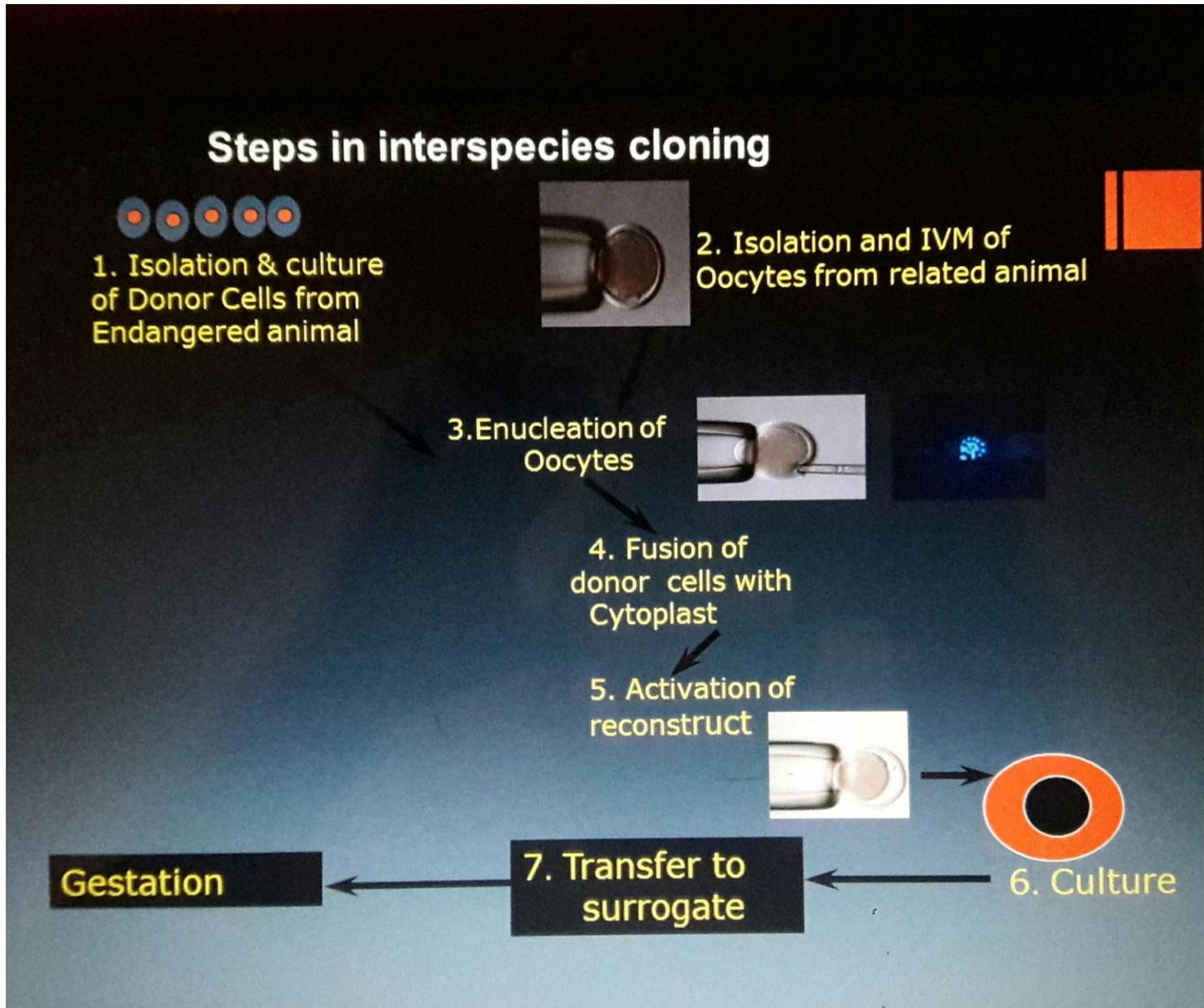
7). As far as intergeneric SCNT is considered viable offspring have not been produced in any mammalian species. However, with intergeneric cloned embryos pregnancies have been established after transfer in sheep or domestic cat recipient (4; 2; 13). The multifactorial causes which are responsible for successful development of iSCNT embryos are similar to those reported for intraspecies SCNT which includes source of oocyte cytoplasm, cell cycle stage of donor cells, genotype of donor cells and synchronization.

Khaleej times, On May 18, 2017, published news that Dr Nissar and his colleagues in Dubai cloned bacterial camel calf by using single humped camel as source of oocytes at the reproductive biotechnology centre in Dubai. Thus it opened the door of success for cloning of double humped camel which are less in number than double humped camels.

Other implications

Besides, the animals which have low reproductive efficiencies, their reproducing efficiency can be increased by interspecies cloning. Interspecies cloning derived embryonic stem cells can be produced and used for therapeutic purposes. It could be used as a model to study events occurring during early embryonic development.

Interspecies cloning technique may become instrumental in rescuing endangered species in future and possibly reverse extinctions that have already occurred. Various wildlife conservation programs have used captive propagation programs to preserve endangered species in captivity. Limitations such as restricted physical space for animals, problems with animal husbandry and general reproductive failure of the animals have created the need for additional propagation programs.



Most ethicists who strongly oppose human cloning see no problem in using the technique to rescue endangered species. Thus, interspecies nuclear transfer technology also creates the possibility for restoring already extinct species from which intact cell lines are available. This highlights the importance of establishing repositories of the cell lines of endangered species, which are imperative to create a 'genetic trust' for future cloning efforts.

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