First step in becoming one with God - Cloning

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During the seventies scientists were able to show that nuclei transferred from adult frog keratinocytes culture could support development upto tadpole stage, but not to adults. But, a few group of scientists under the leadership of a zoologist, Dr. Ian Wilmut, in a small village called Roslin in the outskirts of the capital of Scotland (Edinburgh), after more than 7 years of research, came out with a novel method of cloning. Wherein, the first genetically enginered 'Dolly' (sheep) was born in the farm of the Roslin Institute. (Clone=cells having the same genetic constituents and derived from a single cell by repeated mitosis).

This spectacular achievement was kept as a secret for a few months, since the scientific journal 'Nature' was preparing to publish this major work in its ensuing volume with the photo of Dolly as its coverpage. But an enthusiastic journalist in USA came to know about this wonder a few days before the journal was out of press and thus on a fine saturday (holiday), the whole premises of Roslin Institute was crowded with media persons from all corners of the universe.

Before going into the detailed work of Ian and co-workers let us understand the work in simple term. A number of cells would be removed from a donor. The growth of these cells would be arrested and they are forced into hibernation. The Oocyte would be extracted from an egg-provider. The nucleus of the Oocyte would be removed (enucleated) and the enucleated oocyte is fused with hibernating donor cell. This embrio is allowed to undergo cell division and at a particular cell stage, it is implanted in the surrogate mother which finally give birth to the young one. Thus newborn cloned animals of same genetic makeup could be produced in plenty.

Let peep into the work of Ian and colleagues at the Roslin Institute. They prepared three cell cultures as follows.

I. Day-9 embryo derived cells:

The embryonic disc of a day 9 embryo of a poll dorset ewe were cultured in suitable media and the disc was disaggregated and the cells were altered into a single colony of flattened cells. These cells were used as nuclear donors.

II. Foetal derived cells.

Black Welsh mountain sheep (26 day pregnant) facts were recovered at autopsy and the tissues (except head) were cut into small pieces and the cells were dispersed and cultured in suitable media. The colony of fibroblast like cells which developed were used as nuclear donors.

III. Mammary gland derived cell.

Cells were obtained from the mammary gland of a 6 year old Finn Dorset ewe in the last trimester of pregnancy. These cells were cultured in suitable media and a colony of cells were prepared, which were used as nuclear donors.

These three different diploid cell lines were made quiescent and their growth were arrested (GO phase).

Scottish Black face ewes primed with GnRH were used to collect the oocyte. The nucleus of the oocytes were removed (enucleated) and by using an electrical impulse a donor cell was made to fuse with an enucleated oocyte. These oocytes were activated and thus many reconstructed embryos were developed. These embryos were further cultured in ligated oviduct or special medium and those embryos that developed to morula or blastocyte state were transferred to recipient ewes. One, two or three embryos were transferred to each ewe depending upon the availability of the embryos.

Out-of the 277 eggs, only 29 developed to a stage where they could be implanted and produce the animal.

The team could produce 4 lambs from embryo derived cells, 2 lambs from Foetal derived cells and one from the mammary sepithelial cell. All the lambs displayed the morphological characteristic of the breed used to derive the nucleus donor and not that of the oocyte donor, Thus it was established that a mammal could be

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