Techniques of Cloning



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Techniques of Cloning

" It is now possible to make clones, or exact genetic copies, of sheep, cows, goats, mice and, probably, humans. This opens the way towards the production of replacement body parts from adult cells " (Gurdon and Colman 743).

Cloning techniques have been in use for centuries. The practice of taking cuttings is universal among gardeners, and large companies now propagate desirable plant strains in their millions. Lower <u>invertebrates</u> can also be cloned. For example, cut an earthworm or flatworm in half, and the missing halves will regenerate to create two genetically identical individuals. Although vertebrates cannot be cloned by these routes, identical twins are naturally occurring genetic clones. Moreover, the method of nuclear transplantation, first developed about forty years ago in <u>frogs</u>, has been successfully used to make clones of sheep, mice, cows and goats, and it could probably be applied to people too. By taking a few non-reproductive cells from adult mammals, identical replicas can be created without damage or even inconvenience to the donors.

In vertebrates, fertilization begins with the union of the sperm and the egg. The unfertilized

egg is stopped at a certain stage of the cell-division cycle, and the sperm provides an <u>activation</u> stimulus that triggers the resumption and completion of cell division. "The egg and sperm 'pronuclei' then swell, their chromosomes unravel from the tightly packed, 'condensed' state in which they are stored, and DNA replication can proceed " (Gurdon and Colman 743). The chromosomes then recondense, the nuclear membrane dissolves, and the fertilized egg divides into two identical daughter cells.

Nuclear transfer subverts fertilization by replacing the female genetic material of an unfertilized egg with the nucleus from a different cell. "This was first done successfully on frogs in the 1950s, in the United States and Britain " (Gurdon and Colman 744). A non-reproductive (somatic) cell, such as an intestinal epithelial cell, was ruptured by suction into a glass microneedle. Its nucleus, surrounded by a layer of cytoplasm, was then injected into an unfertilized egg from which the female genetic material had been removed or destroyed by ultraviolet irradiation. Some of

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