Cloning and Stem Cells

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MEDICAL INFORMATION

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Cloning and stem cells are two buzz words in today's world. Too many people hear these words and conjure up pictures of endless look-alikes as well as the harvesting of embryos. But that is only a very small part of the picture.

First let us talk about cloning. By definition a clone is an exact duplicate of something. In the biological world it is a duplicate of something relatively simple such as a fragment of DNA, or as complicated as a whole organism. Deliberate cloning has been performed for decades. For instance, plants have been cloned both in the laboratory as well as commercially for quite some time. Many plant varieties are propagated by cloning. Cloning has been used for years in reproducing viruses and bacteria. Cell lines are often reproduced for basic research and in the production of many of our modern vaccines. DNA is also routinely cloned for identification, forensic, and gene mapping purposes. Currently cloning is often mentioned in the news with regards to the reproduction of animals. Two examples include the sheep cloned several years ago in the United Kingdom, and more recently the announcement by Korean researchers that the first dog had been produced from a cloned cell.

Almost any cells can be cloned including stem cells. Stem cells are primal undifferentiated cells, which retain the ability to differentiate into other cell types. There are basically two kinds of stem cells. These are adult stem cells and embryonic stem cells. An adult stem cell is an unspecialized cell found in specialized tissues of the body, such as the liver or heart. These can renew themselves and (with certain limitations) differentiate to yield all the specialized cell types of the tissue from which they originated. Scientists in many laboratories are trying to find ways to grow adult stem cells in cell culture and manipulate them to generate specific cell types so they can be used to treat injury or disease. Some examples of potential treatments include replacing the dopamine-producing cells in the brains of Parkinson's patients, developing insulin-producing cells for Type I Diabetes and repairing damaged heart muscle following a heart attack with cardiac muscle cells.

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An embryonic stem cell is a primitive (undifferentiated) cell from the embryo. It has the potential to produce a wide variety of specialized cell types. One of the reasons researchers are so interested in embryonic stems cells is because they are more plentiful and have the potential to differentiate into many more types of specialized cells than the stem cells from adult tissues.

From the above short overview, it can be readily seen that both cloning and stem cell research can be applied to two broad categories in the world of dogs. One is the very narrow category of duplicating individuals. The other is the furthering of basic research with the ultimate goal of developing useful procedures that researchers feel can change the face of medicine by the development of techniques to repair damaged organs or even to grow transplants. This area of regenerative medicine, as stem cell research is often called, is a very large part of basic research today.

Much of the controversy in regards to cloning and stem cell research is centered in the ethical debate over reproducing a human, as well as the use of human embryos for the harvesting of stem cells. The ethical debate is extended into the canine field with the Korean announcement that a dog has been cloned. This short article was developed to extend the understanding of cloning but not to take a stand on the ethical issues involved.