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## Cloning Frozen Animals

Pratik Talati

Imagine being able to clone an extinct species that has been frozen for over 10,000 years. With the current technology, this futuristic idea does not seem too far away. Not too long ago, research scientists were able to clone the infamous sheep Dolly from an adult somatic cell by transferring the nucleus. Currently, researchers in Japan have been able to apply a similar technique to clone mice that have been frozen for as long as 16 years.

Teruhiko Wakayama and colleagues at the Center for Developmental Biology at Japan's RIKEN research institute in Yokohama are the first to manage to clone the mice even though their cells had burst. Cells normally burst during the freezing cycle, sometimes compromising DNA integrity, and many researchers believe that these cells cannot be cloned because no live cells are available. Cryoprotectants can be used to prevent cells from bursting during the freezing process, but only if they are applied before cells are frozen. The process used for cloning the mice is similar to the one used in Dolly: taking the nucleus out of an egg cell and replacing it with the nucleus of an ordinary cell from an animal that is going to be cloned. Under the right conditions—a chemical trigger or an electric shock—

the egg divides as though a sperm has already fertilized it.

According to Wakayama's team, of all of the sources for the cells, they have determined that the brain is the best source. However, no one yet has been able to clone a live mouse from a brain cell, which poses a bit of a mystery for these scientists.

Many animals have been cloned, including sheep, pigs, cattle, mice and dogs. Livestock breeders prefer cloning to produce elite herds of desirable animals, while doctors want to use cloning technology in human medicine. For example, initial studies have shown cloning as a therapeutic option for mice with Parkinson's disease, and if further studies prove fruitful, this technique of somatic-cell nuclear transfer can be used for treatment in Parkinson's and other diseases in humans.

As for now, it still remains to be shown whether nuclei can be collected from frozen bodies without cryoprotectants and if they will be viable for generating offspring after a nuclear transfer. The prospect of resurrecting extinct species, such as woolly mammoths, is quite appealing for many researchers because many of these animals have been found preserved in ice for thousands of years. Perhaps several decades later, we may be able to revive these creatures from their frozen graves. Until then, we must wait patiently for science to lead the way.