In the 1996 film *Multiplicity* [2], Michael Keaton plays an overworked construction worker who gets cloned so that he can spend more time with his family. Eventually his clone gets cloned, but this clone is defective, with a low IQ and weird personality. As might be expected, the movie was a total flop at the box office*.

Silly as it was, the movie does raise an interesting question: How healthy are clones? What about clones of clones?

Dolly the sheep, the world's first cloned animal, died young at the age of six. This, along with other data, suggested that cloned animals may not be entirely healthy, specifically that they may have shorter lifespans. However, a follow-up study that examined 13 cloned sheep concluded that cloning had "no obvious detrimental long-term health effects."

Still, the existing data are sparse and contradictory. It would be ideal to compare the health and lifespan of clones with those of their cell donors. So, a team of researchers is aiming to generate just that sort of data. They have chosen to do so by monitoring the health of three clones of Snuppy [3], the world's first cloned dog.

Snuppy (who was named after Seoul National University in South Korea) was born in April 2005. He was a clone of an Afghan hound named Tai, who lived to be 12 years old and died from cancer. Snuppy, in turn, lived to be 10 years old and also died from cancer, although not the same kind that killed Tai. The median life expectancy for Afghan hounds is 11.9 years, and dogs commonly die from cancer. So there was nothing unusual about Tai or Snuppy.

In 2010, when Snuppy was five years old, the researchers collected stem cells from him. They
also collected egg cells from female dogs, whose nuclei were removed. Using a process called somatic cell nuclear transfer (SCNT), the nuclei from Snuppy's donor cells were transferred into the eggs, and 94 embryos were created. These embryos were then implanted into surrogate mothers, which gave birth to four "reclones."

The researchers were already off to a good start. Four live births from 94 embryos, a success rate of 4.3%, is far higher than the success rate achieved when Snuppy was born (0.2%). Sadly, just a few days after birth, one of the four reclones died from diarrhea. This, however, is not out of the ordinary, given that up to one quarter of litters experience the loss of a puppy.

The three remaining clones, which were nine months old when the authors wrote the paper, are alive and well. They will be monitored (hopefully) for years to come in order to provide more data on the health of clones and their reclones. Stay tuned for a follow-up in 2027!

*Note: Michael Keaton instead should have starred in a movie where Batman gets cloned.


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