Canine Cognitive Dysfunction

World first: University of Sydney scientists reverse dog dementia with stem cell therapy

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Innovation in animal and human health

The tale of Timmy the Cocker Spaniel isn't just a comeback story to warm the hearts of dog lovers, it's a breakthrough that could offer real hope to millions of people affected by dementia.

Timmy with his owners, Tony and Michele Leeder-Smith - photo, David Tease

Scientists at the University of Sydney's Brain and Mind Centre appear to have reversed signs of dementia in 13-year old Timmy by injecting him with his own stem cells.

Timmy lives with his owners, Tony and Michele Leeder-Smith, in regional Dapto, two hours from Sydney.

“He started getting up in the middle of the night and would sit in the kitchen where he would stare and bark at nothing,” says Tony Leeder-Smith. “When Timmy’s conditioned worsened he could no longer work out how to climb onto the bed or use the dog door.”

Timmy was suffering from a form of dementia called canine cognitive dysfunction (CCD), which affects up to one in seven of dogs aged ten and above.

“People think it’s a normal part of ageing and getting old, but that’s wrong,” says the Brain and Mind Centre’s Associate Professor Michael Valenzuela, who is leading the DOGS+CELLS Trial Timmy participated in.

> What’s really important to us is that we’ve regained some of the connection with the loving little mate we lost along the way ~ Tony Leeder-Smith

“CCD is a specific medical condition with its own neurodegenerative pathology and long-term trajectory, and vets are beginning to appreciate this.”

Canine Cognitive Dysfunction has similarities to Alzheimer’s dementia in humans. These include memory loss, getting lost around the house, nocturnal agitation and incontinence. The most common sign of Canine Cognitive Dysfunction in dogs is staring blankly at walls.

Dementia in dogs and humans is characterized by a build up of cerebral proteins known as amyloid plaques, linked to the death of large numbers of brain cells. This process typically begins in the hippocampus—the brain’s memory centre—which is why memory is often the first casualty of dementia. From there, the damage gradually spreads to interfere with general brain and bodily functions.

Because the two conditions appear to be the same at a behavioral and biological level, and the brains of dogs are structurally very similar to humans, trialing results in dogs is predicted to translate well to humans. “I’m very confident that results from our trial, whether positive, negative or inconclusive, will be directly translatable to human patients,” Valenzuela says.

There were two main steps in Timmy’s treatment that involved collaboration between staff at the University of Sydney Veterinary Teaching Hospital, human neurosurgeon Dr Erica Jacobsen and Valenzuela’s stem cell team.

In August they took a small piece of skin from Timmy’s abdomen and used it to harvest and grow-up half a million stem cell-like cells in the lab. A few weeks later the cells were injected under anaesthetic into the dog’s hippocampus using Timmy’s MRI brain scan data.

By mid-November Timmy’s owners reported a significant improvement in Timmy’s night-time sleeping patterns such that he was getting up only once during the night, orientating himself through the doggie door to relieve himself, then coming back on his own to his sleeping area. He was also spontaneously more affectionate with the owners and getting along better with the other dogs in the household.

“These latest results are really very promising,” says Valenzuela, “But let’s not forget that this just the first successful patient, so we need to complete more patient transplants before we can be sure the treatment is effective.”

Timmy’s improvement has also been independently verified by his improved score on a rating scale developed by Valenzuela and his University of Sydney colleagues.

“Before the procedure Timmy scored 57 on the Canine Cognitive Dysfunction Rating (CCDR) score, indicating mild dementia," says Valenzuela. “After the stem cell transplant Timmy’s CCDR was reported as 20 by one owner and 34 by the other, which effectively means he no longer has the syndrome.”

Scientists are already trialing tailored stem cell therapies in humans to treat conditions such as multiple sclerosis and age-related blindness. But it’s only recently that researchers have started to realise that stem cells may also be able to heal the brain.

“We used to think that we didn’t have the capacity to grow new brain cells and that those we were born were born with were the ones we died with,” says Valenzuela. “But we now know that’s not true. We hope we can turbo charge the natural process of neuro-regeneration through the transplantation of customized cells.”

“We are in no position to say if Timmy’s improvements are directly linked with the stem cell transplant,” says Tony Leeder-Smith, “but we do know for sure our lives are now more bearable than they were 12 months ago.

“We realise we can’t change the fact Timmy is still physically an old man, but what’s really important to us is that we’ve regained some of the connection with the loving little mate we lost along the way.”

More information

To learn more about the DOGS+CELLS Trial go to http://rng.org.au/dogs-cells-trial-cell-therapy-for-the-reversal-of-canine-cognitive-dysfunction/or call Sarah O’Toole on 0418 838 911.

To test your dog for CCD go to: http://www.surveygizmo.com/s3/1839821/Canine-Cognitive-Dysfunction-Rating-scale-CCDR