

What killed Knut the polar bear? Study offers 'closure'

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Knut the polar bear. Credit: Zoologischer Garten Berlin AG

Thrust into the spotlight during his short life, Knut the polar bear's celebrity has outlived his dramatic drowning in 2011—as has the medical mystery surrounding his demise.

On Thursday, animal and disease experts said they finally have the answer; the seizure that caused Knut to drown in the pool in his zoo pen, before hundreds of shocked visitors, was triggered by a type of auto-immune disease which causes brain inflammation.

"Everyone remembers how he was born, how he was presented to the public, how he lived and then the movement of death, and now... there is some closure. We can actually say this is why he died," said study co-author Alex Greenwood of the Leibniz Institute for Zoo and Wildlife Research in Berlin.

Reported in the journal *Scientific Reports*, this is the first-ever diagnosis in an animal of NMDAR [encephalitis](#), a condition that affects about one in 200,000 people each year.

After his birth in December 2006, Knut soon shot to fame with TV crews and adoring crowds flocking to witness his cuddly cuteness.

Knut the Dreamer

A series of tragedies further captured the public imagination: Knut's was abandoned by his mother, his twin died a few days after birth, and the zookeeper who raised him by hand, died in 2008.

Knut was reportedly bullied by other bears and thought to suffer from a behavioural disorder that caused him to seek out human attention, throwing tantrums when he was denied an audience.

The bear earned the zoo millions of euros, drawing over two million zoo visitors, graced the cover of *Vanity Fair* magazine and even appeared on German postage stamps.

Knut was just four years old when he died.



Knut the polar bear. Credit: Zoologischer Garten Berlin AG

Mourners flocked to his cage, leaving flowers, candles and cards, and a bronze statue dubbed "Knut the Dreamer" was erected in his memory.

The cause of death was suspected to have been a brain seizure, likely from encephalitis, but the exact trigger has remained a mystery.

The [brain inflammation](#) can be caused by viral or bacterial infections, or a faulty immune system reaction which causes antibodies, meant to attack intruder microbes, turn on the body instead.

The most common non-infectious form of the disease is NMDAR encephalitis.

After years of head-scratching, investigators had a breakthrough inspiration to test for NMDAR antibodies, and found "high concentrations" in Knut's cerebrospinal fluid, they said.

In humans, the treatable disease only discovered in 2007, affects mainly young women.

Symptoms generally start with headaches and a high temperature, followed by psychotic episodes like hallucinations and aggression, and finally epileptic seizures.

It is often diagnosed in the late stages but patients react well to treatment—a combination of steroids, blood transfusions and therapy to destroy the errant antibodies.

Knut's diagnosis should open a new field of research into animal encephalitis, said the team.

"Because treatment options are available in humans that could easily be transferred to animals, the death of many animals, particularly of conservation concern, from encephalitis in the future may be preventable," Greenwood said in a telephone conference.

Science legacy

Co-author Harald Pruess said he hoped Knut's high profile would raise awareness of NMDAR encephalitis in humans too—presented with initial symptoms, doctors and patients often do not think of testing for the disease.

In animals, it would be much more difficult to diagnose.

Predators like polar bears tend to hide disease-caused discomfort or weakness from rivals.

"With, for example, Knut's case ... you only saw that there was something wrong when he started to seize," said Greenwood.

Berlin Zoo director Andreas Knierim welcomed the findings.

The research team, he said in a statement, "have made it possible that in the future, diseases in animals similar to Knut's could be diagnosed earlier and treated."

More information: Anti-NMDA Receptor Encephalitis in the Polar Bear (*Ursus maritimus*) Knut, *Scientific Reports*, [nature.com/articles/doi:10.1038/srep12805](https://doi.org/10.1038/srep12805)

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