

Can dolphins develop Alzheimer's disease?

Georgina Mills discusses research that raises the possibility of dementia in toothed dolphins.

TOOTHED dolphins could suffer from Alzheimer's disease (AD), according to a new study that found the classic markers of dementia in brain samples.

The Scottish research, a collaboration between the universities of Glasgow, Edinburgh and St Andrews and the Moredun Research Institute, studied the brains of 22 odontocetes (toothed whales) that had been stranded in Scottish coastal waters. The study involved five species of oceanic dolphin – Risso's dolphins, long-finned pilot whales, white-beaked dolphins, harbour porpoises and bottlenose dolphins – and found that four animals from different dolphin species had some of the brain changes associated with AD in people.

The researchers believe this might provide an answer to unexplained live-stranding events that happen in some odontocete species. They suggest it could also be proof of the 'sick leader' theory, in which it is thought healthy pods of animals find themselves in dangerously shallow waters after following a group leader that is confused or lost.

AD is the most common neurodegenerative disease and primary cause of disability and dependency in elderly people worldwide. Despite continuous research, there is still no cure or treatment to prevent its progression. Although AD is thought to be unique to people, some animals develop aspects of AD-like pathology.

The study searched for three neuropathological hallmarks of AD: amyloid-beta plaques, phospho-tau accumulation and gliosis (a change in cell numbers in response to central nervous system damage).

The brains of all of the aged animals studied were found to have evidence of amyloid accumulation, with the extent of accumulation varying greatly between animals. In three animals of three different species of odontocete, there was co-occurrence of amyloid-beta plaques, intraneuronal accumulation

of hyperphosphorylated tau, neuropil threads and neuritic plaques. One animal showed well-developed neuropil threads, phospho-tau accumulation and neuritic plaques, but no amyloid plaques.

Microglia and astrocytes were present in all brain samples examined, as expected. but the researchers also found differences in cell morphology and numbers between individual animals.

The team says that the occurrence of amyloid-beta plaques and hyperphosphorylated tau pathology in the brains of three species shows that these odontocetes develop AD-like neuropathology spontaneously. However, the significance of this in regards to the health and death of the animals cannot be determined.

Mark Dagleish, senior clinician in anatomic pathology at Glasgow and lead researcher of the study, said: 'These are significant findings that show... that the brain pathology in stranded odontocetes is similar to the brains of humans affected by clinical Alzheimer's disease. While it is tempting at this stage to speculate that the presence of these brain lesions in odontocetes indicates that they may also suffer with the cognitive deficits associated with human Alzheimer's disease, more research must be done to better understand what is happening to these animals.'

Frank Gunn-Moore, head of the school of biology at St Andrews and co-author of the paper, said: 'I have always been interested in answering the question: do only humans get dementia? Our findings answer this question as it shows potential dementia-associated pathology is indeed not just seen in human patients. This study is also a great example of both different research institutes, but also different branches of the life sciences working together.'

The study is published in the *European Journal of Neuroscience* and can be found at <https://bit.ly/3vnzvKd> ●

