New research shows differences in tumour growth rates in Tasmanian devils

Scientists have found differences in the growth rates of fatal tumours in Tasmanian devils, according to new research published today.

A team of researchers from the University of Tasmania’s School of Biological Sciences has estimated the growth rates of tumours of different karyotypes over time, and the developmental progression of the deadly Devil Facial Tumour Disease (DFTD) in wild Tasmanian devils.

The paper, Untangling the model muddle: empirical tumour growth in Tasmanian devil facial tumour disease, was published today in Scientific Reports.

Using field measurements and mathematical models the researchers estimated the daily growth rate and final tumour volume in males and females affected by two genetic types of tumours - diploid and tetraploid.

Estimates of tumour growth rates varied between diploid and tetraploid tumours, but not between males and females. Diploid tumours had slower growth rates, but tetraploid tumours had smaller final volume.

“Several studies have recently suggested that devils are adapting to DFTD, and becoming more tolerant to the disease,” lead report author Dr Rodrigo Hamede said.

“This study suggests that different genetic lineages of tumours have different growth rates and therefore impact on devils, although some devils might be capable of altering the growth rate of tumours.”

The research was conducted by Dr Rodrigo Hamede, Dr Nick Beeton, Dr Scott Carver and Associate Professor Menna Jones, and supported by Tasmanian Department of Primary Industries, Parks, Water and Environment.
It was carried out in a wild population of devils in North West Tasmania which has been monitored by scientists since the arrival of DFTD in 2006.

Dr Hamede said modelling tumour growth rates was important because it allows researchers to calculate vital epidemiological aspects of the disease, such as survival of infected devils, and potential adaptations between devils and tumours to increase tolerance to DFTD.

“It is in the tumour’s own interest to allow devils to survive longer with DFTD, as this would also increase the infective period and the transmission potential of the disease,” he said.

“So it is also important to understand the adaptive capability of tumours. We expect that DFTD is evolving to reach its ‘optimal virulence’, that is, a tumour that allows its host to survive enough time to maximise transmission”.

Co-author Associate Professor Menna Jones highlighted the importance of investigating natural adaptations to DFTD.

“When new diseases break out, the host animals are naïve to the disease and mortality can be very high,” she said. “This was the case with DFTD which has caused widespread decline in devil populations.

“High mortality creates very strong evolutionary selection pressure for the host animal to survive.

“Devils can adapt by evolving resistance to the disease or in their ability to tolerate the infection. Our studies have recently shown that devils are adapting to the cancer at immune genes very rapidly, in as little as four generations or eight years.”

Dr Hamede said the approach used in their study transcends devils and may enhance understanding of how tumour properties interact with growth dynamics in other types of cancers, including humans.

“To our knowledge this is the first study to empirically estimate tumour growth rates in the absence of treatment in a wild population,” he said.

The research was supported by the Australian Research Council and the National Science Foundation, with additional support provided by the University of Tasmania Foundation through funds raised by the Save the Tasmanian Devil Appeal.

Dr Hamede said the support of the Save the Tasmanian Devil Appeal (www.tassiedevil.com.au) has been critical for his ongoing research.

The research paper can found here: www.nature.com/articles/s41598-017-06166-3

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University of Tasmania Communications and Media Office
Telephone: 6226 2124
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