

Tasmanian devils' transmissible cancer: What is the future?

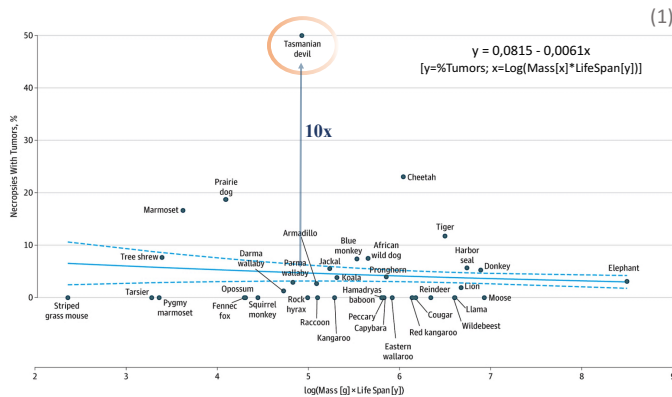
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1 Introduction

Why is Tasmanian devils' cancer incidence so high?

Carcinogenesis is thought to occur via accumulation of mutations and mutation rates depend on cell number, which correlates with body size and lifespan. Then, large and long-lived animals should have more cancers than smaller and shorter-lived ones, due to increased number of cell divisions.

Peto's Paradox represents the lack of correlation between cancer prevalence and body size or lifespan and it can be useful to explore cases that are far from what is expected. Tasmanian devils suffer from **Devil Facial Tumor Disease (DFTD)**, a lethal transmissible cancer that is threatening the species to extinction.



2 Devil Facial Tumor Disease

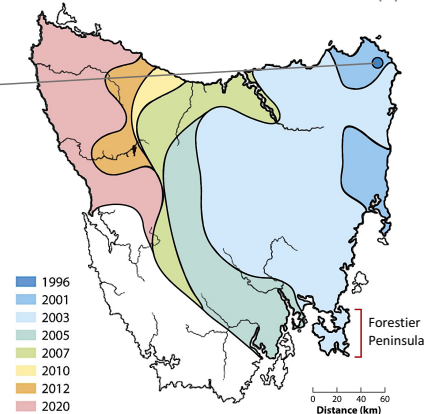
Introduction to transmissible cancers



The ancestral type of DTDF is thought to be derived from a Schwann cell (clonal origin) and it is transmitted by biting during mating or feeding interactions.

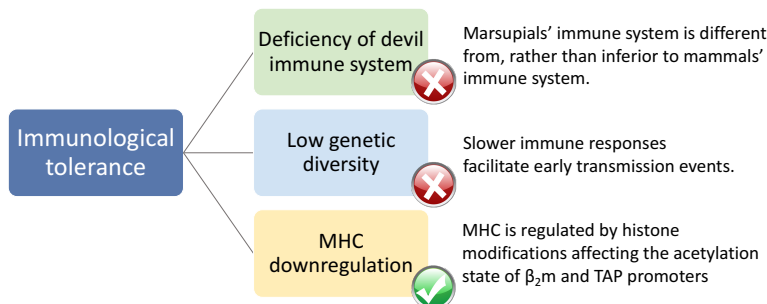


DFTD was first reported in Mount William National Park, northeastern Tasmania, in 1996. In 20 years, the disease has spread to more than 85% of wild Tasmanian devil populations, causing severe declines.



3 Immunology of DFTD

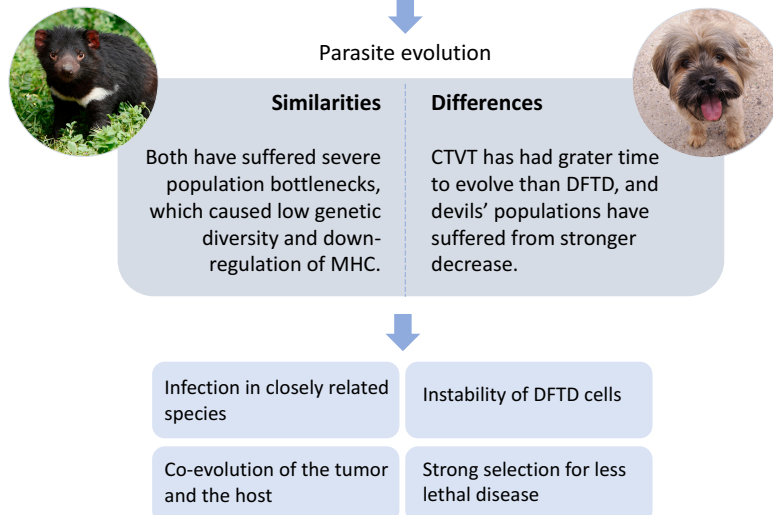
Why devils immune system do not recognize DFTD?



4 DFTD outcome

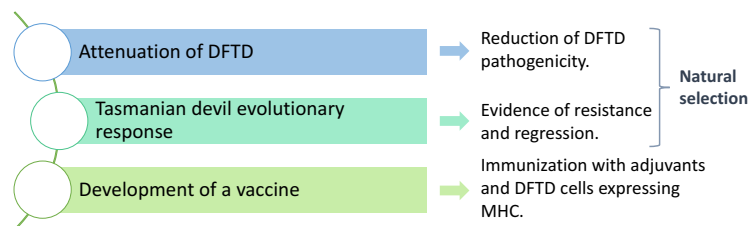
Prediction of DFTD evolution based on comparative biology

Dogs suffer from **Canine Transmissible Venereal Tumor (CTVT)**. During the progressive phase the immune system does not recognize tumor due to down-regulation of MHC. However, after a period, tumor begins to regress as a result of significant increase in MHC expression.



5 Conclusions and Perspectives

Is Tasmanian devil doomed to extinction?



Although devils could evolve resistance to the disease, considering its much larger effective population sizes, it is more likely that the tumor evolve towards an attenuation of virulence.

Conservation of Tasmanian devil

Methods

NCBI Pubmed search by using keywords combined with the appropriated Boolean operators. To calculate devils' cancer incidence I conducted a regression analysis using Microsoft Excel.

References

1. Abegglen LM *et al* (2015). Potential mechanisms for cancer resistance in elephants and comparative cellular response to DNA damage in humans. *JAMA* 314:1850-60.
2. Bender HS, Marshall Graves JA, Deakin JE (2014). Pathogenesis and molecular biology of a transmissible tumor in the Tasmanian devil. *Annu Rev Anim Biosci* 2:165-87.
3. Murchison EP (2009). Clonally transmissible cancers in dogs and Tasmanian devils. *Oncogene Suppl.* 2:S19-S30.