Slide 1

Devil facial tumour disease

Slide 2

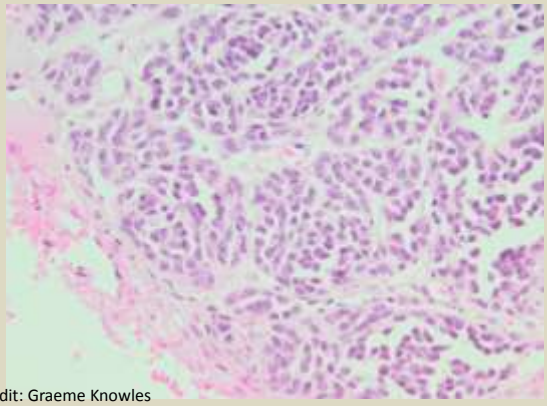
DFTD

- DFTD was first observed in 1996 in the north east of Tasmania (Hawkins 2006)
- The tumour then spread through most wild populations of Tasmanian devils in mainland Tasmania and there has been a significant decline in the wild Tasmanian devil population (Hawkins 2006)
- The Tasmanian devil was listed as endangered by the IUCN in 2008 (Hawkins et al 2008)

Slide credit: Graeme Knowles

Slide 3

Characteristic histopathological findings for DFTD include polygonal, round to pleomorphic cells forming packets and cords (Loh *et al* 2006)



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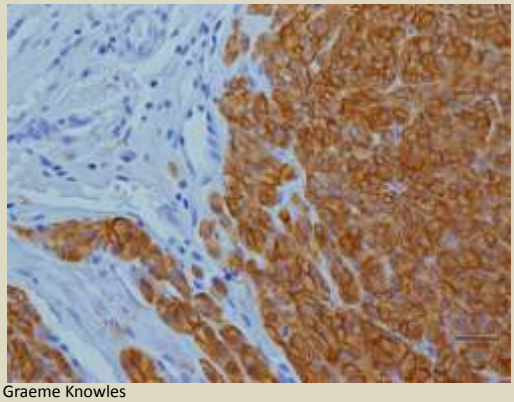
Slide 4

- Genetic analysis confirmed DFTD was derived from Schwann cell (Murchison et al 2010)
- Correlates to IHC positive to periaxin (Tovar et al 2011)



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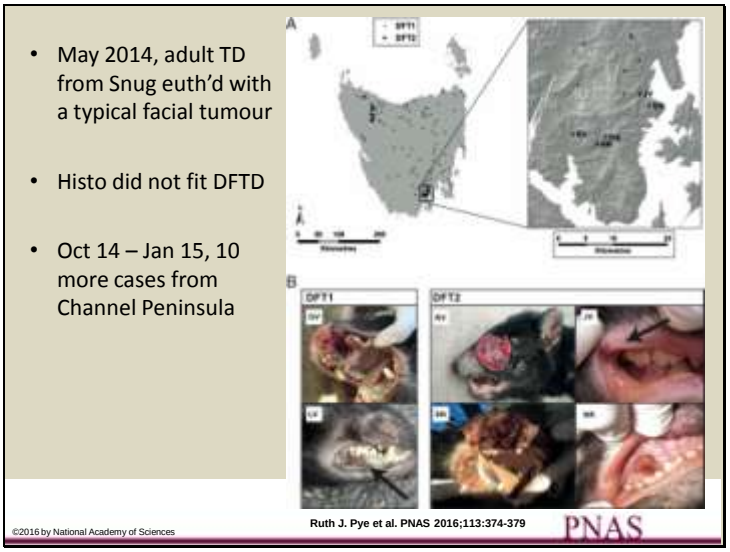
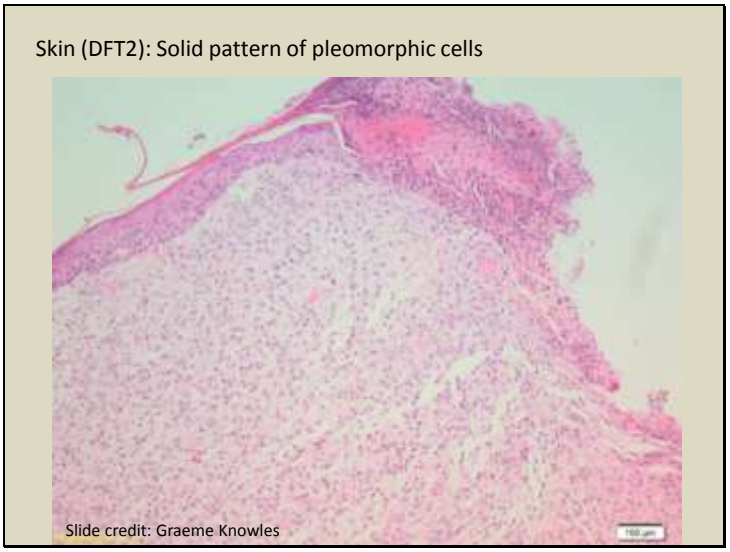
Slide 5



Geographical location and gross appearance of DFT2 tumors.
(*A*) Locations of confirmed DFT1 and DFT2 tumors in Tasmania (*Left*) and the Channel Peninsula (*Right*). Each DFT1 location is represented with a single dot regardless of the number of tumors identified at this location. Tumor diagnosis was performed by histopathology, cytogenetics, and/or genetic analysis.

(*B*) Gross appearance of two DFT1 tumors (*Left*) and four DFT2 tumors (*Right*). Tumors were identified in Tasmanian devils in the Channel region between 2012 and 2015. Tumors are grossly indistinguishable.

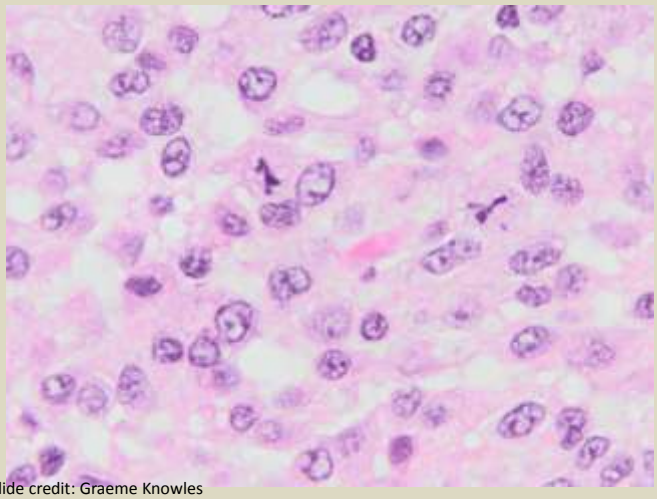
Slide 6



Solid pattern of pleomorphic cells, with a fine fibrovascular stroma, effacing the normal dermis, including adnexa, subcutis and panniculus muscle.
Pleomorphic cells varied from amorphic to polygonal, oval or attenuated.
Cells had partially distinct cell borders, moderate amount of eosinophilic cytoplasm, which in some cells contain microvesicles, round to oval nucleus with prominent nucleolus (often multiple) and vesicular chromatin pattern.
Cells showed marked anisocytosis, karyomegaly, increased nuclear to cytoplasmic ratio and low numbers of multinucleated cells.
Mitotic rate was 10-20 mitotic figures per 10 high powered fields (HPF).

Slide 7

Dermis (DFT2): replaced by pleomorphic cells forming solid pattern



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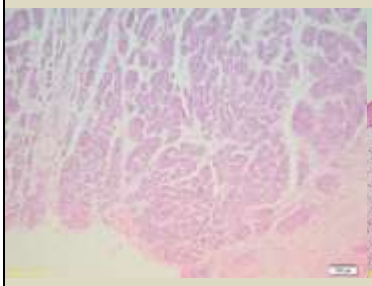
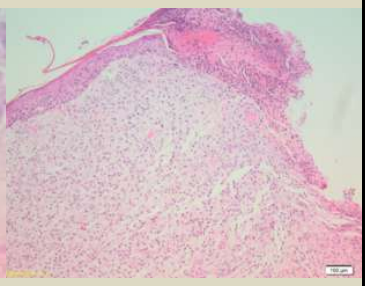
Slide 8

DFTD (DFT1):
packets and cords



New tumour (DFT2):
solid pattern



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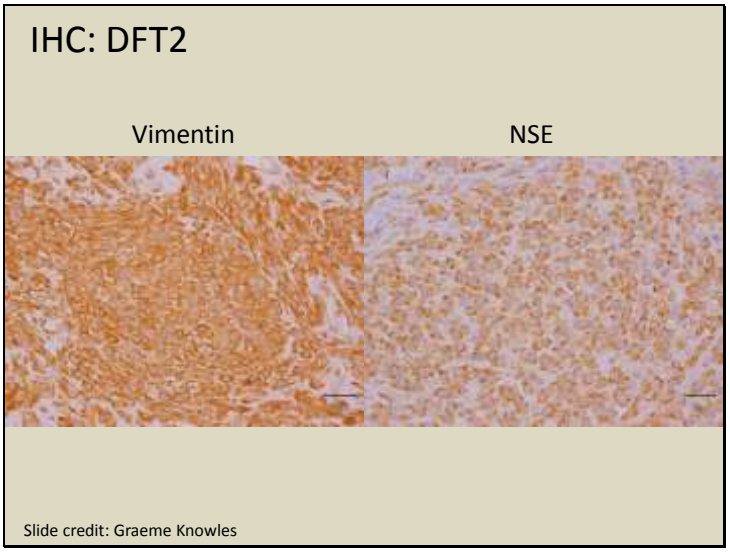
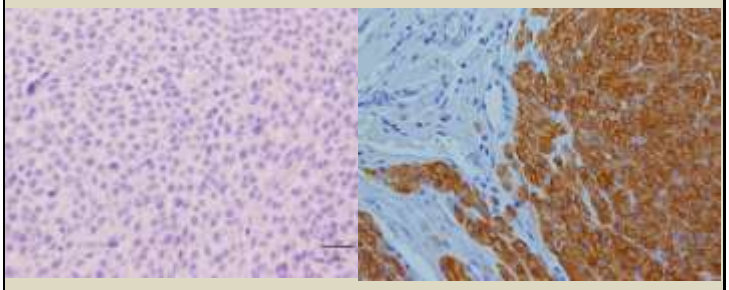


Slide 10

IHC: Periaxin

New tumour (DFT2)

DFTD (DFT1)



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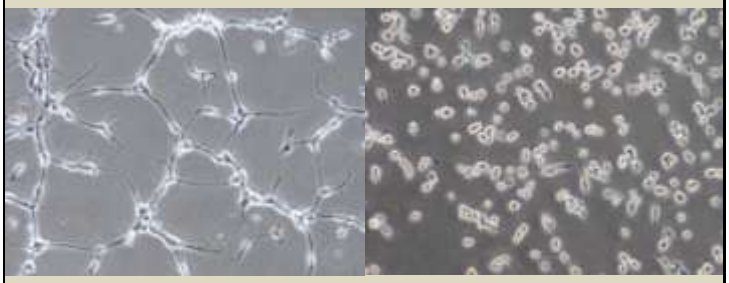
Slide 11

Cell cultures (photos by P Hudson)

New tumour (DFT2)

DFTD (DFT1)



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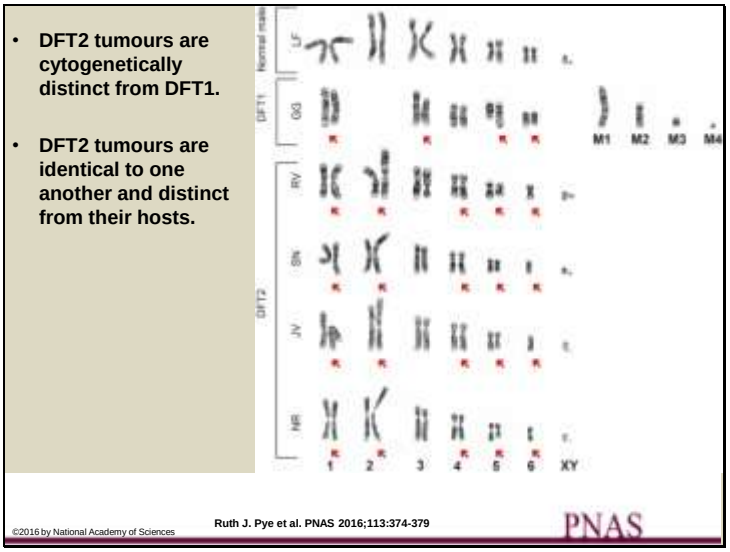
Slide 12



DFT1: absence of chromosome 2, missing sex chromosomes (but was female), presence of 4 marker chromosomes
DFT2: monosomy of chromosome 6, presence of X and Y chromosomes, additions and deletions to other chromosomes

DFT2 tumors are cytogenetically distinct from DFT1. Representative karyotypes of a normal male devil, a DFT1 tumor, and four DFT2 tumors. Red arrows indicate chromosomes carrying cytogenetic abnormalities. Four marker chromosomes found in DFT1 (9) are labeled M1 to M4. Karyotype for NS is presented in Fig. S1.

DFT1 cytogenetic profile differs markedly from the normal devil karyotype, and is characterized by the absence of identifiable chromosome 2 homologs, the presence of four marker chromosomes and missing sex chromosomes. Genetic analysis indicates the original source of the cell was a female devil. (Pye et al, 2016)

DFT2 tumors exhibited the presence of additional material on chromosomes 1, 2, and 4, a deletion involving chromosome 5 and monosomy for chromosome 6. Both X and Y sex chromosomes were present. Presence of X and Y chromosomes indicate original source was a male devil. (Pye et al, 2016)

Genetic analysis revealed that tumors from two DFT2 devils were identical to one another, but completely distinct from DFT1 tumors and from their hosts. (Pye et al, 2016)

Slide 13

Summary

- DFT2 is a transmissible cancer distinct from DFT1
- Can be differentiated by histopathology and PCR and cell culture can support diagnosis

- Are transmissible cancers as rare as we thought?
- Are Tasmanian devils particularly susceptible to emergence of transmissible cancers?
- Is there an exogenous factor that is driving this emergence?

Slide 14

References

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- Tovar *et al*. 2011. Tumor-specific diagnostic marker for transmissible facial tumors of Tasmanian devils: Immunohistochemistry studies. Vet Pathol 48:1195–1203.

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TRANSMISSIBLE FACIAL TUMOURS IN TASMANIAN DEVILS
Graeme Knowles
Acknowledgement