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METABOLISM

The mitochondria that wag the dog

> this ... could be explained by the fact that CTVT lineages periodically acquire mitochondria from their hosts

Canine transmissible venereal tumour (CTVT; also known as Sticker's sarcoma) is a contagious venereal tumour that is found in domestic dogs, wolves and coyotes. One of the singularities of this disease resides in the fact that the tumour cells themselves, rather than a virus, constitute the contagious agent of this cancer. Although it has been estimated that this tumour originated at least 6,000 years ago, perhaps when dogs were first domesticated, analysis of nuclear microsatellite markers determined that the most recent common ancestor with this type of cancer did not appear until much later, probably only around 200 years ago. Burt and collaborators have now used mitochondrial DNA as the main tool to further characterize this unusual tumour.

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The authors initially sequenced mitochondria from 37 CTVTs and also from 42 healthy hosts (33 dogs, six wolves and three coyotes), and found that the level of nucleotide polymorphism among the CTVT samples was high (1.2%). Phylogenetic analyses of the mitochondrial sequences interspersed the CTVT samples with those from healthy hosts. Conversely, analyses of the nuclear microsatellite phylogeny showed the tumours forming a single group distinct from that of dogs and wolves. The authors propose that this discrepancy could be explained by the fact that CTVT lineages periodically acquire mitochondria from their hosts, rather than by a high mutation rate. The phylogenetic tree also suggested that CTVT cells accumulate deleterious mutations.

The authors hypothesize that higher mutation and metabolic rates might render mitochondria in CTVT cells dysfunctional and, in the absence of selection for cells with functional mitochondria, tumour cells might acquire mitochondria from the host to repair or even enhance the lost mitochondrial functions. They also suggest that mitochondrial transfer could occur as a mechanism of repair in human cancers that have mitochondrial mutations and high metabolic activity.

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ORIGINAL RESEARCH PAPER Rebbeck, C. A. *et al.* Mitochondrial capture by a transmissible cancer. *Science* **331**, 303 (2011)
FURTHER READING McAloose, D. Wildlife cancer: a conservation perspective. *Nature Rev. Cancer* **9**, 517–526 (2009)