

Molecular evidence supports the role of dogs as potential reservoirs for *Rickettsia felis*

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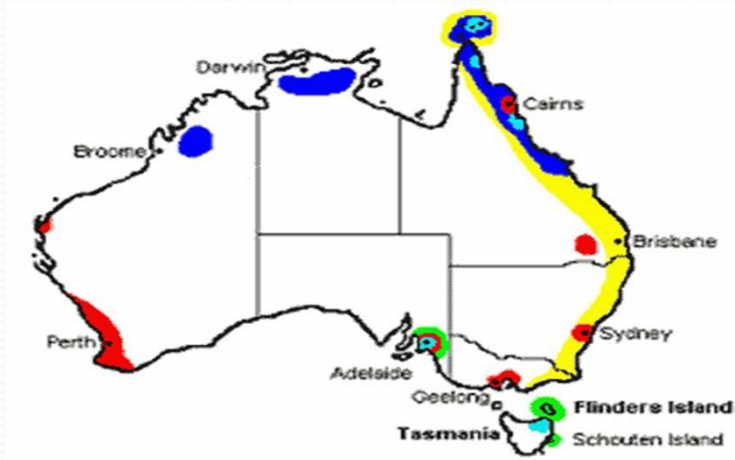
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Introduction

- *Rickettsia* spp – intracellular Gram-negative bacteria
- Transmitted by arthropod vectors



- Murine Typhus (*R. typhi*)
- Scrub Typhus (*Orientia tsutsugamushi*)
- Queensland Tick Typhus (*R. australis*)
- Flinders Island Spotted Fever (*R. honeii*)
- Australian Spotted Fever (*R. marmionii*)

[ARRL, 2010 (<http://www.diagnosticlab.org.au/index.php?n=RICKETTSIA>)]

- Serosurvey on dogs and cats (Sexton et al, 1991; Izzard et al, 2010)

Rickettsia felis

- Emerging zoonosis
- Flea-borne spotted fever or cat flea typhus in humans
 - First detected in *Ctenocephalides felis* in 1990
 - First human case – 1994 in Texas, USA
 - Worldwide, including Australia
 - Clinical signs – pyrexia, headache, malaise, myalgia, rash, eschar
- *Ctenocephalides felis* – vector + reservoir





R. felis in Australia

- Reported in fleas collected from dogs and cats in Australia
 - Schloderer et al, 2006;
 - Barrs et al, 2010 – 19.8%
- Recently, first cluster of human cases reported in Victoria, Australia (Williams et al, in press 2010)

Potential mammal reservoir hosts

- Animals reported to harbour *R. felis*
 - Opposums (3/9, USA), feral racoons (1/699; Japan)
 - Cats (experimental study; Wedincamp & Foil, 2000)
 - No natural infection detected in cats (Barrs et al, 2010; Bayliss et al, 2009; Kamrani et al, 2008)
 - Dogs (n = 1, Spain)
- Natural animal reservoir remains unknown
- Dog as reservoir for human infection??

Aim

- To determine the prevalence and species of SFG rickettsiae in poorly cared for dogs in northeast Australia using molecular diagnostic tools

Methodology

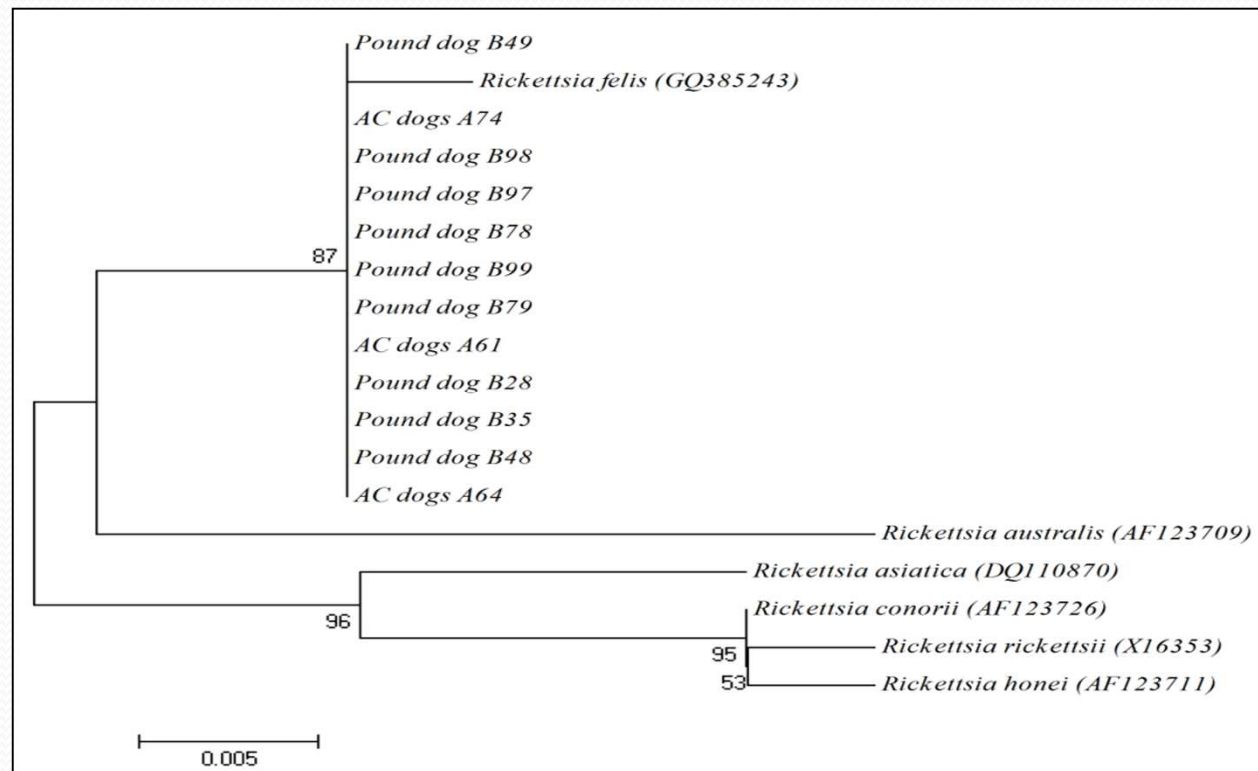
- **Study site:**
 - Southeast Queensland (SE QLD)
 - Northern Territory (NT)
- **Study population:**
 - 100 pound dogs from SE QLD
 - 130 dogs from Aboriginal community in Maningrida, NT
- **Blood samples**
 - Pound dogs – EDTA-anticoagulated whole blood samples
 - Dogs from Aboriginal community – blood on FTA cards
- **PCR and phylogenetic analyses on 3 genetic loci – *ompB* (SFG specific) (Paris et al., 2008), *ompA* and *gltA* genes (*R. felis* specific)**
- **Animal ethics approved by UQ Animal Ethics Committee**



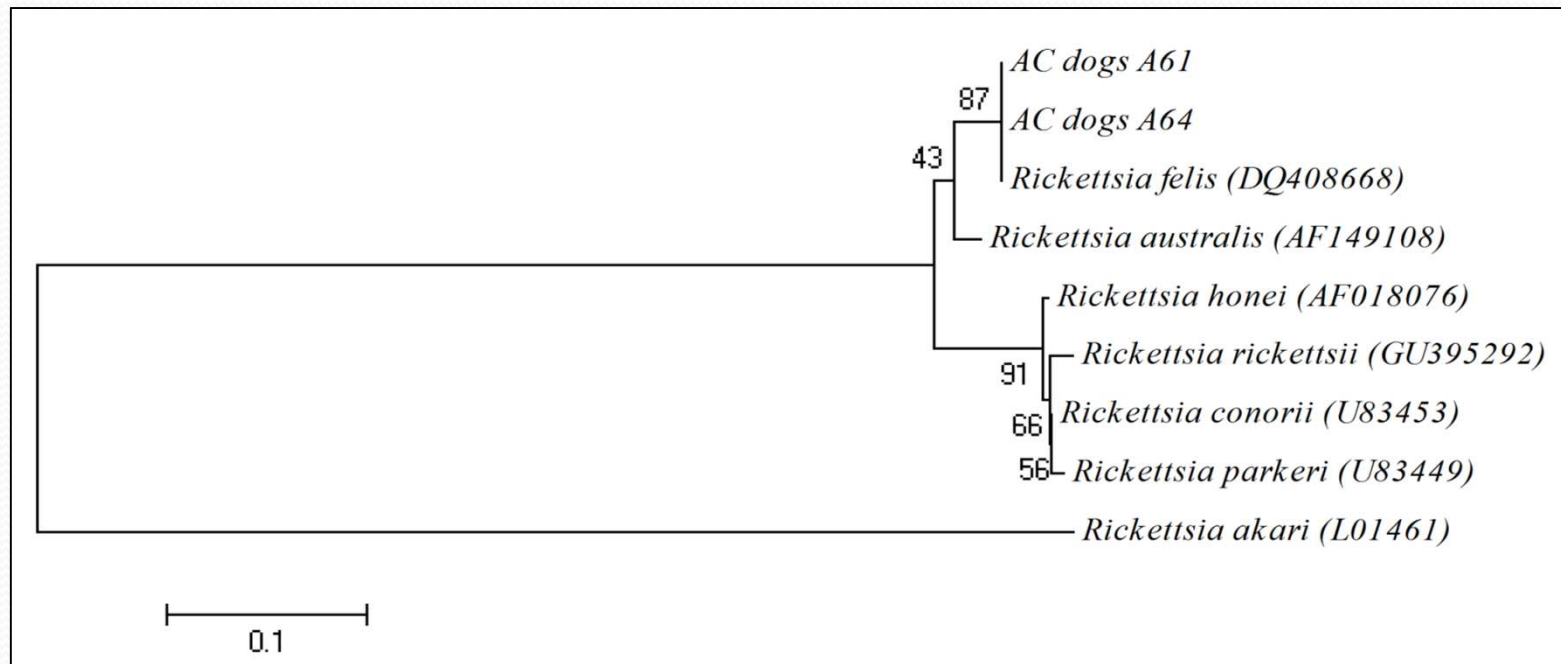
PCR Results

	Pound dogs	Aboriginal community dogs	Total
No. of samples	100 (Jan through to June 2010)	130 (Sept 2009 & Sept 2010)	230
SFG rickettsiae PCR (<i>ompB</i> gene)	9 (9%)	3 (2.3%)	12 (5.2%)
<i>R. felis</i> Nested PCR (<i>ompA</i>)	0	2	2
<i>R. felis</i> Nested PCR (<i>gltA</i>)	0	3	3

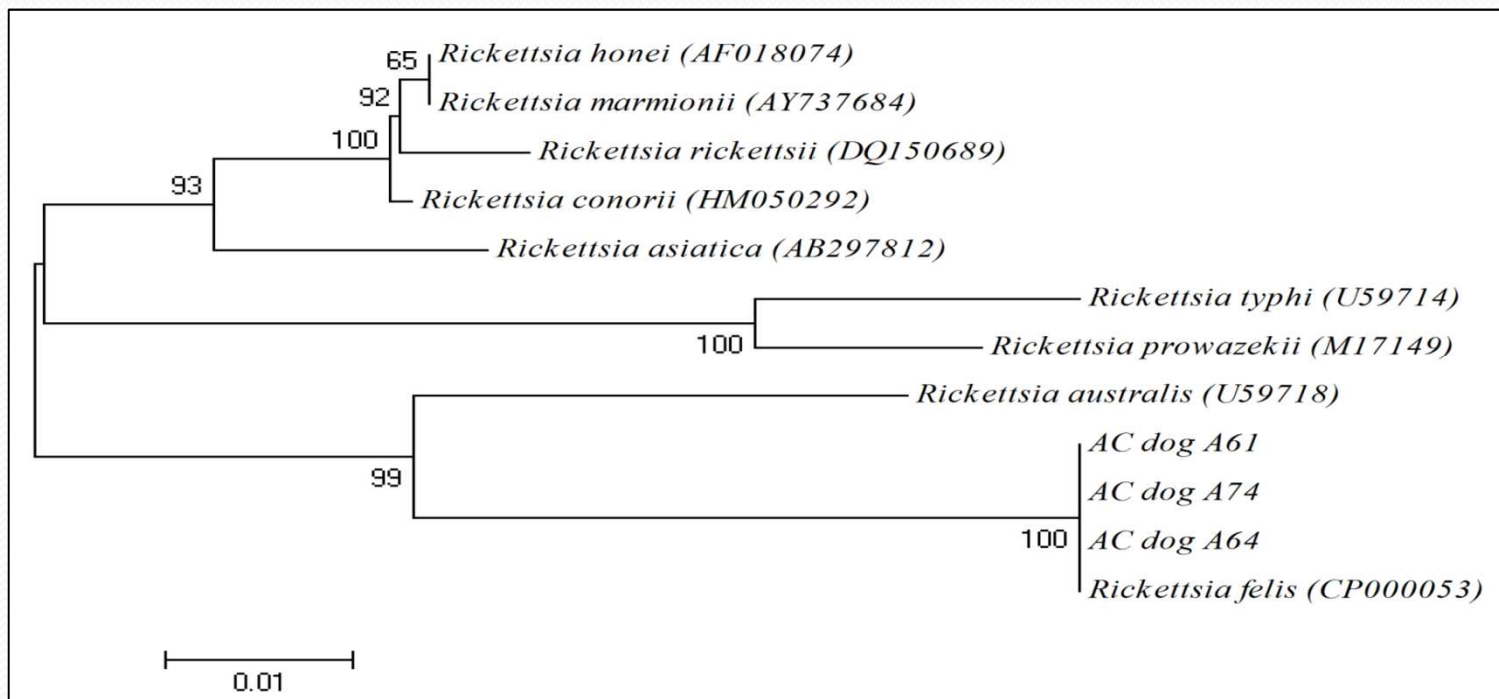
Phylogenetic tree obtained using neighbour-joining analysis of the *ompB* gene of *Rickettsia* sp. detected in 12 dogs clustered with *R. felis*



Phylogenetic tree obtained from neighbour-joining analysis of the *ompA* gene of *Rickettsia* sp. detected in 2 Aboriginal community dogs clustered with *R. felis*



Phylogenetic tree obtained from neighbour-joining analysis of the *gltA* gene of *Rickettsia sp.* detected in 3 Aboriginal dogs clustered with *R. felis*



Discussion

- First detection of *Rickettsia spp* in dogs in Australia
- First to implicate dogs as natural reservoir hosts for *R. felis*
 - Natural host for cat flea, *C. felis*
 - High prevalence of rickettsaemia in naturally infected dogs
- Close relationship with humans makes dogs an important sentinel for human infection

Discussion

- Detection of *R. felis* in fleas, humans and dogs – endemic in Australia
- Pathogenicity in dogs
- Horizontal transmission in flea vector through mammalian hosts unclear
- Transmission dynamics of infection in dogs – future exploration



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Thank you!