

Rhobdochlamydia crassiflans

Fig. 1 Ultrastructure of *Candidatus Rhobdochlamydia crassiflans*. (a) Typical flat, rod-shaped elementary bodies, characterized by a five-layered cell wall (arrow head) and one or two oblong translucent lamellae (arrow) into the cytoplasm. Scale-bar: 1µm

Danielle Corsaro, Vincent Thomas, Genevieve Goy, Danielle Vendis, Renate Radek, Gilbert Greub
 "Candidatus *Rhobdochlamydia crassiflans*", an intracellular bacterial pathogen of the cockroach, *Blattella orientalis* (Insecta: Blattodea)
 Systematic and Applied Microbiology Volume 30, Issue 5 2007 221 - 228

Why investigating the presence of *Chlamydiales* in ticks?

Diversity of *Chlamydiales* bacteria is underestimated and their ecological distribution remains to be further investigated

Many *Chlamydiales* are human and/or animal pathogens but their mode of transmission is largely unknown (*Chlamydia*-related)

Arthropods (ticks and fleas) are important vectors of propagation of both viral and bacterial infectious diseases

- Lyme Borreliosis (*Borrelia burgdorferi*)
- Tick-borne encephalitis (TBE)
- Tularaemia (*Francisella tularensis*)
- Bubonic plague (*Yersinia pestis*),.....

Rhobdochlamydiaceae identified in arthropods (cockroach and terrestrial isopod)

Corsaro et al., 2007
 Kostanjsek et al., 1980

Ticks could play a role in the transmission of *Chlamydiae* to cattle

Caldwell and Belden, 1973
 McKecher et al., 1980

Infect Immun. 1973 Feb 70: 147-51

Studies of the role of *Dermacentor occidentalis* in the transmission of bovine chlamydial abortion.

McKecher DJ, Boshart CL

Abstract
Dermacentor occidentalis nymphal ticks were successfully infected with the agent of bovine chlamydial abortion. Multiplication of the agent was shown to occur during nymphal engorgement, but chlamydial isolations were not made from nymphal ticks after detachment or during subsequent metamorphosis. Primary tissue cultures of nymphal visceral infection in vitro or in vivo failed to demonstrate chlamydial multiplication.

Am J Vet Res. 1980 Jun 41(6):922-4

Preliminary studies on transmission of *Chlamydia* to cattle by ticks (*Omnithodoros coriaceus*).

McKecher DJ, Blida EM, Aulik T, Trumb J

Abstract
 Preliminary findings indicate that *Omnithodoros coriaceus* ticks can harbor *Chlamydia* for long periods and are able to transmit the agent to cattle. Field collected *O. coriaceus* ticks, which were infected experimentally with a bovine respiratory agent from an aborted fetus, transmitted the agent to 2 of 49 calves in three pregnant holders. The agent was subsequently isolated from the fetus of a term calf. The control fetter also aborted with a redwater fever related tick exposure. Also, a chlamydial agent was isolated from field collected *O. coriaceus* ticks in an epizootic bovine abortion (EBA) enzootic area that were held for at least 6 months. In the same enzootic area, a chlamydial agent was isolated from a prenatally delivered calf during a severe EBA outbreak. Seemingly, this species is a candidate for the cause of EBA.

Methodology

Ticks *Ixodes ricinus* collected in Switzerland (Mutt-Rarogne)

Collection → Pooling → DNA extraction → qPCR

1m² white cotton towel dragged over the vegetation

5 adults / pool
10 nymphs / pool

Methodology

Ticks and fleas collected in Algeria (Blida and Skikda)

Collection → DNA extraction → qPCR

Ticks

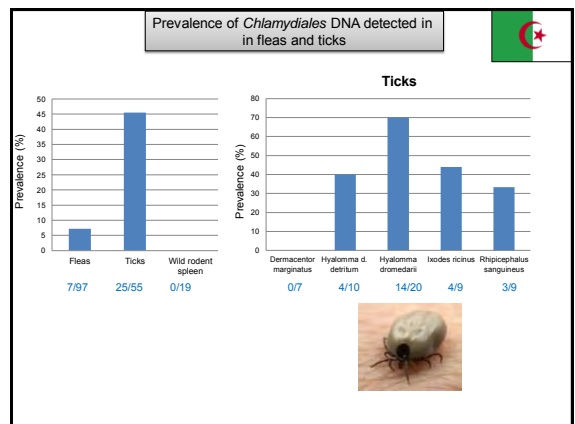
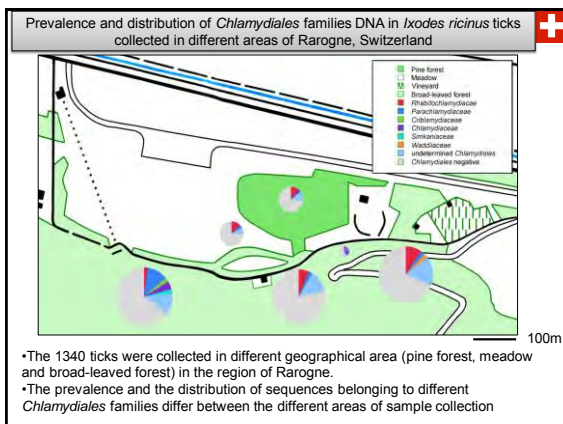
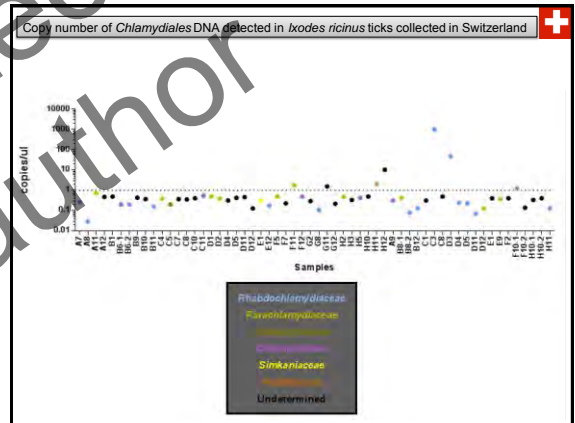
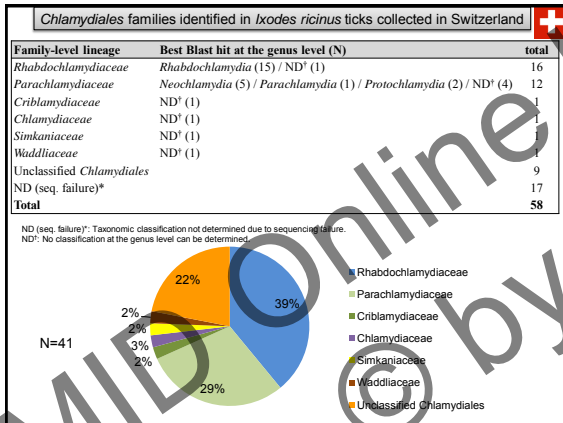
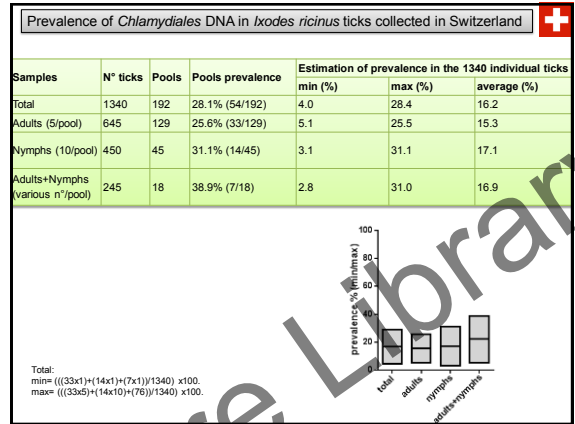
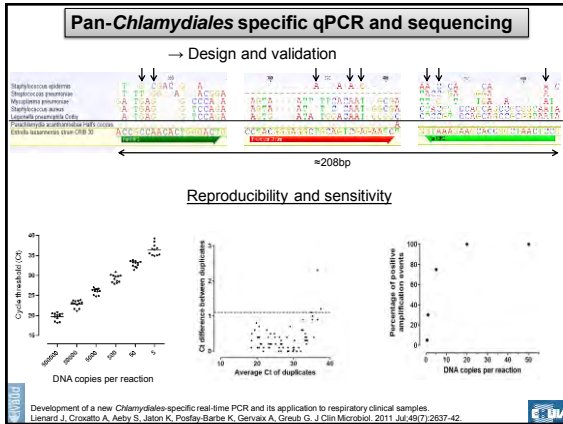
1m² white cotton towel dragged over the vegetation

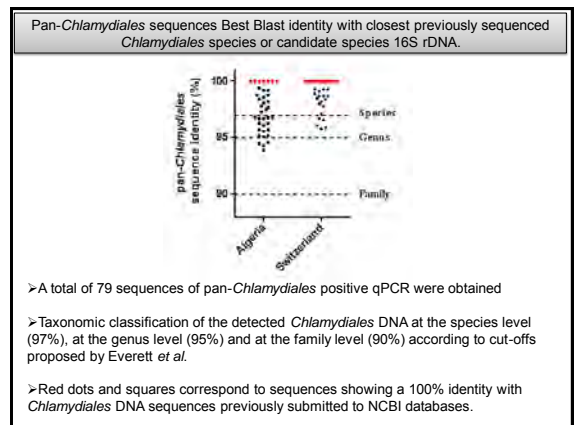
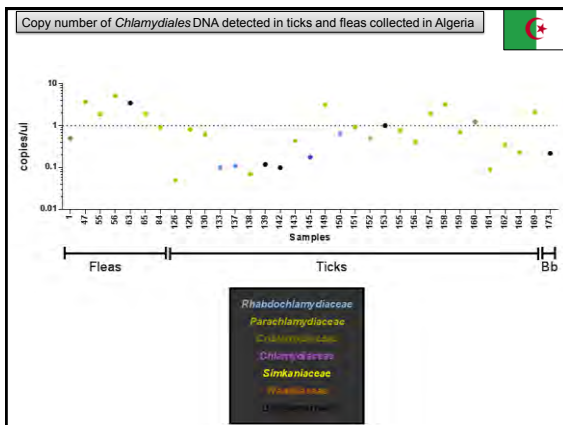
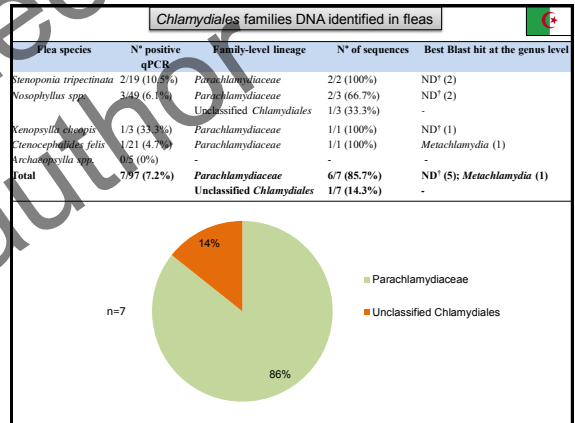
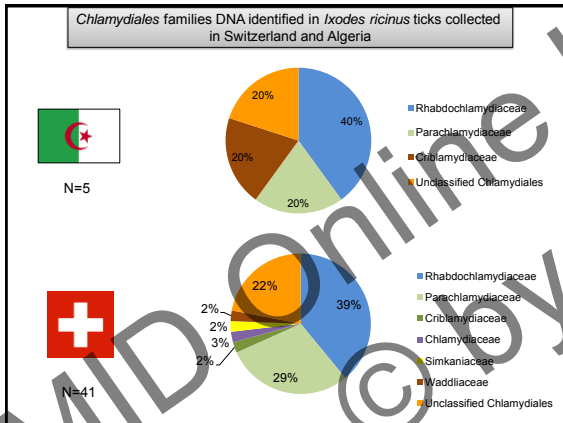
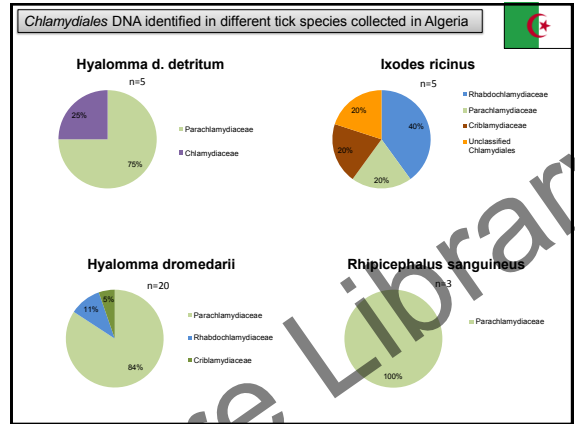
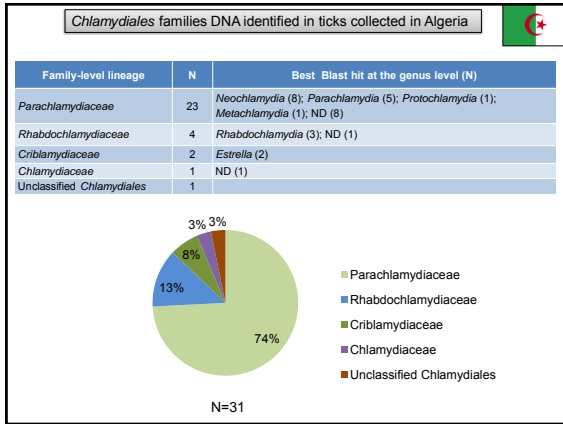
Fleas

Candle trapping

Ticks and fleas collected in Algeria (Blida and Skikda)

Ticks (55)	Reservoir or collection spot
<i>Dermacentor marginatus</i> (7)	Vegetation
<i>Hyalomma d. detritum</i> (10)	Soil
<i>Hyalomma dromedarii</i> (10)	Camel
<i>Ixodes ricinus</i> (9)	Vegetation (Olive tree)
<i>Rhipicephalus sanguineus</i> (9)	Hedgehog
Fleas (97)	Reservoir or collection spot
<i>Stenoponia tripectinata</i> (19)	Rodent (<i>Meriones shawii</i> , <i>Gerbillus gerbillus</i>)
<i>Nosophyllus</i> spp. (49)	Rodent (<i>Meriones shawii</i> , <i>Gerbillus nanus</i>)
<i>Xenopsylla cheopis</i> (3)	Rodent (<i>Meriones shawii</i>)
<i>Ctenocephalides felis</i> (21)	Cat
<i>Archaeopsylla</i> spp. (5)	Hedgehog (<i>Atelerix algirus</i>)

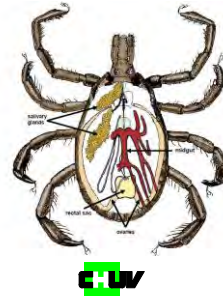




Conclusions

- **Prevalence in Switzerland:** 54/192 pools (28.1%)
→ 4 - 28.4% (average 16%) in 1340 ticks
- Prevalence in Algeria:** 25/55 ticks (45.5%) and 7/97 fleas (7.2%)
- Ticks and fleas potentially associated with a **high diversity** of *Chlamydiales* bacteria
→ *Rhabdochlamydiaceae* and *Parachlamydiaceae* families.
- Ticks and fleas could potentially represent **reservoir and vectors** for *Chlamydiales* dissemination and transmission to multiple hosts
- Detection ranging from **30 – 10⁶ copies DNA /ml** (*Rhabdochlamydiaceae*)
- Among 79 sequences (200bp):
 - 14 sequences from Switzerland and 13 sequences from Algeria showed an identity between 97.1 % and 99.4% → **27 putative new strains** (Everett's cutoff)
 - 5 sequences from Switzerland and 14 sequences from Algeria showed an identity below 97 % → **19 putative new species** (Everett's cutoff)
 - 4 sequences from Algeria showed an identity below 95% → **5 putative new genus** (Everett's cutoff)
- Significant effort still required to **isolate** new *Chlamydiales* genus/species/strains by co-culture (amoebae, tick cell lines)

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