



HAL
open science

Seroprevalence of Q fever among blood donors and screening for *Coxiella burnetii* DNA in environmental dust in a French conurbation recently confronted to clustered human cases

Elsa Jourdain, Xavier Lafarge, Pierre-Edouard Fournier, Magali Perroquin, David Abrial, Séverine Barry, Isabelle Lebert, Raquel Ceniceros, Renaud Pouget, Maxime Robert, et al.

► To cite this version:

Elsa Jourdain, Xavier Lafarge, Pierre-Edouard Fournier, Magali Perroquin, David Abrial, et al.. Seroprevalence of Q fever among blood donors and screening for *Coxiella burnetii* DNA in environmental dust in a French conurbation recently confronted to clustered human cases. ESCCAR International congress on Rickettsiae and 9th Meeting of the European Society for Chlamydia Research (ESCR), American Rickettsia Society; European Society for Chlamydia Research; European Society on intracellular bacteria (ESCCAR), Aug 2022, Lausanne, Switzerland. hal-03757385

HAL Id: hal-03757385

<https://hal.inrae.fr/hal-03757385>

Submitted on 30 Aug 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

➤ Seroprevalence of Q fever among blood donors and screening for *Coxiella burnetii* DNA in environmental dust in a French conurbation recently confronted to clustered human cases

Elsa Jourdain¹, Xavier Lafarge², Pierre-Edouard Fournier³, Magali Perroquin², David Abrial¹, Séverine Barry¹, Isabelle Lebert¹, Raquel Cenicerros⁴, Renaud Pouget⁴, Maxime Robert⁴, Jaqueline Vialard⁵, Marie Massot⁶, Michael Treilles⁷, Bernard Amphoux³, Léa Luciani³, Elodie Rousset⁸

International intracellular
bacteria meeting 2022

August 26th

Context & Objectives

Human clustered Q fever cases

No common source identified despite

- Surveys on infected patients
- Veterinary investigations



This emergence raised issues regarding

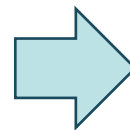
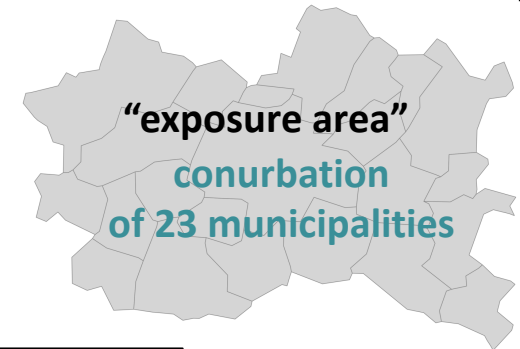
- the risk of exposure for the general population
- the risk of blood donation in this area



April-May 2017

17 suspicions

12 cases confirmed by the National Reference Centre



EXPAIRCOX
research project

Including the current study

Aim 1

To assess the exposure of the local human population to *C. burnetii*

Aim 2

To assess the seroprevalence of *C. burnetii* infection in local blood donors

Environmental investigations - METHODS



spring
2018



Various public places from
13 municipalities
within the "exposure area"

Small ruminant farms
Human population
Blood donation



OUTDOOR

INDOOR

Swabs

(COPAN SRK Solution™)

Wipes

(SODIBOX™)



Dust samples



+ External
Positive Control

DNA extraction



PCR analyses

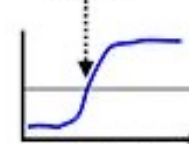
Coxiella burnetii

IS1111 sequence

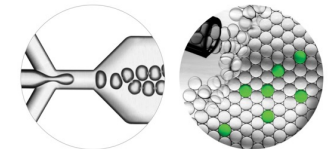


Quantitative
real-time

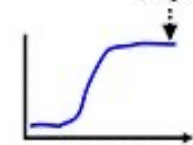
analysis



Droplet
digital



analysis



Less sensitive to
PCR inhibitors

Environmental investigations - RESULTS

160 dust samples from public places

Detection of *C. burnetii* DNA

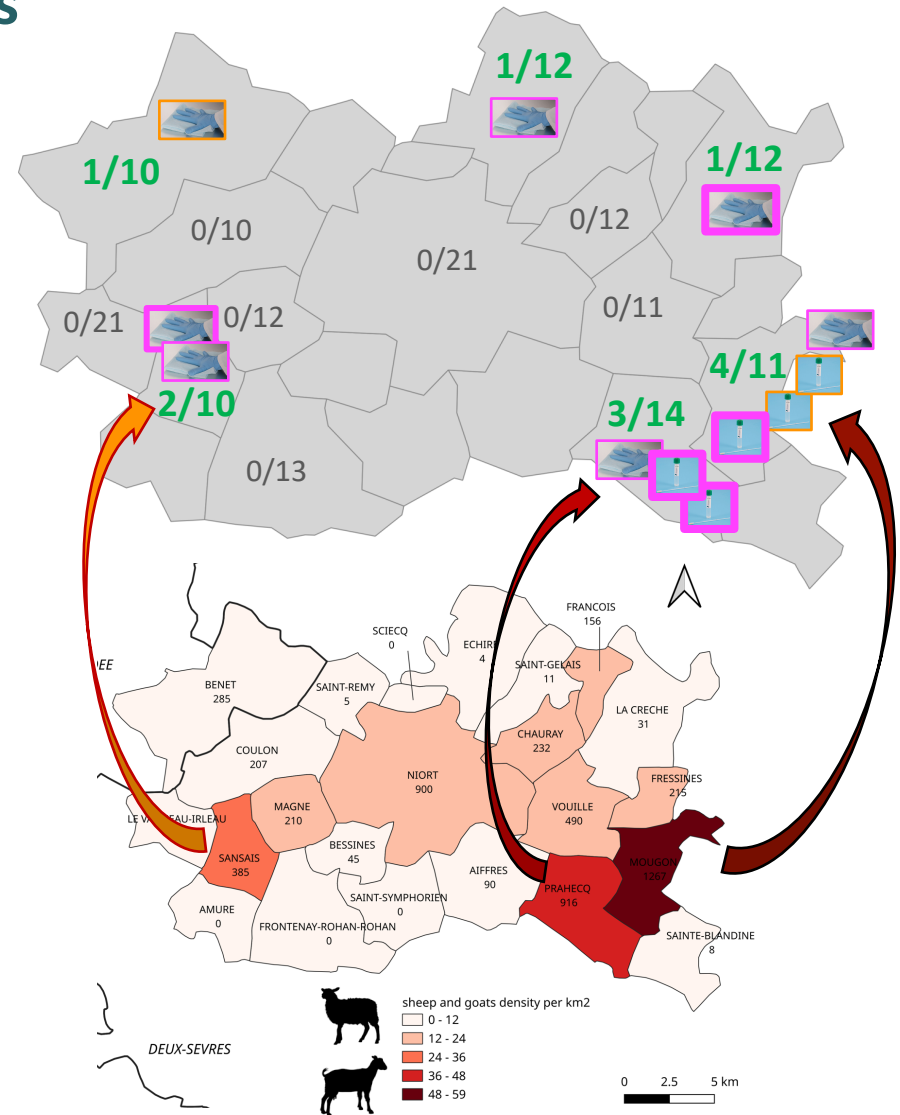
✓ in 12 samples
by droplet digital PCR only

	Outdoor	Indoor	Total
Wipes	2/63	6/19	8/82
Swabs	1/21	3/57	4/78
Total	3/84	9/76	12/160

✓ collected from 6 municipalities

- 3 with 1 positive sample
- 3 with several positive samples

= those with the
highest small ruminants densities



Environmental contamination - DISCUSSION

Detection of bacterial DNA in dust from several public places
one year after the outbreak

Low levels...



Specific ?



Likely...

Correlation with
small ruminants
densities

Consistent
with previous results
in the US

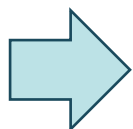
Kersh *et al.* AEM 2010
Presence of *Coxiella burnetii*
DNA in the Environment of
the United States,
2006 to 2008

Associated
risk of infection
for the general
population



???

- In 2018 ??
- In 2017 ???



Serosurvey on blood donors sampled in 2017

to gain knowledge on the prevalence of infection

Serosurvey on blood donors - METHODS

Retrospective study

Blood donors



✓ **Not opposed** to the use of their samples for biomedical research

✓ Donating blood within the "exposure area"

✓ **Personal data**

- Age, sex, residence place
- Donation place and date

Step 1: cross-sectional

1 sample per donor – n=2,500



Occasional donors

unique sample



Regular donors

the latest sample



donated between



If titre ≥ 50

C. burnetii-specific antibodies

IFI test



1 Initial screening: all Ig classes

If titre ≥ 50

2 Phase 1 & 2
IgG
IgM
IgA

Positive if titre ≥ 100

If seropositive

Step 2: infection history

several samples per donor



Regular donors

1 to 19 samples



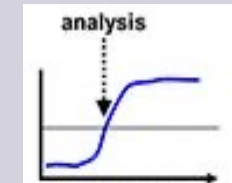
donated between



If ≥ 1 sample seropositive

C. burnetii-specific DNA

Real-time PCR



Serosurvey on blood donors - RESULTS

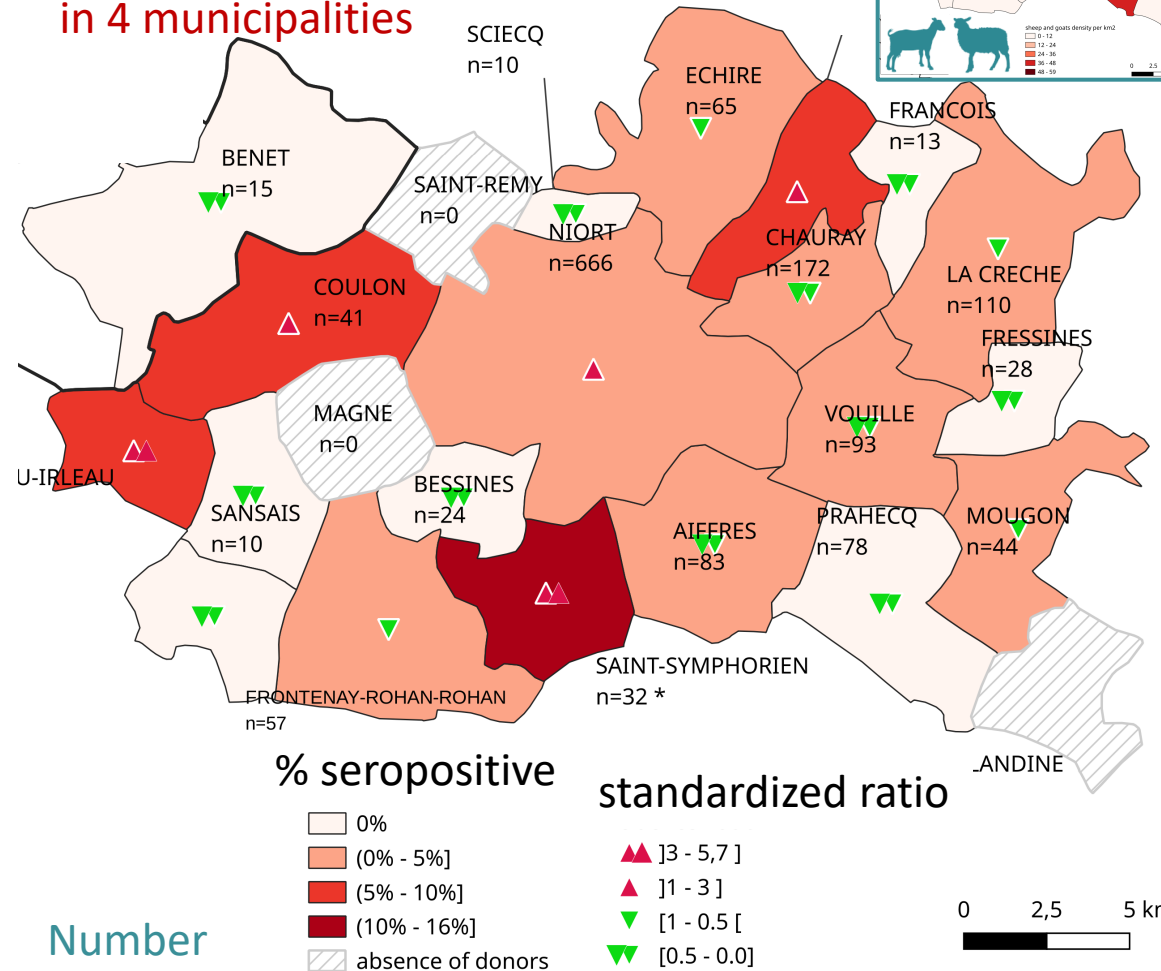
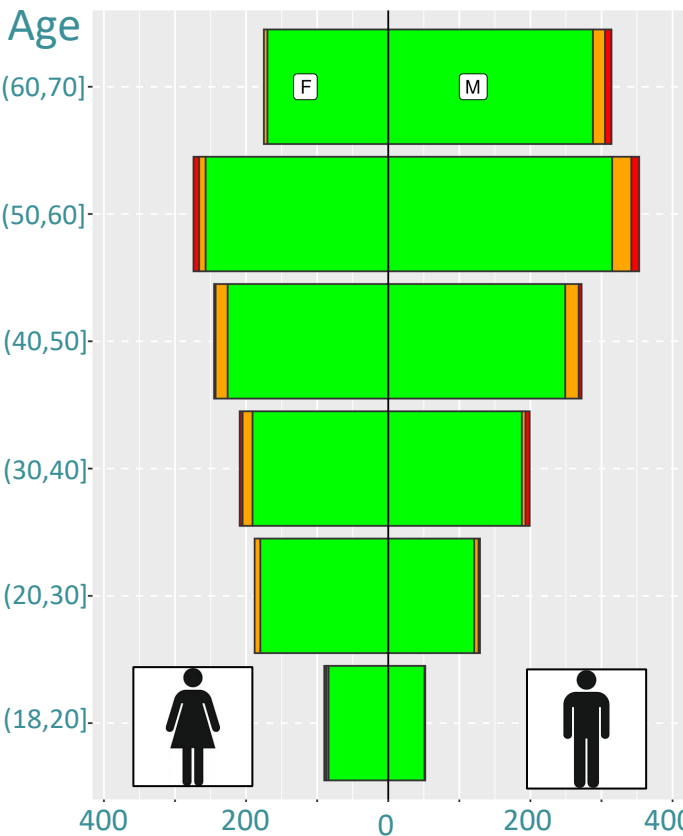
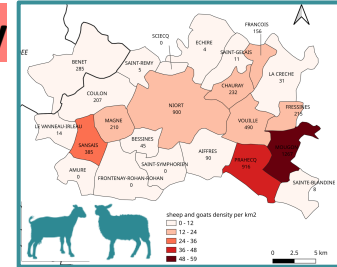
Cross-sectional	n	%
Seronegative	2,320	92.80
Titre =50	131	5.24
Titre ≥100	49	1.96
Total	2,500	100

Seroprevalence ~2%

Variations with residence location ...up to 5% to 16% in 4 municipalities

No significant association with

- **ruminant density**
- **sex and age**



Serosurvey on blood donors - RESULTS

➤ 60 donors → 4 serological profiles



➤ Real-time PCR tests

→ all negative

Serosurvey on blood donors - DISCUSSION

Cross-sectional survey on 2,500 donors

Seroprevalence ~2%
5 to 16% in 4 municipalities

Other recent studies on blood donors

Gidding *et al.* 2014
Australia **1.6-4.9%**
n=2,740

Slot *et al.* 2012
Netherlands **12%** n=543

Noden *et al.* 2014
Namibia **26%** n=319

Beaudeau *et al.* 2020
France **13%** n=347

 **Poorly specific method**

Infection history for 60 donors

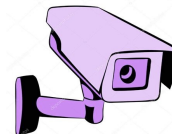
**ORIGINALITY
OF THIS
PROTOCOL**

- ✓ 35 to 49 = past exposure
- ✓ 11 (10?) = recent infection

No DNA detection



Further supports that
**transmission by
blood donation is UNLIKELY**
...all the more so since donations from
symptomatic patients are prohibited



BUT... necessity of
watchfulness for *C. burnetii*
acute and persistent infections
and Q fever chronic fatigue
in this area

➤ Acknowledgements



Blood donors
Municipality staff



Brigitte Martin, Sylvie Wilpotte



Christine Ribreau



Cyrille Maingourd



Copan Italia S.p.A.



➤ Funding

