

# Q-fever in the Netherlands: a short introduction and veterinary research

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- Short introduction
  - Goat husbandry
  - Q-fever in the Netherlands
- Overview veterinary research
- Some results
  - MLVA typing
  - Culturing of *Coxiella burnetii*
- Future research



# Goat husbandry in the Netherlands



[www.natuurcentrumgorinchem.nl/Kinderboerderij...](http://www.natuurcentrumgorinchem.nl/Kinderboerderij...)



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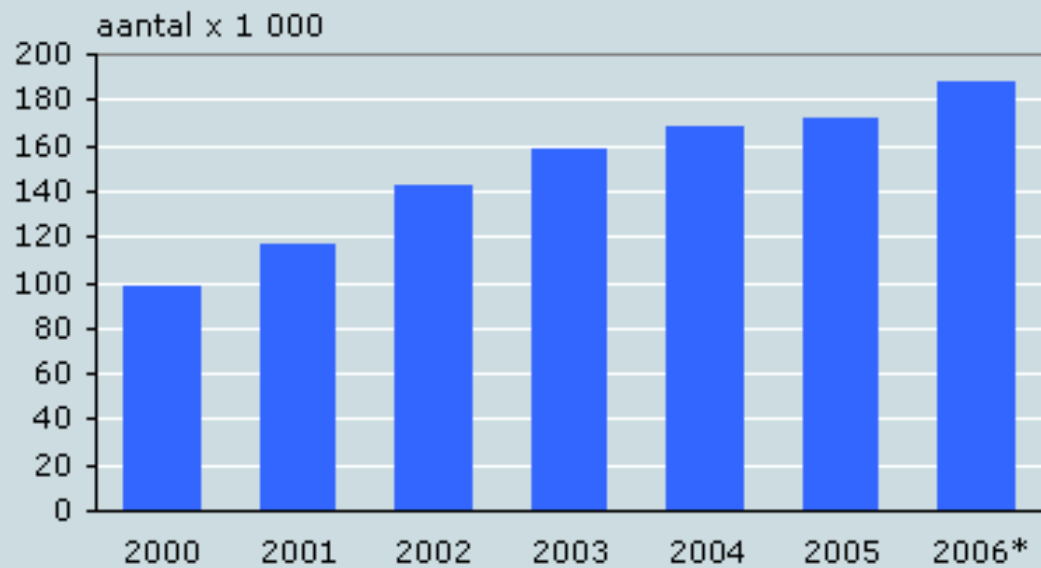


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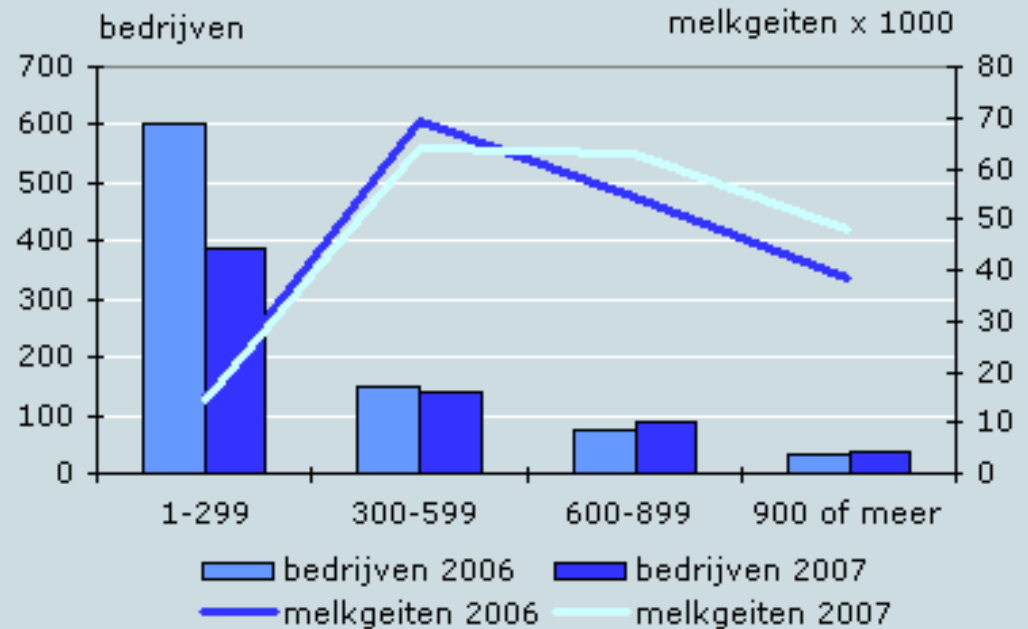


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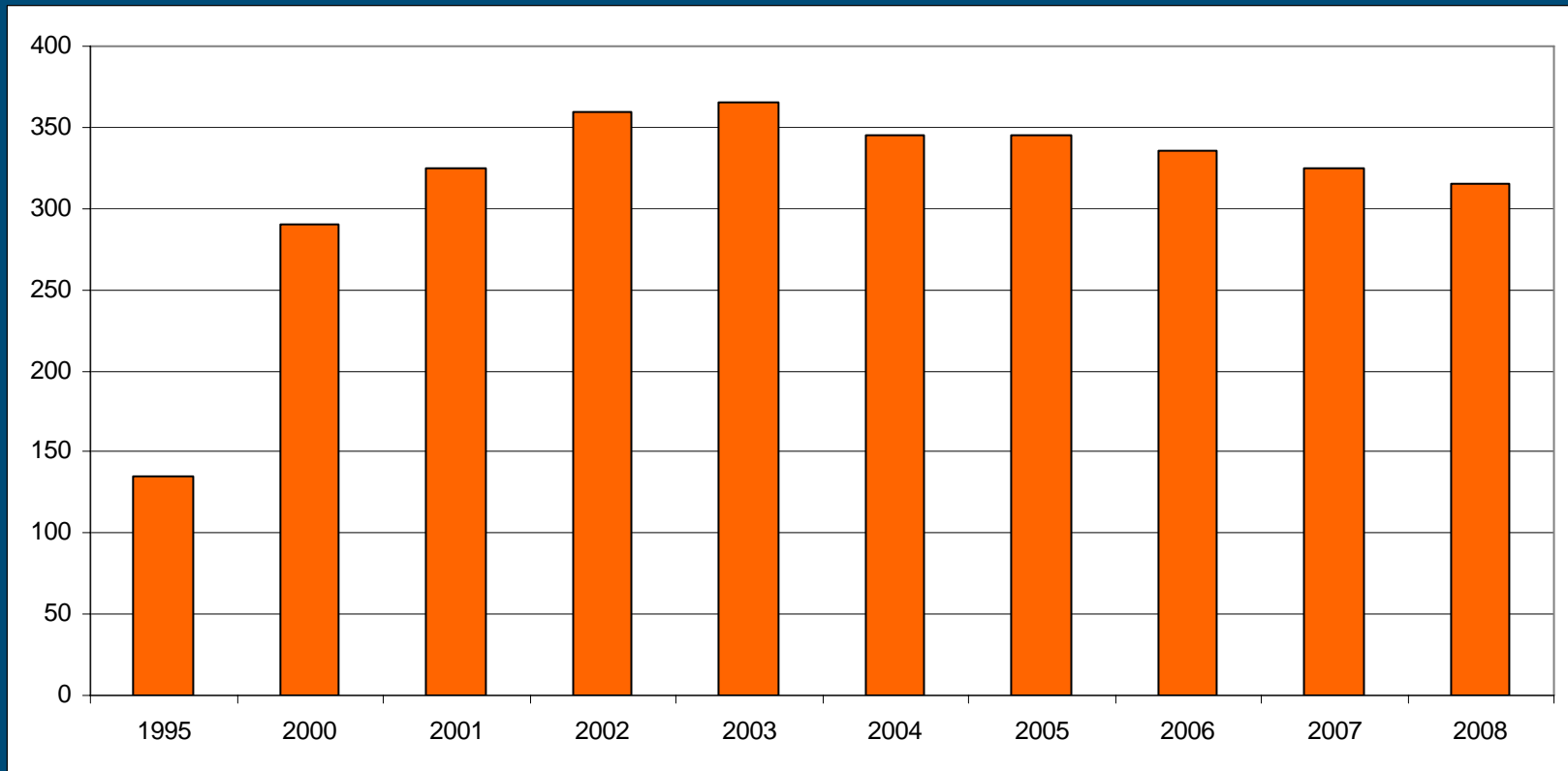
Bron: CBS



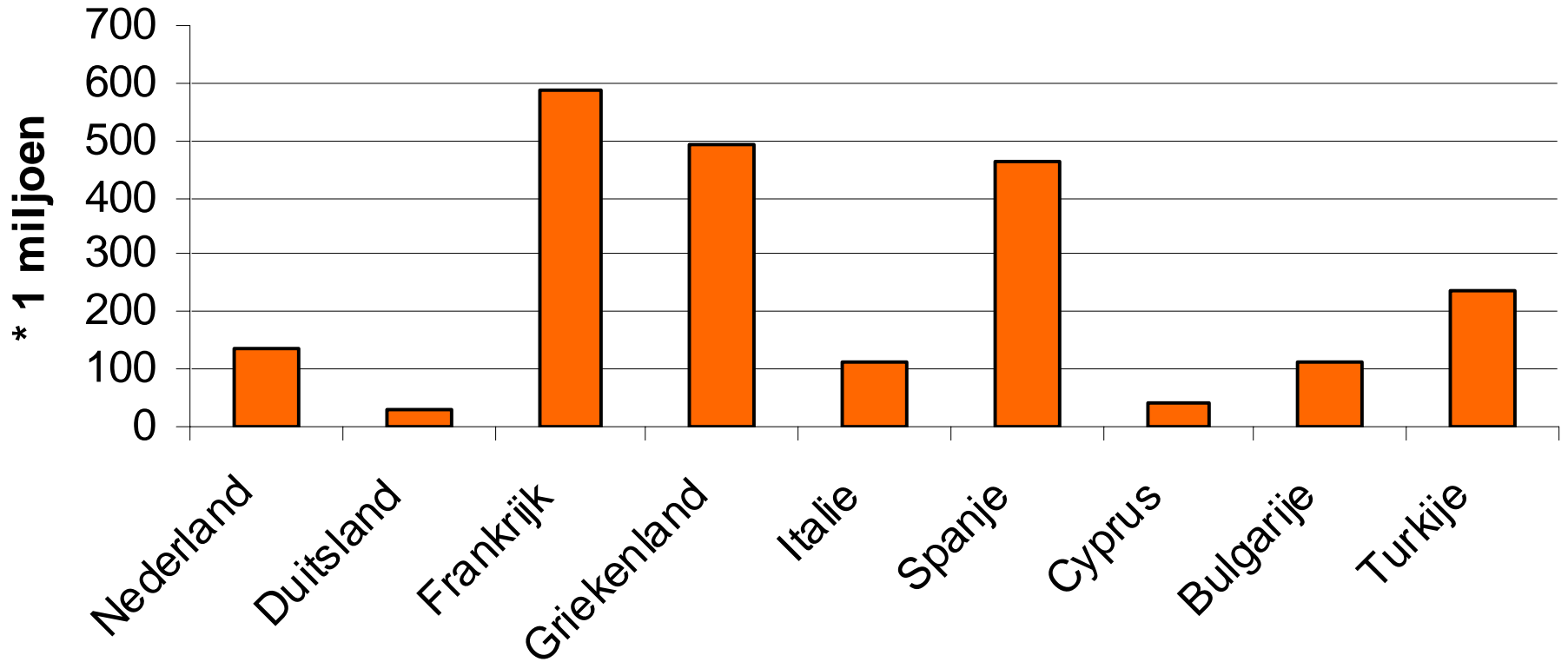
Bron: CBS



# Number of farms with more than 200 dairy goats



## productie Europa



# Symptoms

## Transmission route

animal



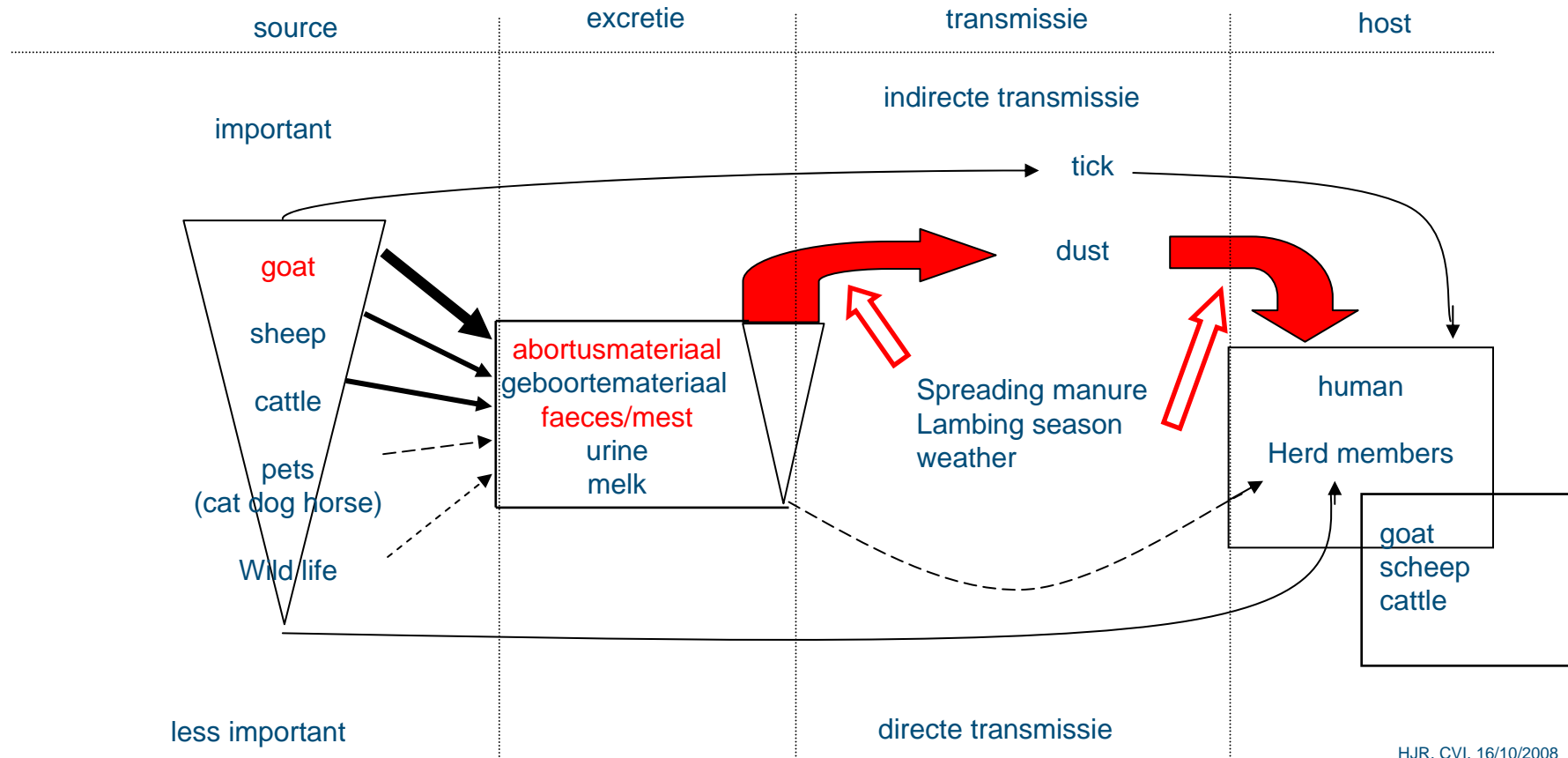
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- Carrier, no symptoms (99%?)
- Abortion
  - goats and sheep
- Decreased fertility
  - cattle

- No symptoms (60%)
- Flue like symptoms
- Pneumonia, hepatitis, endocarditis
- Chronic fatigue



# Model of the transmission routes of *Coxiella burnetii*



HJR, CVI, 16/10/2008



# Q-fever in the Netherlands, premises with abortion

	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>Total</u>
<u>Dairy sheep farms</u>	-	<u>1</u>	-	<u>1</u>	-	<u>2</u>
<u>Dairy goat farms</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>7</u> <sup>*)</sup>	<u>4</u>	<u>26</u>

<sup>\*)</sup> betrof een bedrijf met dieren op twee locaties[XZ2].

Bron: Piet Vellema, Gezondheidsdienst voor Dieren



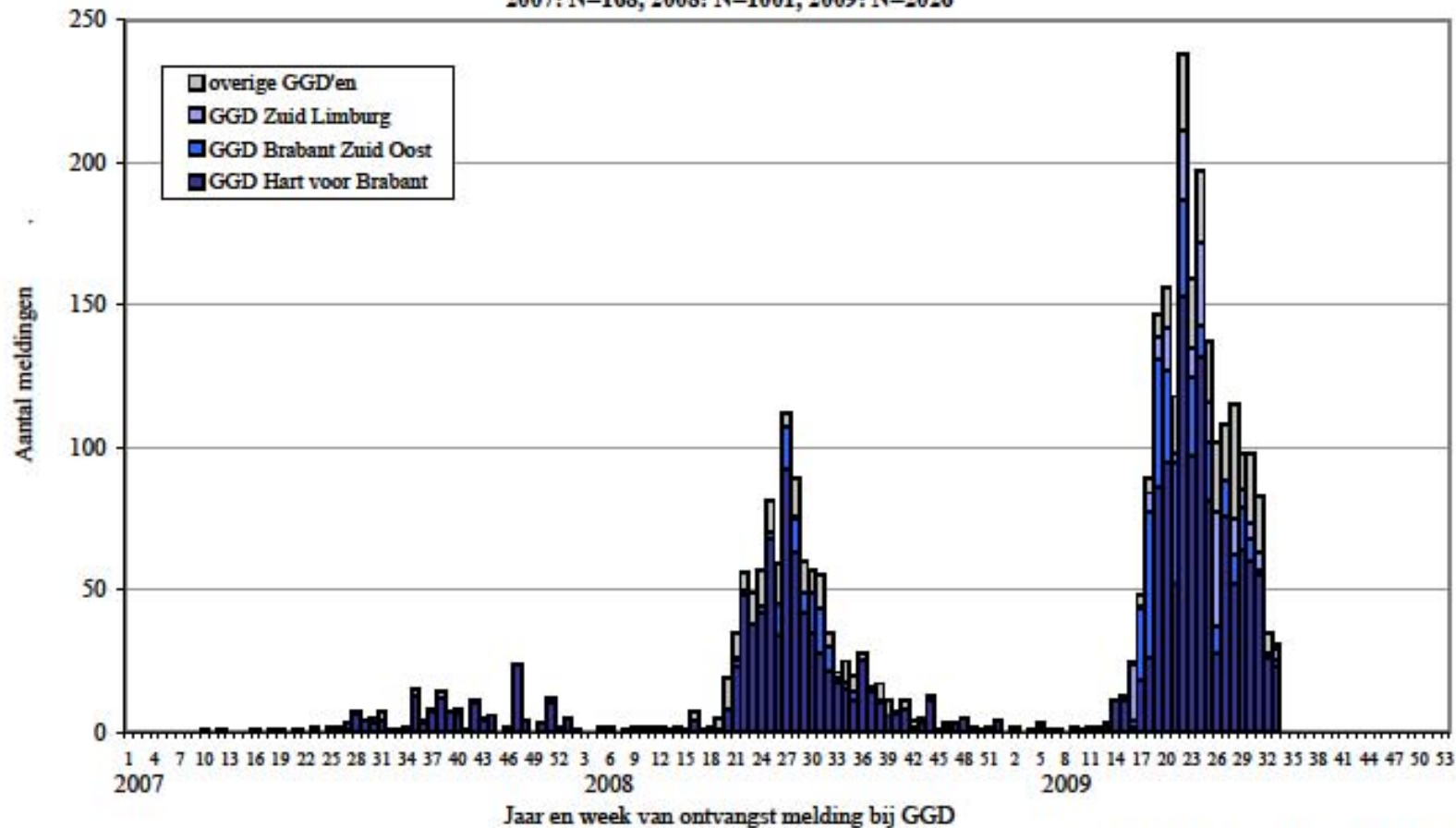
# Bulk milk monitoring

- In October 2009 the bulk milk monitoring started
- Based on bulk milk monitoring with PCR, 61 premises are infected.
- The expectation is that the coming weeks and months we will see more infected premises (due to intermittent shedding)



Aantal gemelde patiënten met Q-koorts naar week van ontvangst melding bij de GGD,  
periode 01-01-2007 t/m 12-08-2009.

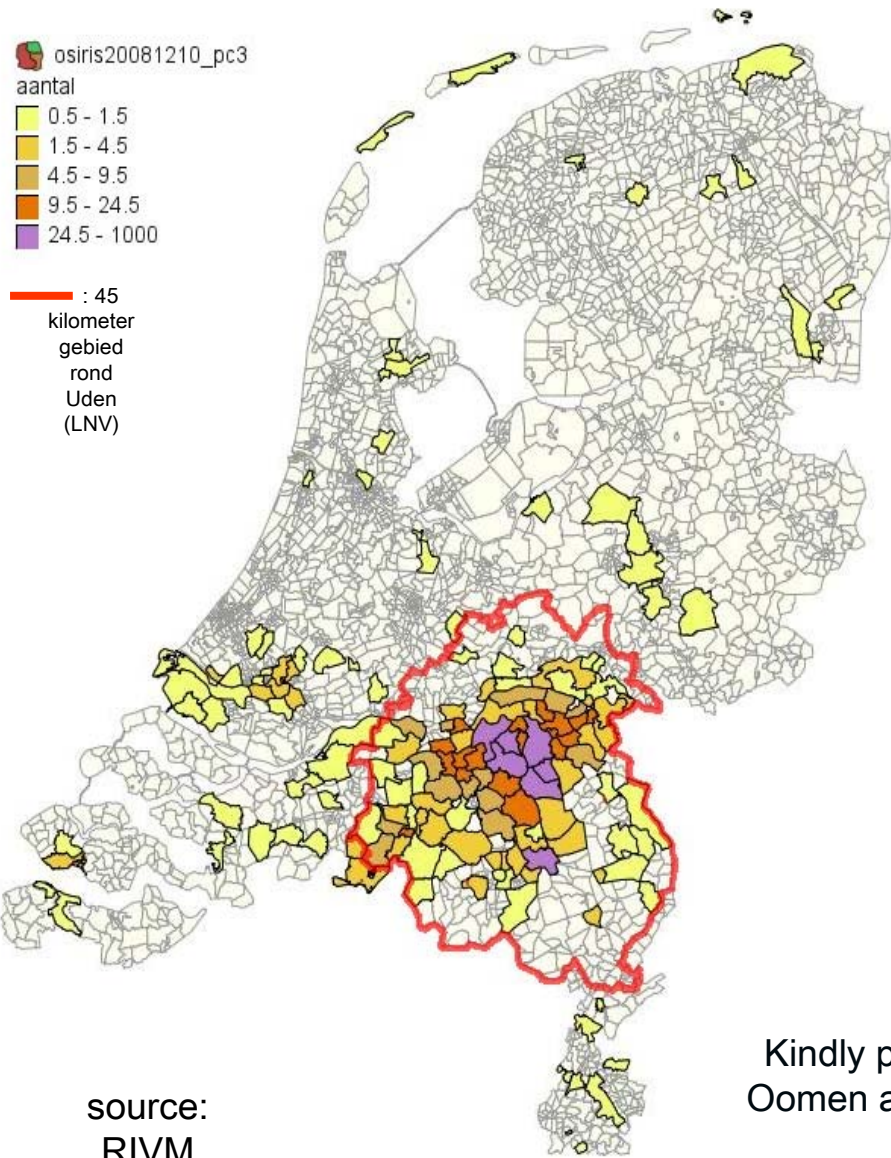
2007: N=168, 2008: N=1001, 2009: N=2026



Samengesteld door Frederika Dijkstra (RIVM/Cib/EPI)

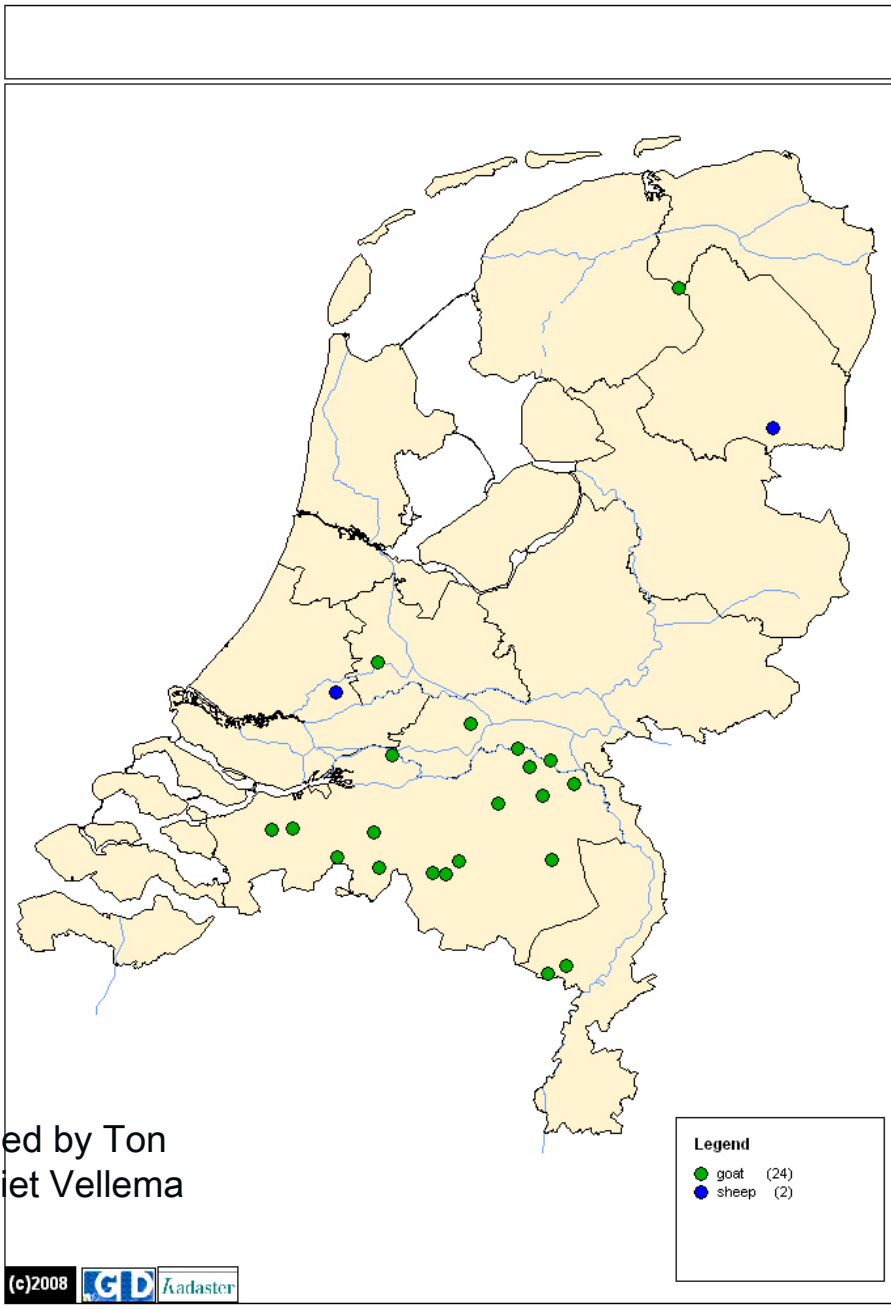
Source RIVM

# Absolute aantallen humane ziektegevallen in 2007 en 2008 (1180) in 3 cijferige postcode gebieden in Nederland.

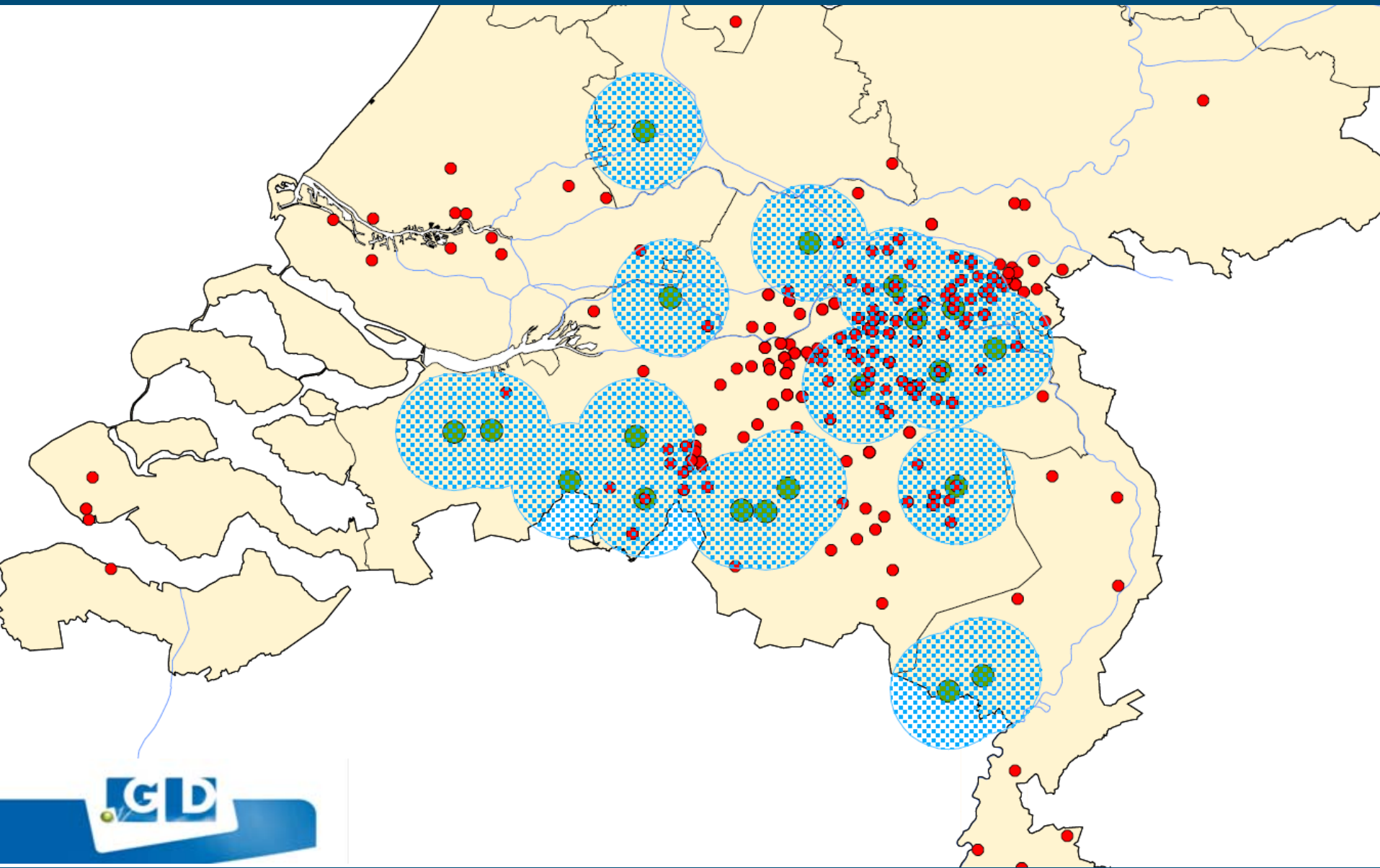


source:  
RIVM

Kindly provided by Ton Oomen and Piet Vellema



(c)2008 GD Kadaster



GD

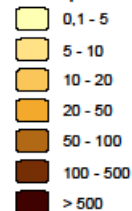


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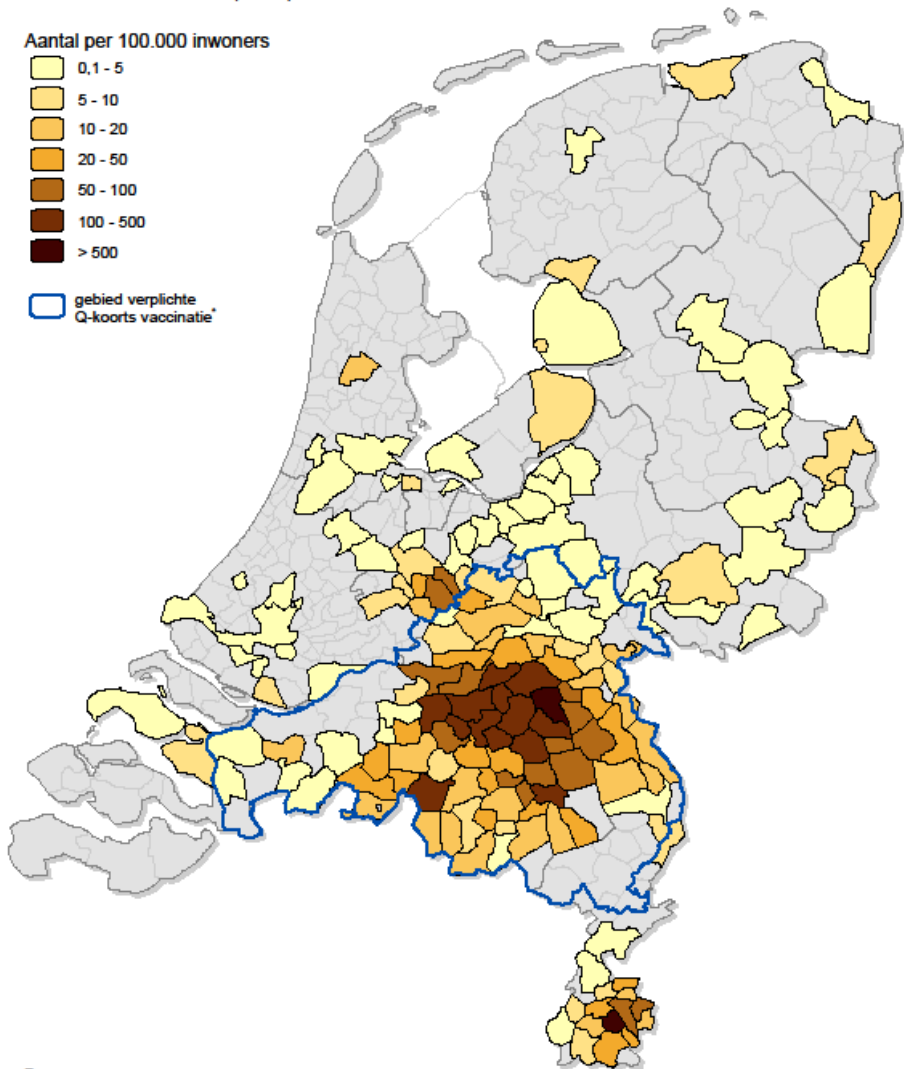
## Gemeelde Q-koortspatiënten 2009

Incidentie per gemeente  
1-1-2009 t/m 12-8-2009 (10:00)

Aantal per 100.000 inwoners



gebied verplichte Q-koorts vaccinatie\*



Bronnen:  
- OSIRIS  
- CBS (2009)

\*) Gebied waar in 2009 vaccinatie tegen Q-koorts verplicht wordt voor schapen en getten op professionele melkgeiten- en melkschapenbedrijven en op bedrijven met een publiekfunctie.  
Bron: Ministerie van LNV

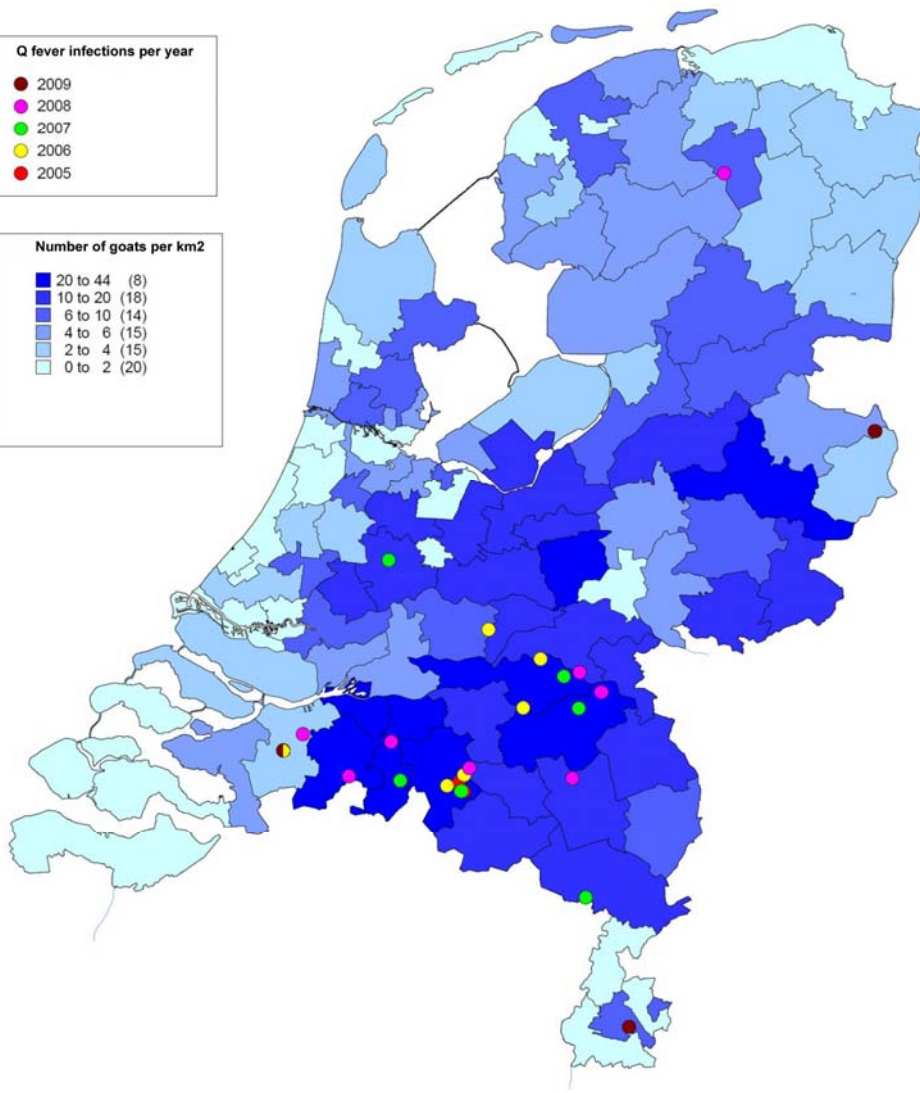
*rivm*

## Q fever infected goat farms per year

Q fever infections per year



Number of goats per km2



# Hypothesis

Dairy goats are the source of human Q-fever:

- Overlapping area
- Succession in time
- Genetic similarity by MLVA
- No other source identified

Research is mainly focused on dairy goats, in 2010 other animals will be included in the research program (i.e. pet animals and horses)



# research

- Integrated human and veterinary research agenda
  - RIVM
  - Animal Health Service
  - CVI
  - Hospitals
  - Local human health centres
  - TNO
  - Faculty of Veterinary Medicine
  - HAS



# Veterinary research

- Prevalence
- Risk factors
- Evaluation of intervention
- Diagnostic tools
- Pathogenesis



# Prevalence

- Goats, positive:
  - 7,8 % of the goats
  - 17,9 % of the goats farms
- Sheep, positive:
  - 2,4 % of the sheep
  - 14,5 % of the farms
- Dairy cattle, positive
  - 50-60 % of the bulk tank milk
- Pet animals
- Wild life



# Evaluation of intervention

- Monitoring vaccination
- Side effects of vaccination
- Improvement of husbandry, climate control
- Survival of *C. burnetii*
  - Manure
  - Milk
  - Environment



# Diagnostic tools

- Detection
- Typing
  - To investigate the connection between goats and humans
  - To exclude other sources
- Culture
  - Reference DNA
  - Detection of viable Cb
  - Characterisation of genome
  - Challenge experiments
    - Shedding
    - immunology



# MLVA typing of *C. burnetii*

- 146 PCR positive samples from 13 farms
- 2008
- Vaginal swabs, organs
- MLVA, Arricau 2006



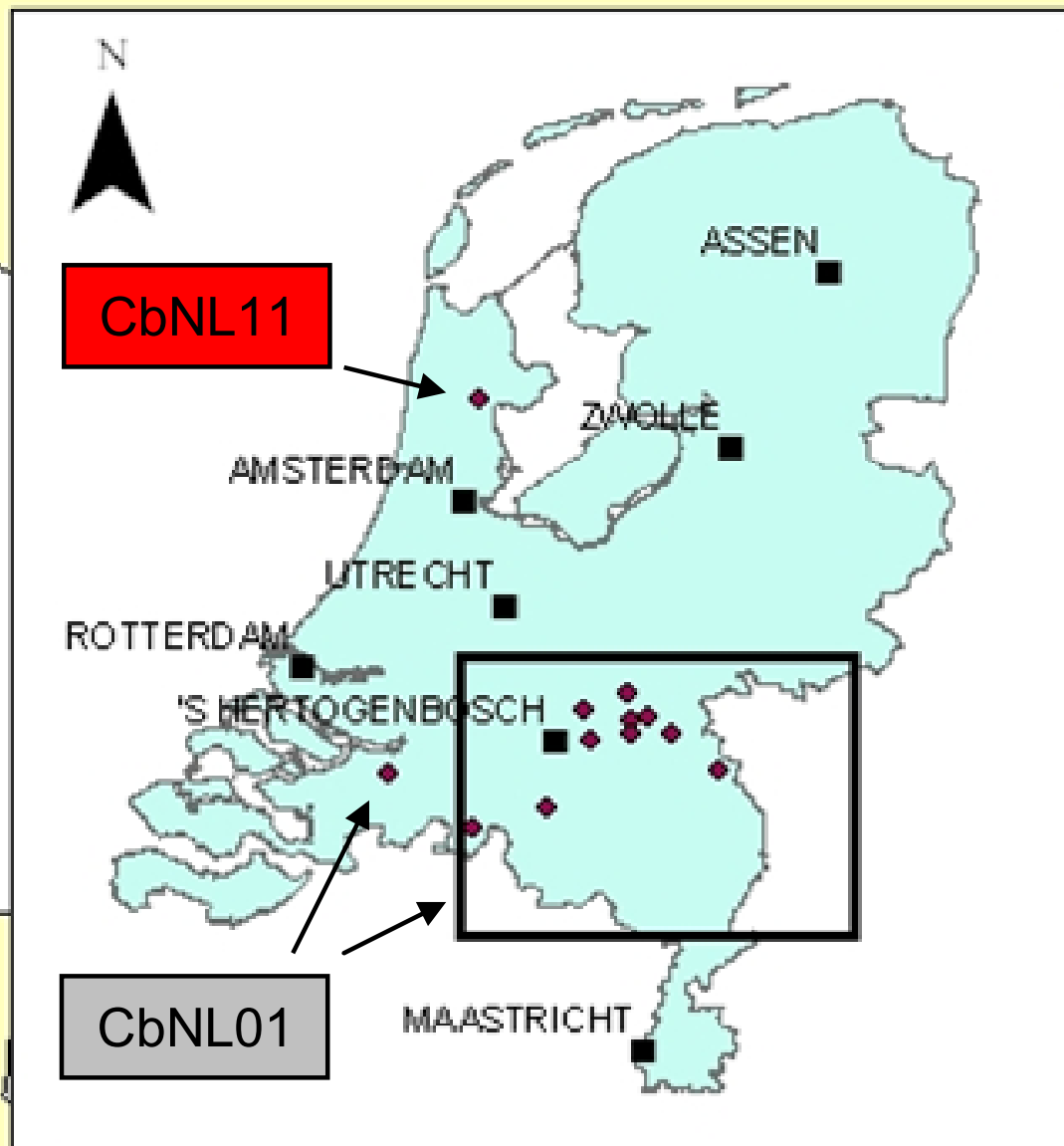
farm ID	provenance	Disease in animals			number of samples tested
		species	symptom	year	
A	Noord Brabant	goat	abortion	2008	20
B	Noord Brabant	goat	abortion	2008	20
C	Noord Brabant	goat	abortion	2008	20
D	Noord Brabant	goat	abortion	2008	39
E	Noord Brabant	goat	abortion	2007	3
F	Noord Brabant	goat	abortion	2008	16
G	Noord Brabant	goat	abortion	2008	4
H	Noord Brabant	goat	abortion	2008	13
I	Noord Brabant	goat	nk	2008	1
J	Noord Brabant	goat	nk	2008	3
K	Noord Brabant	goat	no symptoms	2008	2
L	Noord Brabant	goat	abortus	2008	3
M	Noord Holland	goat	no symptoms	2008	2
13					146

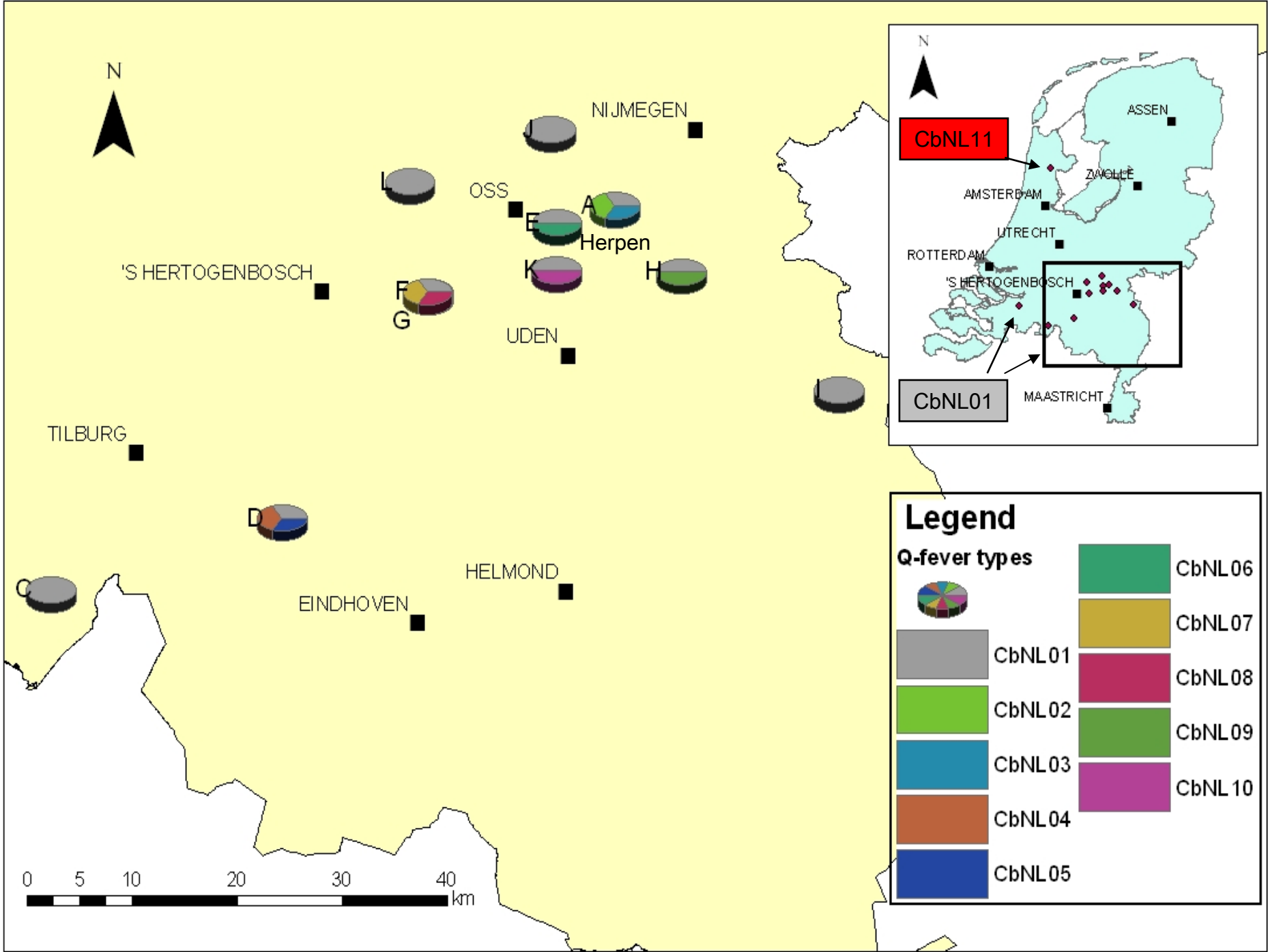


# Results

Locus ID	number of repeats per locus resulting in MLVA types										
	CbNL 01	CbNL 02	CbNL 03	CbNL 04	CbNL 05	CbNL 06	CbNL 07	CbNL 08	CbNL 09	CbNL 10	CbNL 11
ms03	7	7	7	7	7	7	-1	7	7	7	7
ms12	7	7	-1	-1	-1	-1	-1	-1	-1	-1	7
ms21	6	6	6	6	6	6	-1	-1	6	6	6
ms22	6	6	8	6	6	-1	-1	6	6	-1	6
ms30	6	4	6	9	0,5	6	-1	-1	6	-1	6
ms36	12	12	12	-1	12	1	-1	-1	7	7	12
ms27	3	3	-1	3	3	3	-1	-1	3	-1	2
ms28	5	5	5	5	-1	5	-1	-1	5	14	5
ms31	2	2	2	-1	-1	2	7	-1	2	2	2
ms34	6	6	6	6	6	6	6	4	6	6	2
ms24	11	11	10+22	11	11	11	-1	-1	11	-1	-1
	133	2	1	1	1	1	1	2	1	1	2





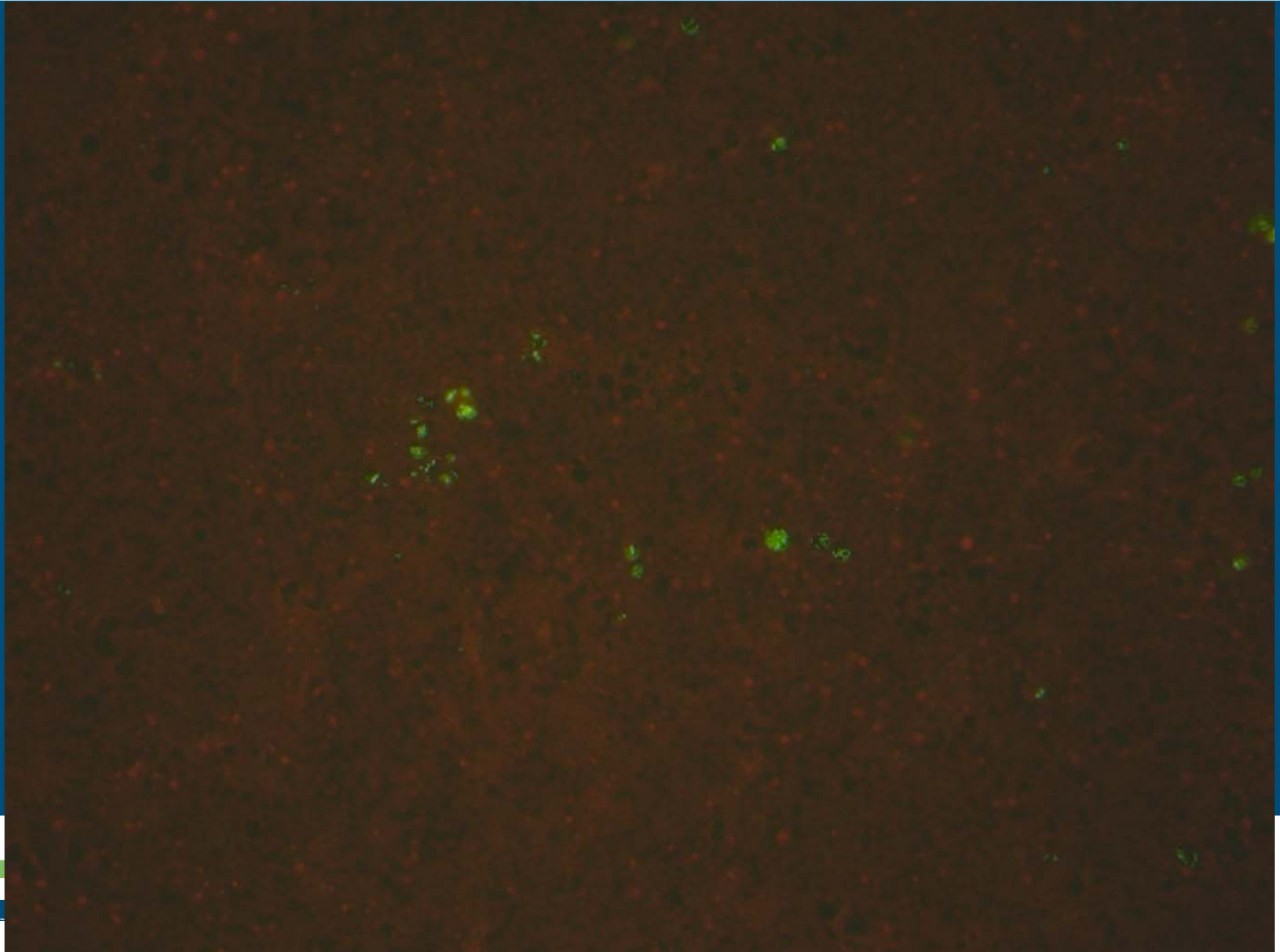


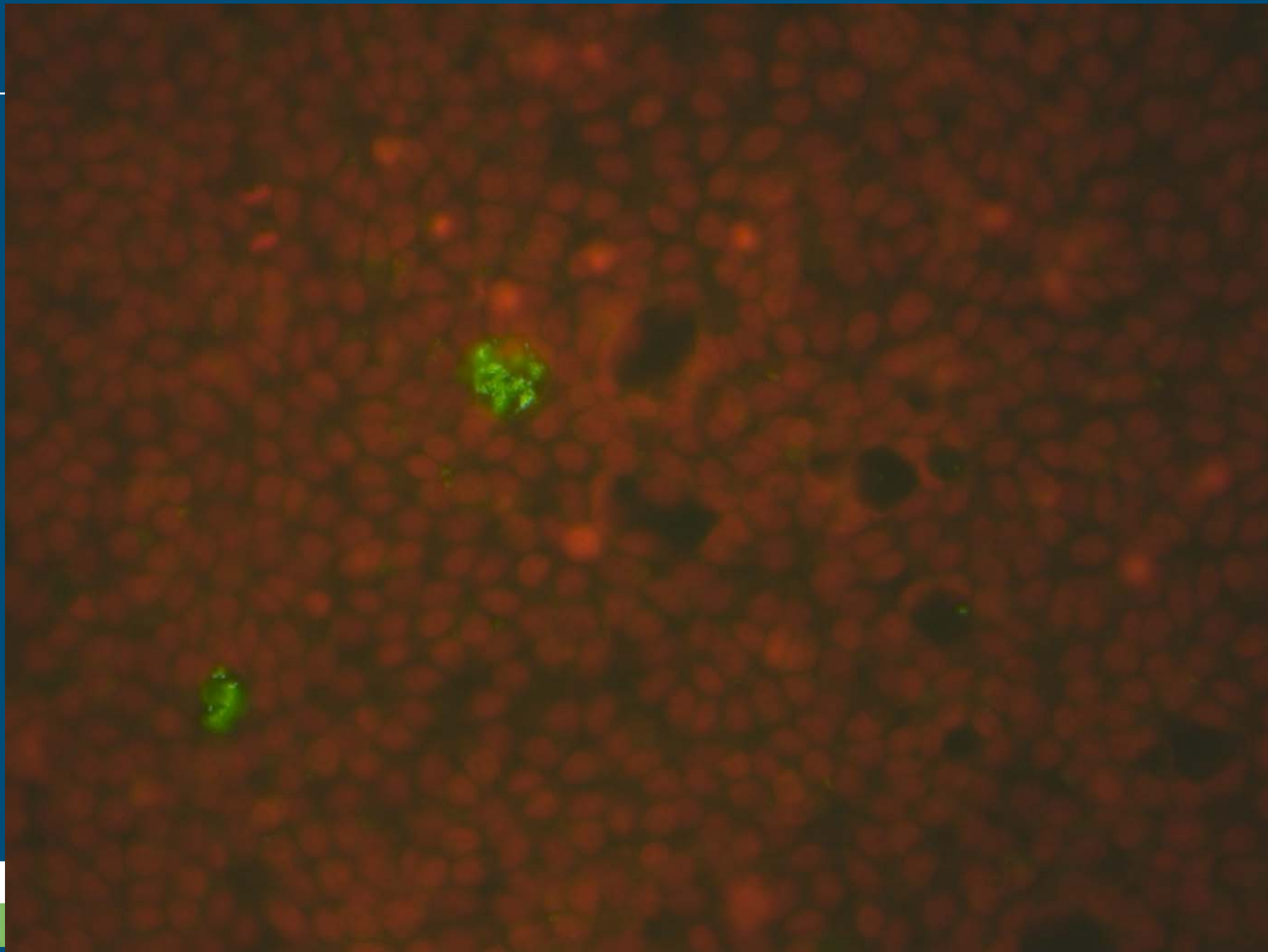
# Conclusions

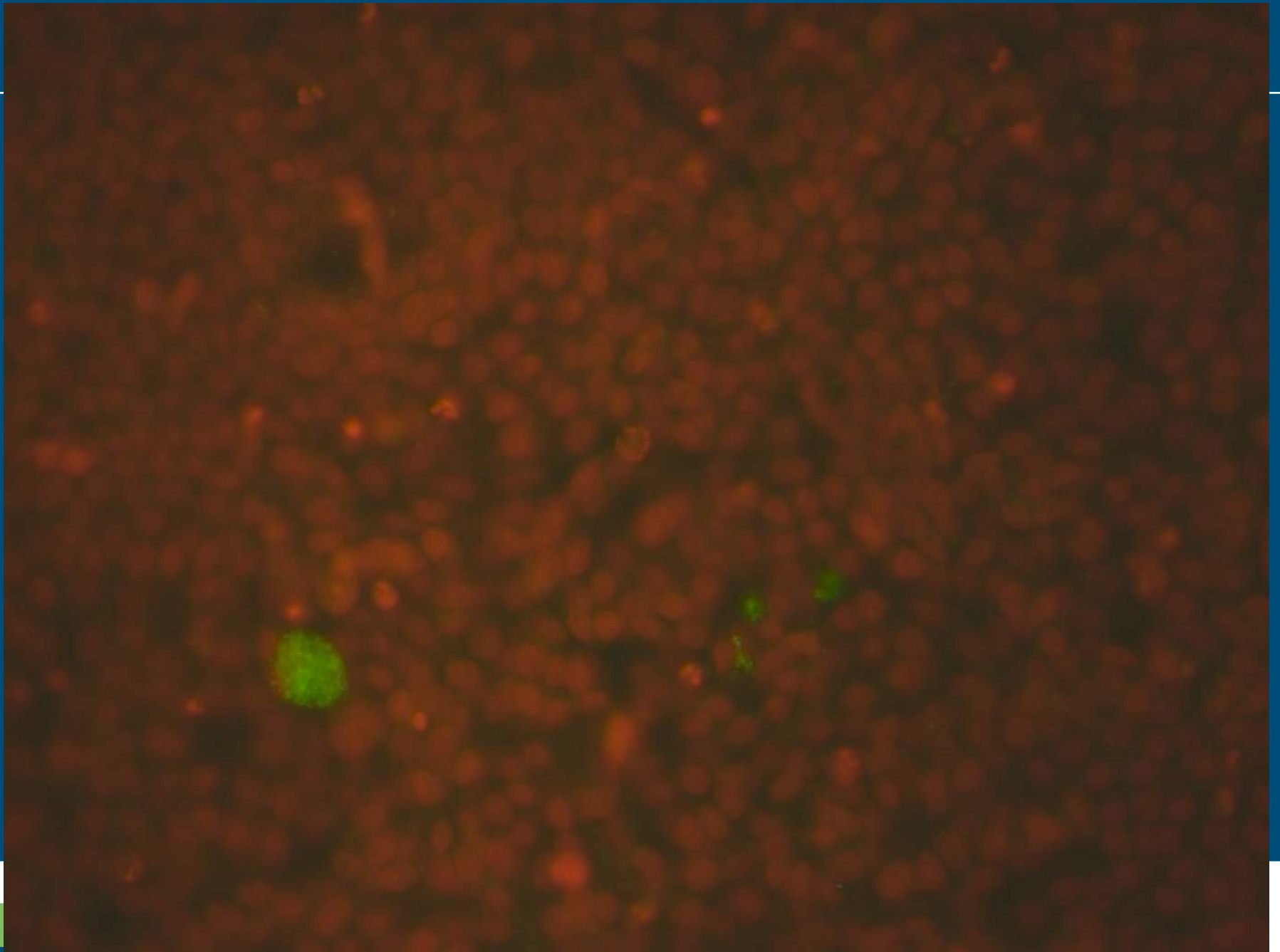
- MLVA typing can be used on clinical samples
- 11 MLVA types are identified so far
- 1 MLVA type is predominantly present on all farm in the high risk area in the southern part of the Netherlands
- indicates clonal spread in one area
- This makes tracing the source of human Q fever in the high risk area to the farm level difficult.

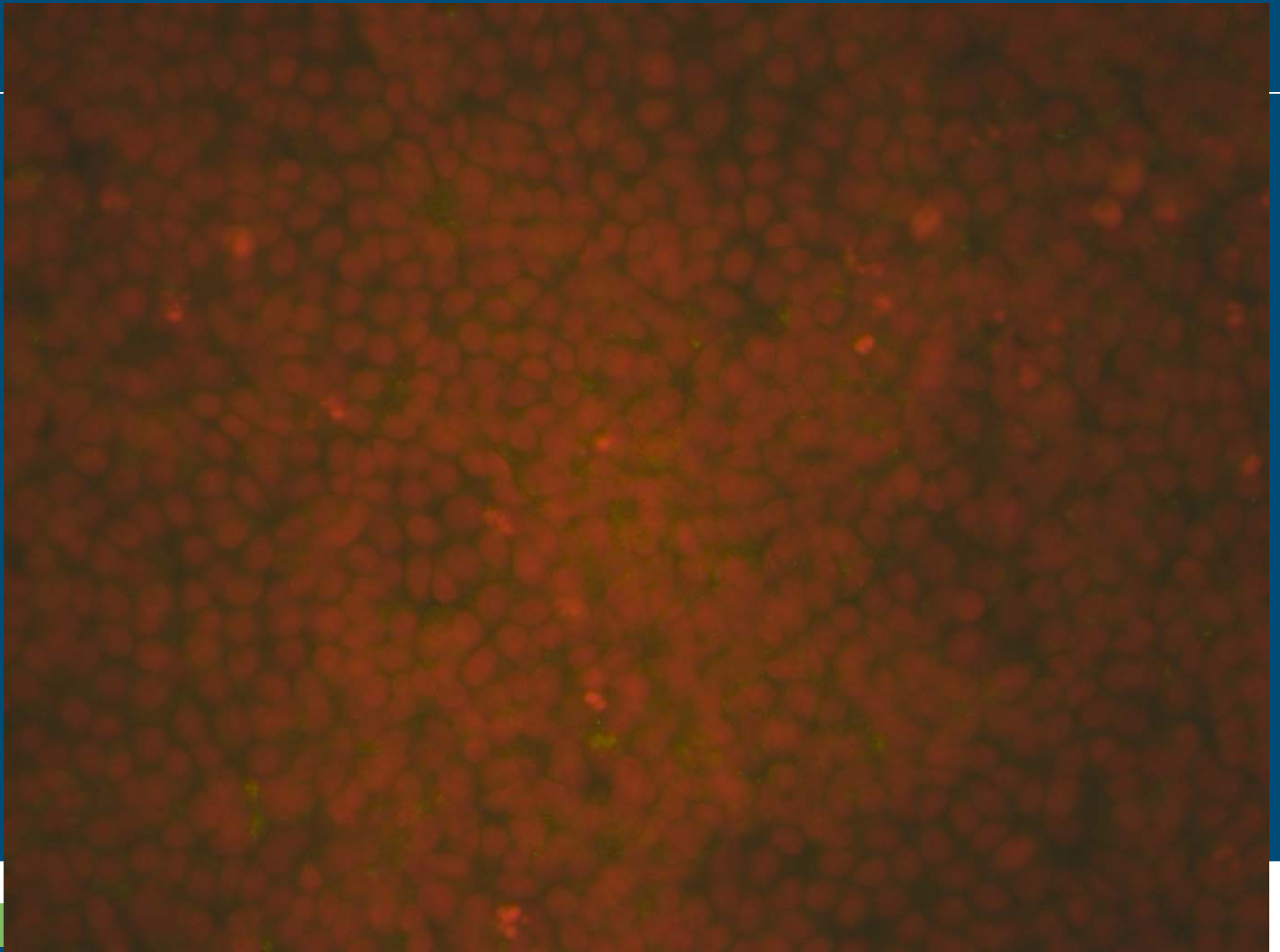


# Culture, first isolation of Dutch isolate in the Netherlands









# Ongoing research

- Harmonisation of interpretation of typing
- MLVA picture of the *C. burnetii* in the Netherlands
- Isolation of human and animal strains
- Genome sequencing and difference mapping
- Survival of *C. burnetii*
- Animals experiments to access:
  - infection route
  - Shedding and immunology of *C. burnetii* in goats
  - pathogenesis



# Discussion

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