



Épidémiologie et surveillance des maladies vectorielles en Belgique :

*Bluetongue virus (BTV), Epizootic Hemorrhagic Disease Virus (EHDV),
West Nile Virus (WNV), Usutu Virus (USUV), Tick-borne encephalitis Virus (TBEV)*

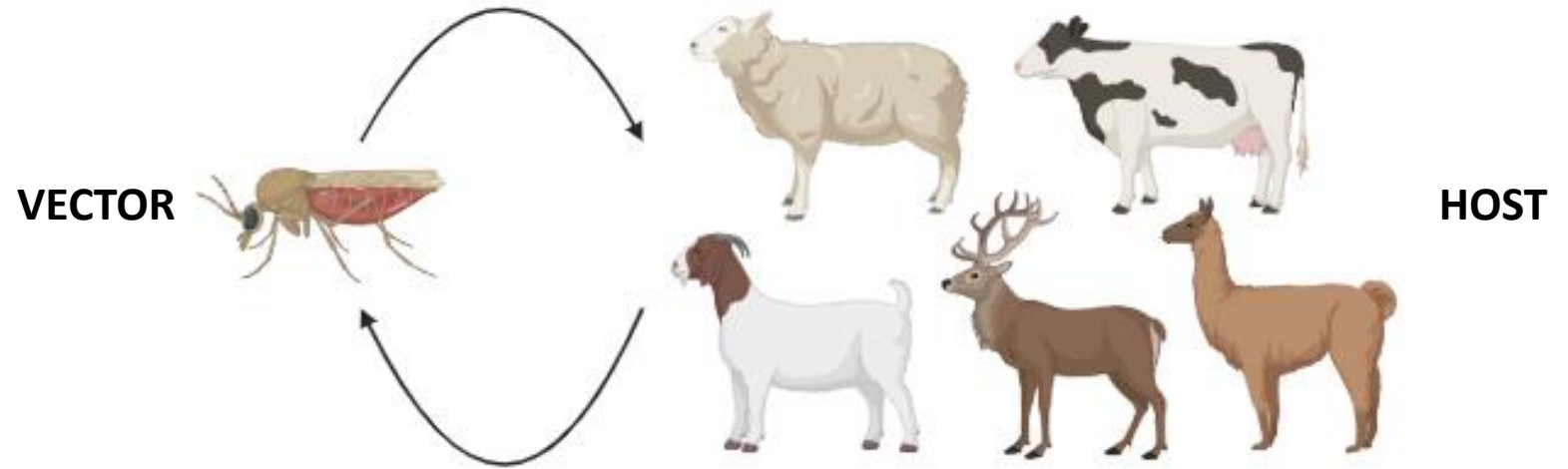


Ilse De Leeuw, Charlotte Sohier,
Nick De Regge, Jean-Baptiste Hanon



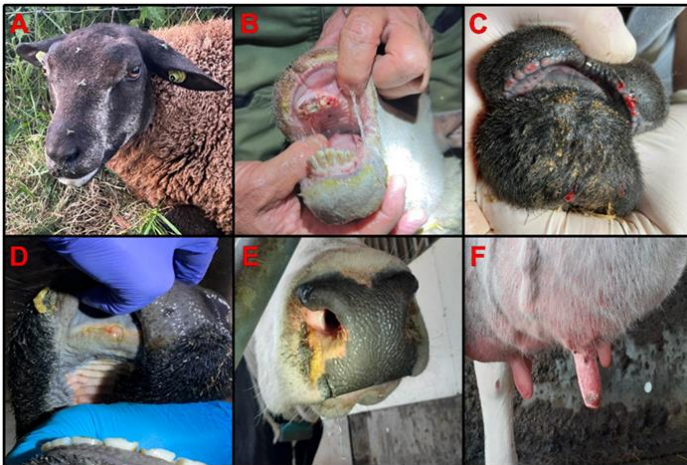
1) Culicoides-borne viruses - BTV & EHDV

Sedoreoviridae (genus Orbivirus)



BTV

- **Notifiable in Europe** (category C+D+E, AHL)
- **24 serotypes**
- Clinical signs
➡ mostly in sheep



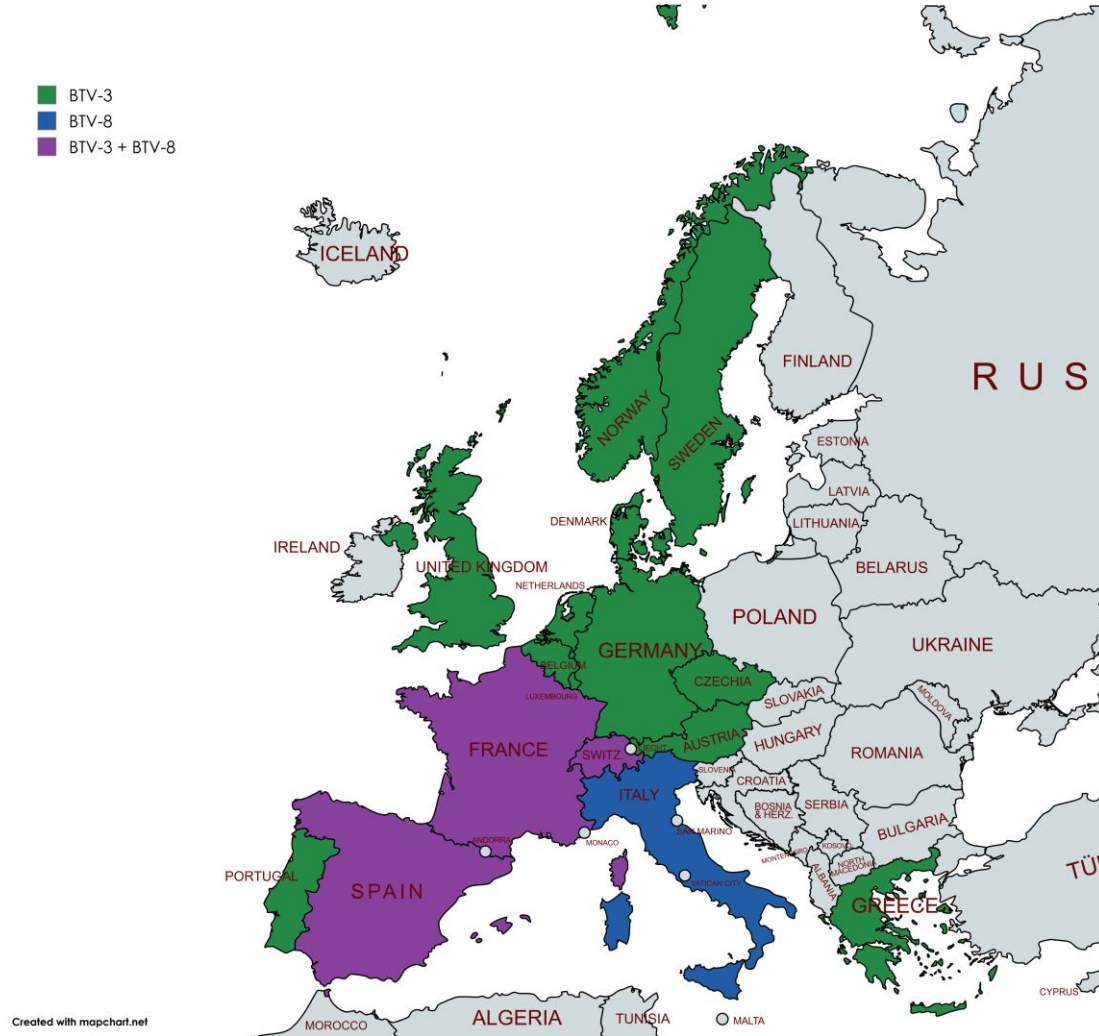
EHDV

- **Notifiable in Europe** (category D+E)
- **7 serotypes**
- Clinical signs ➡ mostly in cattle and deer



Current situation BTV and EHDV in Europe

BTV-3 / BTV-8



EHDV-8



Situation BTV-3 Belgium



05/06/2023

BTV free status

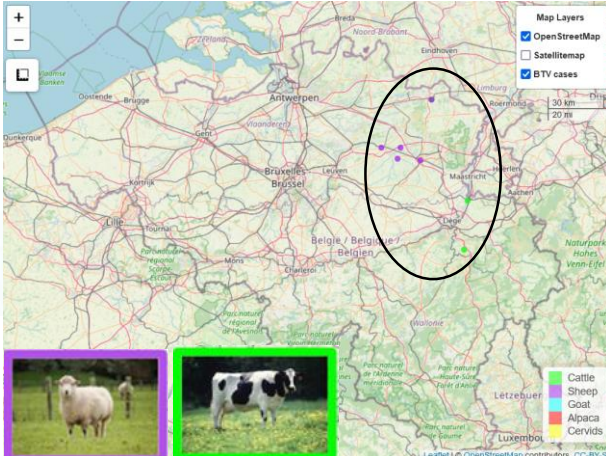


10/23 - 12/23



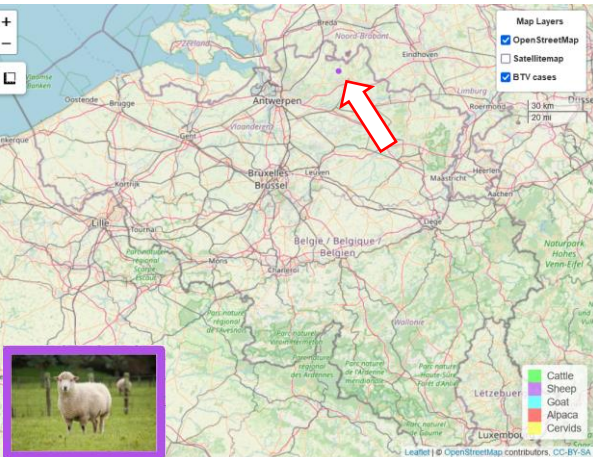
Spring 2024

New vector season

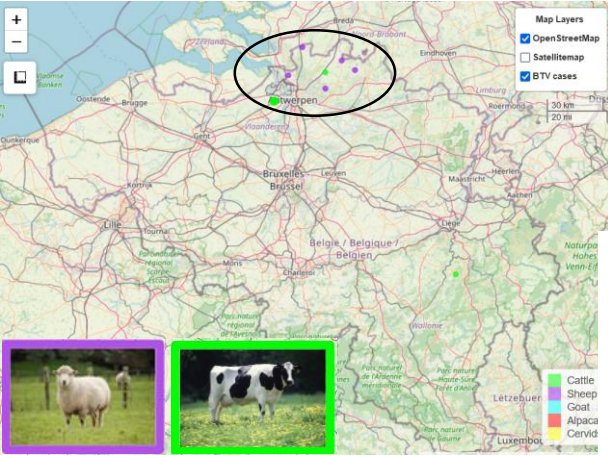


Mid July 2024

09/10/2023



Winter 2024

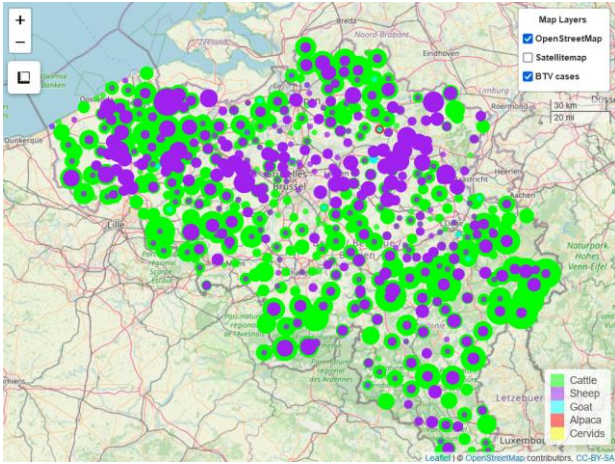


May 2024

BTV-3 vaccine available

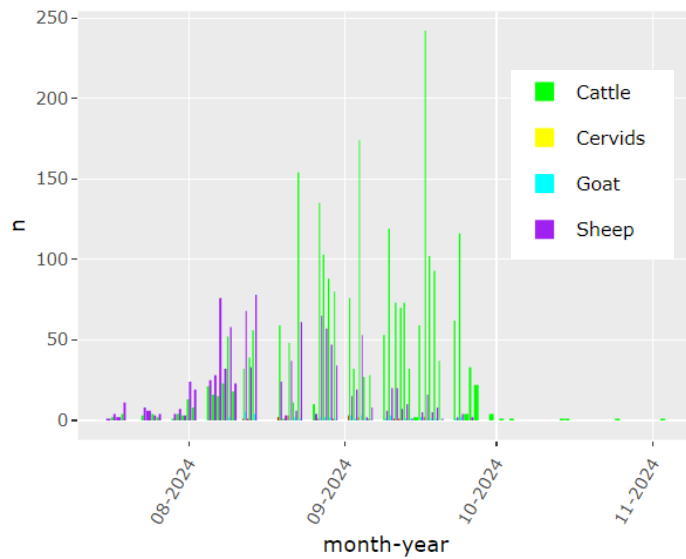


October 2024



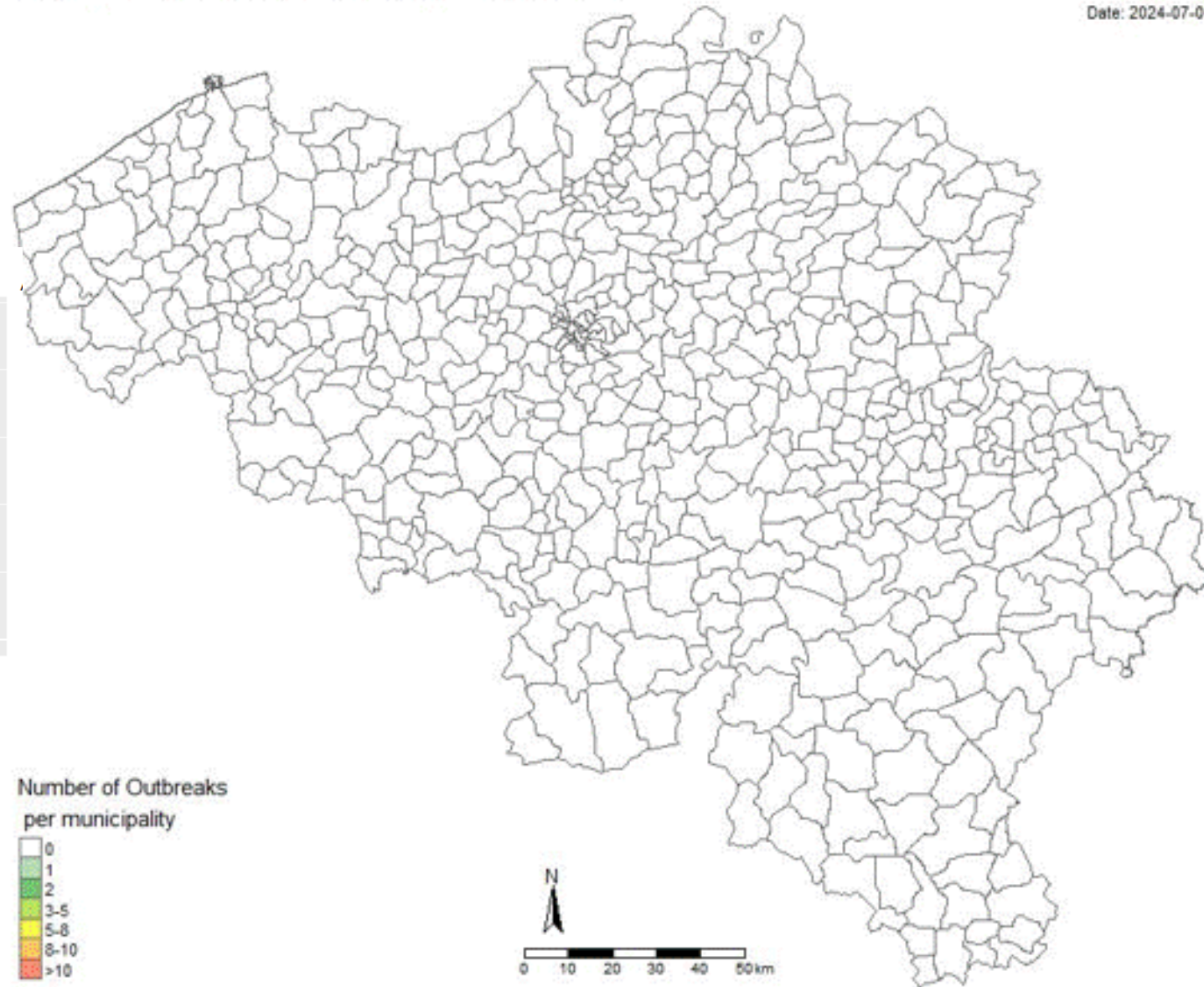
In total: 3668 officially reported outbreaks (PCR)

- 2542 cattle
- 1059 sheep
- 46 goat
- 19 alpaca
- 2 cervids



Number of BTV outbreaks per municipality from 1 June 2024

Date: 2024-07-01



Excess mortality 2024-2023

2023

Number	rejected calf 10kg	calf 25 kg	calf 50 kg	bovine 150 kg	bovine 300kg	bovine 550 kg	bovine 800 kg	bovine total	lamb 10 kg	sheep 40kg	sheep total
July	580	1.140	7.583	855	1.106	2.191	397	13.852	997	2.313	3.310
August	632	1.167	7.598	903	1.245	2.310	360	14.215	1.219	3.308	4.527
September	605	1.169	7.956	1.018	1.488	2.314	361	14.911	1.060	3.351	4.411
total July-September	1.817	3.476	23.137	2.776	3.839	6.815	1.118	42.978	3.276	8.972	12.248

2024

Number	rejected calf 10kg	calf 25 kg	calf 50 kg	bovine 150 kg	bovine 300kg	bovine 550 kg	bovine 800 kg	bovine total	lamb 10 kg	sheep 40kg	sheep total
July	678	1.474	7.736	989	1.549	2.415	454	15.295	2.177	4.046	6.223
August	905	2.062	10.231	1.078	2.138	3.891	620	20.925	2.781	15.796	18.577
September	1.430	2.473	10.564	1.183	2.446	3.212	501	21.809	2.004	8.816	10.820
total July-September	3.013	6.009	28.531	3.250	6.133	9.518	1.575	58.029	6.962	28.658	35.620
Excess mortality 2024 - 2023	1.196	2.533	5.394	474	2.294	2.703	457	15.051	3.686	19.686	23.372
%	66%	73%	23%	17%	60%	40%	41%	35%	113%	219%	191%

Winter screening 2024-2025

- **Goal:**

- ✓ Estimate Seroprevalence of BTV-3 : herd, within-herd and individual level
- ✓ Prove Freedom of BTV-8 and BTV-12

- **Sampling:**

- ✓ Sample collection between 1st December and 31st January
- ✓ 30 cattle and 20 sheep per herd from 100 mixed herds (cattle + sheep): in total 5000 samples
 - Stratified by the number of herds/province
 - Age: cattle between 1 and 5 years, sheep between 6 months and 5 years
 - Not vaccinated against BTV-8 in the last 5 years

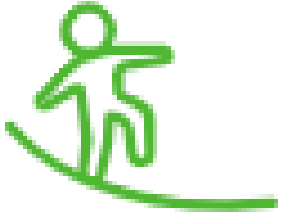
- **Testing:**

- ✓ IDVet BTV ELISA in regional labs on all serum samples
- ✓ BTV-8 and BTV-12 PCR at NRL on EDTA blood of ELISA positive animals (pooling per 10)



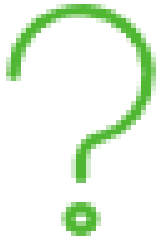
NB : *Mandatory vaccination for BTV (cattle and sheep) and EHDV (cattle) in 2025*

EHDV research updates



New challenge for the livestock industry in Europe

- Vaccine available only recently
- Trade restrictions



Limited knowledge on EHDV-8

- Before only detected in Australia (1982)
- Lack of knowledge on pathogenesis and induced immune response
- Limited number of challenge studies with EHDV-8



Standardization and validation of diagnostic assays

- Need for reference material

ARTICLE-AHEAD-OF-PRINT

Experimental infection of cattle, sheep, and goats with the newly emerged epizootic hemorrhagic disease virus serotype 8

Massimo Spedicato¹, Francesca Profeta¹, Sarah Thabet², Liana Teodori¹, Alessandra Leone¹, Ottavio Portanti¹, Maura Pesciella¹, Barbara Bonfini¹, Simone Pulsoni¹, Francesca Rosso¹, Emanuela Rossi¹, Paola Ripà¹, Angela De Rosa¹, Eugenia Ciarrocchi¹, Roberta Irelli¹, Antonio Cocco¹, Corinne Sailleau³, Nicola Ferri¹, Tiziana Di Febo¹, Damien Vitour³, Emmanuel Bréard³, Daniele Giansante¹, Soufien Sghaier⁴, Thameur Ben Hassine⁵, Stephan Zientara³, Romolo Salini¹, Salah Hammami², Giovanni Savini¹, and Alessio Lorusso^{1*}.



microorganisms



Review

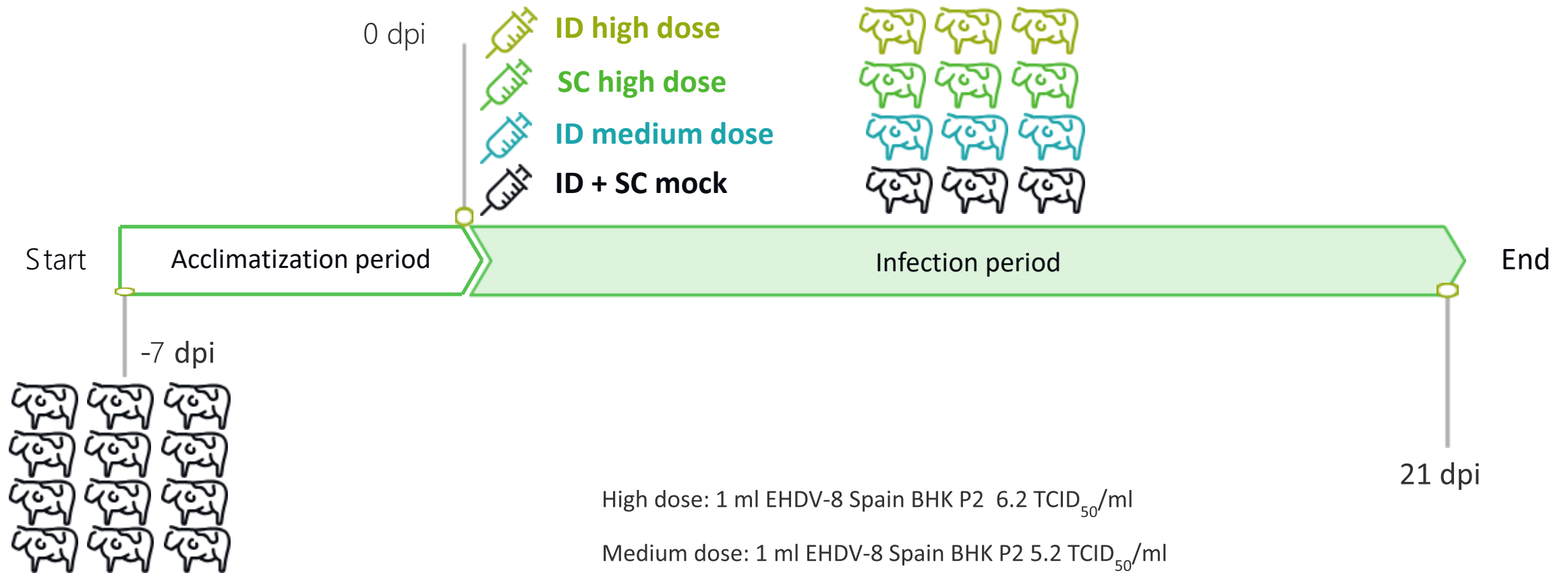
Epizootic Hemorrhagic Disease Virus: Current Knowledge and Emerging Perspectives

Luis Jiménez-Cabello , Sergio Utrilla-Trigo, Gema Lorenzo, Javier Ortego  and Eva Calvo-Pinilla 

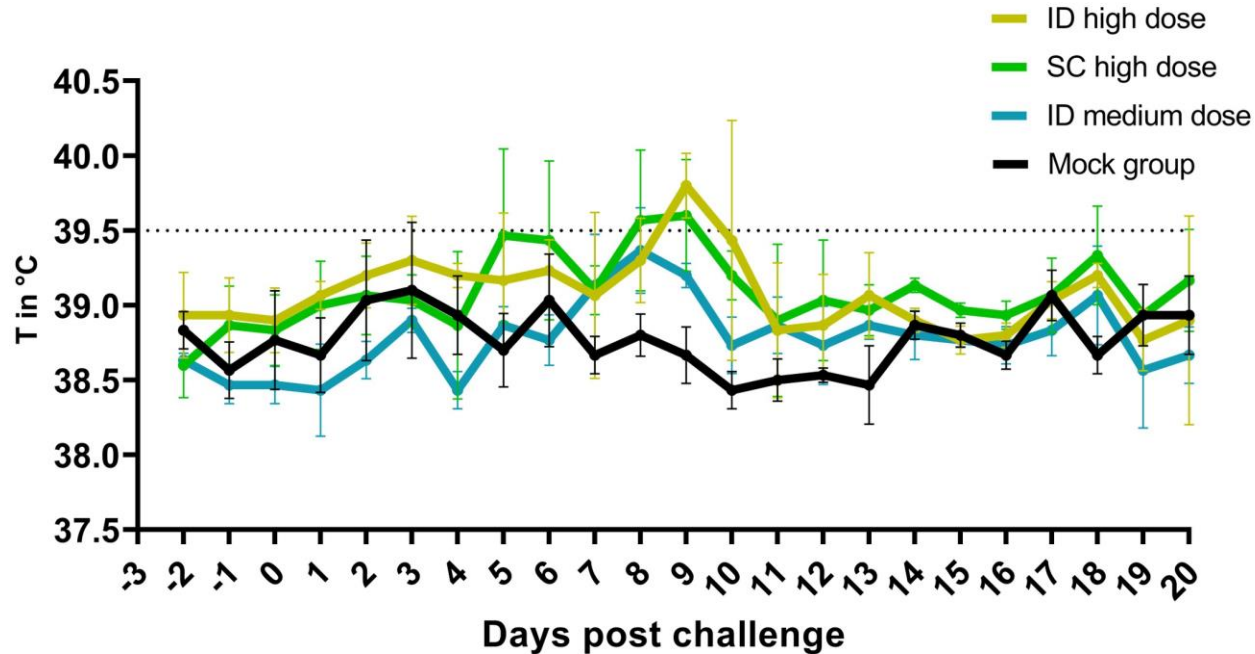


These gaps complicates the development of control policies, highlighting the need for more research

EHDV Experimental study (*Sciensano 2023*)



Results: clinical follow-up



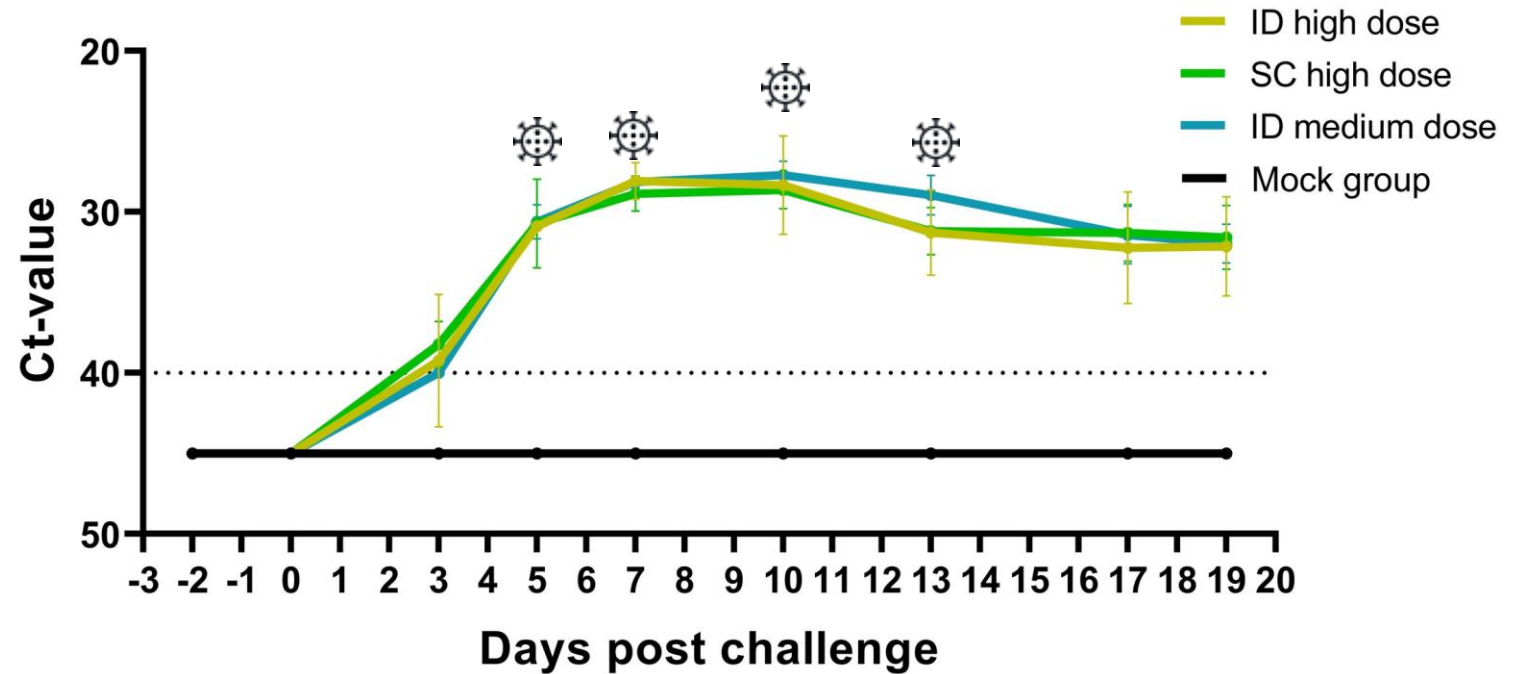
Other clinical signs:

- Elevated T° : all dose groups, but not in mock
- Fever: only high dose groups

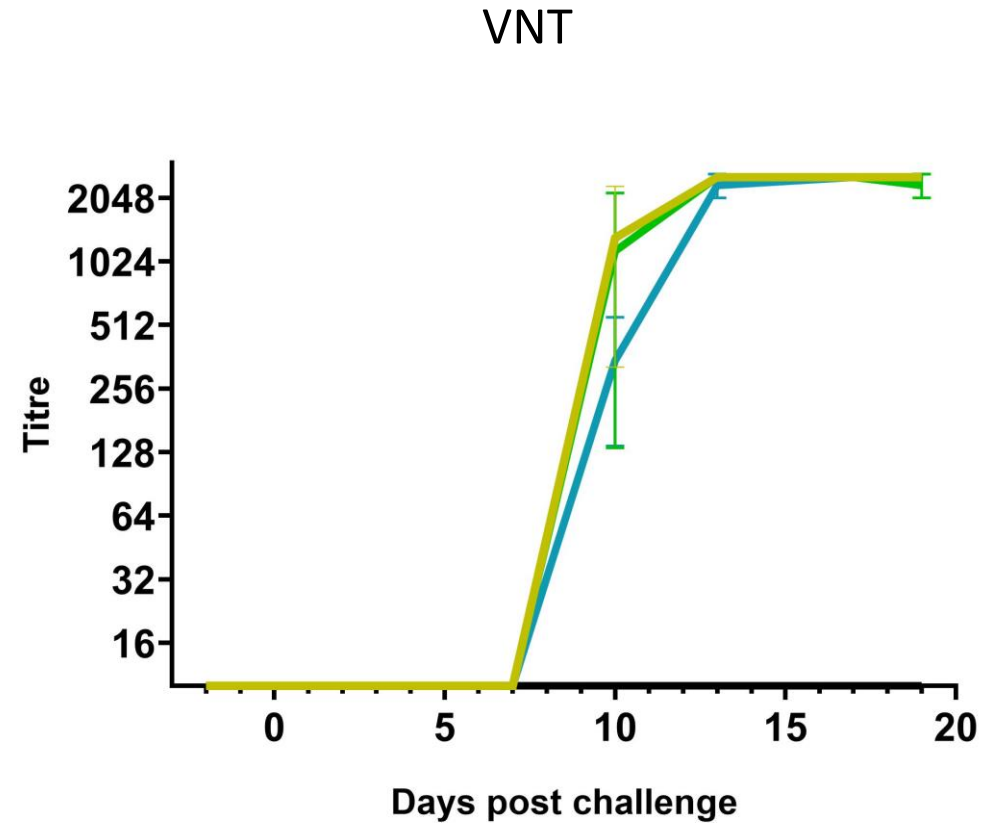
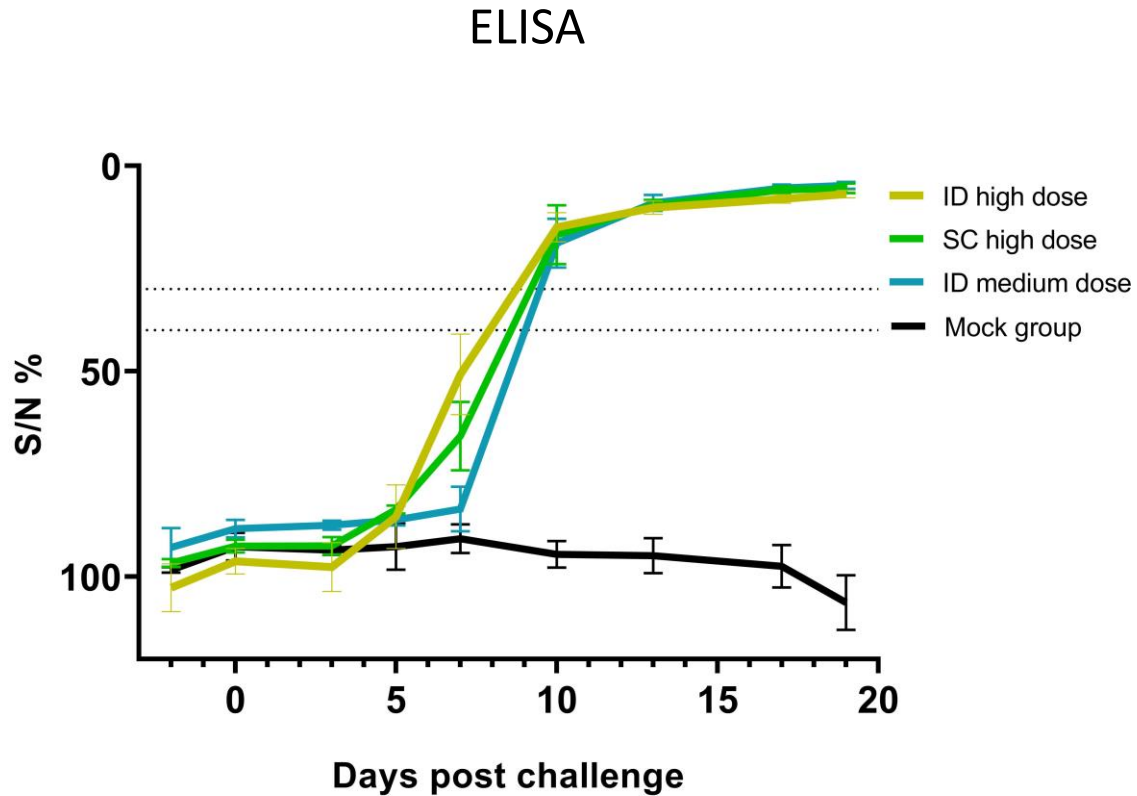
- None
- Except 1 animal in SC high dose group
 - Apathy (starting from 10 dpc)
 - Swollen lymph nodes (12 dpc)
 - Conjunctivitis (15-16 dpc)

Results: viremia

- Onset: 3 dpc in all infected groups
- Peak: 7 -10 dpc
- Challenged animals: 100% viremia
- At least detectable for 20 dpc
- No difference in viremia between different doses and inoculation route
- Virus isolated at 5, 7, 10 and 13 dpc (other time points ongoing)

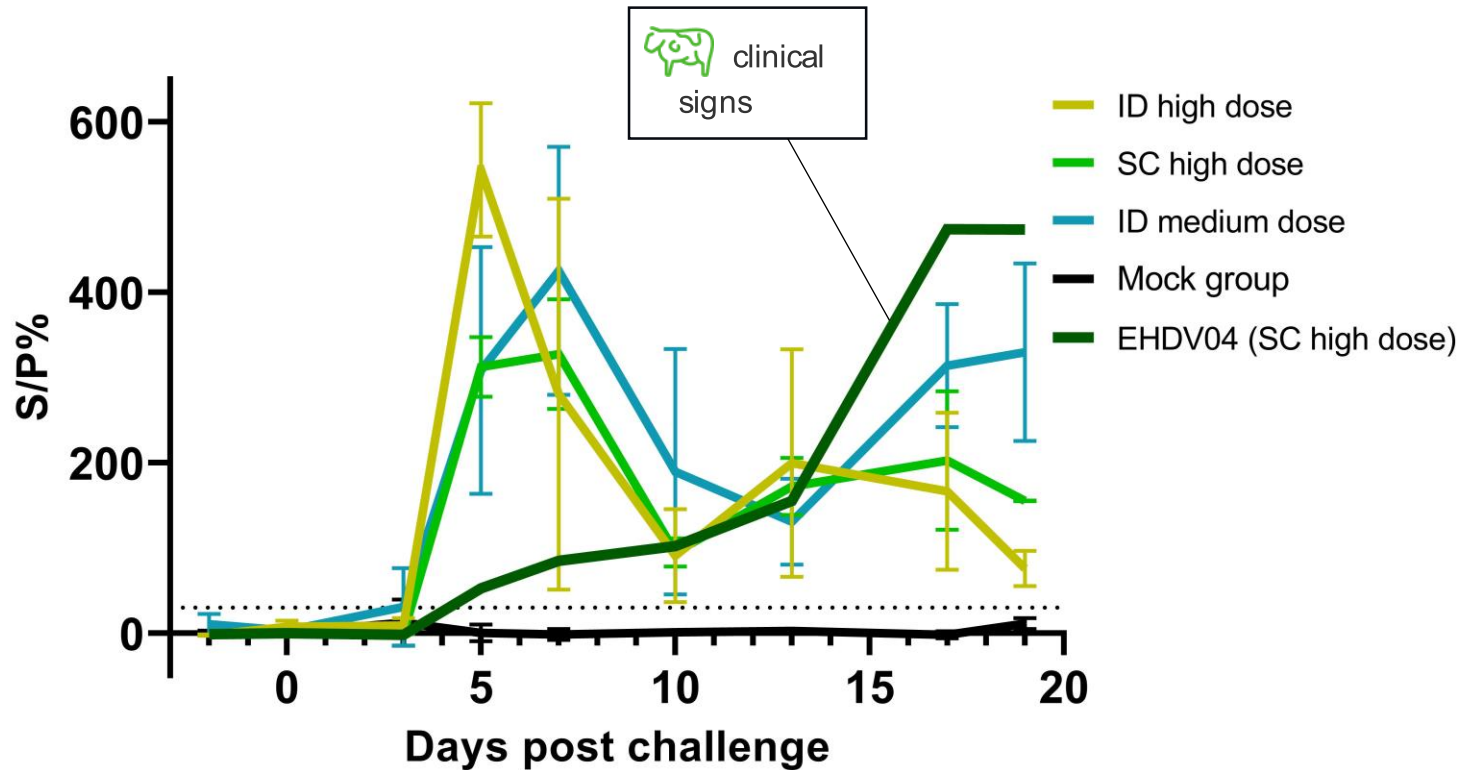


Results: humoral immune response



- 10 dpc: 100% seroconversion (ELISA **and** VNT) in challenged groups

Results: cellular immune response



- Medium to strong response in all groups
- Spike: 5 - 7 dpc, except for clinical animal → suppressed/ delayed cellular immune response?

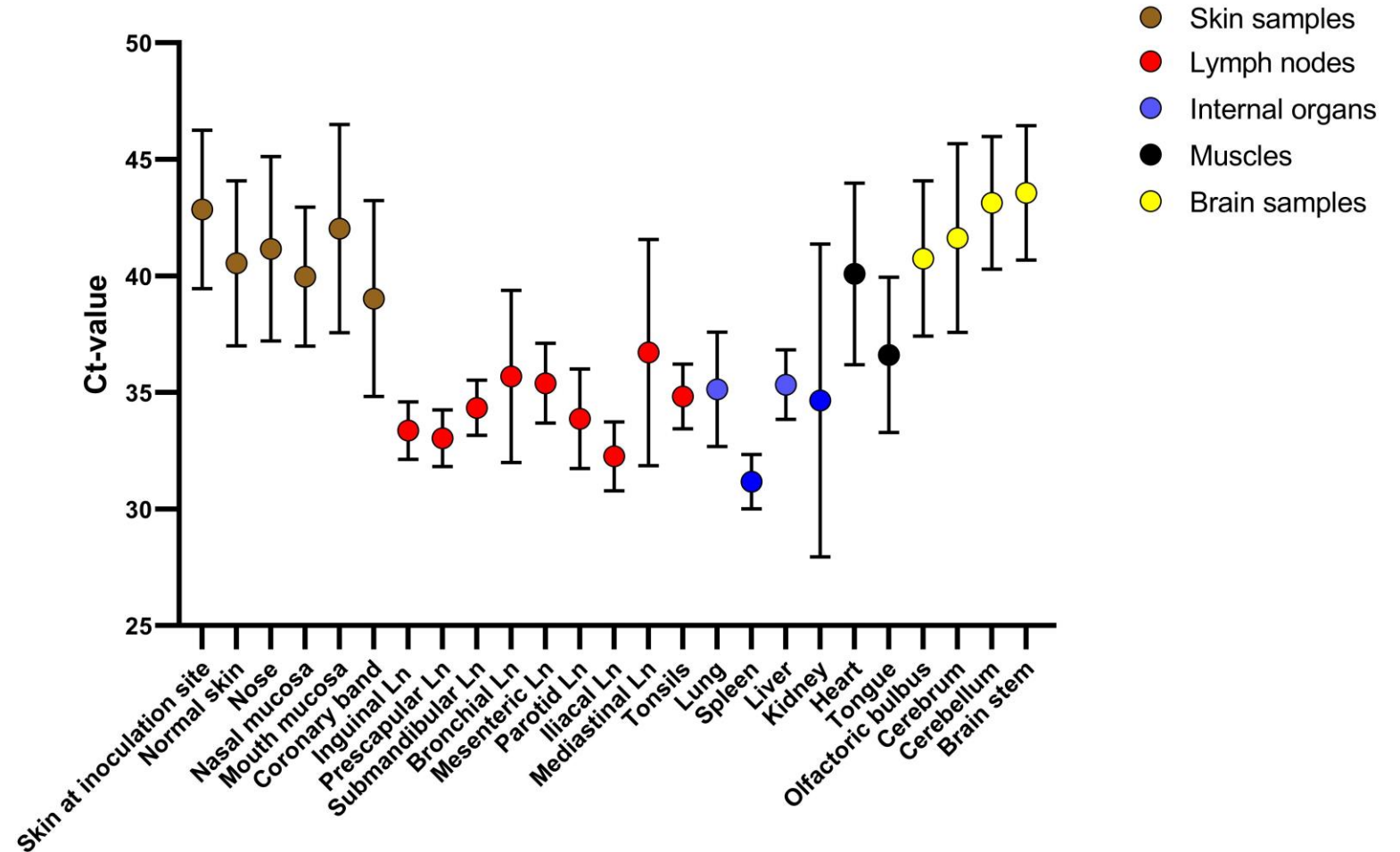
Results: Organ and tissue samples

Skin, brain and muscle samples are in general weaker than lymph nodes and internal organs



Samples of interest:

- Spleen
- Liver
- Kidney
- Prescapular Ln
- Submandibular Ln



Conclusion

- Viremia: early + 100% and remains stable up to 20 dpc
- Serology: 100 % seroconversion at 10 dpc
- Internal organs and lymph nodes: positive PCR results

Diagnostic relevance



- Skin and brain samples: weak positive PCR results

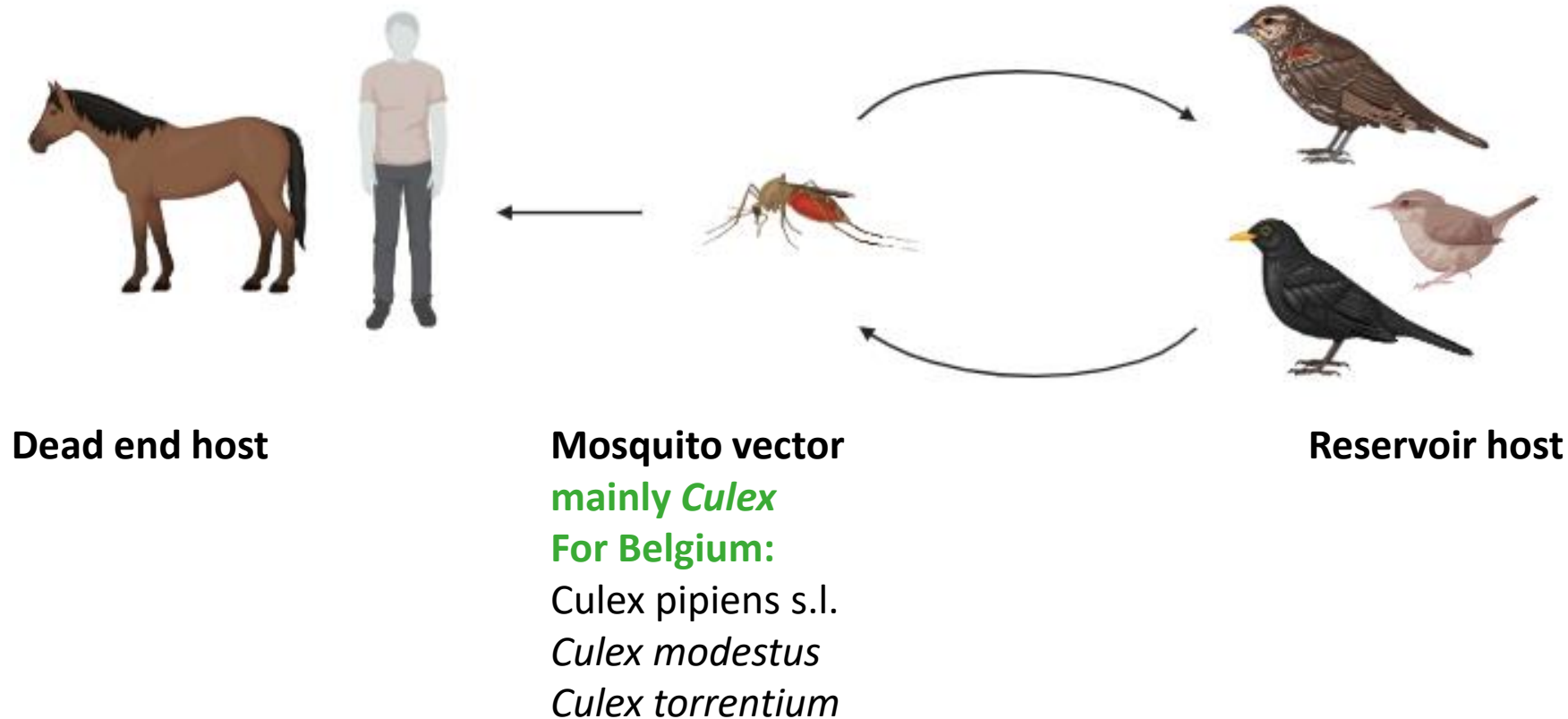
Diagnostic relevance



- Link between clinical disease and suppressed host cellular immune response?
- Limited impact of used challenge dose and route on pathogenesis and induced immune response

2) Mosquito-borne viruses - WNV & USUV

Flaviviridae



WNV

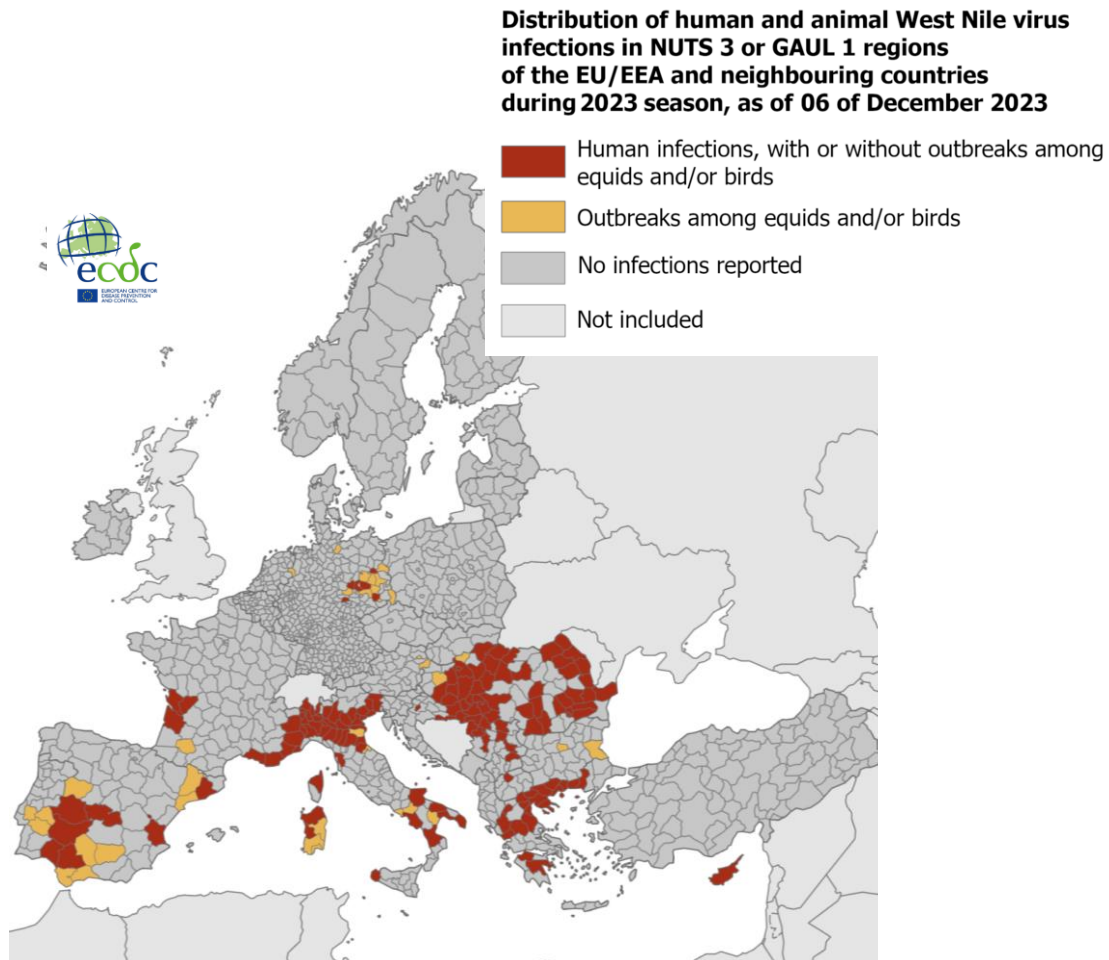
- **notifiable in Europe** (category E, AHL)
- **9 known genetic lineages**,
- Lin 1 & Lin 2 in Europe (humans)

USUV

- **not notifiable**
- **8 lineages** (Africa 1–3 and Europe 1–5)
- In Belgium Lin Eu1, Eu3 en Af3

Current situation WNV & USUV

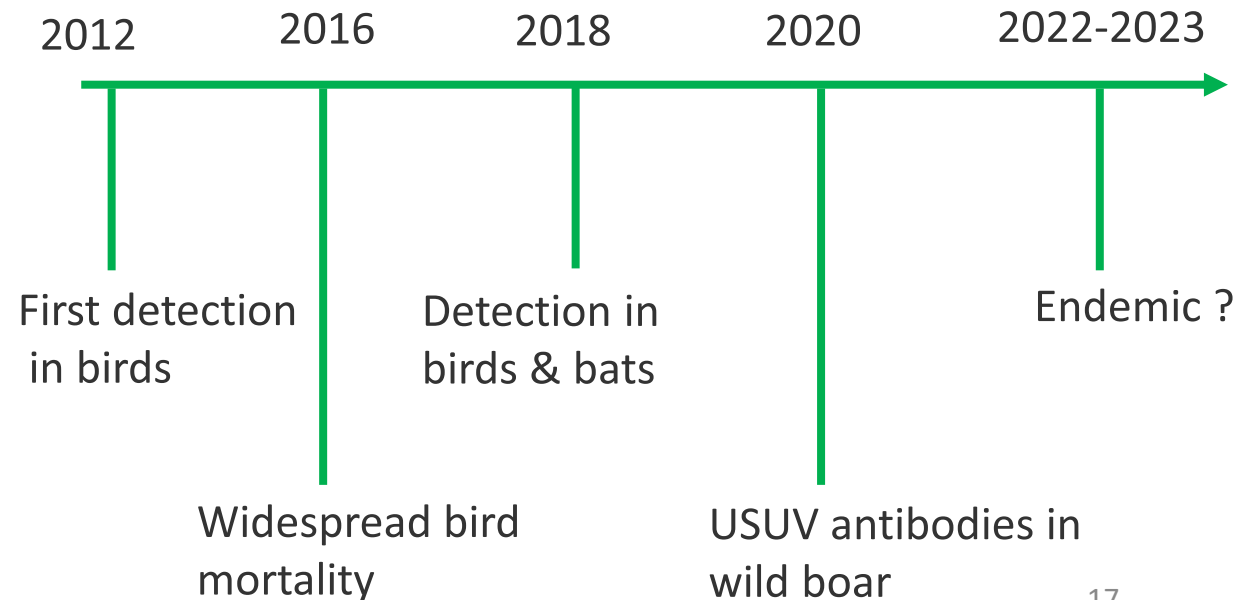
Geographic spread of WNV in 2023: No WNV in Belgium



Geographic spread of USUV in 2023:

15 EU/EEA countries reported USUV, including Belgium

Timeline USUV Belgium



Monitoring of WNV & USUV in birds => key reservoirs

Passive surveillance in birds

- Limited monitoring program in Flanders for WNV (USUV included) in dead birds
- Ongoing since 2016
- Swabs or organs of dead birds => rt PCR
2022: 11 samples
2023: 28 samples

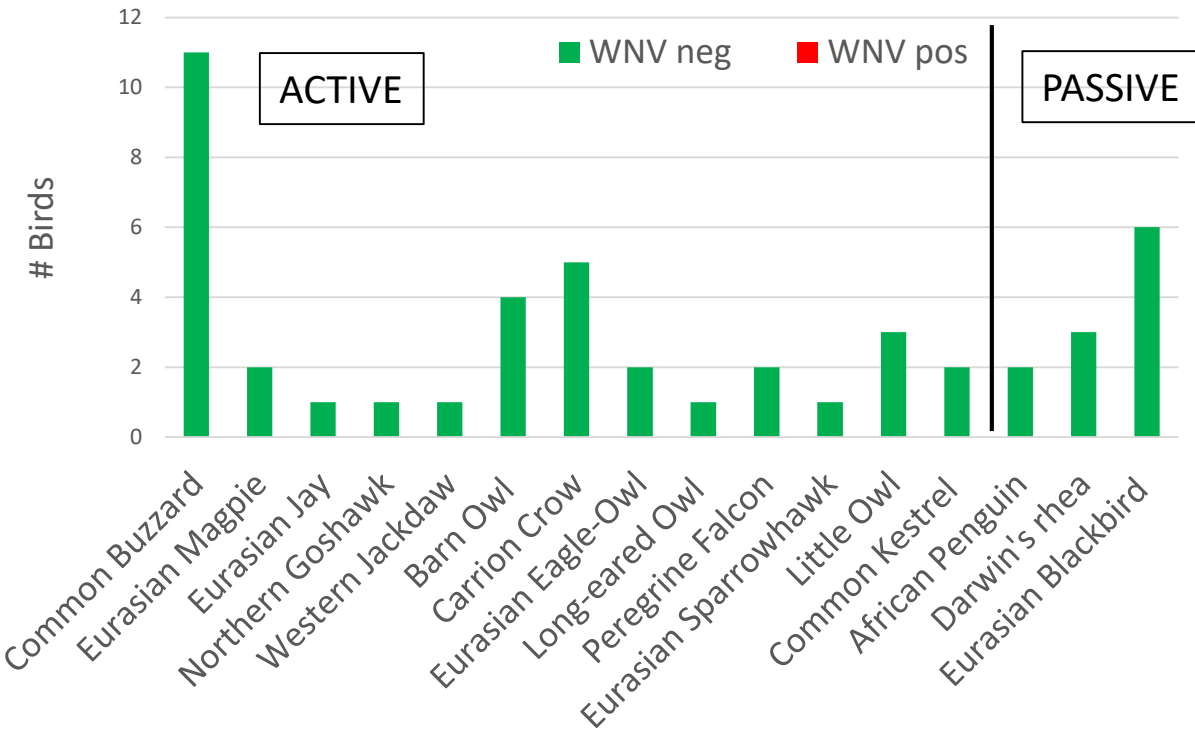


Active surveillance in birds

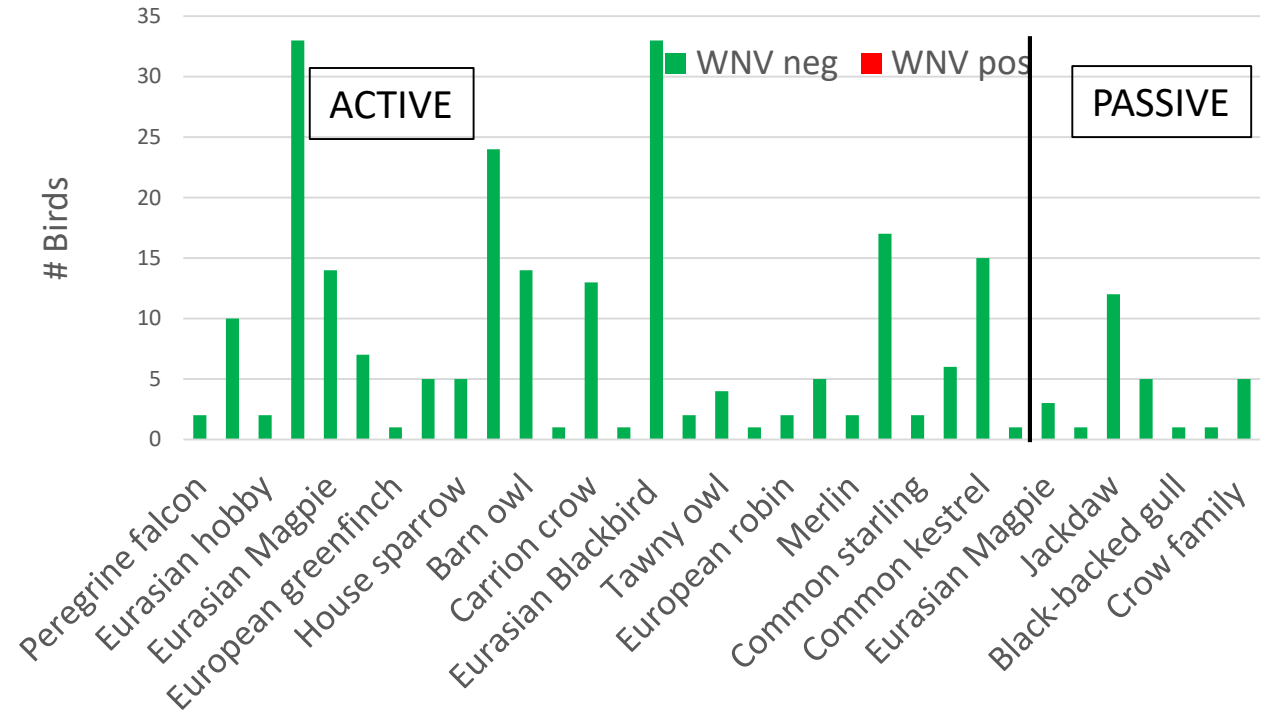
- Limited monitoring for WNV (USUV included) in birds submitted to bird rescue centers (in Flanders)
- New from 2022
- Only swabs => rt PCR
2022: 36 samples from 1 bird rescue center, only Corvids & raptors
2023: 222 samples from 2 bird rescue centers, Corvids, raptors & songbirds

Results of WNV monitoring 2022 & 2023

WNV monitoring 2022

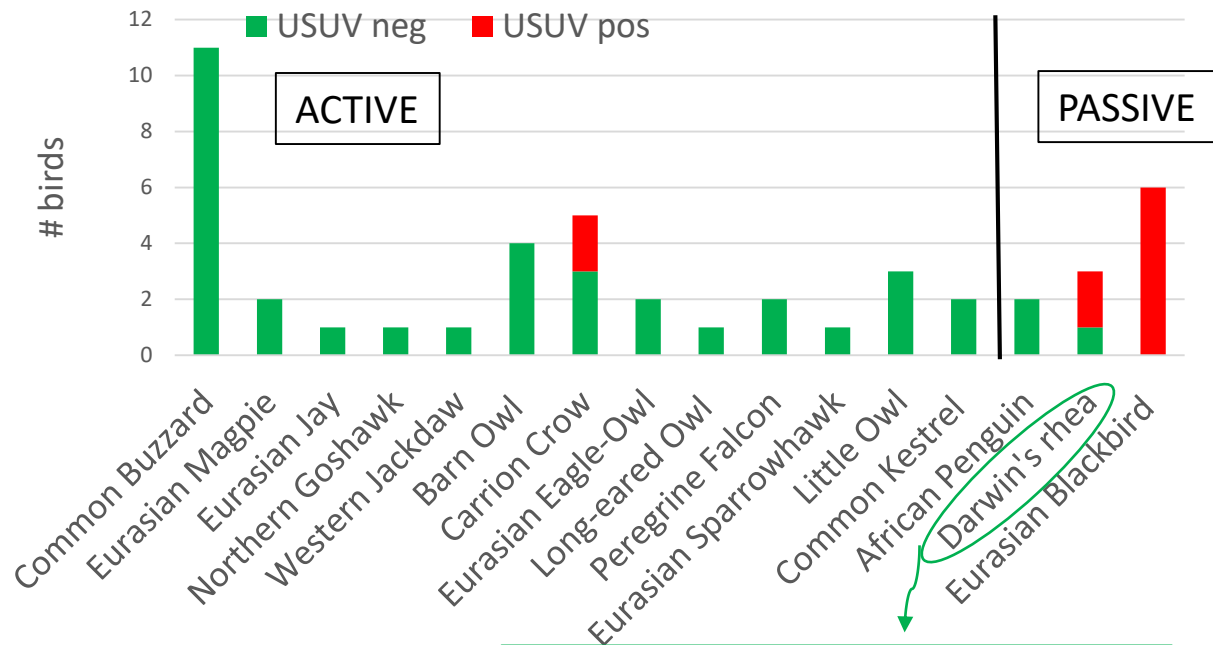


WNV monitoring 2023



Results of USUV monitoring 2022 & 2023

USUV monitoring 2022



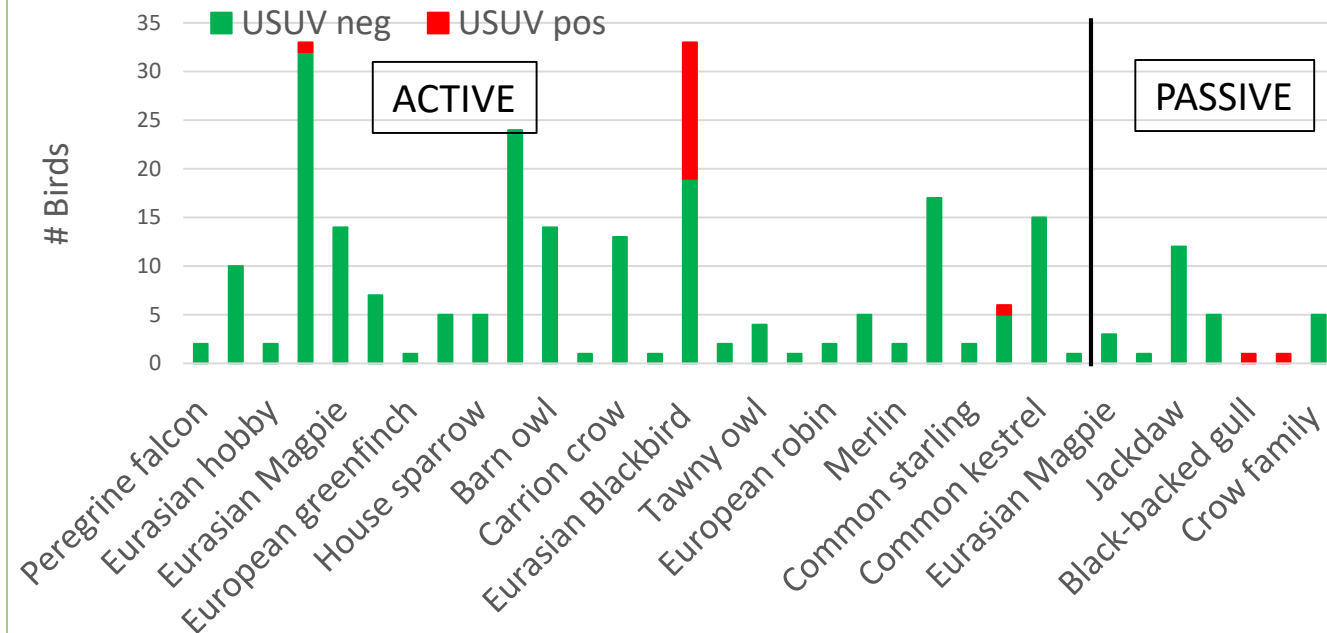
Lineage Africa 3 strain isolated

ACTIVE: 2/36 (5,5 %) => 2 crows

PASSIVE: 8/11 (72,2 %) => 6 blackbirds, 2 darwin's rhea



USUV monitoring 2023



ACTIVE: 16/222 (7,2 %) => 14 blackbirds, 1 buzzard, 1 little owl

PASSIVE: 2/28 (7,1 %) => 1 blackbird & 1 black-backed Gull



Conclusions of monitoring 2022 & 2023

- **no WNV detected yet in Belgium**

- a real absence or a consequence of underdiagnosis due to limited monitoring?

No new detections since 2020 in the Netherlands (only 1 season)

No detections in North of France

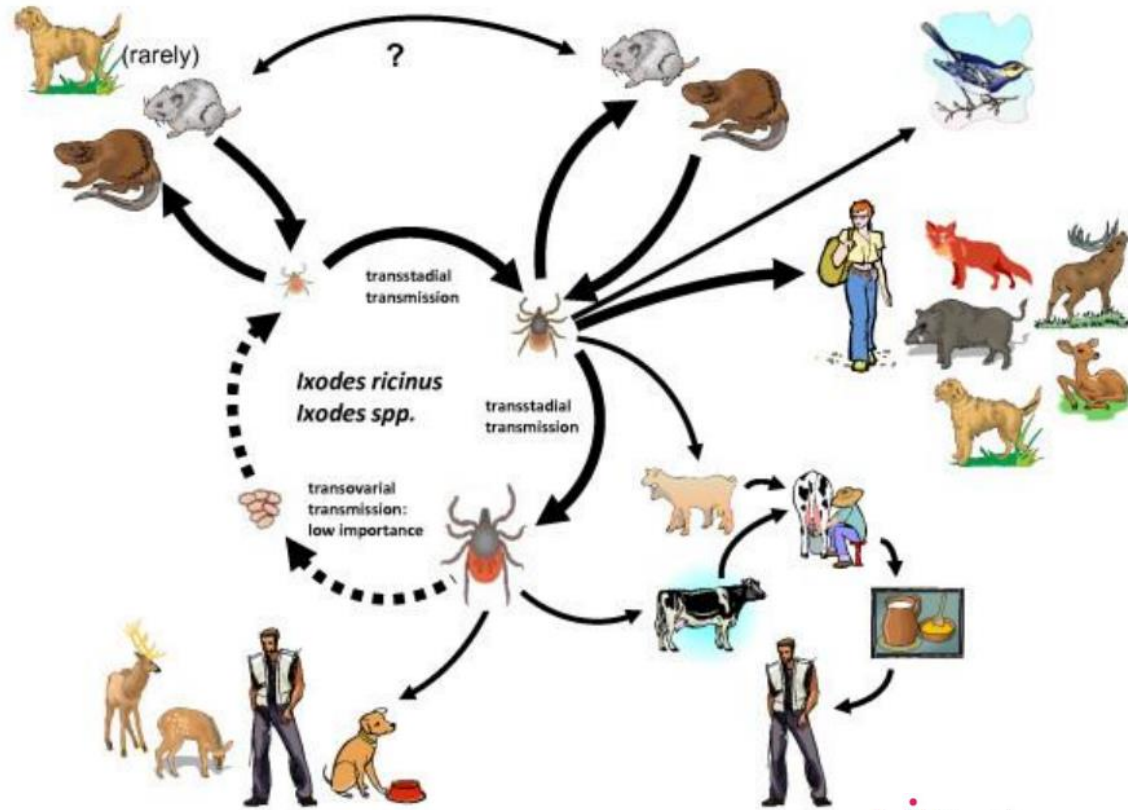
- **USUV detected in both years**

- geographic spread across the surveyed area
- Among the USUV-positive birds, 75 % were Eurasian Blackbird
- Africa 3 lineage was isolated (was also detected in 2017)



3) Tick-borne Encephalitis virus (TBEV)

Flaviviridae



Pfeffer, Parasites and Vectors 2011

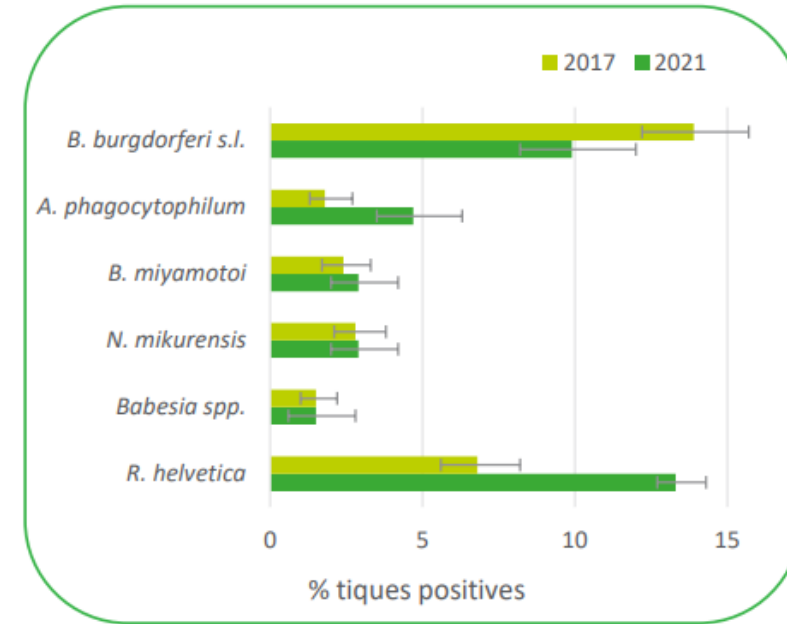
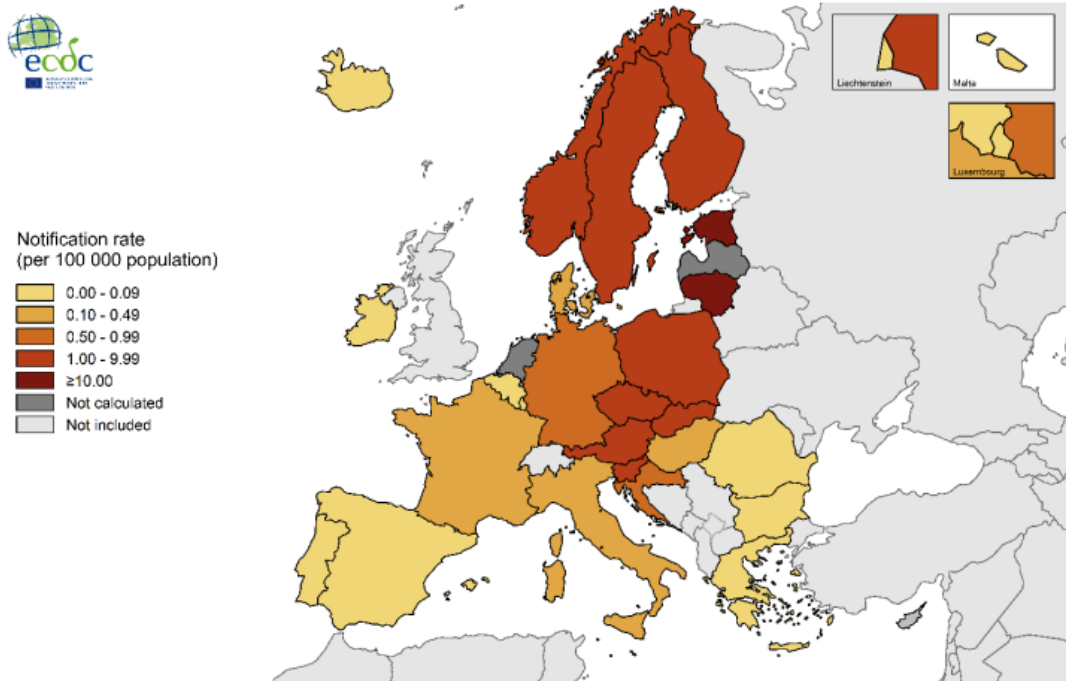
Santé
publique
France
Alexandra Mailles,

Current situation TBE in humans

Geographic spread of TBE in 2022 (humans):

Low incidence rate in Belgium (2017-2022 : 2-7 cases/year) .

e 1. Confirmed tick-borne encephalitis cases per 100 000 population by country, EU/EEA, 2022



Pourcentage de tiques infectées (et IC à 95 %) par agent pathogène en 2017 et 2021, Belgique

Sciensano study 2021 : Geebelen et al.

- 1000 ticks collected on humans (99% *Ixodes ricinus*)
- 0% infected with TBEV ; 10% with *Borrelia b.* (Lyme disease)

Monitoring of TBEV antibodies in animals

Prevalence study 2021

- 480 **sheep sera** (all Belgian provinces)
 - 831 hunted **wild boars** (Flanders)
- Tested by ELISA and Plaque Reduction Neutralization Test (PRNT)
- 1983 **ticks** collected
- Tested by rt-PCR for TBEV : 100% negative



Article

Tick-Borne Encephalitis Virus Prevalence in Sheep, Wild Boar and Ticks in Belgium

Nadjah Radia Adjadj ^{1,*}, Muriel Vervaeke ², Charlotte Sohier ¹, Mickaël Cargnel ³  and Nick De Regge ¹

- ✓ TBEV seroprevalence in sheep : 0.42% (2/480, CI 95%: 0.11–1.51).
- ✓ TBEV seroprevalence in wild boar : 9.27%

Table 2. The prevalence of tick-borne encephalitis virus prevalence per province in wild boar.

Province	Sampled	TBEV-PRNT Positive	Prevalence (%)
Antwerp	325	28	8.62 (CI 95%: 6.03–12.17)
Limburg	439	34	7.74 (CI 95%: 5.59–10.63)
Flemish Brabant	67	15	22.39 (CI 95%: 14.06–33.71)
Flanders	831	77	9.27 (CI 95%: 7.48–11.43)

Thanks for your attention !



Thanks to

Sciensano :

- Service Maladies exotiques et vectorielles
- Centre Experimental de Machelen
- Service Virologie et immunologie aviaire

Other :

- Agency for Nature and Forest (ANB), Flanders
- Bird Rescue centers Brasschaat-Kapellen and Opglabbeek
- EU Reference Laboratory for Bluetongue: Central Veterinary Laboratory (LCV), Spain

