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WOAH Reference Laboratory for **Lumpy skin disease**

Reference Centre World Organisation for Animal Health Founded as OIE

EU Reference Laboratory for Capripox viruses

Funded by the European Union

Food and Agriculture Organization of the United Nations

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EURL FOR CAPRIPOX VIRUSES

-

LATEST ACTIVITIES ON LUMPY SKIN DISEASE AND UPDATE ON DIAGNOSIS

Nick De Regge

Online meeting – GF-TAD SGE LSD Europe

21 February 2024

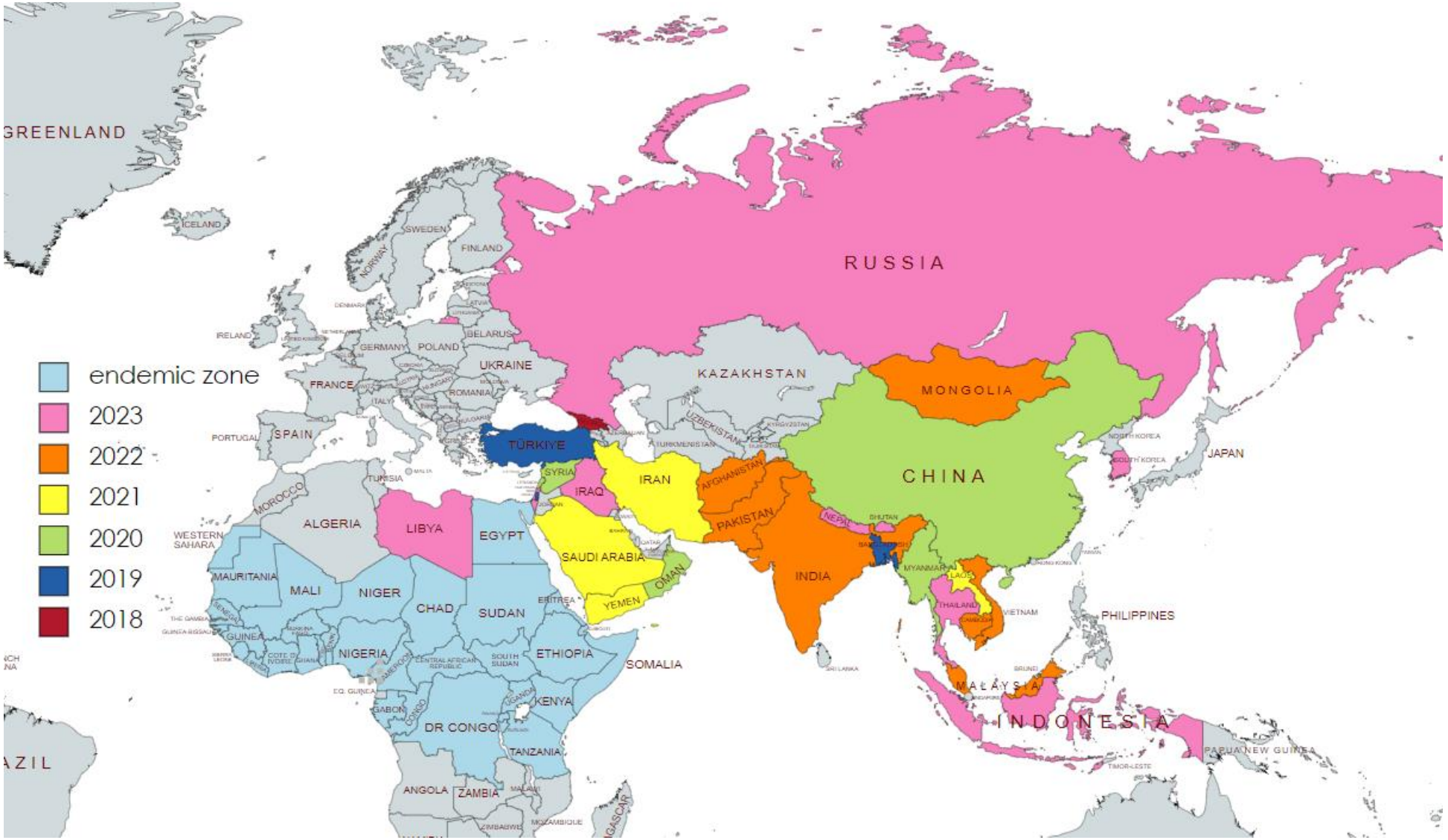
.be

Outline

- **Current epidemiological situation LSDV**
- **LSDV diagnosis: serology**
- **LSDV diagnosis: virology**
- **LSDV vaccines: protection against recombinant strain**
- **LSDV transmission: non-vector transmission of the recombinant strain**
- **Training and support**

Most recent reported LSDV outbreaks (2018 – 12/2023)

Data extracted from WOAH-WAHIS database



Lumpy skin disease virus: phylogeny

viruses

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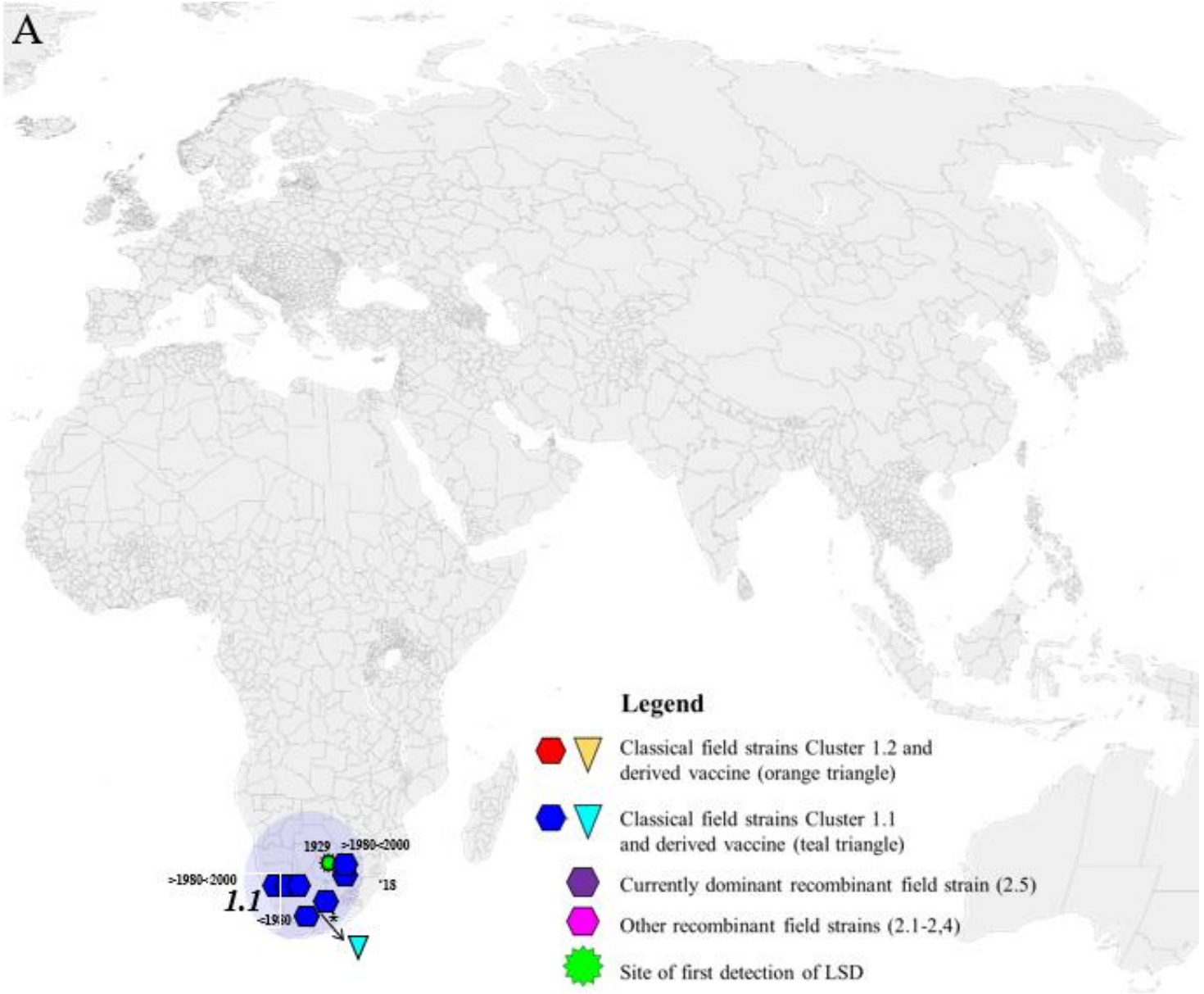
Article

Lumpy Skin Disease Virus Genome Sequence Analysis: Putative Spatio-Temporal Epidemiology, Single Gene versus Whole Genome Phylogeny and Genomic Evolution

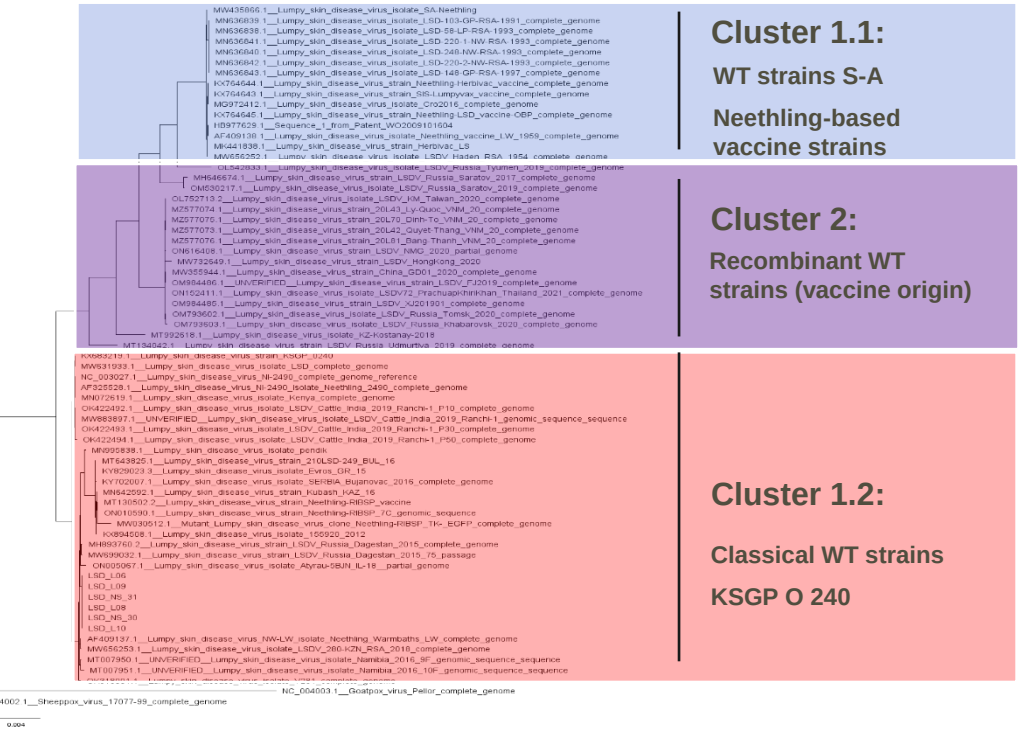
Floris C. Breman *, Andy Haegeman, Nina Krešić, Wannes Philips and Nick De Regge

Origin: badly produced LSDV vaccine containing neethling strain, KSGP strain, and recombinants between both

Lumpy skin disease virus spread



Lumpy skin disease virus spread



Cluster 1.1:

WT strains S-A

Neethling-based vaccine strains

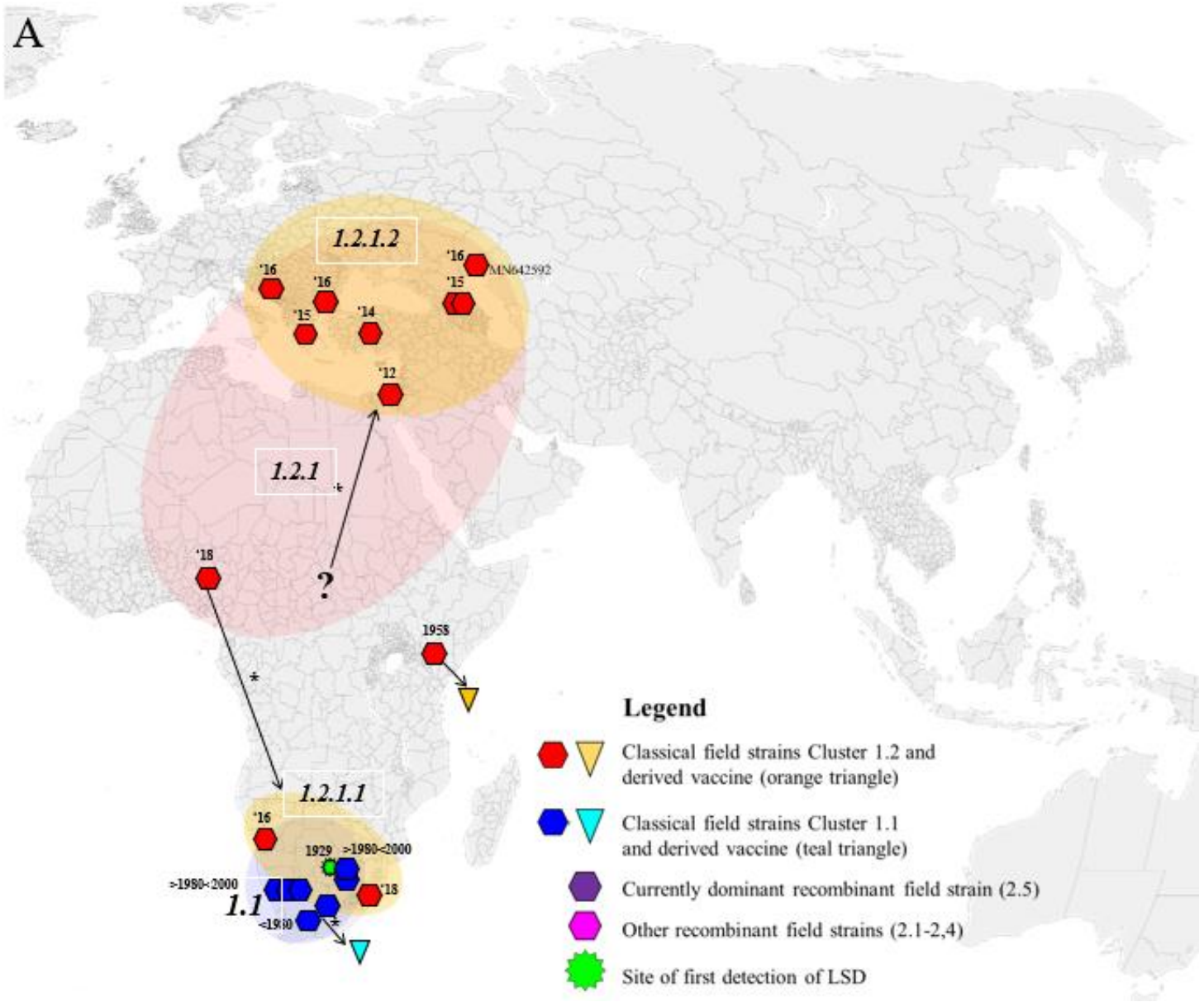
Cluster 2:

Recombinant WT strains (vaccine origin)

Cluster 1.2:

Classical WT strains

KSGP O 240



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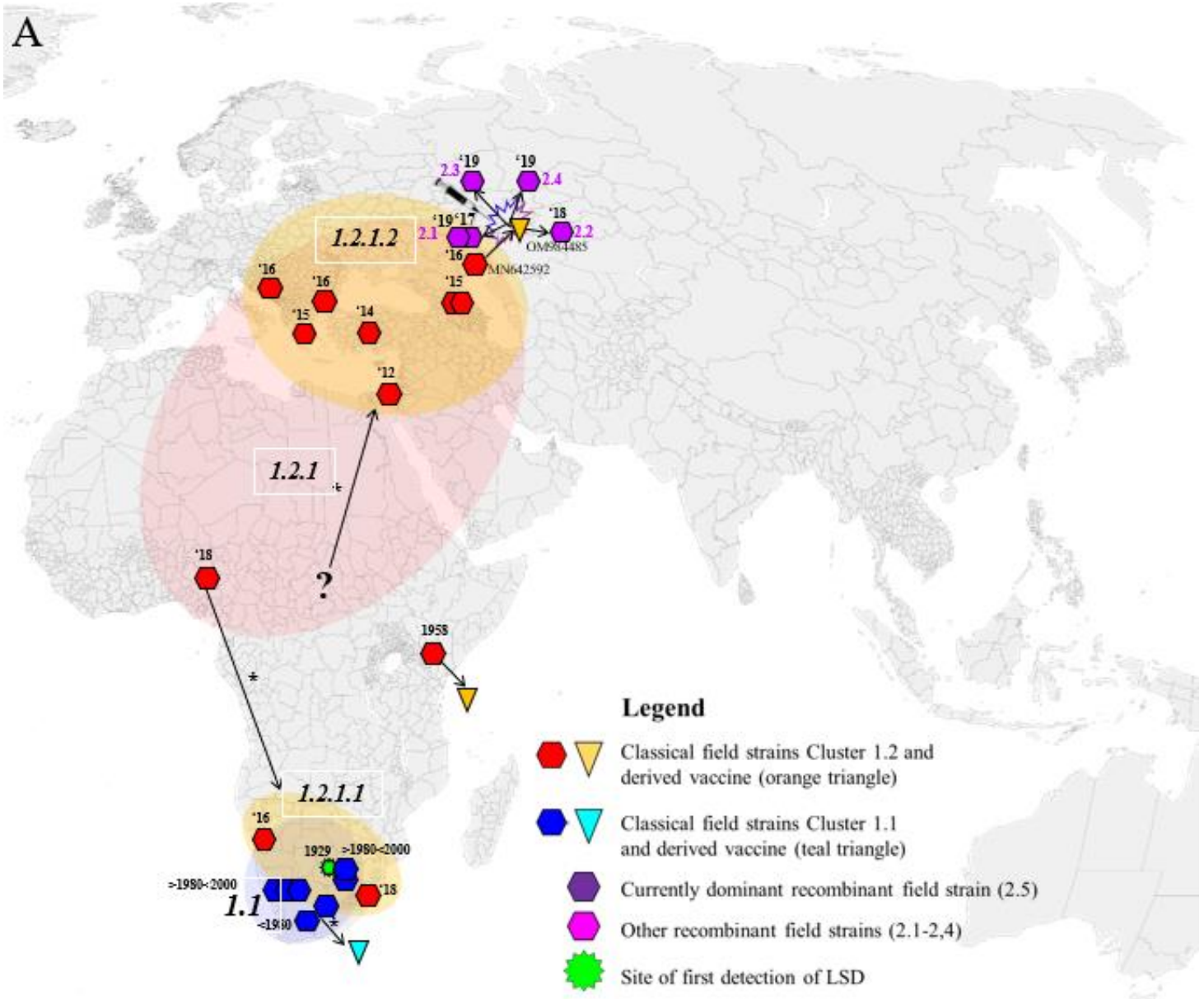

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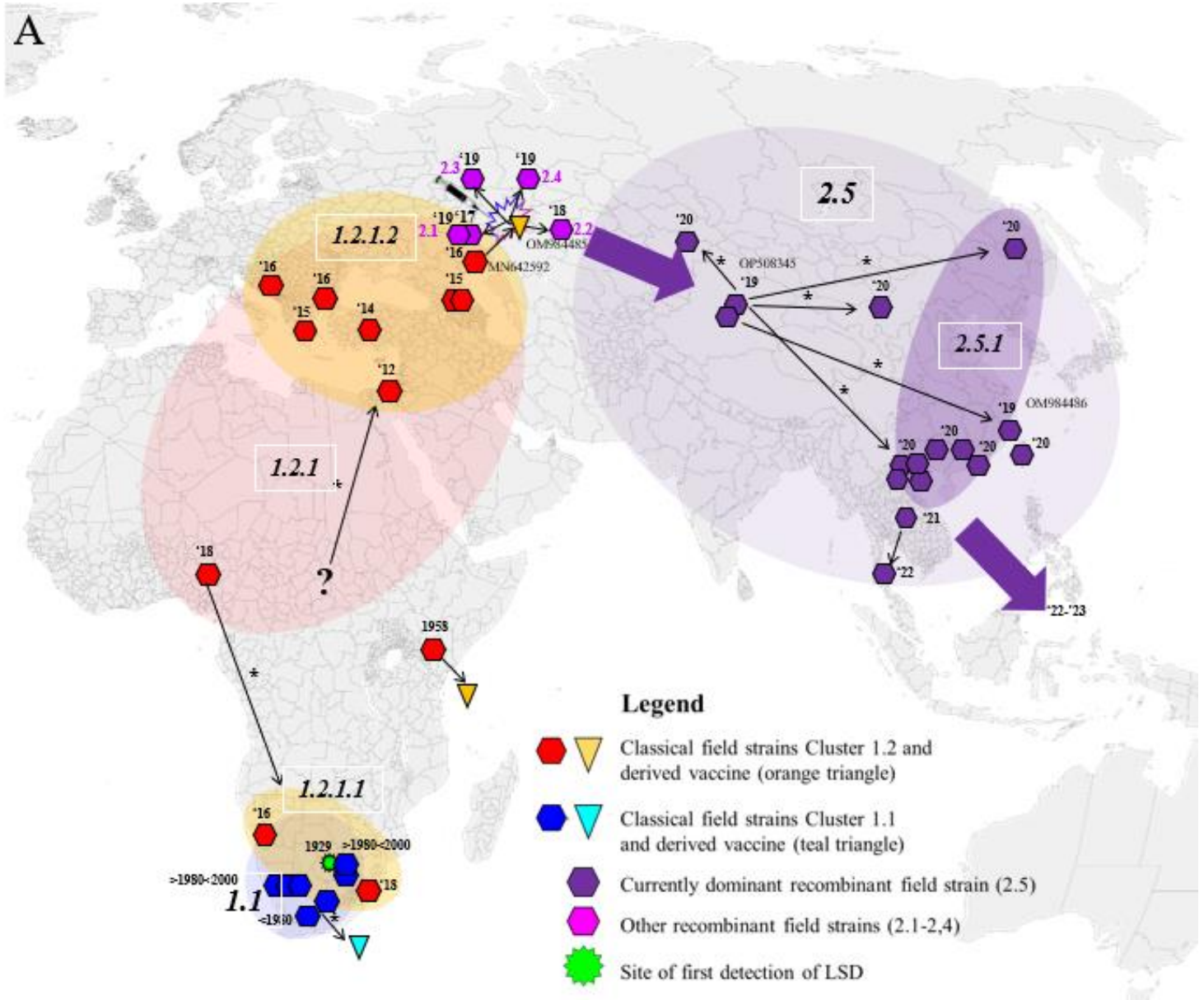

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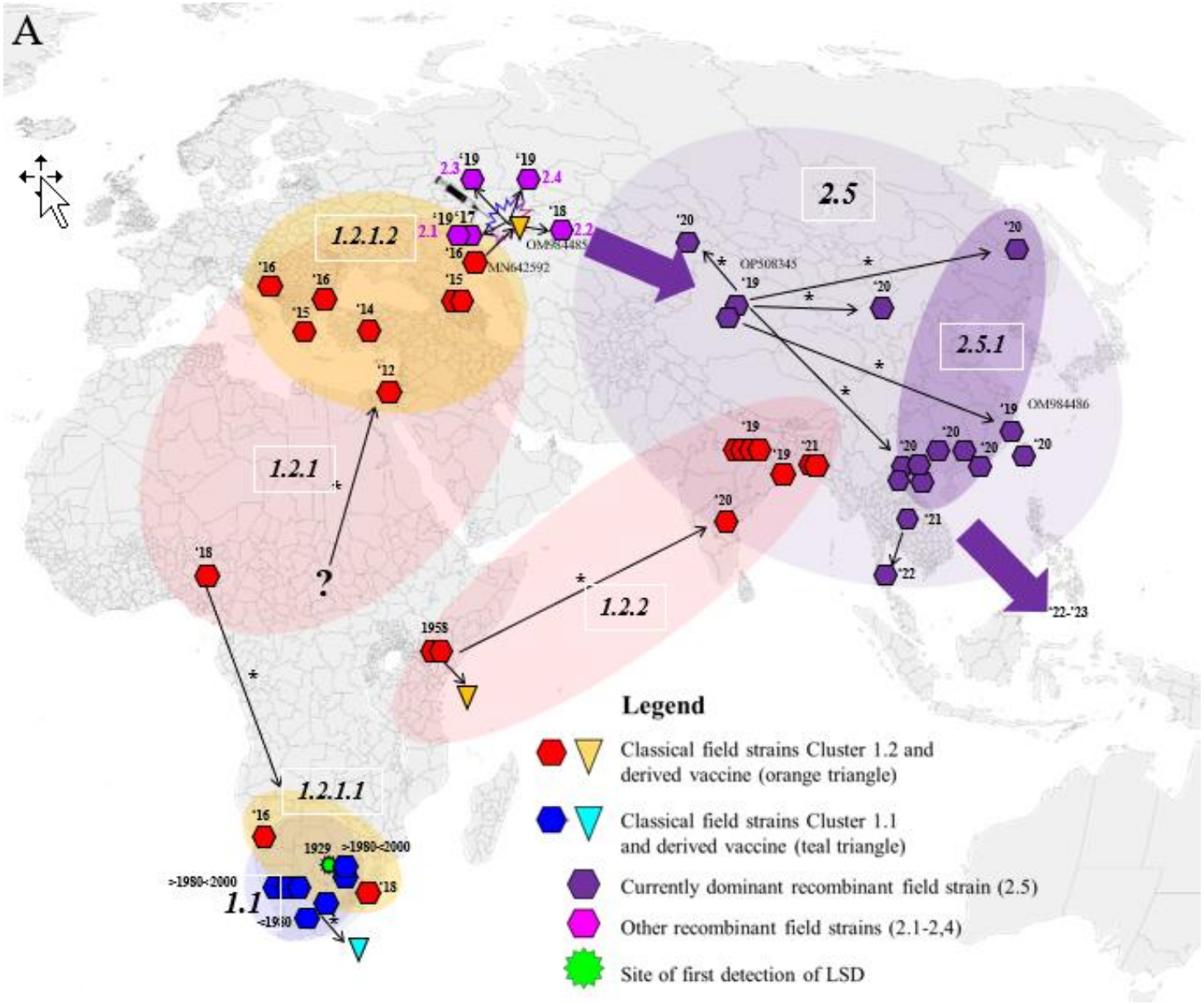
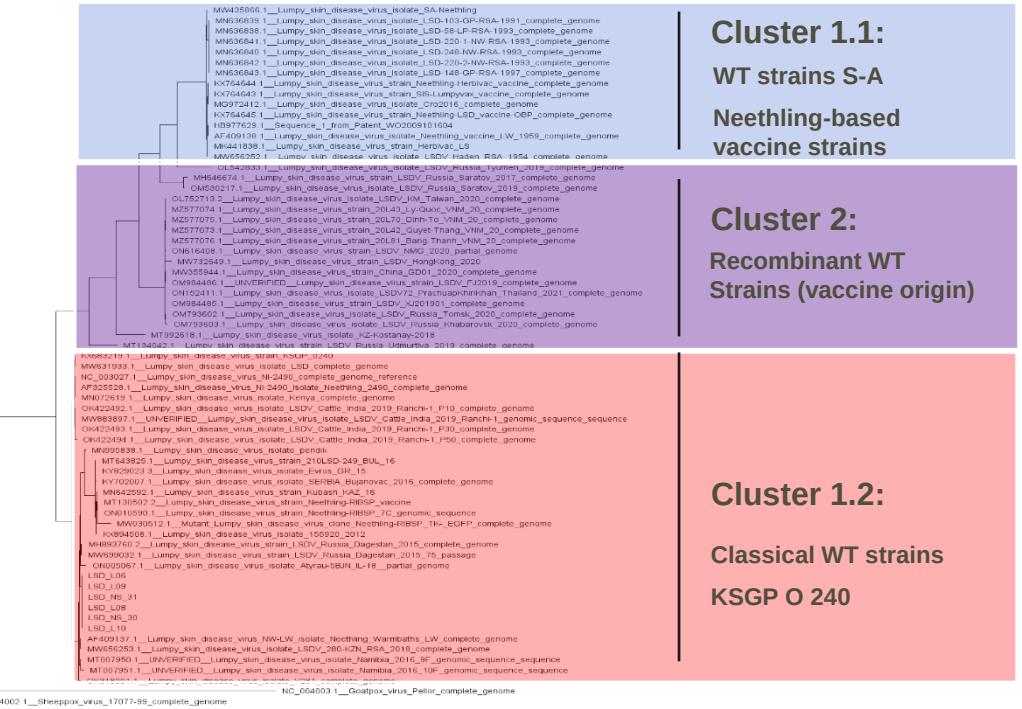
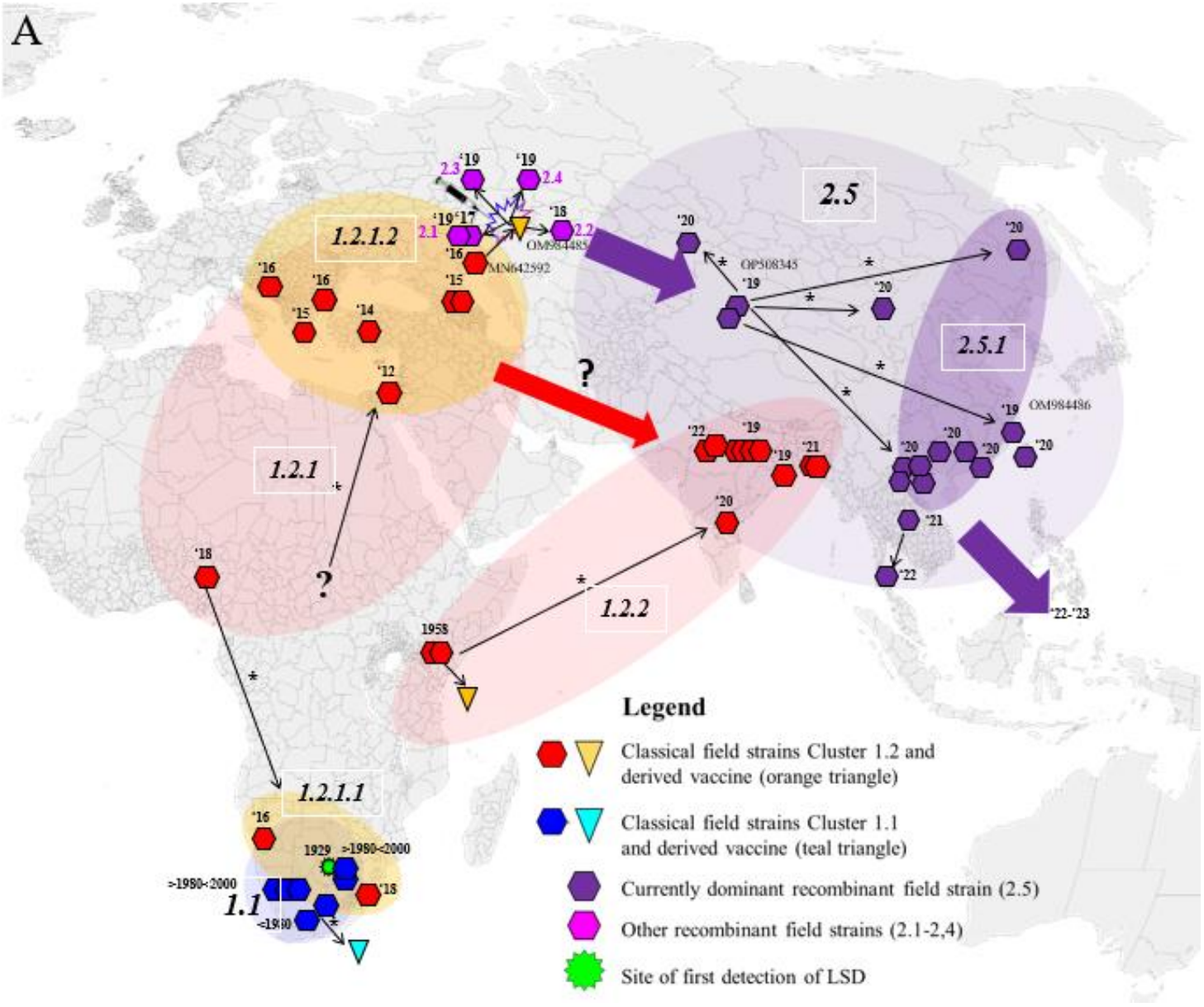


Lumpy skin disease virus spread





viruses
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Article

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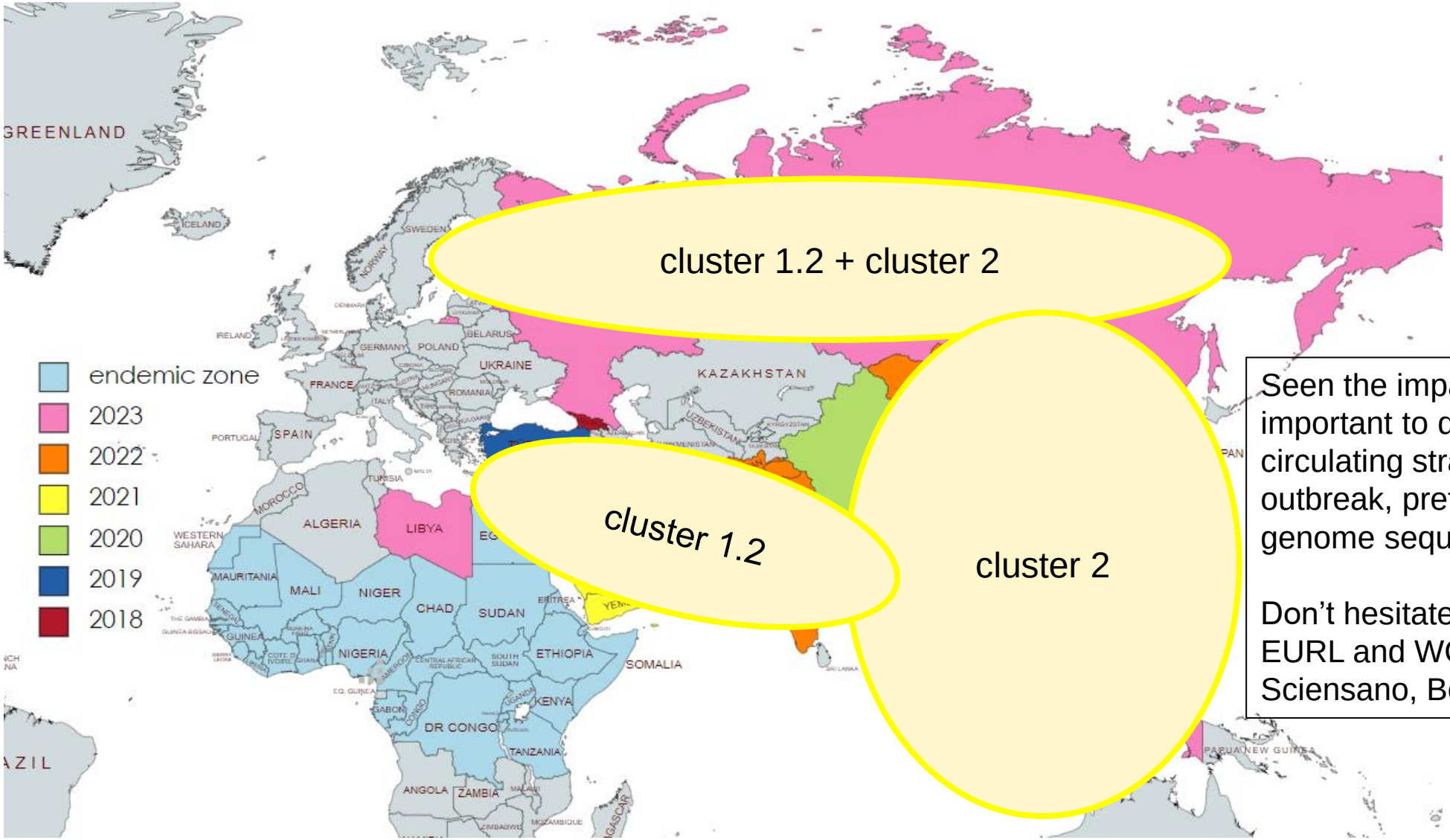
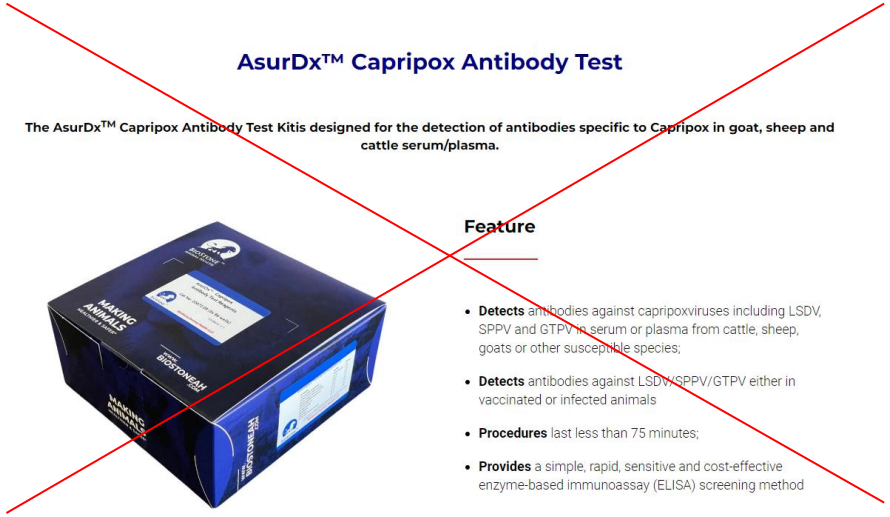


LSDV diagnosis - serology

- **VNT – IPMA – commercial ELISA (ID-Vet)**
- **Unsatisfactory ELISA:**



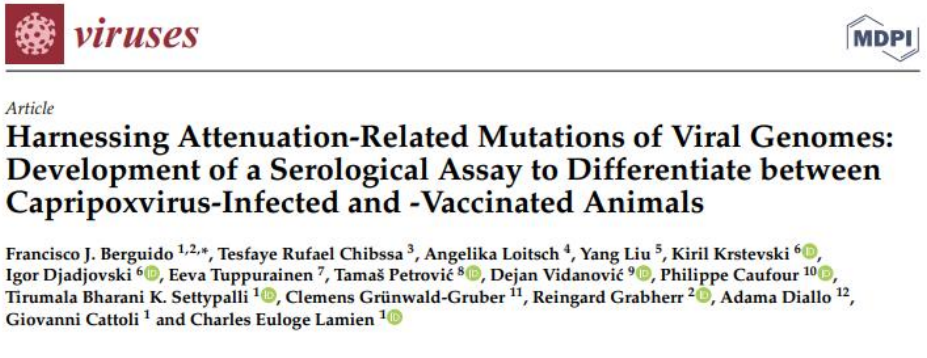
AsurDx™ Capripox Antibody Test

The AsurDx™ Capripox Antibody Test Kitis designed for the detection of antibodies specific to Capripox in goat, sheep and cattle serum/plasma.

Feature

- **Detects** antibodies against capripoxviruses including LSDV, SPPV and GTPV in serum or plasma from cattle, sheep, goats or other susceptible species;
- **Detects** antibodies against LSDV/SPPV/GTPV either in vaccinated or infected animals
- **Procedures** last less than 75 minutes;
- **Provides** a simple, rapid, sensitive and cost-effective enzyme-based immunoassay (ELISA) screening method

- **Experimental DIVA ELISA:**



viruses MDPI

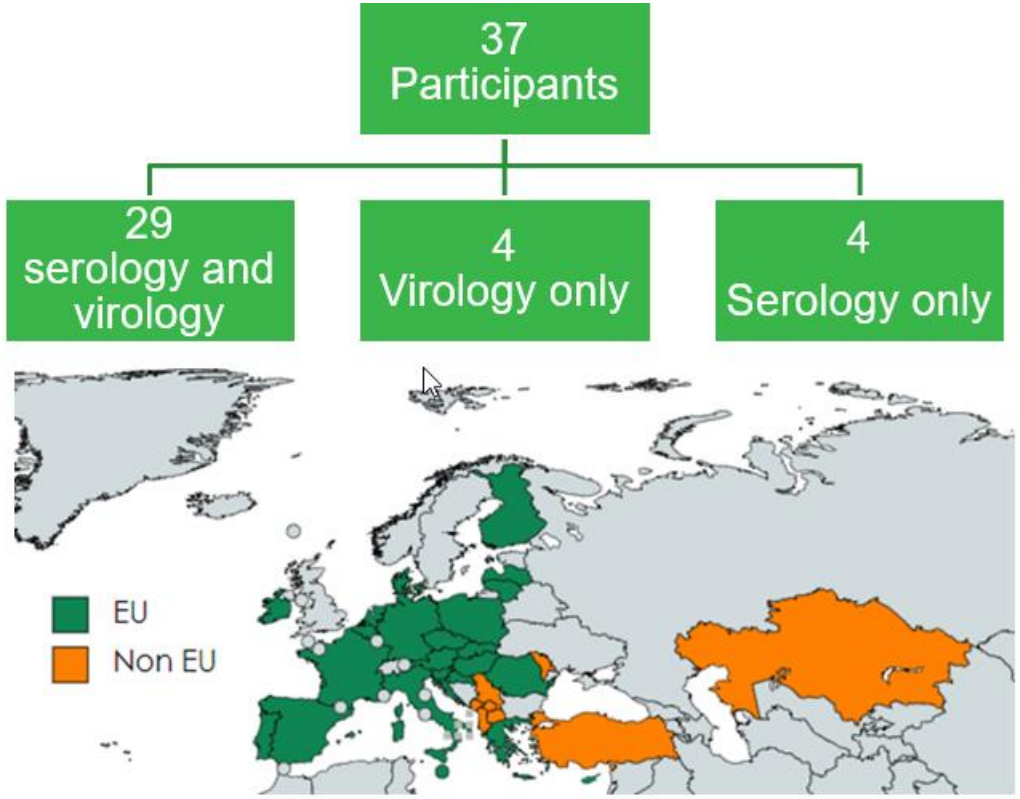
Article

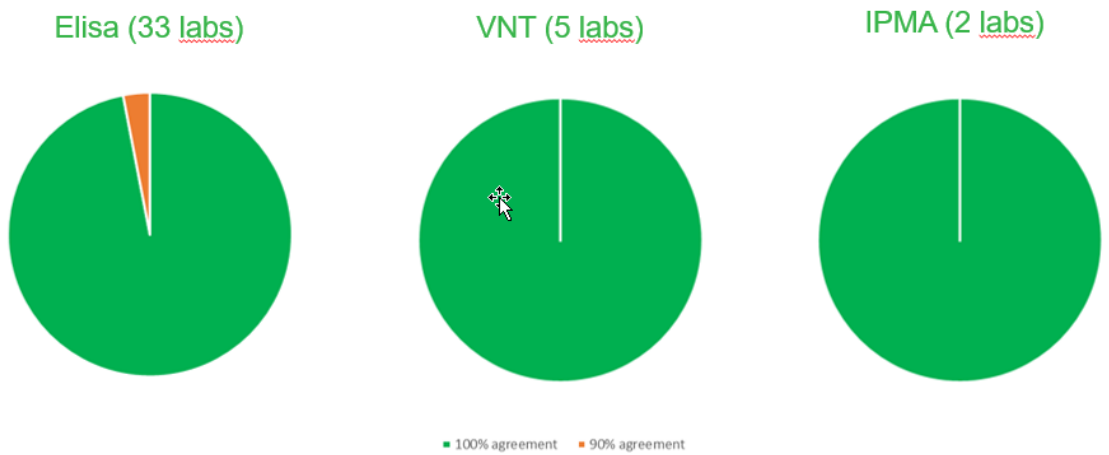
Harnessing Attenuation-Related Mutations of Viral Genomes: Development of a Serological Assay to Differentiate between Capripoxvirus-Infected and -Vaccinated Animals

Francisco J. Berguido [1,2,*], Tesfaye Rufael Chibssa [3], Angelika Loitsch [4], Yang Liu [5], Kiril Krstevski [6], Igor Djadjovski [6], Eeva Tuppurainen [7], Tamaš Petrović [8], Dejan Vidanović [9], Philippe Caufour [10], Tirumala Bharani K. Settypalli [1], Clemens Grünwald-Gruber [11], Reingard Grabherr [2], Adama Diallo [12], Giovanni Cattoli [1] and Charles Euloge Lamien [1]

LSDV diagnosis - serology

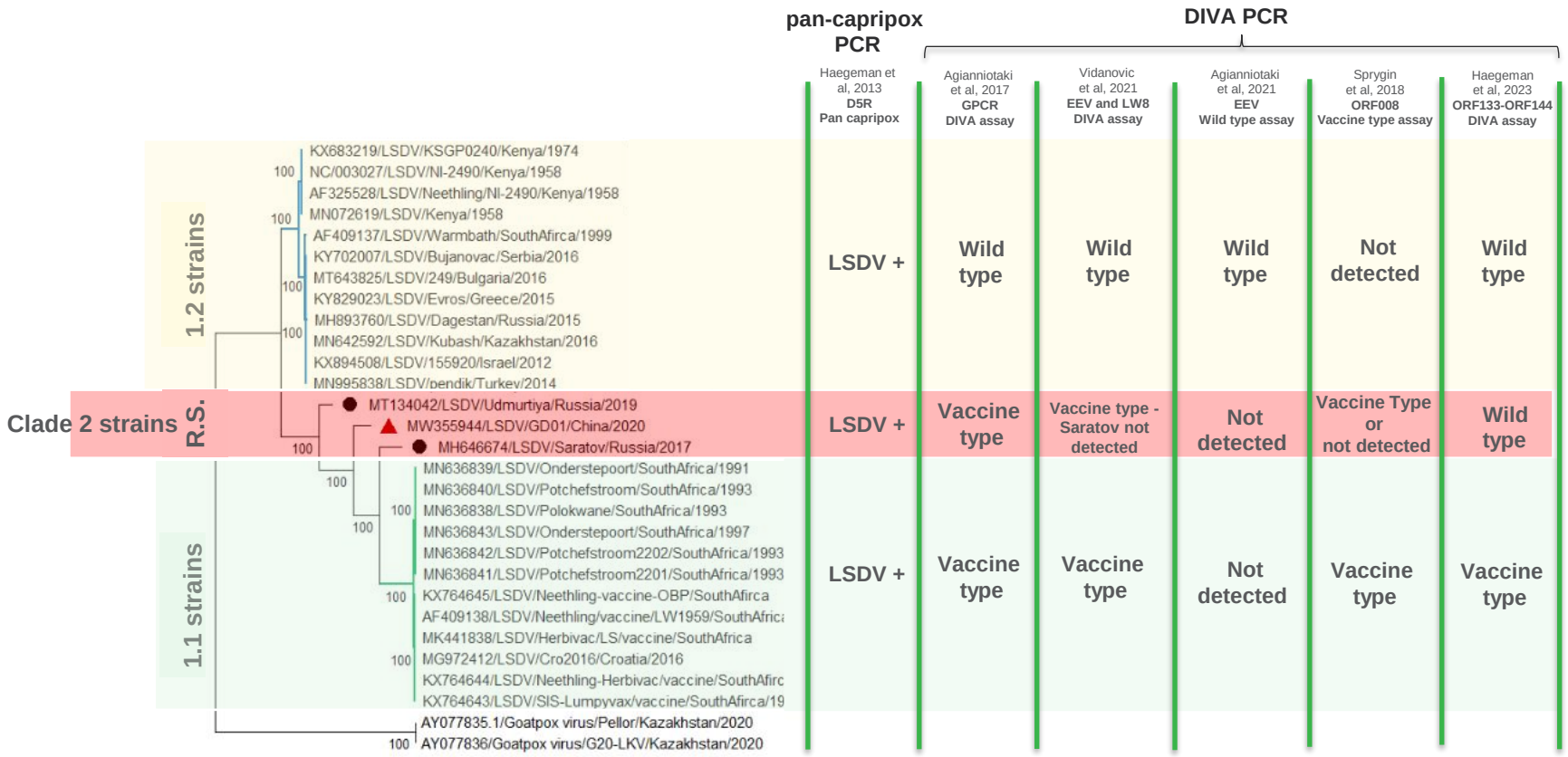
- **Proficiency test 2023**





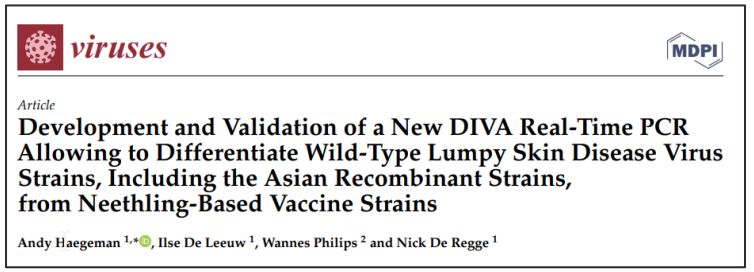
For the detection of specific antibodies to capripox virus in bovine and ovine sera, 33 out of 33 participating laboratories performed satisfactory for all performed tests.

LSDV diagnosis - virology

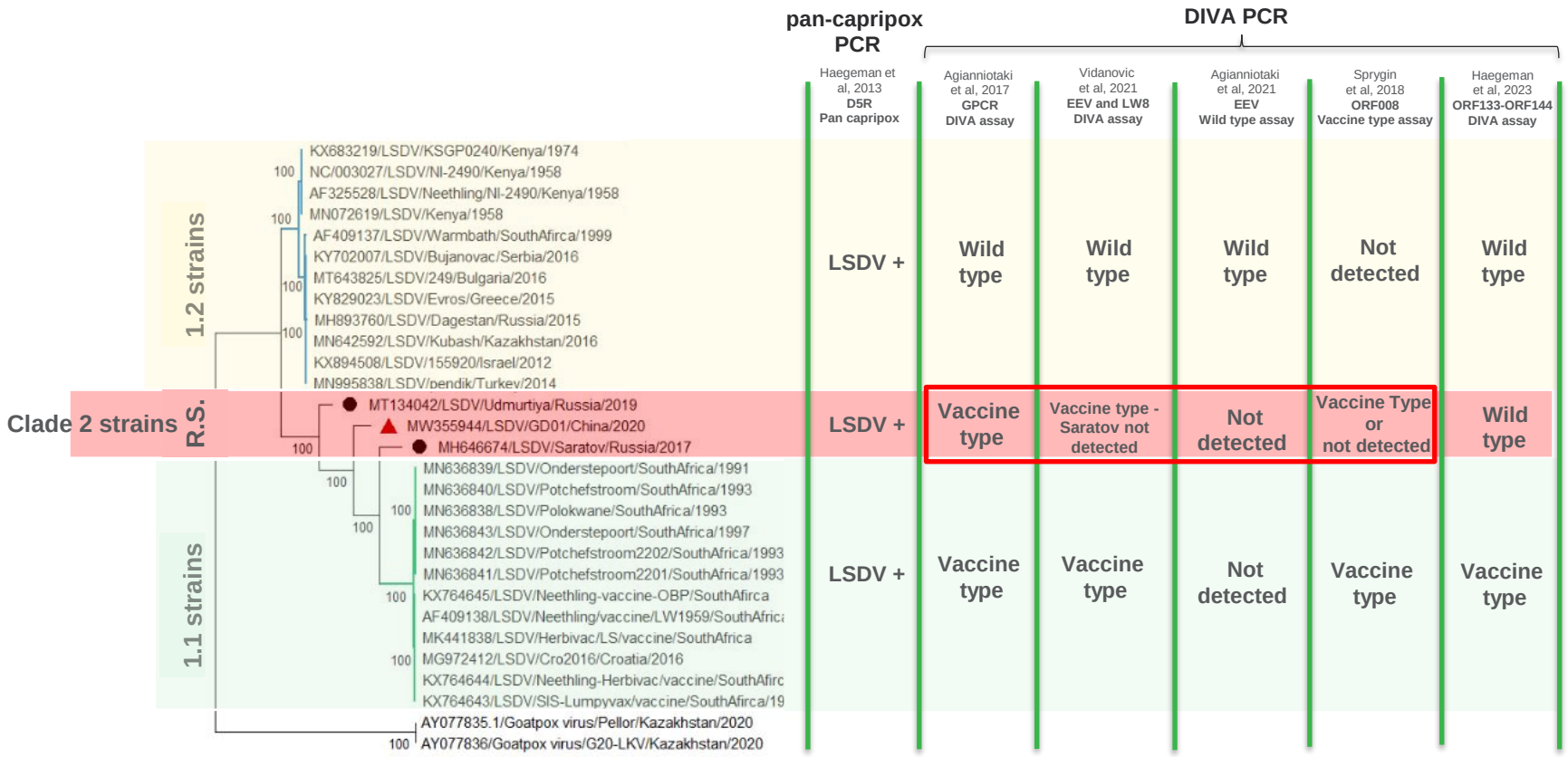


DIVA PCRs are important to differentiate adverse reactions after vaccination from clinical disease induced by virulent field strains:

- Multiple DIVA PCRs exist
- All have specific set-up, fit for purpose in specific epidemiological context
- DIVA test selection depends on knowledge of locally circulating strains
- EURL/WOAH RL available to provide help with whole genome sequencing



LSDV diagnosis - virology



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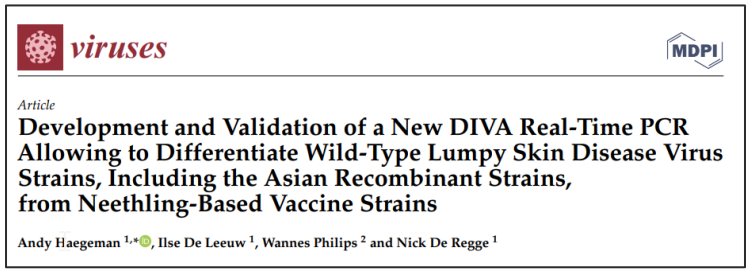
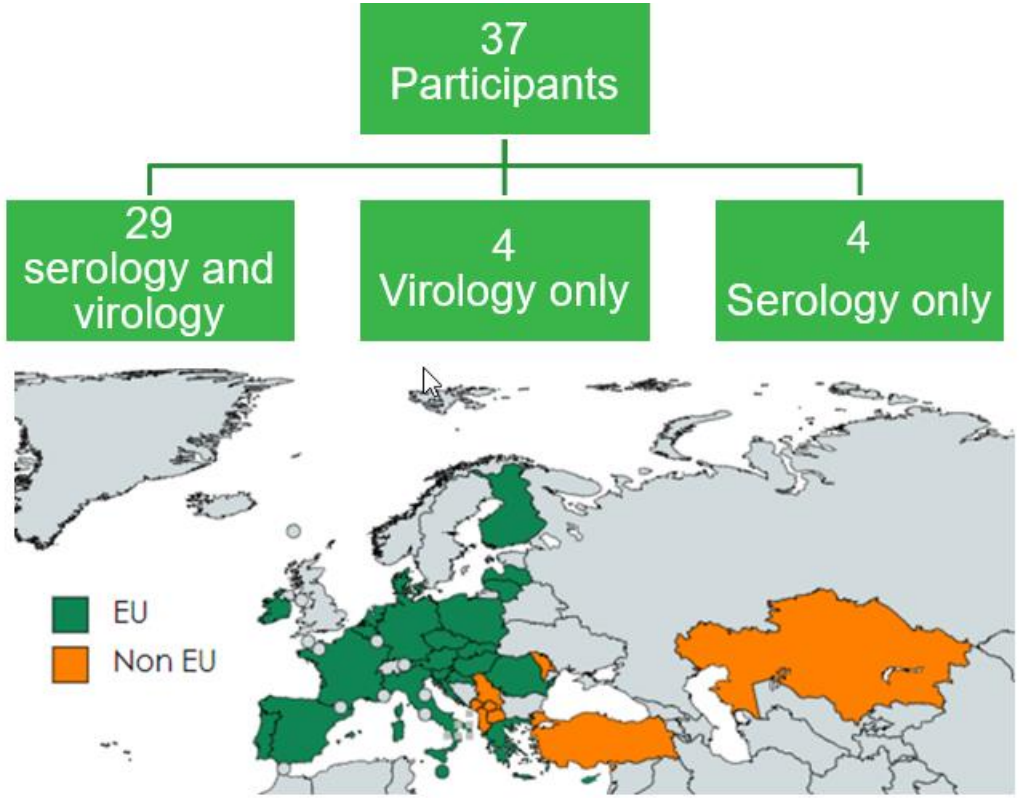

viruses
MDPI
Article

Development and Validation of a New DIVA Real-Time PCR Allowing to Differentiate Wild-Type Lumpy Skin Disease Virus Strains, Including the Asian Recombinant Strains, from Neethling-Based Vaccine Strains

Andy Haegeman [1,*], Ilse De Leeuw [1], Wannes Philips [2] and Nick De Regge [1]

LSDV diagnosis - virology

- **Proficiency test 2023**



Pan-capripox: For the detection of capripox virus nucleic acid detection, the performance of 32 out of 33 laboratories was satisfactory (≥ 90% agreement) for all performed PCRs

Species differentiation: For the differentiation of capripox virus species, the performance of 23 out of 23 participating laboratories performing the test on all samples was satisfactory (≥ 90% agreement)

DIVA PCR: For the differentiation of capripox field from vaccine strains, the performance of 13/23 laboratories was satisfactory (≥ 90% agreement)

9/23 laboratories used an LSDV specific DIVA and did not classify the SPPV samples. All LSDV samples were correctly classified.

1/23 laboratories used an assay that could make the differentiation for all Capripox viruses. The lab misclassified 4 aliquots (TP2, TP4, TP5 and BP1) and reached a level of agreement of 60% and thus an unsatisfactory result.

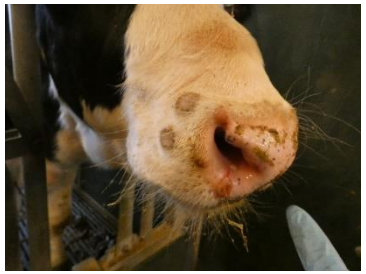
PT2023CAPXVIR_TP3	Bovine tissue	LSDV Rec	8	11 x LSDV Vac, 3 x LSDV wild and 1 x neg	0

Vaccine efficacy against recombinant strain

- **Homologous LAV provide good protection against the classical wild type strains (clade 1.2)**
- **Do they also provide protection against recombinant strains (clade 2)?**

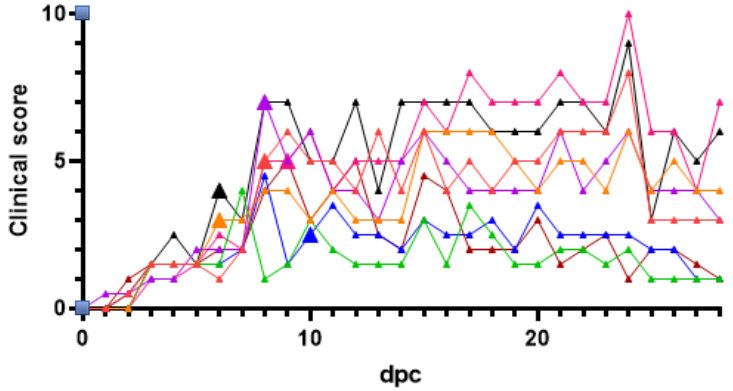
Challenge model in BSL3 animal facilities:

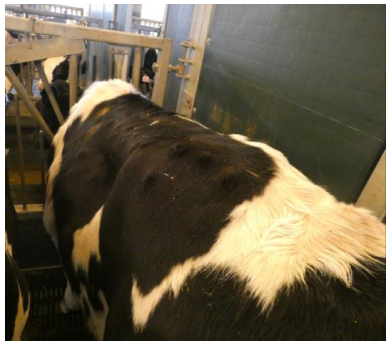
- Vietnam field isolated (cluster 2.5)
- 5ml intravenous
- 4x0,25ml intradermal

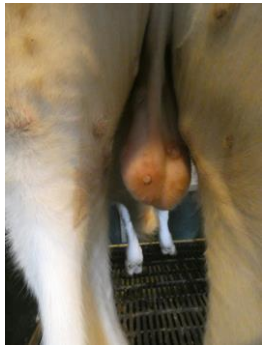


21 dpi monitoring

Clinical monitoring:
- Fever
- Swelling inoculation side
- Lnn swelling
- General health status
- Feed intake
- # noduli



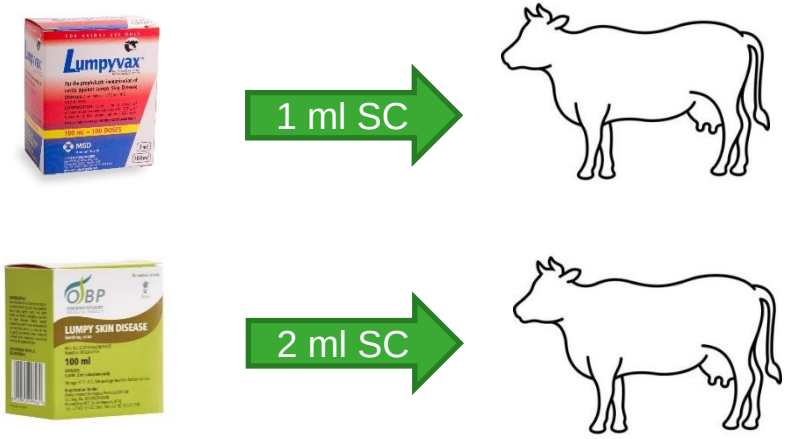


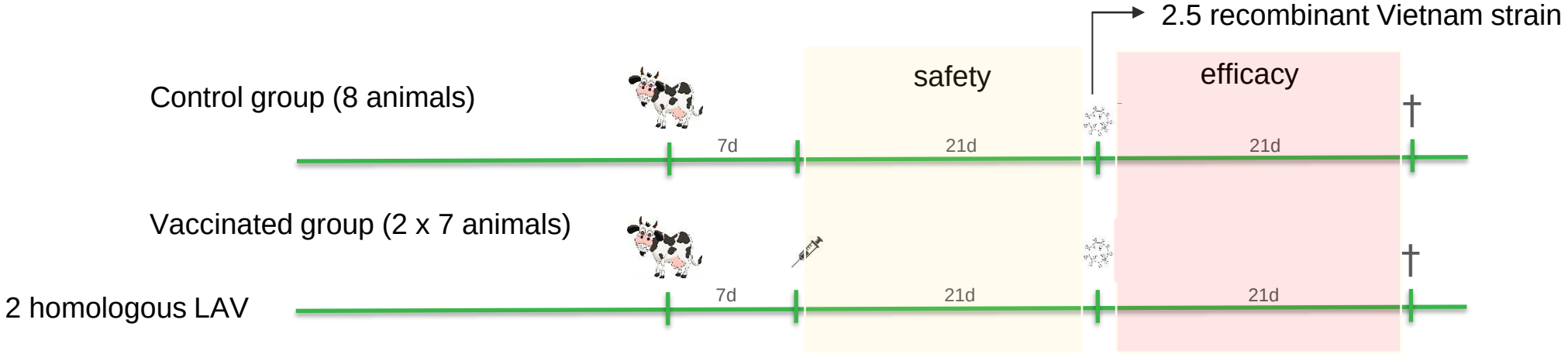


- 6/8 animals developed nodules

Vaccine efficacy against recombinant strain

# Animals	Vaccine	Purpose
7	MSD (Lumpyvax)	Vaccine evaluation
7	OBP	Vaccine evaluation
8	N/A	Control Vaccine and infection model





Vaccine efficacy against recombinant strain

Post vaccination

Clinical sign	Vaccinated animals
Fever	5-7 dpv
Local reaction	Limited
Nodules	No
Other	No vaccine viremia

Post challenge

Clinical sign	Control animals	Vaccinated
Fever	Prolonged	7-8 dpv
Local reaction	Strong (75%)	Limited
Nodules	- 6 skin - 1 lung	No
Other	Wide variety	No

- Homologous live attenuated neethling-based strains provide protection against recombinant (clade 2.5) LSDV strains

Direct transmission of the recombinant strain

- **Classical wild type LSDV strains (clade 1.2) are mainly spread by vectors**
- **Reports indicating non-vector transmission of recombinant strains (clade 2)**

Non-vector-borne transmission of lumpy skin disease virus

Kononov Aleksandr[1], Byadovskaya Olga[1], Wallace B. David[2,3], Prutnikov Pavel[1], Pestova Yana[1], Kononova Svetlana[1], Nesterov Alexander[1], Rusaleev Vladimir[1], Lozovoy Dmitriy[1] & Sprygin Alexander[1]

pathogens

MDPI

Article

A Recombinant Vaccine-like Strain of Lumpy Skin Disease Virus Causes Low-Level Infection of Cattle through Virus-Inoculated Feed

Irina Shumilova [1], Alexander Nesterov [1], Olga Byadovskaya [1], Pavel Prutnikov [1], David B. Wallace [2,3], Maria Mokeeva [1], Valeriy Pronin [1], Aleksandr Kononov [1], Ilya Chvala [1] and Alexander Sprygin [1,*]

Front Vet Sci. 2022 Oct 20;9:1001426. doi: 10.3389/fvets.2022.1001426. eCollection 2022.

Experimentally controlled study indicates that the naturally occurring recombinant vaccine-like lumpy skin disease strain Udmurtiya/2019, detected during freezing winter in northern latitudes, is transmitted *via* indirect contact

Alexander Nesterov [1], Ali Mazloum [1], Olga Byadovskaya [1], Irina Shumilova [1], Antoinette Van Schalkwyk [2,3], Alena Krotova [1], Vladimir Kirpichenko [4], Irina Donnik [5], Ilya Chvala [1], Alexander Sprygin [1]

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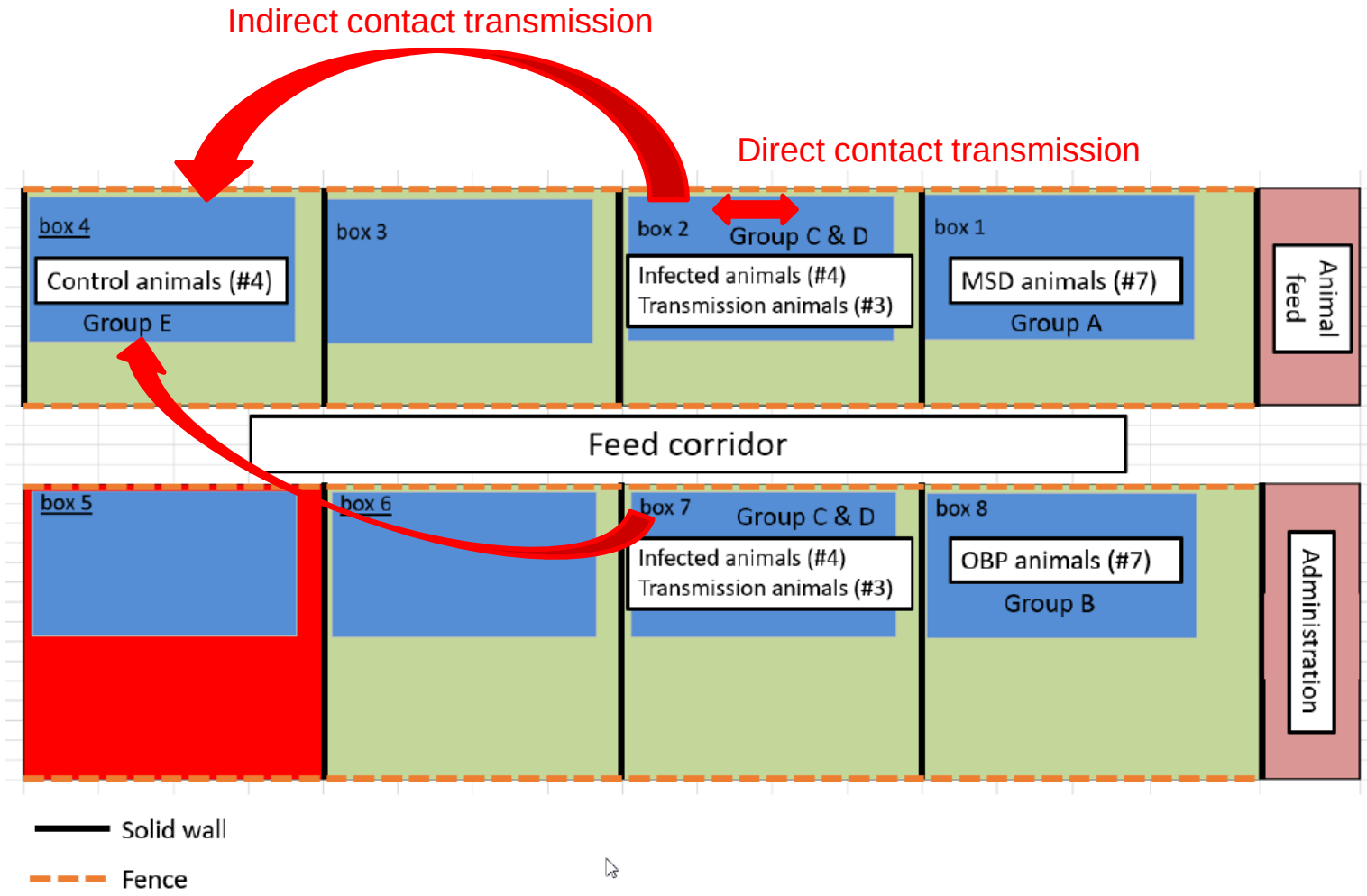

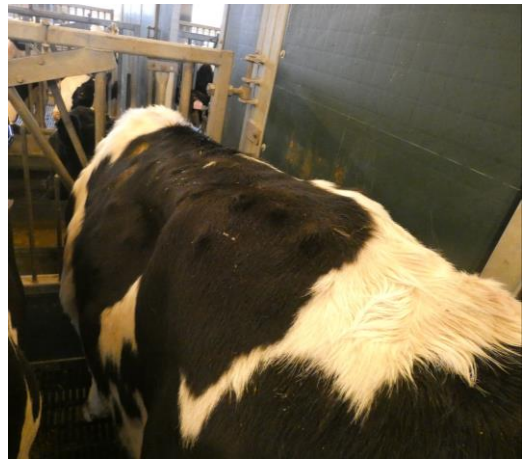

Direct transmission of the recombinant strain

Direct contact animals

- 6/6 developed nodules
- In general, milder disease compared to needle infected group, except 1
- Viremia detected in 5/6
- 5/6 seroconverted (other animal euthanised before seroconversion)

Indirect contact animals

- 1/4 developed nodules
- Milder disease compared to needle infected group
- Viremia detected in 1/4
- ¼ seroconverted

- Non-vector borne transmission capacity of recombinant LSDV strains exist and is higher than for classical strains
- Impact on the LSDV epidemiology: spread during winter, more efficient spread within infected herds, even higher importance for biosecurity

Training activities

- **LSDV:**
  - ✓ Training 2 laboratory technicians Algeria (IAEA)
  - ✓ LSDV symposium Rome (EuFMD-FAO)
  - ✓ LSDV online training course (EuFMD-FAO)
  - ✓ LSDV-PPR-FMD meeting Bhutan (GF-TAD)
  - ✓ SEE Thrace meeting on TADs (EuFMD)
  - ✓ LSDV control strategy ASEAN (WOAH-FAO)
  - ✓ TAD Thrace meeting (EuFMD)
  - ✓ LSDV central Asia (WOAH)
  - ✓ Training 2 laboratory technicians North-Macedonia (EC)

- **SPPV/GTPV:**
  - ✓ EUVET missions (EC)
  - ✓ SPPV online training course (EuFMD-FAO)
  - ✓ SPPV open access online training (EuFMD)
  - ✓ BTSF training SPPV/GTPV (EC)

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Contact

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