



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health
Founded as OIE

8th PPR GREN

PPR emergence in Europe: insights from
viral genetic investigations

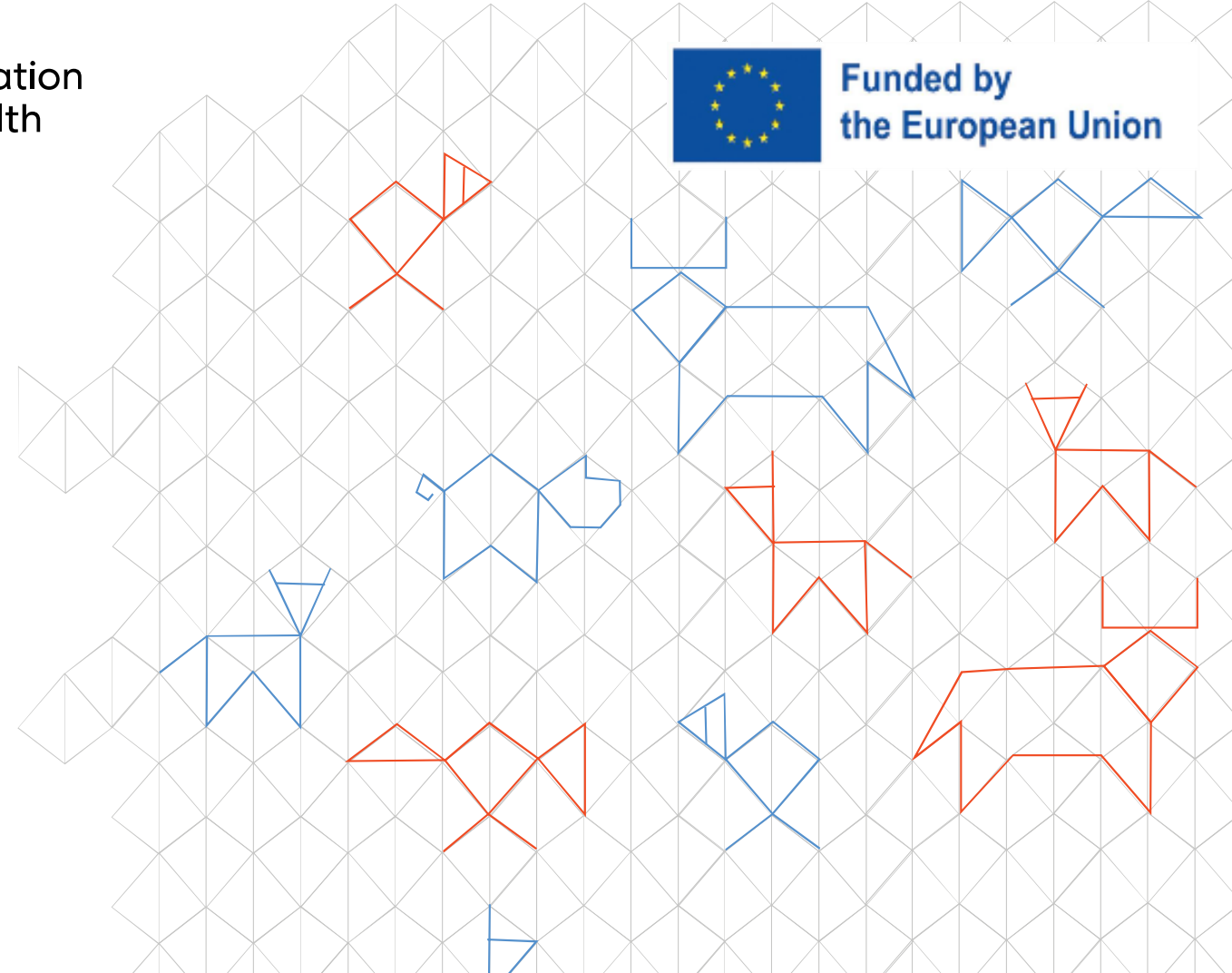
CIRAD

EU / WOAHA / FAO Reference Laboratory for
peste des petits ruminants
Montpellier, France

Arnaud Bataille



Funded by
the European Union



EU Reference laboratory for Peste des Petits Ruminants



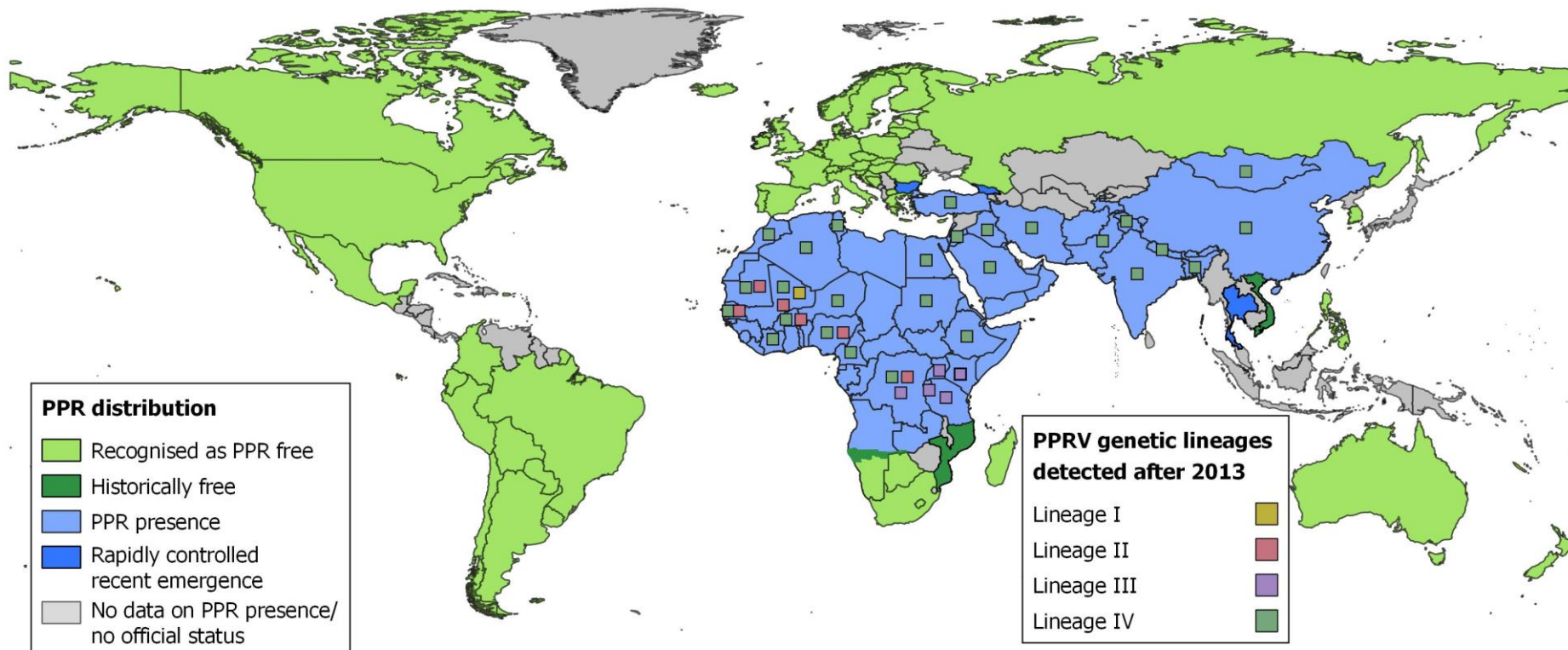
Funded by
the European Union



cirad
LA RECHERCHE AGRONOMIQUE
POUR LE DÉVELOPPEMENT

PPR distribution before 2024

- Widespread in Africa, Middle East and Asia
- Four distinct phylogenetic lineages with lineage IV most widely distributed but one serotype (vaccines available protect against all strains)



Review article: Rev Sci Tech. 2024 Dec; Special Edition: 43-52

PPR emergence in Europe

- First notifications in July 2024 in Greece and Romania
- Emergence in Bulgaria in December 2024
- Emergence in Hungary in January 2025 and new outbreak in Romania in Feb 2025
- First notification in Albania in June 2025, and in Kosovo* in July 2025



(*) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ opinion on the Kosovo declaration of independence.

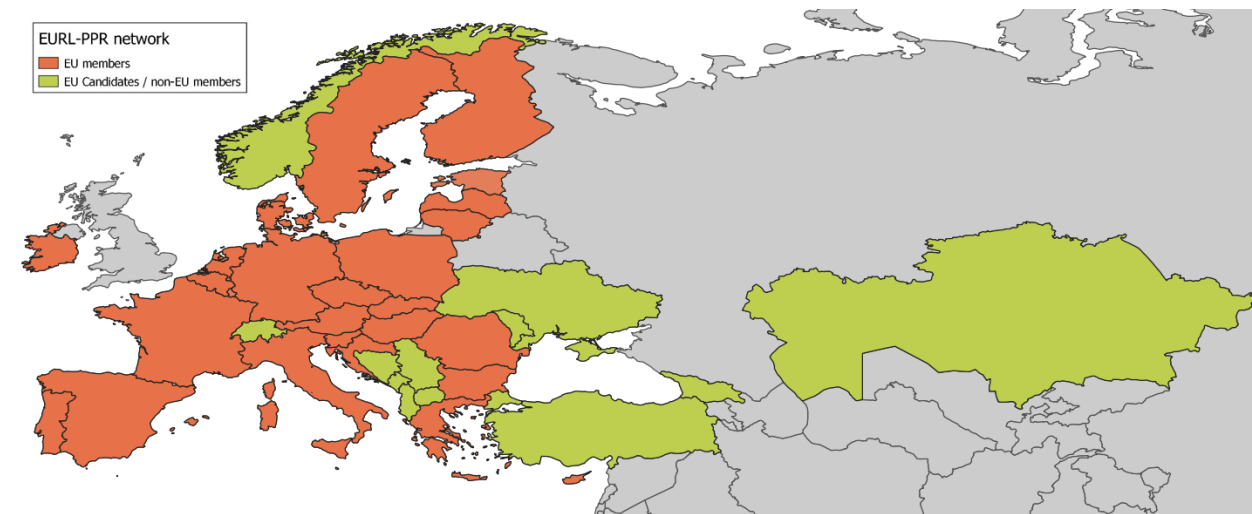
Funded by
the European Union

Support from EURL-PPR

Network of NRLs from 27 EU member states and 14 non-EU states

Activities in support of countries facing PPR emergence:

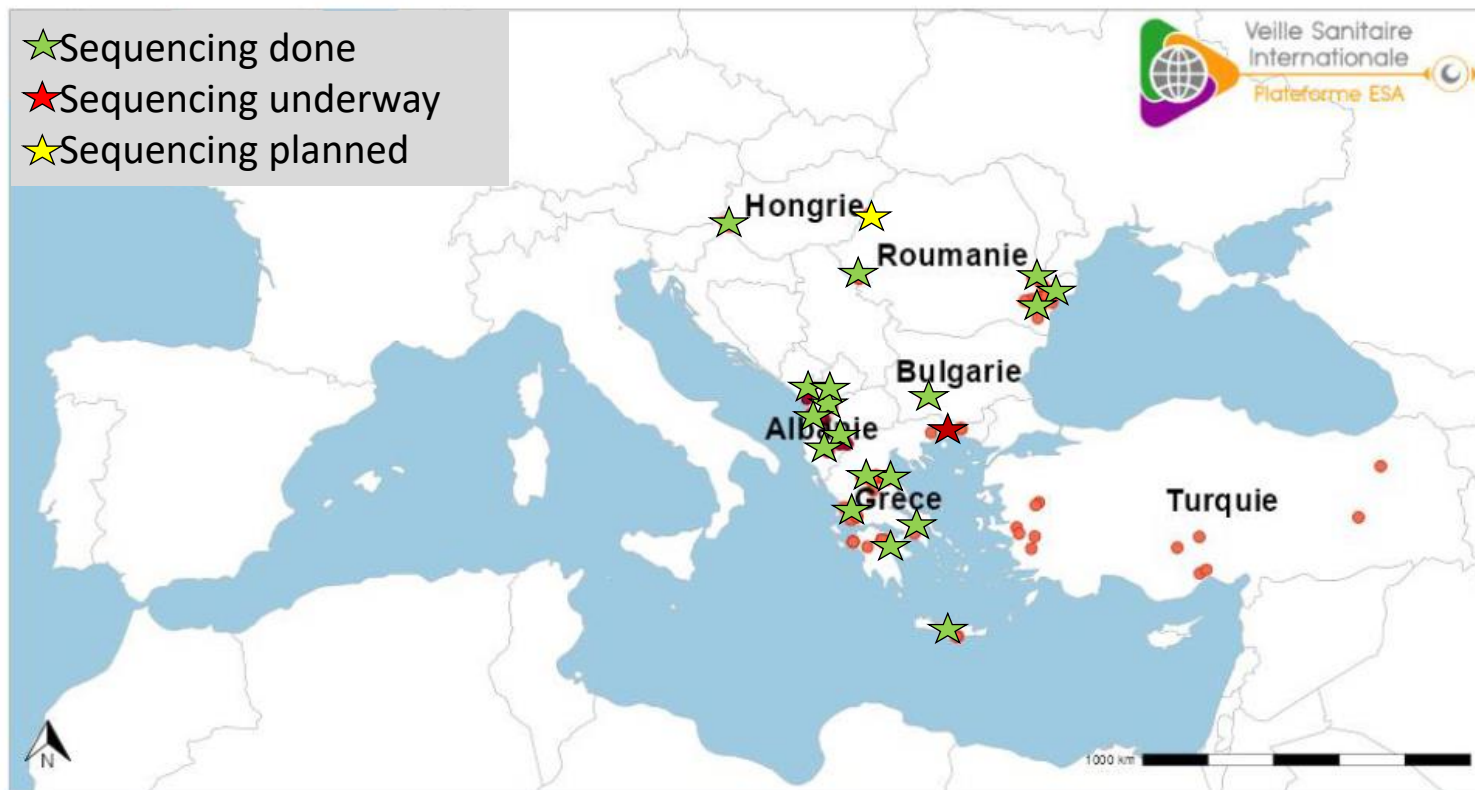
- Participation to field mission
- Confirmatory diagnosis on sera and molecular biology samples received from NRLs
- Supports to NRLs with technical advice and reference material when requested
- Partial genome sequencing (portion of N gene) on all samples tested positive
- Full genome sequencing on some positive sample
- Phylogenetic analyses and genome comparisons



Website: <https://eurl-ppr.cirad.fr/>

On-going sequencing efforts

- Total of 37 full genome sequences obtained so far from Romania (22), Greece (9), Bulgaria (1), Hungary (1), Albania (3), and Kosovo (1) in collaboration with National Reference Laboratories and veterinary authorities of each country
- Method modified to improve genome sequencing capacity with samples with low viral load



Insights into PPR transmission pathway in Europe

Interpretation complicated by:

- Genetic data not obtained from all outbreaks
- Epidemiological data from field investigation only partial
- Samples obtained from some farms weeks after start of infection (accumulation of mutations)
- Preliminary results; analyses on-going

Insights into PPR transmission pathway in Europe

Common origin for emergence of PPR in Europe confirmed for all countries infected

Associated with PPRV strains circulating in North/East Africa, but not with sequences from Turkey. Missing data to identify likely origin of the introduction.

Outbreak in Georgia in 2016 also related to North/East Africa cluster, but not the outbreak of 2024



Insights into PPR transmission pathway in Europe

Common origin for emergence of PPR in Europe confirmed for all countries infected

Associated with PPRV strains circulating in North/East Africa, but not with sequences from Turkey. Missing data to identify likely origin of the introduction.

Outbreak in Georgia in 2016 also related to North/East Africa cluster, but not the outbreak of 2024

Introduction of PPR in Europe (Ancestral Character Reconstruction):

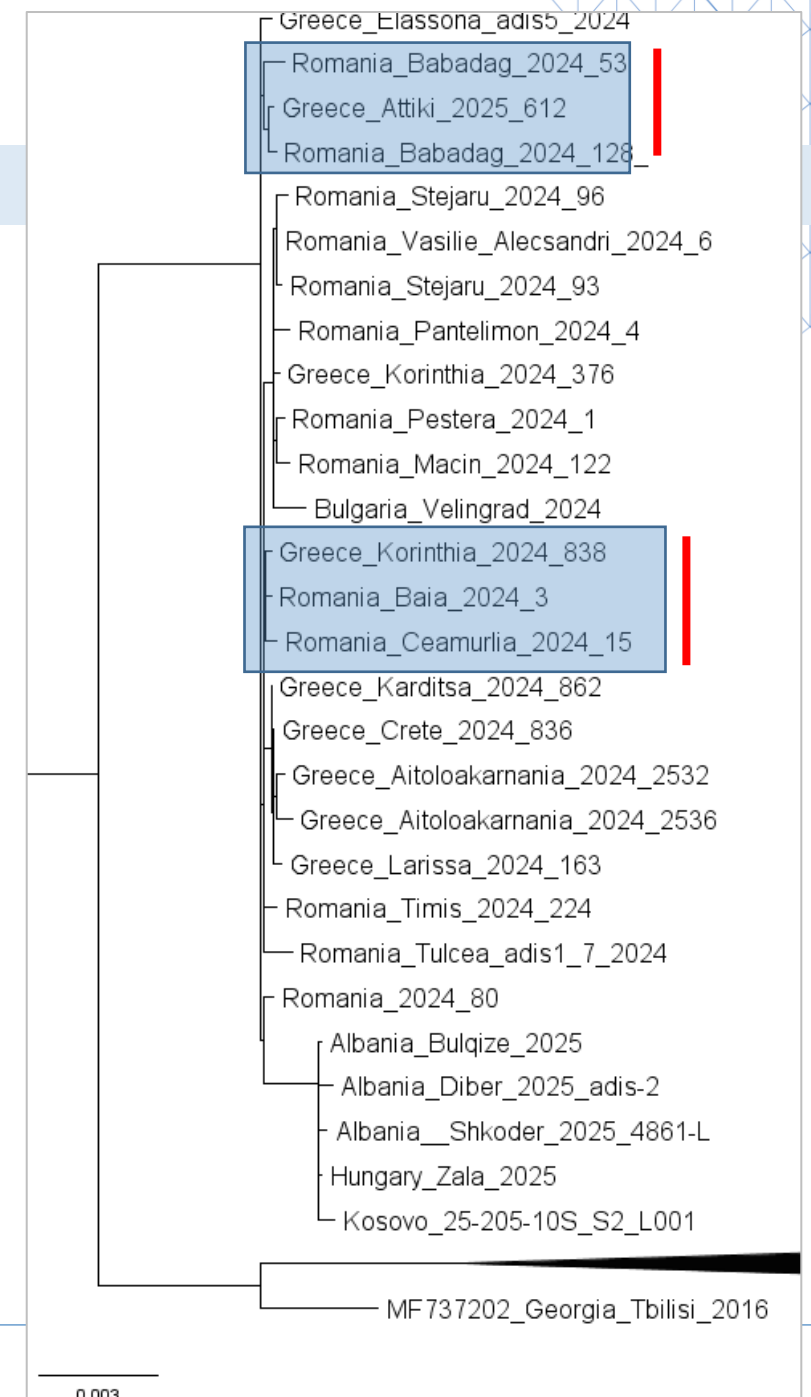
97-99% probability that Romania was the first country infected



Insights into PPR transmission pathway in Europe

Common origin for emergence of PPR in Europe confirmed for all countries infected

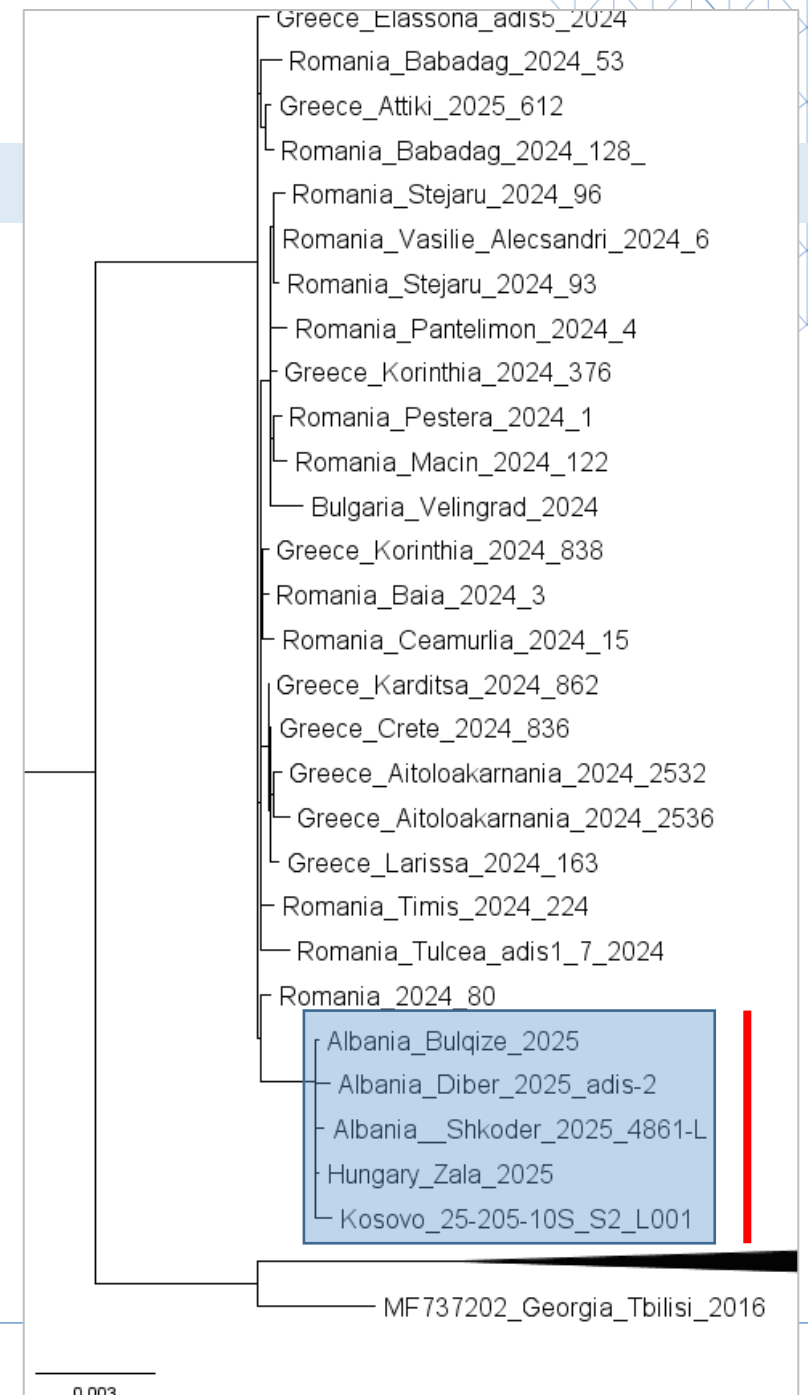
Multiple clusters with sequences from Romania and Greece
Suggesting multiple introductions



Insights into PPR transmission pathway in Europe

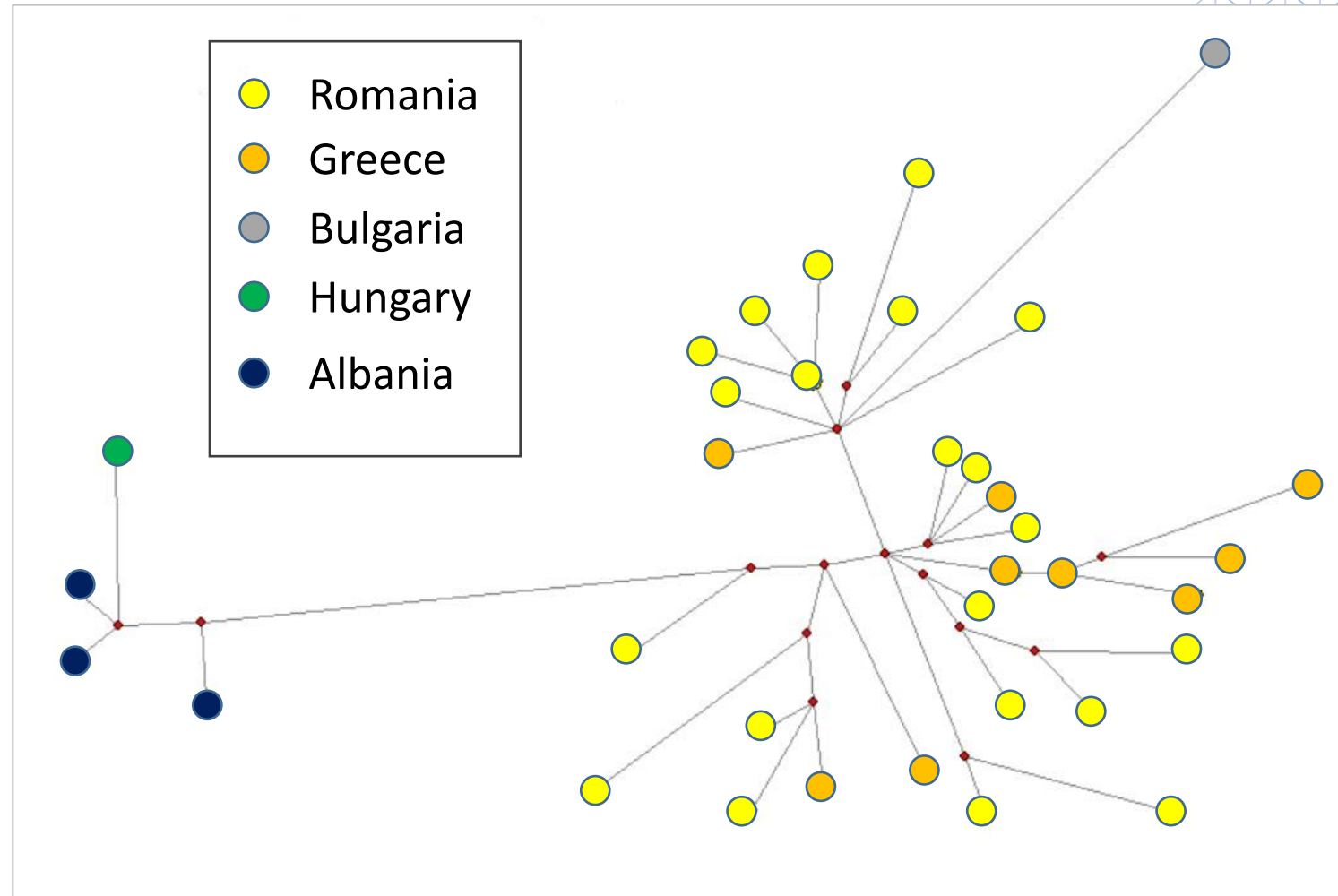
Common origin for emergence of PPR in Europe confirmed for all countries infected

Sequences from Hungary and Albania clustered with a sequence from Romania, but missing sequences from 2025 outbreak in Romania



Insights into PPR transmission pathway in Europe

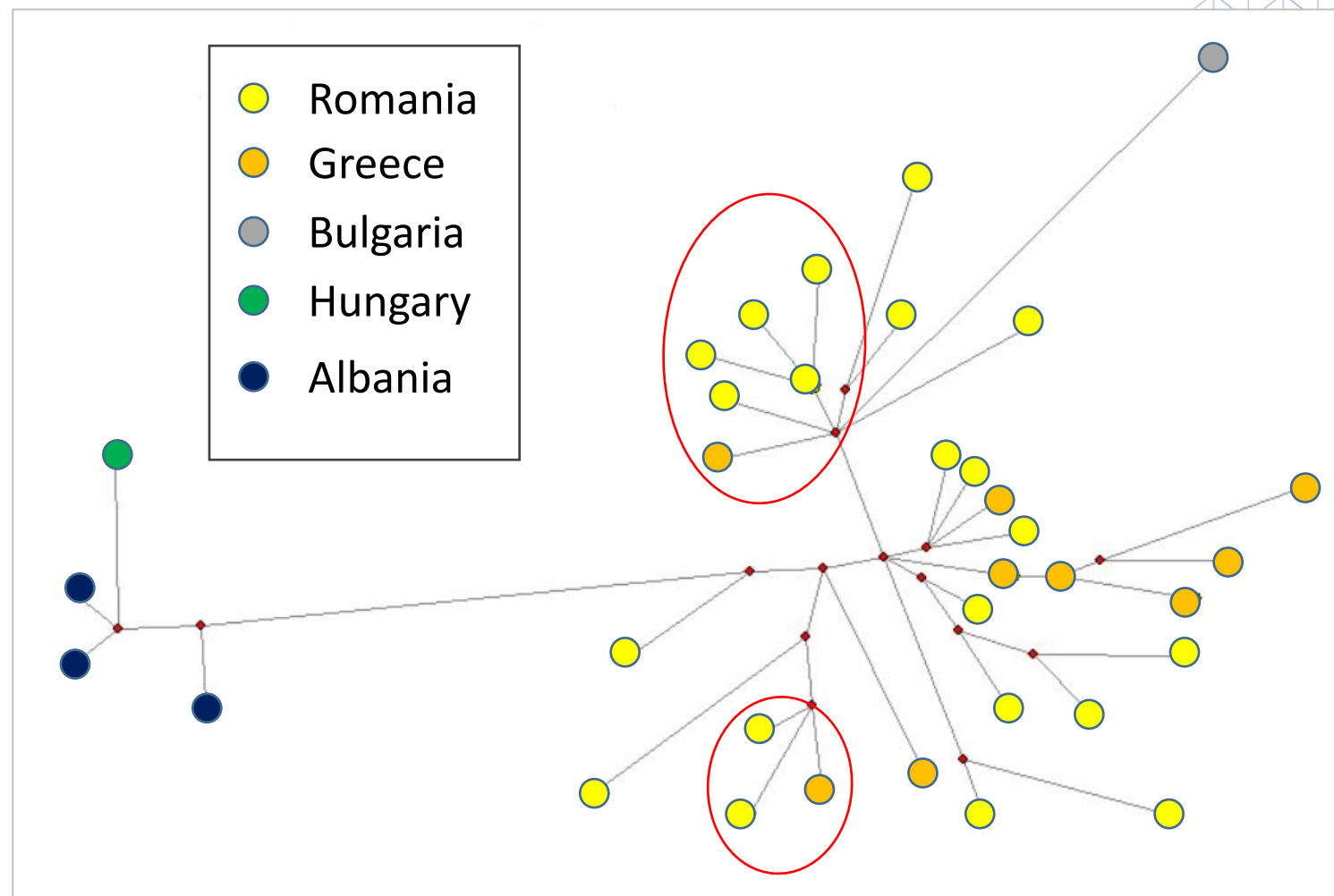
Median-joining network analysis
(Kosovo not yet included)



Insights into PPR transmission pathway in Europe

Median-joining network analysis

Confirms multiple links between Romania and Greece

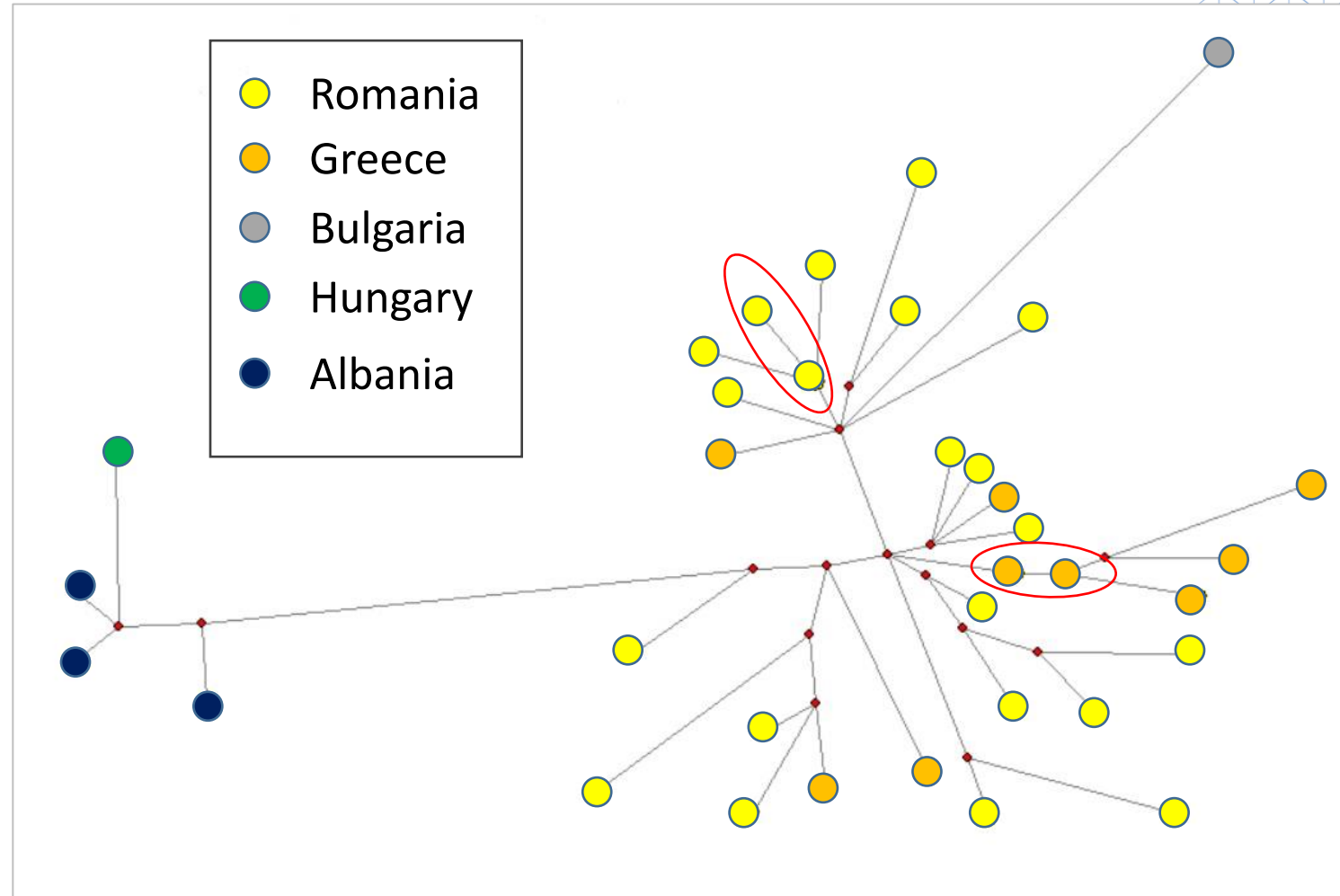


Insights into PPR transmission pathway in Europe

Median-joining network analysis

Confirms multiple links between Romania and Greece

Some info on farm-farm transmissions



Insights into PPR transmission pathway in Europe

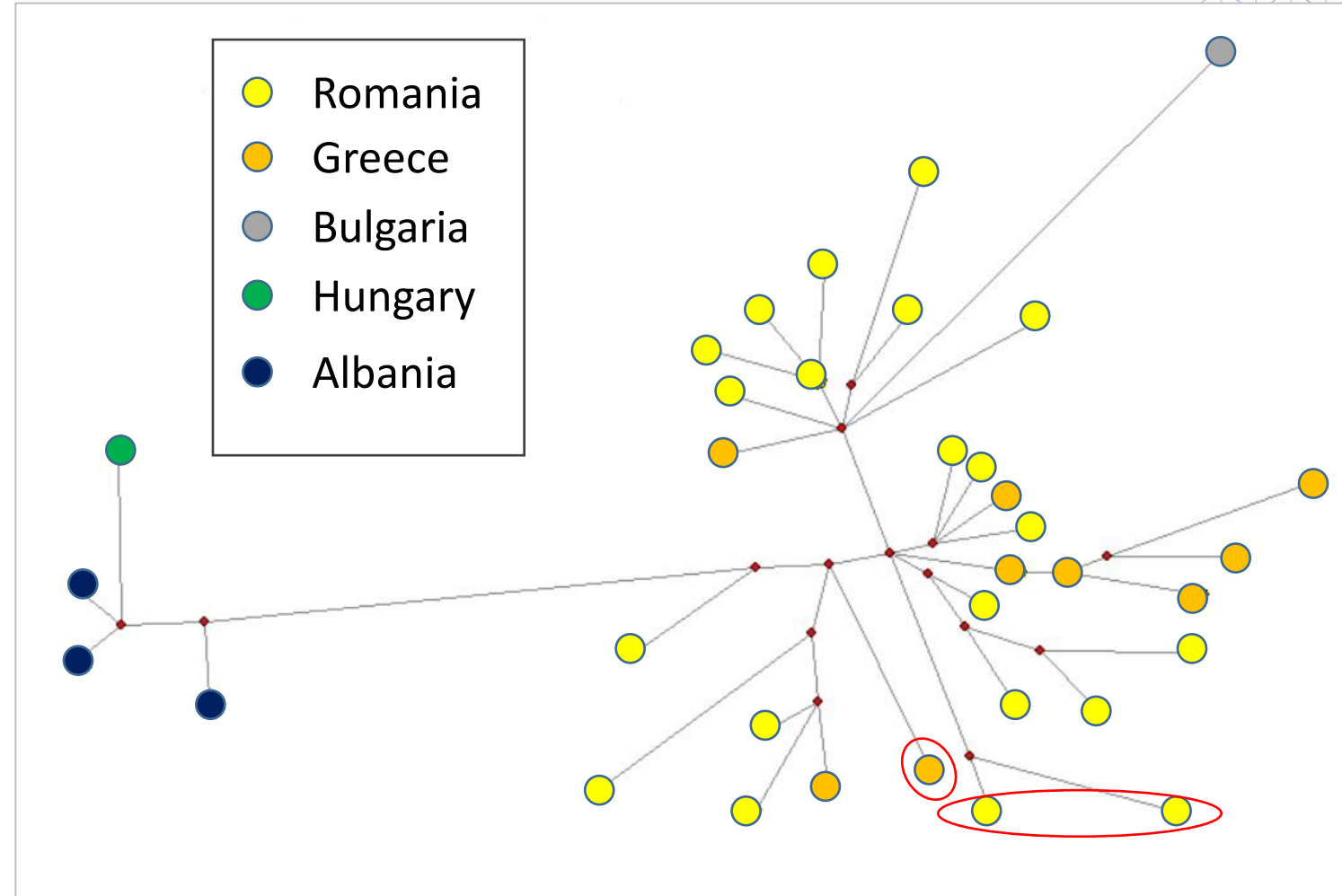
Median-joining network analysis

Confirms multiple links between Romania and Greece

Some info on farm-farm transmissions

Earlier stages of spread hard to assess with this method (samples taken weeks after infection started)

Additional samples may complete some links



Insights into PPR transmission pathway in Europe

On-going analyses:

- Completion of genome sequencing from additional samples from Romania 2025
- Time-depended and space-dependent phylogenetic analyses to retrace in time and space the likely transmission pathways of PPR in Europe

Improving surveillance of PPR in Europe: risk factors to take into account

Symptoms may be difficult to detect and can include

- Loss of appetite, loss of weight, apathy, nasal/ocular excretions, coughing, sudden death, diarrhea, lesions in the mouth
- Varies across species and breeds, and depending on health condition
- For the strain in Europe, high variety of symptoms observed, subclinical transmission cases
- Samples should be sent to NRL if any one of these symptoms are observed or if strong suspicion based on epi investigation



Pictures: General Direction Animal Health and Welfare, Romania

Improving surveillance of PPR in Europe: risk factors to take into account

Indirect transmission

- Investigation in the field **proves** that some farms may have been infected without direct contact with infected animals
- Possible routes of indirect transmission:
 - Trucks visiting multiple farms (milk collection, transport of feed)
 - Persons visiting multiple farms

Clear guidelines for biosecurity measures for disinfection of equipment and personal to be provided in areas at risk



Pictures: T. Aleksandrov

Conclusions

- Genetic investigation starts to provide some information on transmission pathways with Europe but more analyses and data needed
- Control measures in place in Europe but risks of introductions are still high until the situation is clarified concerning unidentified PPRv infections
- All countries should take precautionary measures based on risks associated to legal and illegal animal movements. Cross-border collaboration is essential for efficient control and surveillance (similar to TAD or THRACE programmes)
- Information on symptoms (including subclinical cases), sampling and biosafety procedures should be disseminated largely within the veterinarian community
- EURL-PPR supports for field and lab preparedness and genetic sequencing effort. Collaboration with NRLs and veterinary authorities is key to success
- Generation of more sequencing data across PPR distribution following homogenised procedures is essential to investigate emergences and identify international connectivities



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health
Founded as OIE



Funded by
the European Union

THANK YOU

To receive information on the disease, on appropriate sampling, on laboratory methods, and available supports:

EU and WOA/FAO reference laboratory for PPR

CIRAD, Montpellier, France

email: contact-eurl-ppr@cirad.fr ; arnaud.bataille@cirad.fr

website: <https://eurl-ppr.cirad.fr/>

<https://www.ppr-labs-oie-network.org/>

EU Reference laboratory for Peste des Petits Ruminants



Funded by
the European Union



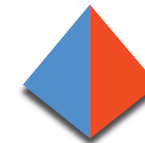
WOAH
Reference Laboratory
Network for PPR

WOAH Reference Laboratory
for peste des petits ruminants

Reference Centre



World Organisation
for Animal Health
Founded as OIE



GF-TADS

GLOBAL FRAMEWORK FOR THE
PROGRESSIVE CONTROL OF
TRANSBOUNDARY ANIMAL DISEASES



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health
Founded as OIE