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EU Reference Laboratory for Capripox viruses

Funded by the European Union

healthy all life long

EURL activities of importance to the LSD diagnosis and the LSD vaccine control

Laetitia Aerts, Wannes Philips, Ilse De Leeuw, Andy Haegeman, Kris De Clercq

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Content

1) Use of DIVA PCR
2) Proficiency test
3) Vaccine control

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1) Use of DIVA PCR

› Transbound Emerg Dis. 2020 Nov 30. doi: 10.1111/tbed.13942. Online ahead of print.

Performance of the currently available DIVA real-time PCR assays in classical and recombinant lumpy skin disease viruses

O Byadovskaya [1], Y Pestova [1], A Kononov [1], I Shumilova [1], S Kononova [1], A Nesterov [1], S Babiuk [2], A Sprygin [1]

Affiliations + expand

PMID: 33253485 DOI: 10.1111/tbed.13942

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1) Use of DIVA PCR

2 commercial DIVA PCR:

- ID Vet
- Biosellal

2 published DIVA PCR:

- Agianniotaki 2017: (GPCR gene)
- Sprygin 2018/ Kononov 2019 (ORF008/ORF126)

Isolate	Type of sample	ID Vet DIVA		Biosellal			Agianniotaki GPCR vaccine	Agianniotaki GPCR field	Sprygin Vaccine (ORF008)	Sprygin Field (ORF126)
		field	vaccine	FAM	VIC	Result *				
Ethiopia/1995 (field)	cell culture	18.5	---	19.88	22.25	vaccine & field	---	23.3	---	24.2
Dagestan/2015 (field)	blood	33.11	---	31.05	33.08	vaccine & field	---	34.4	---	31.3
Volgograd/2016 (field)	nasal swab	23.19	---	24.22	27.86	vaccine & field	---	25.4	---	28.1
Chechnya/2016 (field)	nodule	17.45	---	18.16	21.00	vaccine & field	---	22.3	---	21.7
Kalmykiya/2016 (field)	nodule	15.08	---	15.96	18.60	vaccine & field	---	20.0	---	19.7
Kazakhstan/2016 (field)	nodule	15.26	---	15.62	17.85	vaccine & field	---	20.0	---	20.1
Orenburg/2017 (field)	blood	26.51	---	27.67	---	vaccine	---	28.6	---	32.7
Saratov/2017 (field)	nasal swab	20.23	---	22.52	24.73	vaccine & field	---	24.6	---	25.6
Onderstepoort (vaccine)	cell culture	---	28.88	21.5	---	vaccine	23.2	---	22.41	---
Samara/2017 (vaccine-like virus)	blood	---	30.05	25.54	---	vaccine	27.3	---	25.79	---
Orenburg/2017 (vaccine-like virus)	blood	---	29.33	28.76	---	vaccine	29.5	---	30.01	---
Bashkortostan/2017 (vaccine-like virus)	blood	---	28.72	30.00	---	vaccine	29.8	---	29.99	---
Saratov/2017 (recombinant)	blood	---	35.23	27.56	---	vaccine	32.2	---	---	---
Samara/2018-1461 (recombinant)	blood	24.03	---	22.87	---	vaccine	27.2	---	---	---
Samara/2018-1462 (recombinant)	blood	---	33.85	26.4	---	vaccine	29.7	---	26.83	---
Omsk/2018 (recombinant)	blood	25.12	---	24.53	---	vaccine	26.0	---	30.81	---
Kurgan/2018 (recombinant)	blood	---	---	26.8	---	vaccine	32.0	---	---	---
Chelyabinsk/2018 (recombinant)	blood	---	---	31.97	---	vaccine	35.6	---	---	---
Udmurtiya/2019 (recombinant)	blood	33.93	---	30.75	---	vaccine	34.5	---	39.19	---
Tyumen/2019 (recombinant)	blood	---	35.84	24.83	---	vaccine	27.9	---	28.28	---
Omsk/2019 (recombinant)	blood	---	---	26.23	30.64	vaccine & field	32.2	---	---	31.5
Saratov/2019 (recombinant)	blood	---	---	33.14	---	vaccine	35.0	---	---	---

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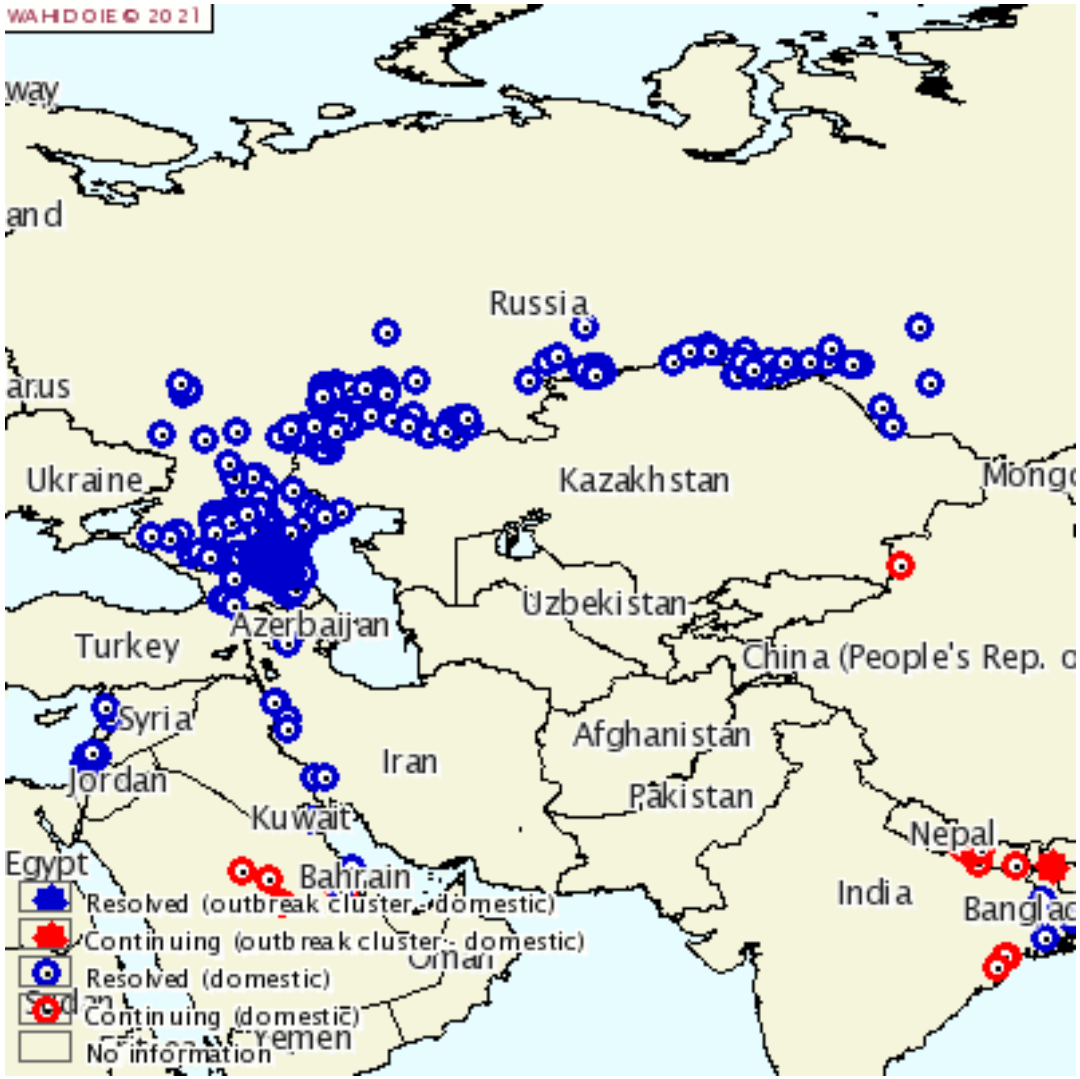
1) Use of DIVA PCR

OIE WAHIS
14/01/2021



1) Use of DIVA PCR

OIE WAHIS
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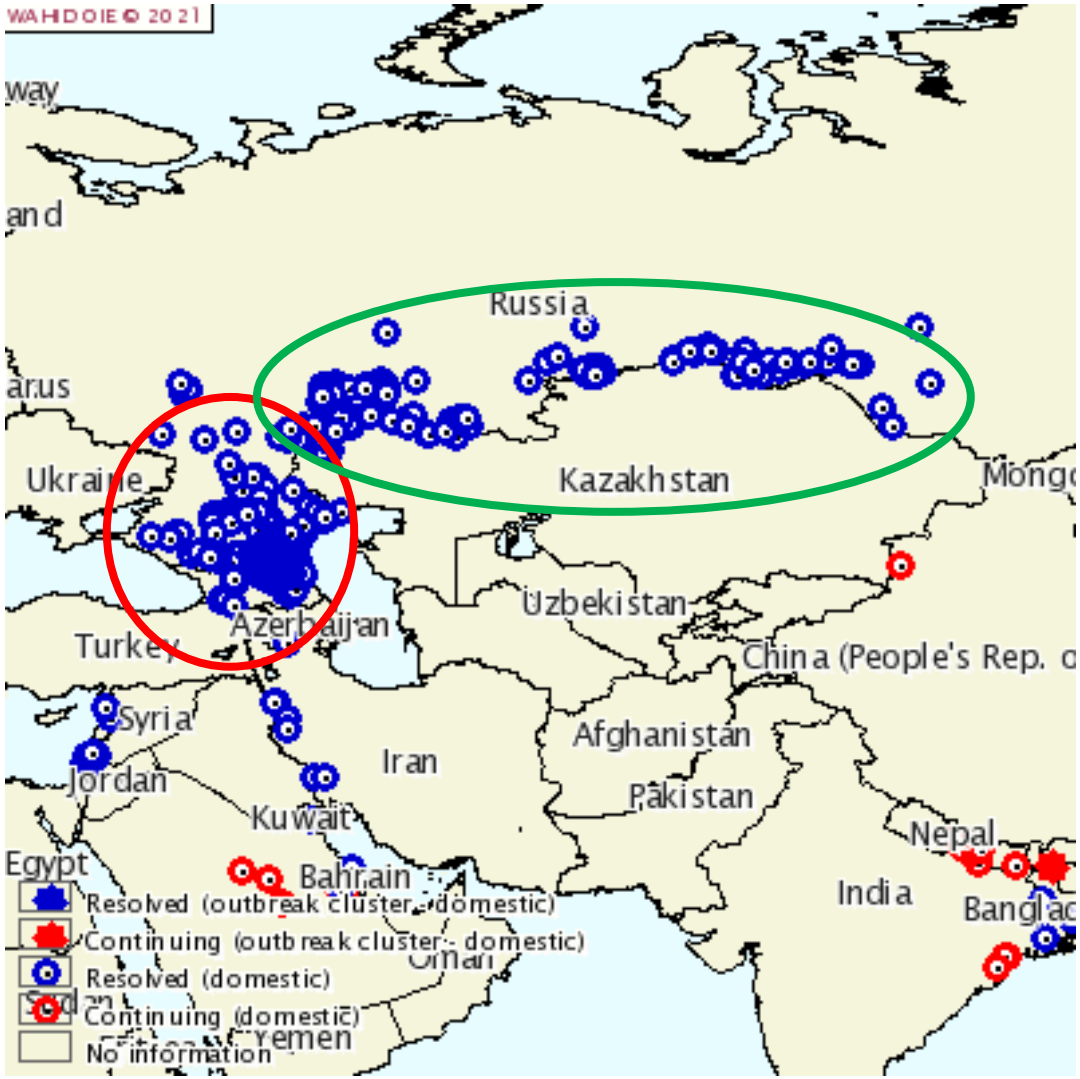

1) Use of DIVA PCR

Field strains before 2017:

Correctly identified by all but Biosellal

Isolate	Type of sample	ID Vet DIVA		Biosellal			Agianniotaki GPCR vaccine	Agianniotaki GPCR field	Sprygin Vaccine (ORF008)	Sprygin Field (ORF126)
		field	vaccine	FAM	VIC	Result *				
Ethiopia/1995 (field)	cell culture	18.5	---	19.88	22.25	vaccine & field	---	23.3	---	24.2
Dagestan/2015 (field)	blood	33.11	---	31.05	33.08	vaccine & field	---	34.4	---	31.3
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Chechnya/2016 (field)	nodule	17.45	---	18.16	21.00	vaccine & field	---	22.3	---	21.7
Kalmykiya/2016 (field)	nodule	15.08	---	15.96	18.60	vaccine & field	---	20.0	---	19.7
Kazakhstan/2016 (field)	nodule	15.26	---	15.62	17.85	vaccine & field	---	20.0	---	20.1
Orenburg/2017 (field)	blood	26.51	---	27.67	---	vaccine	---	28.6	---	32.7
Saratov/2017 (field)	nasal swab	20.23	---	22.52	24.73	vaccine & field	---	24.6	---	25.6
Onderstepoort (vaccine)	cell culture	---	28.88	21.5	---	vaccine	23.2	---	22.41	---
Samara/2017 (vaccine-like virus)	blood	---	30.05	25.54	---	vaccine	27.3	---	25.79	---
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Bashkortostan/2017 (vaccine-like virus)	blood	---	28.72	30.00	---	vaccine	29.8	---	29.99	---
Saratov/2017 (recombinant)	blood	---	35.23	27.56	---	vaccine	32.2	---	---	---
Samara/2018-1461 (recombinant)	blood	24.03	---	22.87	---	vaccine	27.2	---	---	---
Samara/2018-1462 (recombinant)	blood	---	33.85	26.4	---	vaccine	29.7	---	26.83	---
Omsk/2018 (recombinant)	blood	25.12	---	24.53	---	vaccine	26.0	---	30.81	---
Kurgan/2018 (recombinant)	blood	---	---	26.8	---	vaccine	32.0	---	---	---
Chelyabinsk/2018 (recombinant)	blood	---	---	31.97	---	vaccine	35.6	---	---	---
Udmurtiya/2019 (recombinant)	blood	33.93	---	30.75	---	vaccine	34.5	---	39.19	---
Tyumen/2019 (recombinant)	blood	---	35.84	24.83	---	vaccine	27.9	---	28.28	---
Omsk/2019 (recombinant)	blood	---	---	26.23	30.64	vaccine & field	32.2	---	---	31.5
Saratov/2019 (recombinant)	blood	---	---	33.14	---	vaccine	35.0	---	---	---

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1) Use of DIVA PCR

OBP vaccine:

Correctly identified by all DIVA

Isolate	Type of sample	ID Vet DIVA		Biosellal			Agianniotaki GPCR vaccine	Agianniotaki GPCR field	Sprygin Vaccine (ORF008)	Sprygin Field (ORF126)
		field	vaccine	FAM	VIC	Result *				
Ethiopia/1995 (field)	cell culture	18.5	---	19.88	22.25	vaccine & field	---	23.3	---	24.2
Dagestan/2015 (field)	blood	33.11	---	31.05	33.08	vaccine & field	---	34.4	---	31.3
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Chechnya/2016 (field)	nodule	17.45	---	18.16	21.00	vaccine & field	---	22.3	---	21.7
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Kazakhstan/2016 (field)	nodule	15.26	---	15.62	17.85	vaccine & field	---	20.0	---	20.1
Orenburg/2017 (field)	blood	26.51	---	27.67	---	vaccine	---	28.6	---	32.7
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Samara/2017 (vaccine-like virus)	blood	---	30.05	25.54	---	vaccine	27.3	---	25.79	---
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Chelyabinsk/2018 (recombinant)	blood	---	---	31.97	---	vaccine	35.6	---	---	---
Udmurtiya/2019 (recombinant)	blood	33.93	---	30.75	---	vaccine	34.5	---	39.19	---
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Omsk/2019 (recombinant)	blood	---	---	26.23	30.64	vaccine & field	32.2	---	---	31.5
Saratov/2019 (recombinant)	blood	---	---	33.14	---	vaccine	35.0	---	---	---

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1) Use of DIVA PCR

13 field isolates since 2017:

- ID Vet:
  3/13 field
  6/13 vaccine
  4/13 undetected
- Biosellal:
  12/13 vaccine
  1/13 vaccine/field

Isolate	Type of sample	ID Vet DIVA		Biosellal			Agianniotaki GPCR vaccine	Agianniotaki GPCR field	Sprygin Vaccine (ORF008)	Sprygin Field (ORF126)
		field	vaccine	FAM	VIC	Result *				
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Saratov/2019 (recombinant)	blood	---	---	33.14	---	vaccine	35.0	---	---	---

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1) Use of DIVA PCR

13 field isolates since 2017:

- Agianniotaki
  13/13 vaccine
- Sprygin:
  7/13 vaccine
  1/13 field
  5/13 undetected

Isolate	Type of sample	ID Vet DIVA		Biosellal			Agianniotaki GPCR vaccine	Agianniotaki GPCR field	Sprygin Vaccine (ORF008)	Sprygin Field (ORF126)
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1) Use of DIVA PCR

Authors conclusion:

- Current DIVA unable to correctly identify strains currently circulation in Russian and Asian regions.
- Large difference between field isolates in PCR profiles
- Raise issue of current OIE exemption on Neethling vaccine isolates

1) Use of DIVA PCR

EURL opinion:

- Very important findings
- Full genome sequencing of every isolate: useful, but not practical
- Development of new molecular assays: take time
- Agianniotaki 2017 detects all strains in panel. Field isolates with different PCR profiles (last group) are all detected as vaccine (no undetected).
- OIE LSD chapter should be reviewed, including notification
- Offering collaboration and independent confirmation
- Importance of strain sharing and characterization in the context of European preparedness

2) Proficiency test

Objective:

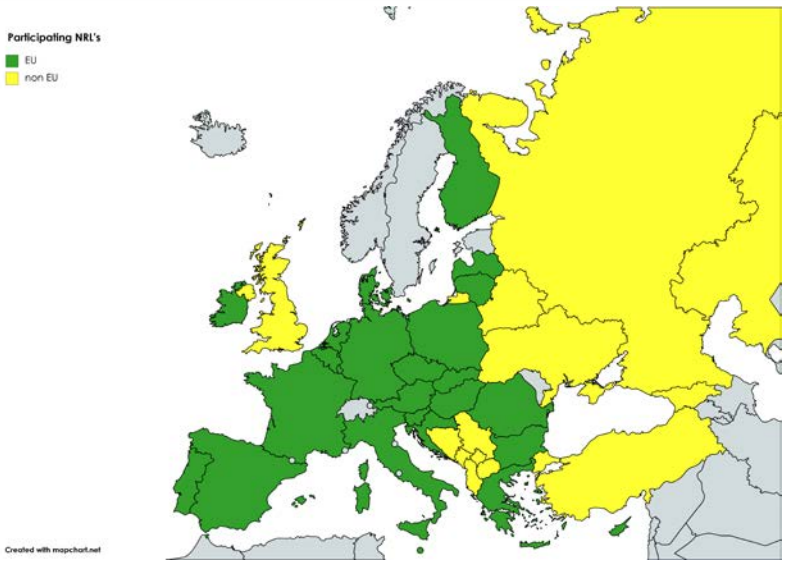
to assess the ability of National Reference Laboratories to perform

- Capripox Virus serological diagnosis
- Capripox Virus molecular virology diagnosis

using their primary diagnostic assay(s)

ISO17043 ‘Conformity assessment - General requirements for proficiency testing’

2) Proficiency test



38 NRL

24 EU
14 3rd countries

31
serology and virology

6
Virology only

1
Serology only

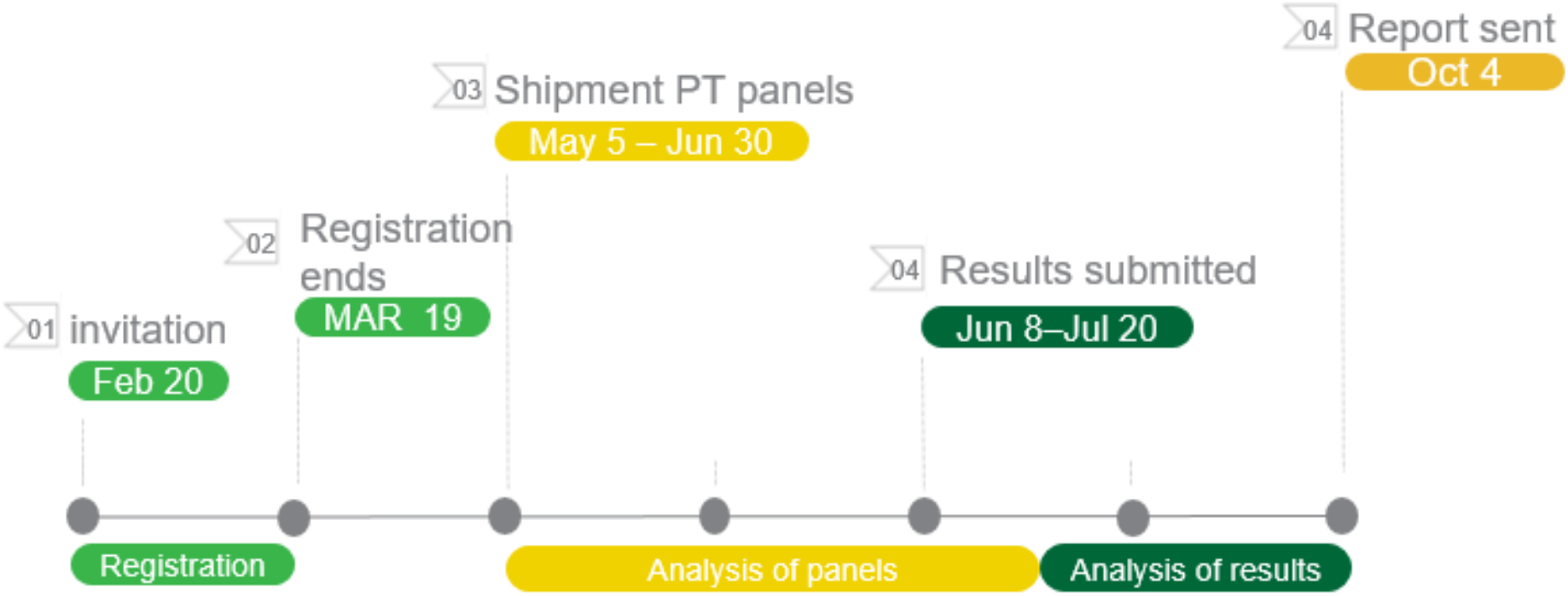
20 EU
11 3rd countries

3 EU
3 3rd countries

1 EU

+ South Korea: serology and virology

2) Proficiency test



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2) Proficiency test

- Serology: all participating laboratories achieved a satisfactory performance
- Virology: 34 out of 37 participating laboratories achieved a satisfactory performance
  - Follow-up for 3 laboratories

- In addition to PT for South Korea, help on diagnostics implementation and development for Vietnam
- Participation in GF-TADs LSD meeting for Asia and the Pacific

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3) Vaccine control

- Independent vaccine testing
  - *In vitro*
  - *In vivo*

→ Identification of BVD in 1 vaccine batch (not used in Europe)

→ Severe local reaction in vaccinated animals with different vaccine batches (not used in Europe)

4) summary

EURL

- Independent vaccine control
- Characterization of strains
- Validation of diagnostics
- Help for 3rd countries in LSD diagnostics

Thanks to the EC for the support

EU Reference Laboratory for Capripox viruses

Funded by the European Union

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