

ATELIER RÉGIONAL SUR LA PROCÉDURE OIE POUR LA VALIDATION D'UN PROGRAMME NATIONAL OFFICIEL DE CONTRÔLE AU REGARD DE LA FIÈVRE APHTEUSE ET DE LA PESTE DES PETITS RUMINANTS



ISTITUTO ZOOPROFILATTICO SPERIMENTALE
DELLA LOMBARDIA E DELL'EMILIA ROMAGNA
"BRUNO UBERTINI"
ENTE SANITARIO DI DIRITTO PUBBLICO

LA NOSTRA
ESPERIENZA,
LA VOSTRA
SICUREZZA.

SPÉCIFICITÉS POUR LA SURVEILLANCE DE LA FIÈVRE APHTEUSE DANS LA RÉGION

Tunis, Tunisie, 14-16 mars 2017

Emiliana Brocchi

OIE/FAO/National Reference Laboratory for FMD – IZSLER, Brescia - Italy



OUTLINE OF THE PRESENTATION



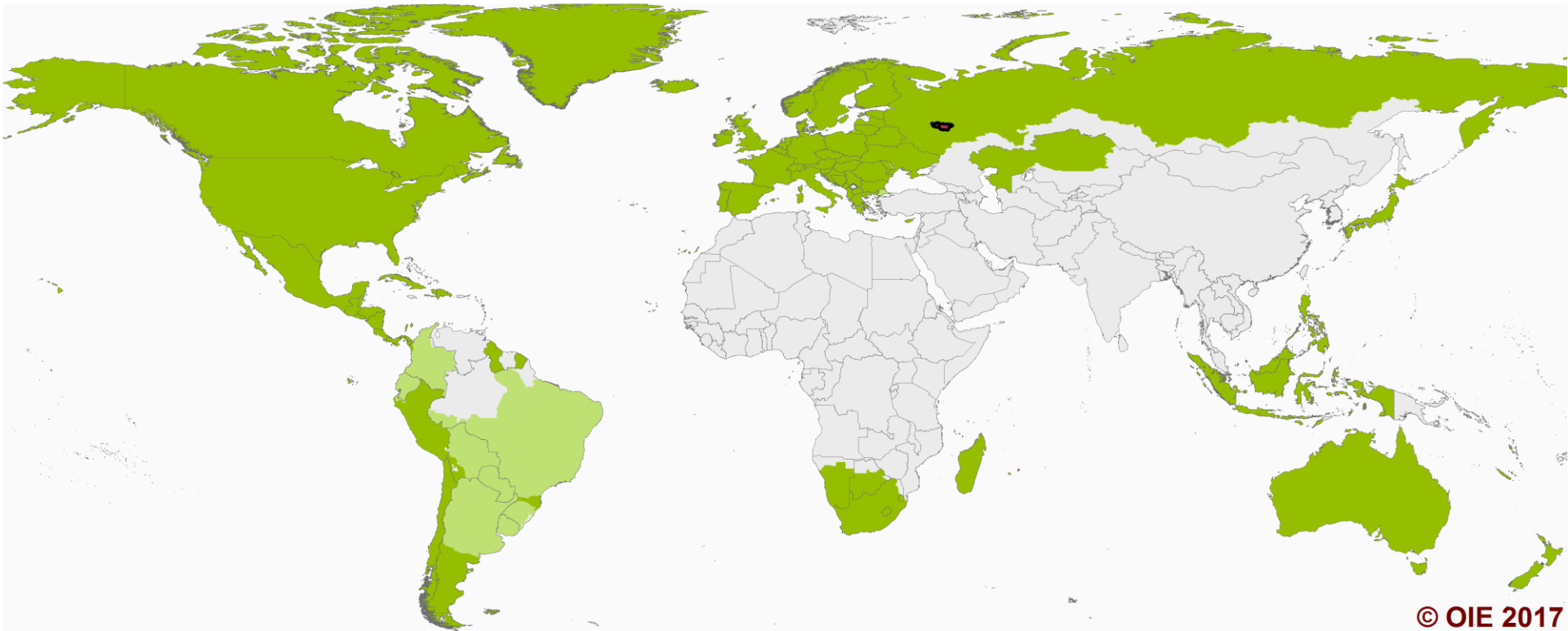
- Global distribution of FMD
- The International Context (Global strategy for FMD control)
- Progressive approach for the control of FMD (PCP)
- FMD-PCP: focus on stages 1-3
- Principles and scopes of FMD surveillance
- Interpretation of surveillance results and follow-up of positives



OIE Member Countries' official FMD status map

Last update January 2017

[Click on a specific region to zoom in](#)



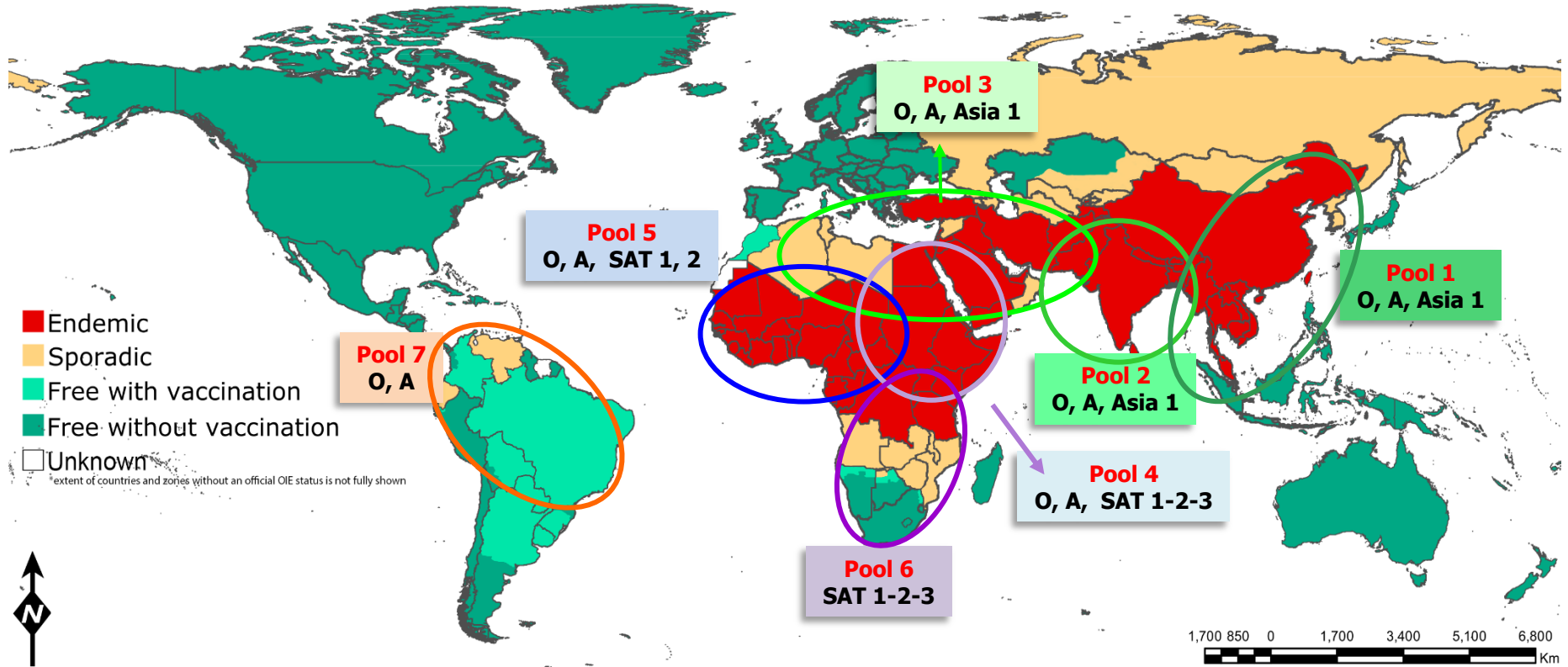
© OIE 2017

-  Member Countries and zones recognised as free from FMD without vaccination
-  Member Countries and zones recognised as free from FMD with vaccination
-  Countries and zones without an OIE official status for FMD
-  Containment zone within a FMD free zone without vaccination
-  Suspension of FMD free status without vaccination



FMD: Conjectured global status

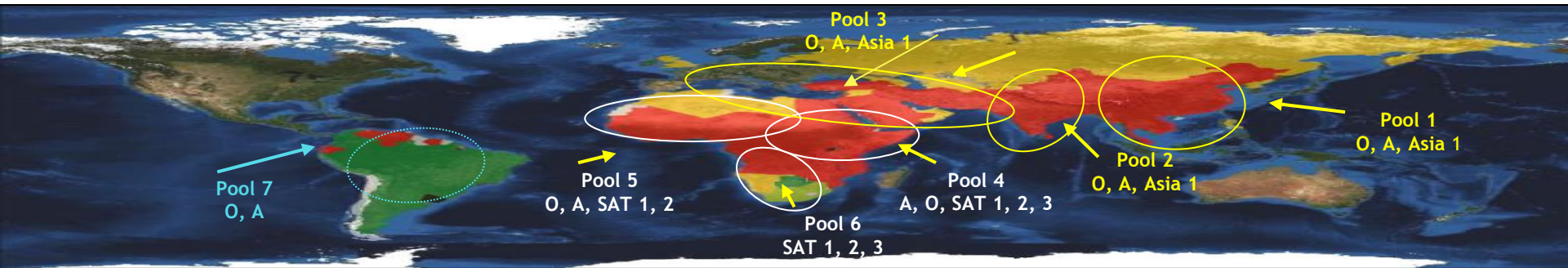
7 endemic pools of FMD viruses



✓ No outbreaks due to serotype C since 2004 (>12 years)



Visualization of FMD by Regional Virus Pools



- Divides the Globe into 7 virus pools, each with
- Multiple serotypes but topotypes mainly confined to that pool
- **Each pool may need tailored vaccines, diagnostics and control strategies**



Global FMD control strategy



THE GLOBAL FOOT AND MOUTH DISEASE CONTROL STRATEGY

STRENGTHENING ANIMAL HEALTH SYSTEMS THROUGH IMPROVED CONTROL OF MAJOR DISEASES

2012



BANGKOK, THAILAND 27-29 JUNE 2012



FAO/OIE Global Conference on
Foot-and-Mouth Disease control

Three Components

1. Improving global FMD control
Main tool → **Progressive Control Pathway (FMD-PCP)**
2. Strengthening Veterinary Services
Main tool → **OIE Performance of Veterinary Services (PVS) Evaluation tool**
3. Improving the prevention and control of other major diseases of livestock

- Developed to assist **endemic countries** to progressively reduce the impact of FMD and increase the level of FMD control
- 6 stages (0 to 5: **from endemic toward free status**)
- In each Stage, specific outcomes need to be completed to progress to the next stage

The Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD)





FMDV distribution by serotypes for POOL 5 West Central Africa



Based on reports to OIE 2012-2016

Probable multiple topotypes within serotypes in FMDV pool 5



Étape 1

Recenser les
risques et les
options en
matière de lutte

Étape 0

Absence de
données fiables
Le risk de FA n'est
pas maîtrisé

DE ÉTAPE 0 A ÉTAPE 1

***Une etude approfondie sur
l'epidemiologie de la FA è prevue***

ACTIVITÉ	LABORATOIRE TOOLS
Surveillance clinique de la FA	Ag-ELISA & LFD
Pays serosurvey (niveau de circulation du virus)	NSP - Ab ELISA

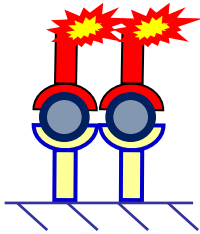
Lien avec un laboratoire international devrait être maintenu - envoi d'échantillons



Ag-ELISA kit for FMD diagnosis



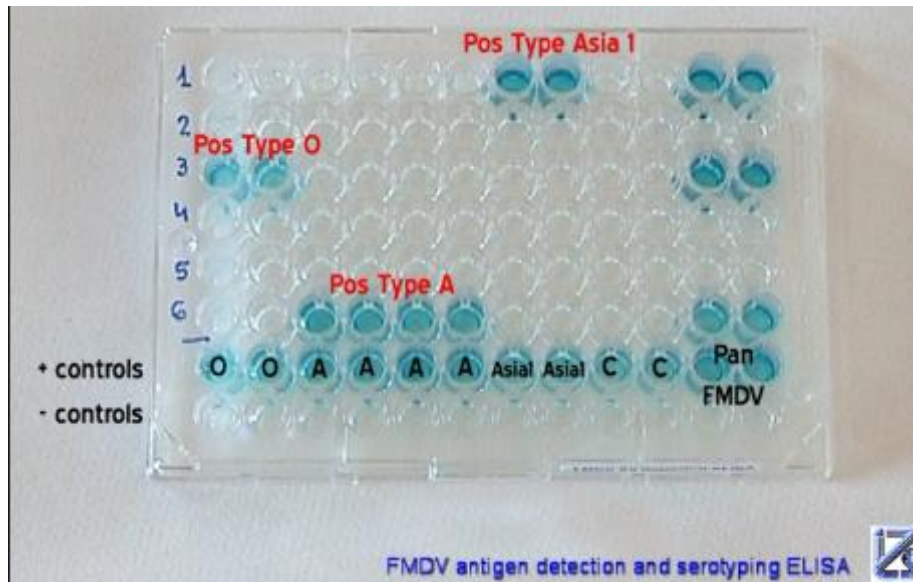
**VIRUS DETECTION AND TYPING IN 2.5 HOURS – VESICULAR EPITHELIUM
VESICULAR FLUID, SALIVA**



Pan-FMDV detector Ab

FMD Virus (Ag) (sample to test)

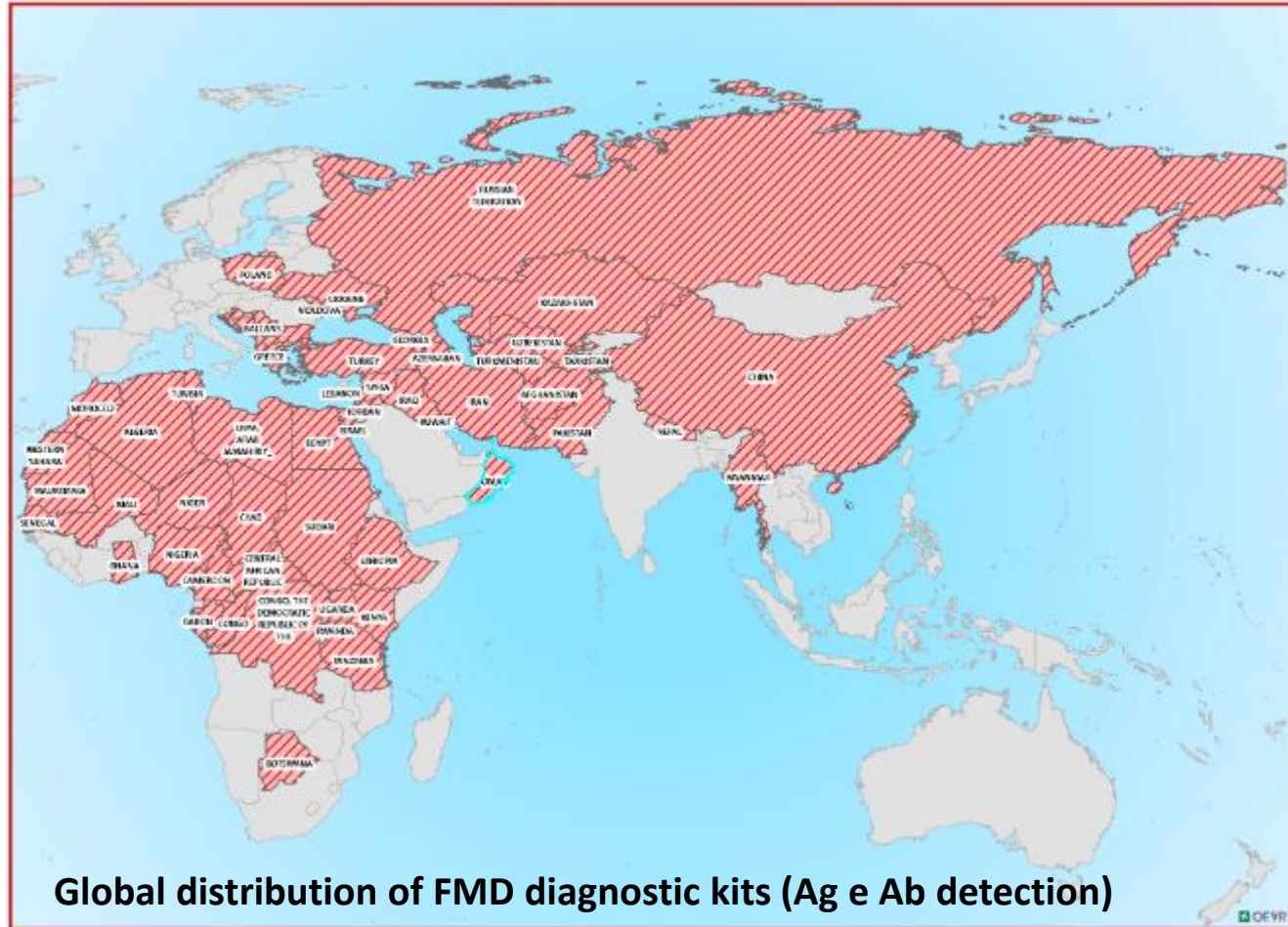
Battery of type-specific catching Ab



- ✓ Stable, robust, fast, simple (only two reagents to handle)
- ✓ All inclusive and ready-to-use kit
- ✓ Used in Africa, Asia, Middle East



Delivery of IZSLER diagnostic kits



Availability of simple diagnostic tools in several endemic countries created laboratory capacity and enabled FMD diagnosis for the first time



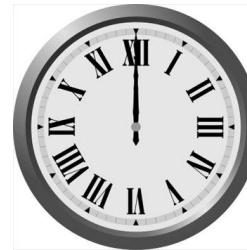
FMD pen-side diagnosis – Strip test



(collaboration between IZSLER – WRL Pirbright – Svanova)



- ✓ Simple
- ✓ Robust
- ✓ Stable
- ✓ **Fast (15 min)**



- ✓ **Pan-FMD diagnosis** (Monoclonal Antibody cross-reactive with 7 serotypes)
- ✓ **Sensitivity similar to ELISA tests (about 80%)**
Reliable for diagnosis of clinical cases (epithelium, vesicular fluid, saliva)



Test for **serosurvey** suited to enter in Stage 1

Antibodies to **Non Structural Proteins (NSP)**

only in infected animals

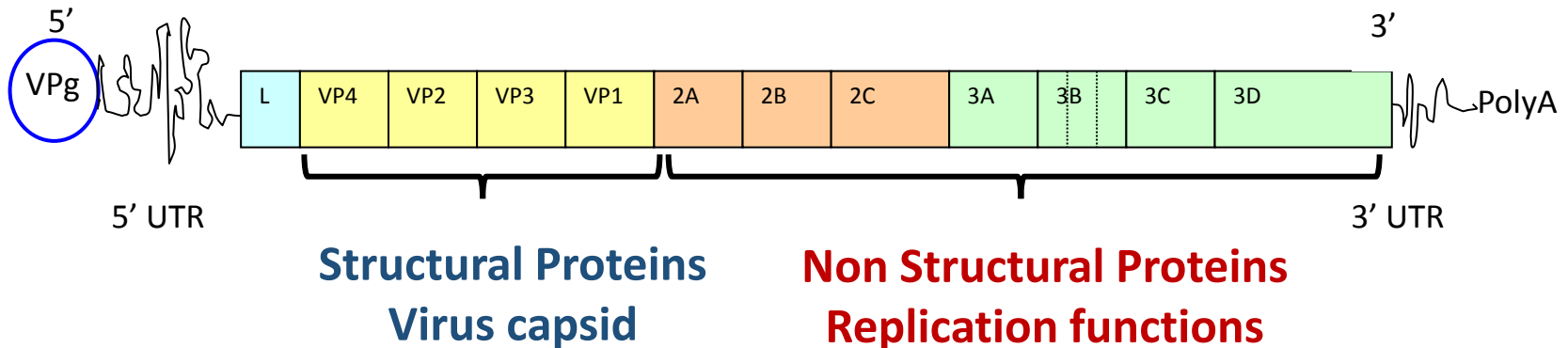
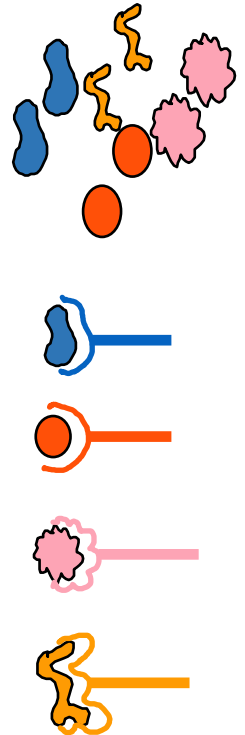
common to all 7 serotypes

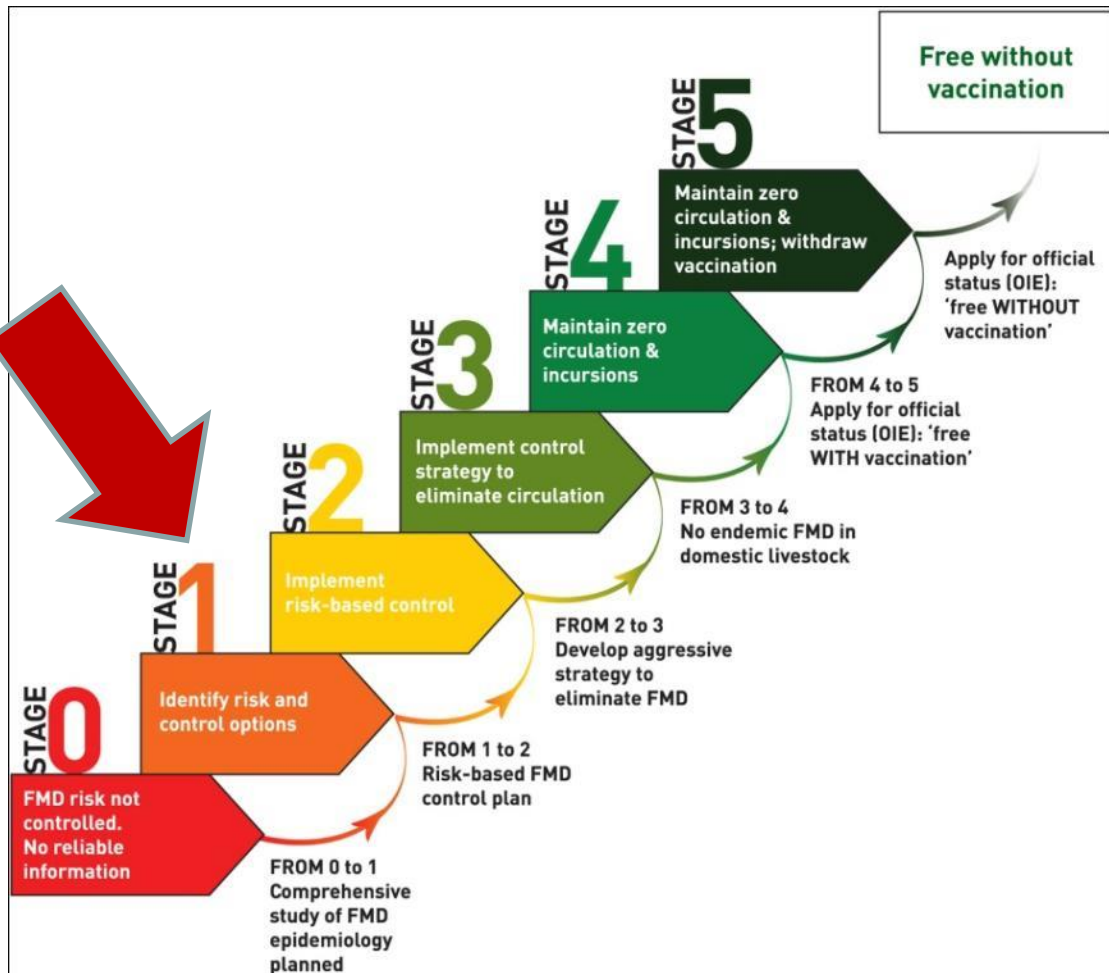
O / A / C / Asia 1 / SAT 1 / SAT 2 / SAT 3

NSP test → A unique assay for all FMD virus types

DIVA test → differentiation vaccinated-infected

ELISA kits commercially available





Objectif de l'Étape 1:

"Bien comprendre l'épidémiologie de la FA dans le pays et mettre au point une approche fondée sur le **risque en vue d'atténuer l'impact de la maladie**"

Évaluation des risques

Stage 1 : Gain understanding of epidemiology and develop risk-based approach to reduce FMD impact

Understand Epidemiology

➤ **Composition and distribution of FMD-susceptible species**

- ✓ Livestock
- ✓ Wildlife

HOST



➤ **Laboratory data**

- ✓ Prevalence
- ✓ Circulating viral strains
- ✓ Spatial distribution

AGENT

ENVIRONMENT

- Husbandry systems
- Movements & marketing
- Socio-economic impact
- Strength of veterinary services

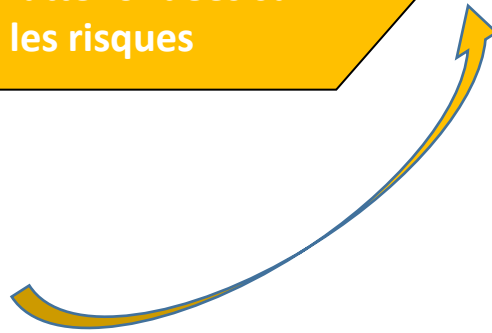


Étape 2

"Mettre en oeuvre
des mesures de
lutte fondées sur
les risques

Étape 1

Recenser les
risques et les
options en matière
de lutte



DE ÉTAPE 1 A ÉTAPE 2

*Un plan stratégique de lutte contre la fièvre aphteuse ayant pour objectif de **réduire** les effets la FA dans au moins une zone ou un secteur d'élevage **est mis au point***



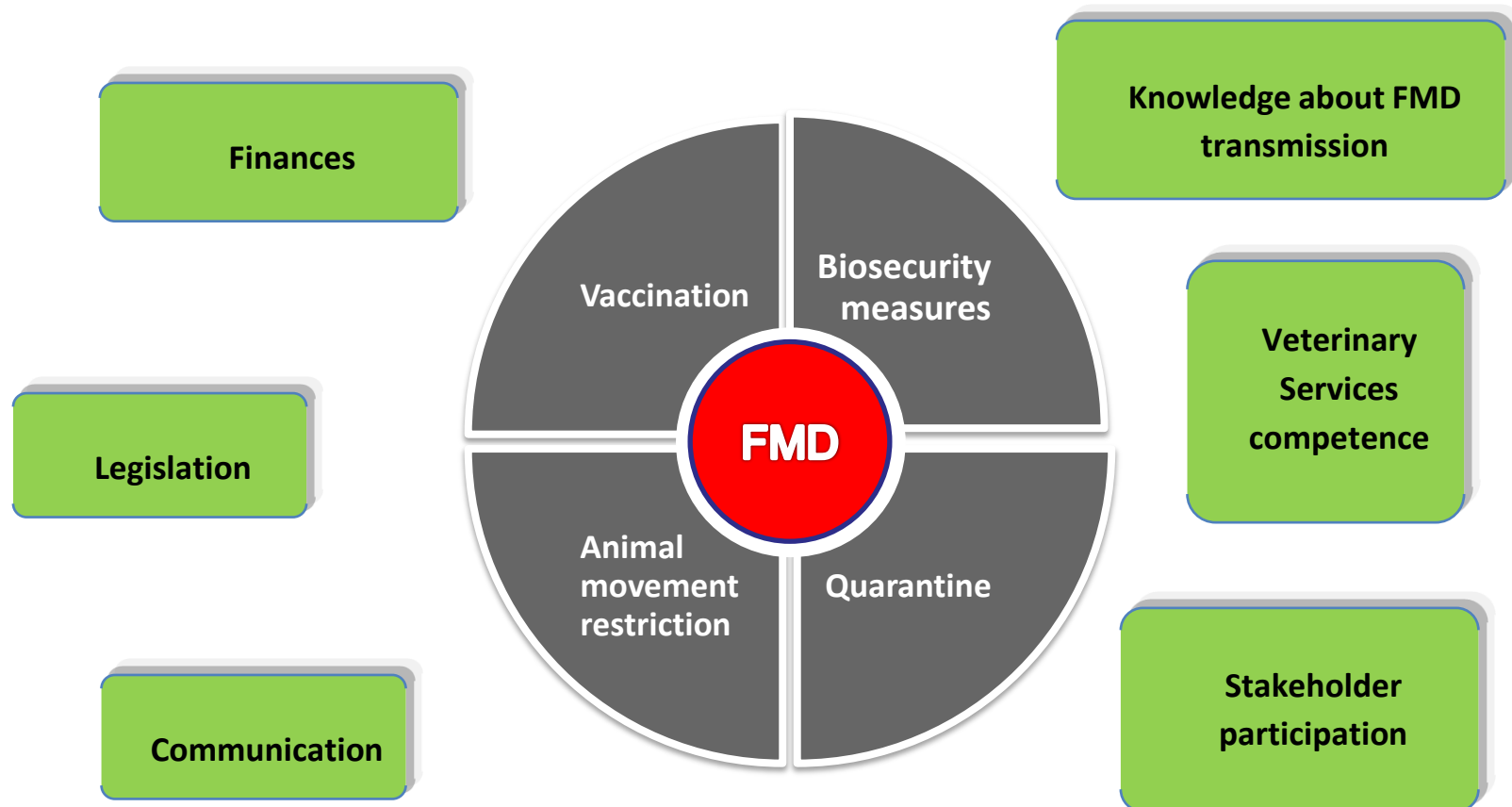
Objectif de l'étape 2:

"Mettre en oeuvre des mesures de lutte fondées sur les risques afin de **réduire l'impact de la fièvre aphteuse** sur un ou plusieurs secteurs d'élevage et/ou une ou plusieurs zones"

Gestion des risques au niveau du secteur

Risk management

FMD control



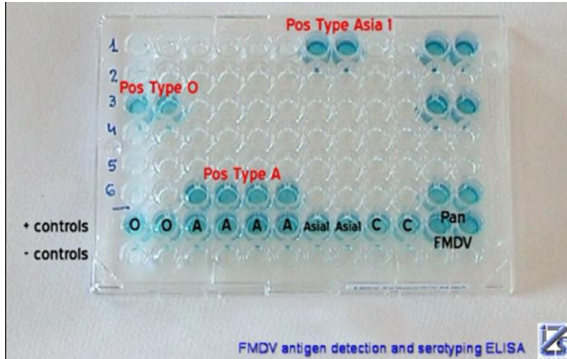


LABORATORY TESTS AT STAGE 2



VIRUS DETECTION

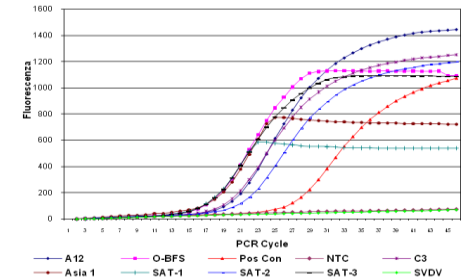
Ag ELISA



LFD



PCR



ANTIBODIES DETECTION

Antibodies to SP → type-specific (relatively)
Seven different assays, one for each FMD virus type



Antibodies to NSP → common to all 7 serotypes
O / A / C / Asia 1 / SAT 1 / SAT 2 / SAT 3
NSP tests → A unique assay for all FMD virus types



SP-ELISA

Vaccination monitoring

NSP-ELISA

(DIVA, differentiation infected/vaccinated)

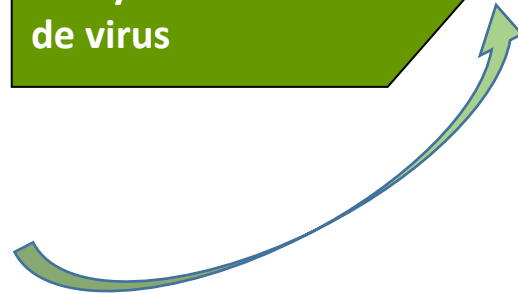


Étape 2

"Mettre en oeuvre des mesures de lutte fondées sur les risques"

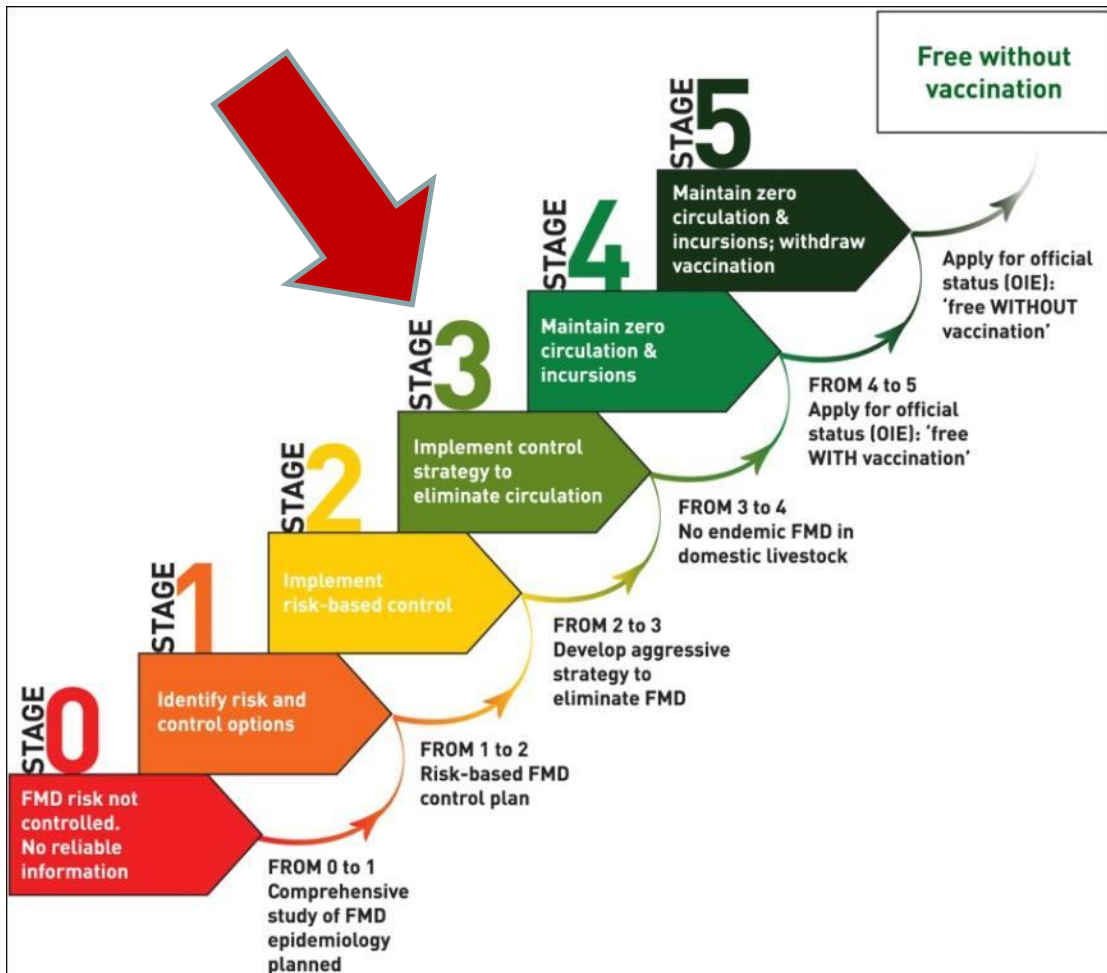
Étape 3

Mener une stratégie de lutte visant à enrayer la circulation de virus



DE ÉTAPE 2 A ÉTAPE 3

Une stratégie de lutte révisée, plus *offensive*, ayant pour but *d'éliminer la FA* dans au moins *une zone du pays*, a été élaborée



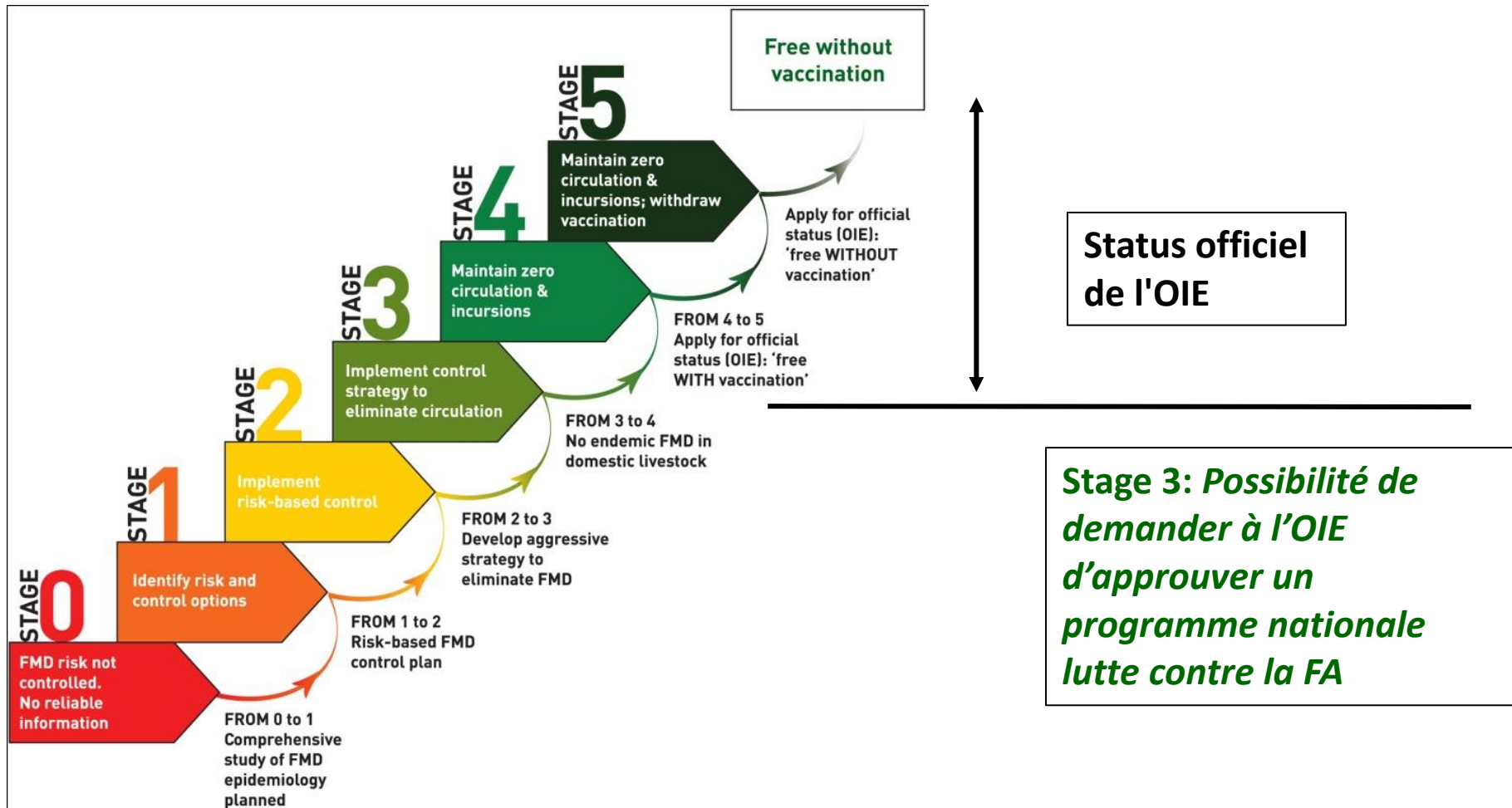
Objectif de l'etape 3:

"Réduction progressive des poussées épidémiques puis **élimination de la circulation du virus** de la FA parmi les animaux domestiques dans **au moins une zone du pays**".

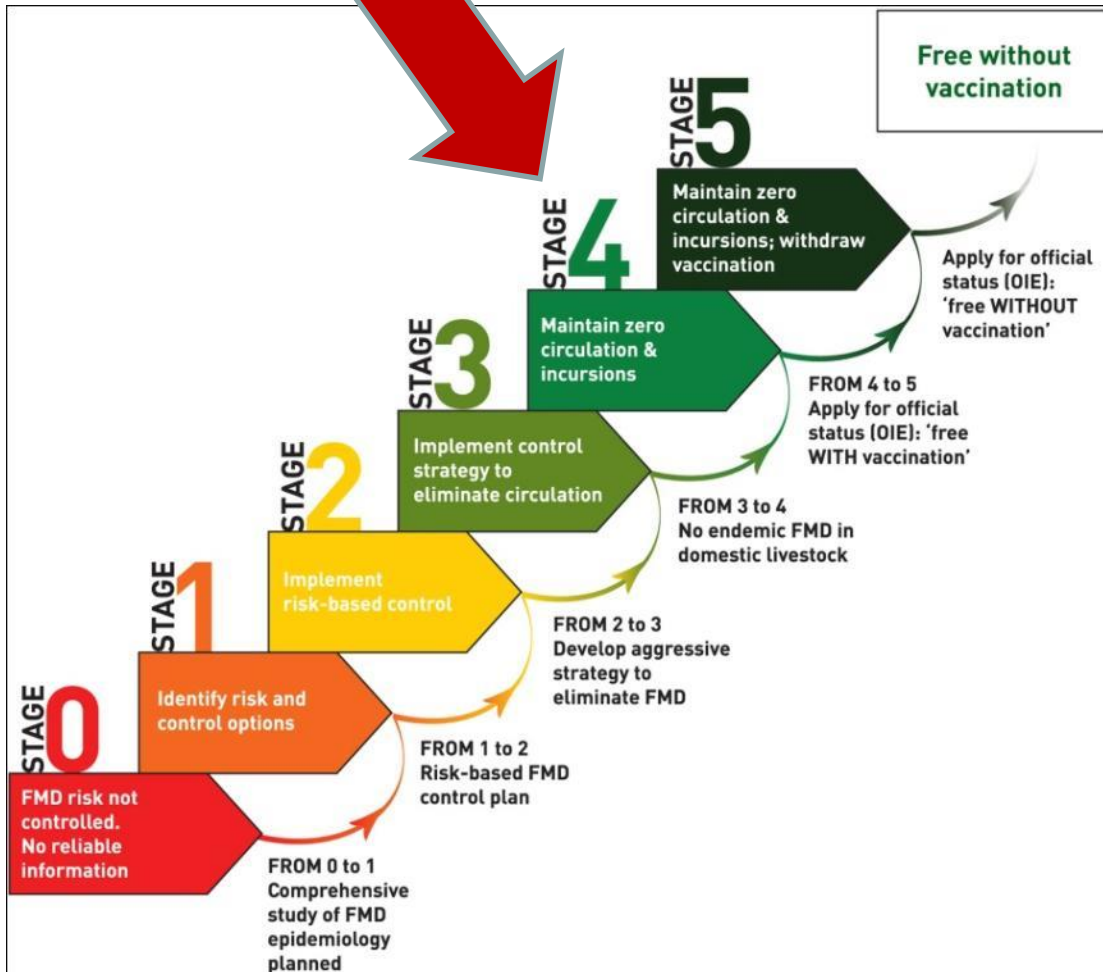
Gestion des risques au niveau de la population



Links between PCP-FMD and OIE health status



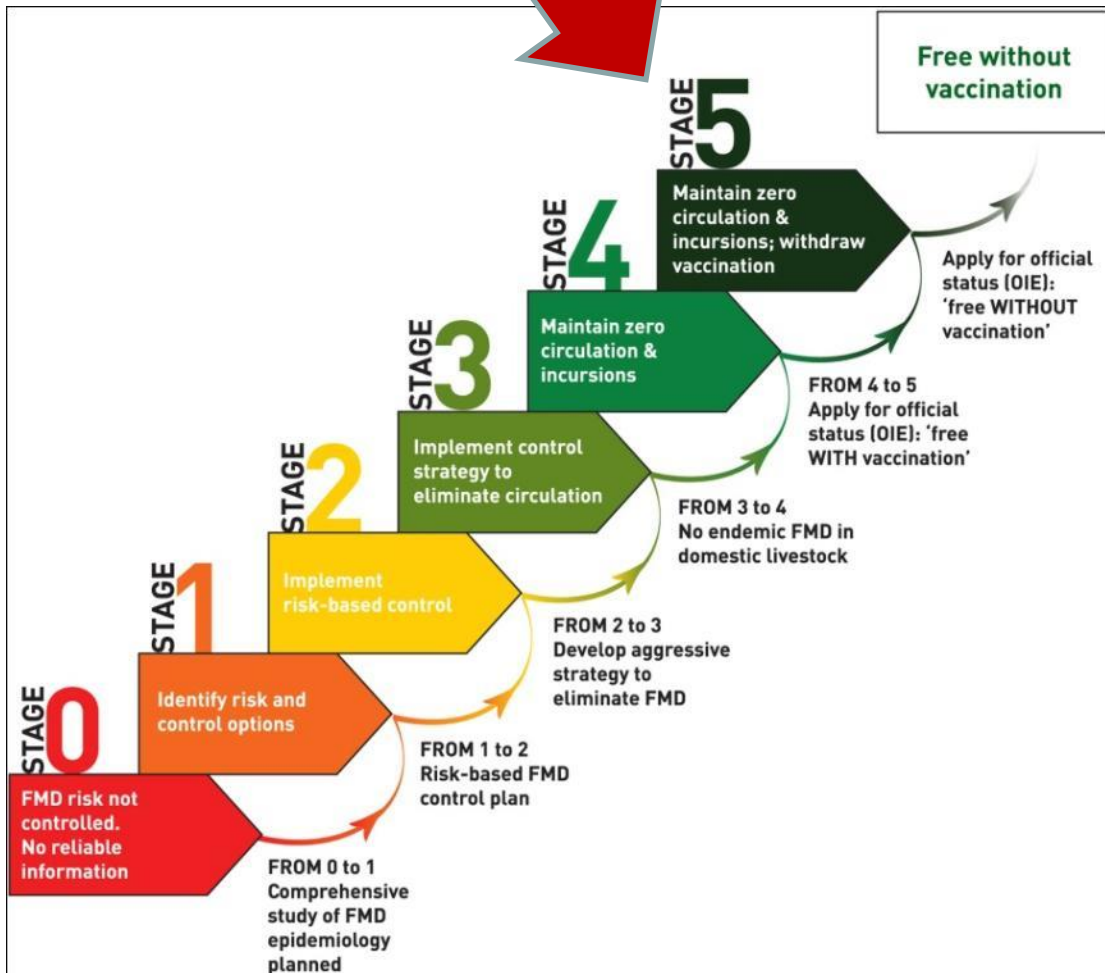
Progresser à l'étape 4 implique **l'intention d'éradiquer le virus de la FA des animaux domestiques**



Objectif de l'etape 4:

"Maintenir une "tolérance zéro" de la FA dans la zone/le pays concerné et obtenir à terme la reconnaissance par l'OIE du statut de "zone exempte de FA avec vaccination"

Supprimer durablement la circulation de virus et les incursions



Objectif de l'etape 5:

Maintenir une "incidence zéro" de la FA dans la zone/le pays et obtenir à terme la reconnaissance par l'OIE du statut de "zone exempte de FA sans vaccination"

Les prescriptions de l'OIE sont remplies et une demande est soumise à l'OIE en vue d'obtenir le statut de «zone exempte de FA sans vaccination»



The key principles of PCP-FMD



To summarize:

- For countries with endemic FMD
- FMD control is applied in achievable steps
- NON-prescriptive approach
- Uses Risk Analysis principles to prioritize risks that are considered most important (risk hotspots) and to promote control activities
- Make optimal use of limited resources for FMD control
- Ongoing monitoring and evaluation of activities (progressive increase in surveillance requirements)



FMD-PCP

Principes directeurs, description des Etapes et conditions à remplir disponible sur le site Web de l'EUFMD

<http://www.fao.org/ag/againfo/commissions/eufmd/commissions/eufmd-home/progressive-control-pathway-pcp/en/>

Agriculture and Consumer Protection Department
Animal Production and Health Division
 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
 for a world without hunger

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HOME THEMES PROGRAMMES/PROJECTS COMMISSIONS RESOURCES

COMMISSIONS

The European Commission for the control of Foot-and-Mouth disease

About EuFMD

The disease

Progressive Control Pathway (PCP)

Upcoming events

inPRESSive!

Training

Situation Reports

Newsletters

Reports

Maps

PCP_NEW.wmv

From 2 to 3

Develop aggressive strategy to eliminate FMD from at least a zone of the country

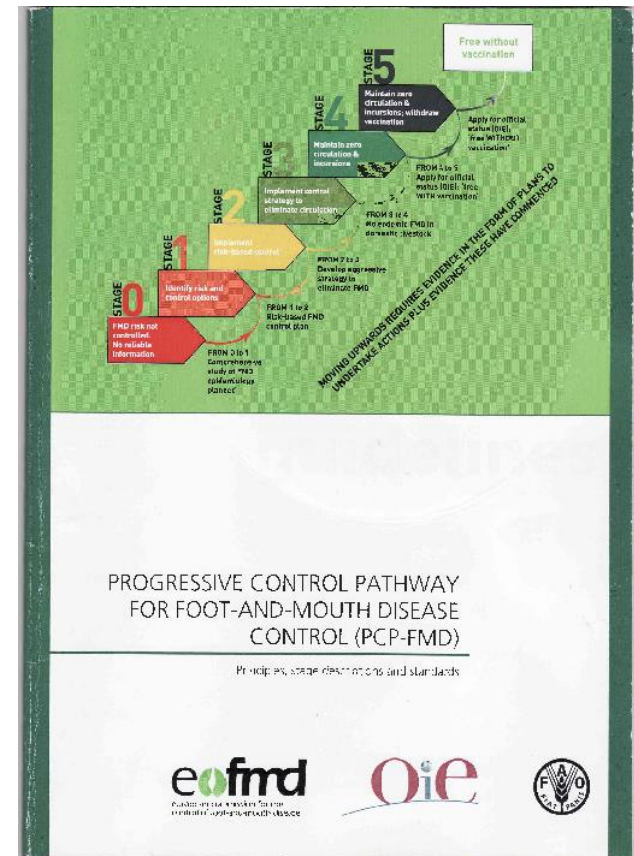
Progressive Control Pathway (PCP)

The Progressive Control Pathway (PCP) is the approach developed by an FAO team for classifying country progress in FMD risk management. In this approach there are criteria for describing the FMD risk management position of countries that are not-free of FMD. It has lead to a tool that can be applied to measure (and communicate) country progress within regional roadmaps, and aims at starting countries along a pathway of activities from measuring risk to risk management, covering the stages before they could apply for recognition of disease freedom.

The Progressive Control Pathway recognises that differences in

Related documents...

The Progressive Control





Principles and scopes of FMD surveillance

1. Early detection
 - ✓ Clinical surveillance
 - ✓ Laboratory support for confirmation of suspected cases
2. Demonstration of freedom
 - ✓ Continuing programme
 - ✓ Epidemiological context and history
 - ✓ Freedom without vaccination → surveillance to demonstrate no evidence of infection
 - ✓ Freedom with vaccination → surveillance to demonstrate no transmission
 - ✓ Target animals subpopulation (age, species, vaccination status, ...)
3. OIE endorsed official control programme
4. Surveillance strategies (randomised or targeted)
5. Follow-up suspected cases and results interpretation
6. Demonstration of population immunity

SURVEILLANCE : clinical, virological, serological

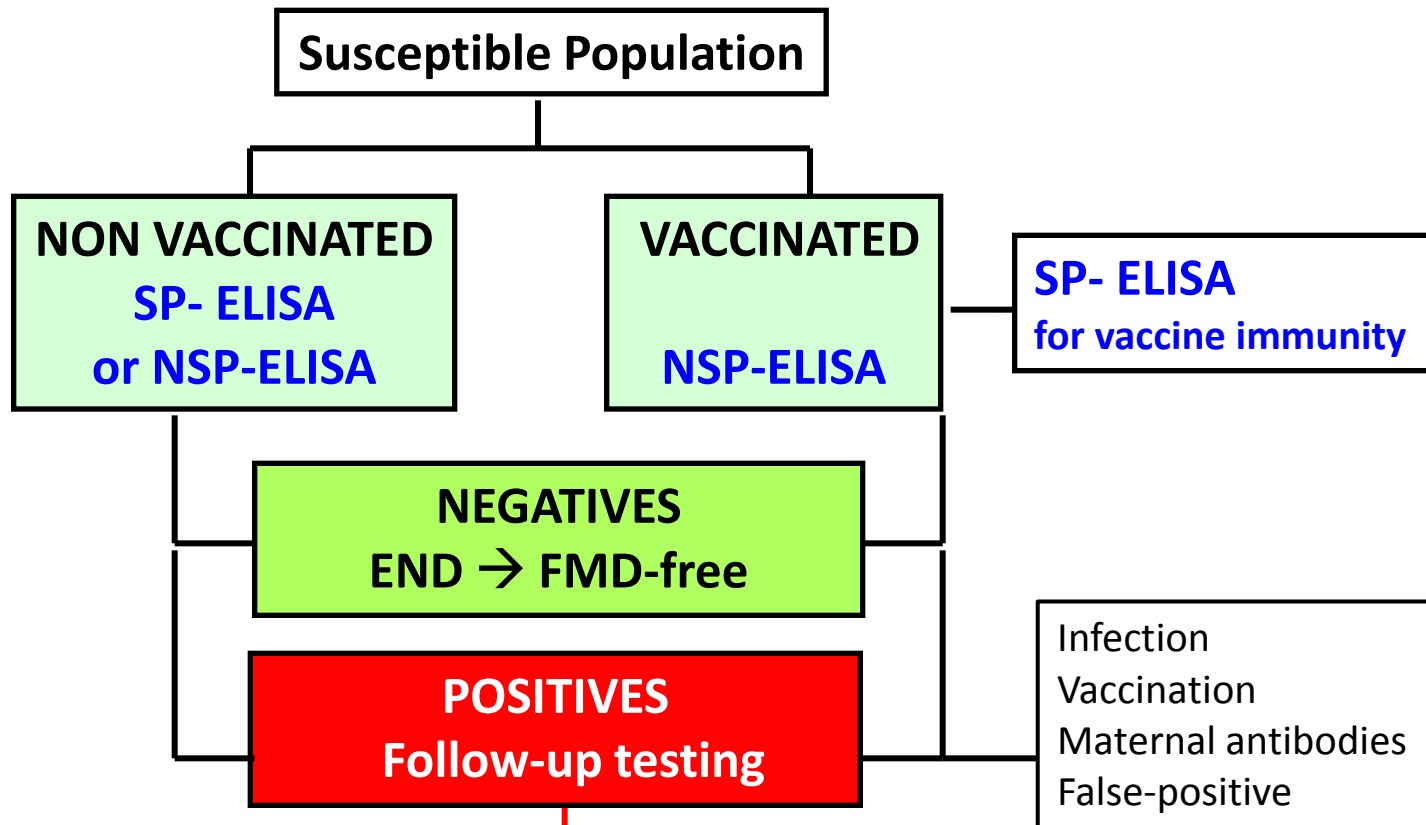


Applications of serology in FMD

- ✓ Investigate suspect cases
(during outbreaks/epidemics)
- ✓ Quantify prevalence of infection
- ✓ Monitor viral circulation
- ✓ Post-Vaccination Monitoring (PVM)
 - Vaccinal coverage
 - Population immunity



Use of serology for definition of “FMD status”



Confirmatory serological assays
Virological assays (probang for carriers, subclinical infect.)
Further sampling & epidemiological interpretation

MERCI

THANK YOU

GRAZIE



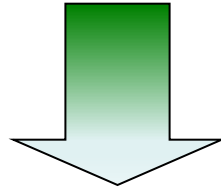
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FMD – SEROLOGICAL DIAGNOSIS

- ✓ **Virus and viral products are accessible only for short periods**
- ✓ **Antibodies persist for months or years**

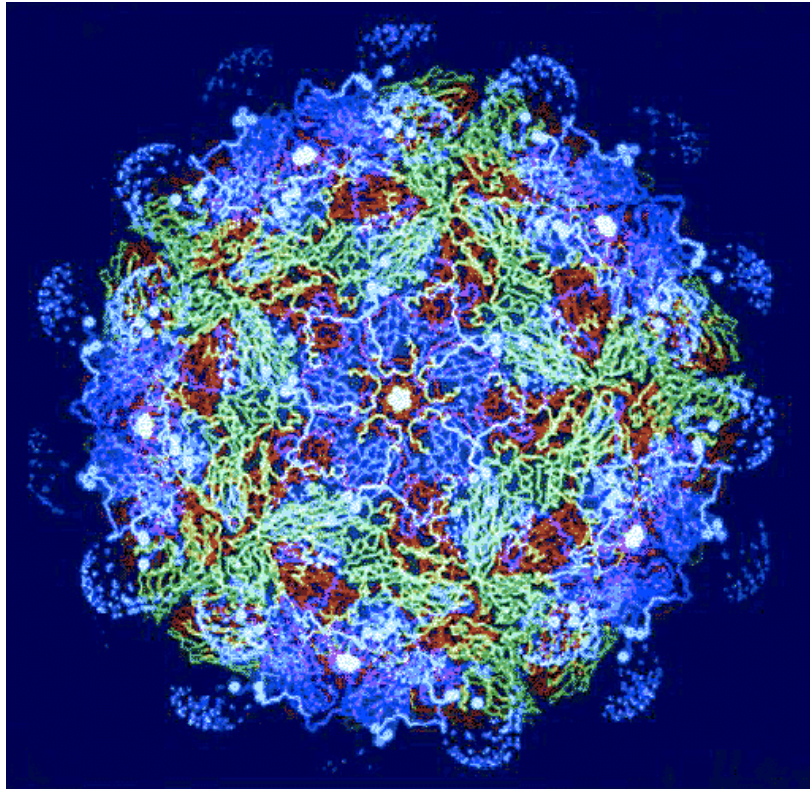


Serology may provide answers to diverse epidemiological needs

Therefore, control of FMD depends largely upon assessment of antibodies



FMD Virus and humoral response

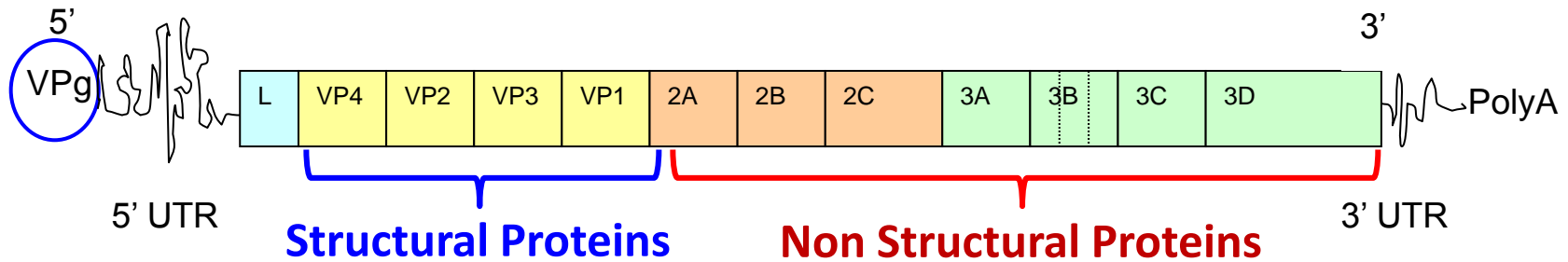


Structural Proteins = SP
(virus capsid)

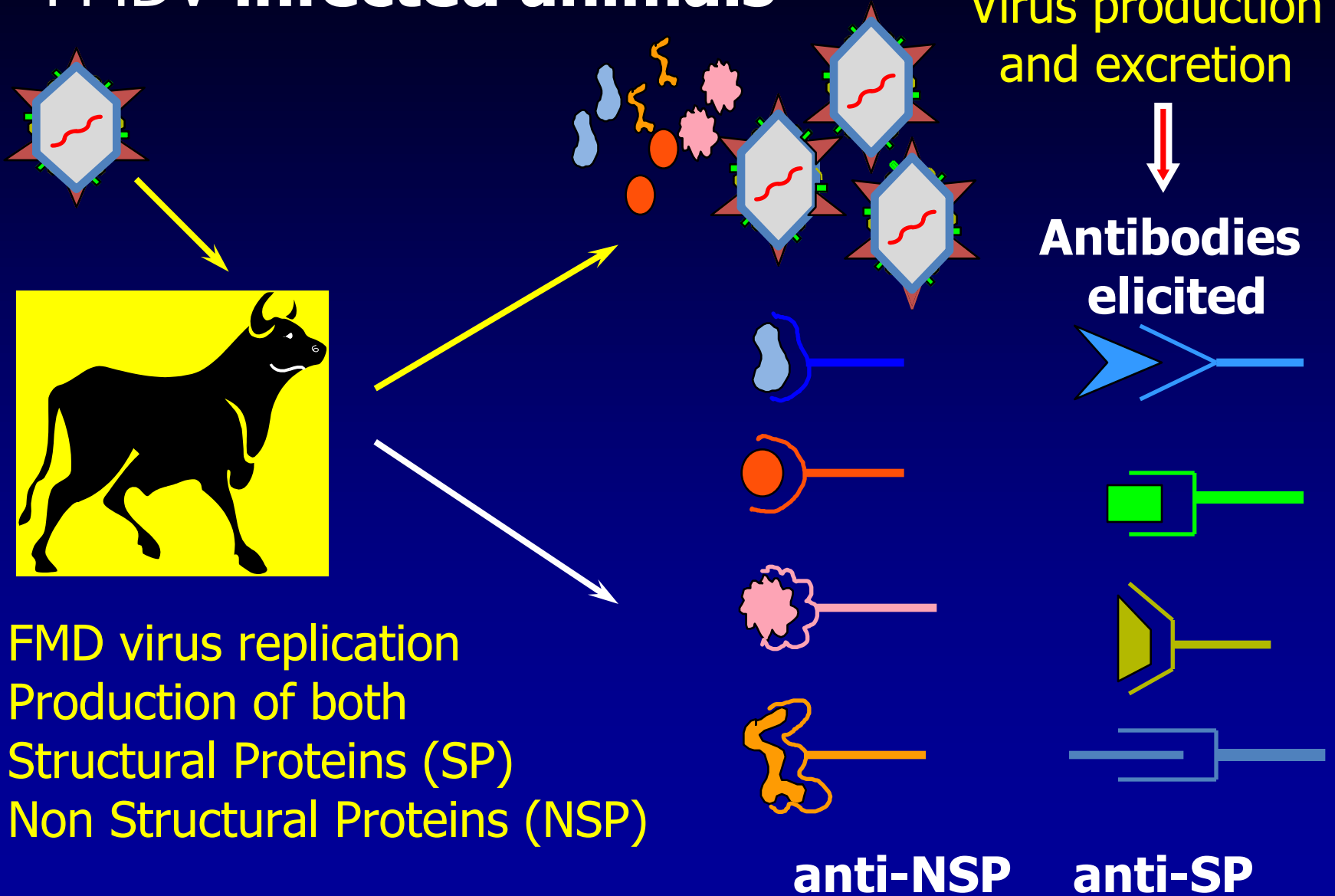
Antibodies anti-SP

Non Structural Proteins = NSP
(virus replication function)

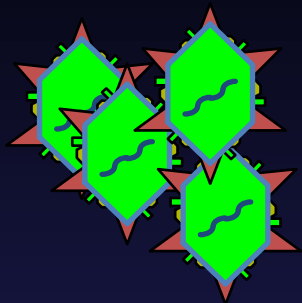
Antibodies anti-NSP



Humoral response in FMDV infected animals



Humoral response in FMDV vaccinated animals



FMDV vaccines:
Inactivated virus
NSP-free

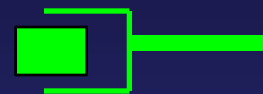
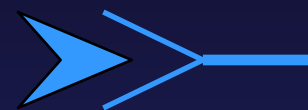


No replication of FMD virus

No production of NSP

Immune system exposed to Structural Proteins (SP)

**Antibodies
elicited only against
Structural Proteins (SP)**



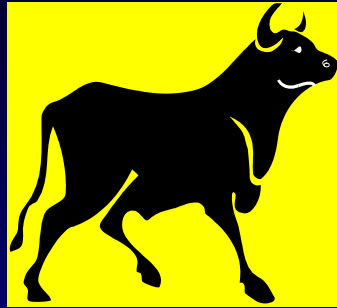
Serological assays

Immune status

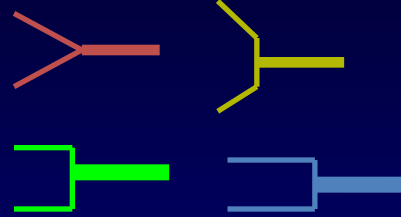
Ab anti-SP

Ab anti-NSP

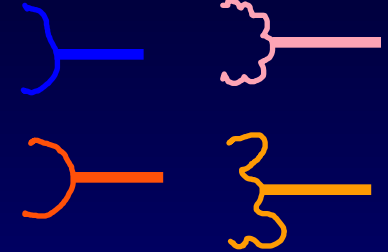
infected



+



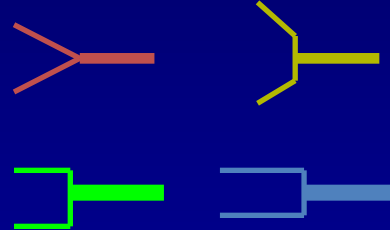
+



vaccinated



+



-

naive



-

-

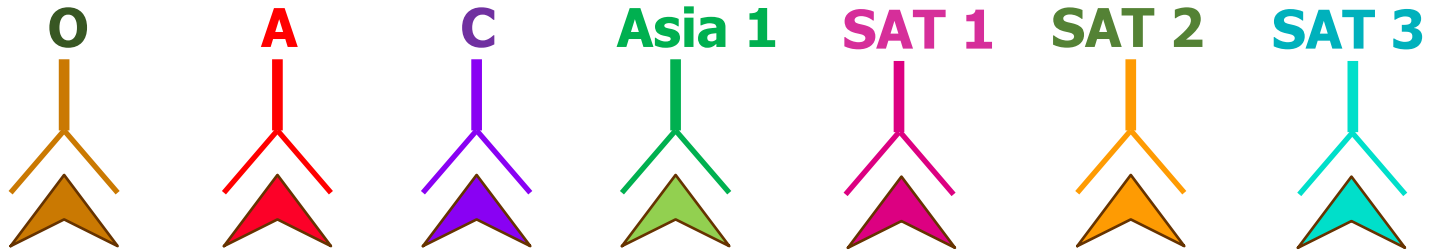


SEROLOGICAL TESTS



Antibodies to SP → type-specific (relatively)

Seven different assays, one for each FMD virus type



Antibodies to NSP → common to all 7 serotypes

O / A / C / Asia 1 / SAT 1 / SAT 2 / SAT 3

NSP tests → A unique assay for all FMD virus types

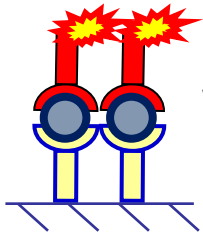




Portfolio of ready-to-use diagnostic kits (ELISAs) produced at IZSLER

VIRUS detection

FMDV ANTIGEN DETECTION
ELISA and SEROTYPING OF
**FMDV O, A, ASIA 1, C, SAT1
and SAT2**



Pan-FMDV detector MAb

Virus (Ag) FMDV

Battery type-specific MAbs



ANTIBODY detection

SOLID-PHASE COMPETITIVE ELISA
(SPCE) FOR ANTIBODIES SPECIFIC TO
FMDV SEROTYPE O

SOLID-PHASE COMPETITIVE ELISA
(SPCE) FOR ANTIBODIES SPECIFIC TO
FMDV SEROTYPE A

SOLID-PHASE COMPETITIVE ELISA
(SPCE) FOR ANTIBODIES SPECIFIC TO
FMDV SEROTYPE Asia 1

SOLID-PHASE COMPETITIVE ELISA
(SPCE) FOR ANTIBODIES SPECIFIC TO
FMDV SEROTYPE SAT 2

SOLID-PHASE COMPETITIVE ELISA
(SPCE) FOR ANTIBODIES SPECIFIC TO
FMDV SEROTYPE SAT 1

DIVA TEST
FMDV 3ABC-TRAPPING INDIRECT ELISA





TRAINING at IZSLER – Laboratory Diagnosis

November 2009: **Iran, Arm, Azerb, Georgia**



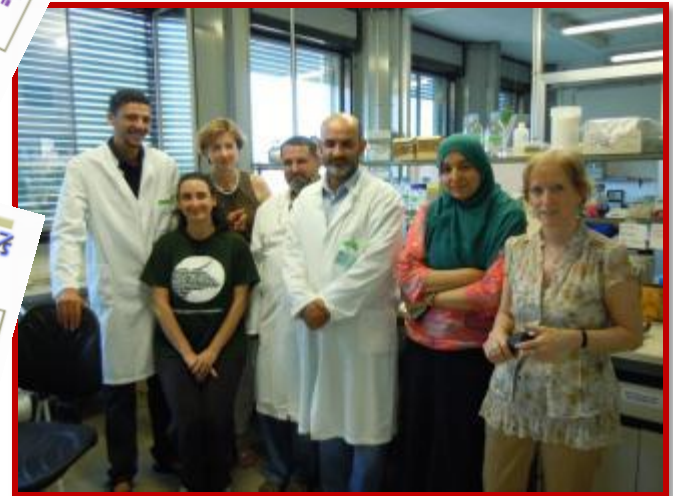
December 2008: **Pak, Afgh, China**



May 2011: **Tajikistan**

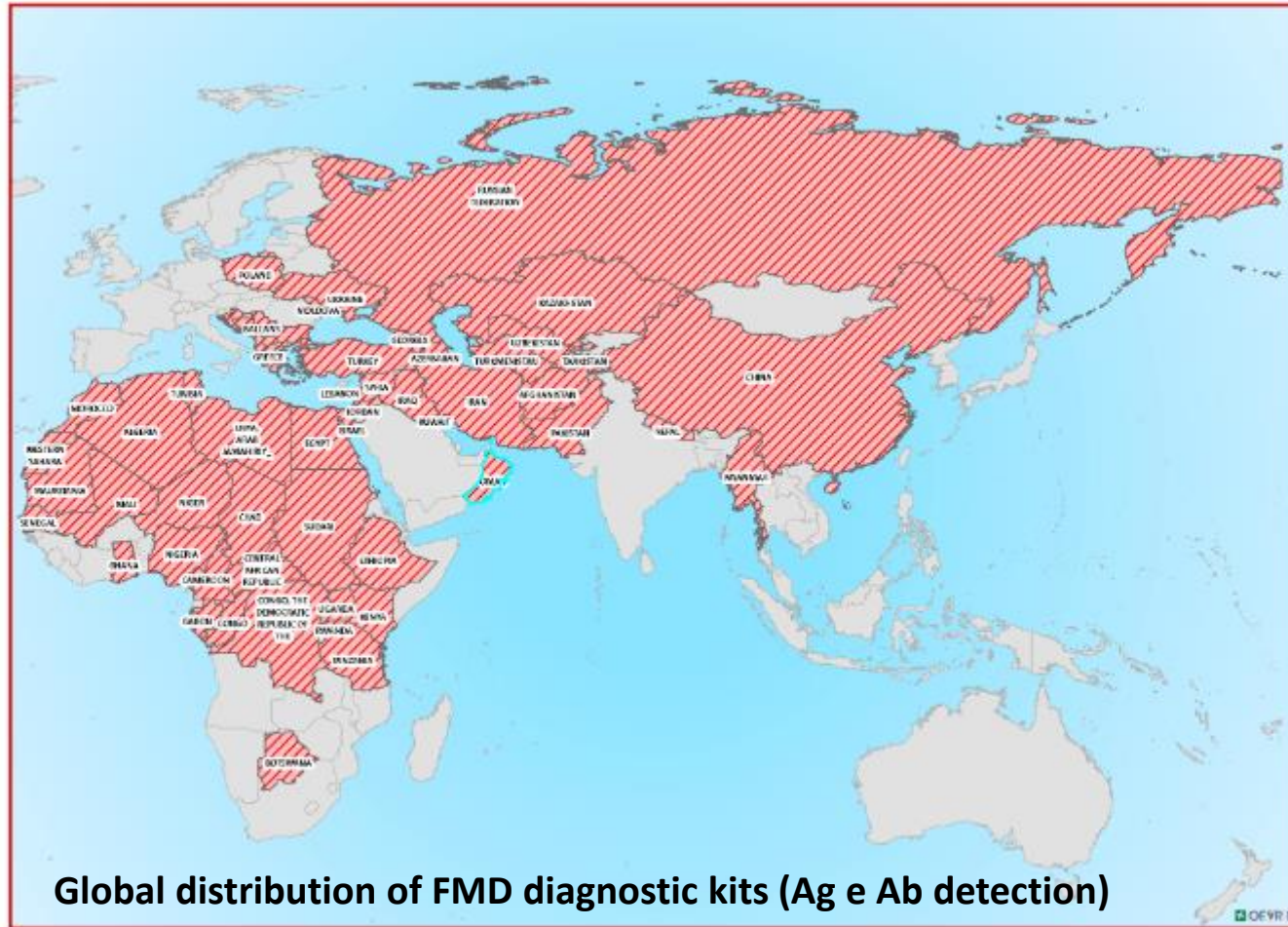


June 2013: **Libya**





Delivery of IZSLER diagnostic kits



Availability of simple diagnostic tools in several endemic countries created laboratory capacity and enabled FMD diagnosis for the first time