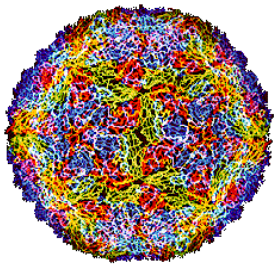
Foot-and-Mouth Disease

SAND2014-2337P



Regional FMD situation and prospects for co-ordinated control (Progressive Control Pathway) (PCP-FMD)

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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. **SAND**

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SOME EPIDEMIOLOGICAL FEATURES

- FMD primarily affects cloven-hooved domestic and wild animals, especially cattle, water buffaloes, sheep, goats and swine,
- There are 7 immunologically distinct serotypes identified by the letters A, O, [C], and Asia1 [SAT 1.2,3].
- 3 are particularly important for Iraq: A, O, Asia 1
- Within each serotype there is great antigenic variation which affects the efficacy of the cross-protection accorded by vaccines. The viruses not only differ antigenically but also in such characteristics as host tropism and transmissibility.
- One should think of FMD as a complex of diseases and recognise the different epizootiological features of topotypes (geographically and immunologically distinct viruses).

SOME EPIDEMIOLOGICAL FEATURES (cont.)

STABILITY AND TRANSMISSION

- FMD virus is inactivated by extremes of pH (below 6.5 or above 11), desiccation and ultraviolet light. It can remain infectious on surfaces and in faeces and hay for many days.

- Transmission occurs between animals by aerosols generated from the respiratory and digestive tract as well as direct and indirect contact between animals. In temperate climates under cool, damp conditions with low insolation and favourable meteorological conditions, aerosol transmission can occur over hundreds of kilometres; otherwise such transmission is rare.

- Affected animals are infectious before the appearance of clinical signs and cows excrete virus in their milk before the appearance of clinical signs.

SOME EPIDEMIOLOGICAL FEATURES (cont.)

- Contact with contaminated fomites such as hands, boots, clothing, contaminated vehicles and feed sacks can also be a source of infection.

- The commonest means by which an FMD virus is introduced into a country is through the feeding of waste food to swine – 'swill' feeding ***NOT IRAQ***

- The next most common is movement of live animals.

- After recovery from infection a proportion of cattle become long-term carriers of infection for up to 2 years. The carrier state in swine and small ruminants is very short. The role of carriers in initiating new outbreaks is still uncertain.

The Chronic Sequel To Disease

- Convalescence is slow after clinical disease and, in intensive production systems, retaining such animals might not be economically sound.

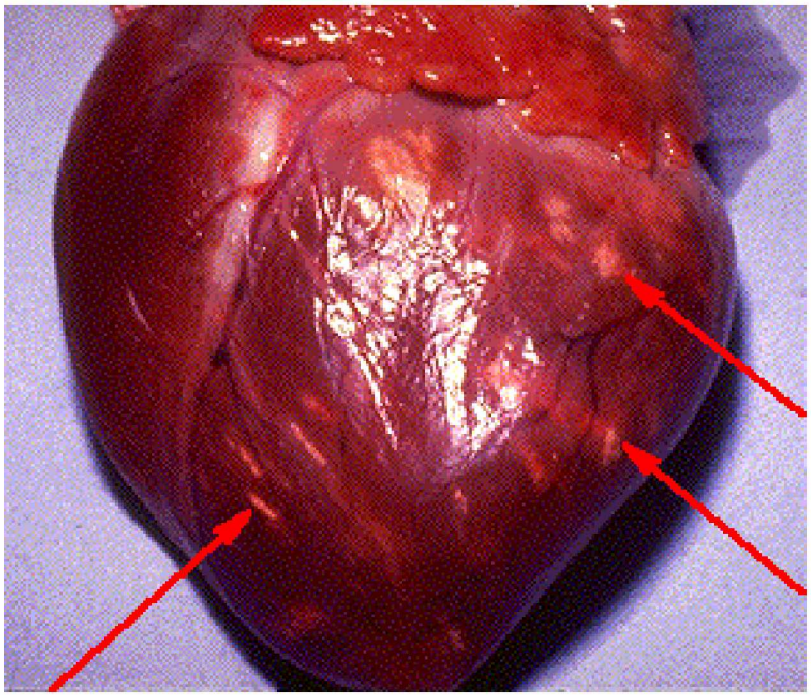
- Mastitis and loss of quarters together with infertility are common sequels to infection in dairy cows.

- A chronic sequel to infection has been described in which cattle have a particularly thick, hairy coat and are dyspnoeic – these cattle have been called ‘hairy panters’.

- Sheep and goats are sometimes referred to as maintenance hosts; fever, oral erosions and lameness occur but are generally mild and sometimes are not detected – ***but this is not always the case***.

SOME CLINICAL FEATURES

Tiger heart in young animals



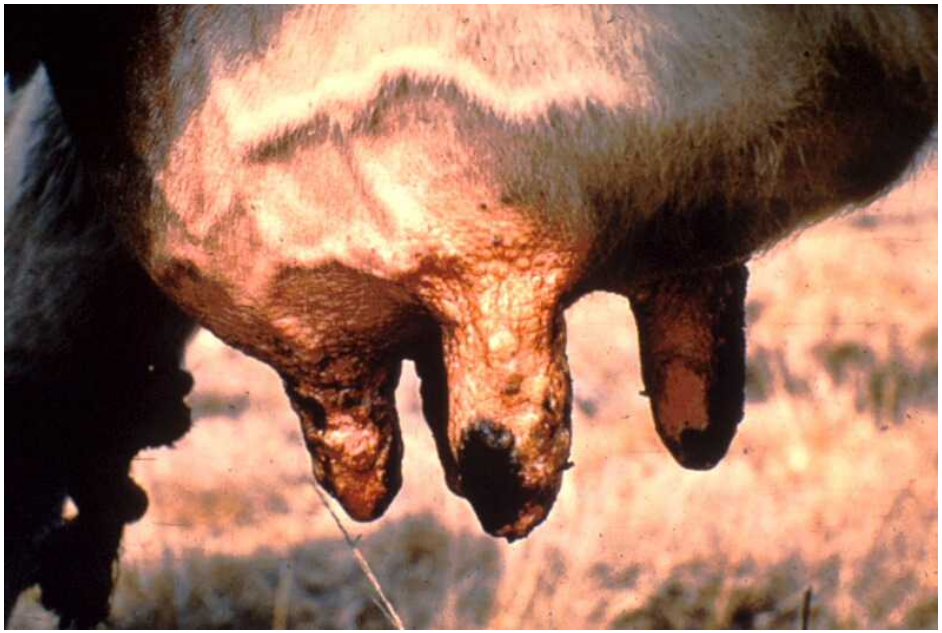
Lameness

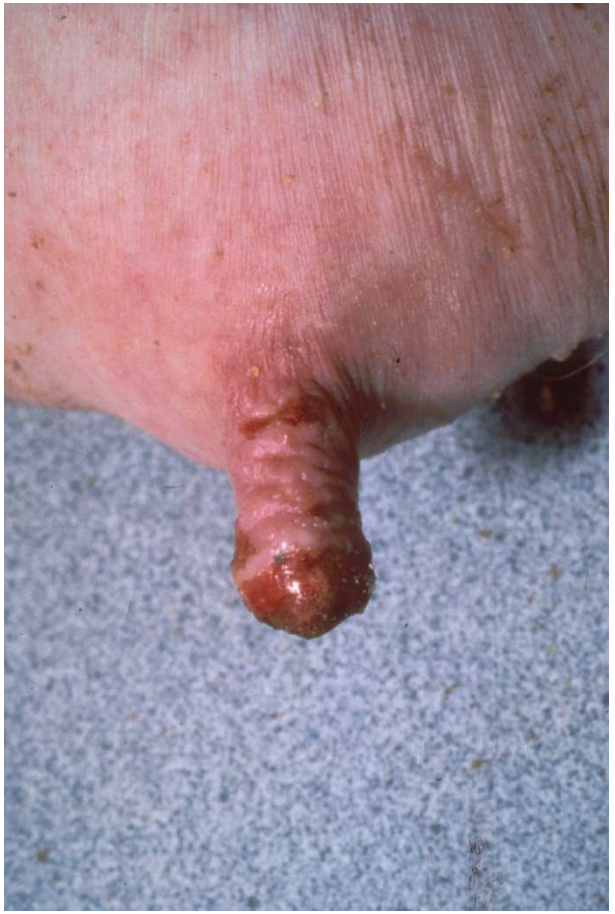
SOME CLINICAL FEATURES (cont.)

Vesicles - Salivation

SOME CLINICAL FEATURES (cont.)

Udder damage - mastitis





SOME CLINICAL FEATURES (cont.)

Small ruminants: difficulty in detection

RISK OF INTRODUCTION TO AFGHANISTAN

Iraq is at constant risk of introduction of FMD from:

1. Importation of livestock

3. Transhumance – nomadic movements across borders

PREVENTION AND CONTROL OPTIONS

PREVENTION

1. Control of imports/trade
2. Emergency preparedness
3. Preventive vaccination

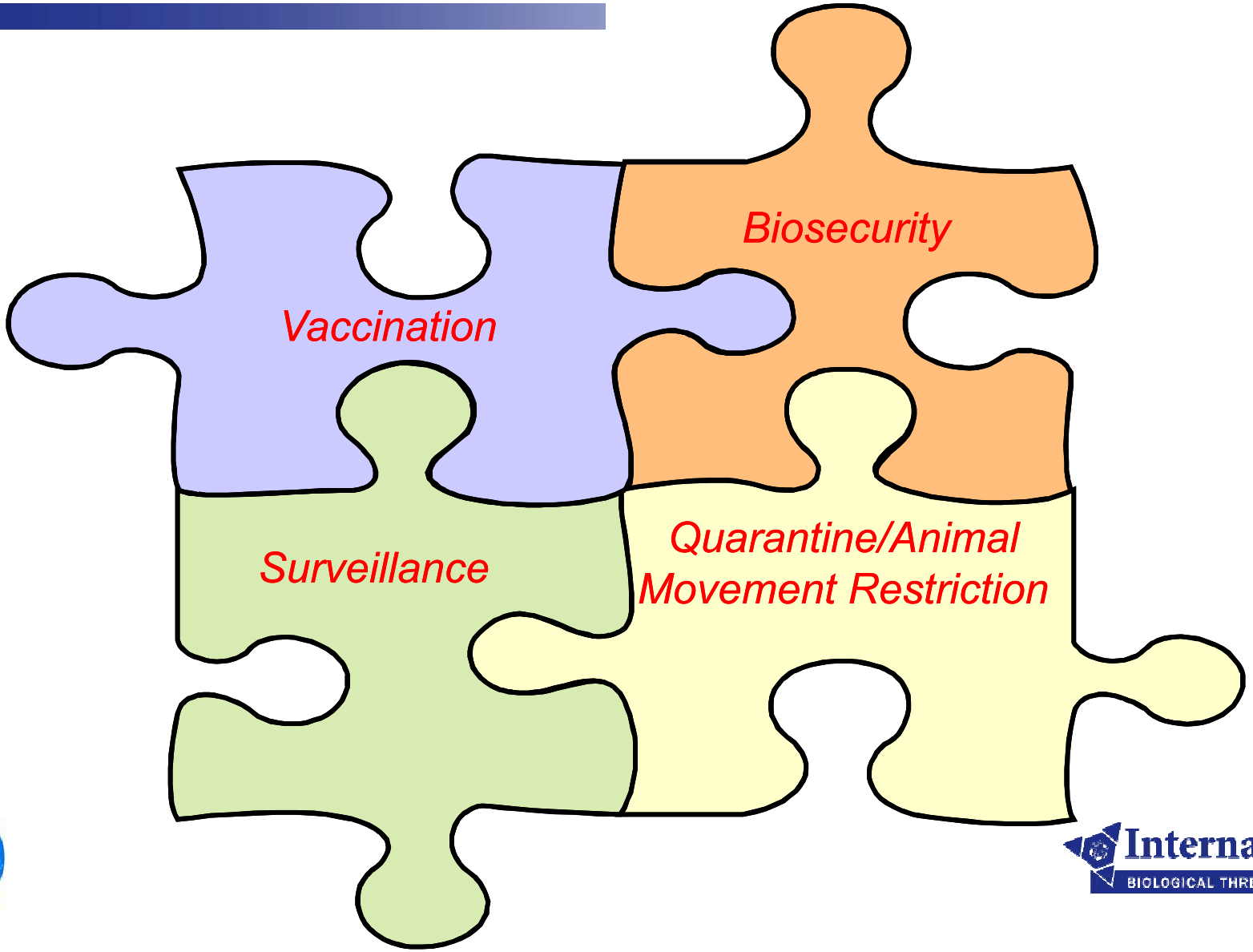
CONTROL

1. 'Stamping out' – slaughter of infected plus dangerous contacts with immediate compensation ??????????????
2. Movement control/quarantine
3. Early detection and focal vaccination
4. Mass vaccination

VACCINES

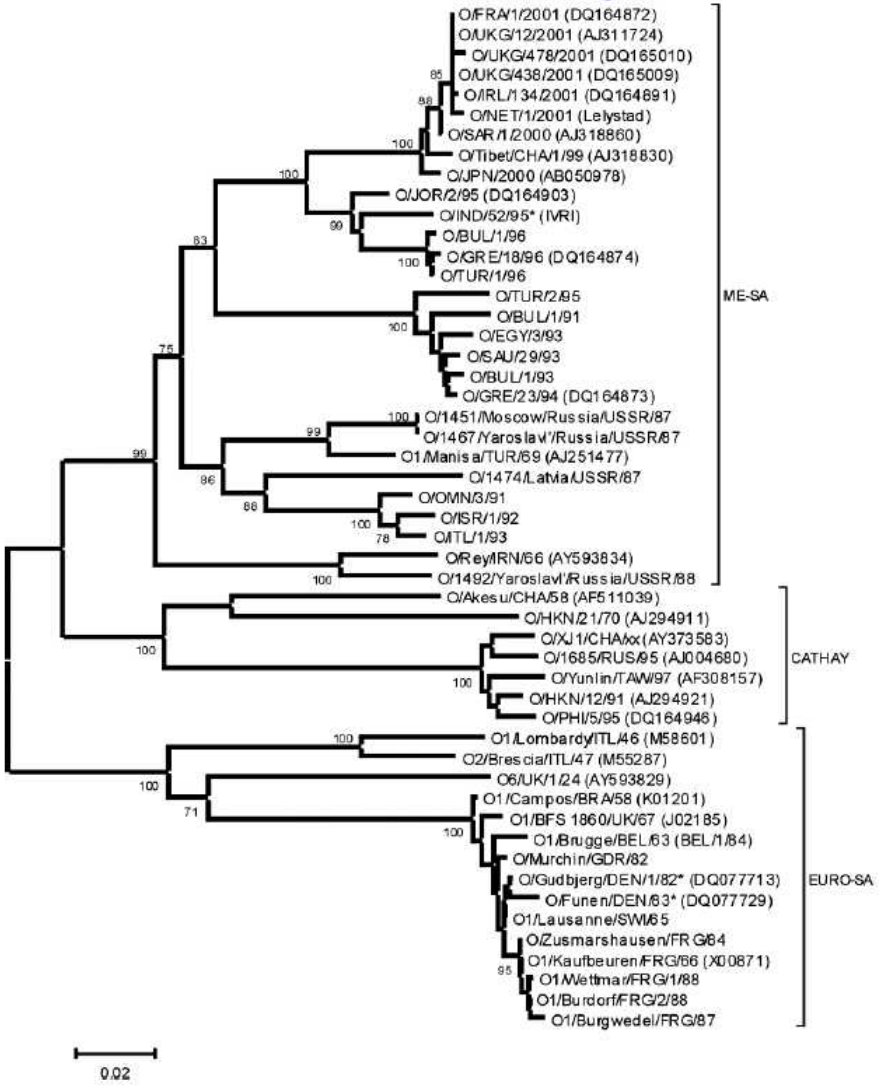
The only vaccines recommended for use are purified 146S, aziridine inactivated, oil or aluminium hydroxide adjuvanted prepared in accordance with OIE guidelines.

Control requires more than just vaccination



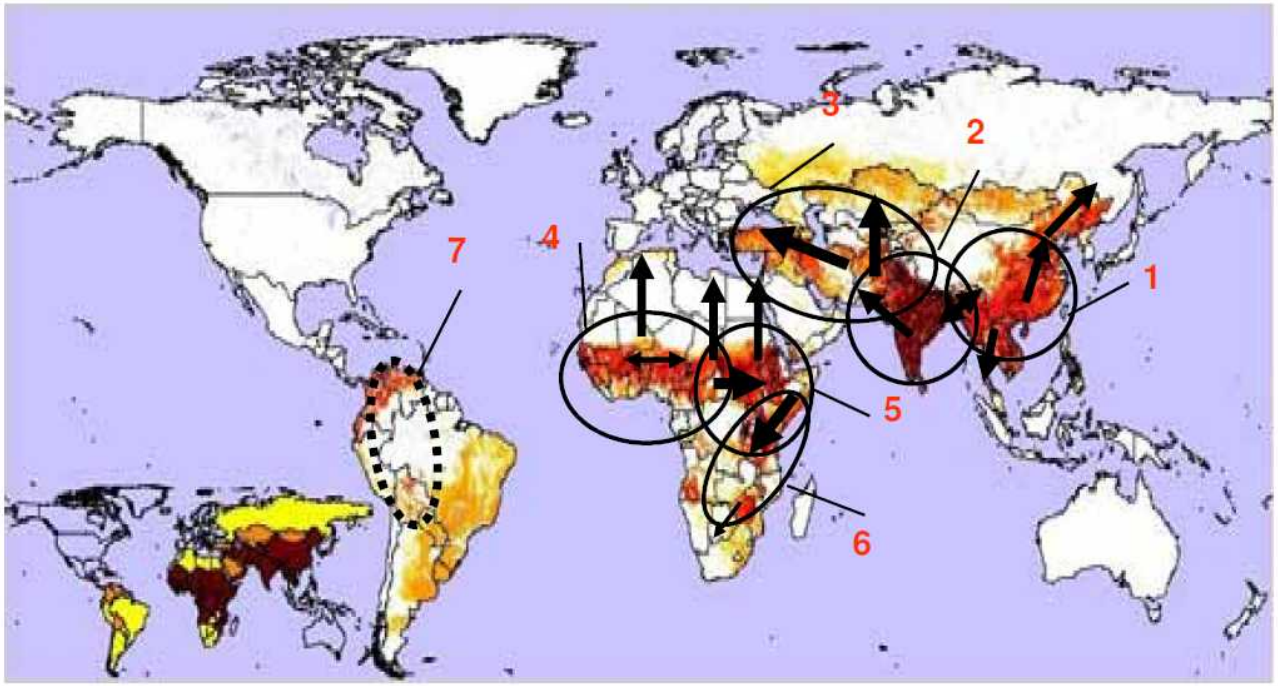
PHYLOGENETIC ANALYSIS – VP1 gene

Mid-pointed routed neighbour-joining phylogenetic tree showing the relationships between FMD Type O viruses



THE SEVEN VIRUS POOLS

Geographical distribution of the seven major FMD virus pools

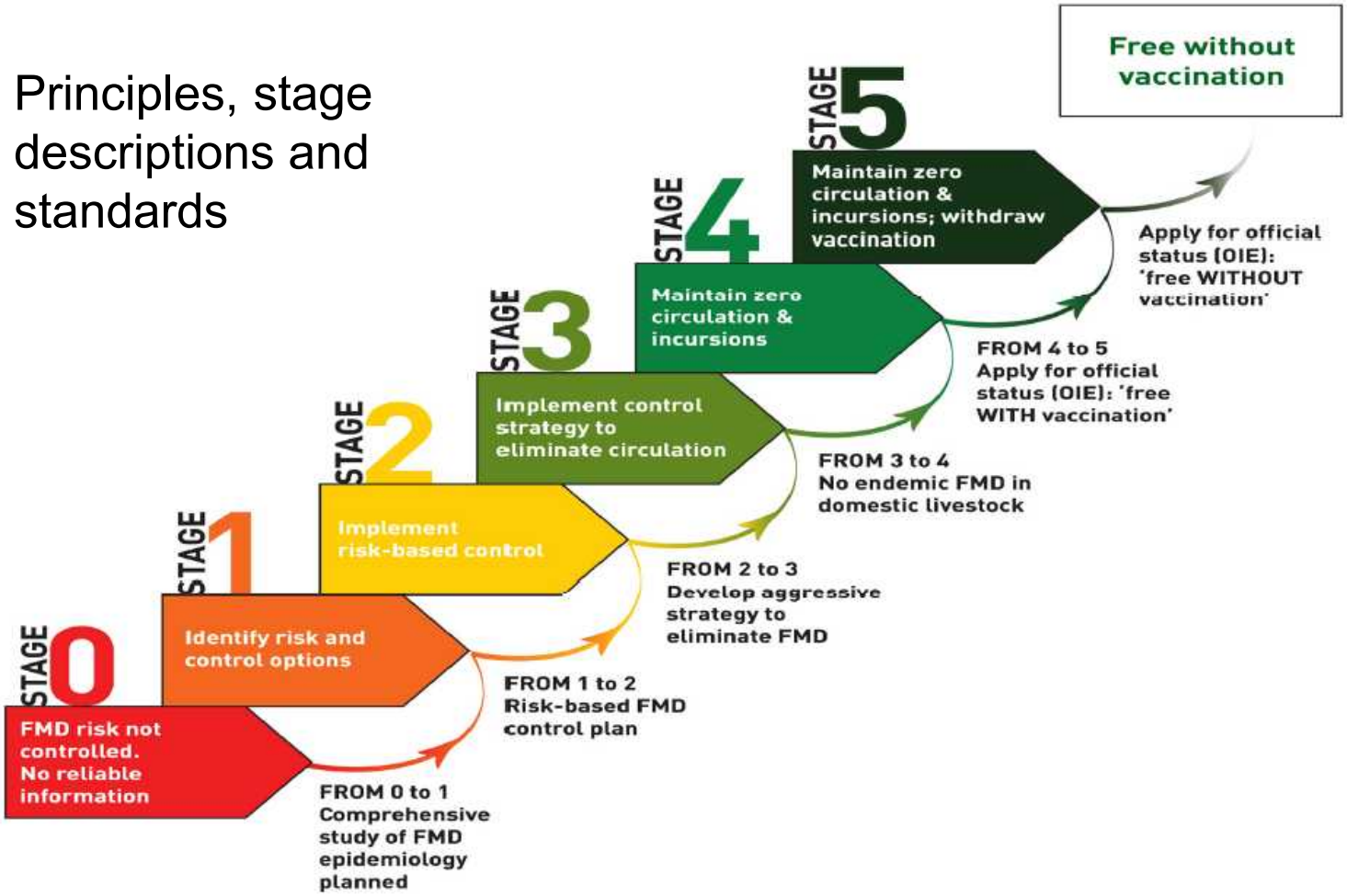


Pool 3: O, A, ASIA1

[SAT 1 & 2] NOT C

THE PROGRESSIVE CONTROL PATHWAY FOR FMD
PCP-FMD

Principles, stage descriptions and standards



Stage 1 of the PCP-FMD

"To gain an understanding of the epidemiology of FMD in the country and develop a risk-based approach to reduce the impact of FMD"

Minimum requirement: There is a comprehensive plan in place to gain insight into the epidemiology and socio-economic impacts of FMD in the country, and results are available from activities working towards Key Outcomes 1 & 2.

Key Outcome 1. All husbandry systems, the livestock marketing network and associated socio-economic drivers well described and understood for FMD-susceptible species (value-chain analysis).

Quality indicators: an overview of all systems involving FMD susceptible species. Importation of animals and animal products as well as movements of animals associated with transhumance or nomadism should be described - information regularly reviewed and updated.

Typical activities: Participatory rural appraisal, stakeholder consultation workshops, analysis of existing data.

Stage 1 of the PCP-FMD (cont.)

Key Outcome 2: Distribution of FMD is well described and understood; a 'working hypothesis' of how FMD virus circulates in the country has been developed.

Quality indicators: Information on the spatial and temporal distribution of FMD and a serological survey designed to identify differences in risk between animal populations or production systems - a baseline for future monitoring.

Typical activities: Passive and/or active FMD monitoring system, serological survey to assess prevalence of FMD in different husbandry systems, participatory epidemiology studies, risk assessment including description of risk pathways to identify important risk hotspots for FMD transmission, where appropriate including wildlife.

Stage 1 of the PCP-FMD (cont.)

Key Outcome 3: Socio-economic impacts of FMD on different stakeholders have been estimated.

Key Outcome 4: The most common circulating strains of FMDV have been identified.

Key Outcome 5: Progress towards developing an enabling environment for control activities.

Key Outcome 6: Demonstrate transparency and commitment to participating in regional FMD control.

Key Outcome 7: Important risk hotspots for FMD transmission are identified.

Monitoring Progress in Stage 1

1	Is there an official, written **plan** in place to study the epidemiology and socioeconomic impact of FMD?
2	Does the plan indicated above include a study of the **structure of livestock production** throughout the country for all FMD susceptible species (cattle, small ruminants, pigs)?
3	Does the plan include activities to estimate FMD **incidence**?
4	Does the plan include activities to describe FMD **transmission pathways**?
5	Does the plan include activities to **estimate the socio-economic impact** of FMD?

PCP Iraq: overview of livestock production

The animal population in Iraq

- Cattle 2552113
- Small ruminants sheep 7722375 goat 1474845
- Buffaloes 285537
- Camels 58293
- Birds 100.000.000

Produced products of animal

Traditional livestock rearing in Iraq, although the country is not fully self – sufficient in animal products.

The shortfall in requirements has been made up recently by the importation of red meat and poultry meat from a number of sources including mainly India, Brazil, Saudi Arabia and France.

PCP Iraq

The national production (Livestock production);

- Meat – 50.000 Tones
- Milk – 750.000 Tones
- Eggs - 300.000.000

PUBLIC OR PRIVATE GOOD ?

- ***FMD AS A PUBLIC GOOD***
  - ✓ State-supported vaccination to reduce disease
  - ✓ State supported FMD control zones to protect the high risk areas

- ***FMD AS A PRIVATE GOOD***
  - ✓ Emphasis on private sector action to protect themselves
  - ✓ Private sector (stakeholders) can purchase quality vaccines
  - ✓ Public role is to monitor FMD risk, license vaccines and communication

PCP Iraq

The last FMD outbreaks in Iraq were in winter of 2011.

- Quarantine ;
- Control on Border Check Points;
- Movement of animal and animal products was restricted ;

- Compulsory routine vaccination was held in infected zones and prophylactic (free) vaccination was held in whole country.
- Disease surveillance and control measures are implemented by vaccination in high risk zones, permanent active surveillance and systematical sero survey.
- Lab. Confirmations A Iran 05 – O1 strain.

PCP Iraq: FMD epidemiology

Working hypothesis on how FMD spreads in the country and FMD risk hotspots (if available)

FMD High Risk Zones:

- Villages and farms bordering to Iran, Turkey.
- Livestock Markets
- Village and farms on the border line of animal trans humans routes
  (Adjacent territories of animal seasonal migrating roads)

PCP Iraq: FMD epidemiology

Introduction of FMD in Iraq;

- From other countries.
- From not controlled occupied territories:
- Animal movement through the borders (Pasture searching) - west / east / north.
- Illegal animal and animal product introducing.
- Cross- border livestock trade.

Risk factors of spread of FMD virus inside the country;

- Huge amount animal movement in seasonal pastures (winter and summer) ;
- Live animal markets

PCP Iraq: Action for control

- During last twenty years , and due to (the siege and wars) which caused the distraction of the veterinary services sector , and bad situation for our organization to implemented its program for disease control , although Iraqi State Company for Veterinary Services – SCVS tried to developed the veterinary services capacity to continuation activity .

PCP Iraq: FMD action for control

- Since 2008 Iraq have been joining with West Euro Asia Roadmap in FMD control (Iraq located in stage 2 in PCP).
- Currently SCVS implemented national plan for FMD control including :
  - Providing vaccines for Massive vaccination trough 2011, 2012, and 2013.
  - High Lab. action for sero surveillance, viral isolation (stereotyping with the assistance of regional and WRL) and vaccination campaign evaluation.
  - Disease reporting and epidemiologic analysis.
  - The cooperation with the global, regional and national level for FMD control.

PCP Iraq: FMD action for control

FMD Disease Control measures

- Clinical surveillance for early detection of FMDV.
- Control of animal movement.
- Monitoring and control on animal transhumance routes.
- Veterinary control on bordering check points.
- Surveillance on live animal markets.
- Vaccination.
- Serological surveillance on NSP and SP antibody detection.

PCP Iraq: FMD action for control

The key elements of the Iraq FMD Control strategy

- Early detection, warning, and prevention.
- Protection of FMD – free areas should be enhanced with stringent controls and surveillance on import and cross – border animal movement
- Monitoring and immediate reporting of illness and sound bio – security practices at farm level
- Outbreaks investigation
- Clinical inspection of animals
- Presently our program on FMD control has been paid more attention in Iraq, especially during 2010- 2012 when PCP was implemented in our action.

Thank you for your attention

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