FMD: Ongoing research and future needs

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Dr Kris De Clercq
Vice-President
OIE Scientific Commission for Animal Diseases
FMD and poverty

FMD: decreased meat and milk production mortality in young animals

The impact and poverty reduction implications of foot and mouth disease control in southern Africa

with special reference to Zimbabwe
FMD and poverty

FMD-lameness: reduction of draught power and transport
FMDV spread factors:
- Regional Trade
  Traditional trade roads
  Price difference
- Movement of animals for religious celebrations

Solid colour = PanAsian strain
Hashed colour = Type O present
Livestock – Wildlife Interface
Emerging Diseases

Global Shipping Routes

Citation: “The complex network of global cargo ship movements” Pablo Kaluza, Andrea Kölzsch, Michael T. Gastner and Bernd Blasius, J. Royal Society: Interface
Solid colour = PanAsian strain present
Hashed colour = Type O present, PanAsian strain suspected

Factor: Illegal transport and feeding of animal products?
FMD Control

Contrasting viewpoints

- Prevention, Surveillance, Control plans
- FMD Eradication

- Animal Welfare and Ethical Considerations
Animal Products
Vaccine Quality Control PVS
Vaccines Cross-Protection
New Vaccines
Antivirals
Diagnostics
Spread Transmission Persistence
Pathology
Immune Response
Economic Factors
FMD Research
3R rule: Replacement, Reduction and Refinement of the current in vivo ‘Gold Standard’ tests
- Validation of correlation models between in vitro laboratory tests and in vivo protection
- In vitro immunoassays to monitor vaccine NSP-purity
- Alternative methods to quantify the antigen payload content in the final vaccine

Will provide an independent in vitro control of the quality of the vaccine batches.
Will strengthen the position of the decision makers for the implementation of the ‘vaccinate-to-live’ policy.
Vaccines
Cross-Protection

FMD Research

- Increase post-vaccination cross-protection
  High-Potency vaccines
- Predicting cross-protection r-value between vaccine strains and FMDV field isolates

Harmonising test methods
Applying guidelines

Will strengthen the position of the decision makers for
- the choice on which vaccine to use
- updating and reinforcing FMD vaccine/antigen banks.
New Vaccines

Antivirals

- New generation vaccines avoiding the need for virus culture
- Antiviral compounds to prevent FMDV replication

FMD Research

- Stimulate innate (rapid) and adaptive (lasting) mucosal immune responses
- Will decrease the post vaccination immunity gap
- Will prevent FMDV infection at the primary portal for virus entry
- Will improve the safe production of FMD vaccines
Will contribute to the global FMD control
Will help to understand the FMD situation in all regions of the world
Will help the OIE to better interpret the dossiers submitted to demonstrated/substantiate FMD-freedom.

- Increase the availability of FMD diagnostics
- Improve standardisation / harmonisation of FMD diagnostic results
- Develop new and better diagnostic tools for confirmatory tests and/or test systems for NSP-serology
Will be used to adapt and improve computerised FMD spread models to optimise FMD vaccination programmes in free and endemic settings alike.

- Quantified knowledge on FMDV transmission within and between different species after applying emergency vaccination
- Study transmission dynamics to set-up early warning systems
- Asian buffalo: transmission of FMDV and efficacy of vaccination
- Role of wildlife (e.g. buffalo, gazelles, wild boar) in FMDV maintenance and transmission
- Increased understanding of the early pathogenesis of FMDV and the interplay between the virus and the host immune response
- Increased understanding of epidemiology, providing more precision to disease transmission models

Will improve the design of vaccines, diagnostic tests and antiviral therapies.
Will ultimately refine disease control protocols.
- Exploration of vaccination strategies

Will enable the design of vaccination strategies for high-risk regions and for endemic regions.
- Matching data on livestock trade movements with molecular epidemiology will enhance understanding of the spread of FMDV between geographical regions. Is essential for the development of FMD control strategies worldwide.

- Financial resource-using activities to control FMD: FMD surveillance and control measures will guide decisions made with the objective of achieving the optimal net outcome.

- Compare the gains from FMD control to the resource costs.
- Increase the knowledge on FMDV stability and FMDV inactivation in animal products such as milk and milk products

Will estimate the risk of raw and treated milk and milk products.
- Vaccine development: thermostable / broad-spectrum / safe
- Vaccine selection and cross-protection
- Vaccine evaluation
- Antivirals based on chemical products or innate immune mimetics
- Diagnostics: further developments in FMDV detection in the field
- Better understanding of animal production systems, FMD dynamics within them and livestock trade movements
- Understanding epidemiology of different FMDVs?
- Role of different host species / wildlife
- Viral and host determinants of replication, pathology and protection
- Adaptation of computerised FMD-spread models to optimise vaccination schemes.
- FMDV stability in animal products and their risk for trade
Thank you!