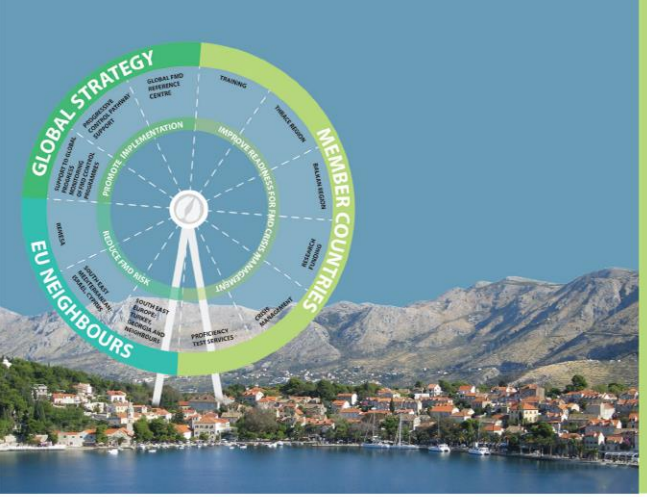

Open session of the Standing Technical and Research Committees of the EuFMD

Cavtat (Croatia), 29-31 october 2014

eufmd
european commission for the control of foot-and-mouth disease

State of foot-and-mouth disease research

Theo Knight-Jones
Epidemiologist, ILRI

Lucy Robinson
Senior Partner, Insight Editing London

GFRA
Global Foot-and-Mouth Disease Research Alliance

FMD Research – historical breakthroughs

Our ability to control a disease is constrained by the tools available

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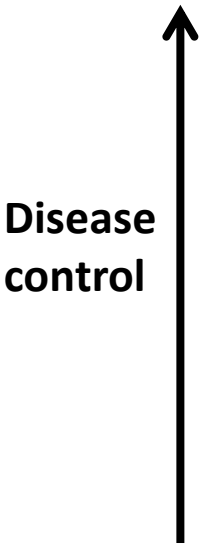
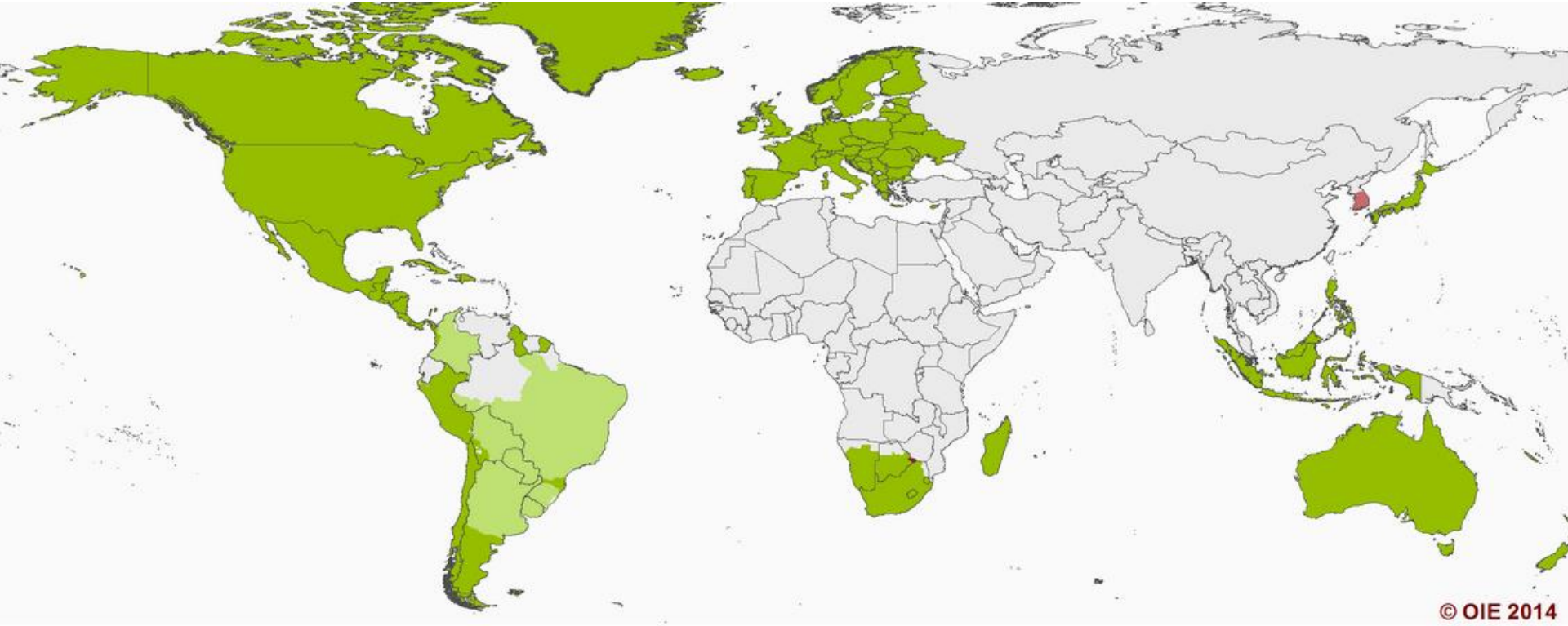


- **Control FMD where control not previously possible**
- **Same level of control but more efficient (time, cost)**
- **Increased certainty in disease/infection status (trade, rapid detection)**
- **Increased understanding**

Global control with current technologies



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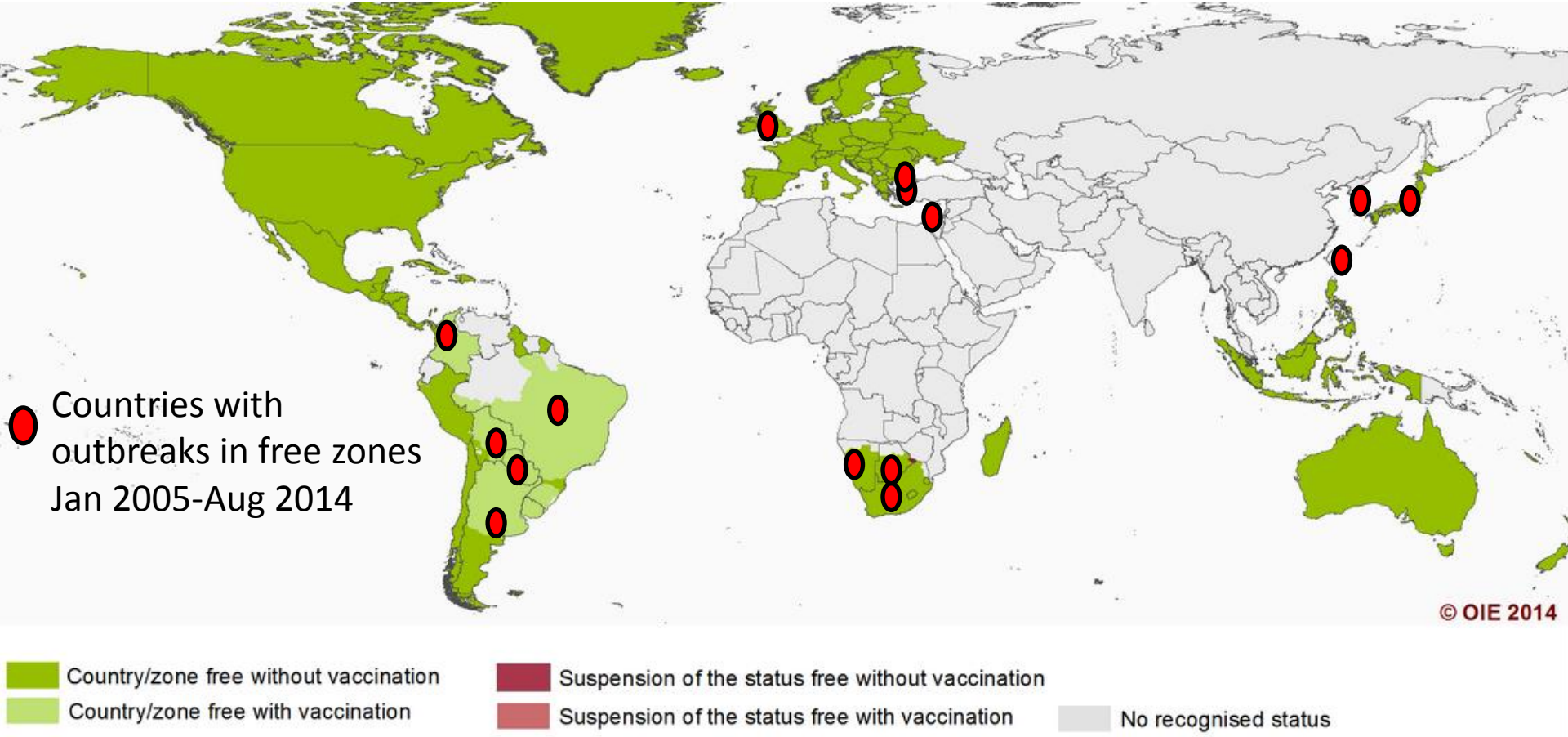

FMD research needs

- Free countries
  - Preparedness, early detection and control
- Free and endemic with vaccination
  - Vaccine immunity - duration, match
  - Vaccine stability, safety, strategy & evaluation
  - Proving freedom
- Limited control activities
  - Impact estimation
  - Feasibility of FMD control – effectiveness, cost, convenience/compliance

FMD research review - approach

- Literature review – FMD publications 2011-14
- Institute updates on current research
  - Contacted >50 FMD research institutes (GFRA/EuFMD)
    - Response from 33
      - Europe – 10 (30%)
      - North America – 5 (15%)
      - South America – 2 (6%)
      - Asia – 6 (3) (18%)
      - Africa – 8 (24%)
      - Australia/New Zealand – 2 (6%)
- Review by GFRA experts

Peer-reviewed publications June 2011-14

Research Category	Papers (n)
Epidemiology	116 (23%)
Vaccines	94 (19%)
Pathogenesis	74 (15%)
Molecular biology	57 (11%)
Diagnostics	55 (11%)
Immunology	50 (10%)
Policy, preparedness and trade	38 (8%)
Wildlife	19 (4%)
Vaccine evaluation *(quality, efficacy, effectiveness)*	16 (3%)
Other	15 (3%)
Economics	14 (3%)
Biotherapeutics	13 (3%)
Total	**505 (100%)**

Half modelling studies

Economic studies needed by those with least resources

Report: Key findings
Vaccines – The ideal FMD vaccine

- Effective, rapid and **long-lasting** protection with one inoculation
- Prevents viral transmission & carrier state
- Allow differentiation of infected from vaccinated animals (DIVA)
- Produced without the need for virulent FMDV
- Protection against multiple serotypes
- Stable antigen – long shelf life
- Reasonable cost to enable eradication programs

Gay et al. 2013

Vaccines

- Progress
  - Empty capsid vaccines
    - Adenovirus vector, Baculovirus expression system
  - Inactivated molecular chimeric vaccine
  - Early stages but:
    - Produced without live FMDV
    - Improved DIVA
    - Improved stability
- Gaps
  - Cost
  - Duration and breadth of immunity – important for endemic settings
  - African vaccine strains- SAT 2 vaccines
  - **Lack of standardised approach to novel vaccine evaluation**

Diagnostics

- Progress
  - Faster, cheaper, simpler diagnostics
    - RT-LAMP, high-speed, portable PCR, sequencing
    - Simple pen-side tests
  - More powerful molecular techniques
    - Next generation sequencing
    - Tools for molecular epidemiology
      - Better understanding of within-host virus evolution, between animal transmission, population level virus ecology
- Gaps
  - Continued progress in rapid/simple diagnostics & molecular techniques
  - Vaccine matching – beyond small scale, imprecise antibody assays
  - Wildlife diagnostics & sampling (under investigation)

Disease management

- Progress
  - Modelling approaches developed & widely used
  - Importance of field evaluation of control programmes
  - Alternatives to stamping out [vaccinate-to-live]
  - Incentivisation through commodity-based trade
- Gaps
  - Evaluation & validation of models
  - Practicalities of vaccinate-to-live
  - Safety & acceptance of commodity-based trade
  - **Strategies & guidance for endemic countries**
    - **Knowledge sharing – South America**

EuFMD – 3 Pillars: Research needs

1. **Improve readiness for FMD crisis management by Members**
   - **Vaccine matching tests & measures of cross-protective immunity**
   - **Further development of modelling approaches for policy guidance**
   - **Improved, cross-protective, DIVA vaccines**

EuFMD – 3 Pillars: Research needs

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2. Reduce risk to Members of an FMD incursion from the neighbourhood

- **Cheaper vaccines with long lasting, broad spectrum immunity**
- **Capacity building – technical skills, regional collaboration, vaccine quality assurance**
- **Improved knowledge and monitoring of wildlife and illegal trade**

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3. Promote the global FMD control strategy

- **Cheaper vaccines with long lasting, broad spectrum immunity**
- **Can FMD be controlled with current vaccines without effective biosecurity?**
- **Economic impact of FMD & when are control efforts cost-effective**
- **Evaluation of commodity based trade as a safe way of exporting from wildlife FMD endemic areas**

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- **Progress in genetic and molecular technologies is crucial & will benefit all**

Conclusion

"Cause for optimism, but much to be done"

Acknowledgements
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EuFMD [funding and support]