

Understanding The Life Cycle Of FMDV In Endemic Settings



Luis L. Rodriguez
Foreign Animal Disease Research Unit

*Plum Island Animal Disease Center
Orient, NY*



FMD Ecology

- Epidemiological knowledge on FMD clinical occurrence is extensive
 - Geographic distribution (pools) of serotypes/topotypes derived primarily from clinical occurrence
- Less known about FMD ecology:
 - Where is FMD between outbreaks?
 - Role of persistence (e.g Asian buffalo) in long term maintenance?
 - What determines emergence of epidemic viral strains?



Subclinical Infections

- In endemic settings the great majority of infections are subclinical
 - Prior immunity (vaccination, maternal)
 - Prior exposure
 - Other factors – genetic resistance?
- Subclinical infections:
 - Acute
 - replication at primary site – clears infection
 - Chronic
 - Replication at primary site – does not clear infection (carrier definition >28 dpi)





When we study clinical FMD
are we seeing the full picture ?

Acute infections, outbreaks

Serotype A, O



Example 1: VIETNAM

MOLECULAR EPIDEMIOLOGY, SURVEILLANCE AND PREDICTIVE TOOLS FOR FMD CONTROL IN VIETNAM

58-1940-0-070F, 057 14S

6/1/2010-9/30/2012



Co-PIs:

Dr. Luis Rodriguez

Dr. Jonathan Arzt

Dr. Thanh Long Ngo, DAH, HCMC

Dr. Ho Huu Dung, DAH, Hanoi

Collaborators

Dr. Helena Ferreira – ORISE

Dr. Carla Huston, Mississippi

State University



Design

Objective 1 – Acute Clinical Samples

- Samples collected during outbreak
- Pigs, buffalo and cattle
- Northern and Southern Vietnam

Objective 2 – Longitudinal Field Study

- HCMC region – transmission cells
- Hanoi-SonLa region – carrier cattle and buffalo (field necropsy)

Objective 3 – Persistent buffalo studies

- Field necropsies
- Molecular characterization (tissue level, cytokine mRNA, protein expression)

(Dr. Dung and Dr. Arzt will present progress of this project in their presentation)



Example 2 PAKISTAN

CHARACTERIZATION OF LOCAL ISOLATES OF FMDV AND DEVELOPMENT OF VACCINES

58-1940-7-161F; 057 002S

9/1/2007 - 8/31/2012

REAL TIME DATA ANALYSIS AND RESEARCH CAPACITY BUILDING TOWARDS FMD CONTROL IN PAKISTAN

1940-32000-052-14S

09/27/2012 - 09/26/2014

Dr. Khalid Naeem – NARC
Dr. Umer Farooq – NARC
Dr. Muhammadimam Afzal, FAO
Dr. Manzoor Hussain, NVL

Collaborators:

Dr. Zaheer Ahmed

Dr. Anna Ludi



Study Design

– Acute Clinical Samples

- Clinical case reports, geographic location, demographics, etc
- Clinical samples, viruses, sequence

– Longitudinal Field Study

- Serological survey of farms for NSP positive animals, probang, history
- Selection of 40 farms for sampling (probang) 4X year for 1 year ==
- NSP-ELISA, RT-PCR and virus

– Establish panel of reference sera for vaccine matching testing

- Vaccination of 10 cattle and 10 buffalo with commercial vaccine to be used in field
- Serum collection at 0, 21 dpv, boost vaccination
- Serum collection at 42 dpv
- Carry out vaccine matching studies

(More details in next presentation – U. Farooq et al)



Example 3 CAMEROON

TRANSMISSION AND EVOLUTION STUDIES OF FMDV IN LIVESTOCK IN THE LAKE CHAD BASIN



Collaborators:
Dr. Rebecca Garabed,
Laura Pomeroy, Ohio State
University

Dr. Simon Dickmu,
LANAVET. Garoua
Cameroon

Dr. Zaheer Ahmed
Dr. Anna Ludi
Dr. Carla Bravo-Rueda



Objective

- To understand the epidemiology of infectious diseases in the ecological context of networks of host movement
- How different networks of livestock movement affect disease epidemiology



Sampling strategy

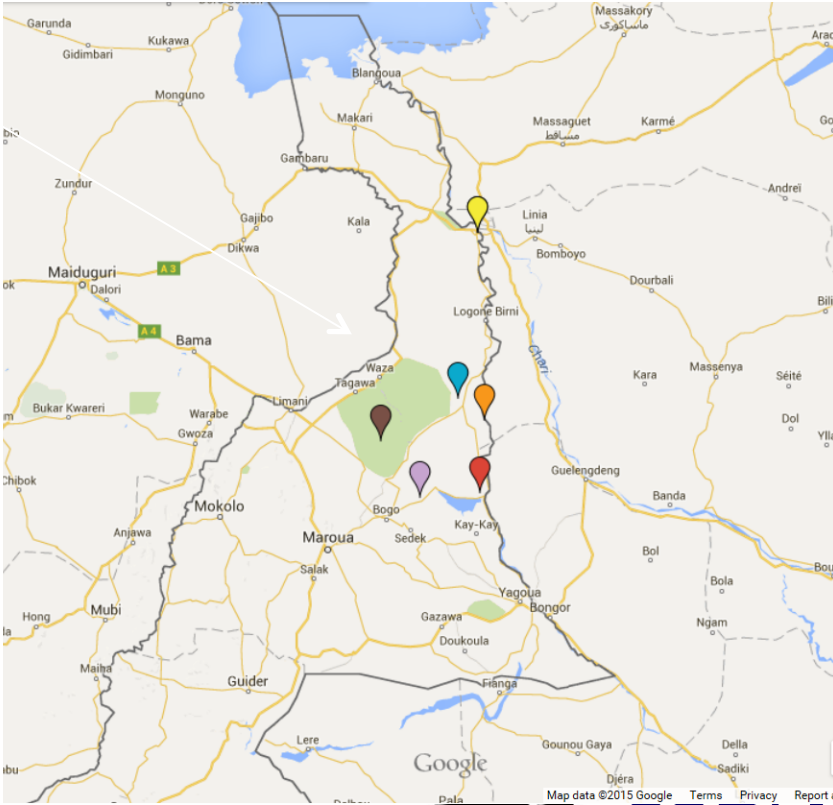
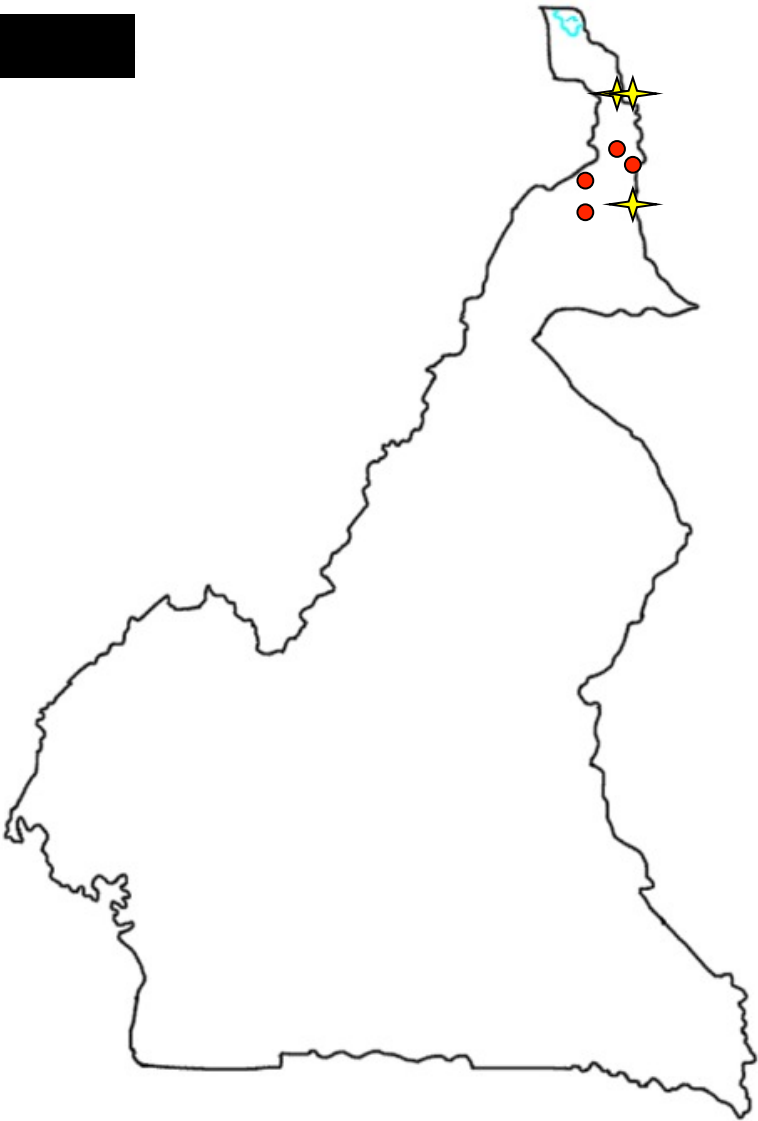
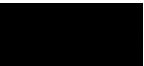
Group	Routine sampling			Additional sampling
	Mobile herds	Sedentary herds	Transboundary trade routes/ market	Reports of clinical disease
Number of herds	15	15	Variable	Variable
Animals / herd	5 / herd ^{a,b}	5 / herd ^{a,b}	10-30 / sampling day	Up to 10 infected individuals
Sample frequency	2x year (rainy season/ dry season)	2x year (rainy season/ dry season)	4x year (2x rainy season/ 2x dry season)	Sampling at report
Samples / activity	Serum, probang, survey	Serum, probang, survey	Serum, probang, survey	Serum, probang, abbreviated survey, lesion swab/ tissue sample/ vesicular fluid



(Details in poster P7 by C. BravodeRueda)



SAMPLING LOCATIONS



CONCLUSIONS

- Studies combining clinical and subclinical surveillance are necessary to understand ecology
- Longitudinal studies – help understand virus circulation (life cycle?)
- Characterization of persistent animals – viruses necessary to assess their role in long term maintenance of infection
- Understanding where the virus hides between outbreaks will help target control programs
- This information is relevant to modeling control programs in the both endemic and non-endemic regions



Funding Acknowledgements

- USDA-ARS – Offshore Research Fund
- USAID – BEP
- NSF
- DHS
- DoD- DTRA





2011.09.14

Thank you!
XIN CẢM ƠN

