Bangkok, 2019

Serological Epidemiology of Foot-and-mouth Disease among Sedentary Mixed-species Herds in Adamawa Region-Cameroon

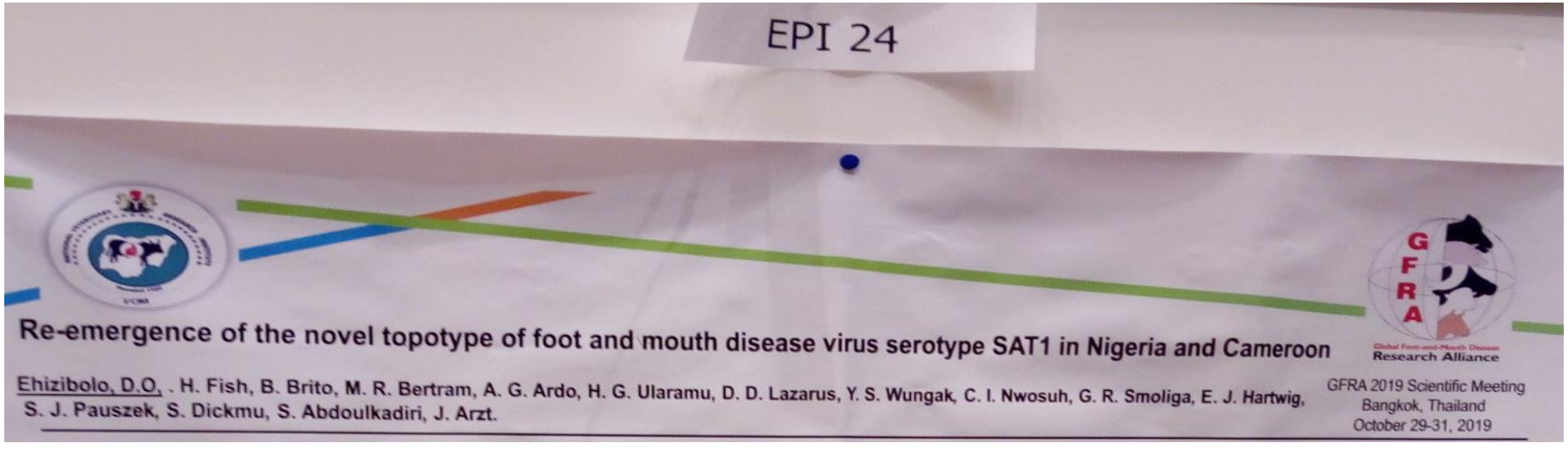
Lendzele, SL (EDGE), Mamoudou, A (SVMS), Mavoungou, JF (IRET-LEV), Dickmu, S (LANAVET) and Garabed, R (OSU)

INTRODUCTION (1/4)

- ✓ Foot-and-Mouth Disease (FMD) is an important virus pathogen of animals world wide.

- ✓ The disease is endemic in Cameroon and cause huge economic losses to farmers:

Total annual cost in FMD management= 62 billion FCFA or 112 million USD (Tanya, 2015).



Apthes on mouth of cattle

INTRODUCTION (2/4)

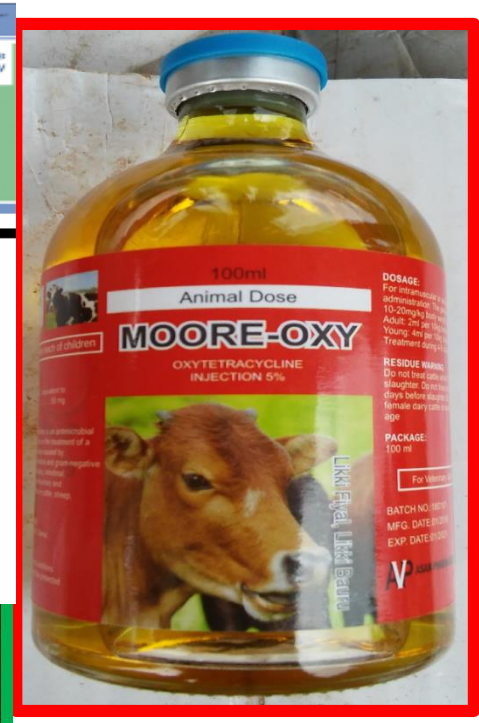
Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Effect of vaccination on cattle subclinically infected with foot-and-mouth disease virus in Cameroon

Miranda R. Bertram[a,b], Amy Delgado[c], Steven J. Pauszek[a], George R. Smoliga[a], Barbara Brito[a,b], Carolina Stenfeldt[a,d], Ethan J. Hartwig[a], Simon Dickmu Jumbo[e], Mamoudou Abdoulmoumini[f], Amba Abona Oliva Marie[f], Robert Salhine[f], Luis L. Rodriguez[a], Rebecca Garabed[g], Jonathan Arzt[a,*]



- ✓ A pilot trivalent vaccine trial in Ngaoundere with **Aftovax** prevented clinical infection but with persistent infection.

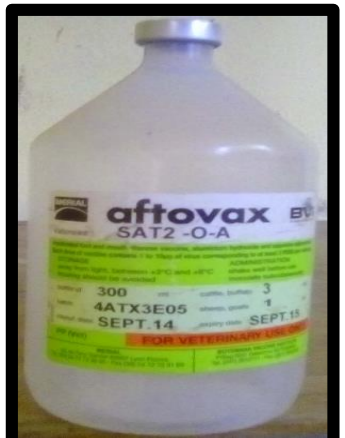
EPI 25

2019 Scientific Meeting
Bangkok, Thailand
25 – 31 October 2019

Foot-and-Mouth Disease in Domestic Small Ruminants in North and Far-North Regions of Cameroon

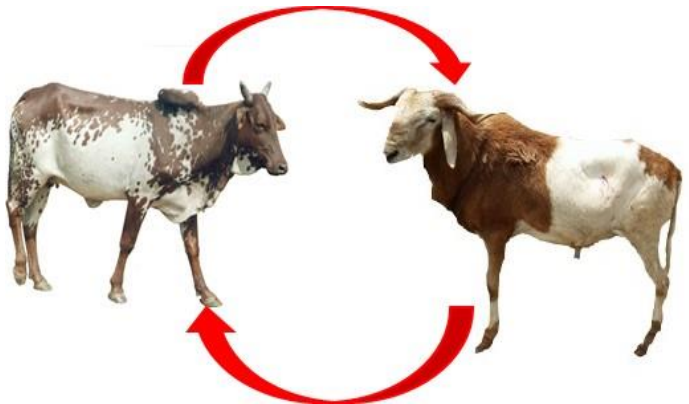
Dickmu, Simon[1] ;Nsangou, Salifou[4] ;Kouamo ,Justin[4] ;Poueme, Rodrigue[1] ;Awah-Ndukum, Julius [4] ;Garabed, Rebecca[3] ;Abdoulkadiri, Souley[1] ;Rodriguez, Luis[2] and, Arzt, Jonathan[2]

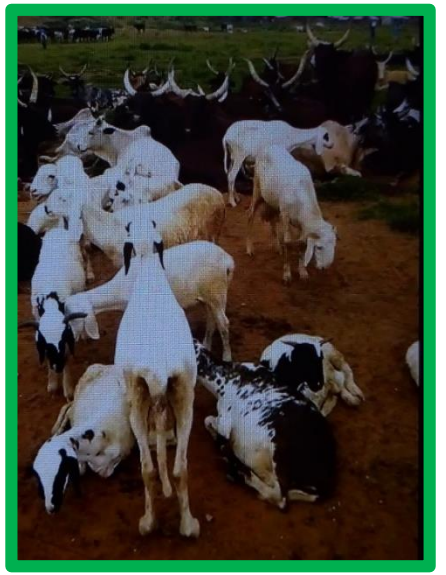
[1]Laboratoire National Vétérinaire, LANAVET, Garoua, Cameroon. [2] Foreign Animal Disease Research Unit, Plum Island Animal Disease Center, ARS, USDA, Orient Point, NY, USA. [3]Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH, USA. [4]School of Veterinary Medicine and Science, University of Ngaoundéré, Cameroon.



INTRODUCTION (3/4)

- ✓ The mixed husbandry system, common in Cameroon permits close range between cattle and sheep.
- ✓ Such closeness can be observed in **Cattle markets** and **grazing fields.**
- ✓ It can therefore be **hypothesized** that FMDV circulates in cattle and sheep populations in close proximity. And that sheep could be reservoir host.
- ✓ For Cameroon to fully atttain the **PCP L2** there is need for a nation wide comprehensive epidemiology study.





Grazing field

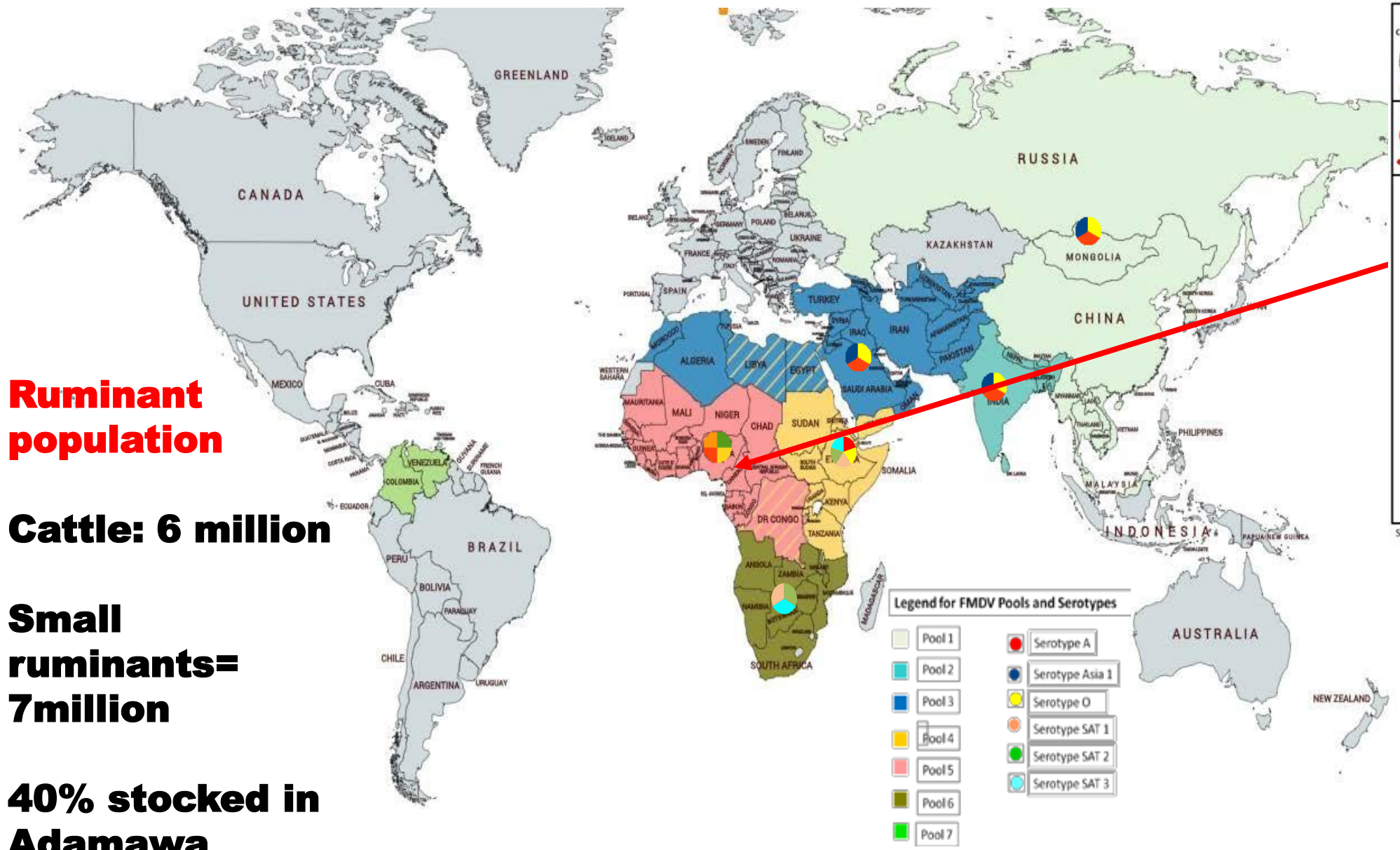
Cattle market

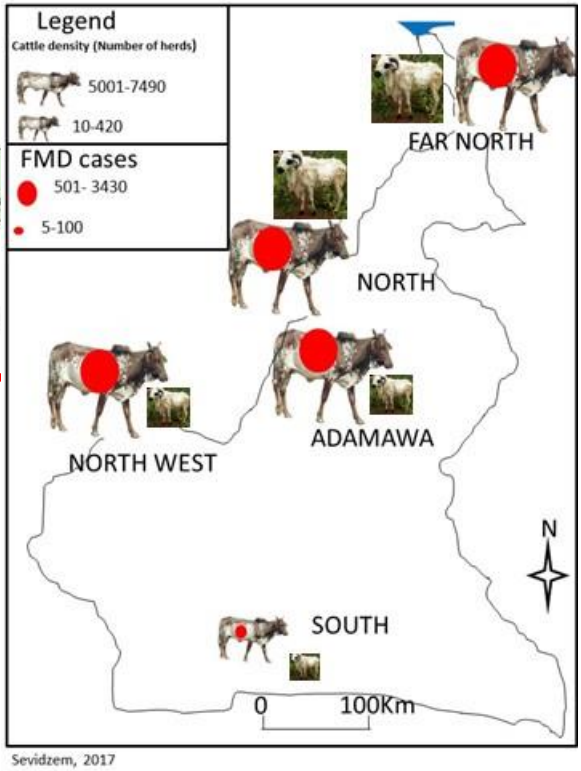
INTRODUCTION (4/4)

Objectives

- ✓ To determine the seroprevalence of FMDV in cattle and sheep in close proximity in Ngaoundere,
- ✓ To determine the FMDV serological types circulating in cattle populations in different sites,
- ✓ To fit serological data from cattle to mathematical models to determine transmission parameters.

Geographical distribution of FMD:Cameroon





Ruminant population

Cattle: 6 million

Small ruminants= 7million

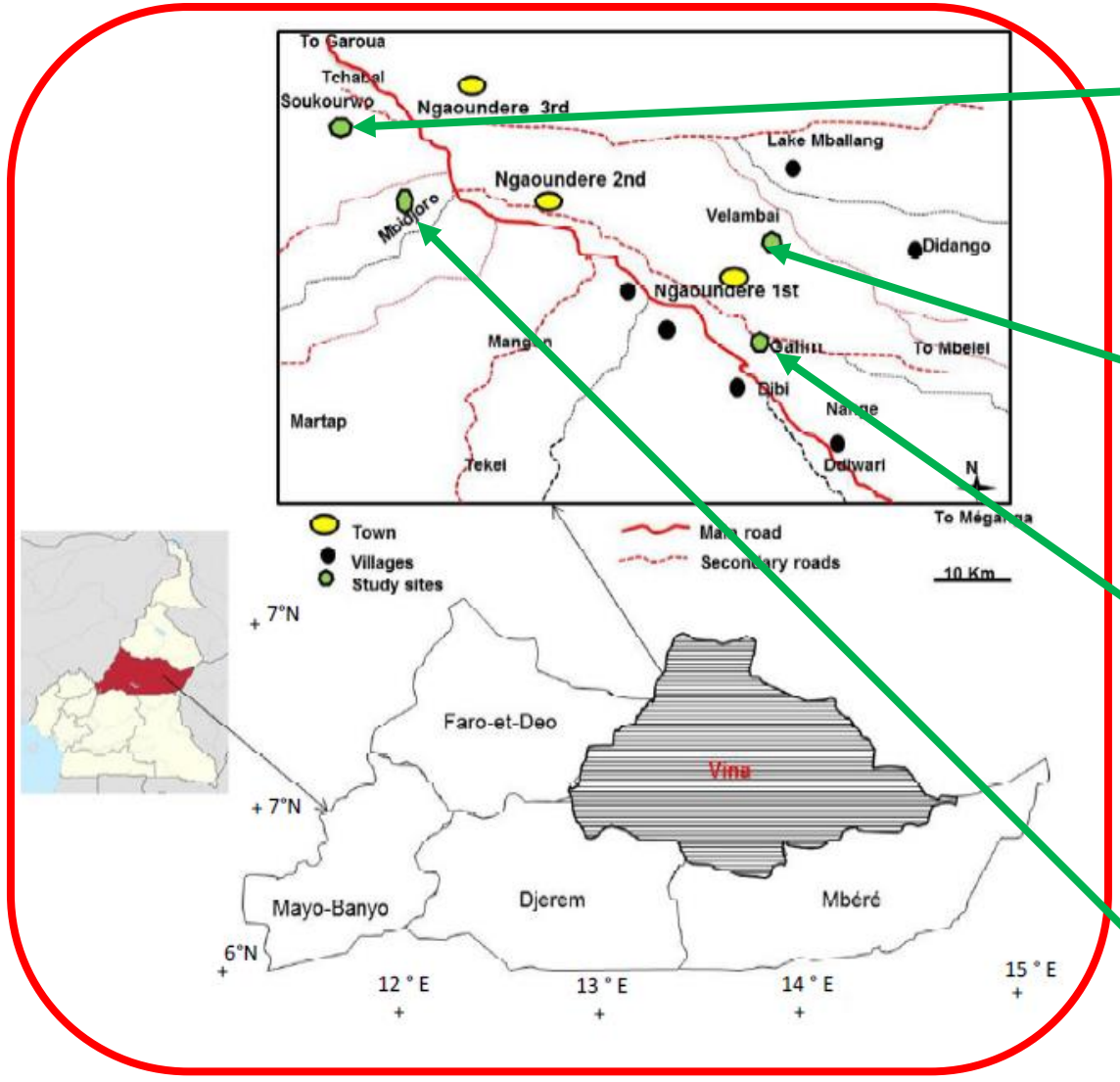
40% stocked in Adamawa

Cameroon=FMDV Pool 5 and sero-characterized by: **A, O, SAT 1** and **SAT 2.**

MATERIALS & METHODS (1/3)

Ngaoundere of Adamawa in Cameroon

- ✓ All cattle & sheep in selected herds from each site were included in the sudy, *i.e.*, **207 cattle** and **140 sheep.**
- ✓ The cattle were all Gudali and sheep Djallonke (*Ovis aries*).
- ✓ All were non-vaccinated.



Soukourwo
Cattle: 45
Sheep: 34

Velambai
Cattle: 39
Sheep: 36

Galim
Cattle: 47
Sheep: 37

Mbidjoro
Cattle: 44
Sheep: 33

MATERIALS & METHODS (2/3)

Blood collection and screening

- ✓ Serum was processed from blood of cattle (Gudali) and sheep (*Ovis aries*) in **2016**.
- ✓ Sera was analysed using NSP ELISA kit (PrioCHECK FMDV NS, Pronics Lelystad B.V. the Netherlands)

Sheep, djallonke (*Ovis aries*)

Tissue collection and screening

- ✓ Cattle tissue serotyped using Ag detection and serotyping ELISA kit (IZSLER).

Gudali

MATERIALS & METHODS (3/3)

Data analysis

- ✓ Statistical analysis was carried out using the R Statistical package.
- ✓ The chi square test was used to compare the prevalence with site, age and sex.

PLOS ONE

RESEARCH ARTICLE

Serotype-Specific Transmission and Waning Immunity of Endemic Foot-and-Mouth Disease Virus in Cameroon

Laura W. Pomeroy[1]*, Ottar N. Bjørnstad[2,3,4,5], Hyeyoung Kim[6], Simon Dickmu Jumbo[7], Souley Abdoulkadiri[7], Rebecca Garabed[1,8]

RESULTS (1/3)

Table 1: Prevalence of FMD NSP antibodies in ruminants with age.

Species	Parameter	Negative (%)	Positive (%)	Total (%)	df	χ^2	P-value
	Age (years)						
Sheep	Young (1 and 1.5)	110 (78.62)	20 (14.30)	130 (92.90)			
15.71%	Adult (>1.5)	8 (5.70)	2 (1.40)	10 (7.10)	1	0.149	0.699
Cattle	<2	20 (68.96)	9 (31.03)	29 (16.57)			
	2 to 3	18 (26.47)	50 (73.52)	68 (38.85)			
65.14%	>3	23 (29.48)	55 (70.51)	78 (44.57)	1	3.4483	0.06332

Table 2: Prevalence of FMD NSP antibodies in ruminants with sex.

Species	Sex	Negative (%)	Positive (%)	Total (%)	df	χ^2	P-value
Cattle	Female	28 (30.10)	65 (69.89)	93 (53.14)			
	Male	65 (57.01)	49(42.98)	114 (65.14)	7	24.853	0.0008057
Sheep	Female	93 (66.40)	14 (10.00)	107(76.40)			
	Male	25 (17.90)	8 (5.70)	33 (23.60)	1	2.371	0.124

RESULTS (2/3)

Table 3: Prevalence of FMD NSP antibodies in ruminants with site.

Species	Site	Negative (%)	Positive (%)	Total (%)	df	χ^2	P-value
Sheep					1	2.371	0.124
	Mbidjoro	24 (17.1%)	9 (6.40)	33 (23.6)			
	Galim	33 (23.6%)	4 (2.90)	37 (26.4)			
	Velambai	32 (22.9%)	4 (2.90)	36(25.70)			
	Soukourwo	29 (20.7%)	5 (3.60)	34(24.30)			
Cattle					3	12.309	.006395
	Mbidjoro	10 (22.72)	35 (77.77)	44 (25.14)			
	Soukourwo	10 (22.22)	34 (72.27)	45(25.71)			
	Velambai	18 (46.15)	21 (53.84)	39(22.28)			
	Galim	23 (48.93)	24 (51.06)	47(26.85)			

Table 4: FMD serotypes detected from VET of cattle with site.

Species	Sites	Total serotyped	Serotype			
			O	A	SAT 1	SAT 2
Cattle	Mbidjoro	15	1	1	1	4
	Soukourwo	17	3	1	0	1
	Velambai	11	1	2	1	0
	Galim	7	3	0	0	0

RESULTS (3/3)

Model results

Table 5: Presentation of the AIC of the two models.

Base model	B-spline age	Maternal immunity	AIC
Catalytic	No	No	43.8
Reverse Catalytic	No	No	37.3
Catalytic	No	Yes	42.1
Reverse Catalytic	No	Yes	33.0
Catalytic	Yes	No	47.0
Reverse Catalytic	Yes	No	46.6
Catalytic	Yes	Yes	36.2
Reverse Catalytic	Yes	Yes	140.8

The most parsimonous was that with the lowest AIC and was reverse catalytic model.

- ✓ The **FOI (λ) was 0.92yr-1** and was constant wrt age and herd.
- ✓ **Rate of waning immunity (ω)=0.32**, meaning cattle are generally immune for **3.12 years p.n.i.**
- ✓ **Maternal immunity duration was 1.5 years**.
- ✓ The **average lifespan of cattle** on the farms was estimated at 8 years.
- ✓ from λ, **the reproduction number (Rt)** was estimated to be **7.33**.
- ✓ **Approximately 87% (0.86)** of cattle always need to be effectively vaccinated to prevent outbreaks.

CONCLUSION

- ✓ FMDV circulated in cattle and sheep populations in close proximity in Ngaoundere.
- ✓ Cattle recorded a higher FMDV NSP antibodies than their sheep counterparts.
- ✓ The **2016 FMDV** out break in Ngaoundere was characterised by **four serotypes** (**O, A, SAT1 & SAT2**), detected in indigenous cattle breed.
- ✓ From model results, the force of infection was constant, cattle were generally immuned for 3 years and **87% (0.86)** of them always need to be effectively vaccinated to prevent outbreaks.

OUTLOOK

- ✓ There is need for a longitudinal country-wide survey on FMD in Cameroon and other countries in the sub-region.
- ✓ As part of the risk identification, the role of ruminants and wild animals in FMD transmission is required in wild life/livestock inferfaces of Cameroon.
- ✓ More FMD genetic studies are required in other regions of the country to know the topotypes in circulation for vaccine matching.

ACKNOWLEDGEMENTS

Laboratories

LANAVET

LEV

DECML

Academic institutions

THE OHIO STATE UNIVERSITY

GFRA Organising committee

GFRA Global Foot-and-Mouth Disease Research Alliance

Participation sponsored by DTRA

DEFENSE THREAT REDUCTION AGENCY UNITED STATES OF AMERICA

Thanks for listening