ASSESSMENT OF FMD VACCINES IN MONGOLIA AND THE ROLE OF BACTRIAN CAMELS

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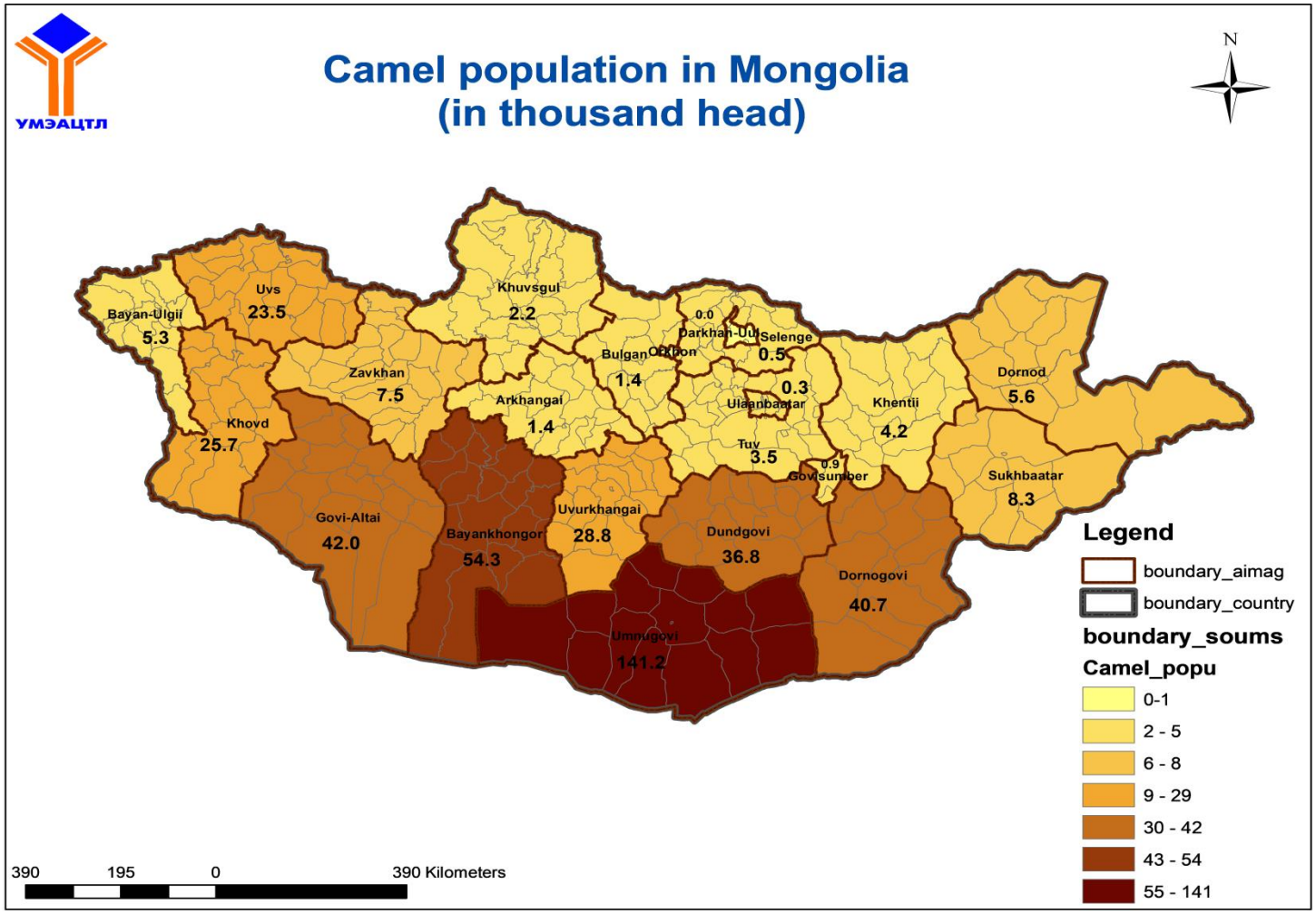
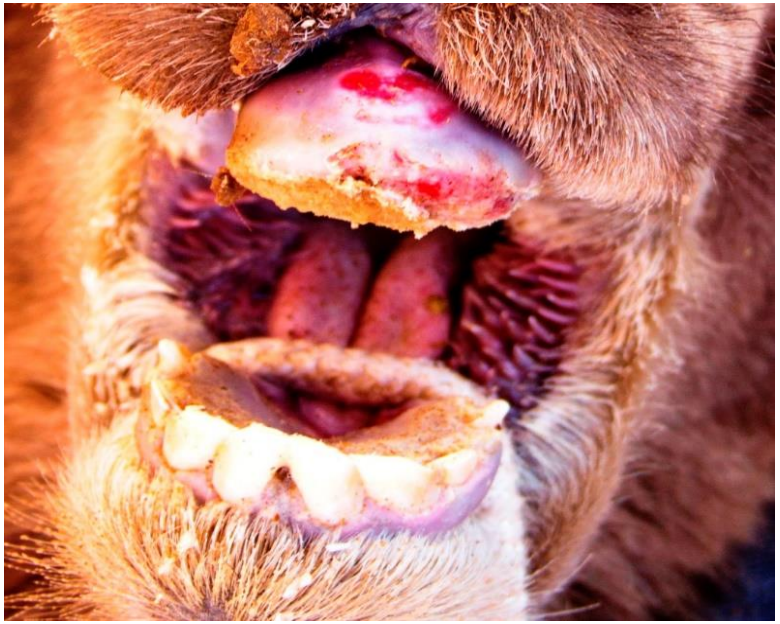
DISTRIBUTION OF BACTRIAN CAMELS

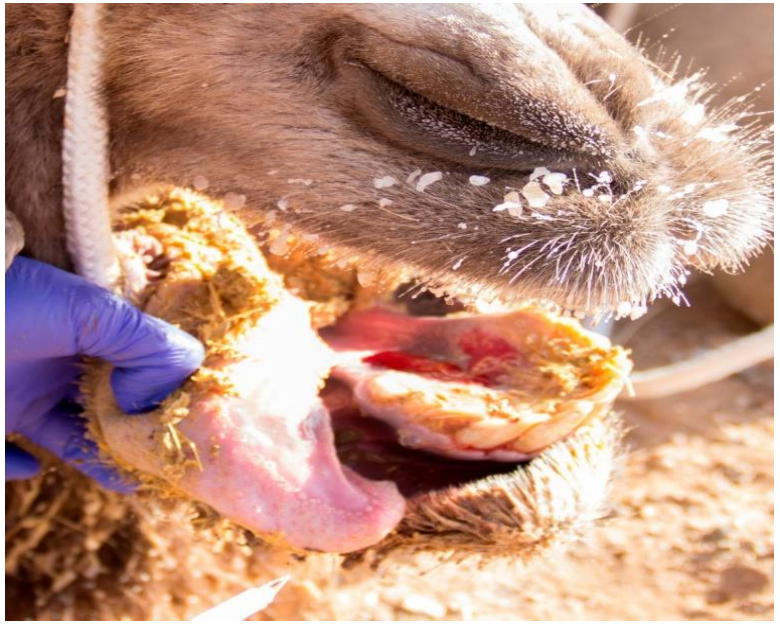


HISTORY OF FMD FOR CAMEL IN MONGOLIA

№	Year (FMD outbreak)	Affected species	Clinical signs	Diagnosis
1	1963-1974	Cattle, sheep, goat, gazelle and **camel**	Lesions in mouth and feet	By symptoms
2	2000	Cattle, sheep, goat, gazelle and **camel**	Lesions in mouth and feet	Serology test
3	2004	Cattle, sheep, goat, gazelle and **camel**	Lesions in mouth and feet	NSP and Ag ELSIA and RT-PCR
4	2010	Cattle, sheep, goat, gazelle and **camel**	Lesions in mouth and feet	NSP and Ag ELSIA and RT-PCR
5	2017-2018	Cattle, sheep, goat, gazelle and **camel,**	Lesions in mouth and feet	NSP, Ag ELISA, RT-PCR and Virus isolation

LESIONS IN MOUTH IN 2018





LAMENEES ON THE FRONT FEET

Lesion in feet and it was easier to detach

FMD CLINICAL SIGNS IN CAMEL IN 2010

The detaching of the soles of the feet

DIAGNOSIS FOR CAMEL IN PREVIOUS YEAR

Year	Origin	Number of herd	Number of camel with clinical signs	Laboratory tests			
				NSP ELISA	Ag ELISA (type O)	RT-PCR	Virus isolation
2001-1	Dornod Bayantumen	2	6	**3**	**0**	**0**	**0**
2004-1	Sukhbaatar Uulbayan	2	8	**5**	**0**	**0**	**0**
2010-10	Dornod Matad	30	15	**3**	**6**	**5**	**0**
2010-11	Khentii Bayankhutag	40	5	**2**	**1**	**1**	**0**
2014-1	Sukhbaatar Erdenetsagaan	18	9	**4**	**0**	**0**	**0**

All outbreaks were caused by FMD virus serotype O

DIAGNOSIS FOR CAMEL IN 2018

№	Origin	Number of camel	Laboratory tests			
			NSP	Ag ELISA	RT-PCR	Virus isolation
1	Dundgovi	13	5	8	13	13
3	Dornogovi	2	1	2	2	1
4	Umnugovi	9	5	1	2	1

It is first time to isolate FMDV from Mongolian Bactrian camel

RESULT OF FMDV FOR BACTRIAN CAMEL

FAO World Reference Laboratory for FMD Genotyping Report page 3 /

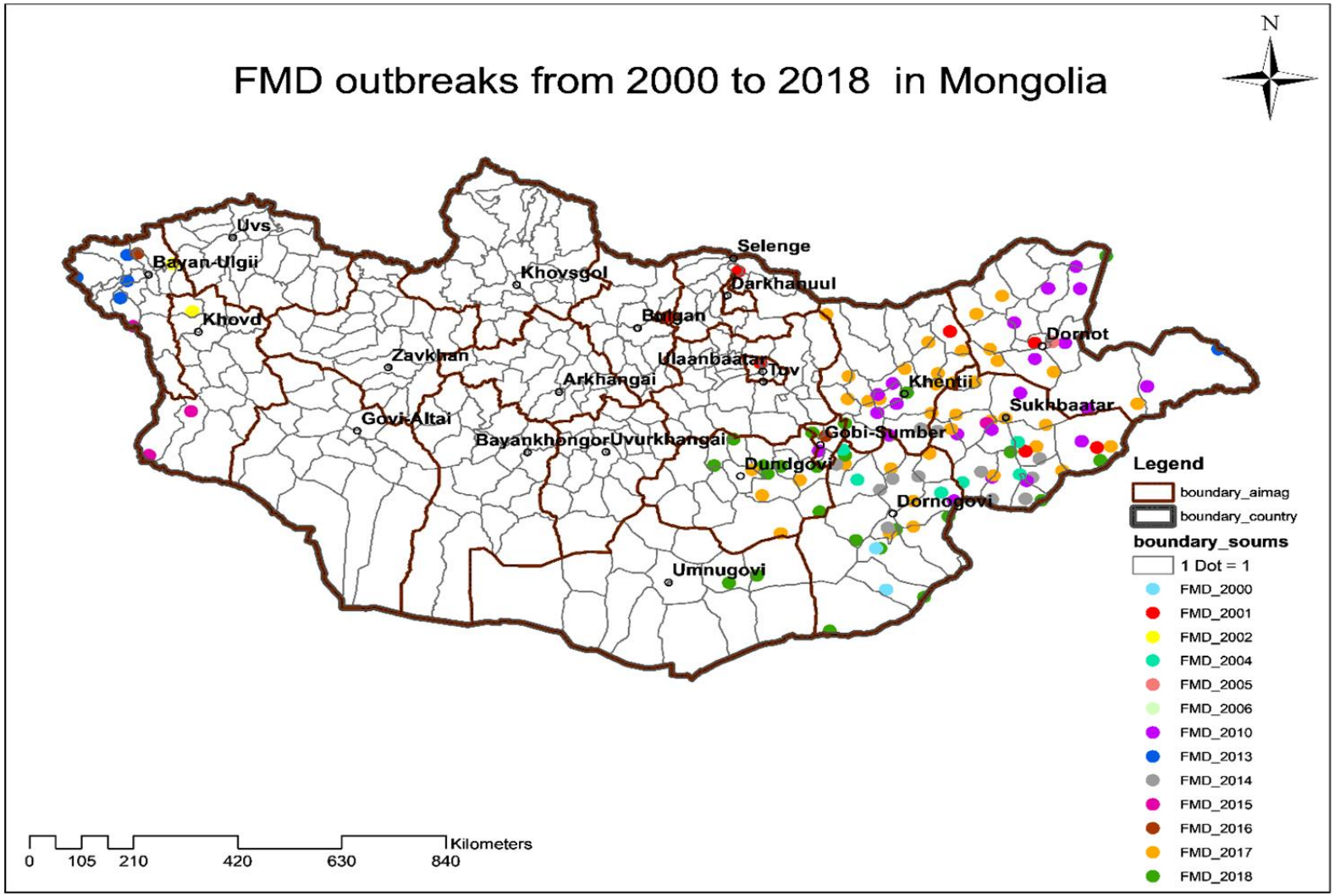
Virus sample name:	MOG/2/2018
Sender reference:	LFBK-34 FMDV Camel No.1 Virus-1
Location of origin:	Gurvansaikhan, Dundgovi
Country of origin:	Mongolia
Date of collection:	03/01/2018
Host species:	
Serotype:	O
Topotype:	ME-SA
Lineage:	Ind-2001
Sublineage:	e
Sequence length:	633
Ambiguities:	0
Material submitted for sequencing:	BTy1
Harvest date of material:	29/08/2018
Primers:	O-1C244F/EUR-2B52R; O-1C272F/EUR-2B52R; FMD-3161F/FMD-4
Received for sequencing:	07/09/2018

SURVEILLANCE FOR CAMEL IN 2018

Origin	Number of herder	Number of herd	Laboratory test			Time
			Number of camel	NSP ELISA	Real-Time PCR	
Dundgovi	2	265	26	**12**	**5**	March,2018 **In outbreak zone**
Umnugovi	2	245	26	**12**	**6**	March,2018 **In outbreak zone**
Dornogovi	1	60	30	**10**	**3**	March,2018 **In outbreak zone**
Dundgovi	5	385	50	**0**	**0**	June,2018 In suspective zone
Umnugovi	10	580	120	**0**	**0**	June,2018 In suspective zone
Dornogovi	8	240	38	**0**	**0**	June,2018 In suspective zone

SECTION 2: POST-VACCINATION MONITORING (PVM)

FMD OUTBREAK IN RECENTLY



2003, 2007-2009, 2011-2012 no outbreak

VACCINATION MAP

FMD IMMUNOGENICITY STUDIES

- **Objective:** The following study is recommended for implementation in Mongolia at the earliest opportunity to establish if currently procured vaccines are likely to be of sufficient quality for FMD control. The focus of these investigations is on cattle, sheep and camel.
- **Material and methods:** Small-scale immunogenicity studies were useful to indicate if a purchased vaccine meets basic requirements regarding quality and are likely to confer protection to strains recently isolated from Mongolia.

  -status- animals involved free from FMDV and antibodies, not vaccinated against FMD; -

  - age – six to nine months;

  - sex – immaterial

VACCINE STRAIN AND FMDV ISOLATES IDENTIFICATION

ID of Vaccine	Adjuvants of vaccine	IGStudy Group	Strains of virus in vaccine	FMD virus isolates used for VNT	FMDV lineage
Vaccine-1 ARRIAH	Oil (Type O and A)	1	O/MESA/PanAsia A/Asia/Sea-97	O/MOG/4/2015	SEA Mya-98
				O/MOG/13/2017	MESA PanAsia
Vaccine-2 ARRIAH	Aqueous (Type O and A)	2		O/MOG/14/2017	MESA Ind2001d
				A/MOG/1/2016	ASIA Sea-97

A following protocol is given in the FAO/OIE Post Vaccination Monitoring Guidelines which is summarised here:

Vaccination protocol:

Species	Dose of vaccine	Number of animals	Number of vaccinated animal	Number of non-vaccinated	Number of boosted animal
Cattle	2ml	12	10	2	5
Sheep	1ml	12	10	2	5
Camel	**2ml**	**6**	**5**	**1**	**3**

	Day
Blood sampling	0
	14+BD
	28
	56
	112
	180
	270

Blood sample collected after first vaccination 112, 180, 270 days to continue this study

LABORATORY TESTING

- All samples tested by NSP antibody ELISA *(*IDVet, *France)* to provide evidence that exposure did not occur during the study period

- All NSP negative samples tested by VNT (at WRLFMD, Pirbright) to the vaccine strains and a representative strain of the appropriate lineage isolated from the field

SUMMARY OF VNT RESULT

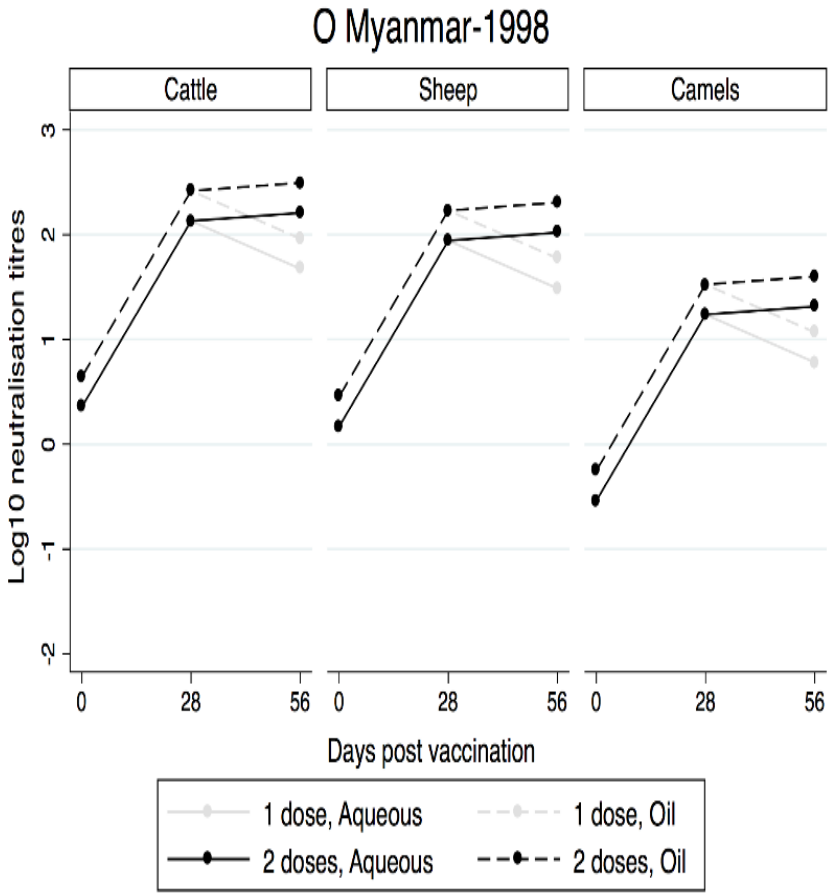
(Oil and aqueous vaccine)

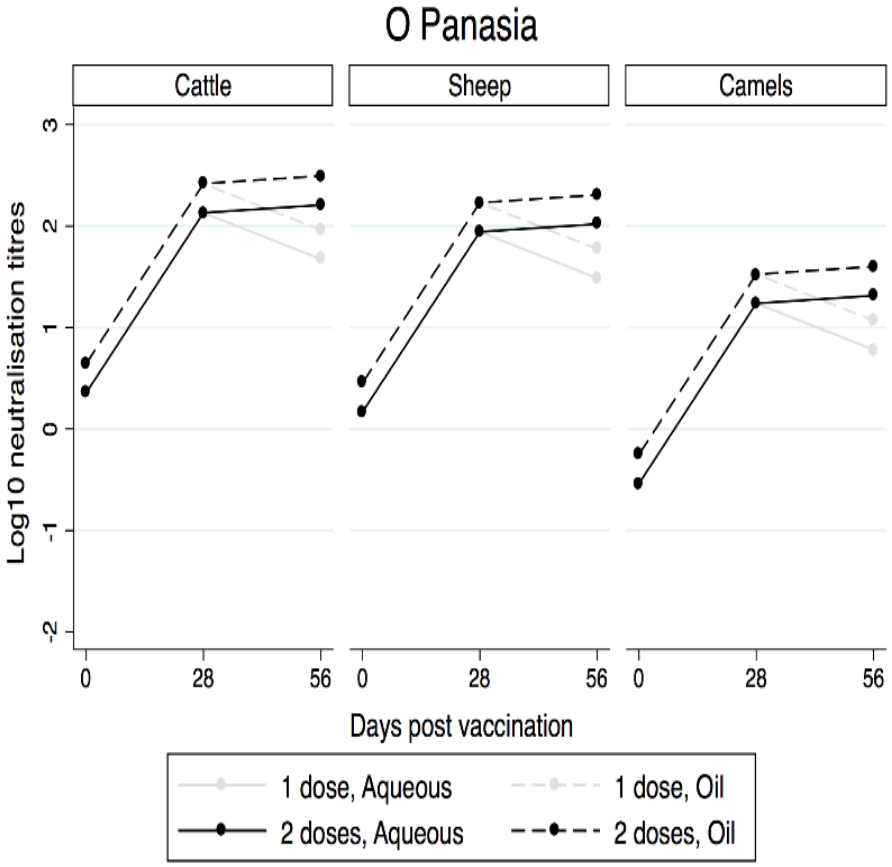
Vaccine	Species	DPV	Serotype			
			O1	O2	O3	A
Oil	Camel	28	0/5	1/5	0/5	4/5
		56	0/5	0/5	0/5	2/5
Aqueous		28	1/5	2/5	0/5	5/5
		56	0/5	0/5	0/5	2/5

Vaccine adjuvant	Species	DPV	Serotype			
			O1	O2	O3	A
Oil	Cattle	28	10/10	10/10	9/10	9/10
		56	9/10	9/10	8/10	9/10
Aqueous		28	9/10	8/10	4/10	7/10
		56	7/10	8/10	5/10	7/10

Summary of the number of positive animals by VNT for each vaccine at 28 and 56 days post vaccination

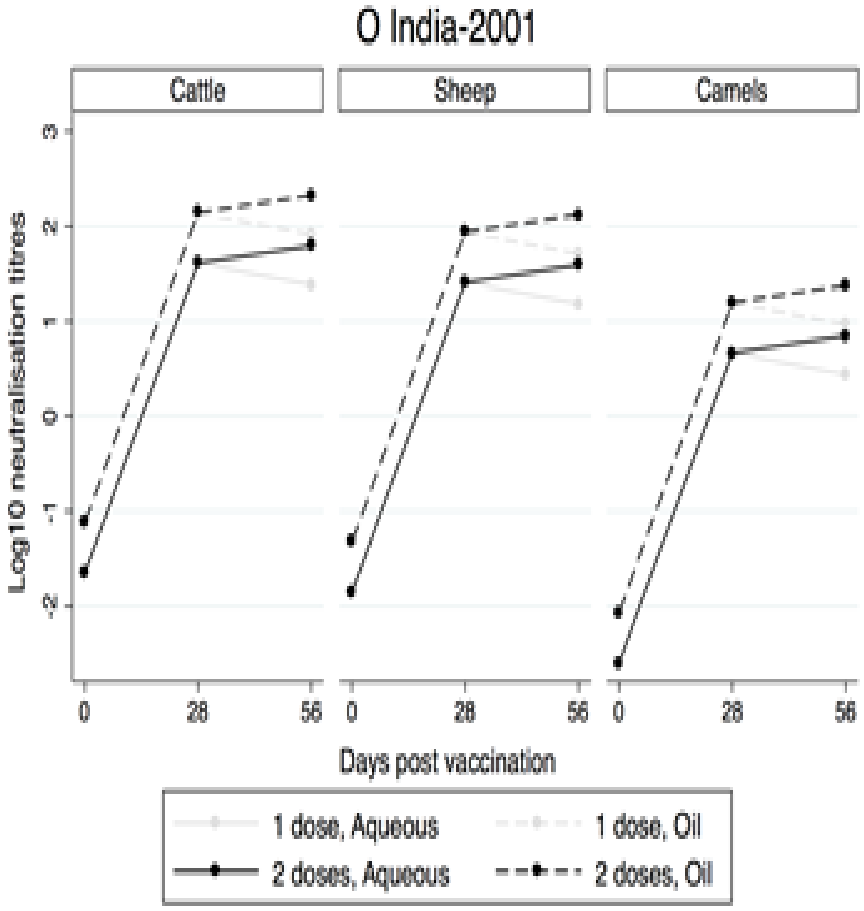
OS18

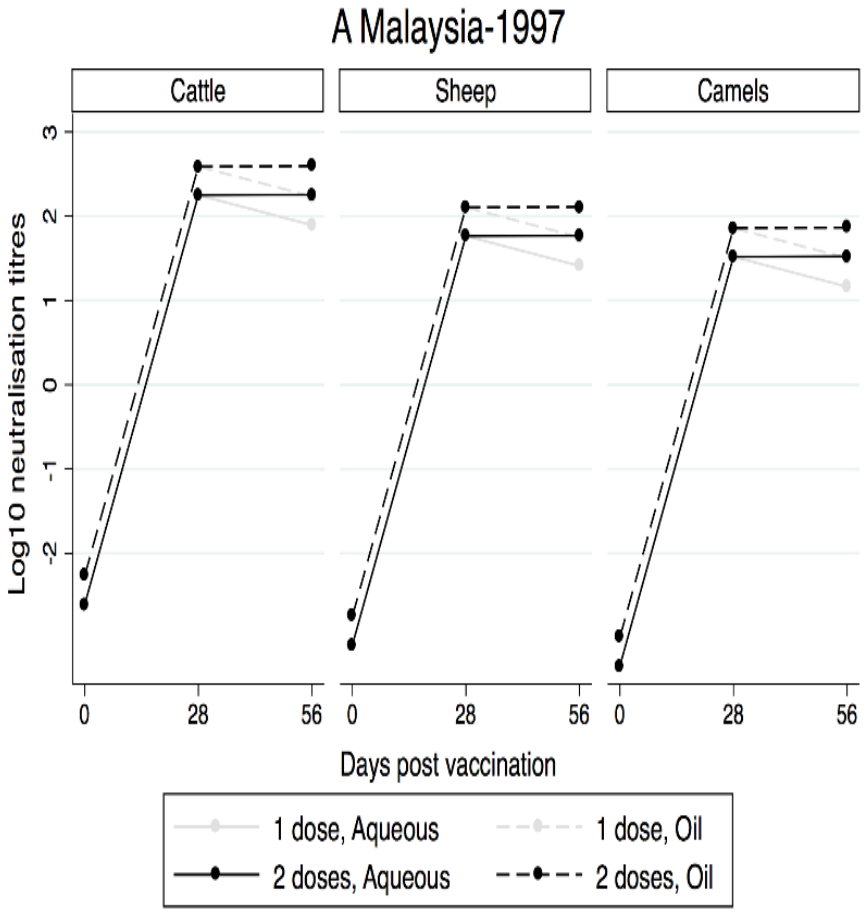




- At day 28, the response to oil based vaccines was significantly higher than aqueous based vaccines for O PanAsia and O India 2001 after adjusting for species. For O Mya-98 and A May-97 there was no difference at day 28.
- At day 56, the response to oil based vaccines was higher for all strains irrespective of species

OS18





- At day 28, **sheep** had significantly lower titres than cattle adjusted for vaccine type used for all strains except O India 2001 although the differences were marginal
- After two doses, there was only a significantly lower titre seen with A Sea-97.

CONCLUSION

1. Titres were significantly lower for camels (after adjusting for vaccine type and number of doses given).
2. Sheep tended to have lower titres compared to cattle after a single dose, being similar after two doses
3. At day 56, the response to oil based vaccines was significantly higher that aqueous based vaccines (adjusted for species and number of doses administered).
4. Significantly higher titres were seen at day 56 when a second dose was given at day 28 (adjusted for species and vaccine type)
5. Bactrian camel is infecting by FMD in naturally.

FUTURE STUDIES (FOR BACTRIAN CAMEL)

- We need to more work is done to elucidate the role of camels such as through a structured serosurvey in countries that have bactrian camels (epidemiology of FMD).

- Also we need to some work to optimise vaccination dose for camel.

Thank you for your attention