

Vaccine matching strain characterisation of FMDV in SEA region

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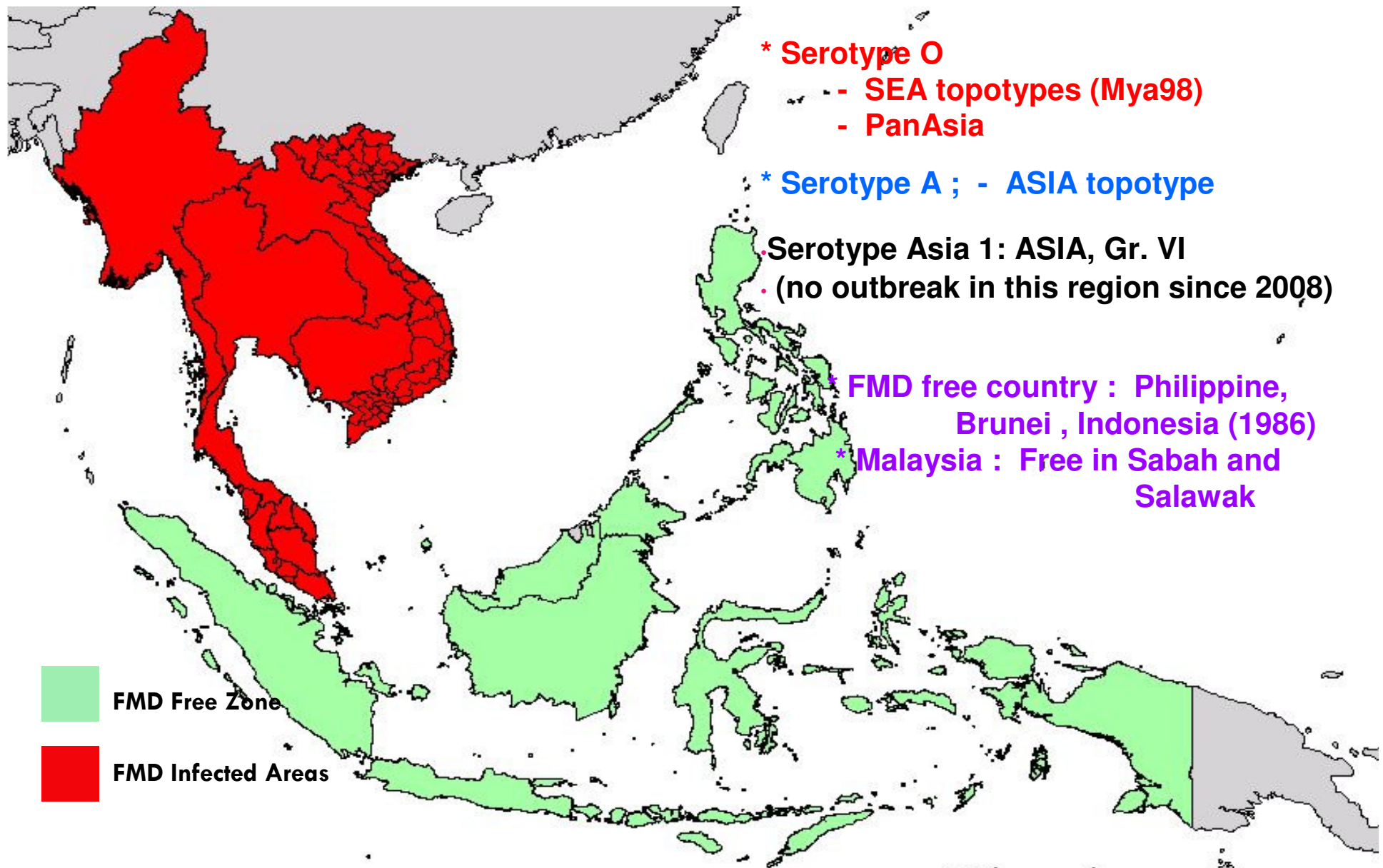
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- ❖ To serve as an OIE Reference Laboratory for FMD
- ❖ To serve as national laboratory for FMD diagnosis within the country (8 Veterinary Diagnostic Center)

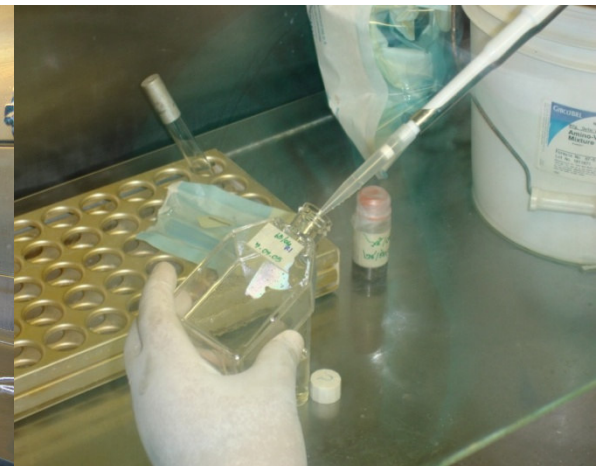


FMD Status in South East Asia



Source : Dr. Ronello Abila, OIE-SRR

- FMD Diagnosis of specimen submission from OIE member countries by ELISA typing, Virus isolation, RT-PCR
- LP ELISA , NSP test



FMD diagnostic chart

Antigen detection

- ELISA typing
- Virus isolation
 - * Pri. lamb kidney cell
 - * BHK 21 Cell line
- RT- PCR



Antibody detection

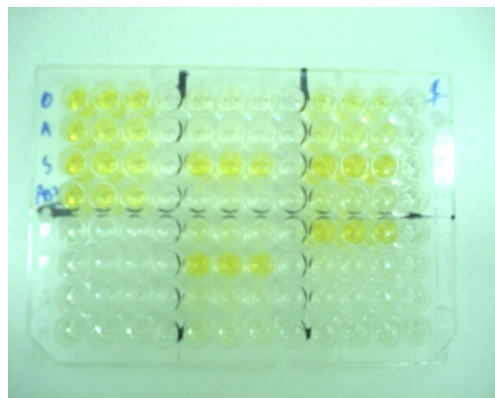
- LP ELISA Test
- NS test



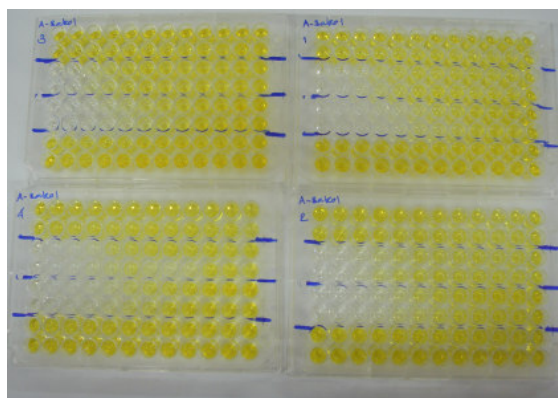
Strain characterisation

- * Antigenic variation (r-value)
- * Genomic variation (Phylogenetic tree)

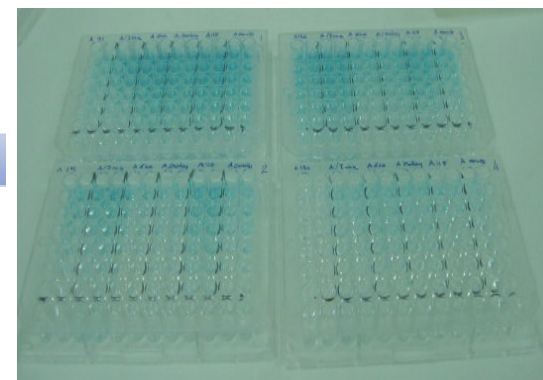
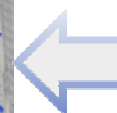
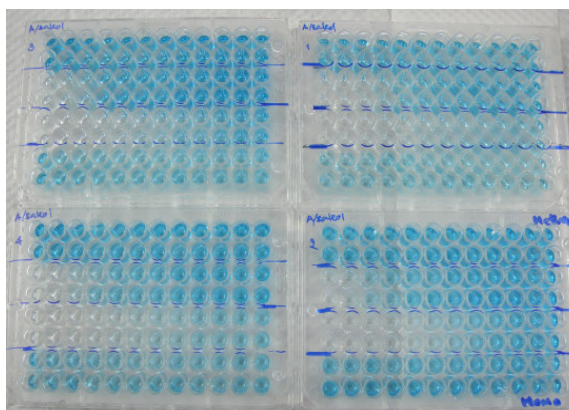
Procedure for vaccine matching investigation (r-value) by LP ELISA method



virus isolation to get high viral titer



Vaccine matching test



antigen titration to select an optimal dilution

FMDV Strain differentiation

Objective:

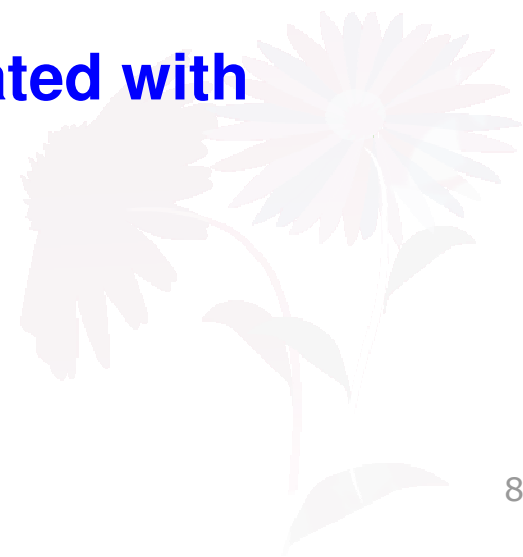
To study antigenic and genomic variation between strains within serotype for epidemiological investigation and immunophylaxis campaign.

Investigation method:

- 1) r-value = to determine serological relationship between virus vaccine strain and field outbreak strain for seed vaccine selection.
- 2) nucleotide sequencing = to analyze genetic relationship among viruses from field outbreak strains.

Material need for r-value investigation

- ◆ **Homologous virus :**
Seed vaccine strain such as O, A or Asia1
- ◆ **Heterologous virus:**
Isolation viruses from field outbreak
- ◆ **Homologous serum:**
Bovine serum, 21 post vaccinated with homologous vaccine strain



Serological methods for r-value

- Complement Fixation (CF) Test
- Virus Neutralization (VN) Test
- Liquid phase blocking ELISA
(LP ELISA)

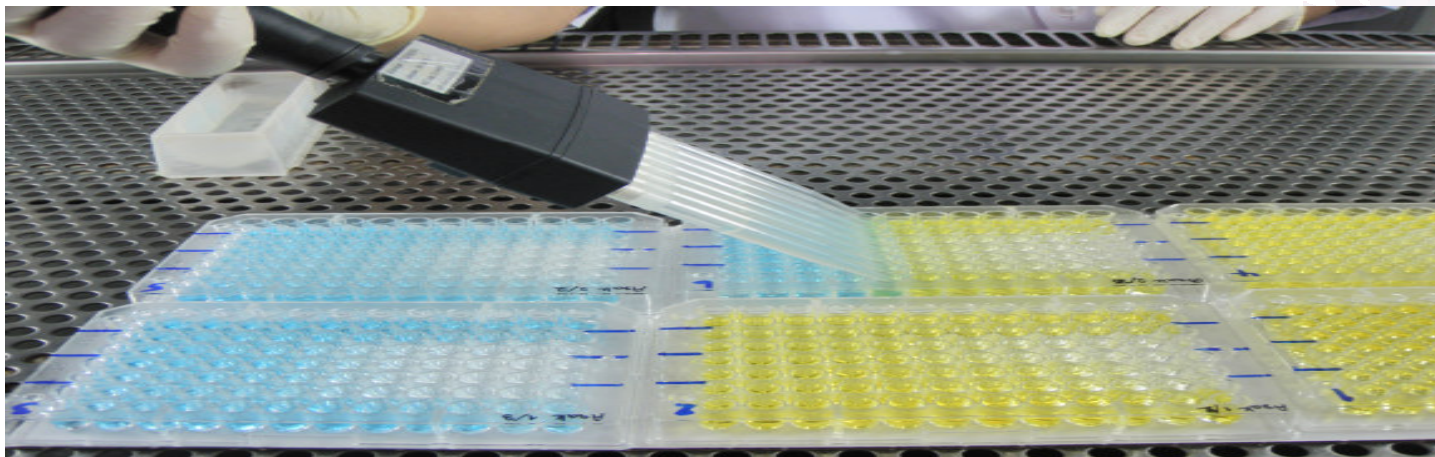
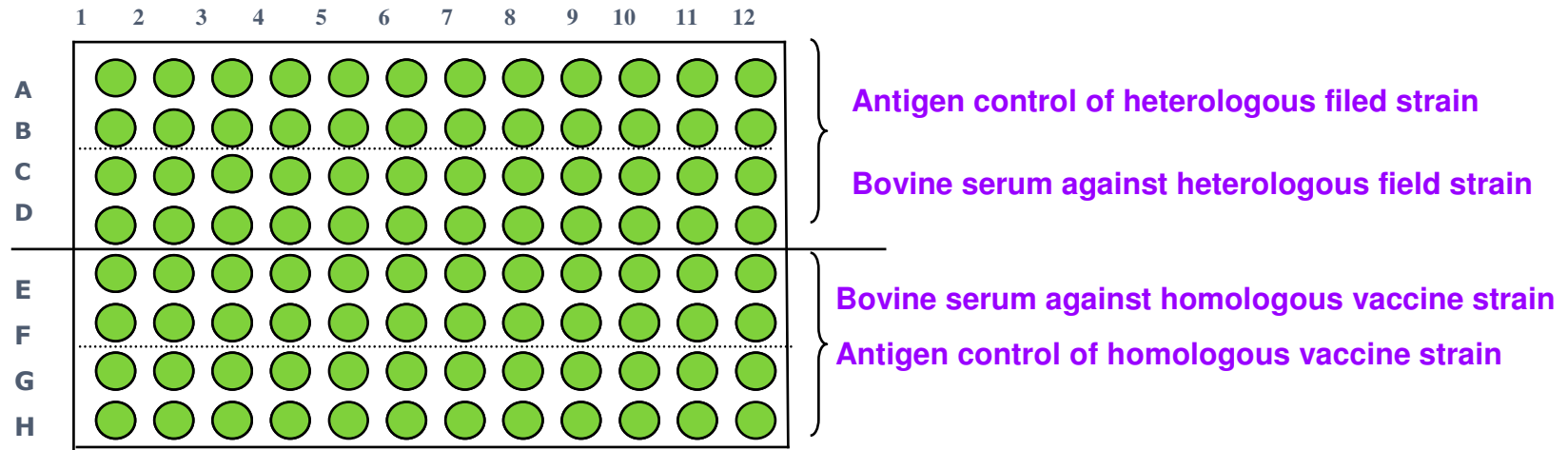
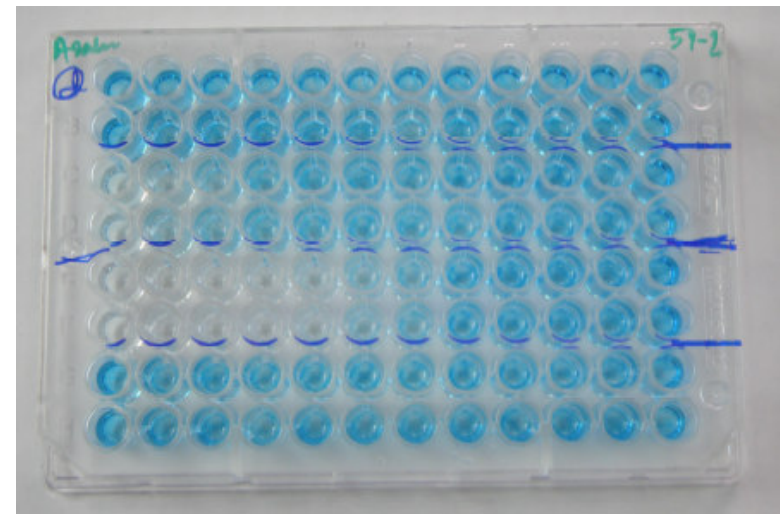
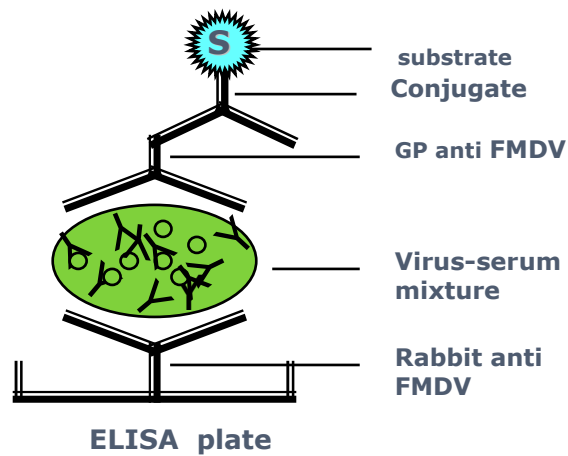


Plate layout and diagram for r-value investigation by LP ELISA



Serum dil. → 1:2 1:4 1:8 1:16 1:32 1:64 1:128 1:256 1:512 1:1024 1:2048 1:4096



Calculation of r-value and criteria for interpretation

$$\text{r-value} = \frac{\text{Serum titer against heterologous field strain}}{\text{Serum titer against homologous vaccine strain}}$$

In the case of VNT:

$r_1 = \geq 0.3$. Suggests that there is a close relationship between field isolate and vaccine strain. A potent vaccine containing the vaccine strain is likely to confer protection.

$r_1 = < 0.3$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect

In the case of LPB ELISA:

$r_1 = 0.4-1.0$. Suggests that there is a close relationship between field isolate and vaccine strain. A potent vaccine containing the vaccine strain is likely to confer protection.

$r_1 = 0.2-0.39$, Suggests that the field isolate is antigenically related to the vaccine strain. The vaccine strain might be suitable for use if no closer match can be found provided that a potent vaccine is used and animals are preferably immunised more than once.

$r_1 = < 0.2$. Suggests that the field isolate is so different from the vaccine strain that the vaccine is unlikely to protect

Table 1. Vaccine matching of FMDV type O in SEA region during 2006-2008 (using O189/87 Thai vaccine Strain)

Country	Year	Total sample	Range of r-value by LP ELISA		
			0-0.19 Poor Matching	0.2-0.39 moderate matching	0.4-1.0 Good Matching
Vietnam	2006	6	-	-	6
Cambodia		4	-	-	4
LAO PDR		3	-	-	3
Thailand			Not done		
Lao PDR	2007	4	-	-	4
Thailand		5	-	-	5
Lao PDR	2008	2	-	-	2
Cambodia		3	-	-	3
Myanmar		2	-	-	2
Thailand		5	-	-	5
					34 (100%)

Table 2. Vaccine matching of FMDV type O in SEA region during 2009-2010 (using O189/87 Thai vaccine Strain)

Country	Year	Total sample	Range of r-value by LP ELISA		
			0-0.19 Poor Matching	0.2-0.39 moderate matching	0.4-1.0 Good Matching
Myanmar	2009	3	-	-	3
Thailand		4	-	-	4
Cambodia	2010	3	-	-	3
Vietnam	2010	11	-	-	11
Thailand	2010	7	-	-	7
					28 (100%)

Table 3. Vaccine matching of FMDV type O in SEA region in 2011 (using O189/87 Thai vaccine Strain)

Country	Year	Total sample	Range of r-value by LP ELISA		
			0-0.19 Poor Matching	0.2-0.39 moderate matching	0.4-1.0 Good Matching
Cambodia	2011	2	-	-	2
Loa PDR	2011	3	-	-	3
Thailand	2011	13	-	-	13
					18 (100%)

Table 4. Vaccine matching strain differentiation by VN test (2010)

Report no:		VNT				
Vaccine:		○	○	○	○	○ TNN
Field Isolate:	VNT	3039	4625	Manisa	Taw98	24/82
○ Cam 06/2010	Mean	0.56	0.65	0.25	>0.99	0.38
○ Cam 08/2010	Mean	0.44	0.67	0.25	>0.89	0.48

Report no:		VNT					
Vaccine:		○	○	○	○	○ TNN	○ Tur
Field Isolate:	VNT	3039	4625	Manisa	Taw98	24/82	5/09
○ Vit 18/2010	Mean	0.76	0.76	0.30	>0.83	0.20	>0.65
○ Vit 23/2010	Mean	0.70	0.62	0.18	0.87	0.10	0.51

Source: World Reference Laboratory for FMD (WRL), UK

Table 5. Vaccine matching strain differentiation by VN test (2011)

Report no:		VNT						
Vaccine:			○		○	○	○	
Field Isolate:		VNT	3039	○ 4625	Manisa	○ Taw98	○ TNN 24/82	○ Tur 5/09
○ Tai 02/2011		Mean	0.51	>0.76	0.29	>0.85	0.21	>0.67
○ Tai 07/2011		Mean	0.49	0.52	0.21	>1.0	0.17	>0.68

Report no:		VNT					
Vaccine:			○	○	○	○	
Field Isolate:		VNT	3039	4625	Manisa	○ Taw98	○ TNN 24/82
○ Lao 01/2011		Mean	>0.67	>0.88	0.25	0.93	0.24

Source: World Reference Laboratory for FMD (WRL), UK

**Table 6. Vaccine matching of FMDV type Asia 1 in SEA during 2005- 2006
(using Asia 1/85 Thai vaccine Strain)**

Country	Year	Total sample	Range of r-value by LP ELISA		
			0-0.19 Poor Matching	0.2-0.39 moderate matching	0.4-1.0 Good Matching
Myanmar	2005	1	-	-	1
Vietnam	2006	4	-	-	4
					5(100%)

Thailand: no type Asia 1 outbreak since 1998

**Table 7. Vaccine matching of FMDV type A in SEA during 2006- 2008
(using A118/87 Thai vaccine Strain)**

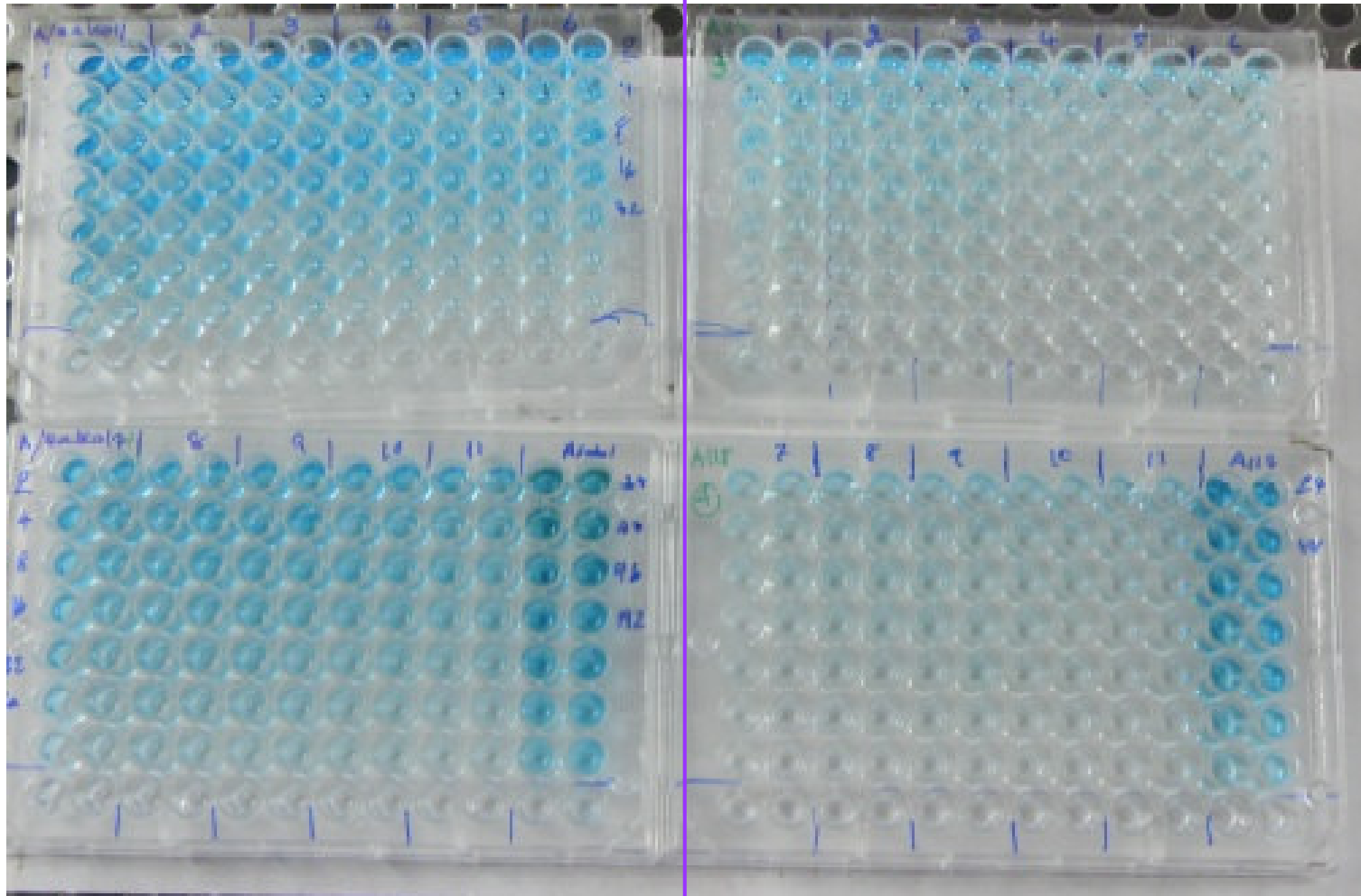
Country	Year	Total sample	Range of r-value by LP ELISA		
			0-0.19 Poor Matching	0.2-0.39 moderate matching	0.4-1.0 Good Matching
Cambodia	2006	2	-	-	2
LAO PDR		4	-	-	4
Thailand		16	-	1	15
LAO PDR	2007	16			16
Thailand		10	-	-	10
Cambodia	2008	1	-	-	1
Lao PDR		1	-	-	1
Vietnam		1	-	-	1
Thailand		14	-	-	14
				1 (1.54%)	64(98.46%)

Table 8. Vaccine matching or r-value of FMDV type A (A118/87) and A/Sakolnakorn/97 in SEA region (specimens received in 2009-2012)

Country	Year	Total sample	Range of r-value by LP ELISA test			
			A118/87		A/Sakolnakorn/97	
			0.2-0.39	0.4-1.0	0.2-0.39	0.4-1.0
Lao PDR	2009	1	-	1	ND	
Vietnam		6	1	5		
Thailand		9	-	9		ND
Thailand	2010	3	No binding reaction by antigen titration	--	3*	
Vietnam	1	1*				
Thailand	2011	39	No binding reaction by antigen titration	--	39*	
	2012	2			2*	

Supporting investigation on FMD profiling test

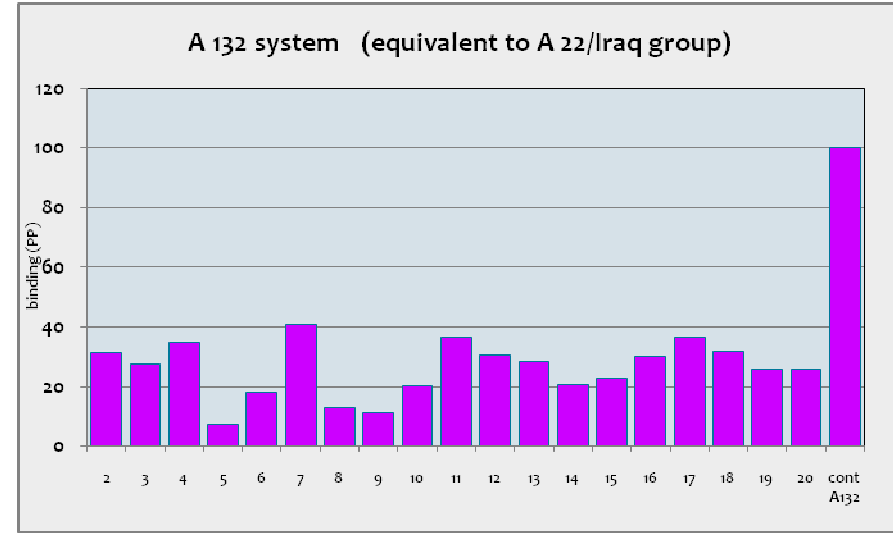
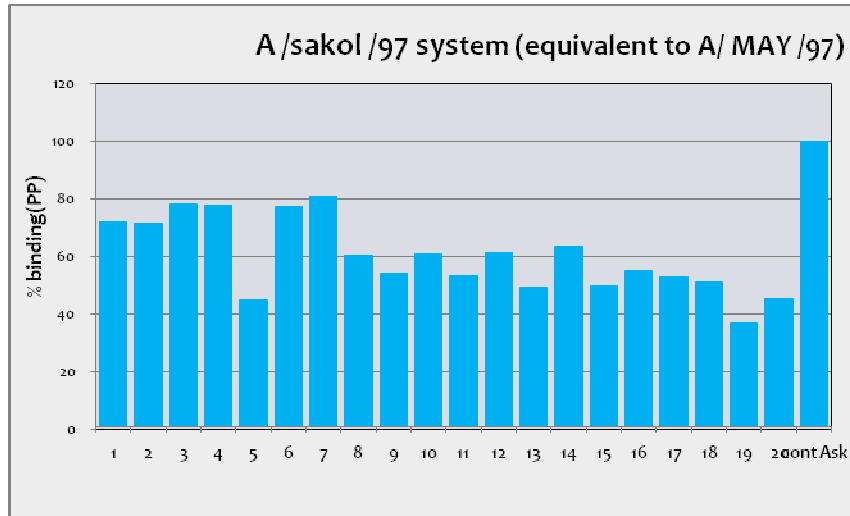
by antigen titration of field virus type A in 2011 (No. 1-11)
indicating the high binding reaction to A/sakol/97 system



A/sakol/97 system

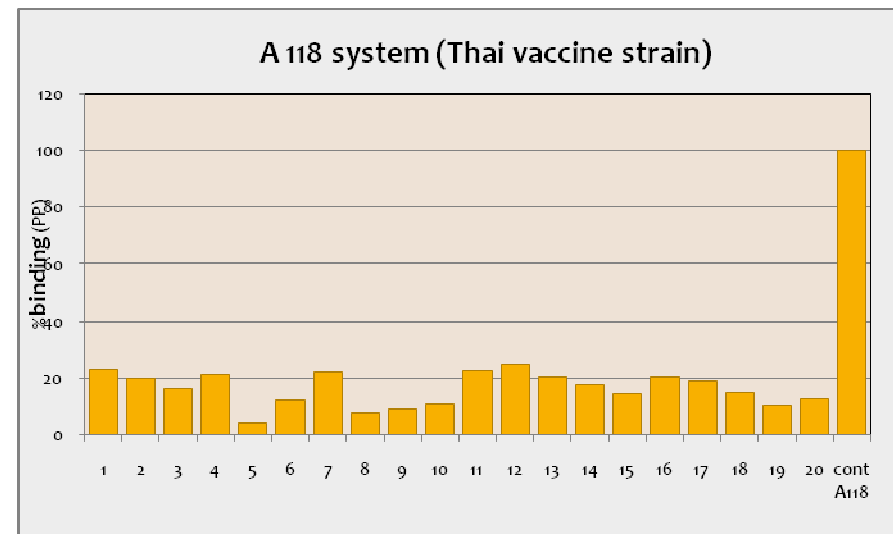
A118/87 system

FMD profiling test of FMD viruses in 2011



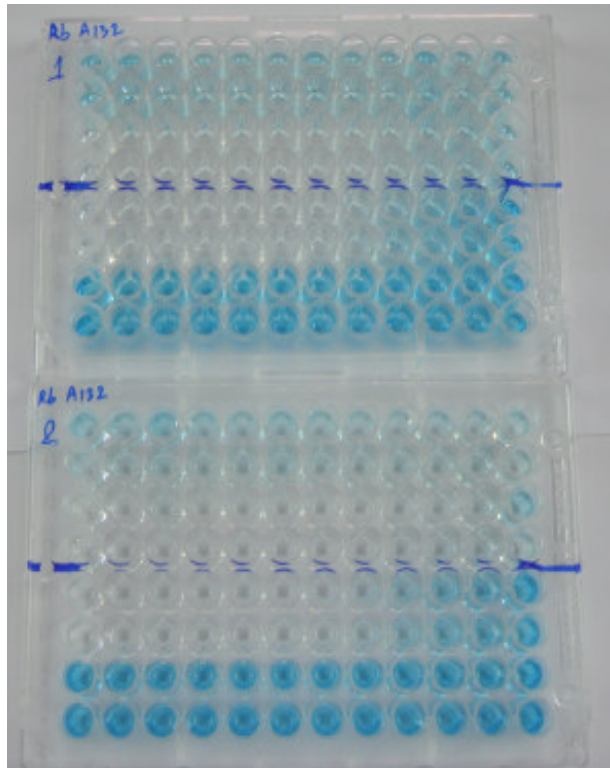
Purpose:

1. to calculate % antigenic binding reaction of field isolate viruses and compare to several reference vaccine strains
2. To select the appropriate reagent system used in vaccine matching test or other research

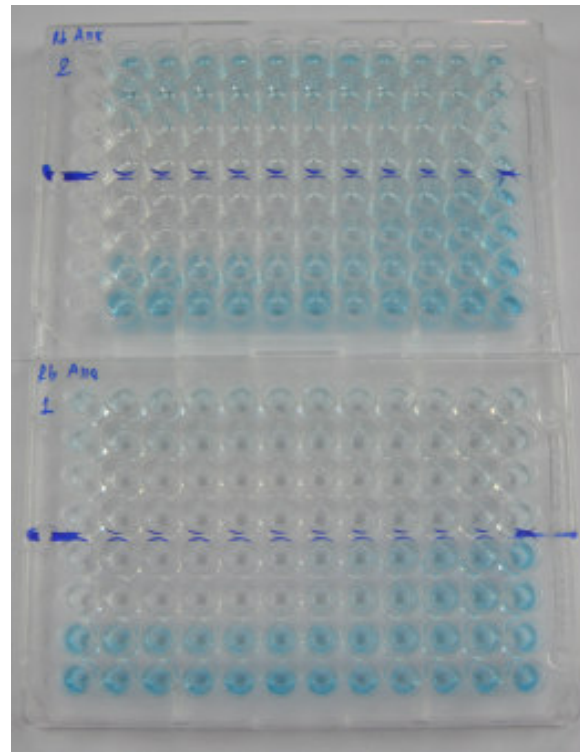


vaccine matching (r-value) using several reference vaccine strain ;

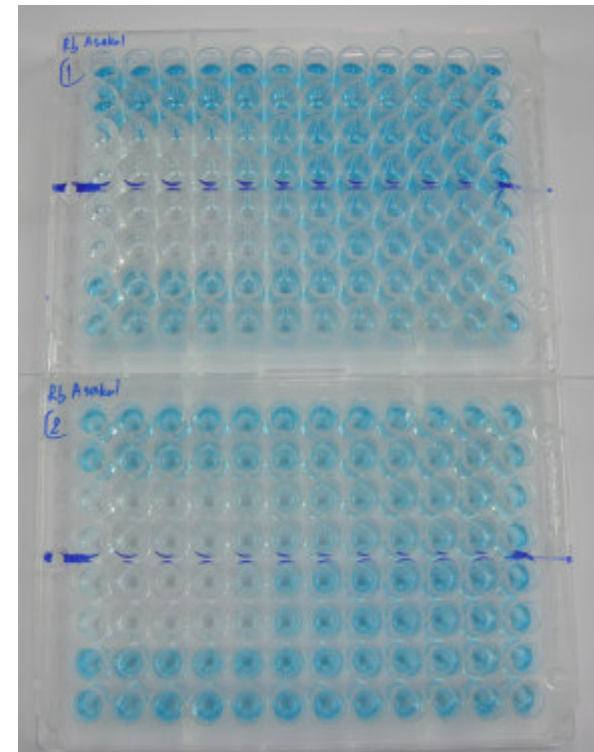
A132 , A118/87 and A/sakol/97 system



A132

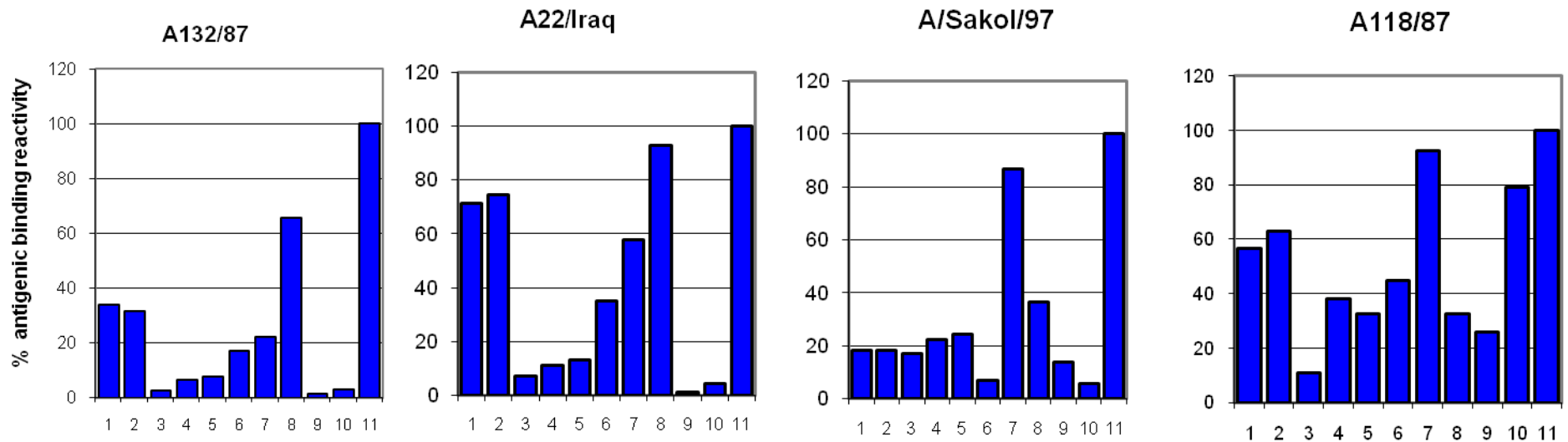


A118/87



A/sakol/97

Figure 1. ELISA Profile test of field isolate viruses from Thailand during 2005-2007 react with reference viruses: A132/87, A22/Iraq, A/Sakolnakorn/97 and A118/87



Sample Name:

No.1 = THA 2/07

No.2 = THA 87/06

No.3 = THA 31-1/05

No.4 = THA 76/06

No.5 = THA 84/06

NO.6 = THA 16/06

No.7 = THA 46-1/05

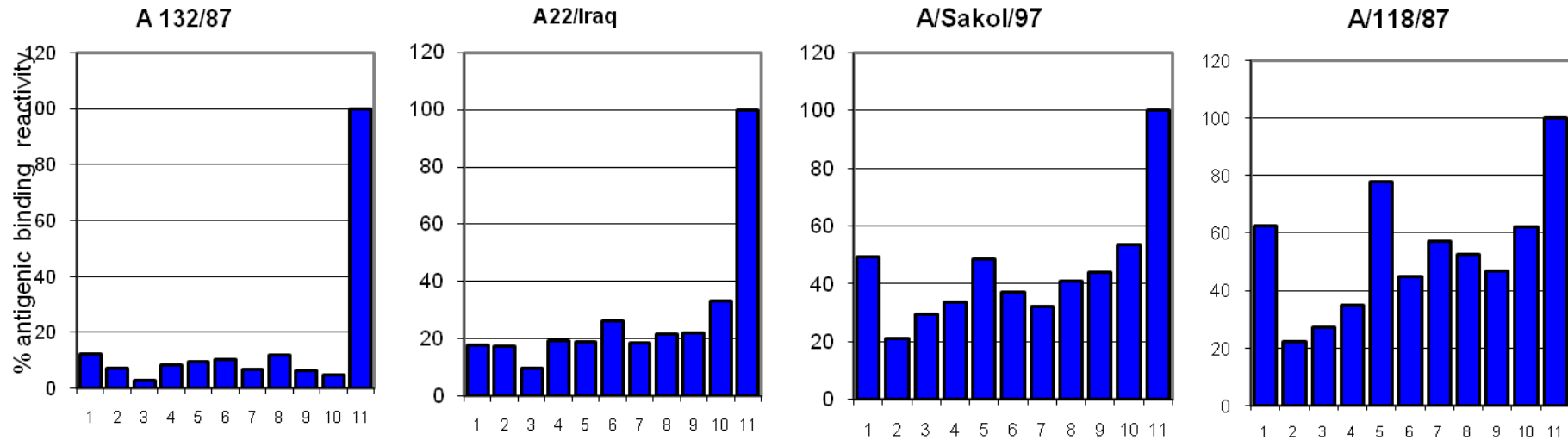
No.8 = THA 80/05

No.9 = THA 50/06

No.10 = THA 78/06

No. 11 = Reference homologous virus

Figure 2. ELISA Profile test of isolate viruses from LAO in 2007 react with reference viruses: A132/87, A22/Iraq, A/Sakolnakhorn/97 and A118/87



Sample Name:

No.1 = LAO 1/07	No.6 = LAO11/07
No.2 = LAO2/07	No.7 = LAO14/07
No.3 = LAO3/07	No.8 = LAO15/07
No.4 = LAO4/07	No.9 = LAO17/07
No.5 = LAO10/07	No.10 = LAO 7/07
No.11 = Reference homologous virus	

Conclusion

1. r-value of type O viruses causing outbreak in SEA region during 2006-2011 demonstrated that no antigenic change from recent vaccine strain.
2. r-value of type A viruses causing outbreak in Thailand during 2010 -2012 has antigenically varied from A118/87 to A/sakol/97 vaccine strain. Therefore, an additional of A/sakol/97 vaccine in the current vaccine was recommended.
3. History of A/sakol /97 vaccine strain was used in late 1997 to 2001 , then changed to 118/87 in beginning of 2001 up to 2009, furthermore by end of 2010 , A/sakol/97 was recommended to use again.

Priority vaccines recommendation in SEA region

Serotype	Internationally available vaccines	Locally produced vaccine
O	O Taiwan 98, O/ 3039 O /4625	Thailand 189/87
A	A/MAY 97/ A22 Iraq	Thailand 118/87, A Sakolnakorn/97 (equivalent to A/MAY/97)
Asia 1	Asia1/Shamir	Thailand/85



*Thank you for
your attention*

Acknowledgements

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- ☺ OIE-SRR , Bangkok
- ☺ SEACFMD member country
- ☺ RRL staff