

Epidemiology of FMDV in South East Asia

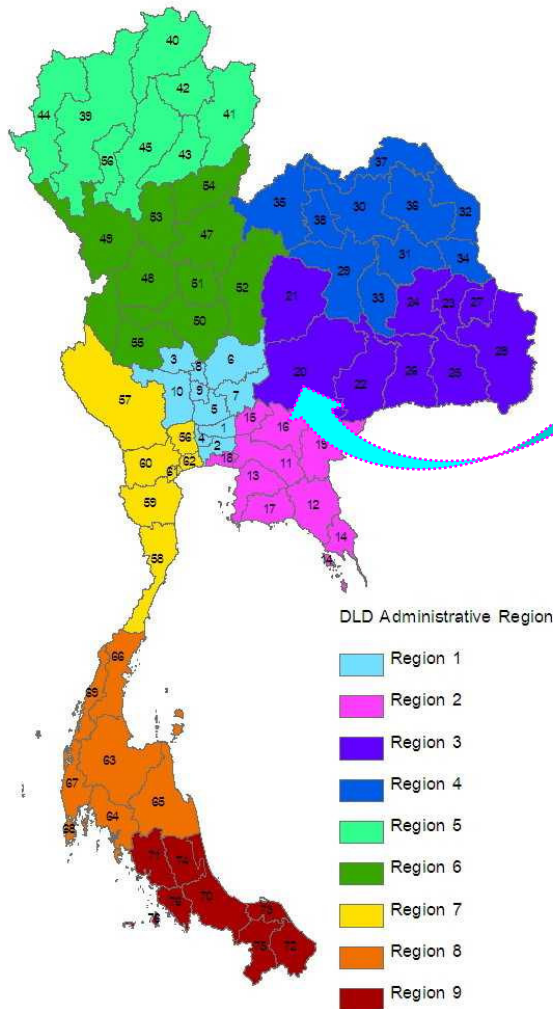
Wilai Linchongsubongkoch*1 Panithan Thongtha*2
Kingkarn Boonsuya Seeyo*2 Janya Samanit*2

*1 *OIE Expert for Foot and Mouth Disease, DLD's consultant*

*2 *Regional Reference Laboratory for FMD in South East Asia*

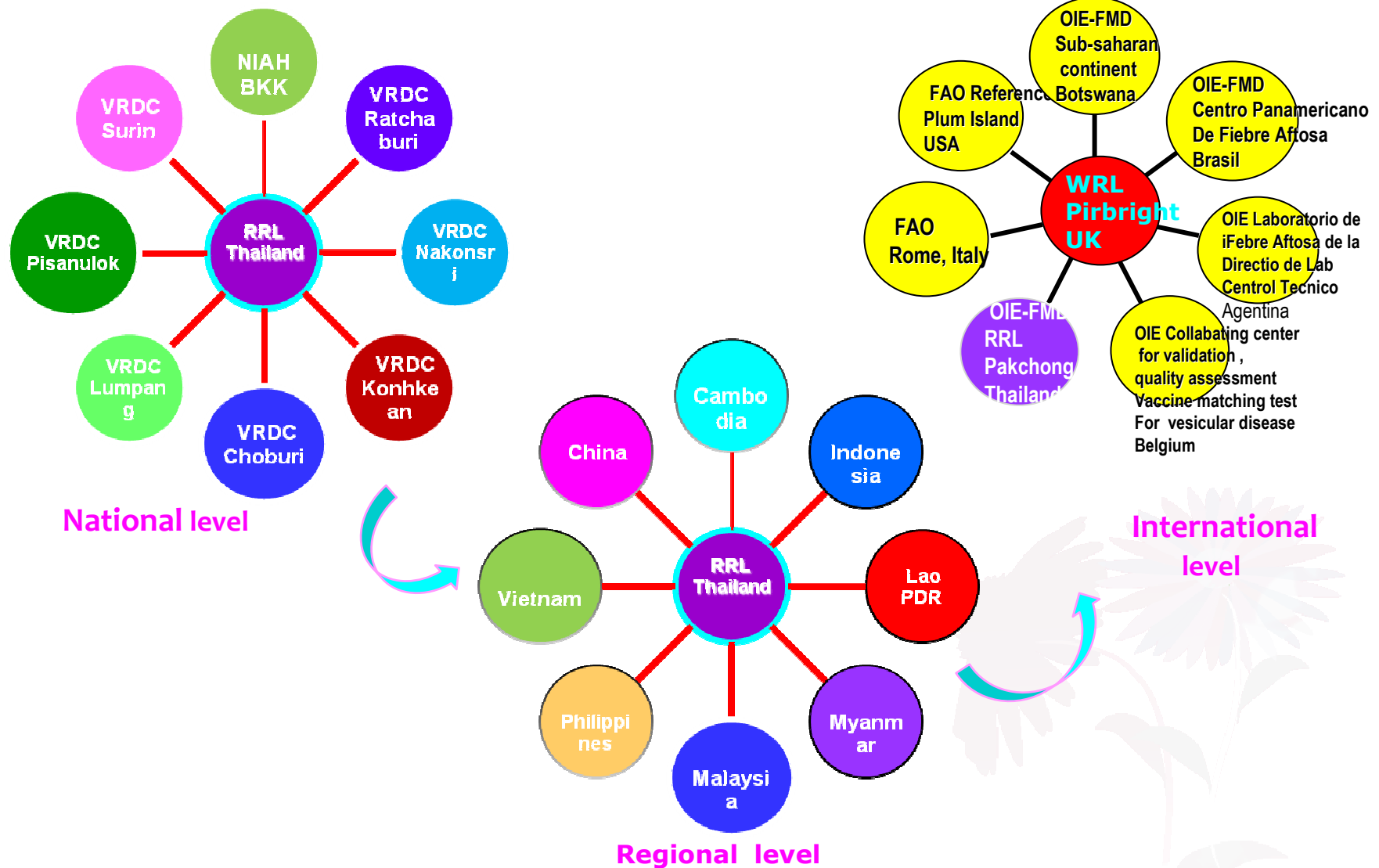
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Department of Livestock Development
Pakchong, THAILAND*

Introduction



- The laboratory in Pakchong, Thailand (RRL) has designated as an OIE Reference Laboratory for FMD, designated by World Organisation for Animal Health (OIE) since May 2009
- The laboratory serve as reference laboratory in SEA region and national laboratory for FMD diagnosis within the country (total 8 Veterinary Diagnostic Center)

FMD Laboratory network connection



FMD Diagnostic Chart

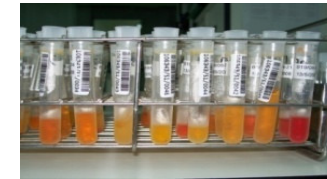
Antigen detection

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



Antibody detection

- LP ELISA Test
- NSPs test



Strain characterisation

- * Antigenic variation
(Vaccine matching)
- * Genomic variation
(Sequencing ,Phylogenetic tree)

FMD serotypes in Southeast Asia

(data from Dr. Ronello Abila, OIE -SRR)

Country	2004	2005	2006	2007	2008	2009	2010	2011
Brunei Indonesia Singapore	NO OUTBREAK							
Cambodia	O	O	O, A	O, A	O, A	???	O	O
Lao PDR	O	O	A	O, A	O	O	O	O
Malaysia	O, A	O, A	O	O, A	O	O, A	O, A	O, A
Myanmar	O	O, Asia 1	O	O	O	O	O, A	O
Philippines	O	O	O			NO OUTBREAK		
Thailand	O, A	O, A	O, A	O, A	O, A	O, A	O, A	O, A
Viet Nam	O	O, A Asia 1	O, A	O, A Asia 1	O	O, A	O	O

**Figure 1 . No. of sample submission to RRL during 2007-2011
by country**

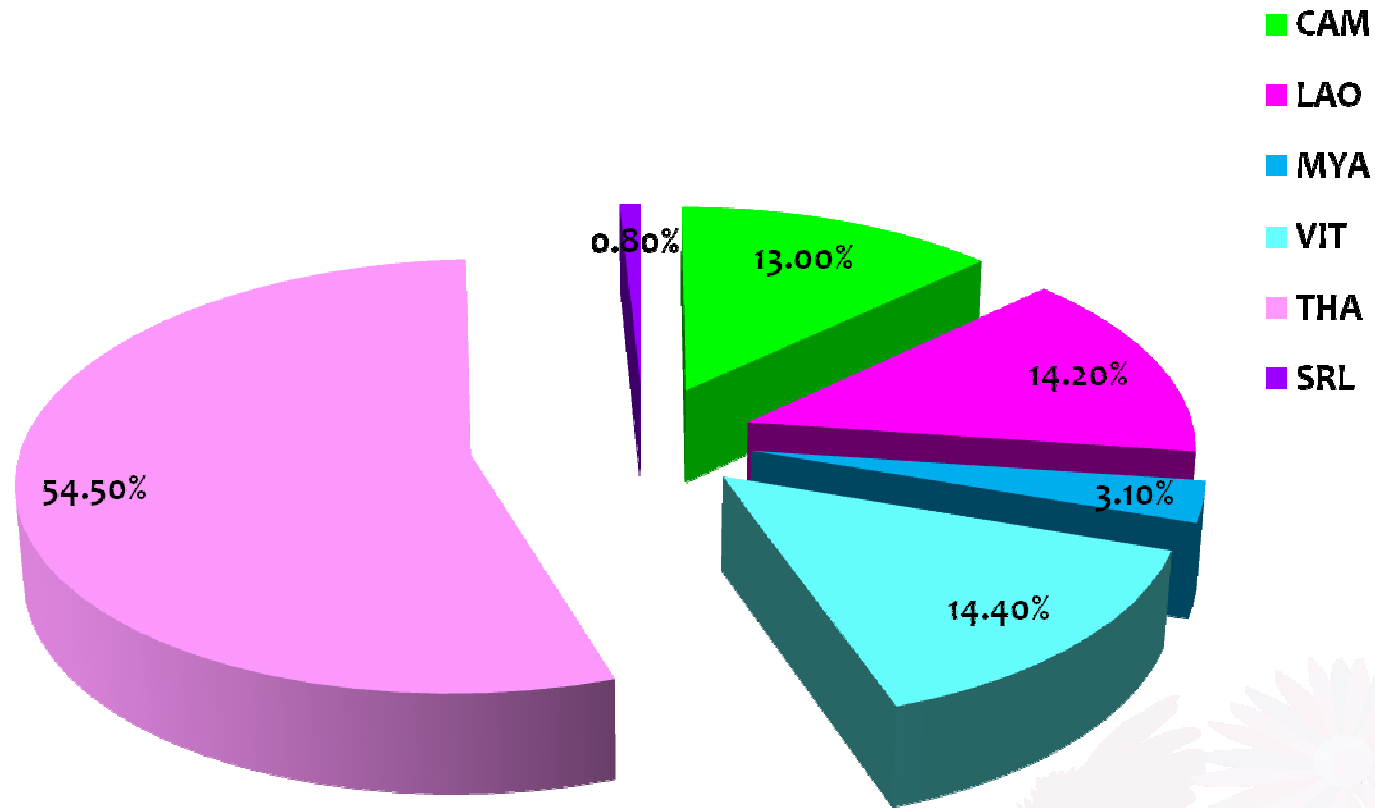


Figure 2. Sample submission to RRL from SEA country during the pass 5 years

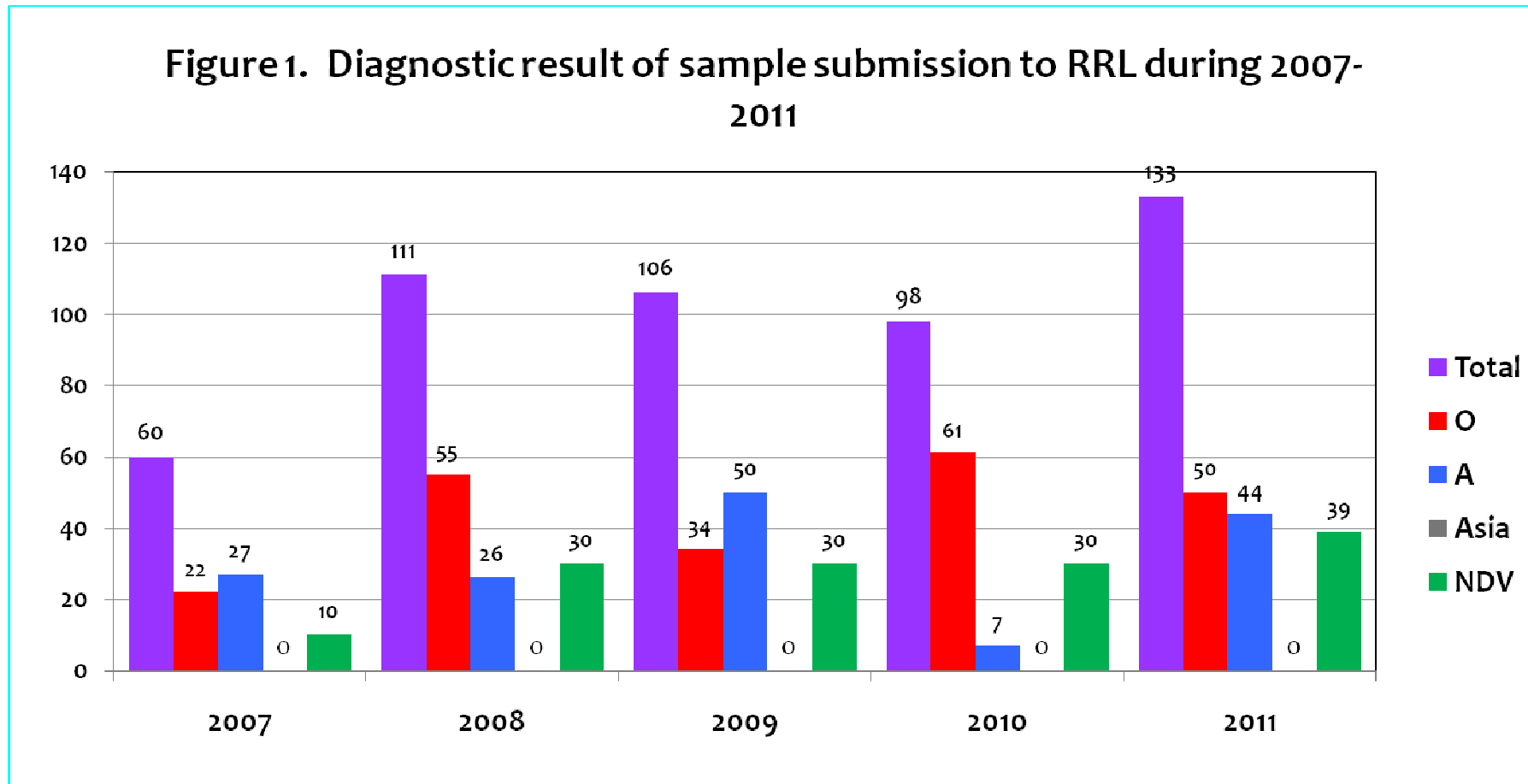


Table 1. Sample submission to RRL for FMD serotype identification focus on 2010-2011

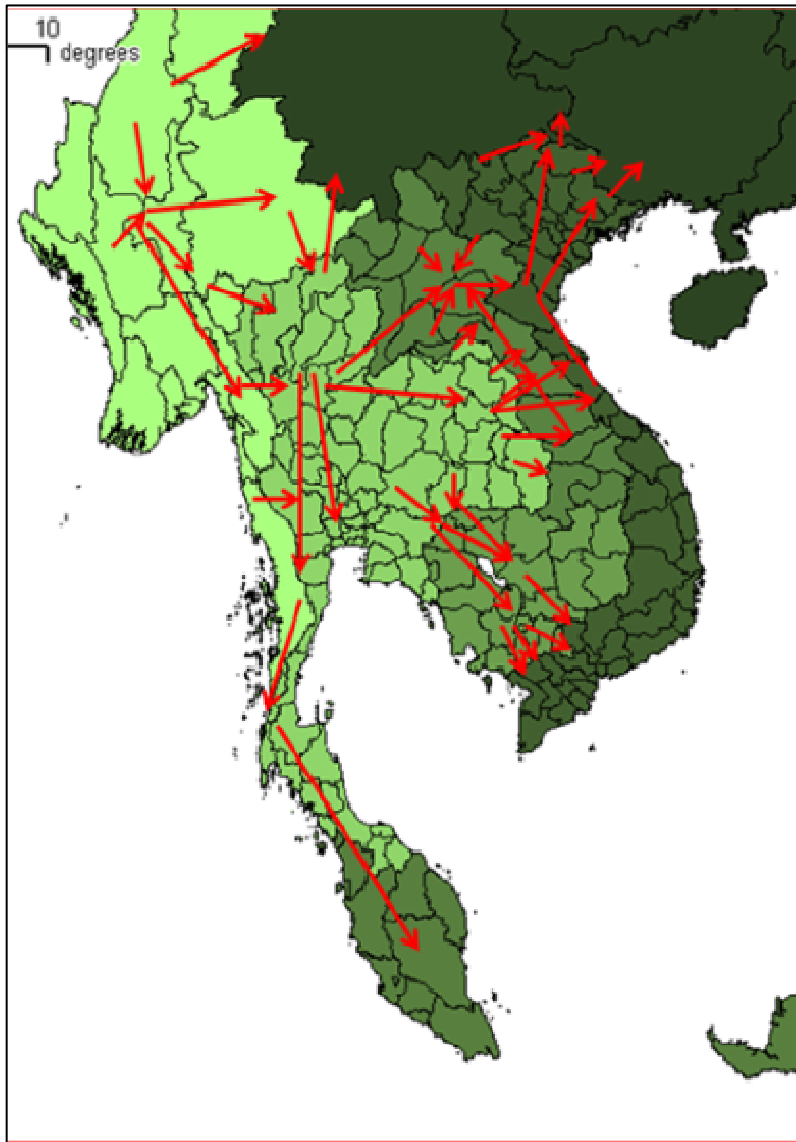
Year	Country	No. of sample	Type identification by ELISA typing				RT-PCR	
			O	A	Asia1	NVD	Positive	Negative
2010	Thailand	48	23	4	-	21	ND	
	Cambodia	20	12	-	-	8	ND	
	Myanmar	3	-	2	-	-	ND	
	Vietnam	27	26	1	-	-	27	-
2011	Cambodia	31	16	-	-	15	22	9
	Loa PDR	20	16	-	-	4	17	3
	Sri Lanka	4	2	-	-	2	4	0
	Thailand	78	16	44	-	18	68	10

2011 FMD outbreaks in SE Asia



(Source: data from Dr. Ronello Abila, OIE -SRR)

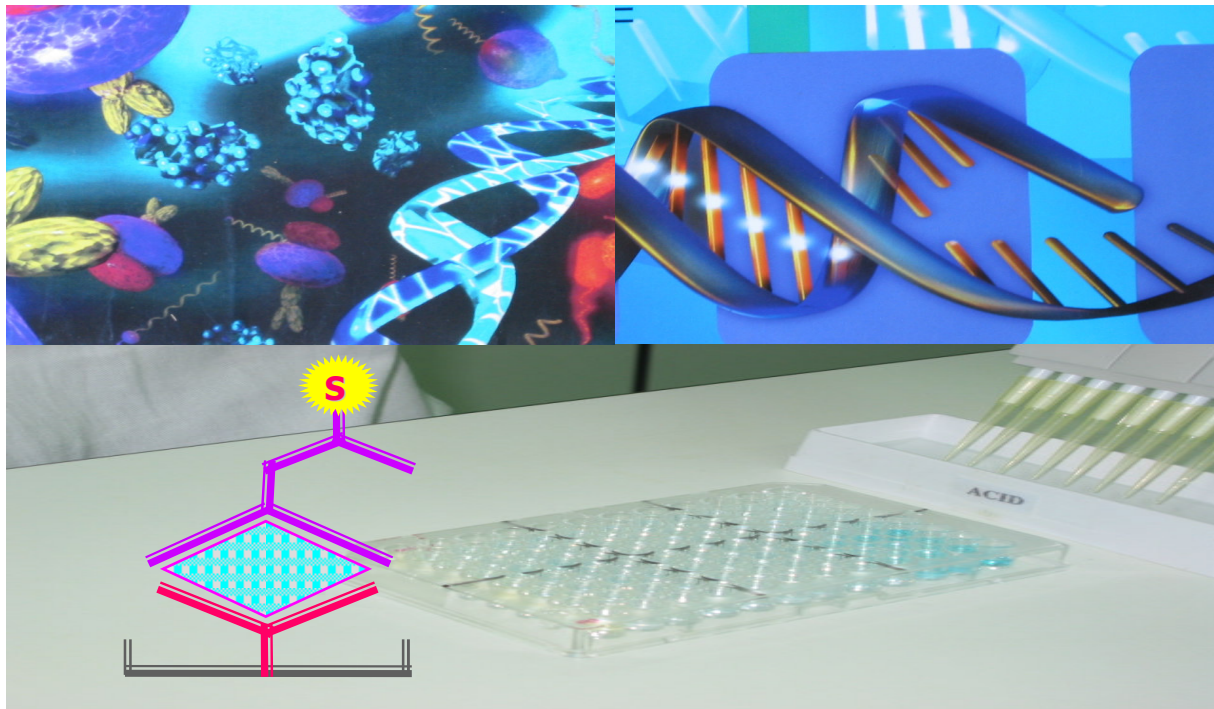
Cattle movement pattern



(Source: data from Dr. Ronello Abila, OIE -SRR)

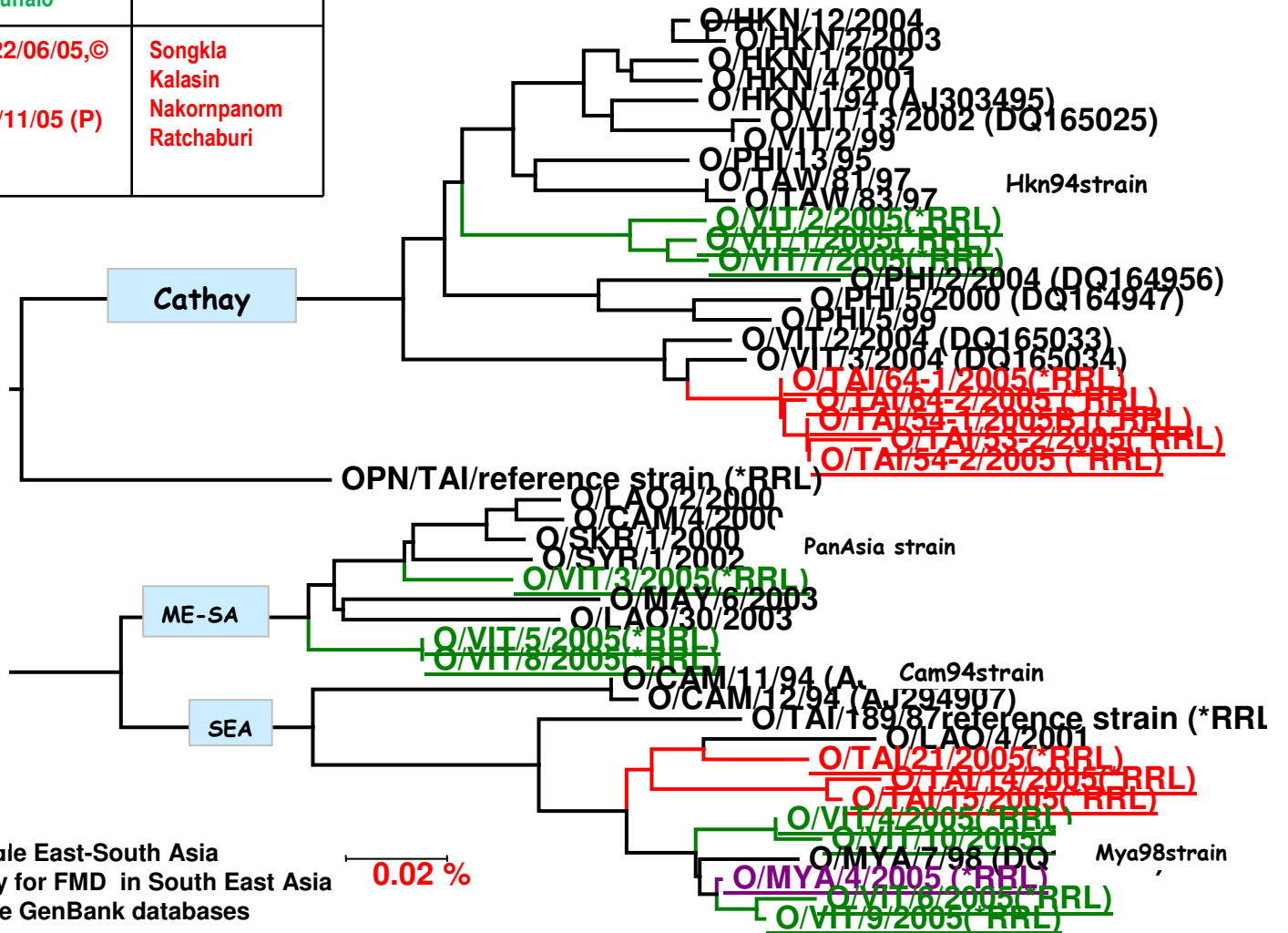
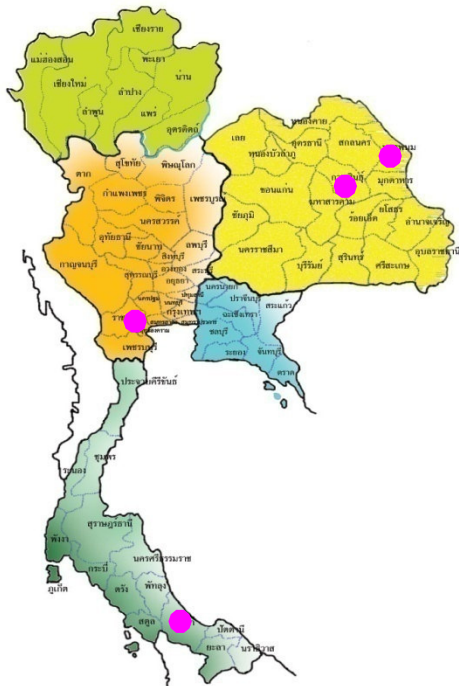


Molecular epidemiology FMDV causing outbreak in SEA region during 2005-2011



Phylogenetic tree of FMDV type O field outbreaks in

Sample	Date of collection	Place
Myanmar 4/2005	15/08/2005	Bago,
Vietnam 1/2005-10/005	all samples received on date 23/01/05 *pig, cattle, buffalo	No history
TAI14/2005 -15/2005 TAI 21/2005 TAI53-2/2005-54-1/2005 TAI64/2005	28/03/05, 22/06/05, © 22/06/2005 9/11/05, 10/11/05 (P) 19/11/2005	Songkla Kalasin Nakornpanom Ratchaburi

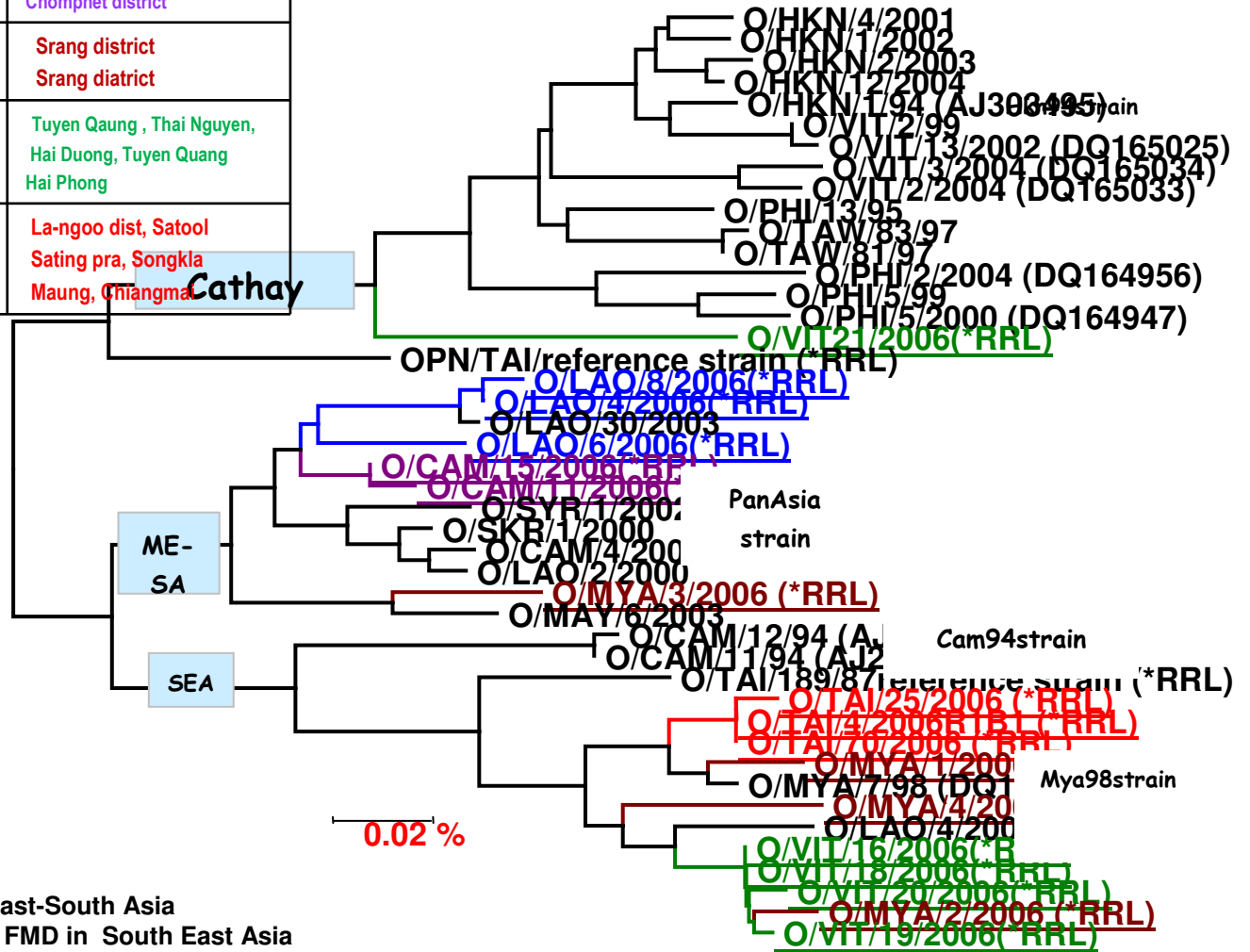
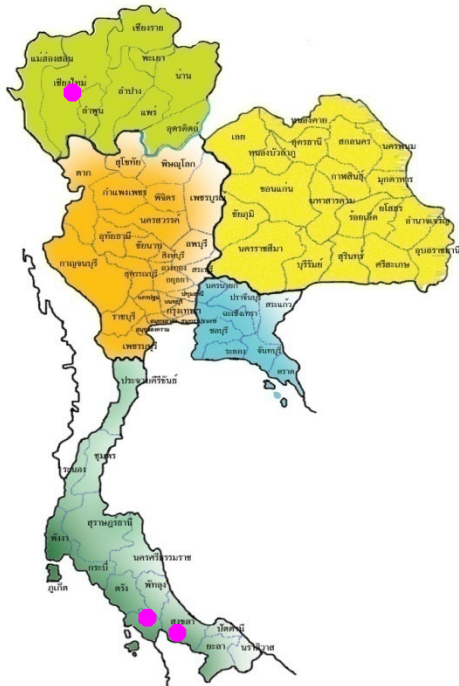


SEA = SOUTH EAST ASIA, ME-SA = MIDDLE EAST-SOUTH ASIA
 *RRL = Regional Reference Laboratory for FMD in South East Asia
 Others sample code = Submitted to the GenBank databases
 (<http://www.ncbi.nlm.nih.gov/>)

Source: Panithan Thongtha, Rattanee Thongtha, RRL Up date 25/02/09

Phylogenetic tree of FMDV type O field outbreaks in South East Asia 2006 (Underline)

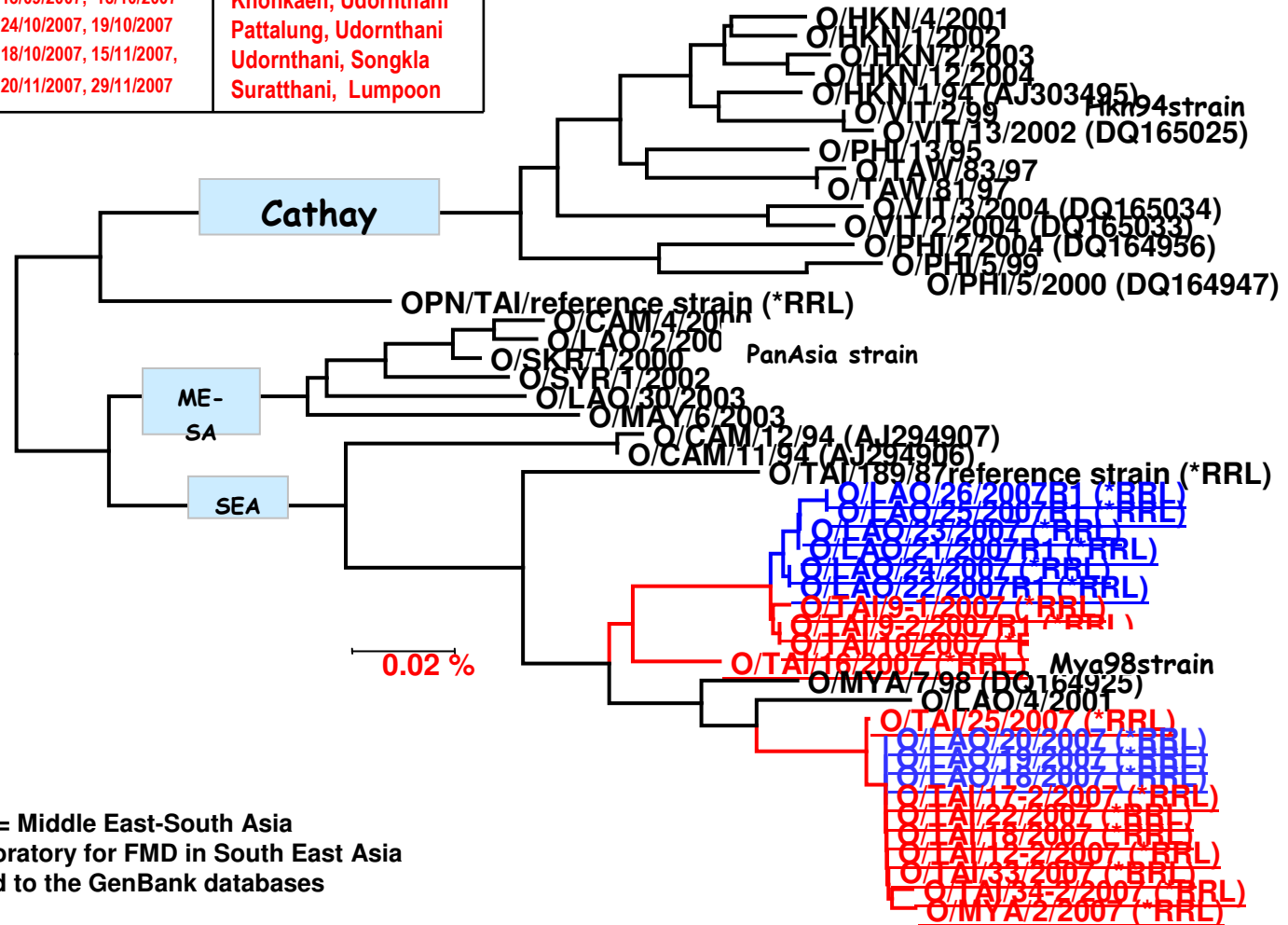
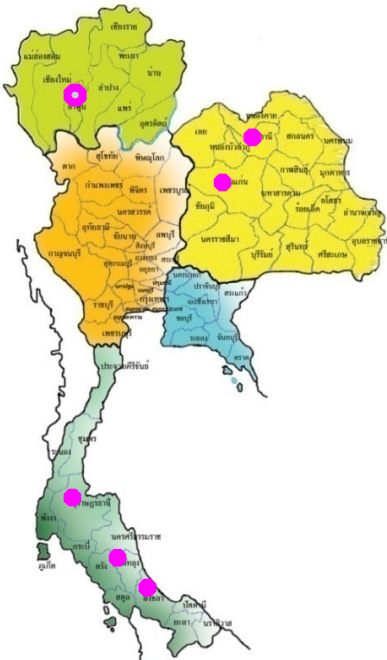
Sample	Date of collection	Place
1. MYA 1/2006	18/05/06 (C)	Ayeyarwaddy district
2. MYA 2/2006	25/10/2006 (P)	Bago district
3. MYA 3/2006	9/12/2006	Rakhine district
4. MYA 4/2006	25/10/2006 (P)	Bago,
5. LAO 4/2006	7/08/03,	Sikhontabong district
6. LAO 6/2006	23/05/03,	Borkeo province
7. LAO 8/2006	18/03/04 ,	Chomphet district
9. CAM 11/2006	20/07/06, (C)	Srang district
10. CAM 16/2006	28/07/06(P)	Srang diatrict
11.VIT 16/2006, 12. VIT 18/2006 13. VIT 19/2009, 14. VIT 20/2009 15. VIT 21/2006	No history	Tuyen Quang , Thai Nguyen, Hai Duong, Tuyen Quang Hai Phong
16. TAI 4/2006	11/01/06	La-ngoo dist, Satool
17. TAI 25/2006	22/02/06	Sating pra, Songkla
18 TAI 70/2006	27/07/06	Maung, Chiangma



South East-South Asia
for FMD in South East Asia
GenBank databases

Phylogenetic tree of FMDV type O field outbreaks in South East Asia 2007 (Underline)

Sample	Date of outbreak	Place
1. LAO 18/2007, 2. LAO 19/2007, 3. LAO 20/2007	27/07/07, 27/07/07,	Kenethao
4. LAO 21/2007, 5. LAO 22/2007	13/12/07	Vientine capital city
6. LAO 23/2007, 7. LAO 24/2007	19/12/2007	Vientine capital city
8. LAO 24/2007, 9. LAO 25/2007	19/12/2007	Vientine capital city
10.TAI 9/2007, 11. TAI 10/2007 12. TAI 16/2007, 13. TAI 17/2007 14. TAI 18/2007, 15. TAI 22/2007 16. TAI 25/2007, 17. TAI 33/2007	13/09/2007, 18/10/2007 24/10/2007, 19/10/2007 18/10/2007, 15/11/2007, 20/11/2007, 29/11/2007	Khonkaen, Udornthani Pattalung, Udornthani Udornthani, Songkla Suratthani, Lumpoon

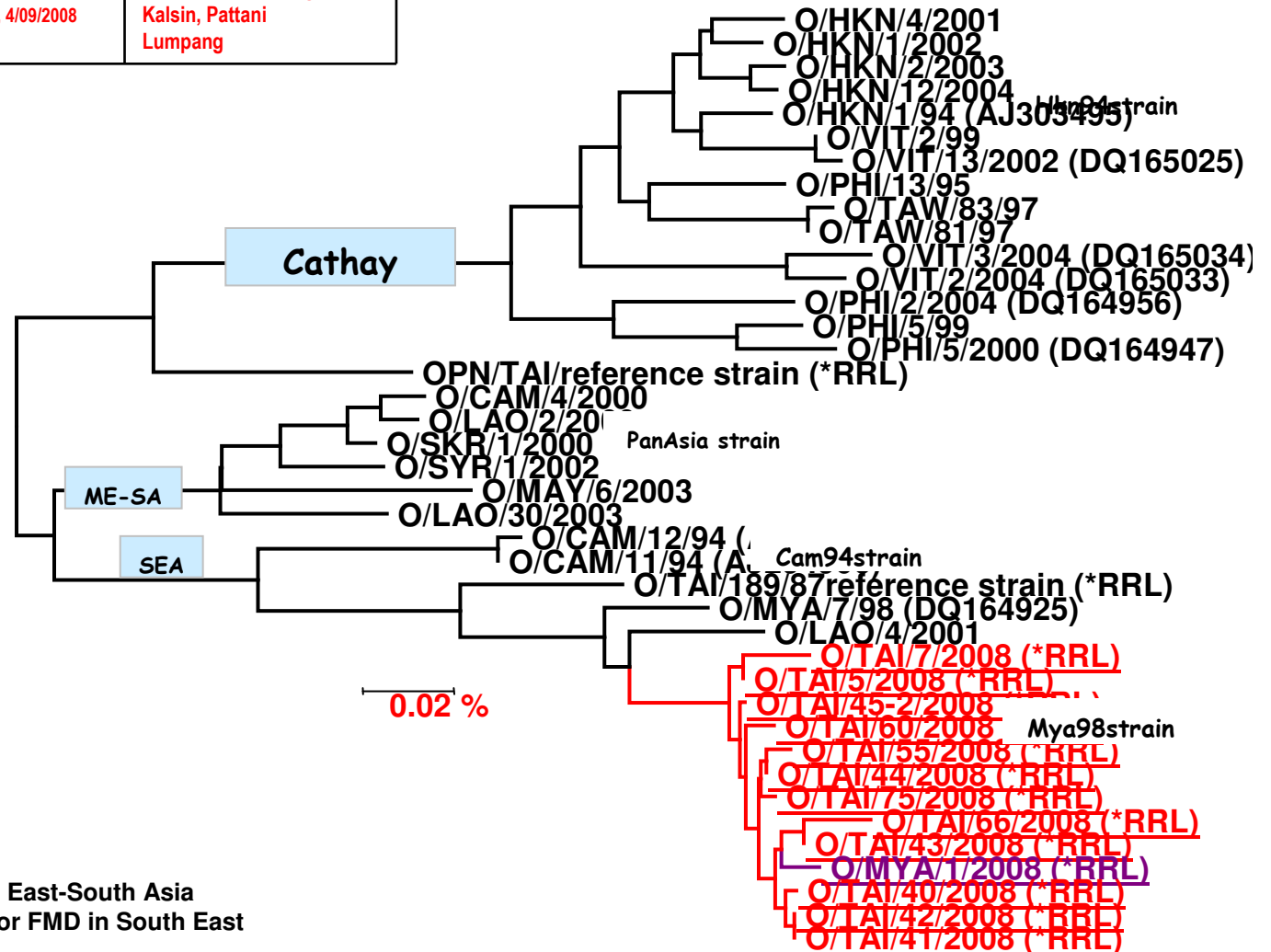
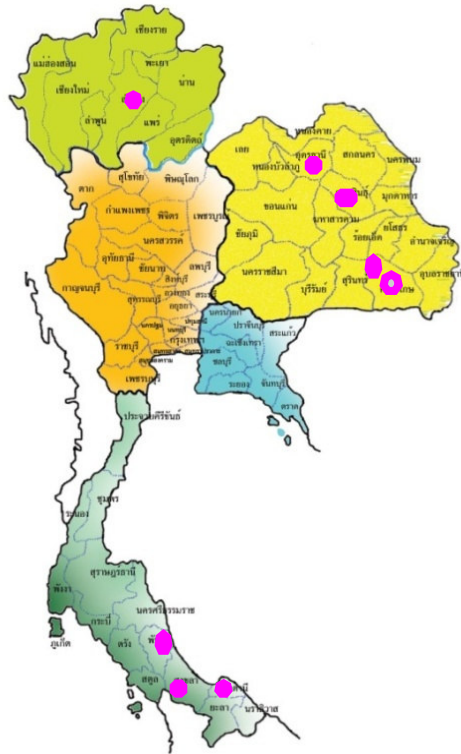


SEA = South East Asia, ME-SA = Middle East-South Asia
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 (<http://www.ncbi.nlm.nih.gov/>)

Source: Panithan Thongtha, Rattanee Thongtha, RRL Up date 25/02/09

Phylogenetic tree of FMDV type O field outbreaks in South East Asia 2008 (Underline)

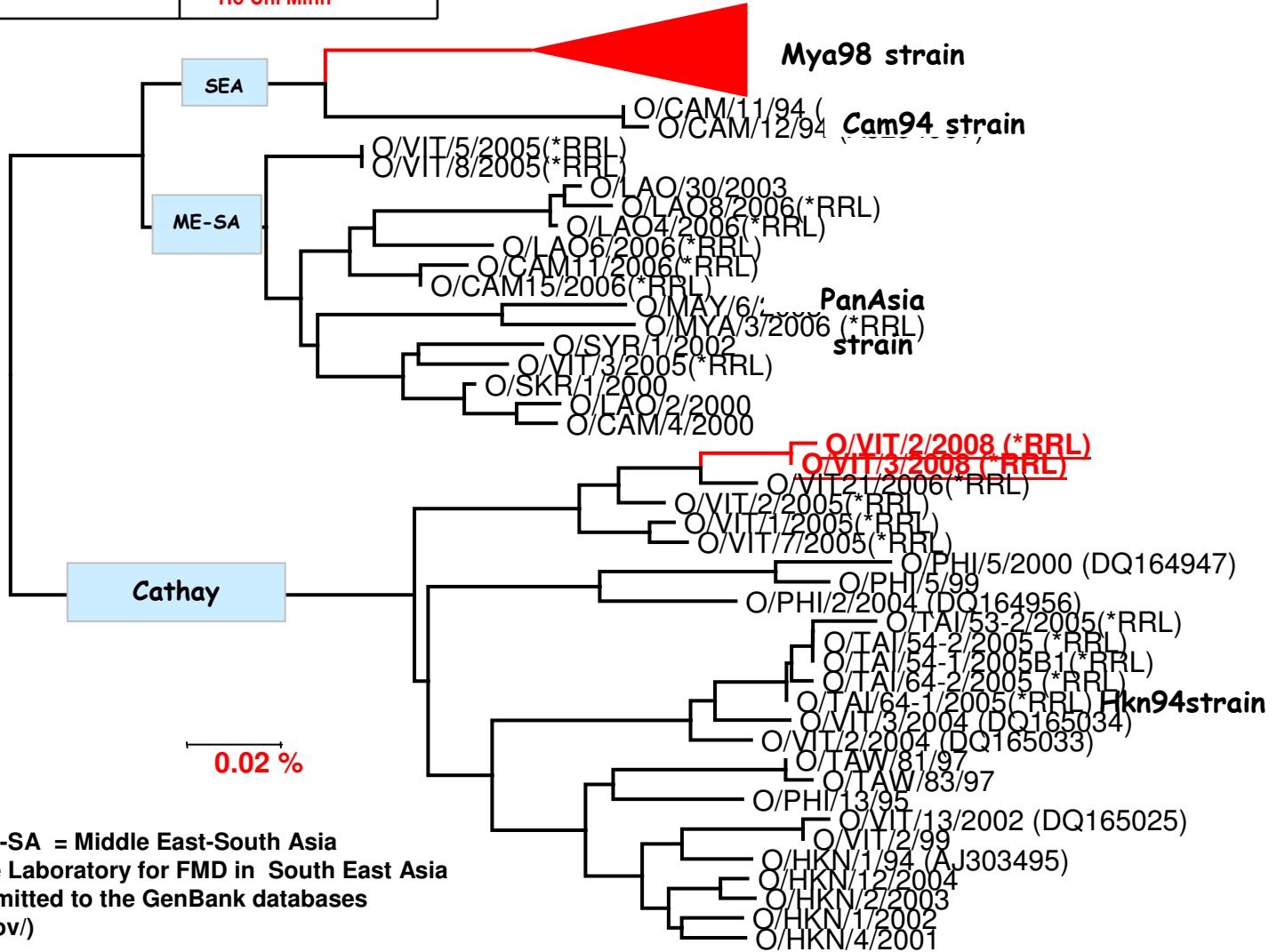
Sample	Date of outbreak	Place
1. MYA 1/2008	16/06/2008	Kayin, Kawkarie district
2. TAI 5/2008, 3. TAI 7/2008 3. TAI 40/2008, 5. TAI 41/2008 6. TAI 42/2008, 7. TAI 44/2008 8. TAI 45/2008, 9. TAI 55/2008 10. TAI 75/2008	27/12/2007, 8/01/2008 24/07/2008, 30/07/2008 30/07/2008, 13/08/2008 16/08/2008, 4/09/2008 12/12/2008	Udonthani, Songkla Kalasin, Srisaked Srisaked, Pattalung Kalsin, Pattani Lumpang



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 Others sample code = Submitted to the GenBank databases (<http://www.ncbi.nlm.nih.gov/>)
 Source: Panithan Thongtha, Rattanee Thongtha, RRL Up date 25/02/09

Phylogenetic tree of FMDV type O field outbreaks in

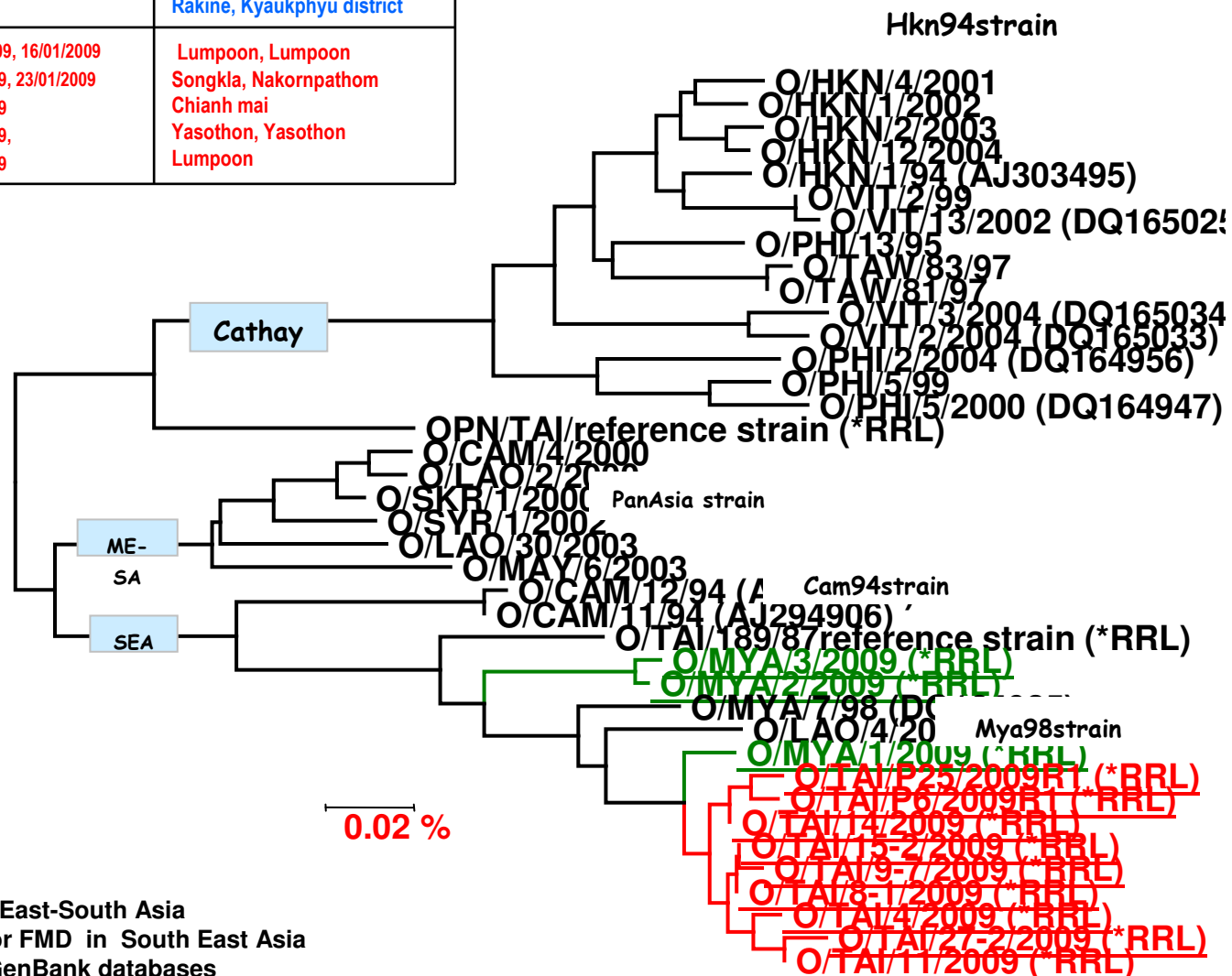
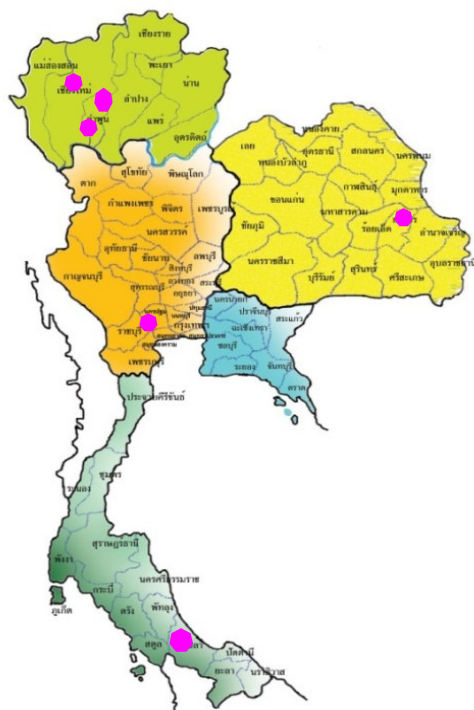
Sample	Date of outbreak	Place
1. VIT 2/2008	----	Ho Chi Minh
2. VIT 3/2008	----	Ho Chi Minh



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 *RRL = Regional Reference Laboratory for FMD in South East Asia
 Others sample code = Submitted to the GenBank databases
 (<http://www.ncbi.nlm.nih.gov/>)

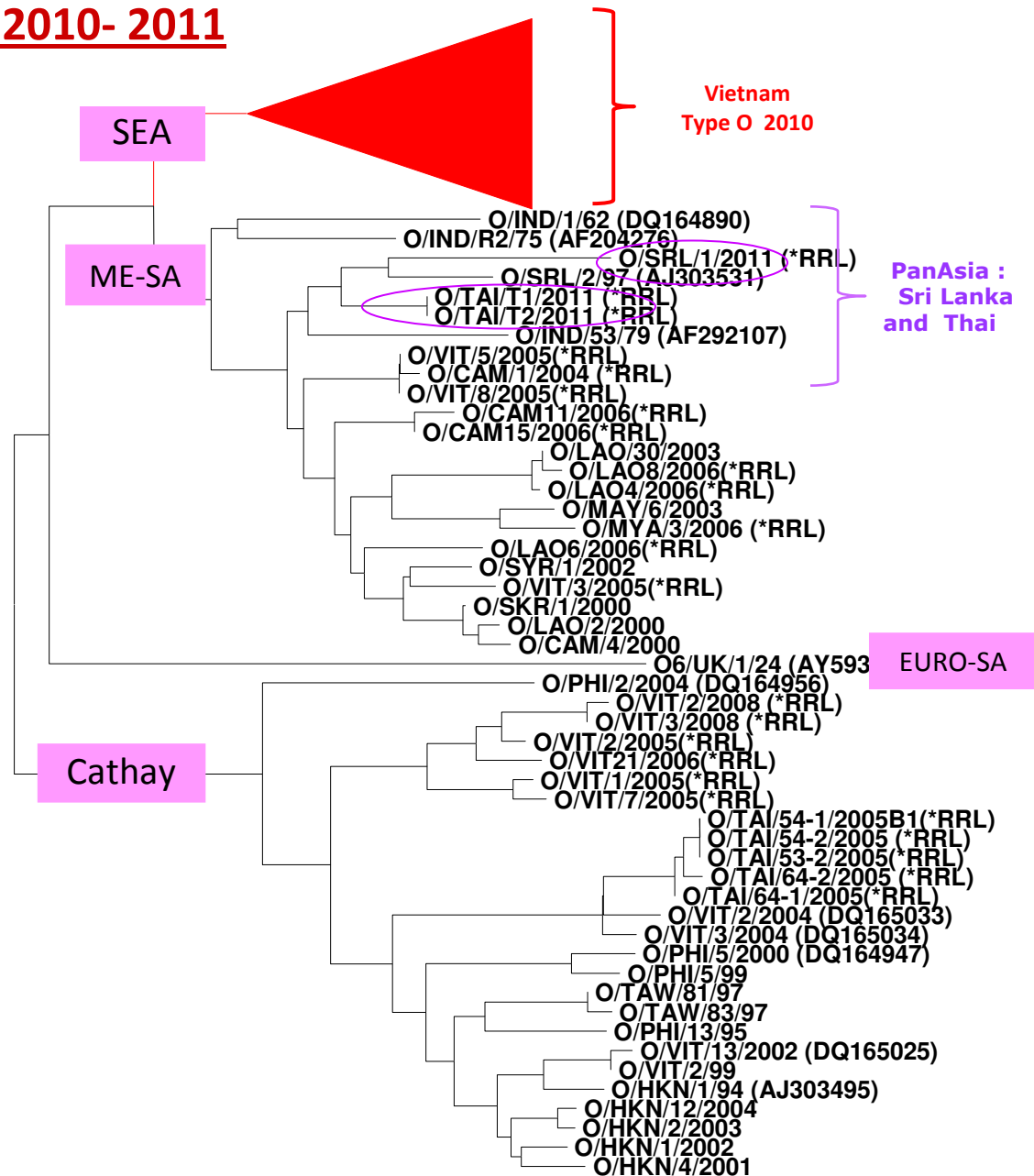
Phylogenetic tree of FMDV type O in 2009

Sample	Date of outbreak	Place
1. MYA 1/2009 2. MYA 2/2009 3. MYA 3/2009	---	Yagon, Kawmu township Magway , Magway township Rakine, Kyaukphyu district
4. TAI 8/2009, 5. TAI 9/2009 6. TAI 11/2009, 7. TAI 14/2009 8. TAI 15/2009, 9. TAI P25 /2009 10. TAI P26/2009 11. TAI 27/2009	16/01/2009, 16/01/2009 19/01/2009, 23/01/2009 23/01/2009 19/05/2009, 23/02/2009	Lumpoon, Lumpoon Songkla, Nakornpathom Chianh mai Yasothon, Yasothon Lumpoon



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 Others sample code = Submitted to the GenBank databases
 (<http://www.ncbi.nlm.nih.gov/>)

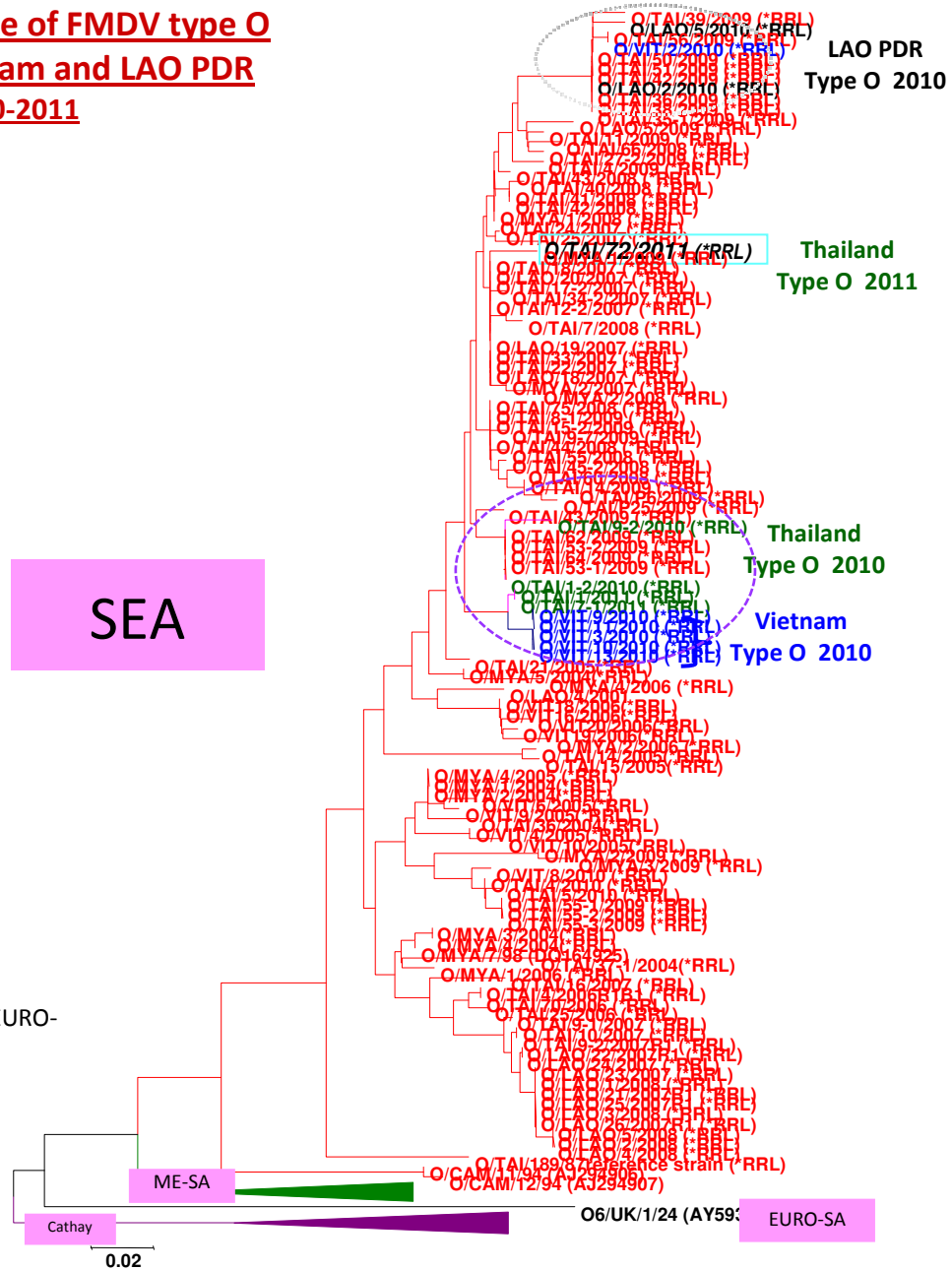
Phylogenetic tree of FMDV type O outbreak in South East Asia 2010- 2011



ME-SA = Middle East-South Asia,
 EURO-SA = Europe-South America

0.02

**Phylogenetic tree of FMDV type O
Thailand, Vietnam and LAO PDR
2010-2011**



ME-SA = Middle East-South Asia, EURO-SA = Europe-South America

SEA

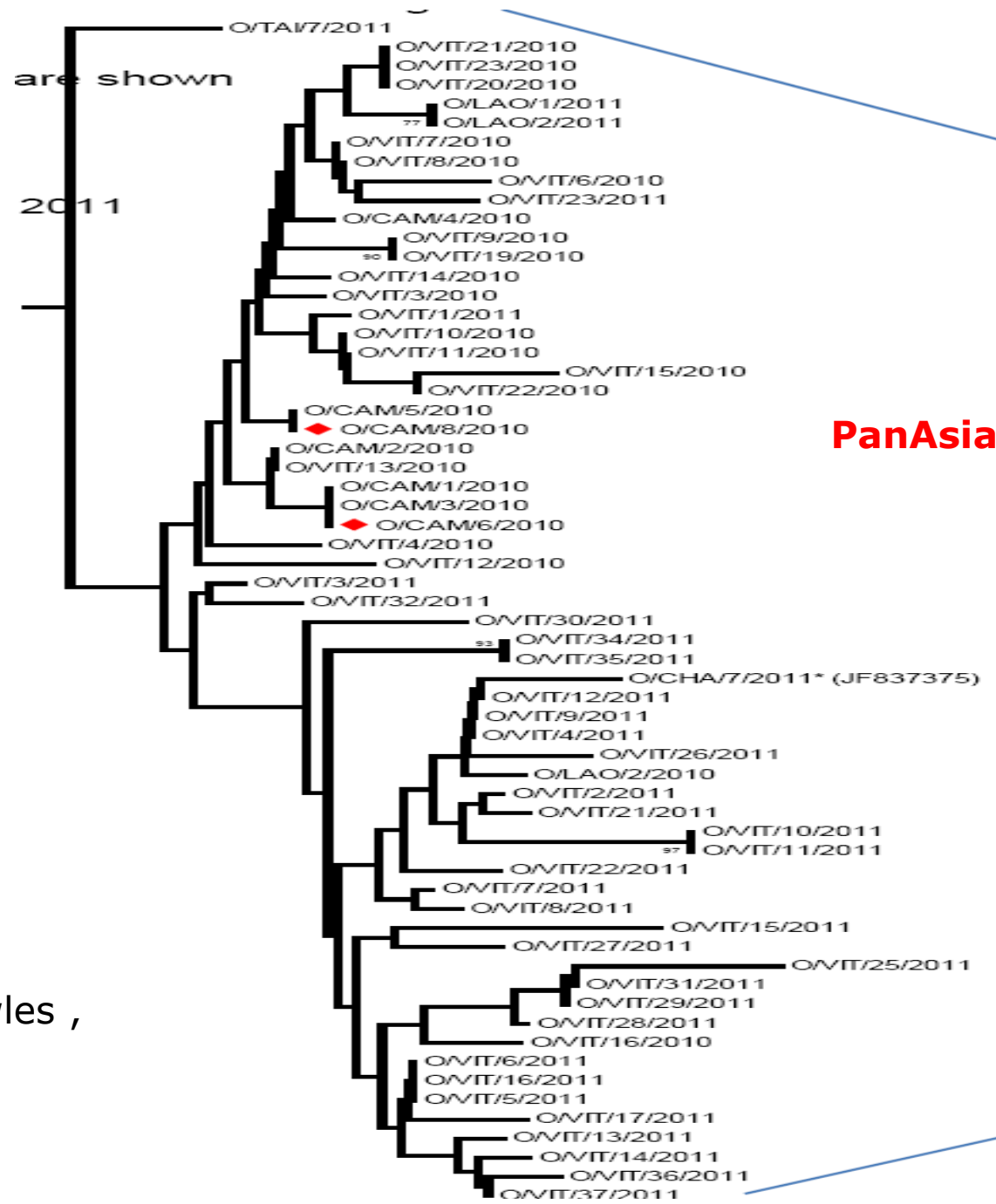
LAO PDR
Type O 2010

Thailand
Type O 2011

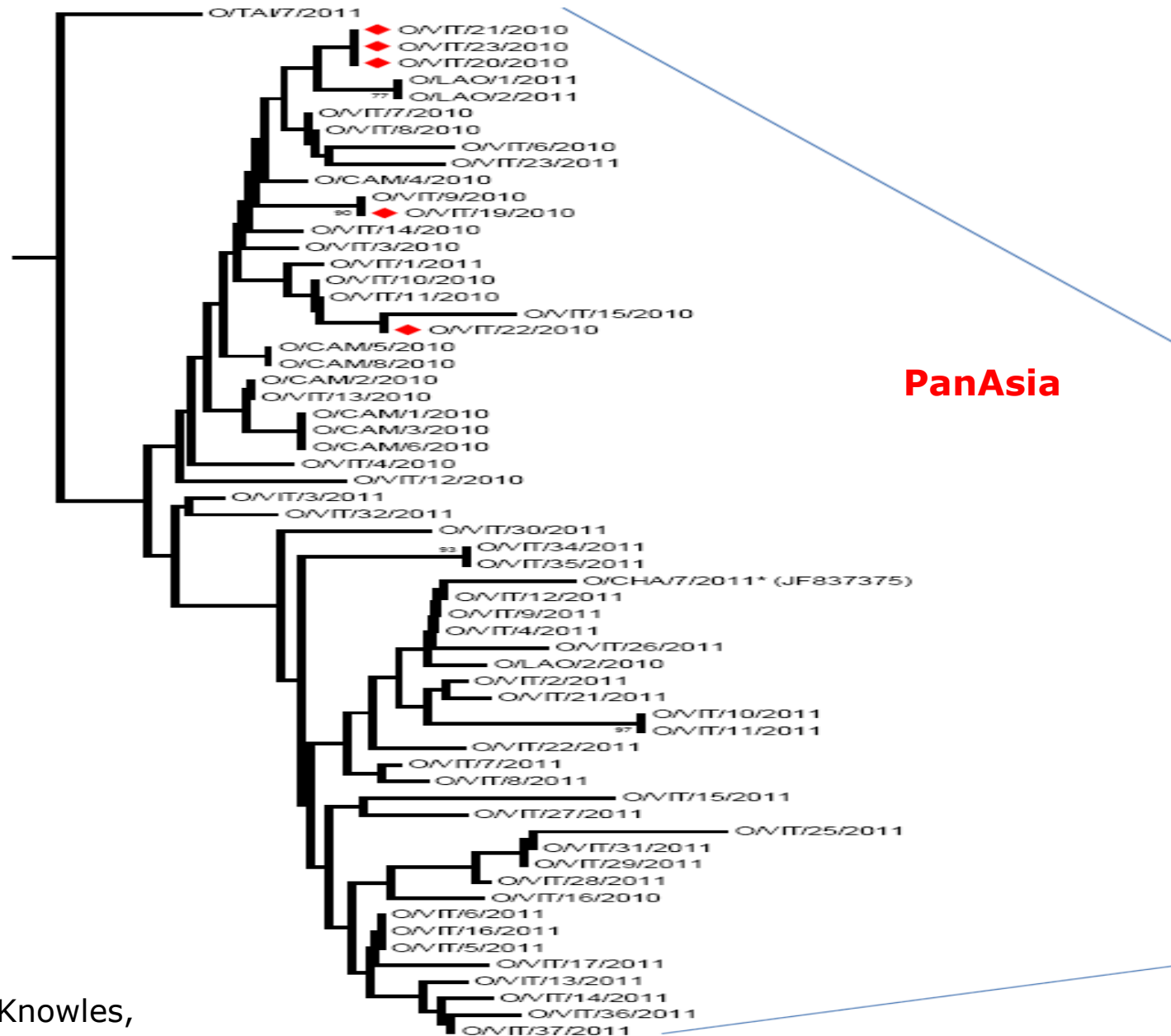
Thailand
Type O 2010

Vietnam
Type O 2010

O6/UK/1/24 (AY59) EURO-SA



Source: Nick Knowles, WRL, UK



Source: Nick Knowles,
WRL. UK

summary of FMD Sequencing results

Table 2 . Phylogenetic tree analysis of FMD type O in 2005-2007

Country	No. sample testing	Species	Topotype
Myanmar 2005 2006	1 4	Cattle	SEA (Mya 98) PanAsia
Vietnam 2005 2006	2 5	Cattle, buffalo, pig	SEA (Mya98), PanAsia , Cathay SEA, Cathay
Lao PDR 2006 2007	3 9		PanAsia SEA (Mya 98)
Cambodia 2006	2		PanAsia
Thailand 2005 2006 2007	6 3 12	Cattle , pig	SEA Mya98), Cathay, Cathay SEA (Mya 98) SEA (Mya 98)

summary of FMD Sequencing results

Table 3. Phylogenetic tree analysis of FMD type O in 2008-2011

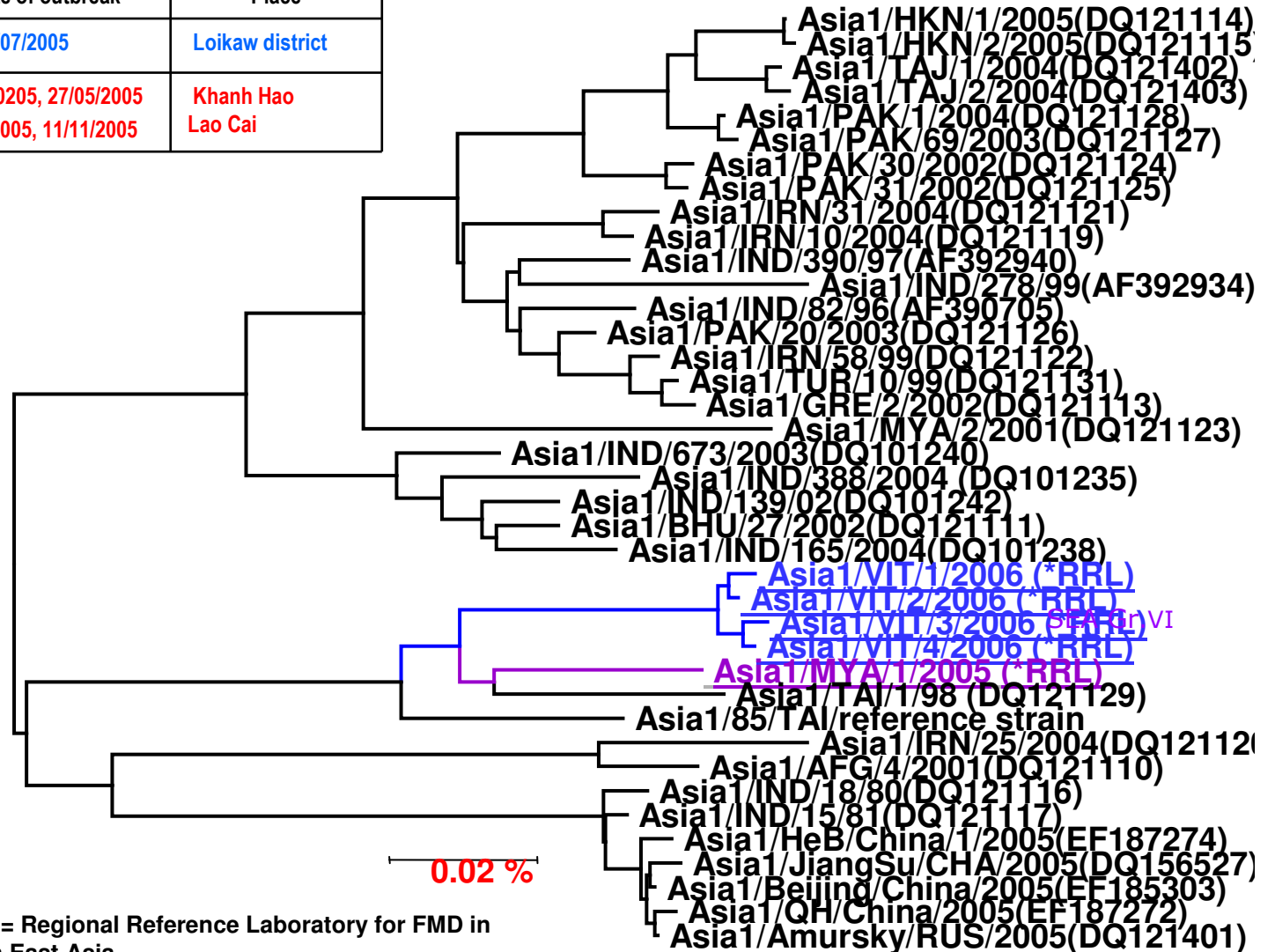
Country	No. sample testing	Species	Topotype
Myanmar 2008	1	Cattle	SEA (Mya 98)
2009	3		
Lao PDR 2008	5	Cattle	
2009	1		SEA (Mya 98)
2010	2		
Vietnam 2009	2	Pig	Cathay
2010	6	cattle	SEA
2010			PanAsia
Sri Lanka 2011	1	cattle	Pan Asia
Thailand 2008	15	Cattle, buff	SEA (Mya 98)
2009	6		SEA (Mya 98)
2010	4	cattle	SEA
2011	5	Cattle, Pig	PanAsia and SEA

Table 4. Phylogenetic analysis of FMDV type Asia1 causing outbreak during 2005-2006

Country	No. of sample	Date of sample collection	Place of outbreak	Topotype
Myanmar	1	28/07/05 *cattle	Loikaw district	SEA group IV
Vietnam	4	27/10/06 11/11/06 *cattle, buffalo	Khanh Hao Lao Cai	SEA group IV

Phylogenetic tree of FMDV type Asia1 field outbreaks in South East Asia 2005-2006 (Underline)

Sample	Date of outbreak	Place
1. MYA 1/2005	28/07/2005	Loikaw district
2. VIT 1/2006 3. VIT 2/2006	27/10/2005, 27/05/2005	Khanh Hao
4. VIT 3/2006, 5. VIT 4/2006	11/11/2005, 11/11/2005	Lao Cai



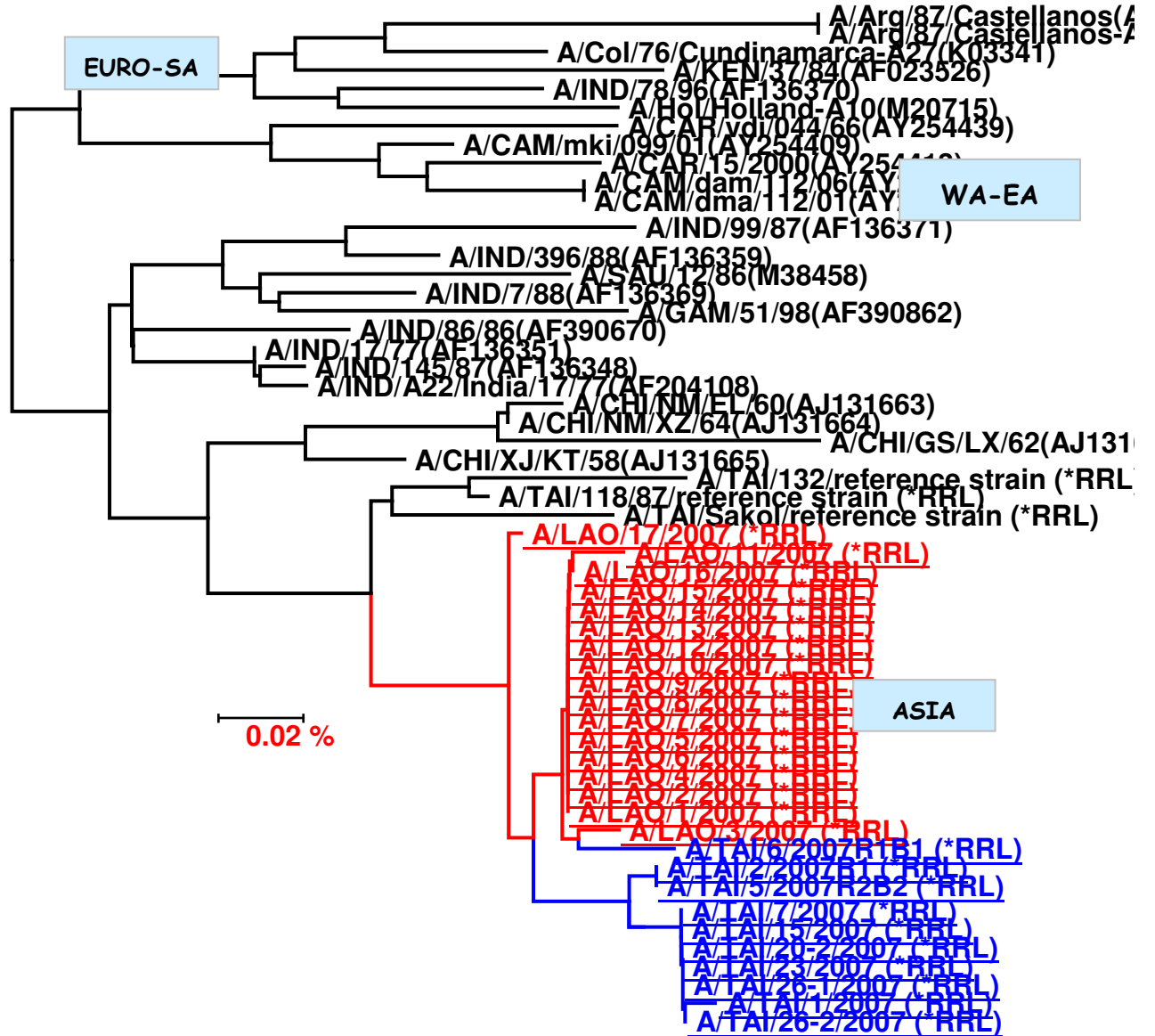
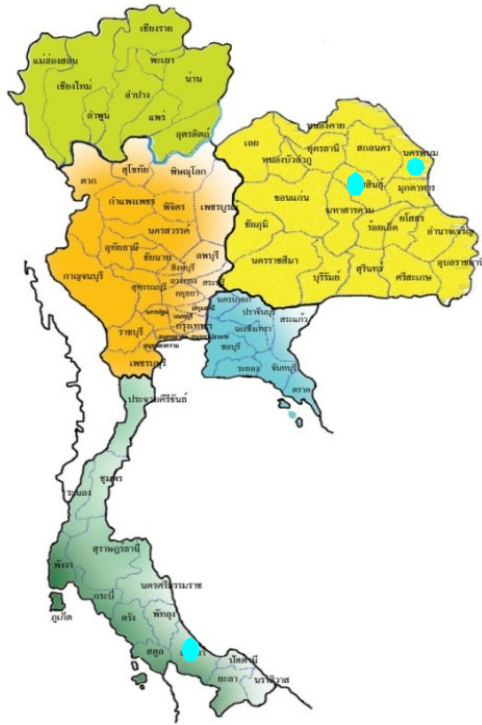
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Source: Panithan Thongtha, Rattanee Thongtha, RRL Up date 25/02/09

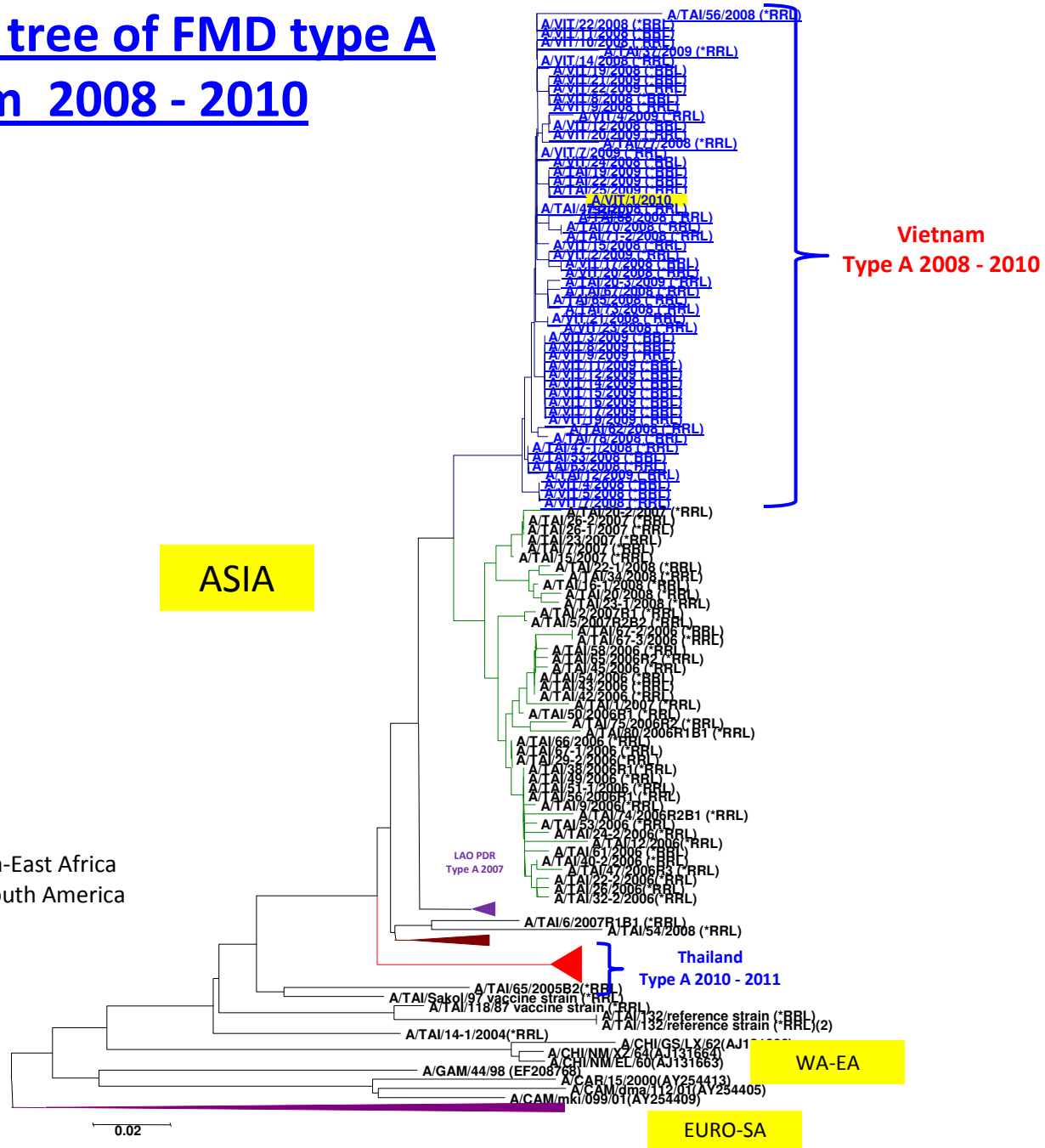
Phylogenetic tree of FMDV type A field outbreaks in South East Asia 2007 (Underline)

Sample	Date of outbreak	Place
1.LAO 1/2007-3/2007	25/12/2006	Hatsaifong district
2.LAO 3/2007-16/2007	25/12/2006	Saythany district
3.LAO 17/2006	25/12/2006	Sikottabong district
4. TAI 2/2007	19/12/2006	Nakonpanom
5. TAI 5/2007	19/02/2007	Kalasin
6.TAI 7/2007,	29/08/2007	Songkla
7.TAI15/2007	17/10/2007	Songkla
8. TAI 20/2007,	9/10/2007,	Songkla
9.TAI 23/2007	13/11/2007	Songkla
9. TAI 26/2007	19/11/2007	Songkla



Phylogenetic tree of FMD type A Vietnam 2008 - 2010

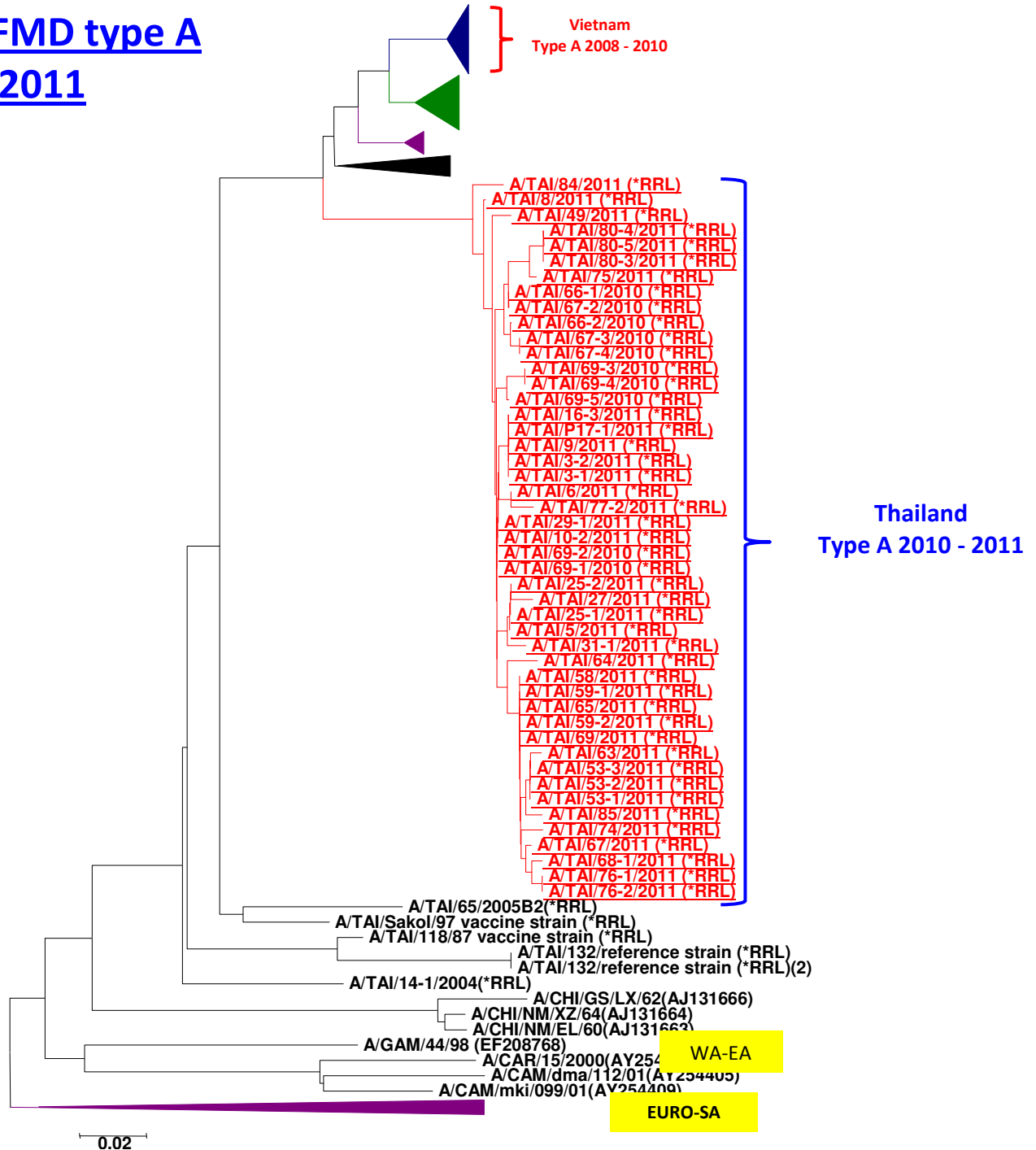
WA-EA = West Africa-East Africa
EURO-SA = Europe-South America



Phylogenetic tree of FMD type A Thailand 2010-2011

WA-EA = West Africa-East Africa
EURO-SA = Europe-South America

ASIA



Report on FMDV A in Myanmar in 2010

Batch: WRLFMD/2010/00044

Software: MEGA 4.0

No. of Taxa : 84

Data File : n:\evd\meg\db\fmdv\A\MYA2010a.meg

Data Title : A Myanmar 2010

Data Type : Nucleotide (Coding)

Analysis : Phylogeny reconstruction

Tree Inference : =====

->Method : Neighbor-Joining

->Phylogeny Test and options : Bootstrap (1000 replicates; seed=24054)

Include Sites : =====

->Gaps/Missing Data : Pairwise Deletion

->Codon Positions : 1st+2nd+3rd+Noncoding

Substitution Model : =====

->Model : Nucleotide: Kimura 2-parameter

->Substitutions to Include : d: Transitions + Transversions

->Pattern among Lineages : Same (Homogeneous)

->Rates among sites : Uniform rates

No. of Sites : 639

No Of Bootstrap Reps = 1000

Only bootstrap values of 70% and above are shown

*, not a WRLFMD Ref. No.

N.J. Knowles & J. Wadsworth, 08 December 2010

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Conclusion/1

Serotype O : the most common were 3 topotypes :

SEA (Myn 98, PanAsia and Cathay

- Recent outbreak type O since 2010 -2011 were SEA and panAsia topotype
- Cathay pig adapted, present in Vietnam 1997 to 2009, confirmed in Thailand and Malaysia in 2005

Serotype Asia 1 : SEA group IV (Valarcher et al.,2009)

- ✱ Sporadic outbreaks in Myanmar and Vietnam
- ✱ Not seen in Thailand since 1998,
- ✱ Lao PDR, Malaysia and Cambodia since 2000
- ✱ Last seen in Myanmar in 2005 and Vietnam in 2007

Conclusion/2

Serotype A : only ASIA topotype has been found in this region

- Present in Thailand since September 2009,
then outbreak again in November 2010-2011
- Present in Malaysia in 2003
- Present in Vietnam in 2004 and 2009-2010
- Out break in Myanmar, samples received in Oct 2010*
(close to A/IND2000)
- Sporadic in Lao PDR in 2003 and 2006/2007





*Thank you
for your
attention*

Acknowledgements

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