



國家衛生研究院
National Health Research Institutes

Asia-Pacific Network for Enterovirus Surveillance (APNES)

Fanglin Kuo, MS, PhD
Postdoctoral research fellow

1



Country	Characteristics
Vietnam	<ol style="list-style-type: none"> 1. Seroprevalence of EV-A71 infections: 55% 2. 1,500,000 newborns/year 3. Ongoing vaccine development 4. Member of ASEAN
Malaysia	<ol style="list-style-type: none"> 1. Seroprevalence of EV-A71 infections: 60% 2. 500,000 newborns/year 3. Ongoing vaccine development 4. Member of ASEAN and PIC/S
Cambodia	<ol style="list-style-type: none"> 1. Seroprevalence of EV-A71 infections: 88.8% 2. 400,000 newborns/year 3. Member of ASEAN
Thailand	<ol style="list-style-type: none"> 1. Seroprevalence of infections: CV-A (31.2%), EV-A71 (9.1%) 2. 765,600 newborns/year 3. Member of ASEAN and PIC/S

ASEAN: Association of Southeast Asian Nations

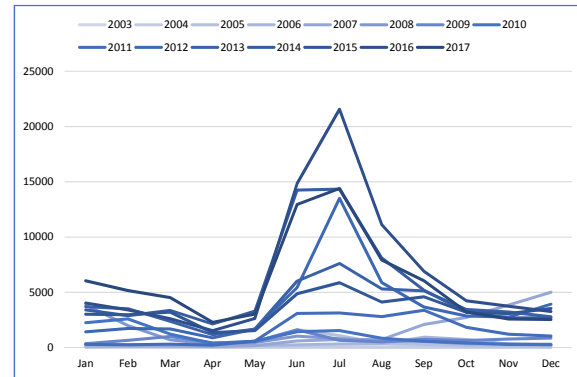
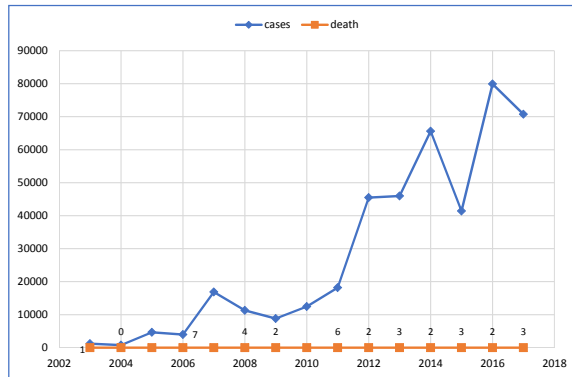
PIC/S: Pharmaceutical Inspection Convention and Pharmaceutical Inspection Co-operation Scheme

2

2



2000 – 2017 HFMD in Thailand



<http://www.boe.moph.go.th/boedb/surdata/disease.php?ds=71>

3



Virus characterization of HFMD (2008 – 2013)

Table 1 Demographic and clinical data associated with different enterovirus genotypes

	HFMD	HA	HFMD/HA	All
No of case	795 (67.3%)	197 (16.7%)	190 (16.1%)	1182
No of sample	833 (67.3%)	202 (16.4%)	202 (16.4%)	1237
Age range (median)	4d to 54y (2.4y)	3 m to 16y (2.6y)	1 m to 50y (3y)	4d to 54y (2.5y)
Mean age \pm SD	3.4y \pm 4.8y	3.4y \pm 3.0y	5.1y \pm 8.3y	3.6y \pm 5.0y
Sex ratio (F:M)	1:1.4	1:1.1	1:1.2	1:1.3
Virology: EV71	66 (8.3%)	2 (1%)	40 (21.1%)	108 (9.1%)
CV-A16	65 (8.2%)	2 (1%)	35 (18.4%)	102 (8.6%)
Other CV-A	217 (27.3%)	22 (11.2%)	28 (14.7%)	267 (22.6%)
Pan-EV	131 (16.5%)	88 (44.7%)	10 (5.3%)	229 (19.4%)
Negative	316 (39.7%)	83 (42.1%)	77 (40.5%)	476 (40.3%)

HFMD, Hand, foot, and mouth disease; HA, Herpangina; EV71, Human enterovirus 71; CV-A, Coxsackievirus species A; Pan-EV, Pan-enterovirus; y, year old; m, month old.

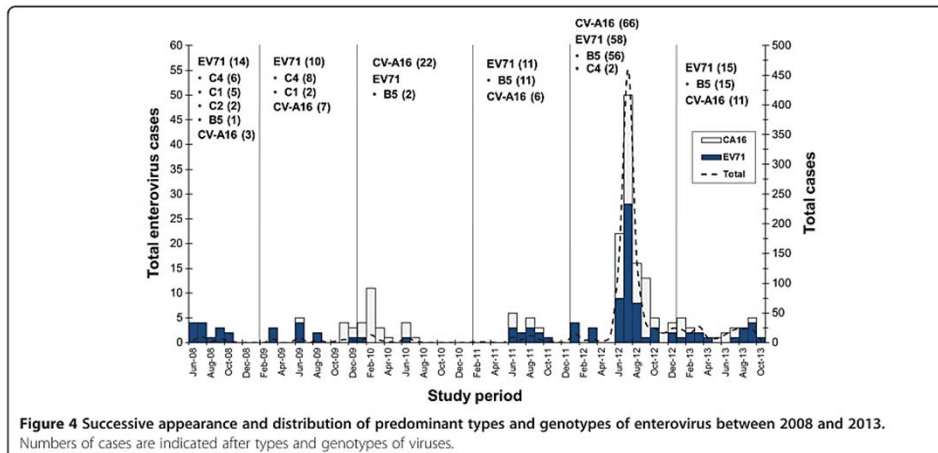
(Linsuwanon, Puenpa et al. 2014)

4

4



Virus characterization of HFMD (2008 – 2013)



(Linsuwanon, Puenpa et al. 2014)

5

Year	Sample	Sample size/disease	Age	%	Reference
2014 – 2016	Specimens	1049 Patients with HFMD		CV-A6: 32.9% CV-A16: 11.6%	(Puenpa, Suwannakarn et al. 2017)
2010 – 2016	Fecal samples	1310 HFMD patients with no diarrhea	1 – 66y	EV-A: 92.6% CV-A6: 54.8%	(Chansaenroj, Tuanthap et al. 2017)
2010 – 2014	Fecal samples	1266 at Chiang Mai Patients with acute gastroenteritis	< 12y	EV: 5.8% EV-C96: 12.3%	(Kumthip, Khamrin et al. 2017)
2011 – 2013	Specimens	11 at Lopburi Patients with HFMD	<15y	CV-A16: 44.5% EV-A71: 29.6%	(Owatanapanich, Wutthanarungsan et al. 2016)
2013	Specimens	203	16d - 50y	EV-A71: 30% CV-A8: 26% CV-A16: 21%	(Mauleekoonphairoj, Puenpa et al. 2015)
2008 – 2013	Specimens	1182 Patients with HFMD or HA	4d - 54y	EV-A71: 9.1% CV-A: 31.2%	(Linsuwanon, Puenpa et al. 2014)
2012	Specimens	704 Patients with HFMD or HA	1m - 54y	CV-A6: 33.5% CV-A16: 9.4% EV-A71: 8.8%	(Puenpa, Mauleekoonphairoj et al. 2014)
2010 – 2011	Specimens	6266 Children	6m - 10y	EV: 41.5%	(Taylor, Lopez et al. 2017)
2008 – 2011	Resp samples	121 at Bangkok		EV: 43% EV-A71	(Zhou, Fernandez et al. 2016)
2006 – 2011	Resp samples	1810 Patients with resp illnesses	< 15y	EV-D68: 1.4%	(Linsuwanon, Puenpa et al. 2012)
2008 – 2009	Specimens	48	4m - 26y	EV-A71: 47.9% CA-16: 8.3%	(Chatproedprai, Theanboonlers et al. 2010)

6



2018 EV (Jan 1 - May 15)

	HFMD	Enterovirus	EV-A71	Death
Cambodia				
China	380000			4
Hong Kong (China)	46		9	
Japan	10341	8	2	
Malaysia				
Singapore	1159			
Vietnam	11654			0
Thailand	11672			0
Taiwan		9	5	
Total		17	16	4

7

7



References

- Horwood, P. F., Andronico, A., Tarantola, A., Salje, H., Duong, V., Mey, C., . . . Buchy, P. (2016). Seroepidemiology of Human Enterovirus 71 Infection among Children, Cambodia. *Emerg Infect Dis*, 22(1), 92-95. doi:10.3201/eid2201.151323
- NikNadia, N., Sam, I. C., Rampal, S., WanNorAmalina, W., NurAtifah, G., Verasahib, K., . . . Chan, Y. F. (2016). Cyclical Patterns of Hand, Foot and Mouth Disease Caused by Enterovirus A71 in Malaysia. *PLoS Negl Trop Dis*, 10(3), e0004562. doi:10.1371/journal.pntd.0004562
- Ooi, M. H., Wong, S. C., Podin, Y., Akin, W., del Sel, S., Mohan, A., . . . Solomon, T. (2007). Human enterovirus 71 disease in Sarawak, Malaysia: a prospective clinical, virological, and molecular epidemiological study. *Clin Infect Dis*, 44(5), 646-656. doi:10.1086/511073
- Tran, C. B., Nguyen, H. T., Phan, H. T., Tran, N. V., Wills, B., Farrar, J., . . . Simmons, C. P. (2011). The seroprevalence and seroincidence of enterovirus71 infection in infants and children in Ho Chi Minh City, Viet Nam. *PLoS One*, 6(7), e21116. doi:10.1371/journal.pone.0021116
- Van Tu, P., Thao, N. T. T., Perera, D., Truong, K. H., Tien, N. T. K., Thuong, T. C., . . . McMin, P. C. (2007). Epidemiologic and virologic investigation of hand, foot, and mouth disease, southern Vietnam, 2005. *Emerg Infect Dis*, 13(11), 1733-1741. doi:10.3201/eid1311.070632

8

8