A study on the trends of Foot-and-Mouth Disease vaccinations in large ruminants in Cambodia

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Foot-and-Mouth Disease

- Non-enveloped RNA virus with an icosahedral capsid
- Endemic in Cambodia and Southeast Asia
- Serotypes O, A, C, SAT 1, SAT 2, SAT 3, Asia 1
- Serotypes O, A and Asia 1 are found in Cambodia
- Affects cattle, buffaloes, pigs, sheep and goats

- Survives in the environment within animal secretions and products for extended periods of time
- Survival depends on temperature, pH and humidity
How is it spread?

1. Direct contact
2. Aerosol
3. Fomites in contaminated environment
4. Possibly arthropod

- Usually transmitted by inhalation of the viral particles, although ingestion is also possible

- Cattle can remain carriers for up to 2 years after recovery!
Clinical Signs

- Fever, loss of appetite, depression, decreased milk production

Epithelial form:
- Drooling (vesicles forming in the oral cavity)
- Vesicles forming around the interdigital skin and coronary band

Malignant form:
- Necrosis of cardiac muscle → Death
- Secondary bacterial infections → lameness, mastitis, pneumonia
- High morbidity, Low mortality

Photos by Dr. Caroline Hahn

Norris 2015
Cattle Industry in Cambodia

› 99% of cattle are owned by smallholder farmers
› Often kept for draught, beef production, and more importantly as an asset store that can be sold for cash when the farmers need money
› Best quality cattle are sold to major Vietnamese cities for slaughter
› Lesser quality cattle are sold to Phnom Penh
› Poor quality or sick animals slaughtered and sold within provincial markets
› Total numbers of cattle in Cambodia have been decreasing
› Numbers of cattle raised commercially have increased

Young et al. 2016; DAHP 2016
FMD in Cambodia

- Estimated to be about 20% prevalence nationwide, higher in the southern provinces
- Reporting rates are very low, reported incidence only 0.62% in 2015
- Perpetuated by unregulated movement of livestock from Thailand to Vietnam
- Poor understanding of biosecurity by smallholder farmers
- Viewed as a less important disease compared to Haemorrhagic Septicaemia due to its low mortality rate

Tum et al. 2015; Young et al. 2016; Hawkins, Sieng & Kerr 2013; Kerr et al. 2013
FMD in Cambodia

Costs

- Pre-FMD value of cattle = USD 404.19
- Post-FMD value of cattle = USD 203.25
- Value of cattle that died of FMD = USD 80.50
- Total annual cost to the country due to FMD = USD 134,829,478

› Inactivated vaccine

› Serotype specific

› Vaccine failure is common due to large variations even within serotypes

› Commonly used to prevent debilitating clinical signs in FMD endemic countries

› May allow continuous viral replication within epithelial tissues, creating subclinical shedders

› Has shown to be effective in preventing or limiting outbreaks by previous studies in Cambodia and Laos

Norris 2015; Nampanya et al. 2012; Perry et al. 2002
Low vaccination rates, 1.30% in 2015 (42.8% for HS)

FMD vaccines relatively more expensive

USD 1 - 1.20 per dose

Provided for free by the government via DAHP

Total annual cost of vaccinating national herd is USD 25,827,373

Supply of vaccines is supported by the OIE
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Kg. Cham</td>
<td>1.41%</td>
<td>36</td>
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<tr>
<td>Kg. Speu</td>
<td>0.30%</td>
<td>77</td>
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<tr>
<td>Kandal</td>
<td>0.76%</td>
<td>37</td>
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<tr>
<td>Prey Veng</td>
<td>0.14%</td>
<td>45</td>
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<tr>
<td>Svey Rieng</td>
<td>1.17%</td>
<td>26</td>
</tr>
<tr>
<td>Takeo</td>
<td>1.28%</td>
<td>37</td>
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<tr>
<td>Banteay Meanchey</td>
<td>15.24%</td>
<td>11</td>
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<tr>
<td>Mondolkiri</td>
<td>14.26%</td>
<td>0</td>
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<tr>
<td>Pailin</td>
<td>15.16%</td>
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## Vaccination

<table>
<thead>
<tr>
<th>Year</th>
<th>Vaccines supplied by DAHP</th>
<th>Number of animals vaccinated</th>
</tr>
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<tbody>
<tr>
<td>2013</td>
<td>44270</td>
<td>86677</td>
</tr>
<tr>
<td>2014</td>
<td>42300</td>
<td>38985</td>
</tr>
<tr>
<td>2015</td>
<td>40000</td>
<td>44478</td>
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</tbody>
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Vaccination

- High risk provinces have low vaccination rates
- Annual vaccination rates have been decreasing
- Slight increase in 2015
- Numbers of reported outbreaks have been decreasing
- Supply of vaccines has been decreasing
- Strong correlation between vaccination rates and number of outbreaks
Village is involved as a High Intervention case in current ACIAR project
Farmers have been trained by the ACIAR staff on best farming practices
FMD incidence is low, last case of FMD before 2001
Vaccinations against FMD has been irregular, once in 2001 and 2002 by DAHP and more recently in 2015 and 2016 by ACIAR
Almost all villagers brought their cattle for vaccination in recent vaccination days
Visitors displayed an understanding of the transmission of infectious diseases

- Growing forage to feed their cattle
- Tethering cattle when grazing on the field to prevent direct contact
- Thorough cleaning and disinfection of premises
- Obtaining new cattle only after selling off entire herd
Visit to Sen Ouk Village

› Level of biosecurity depends on the number of cattle owned
› Farmers with fewer cattle tend to have other sources of income and are less likely to view biosecurity and cattle health as a priority
› Breeding tends to happen within the village, with the village bulls, or via AI
› Some villagers may bring their cattle to other villages if they hear that there is a good bull
› Because quarantine is deemed “unnecessary”, new cattle will also be brought to the field for common grazing
Why are vaccination rates so low?

- Vaccination rates are still very low, but beginning to improve
- Poor understanding of disease and value of vaccination
- Cost of vaccine and poor understanding of the costs related to FMD
- Strong correlation with the number of outbreaks suggests that many farmers may vaccinate only when an outbreak is occurring
- Number of vaccines supplied by the government is very limited, vaccines may be used for targeted vaccinations to control outbreaks instead

Tum et al. 2015; Young et al. 2016
What can be done

› Some improvement can be observed in 2015, but a lot more needs to be done to improve the vaccination rates in Cambodia

› Increased collaboration with the government, commercial sector and VAHWs is required to decrease cost and improve the distribution and application of vaccines

› A mass vaccination program may not be feasible at this point in time with the current resources

› Will require continued support from external donor agencies e.g. OIE

› Private purchase of vaccines by individual farmers/villages

Young et al. 2016; Young et al. 2013
What can be done

› From previous ACIAR studies, we have learnt that smallholder farmers are able to improve the health and condition of their cattle after training and education through improved husbandry and biosecurity

› Improved attitudes towards vaccinations have also been seen in Sen Ouk village

› Training programs for smallholder farmers will increase their keenness to vaccinate their cattle against FMD

› Increase willingness of farmers to purchase their own FMD vaccines instead of relying on government supply

Nampanya et al. 2012; Young et al. 2013
References

- Hawkins, C, Sieng, S & Kerr, J 2013, Livestock trading and foot-and-mouth disease risk, paper presented to Cattle health, production and trade in Cambodia; proceedings from three ACIAR-funded projects presented at an international workshop held in Phnom Penh, Cambodia, 7-8 June 2011, Phnom Penh, Cambodia, Australian Centre for International Agricultural Research, pp. 94-100.
- Norris J 2015, ‘Family Picornaviridea’, lecture notes distributed in the topic VETS3040 Veterinary Microbiology, University of Sydney, Camperdown.