African horse sickness

OIE Guidelines on preparedness and implementation of emergency vaccination in the Asian region

WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

Preferred citation

World Organisation for Animal Health (OIE) (2020). – OIE Guidelines on preparedness and implementation of emergency vaccination in the Asian region, Paris. France, 32 pp.

Disclaimer

ISBN 978-92-95115-86-6

Front cover photo

Acknowledgements

The OIE would like to thank Susanne Münstermann (author) and Lance Bellers (graphic designer) who developed these *Guidelines*.

The Organisation would also like to thank the group of AHS experts which was regularly consulted contributing to both the compilation of the information for this publication and in reviewing its technical content. Specifically, this group consisted of Alf-Eckbert Füssel, Hichem Bouzghaia, Jim Maclahan, Evan Sergeant, Stephan Zientara (members of the OIE Ad-Hoc Group of Experts on AHS); Kenneth Lam (International Horse Sport Confederation); Karen Rickards (International Confederation of Working Equids); Noppawan Buamithup, Pornpiroon Chinasorn, Nuttavadee Pamaranon, Atommie Lekcharoensook (Thailand Department of Livestock Development); and Nara Ketusingha, Chalermcharn Yotviriyapanit and Metha Chanda (Thailand Equestrian Federation).

This initiative was coordinated by Laure Weber-Vintzel (OIE South-East Asia) with assistance from Mauro Meske (OIE HQ, Status Dept), Jee Yong Park (OIE HQ, Science Dept) and Caitlin Holley (OIE Asia and the Pacific).

It was made possible through the generous support of the Government of the People's Republic of China.

Contents

List of acronyms

ADR	Accord européen relatif au transport international des marchandises dangereuses par route
AHS	African horse sickness
AHSV	African horses sickness virus
AITS	Animal identification and traceability system
CVO	Chief Veterinary Officer
DEET	Diethyltoluamide
DIVA	Differentiating infected from vaccinated animals
EDTA	Ethylenediaminetetraacetic acid
ELISA	Enzyme-linked immunosorbent assay
FAO	Food and Agriculture Organization of the United Nations
FEI	Fédération Equestre Internationale
GEMP	Good emergency management practices
GPS	Global Positioning System
IATA	International Air Transport Association
IFHA	International Federation of Horseracing Authorities
NGO	Non-governmental organisation
M&E	Monitoring and evaluation
MoU	Memorandum of Understanding
OIE	World Organisation for Animal Health
PCR	Polymerase chain reaction
PPP	Public-private partnership
PVS	Performance of Veterinary Services
RT-PCR	reverse-transcription polymerase chain reaction
SEA	South-East Asia
SOP	Standard operating procedure
WAHIS	World Animal Health Information System

Foreword

The OIE has commissioned these *Guidelines* to help to establish an environment that will enable the implementation of emergency African horse sickness (AHS) vaccination. For greatest impact, these *Guidelines* should be consulted before the occurrence of AHS has been detected in a country. Ideally, they should be used either when there is an increased risk of AHS entry or when equine disease contingency planning is being developed. However, they still remain relevant after the introduction of AHS, once emergency vaccination is considered.

Considering the important impact of AHS on equid populations and its potential for spread, we all have to be prepared to respond to its incursion. AHS is a vector-borne disease, transmitted by bloodsucking midges of the genus *Culicoides*. It has been a threat to horses in sub-Saharan Africa ever since it was first recorded in 1569 in East Africa, but the virus has also spread sporadically to countries in North Africa, the Middle East, the Arabian Peninsula, South-West Asia, the Mediterranean region and more recently to South-East Asia. It can kill between 50 to 95% of infected horses very quickly but can also cause chronic disease in other equids (mules, donkey, zebras).

In non-endemic countries that face AHS introduction, emergency vaccination (in association with other measures) is the control measure of choice. In the decision-making process and the design of the emergency vaccination plan, the vaccines currently available, and the specificity of the disease should be carefully considered.

These OIE *Guidelines* are aimed at Veterinary Services in those countries at risk from AHS which wish to be prepared for its possible introduction, or which are considering emergency vaccination to control AHS and prevent its further spread to the rest of the country; or at those involved in national equine health activities.

In the pages that follow, these *Guidelines* provide key practical information to support countries in preparing and implementing an emergency vaccination strategy against AHS. Given that most readers and users would have a broad animal health knowledge, this publication is short, easy-to-read, with practical examples and guidance. With the technical input from a dedicated expert group, we sincerely hope that **these OIE *Guidelines* will prove useful to Veterinary Services in Asia and will help to prevent further spread of AHS**.

釘田博文

Dr Hirofumi Kugita
OIE Regional Representative for Asia and the Pacific

Dr Ronello Abila
OIE Sub-Regional Representative for South -East Asia


Marked swelling of supraorbital fossa
OVI/ARC

1 Introduction

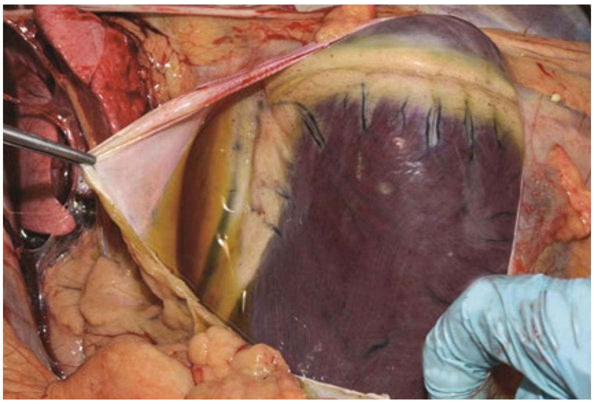
1.1 The disease

African horse sickness (AHS) has been a threat to horses in sub-Saharan Africa ever since it was first mentioned in 1569 in East Africa (4). This orbivirus (genus *Reoviridae*), which expresses itself in nine serotypes, can kill horses very quickly but can also cause more chronic disease in other equids. The mortality rate can be very high in horses, killing between 50 to 95% of infected animals, depending on the different forms of the disease. Mules are less affected (mortality 50%) and donkeys and zebras least affected, showing some mild fever. Zebras can act as asymptomatic maintenance hosts of the disease due to an extended viraemia of up to 40–48 days. The virus has also been found in dogs showing acute respiratory distress syndrome or sudden death after transmission via consumption of meat from infected horses. Viral antigen and antibodies have been found in dromedaries and African elephants, but their role in the epidemiology of the disease is not clear. They might, however, be useful as sentinel animals, for example, in zoos.

The clinical signs of the pulmonary, cardiac, mixed and horse sickness forms of the disease are summarised below. The incubation period, depending on the form of the disease, varies from three to 28 days, but is usually less than nine days. For the purpose of the *OIE Terrestrial Animal Health Code* (*Terrestrial Code*) (18), the infective period is considered to be 40 days.

***Pulmonary* (*peracute*):** respiratory distress, extended head and neck, profuse sweating, froth exudes from the nostrils in the final stages, which can take only a few hours. Post-mortem findings are interlobular pulmonary oedema with distended, non-collapsed and heavy lungs, hydrothorax, thoracic lymph nodes are oedematous, and there is congestion of the gastric fundus.


PIADC
Abundant white foamy nasal discharge


PIADC

Horse, heart: moderate hydropericardium

***Cardiac form* (*subacute*):** head and neck show severe swelling, sometimes down to the chest. The supraorbital fossae and the conjunctivae are also swollen and this is characteristic for this form. Paralysis of the oesophagus may result in aspiration pneumonia; sublingual haemorrhages are always a poor prognostic sign. Post-mortem findings are petechiae and ecchymosis on the epicardium and endocardium, often hydropericardium, lungs are oedematous and flaccid. A yellow gelatinous infiltrate can be seen in the subcutaneous and intermuscular fascia of the head, neck and shoulder.

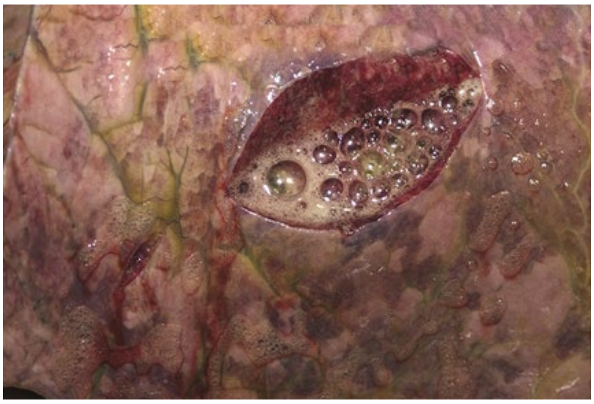
***Mixed* (*acute*) *form*:** is most frequently seen and has elements of pulmonary and cardiac forms. Mortality can reach 70%.

***Horse sickness fever form* (*mild*):** this mild form is seen in equids such as zebras and donkeys which are considered to be more resistant to the disease.

In case of a suspected outbreak of AHS, it is most urgent to identify the agent and to rule out other causes such as equine encephalosis (see 2.3). The AHS virus can be isolated from the blood of live animals (best during the febrile phase), or from tissue samples, especially spleen, lung and lymph nodes, collected at necropsy.

Use of tests, such as ELISA or RT-PCR, for the initial identification of the index case are recommended, followed by virus isolation in tissue culture. If this capacity does not exist in-country, the services of the OIE Reference Laboratories for AHS should be used (12).

In addition to laboratory confirmation, typical clinical and post-mortem findings should also be considered in the evaluation of a suspected outbreak (see 2.7).


PIADC

Horse, lung: severe pulmonary edema

Once AHS virus infection has been diagnosed, it is important to identify the serotype involved in the outbreak by virus neutralisation or serotype specific PCR. Identification of the serotype will allow for the appropriate vaccine to be selected and will facilitate the epidemiological investigation.

Details on diagnostic tests are provided in Chapter 3.5.1. of the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (11).


DJAHNE MONTABORD

Equids such as donkeys and zebras are considered more immune to the disease


BELGIN BALIM

1.2 Transmission

Culicoides

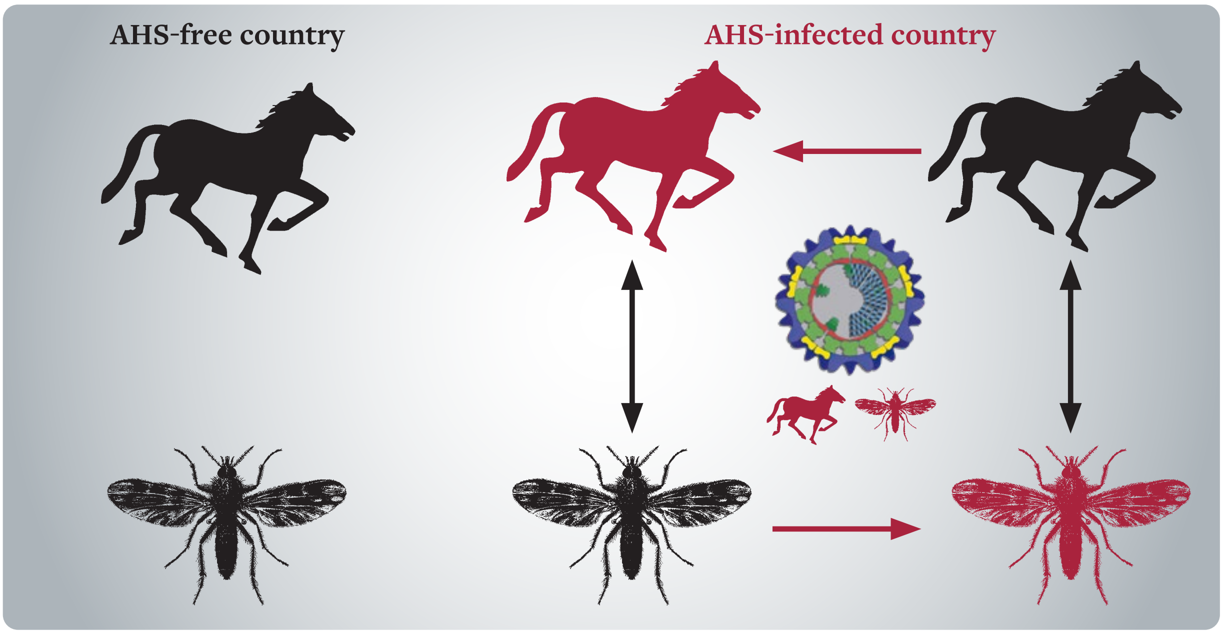
AHS is transmitted by bloodsucking midges of the genus *Culicoides*, the same vector as for other vector-borne diseases such as bluetongue and for equine encephalosis. (Note: *Culicoides* are morphologically distinct from mosquitoes as they have no proboscis.) These midges appear in high population densities and therefore their sheer numbers give them a high transmission capacity. The main species involved in transmission in endemic countries is *C. imicola*. However, *C. imicola* is not abundant in South-East Asia (SEA), and appears not to be present in southern Thailand or countries further south (Malaysia, Indonesia), **therefore any bloodsucking midge associated with equids should be regarded as a potential vector** (2). In SEA countries at risk of introduction of AHS, vector surveys would be useful to complement the limited knowledge on vector capacity for the virus, especially where skills and capacity exist. Regional cooperation or assistance from international partners should also be sought. Techniques to identify groups of *Culicoides* midges and the virus load they are carrying during various seasons have been described for bluetongue outbreaks in Germany (6) and Belgium (23) and these standard techniques could be referred to for a survey on vector capacity for AHS. A recent modelling study on the likelihood of geographical expansion of *C. imicola* in SEA includes southern and eastern parts of the People's Republic of China, Myanmar, Thailand, Vietnam and Cambodia (7).

As *Culicoides* are susceptible to temperature, the disease has a seasonal and cyclical appearance with peaks occurring during hot and humid seasons and monsoon or El Nino periods, and few cases during the cold season. However, this seasonal mechanism might not apply in tropical regions such as SEA, allowing longer periods of abundance. *Culicoides* midges remain infected for their complete life span of 20 to 90 days, but do not transmit the virus to their offspring.

As Figure 1 shows, the key determinant for presence or absence of the disease in a country with a susceptible equid population and competent vectors is the introduction of the AHS virus. This introduction can happen either through an infected equid or infected midge; after intrinsic incubation (two to four days) in the midge or extrinsic incubation in the equid (three to 28 days), both can establish the cycle of virus transmission.

The key to controlling a disease outbreak is the disruption of transmission to the susceptible host through vector control (see options described in Chapter 3.1) and the disruption of transmission from the infected equid to the competent vector through vaccination of the equids (Chapter 3.2), combined with vector protection or removal of the infected equid as a source of virus for the vectors (euthanasia of the diseased animal).

Figure 1. Presence and absence of AHS



© OIE, 2020 after Alain Guthrie, OIE Webinar, 20.4.20

1.3 Geographical distribution

AHS occurs regularly in sub-Saharan Africa, but the virus has also spread to countries in North Africa, the Middle East, the Arabian Peninsula, South-West Asia and the Mediterranean region.

The disease could potentially spread in any area where *Culicoides* are present, following the introduction of infected vectors or equids. With climate change and milder winters in the northern hemisphere, and an increase in international trade, the risk of northward migration of the vector is increasing. When vector, host or virus movements introduce viruses into new locations, local *Culicoides* species can also become new vectors involved in local transmission cycles.

Following the recent arrival of the AHS virus in Thailand and Malaysia, and given that climatic conditions are conducive for bloodsucking midges in the region, there is a real risk that the disease could spread, and SEA countries need to raise awareness of this possibility and be prepared.

Map 1. Historical distribution of AHS outbreaks in the world

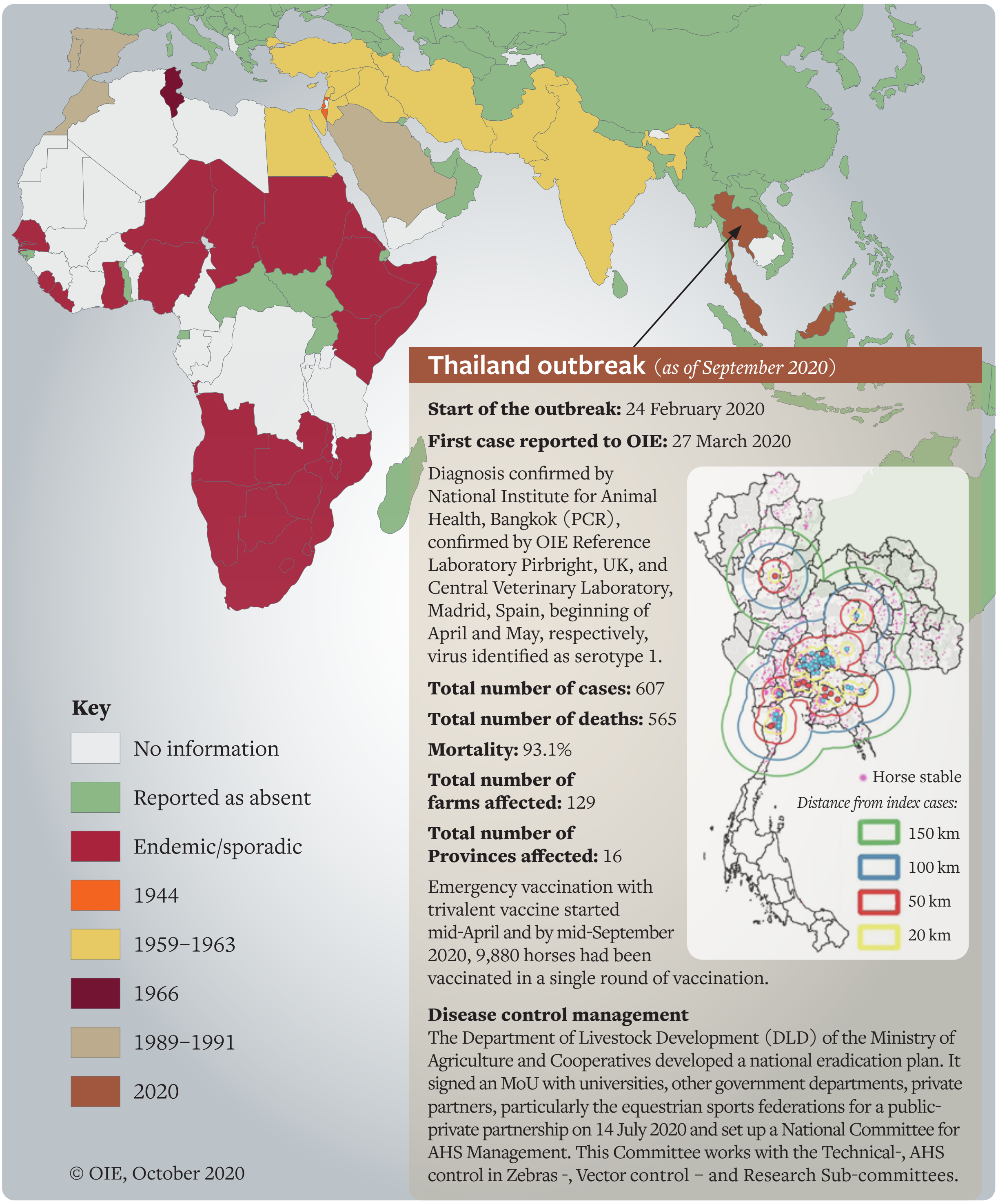


Figure 2. **The Emergency Management Cycle**

2 Preparedness for emergency vaccination

As the African swine fever and COVID-19 pandemic crises demonstrated, any emerging disease can expose a country's lack of preparedness. For animal diseases, the Food and Agriculture Organization of the United Nations (FAO) has developed a system and handbook on *Good Emergency Management Practice* (GEMP) (5). These *Guidelines* should be consulted to improve preparedness for a possible incursion of AHS into any country in the region free of the disease. While GEMP takes you through the steps outlined in Figure 2, these OIE *Guidelines* focus on the 'response', specifically on emergency vaccination, and other measures are only briefly touched upon in Part 2.

2.1 Importance of Veterinary Services

Strong Veterinary Services are crucial when it comes to rapid response to and control of animal disease outbreaks and emergencies, such as the introduction of an emerging disease. Since 2006, the OIE has offered its Members the possibility of a voluntary external evaluation of their Veterinary Services via the Performance of Veterinary Services (PVS) Pathway (14) which assesses a range of critical competencies, including those on **emergency preparedness** and **financial capacity to deal with emergencies**. When a new disease occurs in a region and regional spread is considered a serious possibility, it is highly recommended that countries consult or update their PVS evaluations. It should be noted that for many Veterinary Services equids are not a priority for budgeted activities or included in routine surveillance systems. Consequently, preparedness plans should be scrutinised to make sure they include equids. This is an essential prerequisite if a country participates in international movement of equids.

Another element at the core of PVS is the functionality of the '**chain of command**' between Veterinary Services headquarters and often decentralised, distant district veterinary stations. Due consideration should be given to the need for the correct action at remote places while advocacy, contingency and action planning takes place at the level of the Chief Veterinary Officer (CVO) and team. Veterinary Services should be understood as being inclusive of Community Animal Health Workers, Veterinary Assistants or other Veterinary para-professionals (20). In the rest of the document, they will be referred to as veterinary and extension personnel.

To assist Veterinary Services when dealing with an emerging disease in horses, and if not already established in 'peace time', a **public-private partnership** (PPP) should rapidly be established by including national equestrian federations, national racing federations,

THE DONKEY SANCTUARY

Donkey working at Hossana brick kiln, Nepal

Introduction
Preparedness
Emergency vaccination
M&E
Conclusion

THAILAND EQUESTRIAN FEDERATION / THAI POLO & EQUESTRIAN CLUB PATTAYA

(*Left and right above*) **Horse trials in Asia**

the polo sport community and non-governmental organisations (NGOs) looking after working equids in the preparedness and contingency activities. This will facilitate access to and work with sport, race and working horses and their owners, and possibly ensure access to donkeys and mules. Where possible the PPP partners should be invited to contribute in kind and cash since emergency budgets of Veterinary Services might not include sufficient resources for equids. Guidelines on how to set up successful PPPs have been published in the *OIE PPP Handbook: Guidelines for Public-Private Partnerships in the veterinary domain* (13).

Veterinary Services should have authority over the animal health conditions governing imports into and transit through their own country, including knowledge of arriving consignments of captive wild equids destined for national parks/zoological collections (e.g. zebras). Where necessary, inter-governmental department arrangements or memoranda of understanding (MoUs) should be set up accordingly.

Another very important role for Veterinary Services facing a possible incursion of a disease is to reinforce international border controls; in this case, for imports of live equids, equine semen and embryos, and to ensure compliance with import requirements (18). Should import of live equids be necessary during times of risk, due consideration should be given to vector protected quarantine in the country of origin and/or after importation. Illegal movements across borders are certainly a challenge but these need to be prevented, notably by enhanced intelligence and targeted controls. Chapter 3.1 will highlight the dangers associated with illegal movement within a country and across borders, should an outbreak occur.

MONICA VOLPIN/PIXABAY

Polo match

2.2 Laboratory capacity

The better prepared a country is during 'peace time', the better the response and the faster it can be triggered in a suspected outbreak. Preparations should include an evaluation of laboratory capacity and the skills of laboratory personnel to diagnose equine diseases using serology, molecular biology and virus isolation techniques. They should also include a check on the availability of materials and reagents to carry out specific tests, such as ELISA or RT-PCR for AHS. This might be an occasion to request an OIE Laboratory Mission, a targeted support in the PVS pathway. Due consideration should be given to increasing the capacity of provincial/district/field laboratories to enable them to carry out rapid diagnostic tests such as ELISA or RT-PCR. Regular proficiency testing and accreditation of laboratories involved in official control measures are as necessary as close cooperation with regional OIE Reference Laboratories (12).

2.3 Capacity building

AHS is an emerging disease in the Asia region; veterinarians working in the field, pathologists and laboratory technicians will most likely not yet have encountered it in their professional lives. While it is likely that in a fully susceptible population, horses will display characteristic signs of the disease, the disease might also take an acute/peracute course without

Introduction
Preparedness
Emergency vaccination
M&E
Conclusion

significant clinical signs and it might therefore be mistaken for other diseases such as equine encephalosis, acute heart failure, acute pleuritis or pneumonia, equine viral arteritis, equine infectious anaemia, anthrax, plant toxicosis, chemical poisoning, heat stress, piroplasmosis, Getah virus infection, Hendra virus infection and trypanosomosis.

It is therefore very important to refresh the knowledge of veterinary and extension personnel working in the field, as well as pathologists and laboratory technicians, about the epidemiology, clinical symptoms, pathology and diagnosis of the disease. In order to do this, laboratory personnel, field veterinary personnel and pathologists should refer to the OIE disease cards for AHS and all the diseases that could be considered as differential diagnosis (10) and to a series of webinars organised by the OIE during April and May 2029 (21).

2.4 Legislative framework

Governments need to ensure that the appropriate legislative framework and regulations are in place to enable national authorities at central and local levels to take rapid action for emergency disease control of notifiable diseases. For countries which operate under a decentralised system of government, it is important to ensure consistency of legislation regarding animal disease emergencies throughout the country. This legislation should be reviewed regularly so that required action can be taken within a conducive legal framework.

In the specific case of AHS, Veterinary Services should check if the following requirements are supported by legislation, and if not, amendments or wavers should be initiated as soon as possible.

Title	Yes? No?
Is AHS a notifiable disease for all equids in my country?	
Is the importation of AHS vaccine permitted, and under what authorisations (e.g. under an emergency registration)? If yes, how long will it take to get an import permit? If no, how best can an import permit be obtained?	
Can the Competent Authority ensure that the import and use of vaccines is only permitted under its authority?	
Are there approved quarantine facilities for equids with the possibility of vector protection?	
Is there a sanitary mandate for private veterinarians to carry out surveillance or vaccination?	
Is there a compensation policy that includes equids in case they have to be euthanised for disease control purpose by the Veterinary Services?	
Can movement restrictions for equids be applied and enforced (i.e. can fines for non-compliance be issued)?	
Do the Veterinary Services have knowledge of and authority over health requirements for captive wild equids, including for their importation?	
Is there a legal obligation to register equids and their holdings?	
Is there legal provision for the control of movement of equids within and into the country?	
Can vaccination for equids be made mandatory and enforced?	
Is there an emergency fund that could cover the cost of activities required to control an AHS outbreak?	

Even if the legislative framework supports these basic requirements to prevent and control an outbreak of AHS, laws and regulations are only of value if they can be enforced. Animal health and other officials must therefore be given the necessary delegated powers to act in an emergency, if necessary, with assistance from law enforcement authorities.

2.5 Animal identification

Even if countries have established animal identification and traceability systems (AITS) in place, they are usually developed for livestock, and mainly cattle, with a view to ensuring food safety and making it possible to trace exports of live animals and their products.
For equine species, AITS are usually developed for sport horses (competition and race horses), following international norms established by the Fédération Equestre International (FEI) or the International Federation of Horseracing Authorities (IFHA). Those horses are normally issued with a life number and a transponder/microchip number and hold an equine passport which gives the details of owner and horse.

Although horses are most at risk from AHS, all equids are susceptible to possible outbreaks of the disease. Horses, donkeys and mules serve many different purposes. In addition to sport and leisure, many are used for transport and work in construction and brick making, agriculture, drawing water and so on. However, these working equids are rarely included in AITS.

It is therefore imperative for preparedness plans to include the elaboration of a simple but effective AITS. The system can be paper based or electronic or a combination of both. As an example, a basic passport was developed for working horses in the Greater Jakarta area which included the geo-referenced recording of the holding and the information shown in Figure 3.

Figure 3. Example ID cards

Kartu Ternak
(Animal Card)

Nomor (ID Number) : 7143331
Kode ternak (Code from Database) : 3175ua0101819
Spesies : Kuda (horse)
Ras / bangsa (breed) :
Jenis kelamin (sex) : Jantan
Tanggal lahir (Date of birth) : 07/11/2014
Tanda khusus (special marks) :
Nama pemilik (name of owner) : Udin Ali
ID pemilik (owner ID) : 6289652442039
Alamat (Address) : Tugu Selatan, Koja, Jakarta Utara, Dki Jakarta
GPS data :

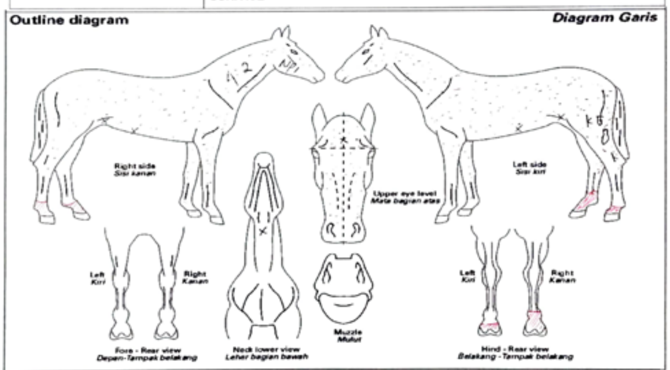
Foto Ternak
(horse picture)

Catatan kesehatan hewan: (animal health records)

No.	Kegiatan[1] (Activities)	Jenis[2] (Type)	Tgl/Bln/Th	Keterangan (remarks)

[1]Jenis kegiatan: Pengobatan, Vaksinasi, Pengujian, dll.(Acitivities like medication, vaccination, testing)
[2]Jenis: nama obat, nama vaksinasi, jenis penujian, dll.(Type: name of drug, of vaccine , of test)

Warna (Colour)	BAY
Tinggi (Height)	127 CM
Nomor Microchip (Microchip Number)	-
DESKRIPSI SINYALEMEN (SIGNALEMENT DESCRIPTIF)	
Kepala (Head)	MEDIAN WHORL AT FOREHEAD. "NPI" TATTOES AT RIGHT CHEEK.
Kaki Kiri Depan (Left Front)	NIL
Kaki Kanan Depan (Right Front)	NIL
Kaki Kiri Belakang (Left Back)	WHITE TO PASTERN
Kaki Kanan Belakang (Right Back)	WHITE TO FETLOCK
Tubuh (Body)	WHORL AT UPPER WINDPIPE. TWO BELLY WHORLS AT RIGHT AND LEFT. "42" TATTOES AT RIGHT NECK. "KE" TATTOES AT LEFT HINDQUARTER ABOVE MEDIUM SCAR. DOTS OF WHITE HAIRS ALMOST ALL OVER THE MOBY SURFACE



KESIMPULAN (CONCLUSION) : A BAY HORSE WITH "NPI" TATTOES AT RIGHT CHEEK, "42" TATTOES AT RIGHT NECK. "KE" TATTOES AT LEFT HINDQUARTER ABOVE MEDIUM SCAR AND DOTS OF WHITE HAIRS ALMOST ALL OVER THE MOBY SURFACE.

Perhatian :

1. Dokumen ini adalah untuk identifikasi kuda;
2. Wajib dibawa jika kuda dalam perjalanan / dilalulintaskan;
3. Jika dokumen ini hilang atau kuda yang tercantum mati harus segera dilaporkan kepada Dinas Ketahanan Pangan, Kelautan dan Pertanian Provinsi DKI Jakarta;

Jakarta,
Dokter Hewan Pemeriksa
(Veterinary Services)
( )

LIVESTOCK AND ANIMAL HEALTH SERVICES, MOA, INDONESIA

The information, sent by smart phone to the epidemiology unit as a picture or delivered as hard copy, was entered in a new folder 'equines' (there were no donkeys in the area) in the already existing animal health database, which also included AITS data.

The collection of this information, which can be facilitated through a PPP, finally provides census data and the basis for calculation of surveillance sampling frames. This information is also essential for calculating quantities of reagents for tests and quantities of vaccines to be ordered as well as for organising vaccination campaigns.

2.6 Surveillance

For rapid detection of disease outbreaks, owners of equids, extension personnel and veterinary personnel have to be alert and on the lookout for suspicious symptoms. They need to be aware of the clinical signs of a foreign disease such as AHS and that there is a risk of introduction of this disease. Suitable, easy to understand extension material for use with farmers and horse owners on AHS has already been developed and translated into local languages. This material is available on the OIE Asia-Pacific website (1) and could be adjusted to other local circumstances and languages. Close cooperation with and support from PPPs, and NGOs working with equids or local equestrian federations, are very important in this regard.

The most effective method of rapid detection is through passive surveillance, with veterinary personnel using scheduled farm visits not only to attend to livestock but also to have a look at horses, mules or donkeys and look for possible signs of AHS. Veterinary and extension personnel should keep records of their surveillance observations, including negative results. Veterinary personnel are also responsible for ensuring that farmers are aware of the risks of emerging diseases such as AHS.

SUSANNE MÜNSTERMANN

Checking for the microchip

Active surveillance, usually more costly and personnel-intensive, should be combined with passive surveillance efforts, but should be limited to high risk areas, such as near borders with an infected country or market places where many horses or donkeys are gathered. Clinical inspection and random sampling of horses, mules and donkeys should be included. Sentinel herds of horses or individual animals that are regularly visited in high risk areas can also be considered. All suspected cases should be investigated and the outcomes recorded, even if negative.

Should an outbreak occur, the extent of the initial outbreak (geographical spread and number of affected locations) needs to be established early in the outbreak by carrying out surveillance over a wide area (see 3.1).

Surveillance should also include identifying the vector of the disease. While this requires skills and facilities that might not be available everywhere, a country should make an effort to get an understanding of the distribution and abundance of possible vectors of AHS, particularly in the areas considered at risk. Existing information on other diseases also caused by orbiviruses and their vectors should be taken into account.

For surveillance, reference can be made to Chapters 1.4. (14) and 1.5. (15) of the *Terrestrial Code*.

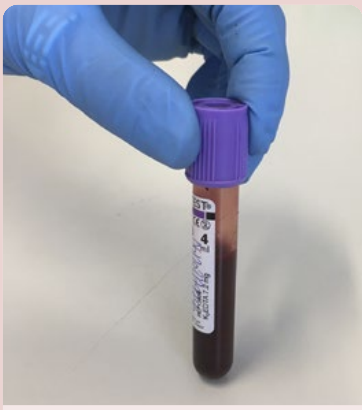
2.7 Disease investigation

In the event of a suspected case being identified during surveillance, a sound clinical examination should be carried out and good records kept of all observations and the identity of the animal.

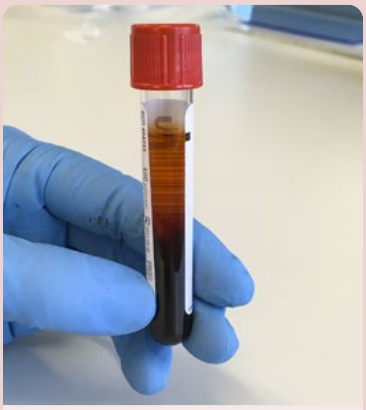
Whole blood samples, collected in tubes with anticoagulants, and serum samples, collected in a tube without anticoagulants, should be taken from suspected cases, labelled with the location, (preferably including GPS coordinates) and identity of the animal, stored in cooling equipment, and taken as soon as possible to the nearest laboratory, together with a detailed description of the clinical symptoms.

Collecting, storing and transporting samples

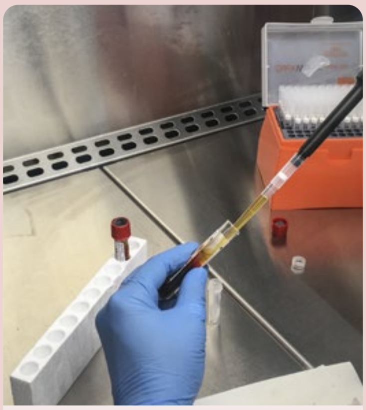
To collect a **whole blood sample** (for use in PCR and cell culture): use a vacutainer tube with anticoagulant (preferably EDTA), place in a cool box at +4°C.



Whole blood with EDTA anticoagulant

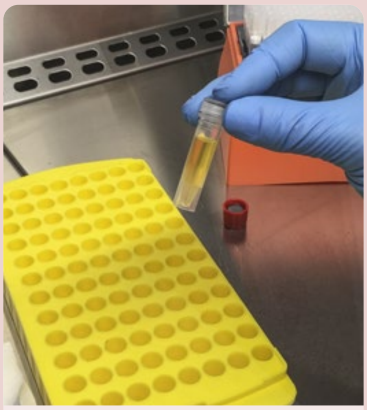


Whole blood without anticoagulant



Decanting the serum

Transfer of serum into serum tube



Storage of serum

To collect a **serum sample** (for serology e.g. ELISA): use a vacutainer without anti-coagulant, allow the blood to settle at ambient temperature, protected from extreme heat until clear; decant in a vial after removal of the blood clot. Better separation can be achieved by placing tubes at a 45° angle. Do not delay in decanting to avoid haemolysis.

Store ALL samples
(blood, serum, organs)
at +4°C for up to 1 week.

If storage is required for > 1 week:

Serum at – 20°C

Blood at +4°C
(as short as possible but possibly up to 4 weeks)

Organs at – 80°C.

Ensure continued power supply to maintain these temperatures.

EDTA and whole blood samples packed for transport

Storage in fridge

Transport
IATA and ADR categorise clinical samples and culture as B UN 3373. Chose packaging material accordingly. www.un3373.it/ENG/Packing_Instruction_P.I.650_IATA.html

In the case of unexplained sudden death of an equid, a post-mortem should be carried out by a competent veterinarian/pathologist (see also 2.3), respecting necessary biosecurity measures. Samples of organs that show pathological changes should be taken, as should samples from the spleen, lymph nodes and lungs. These should be protected from possible contamination by secondary pathogen growth by, for example, storing them in ethylene glycol. They should also be transported in cooling equipment.

Case definition

For the laboratory and the investigating veterinary officers to conclude these investigations, a case definition should be established for a positive, a suspected and a negative case in line with the OIE definition (15):

- AHS virus has been isolated and identified
- Antigen or RNA of the AHS virus has been identified in clinically sick animals or those that are epidemiologically linked to a positive case
- Antibodies have been detected by serology in unvaccinated horses.

2.8 Disease reporting

It is the responsibility of all veterinary personnel to report the outcome of suspicious preliminary investigations. Outside sub-Saharan Africa, AHS is a foreign, notifiable disease, and the most rapid means of communication, normally telephone or SMS or tools within the electronic reporting system, should be used to inform the CVO and the Epidemiology Unit. The CVO will decide if the investigation results as compared to the case definition justify immediate notification to the OIE through OIE-WAHIS.

2.9 Public awareness and communication

It is of utmost importance to inform the owners of susceptible species about AHS, and prepare them for possible outbreaks of the disease. It is advisable for Veterinary Services to establish a communication working group or to collaborate with the communications department of the Ministry of Agriculture to develop key public awareness messages and materials.

DJAHNE MONTABORD

Sampling donkeys

Following the AHS outbreak in Thailand, some material for the Asian context has already been developed and can be found on the OIE Asia website (1).

In addition to communicating with the public to create awareness, it is equally important to establish clear communication channels between the different levels of Veterinary Services and to the key stakeholders such as equestrian federations, NGOs engaged with working equids, directors of zoos and others.

AHS outbreaks do not respect national borders, so communication between neighbouring countries and, where applicable, with the Regional Economic Community, is also very important to alert them of the risk to the region.

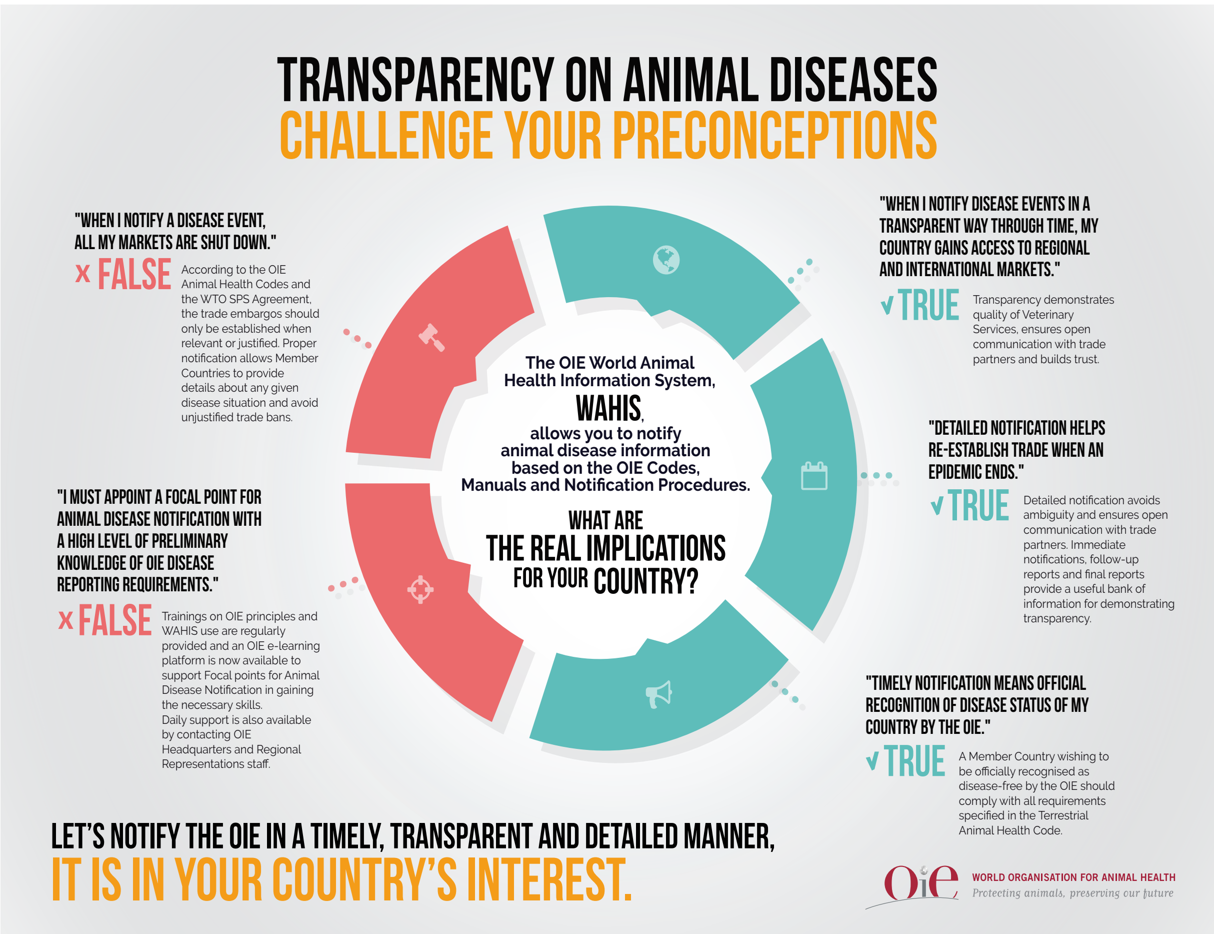
Communication between farmers, owners of equids and veterinary and extension personnel needs to be improved so that materials prepared by central authorities reach the relevant people.

Should an outbreak occur, communication style will have to switch to emergency mode and will have to introduce and explain the rationale for the necessary control measures, in particular those perceived as difficult, disturbing and unnecessary, such as euthanasia of severely affected animals, quarantine, vector control and movement bans. This communication should focus on the benefits that will be derived from taking measures to eradicate the disease rather than leaving it to take its course. Guidance on how to frame these messages can be taken from the *OIE Communication Handbook* (9).

2.10 Contingency planning and emergency funding

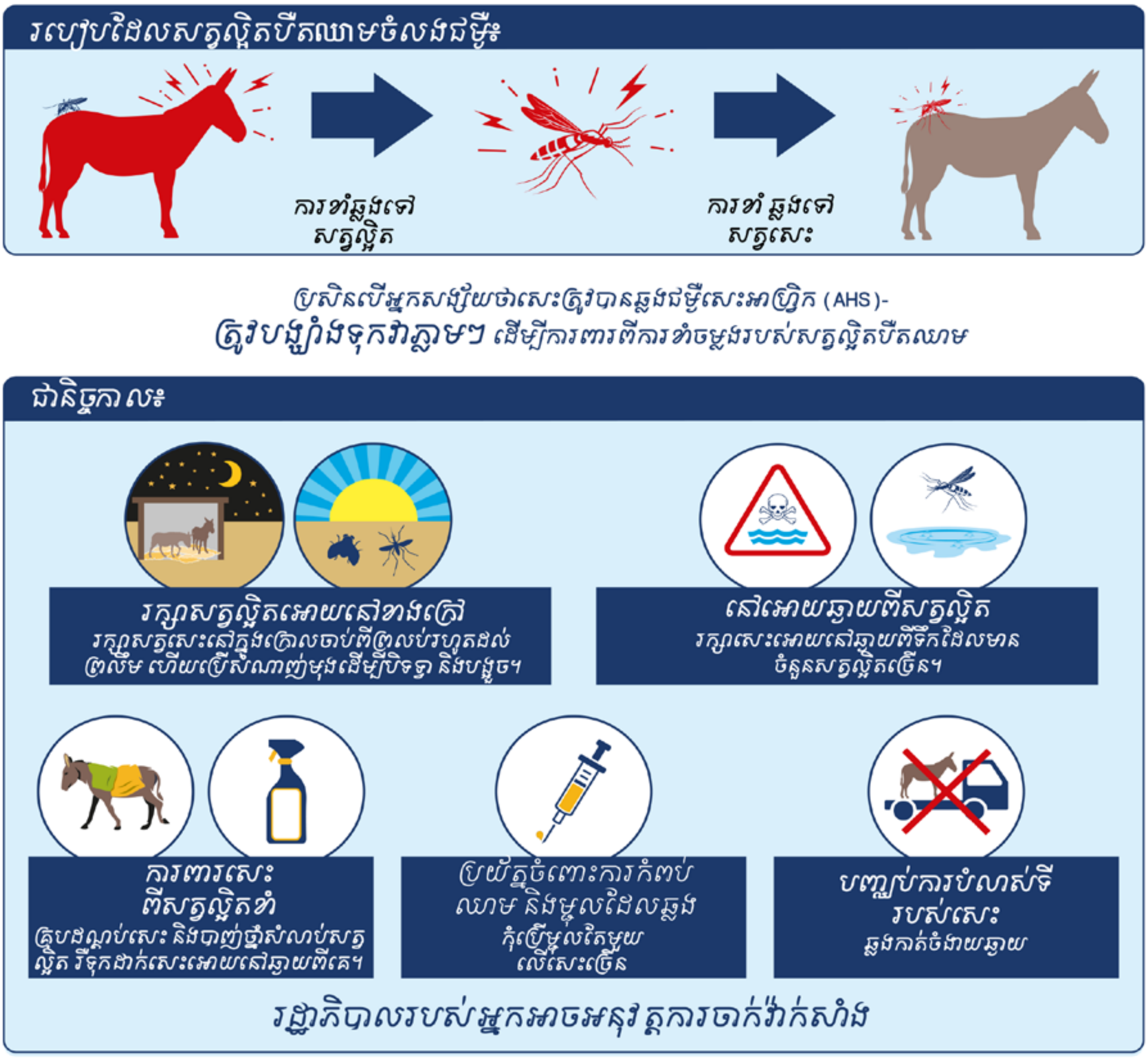
Countries at risk of possible outbreaks of AHS should prepare contingency plans and standard operating procedures (SOPs). These should be short, flexible and easy to understand, since they are critical to enabling a swift response once an outbreak has been detected. Any delay in an effective response and control measures will have a significant impact on the speed and ultimate cost of outbreak control.

All stakeholders in the preparation of a possible incursion of AHS should be identified and



OIE

Infographic on OIE-WAHIS



INTERNATIONAL COALITION FOR WORKING EQUIDS

Part of an ICWE poster in Cambodia

either be directly involved in the preparation of the Contingency Plan or be consulted before finalisation of the plan, to foster collaboration and PPPs between stakeholders.

The Contingency Plan should touch on all chapters listed in these *Guidelines*, and also include other items, most importantly funding/financing of emergency action and outbreak control. A good overview on the structure of a Contingency Plan is available in the *GEMP Manual* (5).

TAMLIN WATSON, DONKEY SANCTUARY

Working donkeys in the mountains of Nepal

In the event of an outbreak of AHS, all elements that have been put in place during the preparatory phase, will kick into action, guided by the Contingency Plan and supported by available funding for implementation. Whether special funds are allocated to a specific Contingency Plan for AHS, or if funds are allocated from a general emergency funding budget needs to have been discussed during the development of the AHS Contingency Plan. As disease control actions will be limited by available government funds, it is advisable to have good PPPs established during ‘peace time’ that can be called upon during an outbreak.

Vaccination during the outbreak in Thailand

JORGE SILVA/REUTERS

3 Preparing and implementing emergency vaccination

Emergency vaccination is a key control measure in case of introduction of AHS in a previously free environment. Implementing it would require Veterinary Services to have identified the areas in which the equids should be vaccinated. To do so, and to limit the vaccination area, it is critical to respond quickly to any AHS suspicion and confirmation and to put in place other control measures in parallel.

Figure 4. The essential steps outlined in these *Guidelines*

- 3.1 Stop the spread of the disease
- 3.2 Control of the disease: vaccination
- 3.2.1 Where, when and how to vaccinate?
- 3.2.2 Vaccination plan
- 3.2.3 Measures to be taken after vaccination
- 3.3 Post-vaccination monitoring

3.1 Stop the spread of the disease

Rapid response to an outbreak is the aim of any emergency operation as time lost between the first clinical signs of the disease occurring and taking action to stop the spread of the disease has a direct correlation to the cost and success of the operation.

Therefore, the following steps should be taken as rapidly as possible in the field:

Preliminary diagnosis

If a suspected case is reported, use a rapid diagnostic test such as ELISA or RT-PCR to confirm AHS (but also take all other necessary samples to the laboratory for additional testing). If positive:

Quarantine order

- The holding with the index case needs to be put under quarantine; animals are not to leave the holding; vector control and, if feasible, confinement of animals under mosquito mesh with appropriate gauge (e.g. 32 gauge as was used in Thailand), regularly sprayed with insecticides; animals to be sprayed with insect repellents.

Develop an epidemiological timeline

- Establish the date of earliest occurrence of clinical signs in suspect or confirmed cases on the quarantined property. Use the maximum incubation periods (28 days) prior to the appearance of the first clinical signs to identify the start of the risk period for movements onto the property for tracing the possible source, and movements off the property for tracing possible spread.

Tracing of in-contact equids

- Identify movements of animals onto and off the quarantined holding(s) since the start of the risk period, the source or destination properties for these movements, identify the in-contact equids on such properties and carry out an examination.

Movement restrictions

- Establish a reasonably sized 'infected/outbreak zone' which animals on other holdings with equids are not allowed to leave without specific authority and following a risk management approach (e.g. isolation and testing). Remember to activate sufficient personnel (drawing also from security forces if necessary) to be posted at checkpoints to control the effectiveness of movement restrictions; impose fines for non-compliance with movement restrictions in accordance with the law (see 2.4).

Determine the extent of the outbreak

- Carry out clinical and serological surveillance in a reasonably sized protection zone around the outbreak zone (include information on movement of infected horses during the incubation period into considerations of size of the protection zone).

Emergency communication

- Inform the public and all stakeholders about the outbreak and control measures put in place, such as movement controls, using all available communication channels and the established PPP communication flows.

Once these initial emergency measures have been put in place, other, equally important activities have to be considered:

Additional activities and considerations

- **Clinical cases:** diseased horses showing the clinical signs described under 1.1 must be examined by veterinarians and in severe cases euthanasia should be considered. Not only does euthanasia remove a potential source of virus to prevent further spread, but the welfare and suffering of the animal needs to be considered also. Other, less severely diseased horses can receive supporting non-specific treatment, provided vector control is assured.
- **Carcasses** of deceased or euthanised horses must be burnt or buried at a safe distance away from pastures, paddocks and the holding.
- **Vector protection:** to break the cycle of infection, vectors should be kept away from infected animals as much as possible. The classical methods are a combination of:
  - stabling of horses from two hours before sunset until two hours after sunrise
  - using insect repellents on horses (such as DEET)
  - using insecticides on the netting and/or stables where horses are kept (such as Cypermethrin) according to manufacturer's recommendation
  - clearing of potential midge habitats such as open drainages, water pools, etc.
  - keeping animals of other species as decoys around horse stables.

Installation of mosquito mesh/netting is a suitable but expensive method of protecting horses from biting midges. The feasibility of covering entire stables in mosquito netting needs to be evaluated before this method is made mandatory. If this method is chosen and animals are kept either permanently or from dusk to dawn under full netting, the temperature must also be regulated using mobile ventilation devices.

- **Identification of all equids:** if this has not been done during the preparation phase, it is of the utmost importance to carry out a rapid census survey and to deploy a simple but effective identification system. It is best to do this in close cooperation with all stakeholders, especially equestrian and racing federations and NGOs that work with horses or donkeys.


THAI EQUESTRIAN FEDERATION


THAI EQUESTRIAN FEDERATION

(*Left and right above*) **Full protection of Thai Polo Club and ventilation**

Introduction
Preparedness
Emergency vaccination
M&E
Conclusion

Introduction Preparedness Emergency vaccination M&E Conclusion

While these emergency measures are being undertaken in the field, rapid reaction in the laboratory is also required for the following:

Diagnosis

- Using rapid tests like ELISA and RT-PCR, confirm the diagnosis.

Identify the virus

- Using type-specific Real-Time PCRs, the serotype of the AHSV should be confirmed.

Sequence the virus genome

- Full genome sequencing should be carried out by the Central Veterinary Laboratory or an OIE Reference Laboratory on selected samples throughout the outbreak and recovery phase. It is very important to reference this data in case there are further disease outbreaks.

Report

- Report the results of testing to OIE.

Official control measures by the Competent Authority must be set up and communicated clearly to the owners of equids in the affected areas. While the **concept of zoning** as explained in the OIE *Terrestrial Code* in Chapter 4.4. is the general guidance, European legislation[i] (3) recommends the following distances for the zoning concept:

Infected or Core zone This is a zone of 20 km, part of the protection zone, surrounding the initial and any subsequent holding in which an outbreak occurs.

Measures: no movement of animals, vector protection, official surveillance with regular visits by the official veterinarian to holdings with equids; **vaccination of non-diseased animals**.

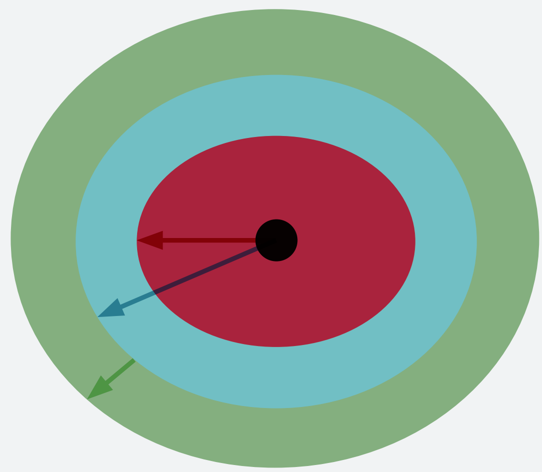
Protection zone This zone is surrounding the holding for at least 100 km and is considered part of the infected zone.

Measures: movement only for the purpose of slaughter or with special authorisation by the CA; official surveillance with regular visits by the official veterinarian to holdings with equids; vector control; **vaccination**.

Surveillance zone This zone of at least 50 km is surrounding the protection zone.

Measures: regular clinical and serological surveillance of unvaccinated animals; if evidence for virus circulation is found, take samples for whole genome sequencing; **vaccination prohibited**.

Figure 5. **The concept of zoning**



Key

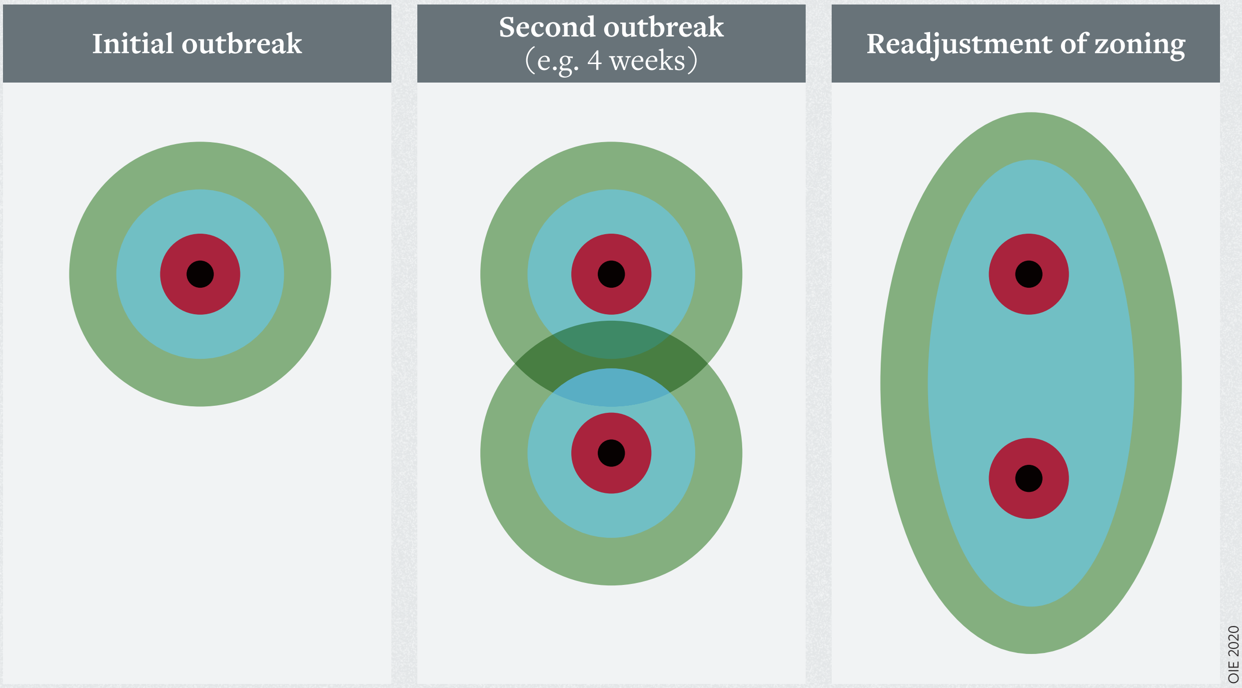
Infected zone (VACCINATE non-infected equids)

Protection zone (VACCINATE all equids)

Surveillance zone (VACCINATION PROHIBITED)

[i] Reference to EU legislation is provided since European countries are in a comparable epidemiological situation to countries in Asia, having been free from AHS for more than two decades. This is one of the few known examples of regulation proposing specific zoning requirements in response to the incursion of AHS.

Figure 6. **Zoning during stages of an outbreak**



While the distances mentioned here are guidelines under European Union legislation (3), they can be adjusted, i.e. reduced (as in Thailand, which set the protection zone at 50 km) or increased, taking the following features and risk factors into consideration:

Geography and ecology

- Any areas such as high mountains or deserts with climates that are non-conducive environments for vectors or non-conducive habitats for equids, are not priorities for inclusion in the protection zone.

Vector density and distribution

- Areas with high vector density need to be included while those where there are no vectors can be excluded. To determine those areas, prevailing winds, seasons of the year (here specifically monsoon rains and where they are heaviest) need to be considered to estimate vector dispersion. Collaboration with the meteorological services is recommended. Vector surveillance conducted during 'peace time' provides helpful information and considerations for designating protection zones

Movement routes

- Areas that are easy to reach for equids, legally or illegally, should be included, while those which are impossible for equids to access can be excluded.

Administrative boundaries

- If protection zones extend into different administrative areas in your country or into a neighbouring country, local and foreign authorities need to be involved in setting up the extent of the zone.

Multiple outbreaks

- Should there be a rapid spread of the disease with multiple holdings located considerable distances apart, readjust and merge the zones to as few as possible, with one consolidated protection and surveillance zone. In case of overlapping zones, the stricter rules prevail.

JORGE SILVA/REUTERS

Vaccination during the outbreak in Thailand

3.2 Control of the disease: vaccination

For vaccination strategies and programmes, reference is made to the *OIE Terrestrial Code* Chapter 4.18. on vaccination (7). It is important to only procure high-quality vaccines, compliant with the *OIE Manual* Chapter 3.5.1. (11).

Unlike in endemic countries where vaccination is used as a preventive measure, in non-endemic countries vaccination is the **control measure of choice** (associated with all other measures described in 3.1), given that the ubiquitous presence of bloodsucking midges in tropical countries will make an effective, long-lasting interruption of the vector–equid contact virtually impossible.

For the procurement of the vaccines, reference is made to the *OIE Manual* (11) which currently only lists the live attenuated vaccine. This vaccine comes as a polyvalent vaccine in two bottles, with one bottle containing serotypes one, three and four, and the second bottle containing serotypes two, six, seven and eight. Serotypes five and nine are not included, but it is believed that cross-protection is achieved when using the polyvalent vaccine, using both bottles.

While a live attenuated vaccine has been used successfully in sub-Saharan Africa for decades and has reduced the threat of this deadly disease, in 2014, researchers in South Africa have discovered that the vaccine can also introduce disease in the form of either genome sequence reassortment with the outbreak strain or return to virulence of the original vaccine strain (24).

Considering this potential risk of introducing AHSV serotypes foreign to a non-endemic country when using a live attenuated vaccine polyvalent vaccine, it is highly recommended that, if an inactivated vaccine is not available, a monovalent vaccine corresponding only to the serotype involved in the outbreak should be imported.

3.2.1 Where, when and how to vaccinate?

At the start of the procurement process the number of doses for at least a single round but preferably for two rounds of vaccination for all equids should be ordered.

Several considerations need to be taken into account:

Considerations to be taken into account

- If the country has been free of the disease, all equids are fully susceptible and should be included in the vaccination plan.
- If the outbreak was caused by a single virus serotype, the corresponding monovalent vaccine should be ordered.
- A **revaccination** with monovalent vaccine at the earliest eight weeks and at the latest less then one year after the first outbreak is strongly recommended; although serotype one monovalent vaccine particularly creates a very good immune response and would in principle not require a booster vaccination, a revaccination has the advantage of enhancing seroconversion in the overall population by covering again those that did not sero convert in the first round of vaccination. This might particularly be the case in working equids which often suffer from other immune-compromising diseases such as severe endo- and ecto-parasites, sores with chronic infections and malnutrition.

Should a monovalent vaccine not be available for the emergency vaccination (it might need to be produced on demand; there might be issues with registration either on the exporting or importing country's side), a commercially available polyvalent vaccine containing the outbreak serotype and as few other serotypes as possible should be ordered in sufficient quantities for at least one round but preferably two rounds of vaccination.

Where necessary, the vaccine should be imported through an emergency registration mechanism.

Whether countrywide or limited to protection zone(s), all equids, including captive wild equids (e.g. zebras in a zoo) in the country, **should be vaccinated as soon as possible after a case has been observed outside the quarantine holding with the index case**. The same vaccination protocol is applied for all equids, regardless of the species, size or age. Commercially available vaccines are freeze dried, so they need to be reconstituted with the sterile diluent provided shortly before use and should be used immediately, usually as a subcutaneous injection.

Pregnant mares should not be vaccinated during the first three months of pregnancy, foals from vaccinated mares have maternal antibodies and can be vaccinated as of four months of age. Foals from unvaccinated mares can be vaccinated at any age. Hence an appropriate number of vaccine doses need to be kept in reserve to vaccinate foals born after the emergency vaccination campaign. It is recommended that vaccination should start in the outbreak zone and work outwards towards the perimeters of the defined infected zone (infected plus protection zones).

During vaccination, animals need to be **permanently marked** to show that they have received the vaccine. Hot or freeze branding used to be the method of choice, but modern methods like microchipping and issuing simple passports or registration cards might also be considered. Good record keeping of equid identity, location and time of vaccination in a data recording system by Veterinary Services is essential.

Consideration has to be given to the fact that emergency vaccination during an epizootic outbreak might also see some horses die despite the vaccination as they could have been in their incubation period already. These 'vaccination deaths' as they were termed in the eradication process in Portugal, should be avoided as much as possible by giving the animals a thorough health check before vaccination (22).

JORGE SILVA/REUTERS

Vaccination during the outbreak in Thailand

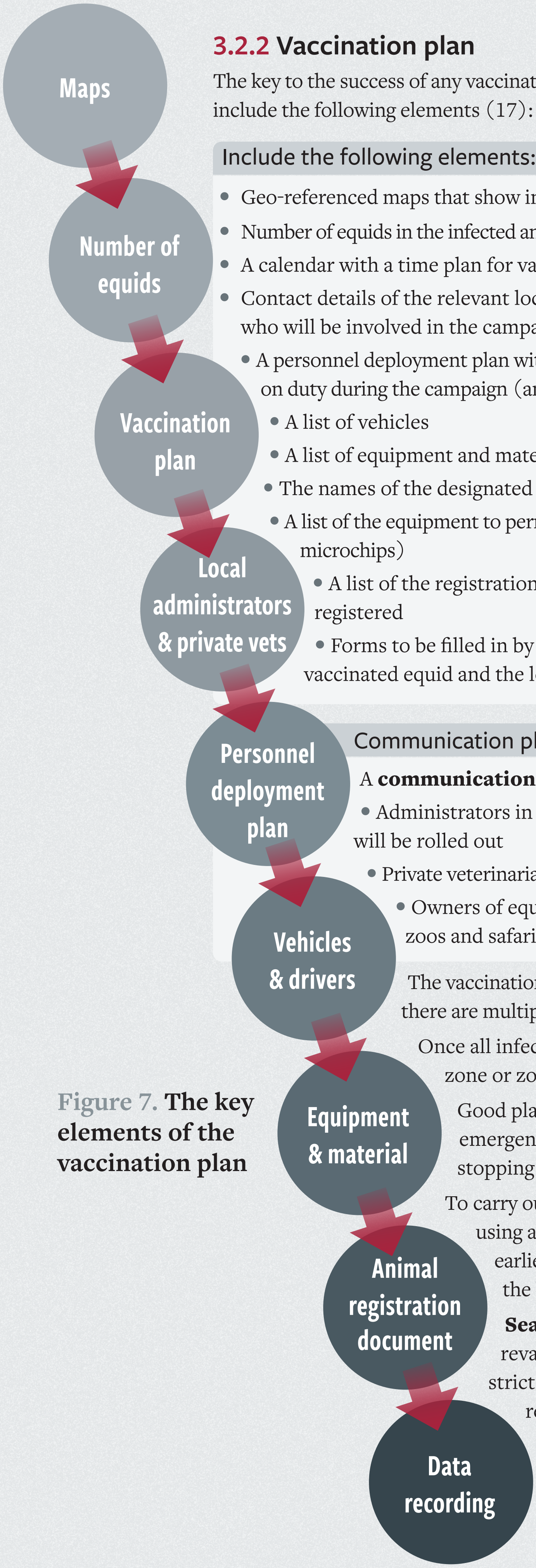


Figure 7. **The key elements of the vaccination plan**

3.2.2 Vaccination plan

The key to the success of any vaccination campaign is good planning and this should include the following elements (17):

Include the following elements:

- Geo-referenced maps that show infected holdings and the three established zones
- Number of equids in the infected and protected zones designated for vaccination (see 3.1)
- A calendar with a time plan for vaccination in the different areas
- Contact details of the relevant local administrations and the private veterinarians who will be involved in the campaign
- A personnel deployment plan with allocation of dates and times for each person to be on duty during the campaign (animal handlers should also be included in the teams)
- A list of vehicles
- A list of equipment and material (including vaccines) to be taken in each vehicle
- The names of the designated drivers for each vehicle and their duty roster
- A list of the equipment to permanently mark vaccinated animals (brands or microchips)
- A list of the registration documents for individual animals that are not yet registered
- Forms to be filled in by vaccinators for recording of details of each vaccinated equid and the location of the holding

Communication plan

A **communication plan** needs to be established to reach out to:

- Administrators in different districts/provinces where the campaign will be rolled out
- Private veterinarians or paraveterinarians involved in the campaign
- Owners of equids (farmers, equestrian federations, operators of zoos and safari parks)

The vaccination campaign should start in the infected zone or, if there are multiple infected zones, in all those areas simultaneously.

Once all infected zones have been vaccinated, the protection zone or zones should be vaccinated next.

Good planning, blanket vaccination[ii] and overall speed of the emergency vaccination campaign will determine success in stopping the further spread of the disease.

To carry out a second vaccination (booster) a similar approach using a similar vaccination plan, starting between at the earliest eight weeks after the emergency vaccination and at the latest one year after the outbreak, should be applied.

Seasons of low vector activity should be selected for revaccinations (e.g. during dry and colder seasons), and strict vector control should again be implemented after revaccination.

[ii] As defined in the OIE *Terrestrial Code* Chapter 4.18.: 'vaccination of all susceptible animals in an area or an entire country or zone, and therefore here vaccination of 100% of the equids located in the designated vaccination zones'.

3.2.3 Measures to be taken after vaccination

Once emergency vaccination has been carried out, vaccinated equids should not leave their holdings for 40 days, the infective period. If emergency vaccination takes place during a vector active period, vector screening of stables or premises should be considered so that animals are under protection from at least two hours before sunset to two hours after sunrise. This period should be extended if vector activity can be demonstrated for longer periods during the day.

Serological monitoring of the efficiency of a vaccination campaign is not possible, as there is no DIVA test available to differentiate between infected animals and those that have been vaccinated with a live-attenuated vaccine. Therefore, the best approach is a very detailed and thorough recording of the vaccination campaign, particularly the number of animals vaccinated versus the number of registered equids. Some selected horses (e.g. young horses, pregnant horses and sentinel horses) should, however, be sampled and tested to check if the virus is still circulating within the vaccinated population.

The specific movement restrictions for the designated infected (= no movement) and protection zones (= restricted movement) shall remain in place for up to 12 months (3). Vaccinated equids can move **within** the protection zone either four weeks after the vaccination or, if movement is intended earlier, after a blood sample has tested negative with RT-PCR at the earliest 10 days after vaccination. It should, however, be noted, that in some cases, virus genome (from modified live vaccine as well as infective virus) can be detected for up to 90 days and that animal movement should only be allowed once the RT-PCR is negative.

Movements of horses within the protection zone and the surveillance zone need to be recorded and monitored and contraventions should be reprimanded.

3.3 Post-vaccination monitoring

After vaccination, the following combination of measures should be put in place to assess the success of the vaccination campaign and to rule out circulation of virus:

- high level of passive surveillance of vaccinated animals with good records, including negative reports
- setting up sentinel herds (e.g. young unvaccinated animals) in the vaccinated areas for regular testing
- investigation of any suspicious case in vaccinated and unvaccinated animals.

CPWO

Covering the stable of working horses in Cambodia

Introduction
Preparedness
Emergency vaccination
M&E
Conclusion

4 Monitoring and evaluation of the response to an epidemic

It is advisable to set up a monitoring and evaluation system (M&E) from the beginning of the disease outbreak. This M&E system will help to monitor the following aspects:

Financial monitoring

- Release of emergency funds – speed of this release and amount available
- Flow of disbursement of funds – with attention to funds running low and need for replenishment

Personnel deployment monitoring

- Time allocation and time consumption – with attention to sufficient experienced personnel of all necessary categories being available to be allocated at different times so that there are no shortages; consideration of all personnel involved

Equipment and material monitoring

- Available vaccine doses and utilisation over time – daily counting of used, spoiled, lost doses and stocktaking
- Available sampling material such as tubes, needles, syringes, transportation boxes, wrapping material, cooler boxes, marker pens, etc. – daily inventory with attention to early replenishment
- Available laboratory tests and consumables – daily inventory update with attention to early replenishing
- Permanent marker equipment

Surveillance monitoring

- Sampling frame in the different zones – monitoring of implementation
- Reports on positive and negative surveillance samples
- Reports from increased passive surveillance
- Continuous monitoring of possible risks associated with the use of modified live vaccine by collecting a limited number of samples for whole genome sequencing in the vaccinated zones and comparison with the virus and the vaccine genome
- Vector surveillance – monitor results to determine seasonality, density and dispersion; monitor infectivity of vectors (1, 2).

Data collection and analysis monitoring

- Analysis of vaccination data – calculation of coverage ratio
- Analysis of surveillance data – calculation of negative/positive ratio from post-vaccination antibodies and protective titres; calculation of time between reporting and disease occurrence, etc.
- Regular reporting – monitor that regular reports are submitted by the laboratory and the surveillance and vaccination teams

5 Conclusion

CPWO

Preventive measures in border region of Cambodia with Thailand.

The risk of AHS further spreading in the region cannot be ignored, and as outlined in the first and second parts of these *Guidelines*, Veterinary Services should be prepared and develop Contingency Plans, which include plans for vaccination as outlined in 3.2.2. Most importantly they need to keep in contact with the infected neighbouring country(ies) and assess the risk of possible incursion on the basis of information available on trade routes, movement of people and livestock (including equids), proximity of infected areas to national borders and vector density, seasonality and dispersion.

It is advisable that all neighbouring countries to infected country(ies) follow the OIE *Terrestrial Code* Chapter 12.1 (12) and carry out active surveillance of susceptible equids like horses in an area at least 100 km from the border. Using sentinel herds or individual young animals is advisable. Vector protection of horses in areas that are geographically close to infected zones can be considered, as was done in Cambodia in three provinces bordering Thailand (8).

Countries are advised to build confidence with their stakeholders and trading partners by openly and regularly publishing surveillance reports (including negative reports) and reports on any investigations of suspicious cases.

Should the virus be introduced into a country in the region, parts two and three of these *Guidelines* apply. Emergency vaccination campaigns against AHS need to go hand-in-hand with all other measures described here in order to stop the spread of the disease.

Ultimately, any country that experiences an outbreak of AHS should aim for full eradication of the virus and, following the guidance given in the OIE *Terrestrial Code*, prepare a dossier for submission to the OIE for official recognition of AHS freedom or recovery of free status (19).

References

1. AHS – Relevant materials from Members and partners (July 2020): https://rr-asia.oie.int/en/projects/african-horse-sickness/african-horse-sickness-awareness-materials-in-members/

2. Bellis G., Thepparat A., Wardhana A., Le L., Duan Y. & Jiahui L. (2020). – Potential Vectors of AHS in Asia. OIE Webinar on 20 April 2020. https://rr-asia.oie.int/wp-content/uploads/2020/04/ahs-webinar-3_asian-vectors-of-ahsv_glenn-bellis-et-al.pdf

3. Council Directive 92/35/EEC: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0035&from=EN

4. Dennis S., Meyers A.E., Hitzeroth I. & Rybicki E.P. (2019). – African horse sickness: a review of current understanding and vaccine development. *Viruses*, **11**, 844. DOI: 10.3390/v11090844

5. FAO (2011). – Good Emergency Management Practice: the essential. A guide to preparing for animal health emergencies. www.fao.org/3/a-ba0137e.pdf

6. Hoffmann B., Bauer B., Bauer C., Bätza H-J. *et al.* (2009). – Monitoring of putative vectors of bluetongue virus serotype 8, Germany. *Emerg. Infect. Dis.*, **15** (9), 1481–1484. DOI: 10.3201/eid1509.090562.

7. Leta S., Fetene E., Mulatu T., Amenu K. *et al.* (2019). – Modelling the global distribution of Culicoides imicola: an ensemble approach. Sci. Reps, 9, 14187. DOI: 10.1038/s41598-019-50765-1.

8. OIE Cambodia Partnership (2020). – Partnerships to prevent the spread of African horse sickness in the Asia-Pacific region. *OIE News*, **June**. https://oiebulletin.com/wp-content/uploads/2020/06/OIE-News-June-2020-Partnerships-to-prevent-the-spread-of-African-Horse-Sickness-in-the-Asia-Pacific-region-ICWE.pdf

9. OIE Communication Handbook: Veterinary Services: www.oie.int/fileadmin/home/eng/Media_Center/docs/pdf/EN_Guide_de_Communication_FINAL.pdf

10. OIE technical disease cards on AHS and other diseases important for differential diagnosis: www.oie.int/en/animal-health-in-the-world/technical-disease-cards

11. OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 3.5.1. www.oie.int/fileadmin/Home/eng/Health_standards/tahm/3.05.01_AHS.pdf

12. OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, AHS Reference Laboratories. www.oie.int/en/scientific-expertise/reference-laboratories/list-of-laboratories/

13. The OIE PPP Handbook: Guidelines for Public–Private Partnerships in the Veterinary Domain (2019). www.oie.int/publicprivatepartnerships/ppp/en/Handbook_en.html#p=2

14. OIE PVS Pathway www.oie.int/en/solidarity/pvs-pathway/

15. OIE Terrestrial Animal Health Code, Chapter 1.4. www.oie.int/index.php?id=169&L=0&htmfile=chapitre_surveillance_general.htm

16. OIE Terrestrial Animal Health Code, Chapter 1.5. www.oie.int/index.php?id=169&L=0&htmfile=chapitre_surveillance_vector.htm

17. OIE Terrestrial Animal Health Code, Chapter 4.18. www.oie.int/index.php?id=169&L=0&htmfile=chapitre_vaccination.htm

18. OIE Terrestrial Animal Health Code, Chapter 12.1. www.oie.int/index.php?id=169&L=0&htmfile=chapitre_ahs.htm

19. OIE webpage on the official recognition of AHS free status: www.oie.int/en/animal-health-in-the-world/official-disease-status/african-horse-sickness/

20. OIE Terrestrial Animal Health Code, Glossary. Definition of Veterinary Services. www.oie.int/index.php?id=169&L=0&htmfile=glossaire.htm

21. OIE webinars on African horse sickness, April to May 2020. https://rr-asia.oie.int/en/events/oie-webinar-on-the-african-horse-sickness/

22. Portas M., Boinas F.S., Olivera J., Sousa E. & Rawlings P. (1999). – African horse sickness in Portugal: a successful eradication programme. *Epidemiol. Infect.*, **123** (2), 337–346. DOI: 10.1017/s0950268899002897.

23. Vanbinst T., Vandenbussche F., Vandemeulebroucke E., De Leeuw I. *et al.* (2009). – Bluetongue virus detection by real-time RT-PCR in *Culicoides* captured during the 2006 epizootic in Belgium and development of an internal control. *Trans. Emerg. Dis.* **56**, 170–177. DOI: 10.1111/j.1865-1682.2009.01077.x.

24. Weyer C., Grewar J.D., Burger P., Rossouw E., Lourens C., Joone C. *et al.* (2016). – African horse sickness caused by genome reassortment and reversion to virulence of live, attenuated vaccine viruses, South Africa, 2004–2014. *Emerg. Infect. Dis.*, **22** (12), 2087–2096. DOI: 10.3201/eid2212.160718.

The OIE is an intergovernmental organisation created in 1924. Its 182 Members have given it a mandate to improve the health and welfare of animals worldwide. It is supported in its activities by 301 centres of scientific expertise and 12 regional offices spread across every continent.

World Organisation for Animal Health (OIE)
12, rue de Prony, 75017 Paris (France)
Tel: +(33) 1 44 15 18 88
Email: oie@oie.int

OIE Regional Representation for Asia and the Pacific
Food Science Building 5F – The University of Tokyo
1-1-1 Yayoi, Bunkyo-ku
Tokyo, 113-8657 (Japan)
Tel: +(81) 3 5805 1931 / Fax: +(81) 3 5805 1934
Email: rr.asiapacific@oie.int

OIE Sub-Regional Representation for South-East Asia
c/o Department of Livestock Development
69/1 Phaya Thai Road
Ratchathewi 10400, Bangkok (Thailand)
Tel: +(66) 2 653 48 64 / Fax: +(66) 2 653 49 04
Email: srr.seasia@oie.int

Follow the OIE on:

www.oie.int

https://rr-asia.oie.int/en/

https://rr-asia.oie.int/en/projects/african-horse-sickness/

www.oie.int/twitter

www.oie.int/youtube

www.oie.int/facebook

flickr www.oie.int/flickr

Linkedin linkedin.com/company/world-organisation-for-animal-health

WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future