



Lumpy Skin Disease

Critical facts

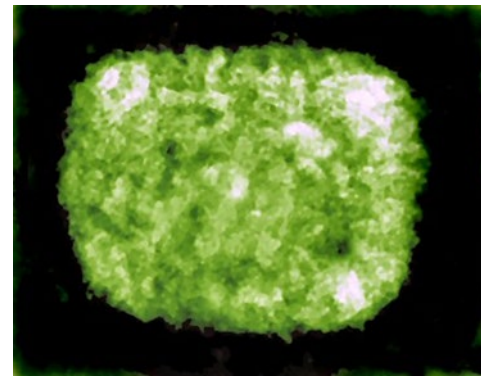
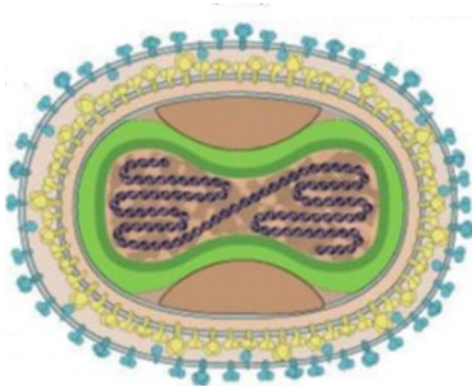
- **Lumpy skin disease (LSD)** is a disease of cattle and Asian water buffalo that is included on the **OIE (World Organisation for Animal Health)** list of notifiable diseases.
- **Lumpy Skin Disease (LSD)** is an emerging disease that causes substantial economic loss. Animals of any age and gender are susceptible to the disease.
- **LSD** had spread to **Cambodia** from **Thailand**. The disease was first detected in early **June 2021** in **Preah Vihear** and **Oddar Meanchey** provinces, then spread to other provinces. As of **August 29**, there were nearly **39,000** infected cows in **158** districts in the capital and provinces.



ETIOLOGY

Classification of the causative agent

- Lumpy skin disease (LSD) is caused by a virus, the lumpy skin disease virus (LSDV) also known as Neethling virus
- LSDV is enveloped, brick shaped (exceptionally large) DNA virus under the family Poxviridae and genus Capripoxvirus



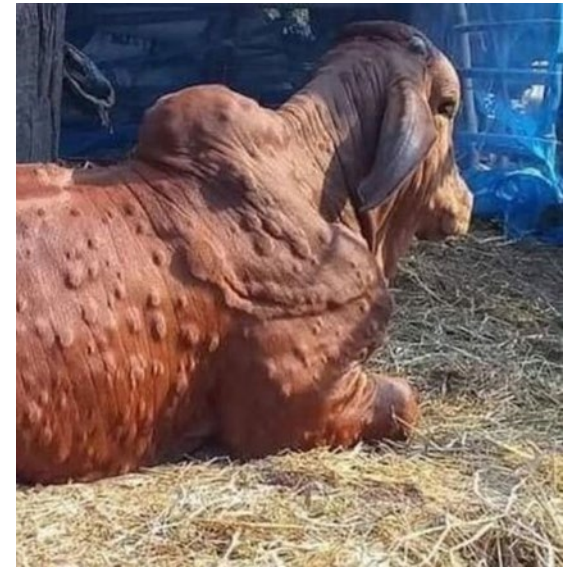
- For many years, it appeared to be stable, but now, surveillance of LSDV is critical because recently variants emerge due to recombination between the Neethling vaccine strain and field isolates and the recombinant LSDVs could induce more severe disease than the typical field isolates.





Poxviruses (members of the Poxviridae family)
can infect both humans and animals.

- *Varicella, avian pox, LSD...*



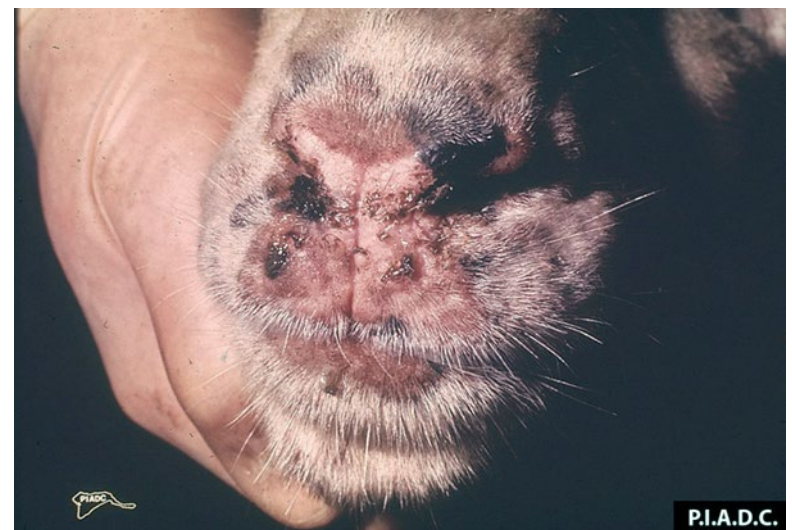


Genus *Capripoxvirus*, contains three species:

- LSDV
- Goatpox virus (GTPV)
- Sheep pox virus (SPPV)

Strains of SPPV and GTPV can pass between sheep and goats.

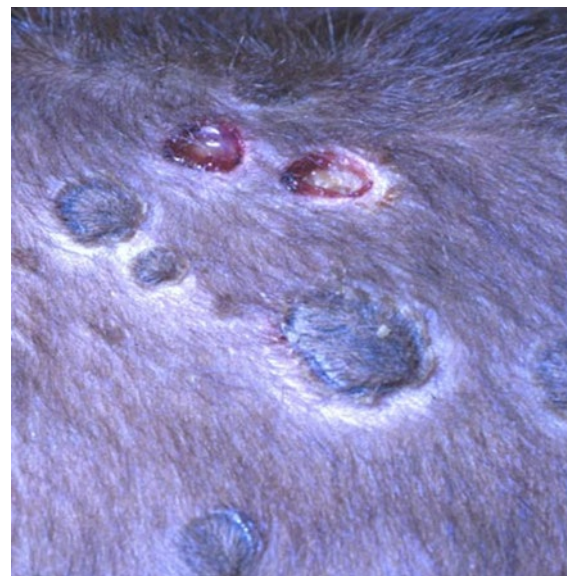
LSDV is closely related to GTPV and SPPV (~ 96% similarities) and causes disease in cattle only





Survival

- LSDV is remarkably stable, surviving for long periods at ambient temperature, especially in dried scabs
- LSDV is very resistant to inactivation, surviving in necrotic skin nodules for up to 33 days or longer, desiccated crusts for up to 35 days, and at least 18 days in air-dried hides
- LSDV can remain viable for long periods in the environment
- LSD virus is susceptible to sunlight and detergents containing lipid solvents, but in dark environmental conditions, such as contaminated animal sheds, it can persist for many months





How to destroy the virus?

Disinfection can be used on the animals to prevent survival of the virus on the skin or to disinfect equipment in contact with cattle but cannot be used to kill the virus in premises, on the soil as they are active only on clean surfaces not if soiled by organic matter.

What kind of disinfectant?

- Sodium hypochlorite /bleach or eau de javel 2%–3%,
- Iodine compounds/betadine , but risk of photosensitization so NO
- Virkon® (2%)
- Quaternary ammonium compounds (0.5%) TH4+





EPIDEMIOLOGY

Susceptible Species

- Cattle
- Zebu
- Water buffalo
- Yaks
- Giraffes
- Impalas

LSD virus does not affect sheep and goats

LSDV is not zoonotic





Reservoir

Extensive serological surveys of wild ruminant species in Africa have not identified a wildlife reservoir of LSDV

However, Kenyan African buffalo are thought to potentially be maintenance hosts



High morbidity and relatively low mortality

- Morbidity rate looks at the incidence of a disease across a population during a period of time (1 year)
- Mortality rate is the ratio of death in a population

The mortality rate is usually less than 10%, the disease morbidity rate can be as high as 90% (FAO)

The high morbidity explains why LSD is one of the most economically significant viral diseases of cattle, mainly due to:

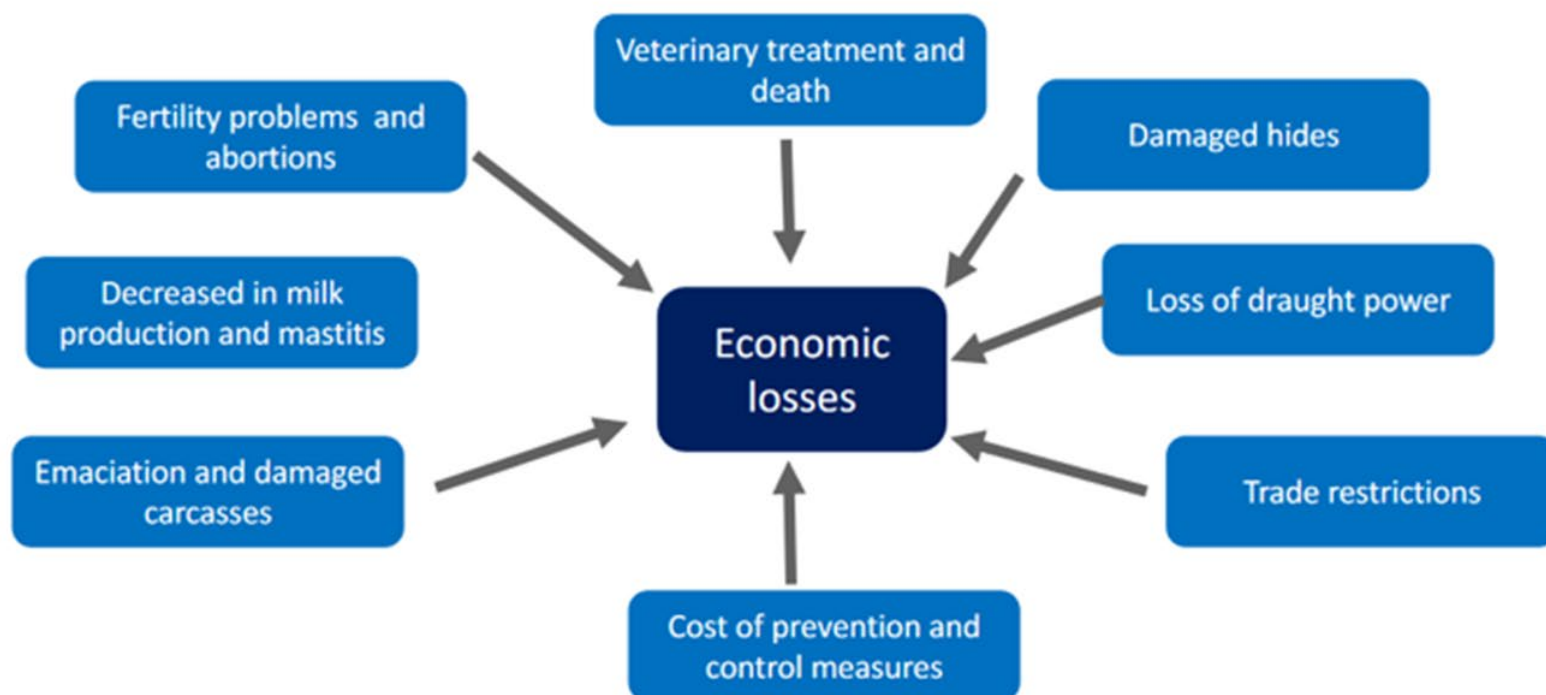
- Severe emaciation to death
- Difficult milking due to decrease of milk production (mastitis) and lesion on the teats
- Low fertility of female and male
- Lost of draft power caused by weakness and lameness





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Impact of LSD






Risk factors

The risk factors for the severity of LSD are identified in 3 basic categories:

- *Host associated factors*
Buffalo have a lower morbidity rate than cattle. Cattle of both sexes are susceptible to the virus. Young animals exhibited higher susceptibility and severity than the aged cattle.
- *Agent related factors*
LSDV is remarkably stable under varying environmental conditions. The virus was reported to be shed in nasal, lachrymal, and pharyngeal exudations of diseased animals, and likewise in saliva, blood, milk, and semen.
- *Environment and management factors*
Warm and humid climatic conditions that favor higher proliferation of mosquitoes, flies, and ticks are reported as important environmental risk factors. The disease is mostly seen during wet seasons.



How is the virus spread?

- It is not fully understood how Lumpy Skin Disease virus is transmitted between animals. It is believed that arthropod vectors (LSDV has been isolated in the mosquito genera *Aedes* and *Culex*, biting flies, ticks), can all spread the disease.
- Direct contact is considered to play a minor, if any, role in the transmission of the virus.
- It is not known if transmission can occur via fomites, feed and water contaminated with saliva.  Contaminated needles during vaccination
- Infected bulls can excrete the virus in the semen, however transmission of LSD via infected semen has not been demonstrated



Sources of virus

- **Skin nodules, scabs and crusts contain relatively high amounts of LSDV. Virus can be isolated from this material > 1 month**
- **LSDV can be isolated from blood, saliva, ocular and nasal discharge, and semen**
- **LSDV is found in the blood (viraemia) intermittently from approximately 7 to 21 days post-infection at lower levels than present in skin nodules**

LSD does not cause chronic disease

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DIAGNOSIS

Clinical signs

The clinical signs and pathology of LSD in naturally and artificially infected cattle are well documented

Initial signs

- Typically, cattle develop a febrile response one to two weeks after exposure to the virus
- Animals remain febrile for four to 14 days, with excessive salivation, lachrymation and nasal discharge that later becomes mucopurulent.
- In the majority of affected cattle the superficial lymph nodes are enlarged.



The nodules

- Skin nodules, the characteristic feature of the disease, usually appear two to five days after the initial febrile response.
- Nodules can be found all over the body, but particularly on the head, neck, udder, scrotum, perineum.
- The nodules, which are randomly distributed and range in diameter from 10 to 30 mm, involve both the skin and subcutaneous tissues and sometimes even the underlying musculature.
- The size of the nodules is usually fairly uniform but several nodules may fuse to form large, irregularly circumscribed nodules or plaques
- The nodules are well-circumscribed, firm, round and raised
- Skin lesions either resolve, become indurated in which case they persist as hard lumps for 12 months or longer.





Randomly distributed nodules



Variable-sized skin nodules



Fibrotic indurated skin lesions





Lesions

Lesions discovered during deep examination or autopsy explain non-specific symptoms:

- Nodular lesions may extend into underlying tissue such as tendons resulting in lameness
- Most affected animals have multifocal, necrotic areas in the buccal cavity giving salivation and difficulty to graze and in respiratory tract (nasal cavity, larynx, trachea and bronchi) causing pneumonia.
- In bulls, lesions may occur on the scrotum and in the parenchyma of the testes resulting in acute orchitis that may progress to fibrosis and atrophy and infertility.

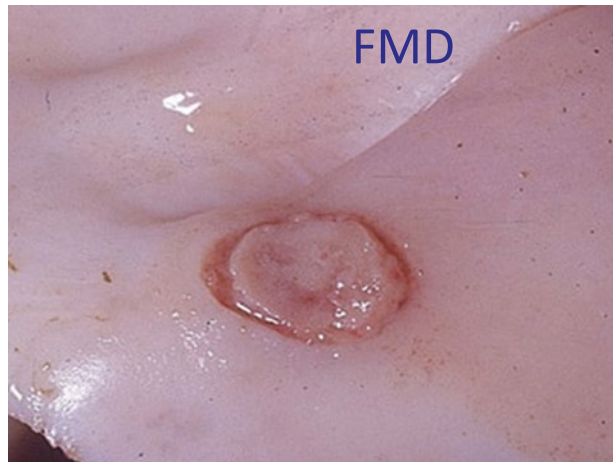




Differential diagnosis

Severe LSD is highly characteristic, but milder forms can be confused with the following:

- Insect or tick bites: insects and many ticks are observed and lesions disappear rapidly after taking action
- *Warts*
- *Ring worm*
- *Photosensitisation*
- FMD salivation at the initial stage and lesion on the hoof



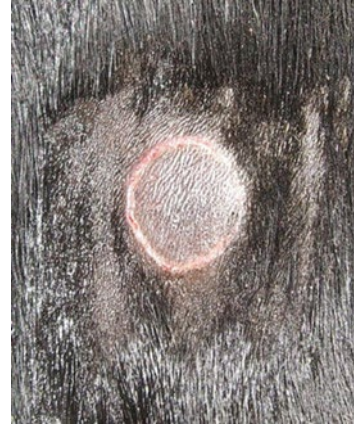


- Ring worm
- Warts
- Photosensitisation



Laboratory Diagnosis of LSD

A presumptive diagnosis of LSD can be made on the clinical signs but it is advisable to confirm the diagnosis by submitting samples to the laboratory.



PCR

- During the nodular skin lesion appearance stage, a confirmatory laboratory diagnosis can be performed;
- The confirmatory tests are mostly in the form of PCR or RT-PCR. Fluids like saliva, nasal swab, or whole blood can be collected from clinically infested animals but, samples obtained from the skin lesions yield more positive results in PCR due to the greater load of viral particles sheltered in the nodule. PCR is the most rapid, sensitive and specific technique and additionally the quickest method.



Virus Isolation

- Virus isolation (VI) followed by PCR to confirm the virus identity takes longer and is more expensive but has the advantage of demonstrating the presence of live virus in the sample
- Material for virus isolation and antigen detection should be collected by biopsy or at post-mortem examination from skin nodules
- Buffy coat from blood collected into heparin or EDTA during the viraemic stage of LSD, can also be used for virus isolation
- Samples for virus isolation should preferably be collected within the first week of the occurrence of clinical signs, before the development of neutralising antibodies, however virus can be isolated from skin nodules for 3-4 weeks
- In practice, the samples may be kept at 4°C for up to 2 days prior to processing



Genomic sequencing

- Live attenuated vaccines (LAVs) are widely used for LSD control in various countries.
- Putative recombination events between a vaccine strain and a field strain were identified in China, which modify the virulence and transmissibility of the virus.
- For the recombination analysis, LSDV genomic sequences are aligned and phylogenetic analysis of two genes suggested that the LSDV causing the LSD outbreaks in Xinjiang, in China in 2019 were vaccine-recombinants and likely from the same unknown exotic source.
- It has been found that vaccine-recombinant LSDVs increased the viral virulence as compared with a field LSDV



Serology

- Serological screening of animal populations is a cornerstone of any surveillance, control/eradication strategy, but, the serological tools have been addressed less. Only recently, one ELISA commercial kit is available.
- ELISA has been confirmed experimentally showing higher sensitivity and specificity in comparison to (IFAT), Indirect Immunofluorescence test or Virus Neutralization Test (VNT).
- A fairly new assay called Immuno-peroxidase Monolayer Assay (IPMA) has been identified for potential use in LSD diagnosis. It is a cheap and convenient test, adapted to low biosafety levels, and has higher sensitivity and specificity than VNT and commercial ELISA.





TREATMENT, PREVENTION AND CONTROL



LSD Treatment

There is NO TREATMENT for LSD as it is caused by a virus

Supportive care:

- Prevent secondary infections of the nodules and pneumonia: antibiotic injectable i.e. Oxytetracycline 10 mg/kg/day for five successive days
- Treat inflammation that cause pain with non-steroidal anti-inflammatories but Dexamethasone 0.2 mg/kg/day for three consecutive days is more effective
- Disinfect suppurating nodular lesions with TH4+ or other disinfectant AFTER cleaning with water and soap.





Vaccination

- Vaccination of cattle plays a fundamental role for the control and eradication of LSD. Vaccination is the only way to prevent the spread of the infection in endemic and newly affected regions.
- To date, no country has been able to eradicate LSD without vaccination.
- Selection of the best vaccine is a major challenge for veterinary authorities. The available vaccine products vary in terms of quality, efficacy, safety, side effects, and price.
- Only healthy animals should be vaccinated with a live vaccine.
- Vaccination of already infected animals leads to more severe disease and potential recombination of vaccine and field strain.

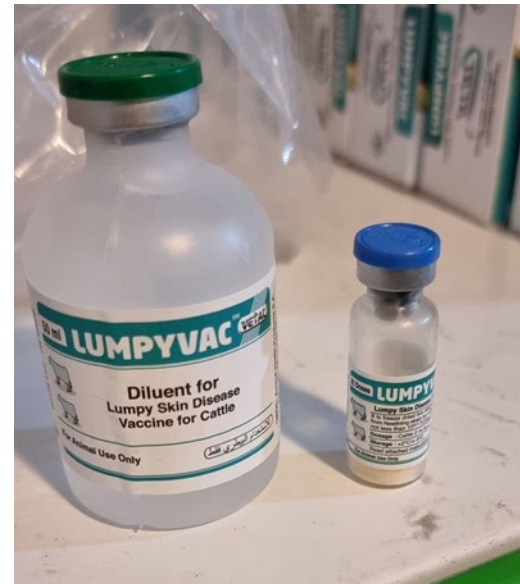


Vaccines

It can be used homologous LSD strains or heterologous Capripoxvirus strains for vaccination of cattle against LSD

- Heterologous vaccines contain either attenuated sheeppox virus (**SPPV**) or goatpox virus (GTPV).
- Homologous vaccines contain LSDV Neethling strain. Preferably, vaccination should be conducted with the homologous strain.

In Cambodia GDAH received LUMPIVAC vaccine, containing an attenuated LSDV-Neethling virus. It is produced by VETAL Animal Health based in Turkey.





Vaccination program

- Cattle already showing clinical signs should not be vaccinated with a live vaccine.
- Adults - annual vaccination
- Calves from vaccinated or naturally infected mothers -at the age of 3 to 4 months
- Calves from unvaccinated dams - can be vaccinated at any age
- Newly purchased animals –Vaccinate 28 days before introduction to the herd
- Pregnant, healthy cows/heifers - can be safely vaccinated.

Antibodies appear 10 days post-vaccination and reach a peak 30 days later



Side effects

A local response to the vaccine usually correlates with good antibody production

Vaccine side effects caused by homologous vaccines:

- Small local reaction at the vaccination site
- Short fever peak
- Generalized skin reaction, so-called “Neethling disease” -
Appearance of generalized small skin lesions within two weeks after vaccination. These lesions disappear within in a week or so.
- Side effects only when cattle are vaccinated with LSD vaccine for the first time. When revaccinated, animals are not likely to show adverse reactions





Vaccination campaign in Cambodia

- GDAH has received 20,000 doses of LSD vaccine to be followed by a second batch of 50,000 doses (300,000 doses? Khmer Times)
- The lumpy skin disease (LSD) vaccination working group has vaccinated about 3,000 cattle since the campaign started throughout the country in late August. Near 1 million cattle are prone to be contaminated in Cambodia.

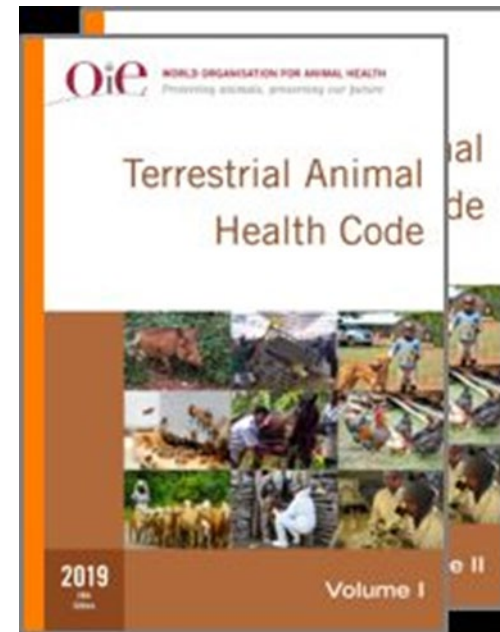
Recently, a mathematical model has been developed to estimate how many years the vaccinations need to be continued until LSD will be eliminated from the region. Based on these calculations, it was concluded that the elimination of the disease requires at least three to four annual vaccinations rounds with a 80% vaccination coverage





Notification to OIE

- LSD is on the list of OIE-notifiable diseases
- Member Countries are obligated to report cases and outbreaks to the OIE, according to the Terrestrial Animal Health Code



For more details, visit

https://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_Lsd.pdf

Control of LSD

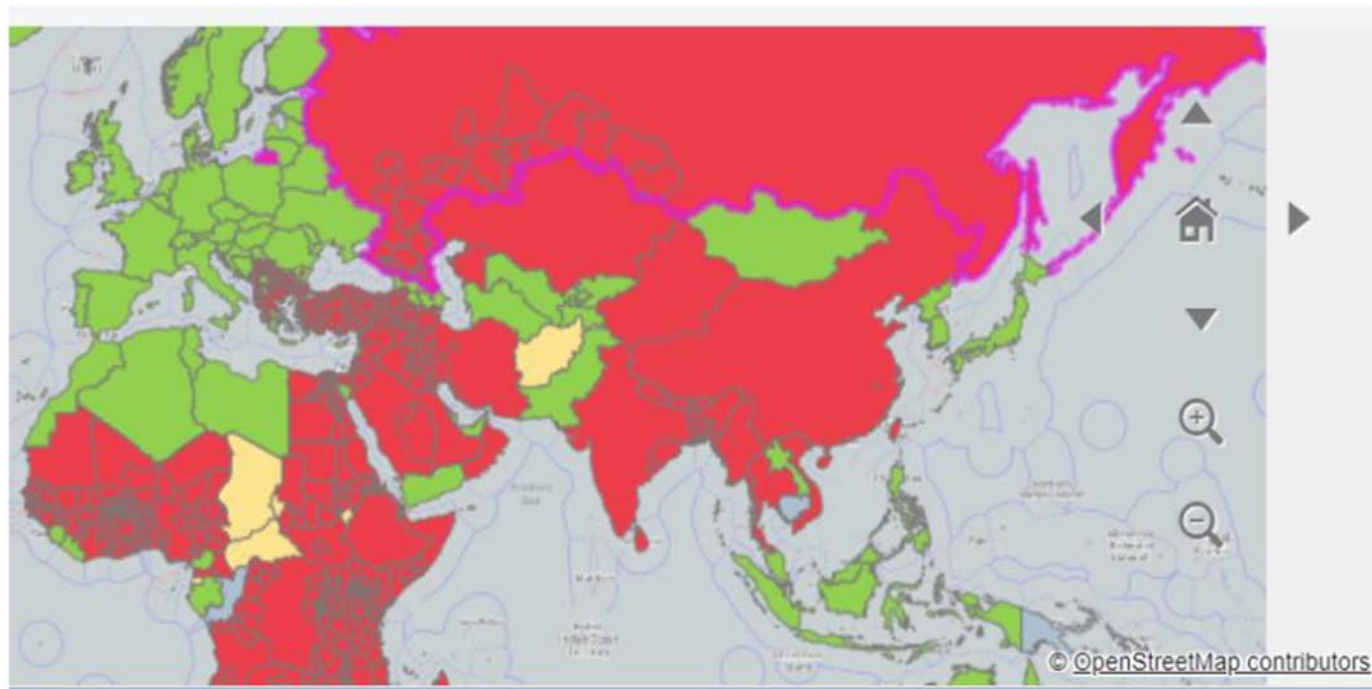
- Following the first report of lumpy skin disease (LSD) in Asia in 2019 in Bangladesh, China and India, the disease continued its spread affecting Vietnam in October 2020, Myanmar in November 2020, Thailand in April 2021 followed by Cambodia in May 2021.
- With increasing risks of LSD spread in South-East Asia region, the need for rapid detection and implementation of appropriate response and control measures are critical to control the disease and to minimize impact.
- *A virtual LSD Coordination Meeting for South-East Asia” was organized on 11 June 2021. Dr. Tum Sothyra updated Cambodia situation and response.*





LSD Status (based on country report)

as June 2021





Principles of control (FAO/OIE)

1. Early detection
2. Vector control
3. Bio-security
4. Stamping out
5. Vaccination
6. Communication



Challenges for early detection

1. Knowledge, awareness (veterinarians, VAHW, farmers); Tools to inform professionals and farmers must be tailored for Cambodia (farming system, language...)
2. Remote border areas and unofficial transboundary movement of cattle
3. Small farms, often villagers own only few heads and are part time farmers
4. Few District/Provincial Veterinarians, low reporting from the field
5. Sampling must be appropriate, shipment to NAHPRI as well
6. Proper lab testing (capacity building, availability of reagents, QC)

Effectiveness- High





Challenges for implementing vector control

1. Various vectors, mosquitoes, flies, ticks; different breeding sites, season, housing...
2. Lack of knowledge on veterinary entomology in Cambodia
3. Repellents or insecticides must be tested to confirm effectiveness
4. Short effect of insecticides especially in rainy season or daily bathing of cattle
5. Cost, toxicity and pollution is a concern

Effectiveness- LOW





Challenges for implementing bio-security

1. LSD is spread by biting insects which move from farm to farm
2. Backyard herds; 1-10 heads, premises are basic
3. Herd density in villages is often high as cattle remain a cash reserve for families
4. Free roaming, and communal
5. General disinfection- mostly because disinfection surfaces

Effectiveness- low





Challenges to implement movement control

1. Enacting legislation, regulation; *Dr. Tan Phannara, head of the GDAHP, said on June 7 that the authorities had already taken measures at the border to prevent and ban cattle and buffalos from being imported without permission.*
2. Permit prior to movement after inspection
3. Traditional transboundary trading (Thailand and Vietnam) in remote areas, small villages, with limited roads accessibility
4. Vector born disease, flying vectors do not respect borders



Effectiveness- moderate

Stamping out PRO's vs. CON's

Can be effective and practical if:

- First emergence in a defined area is detected early enough
- Infection / detection period is short
- Risk of repeated cattle movements is low



But:

- Expensive: cost of cow compared to cost of vaccine dose
- Disposal of diseased carcasses
- Demands much more resources; personnel, time than vaccination
- Destructive to farmers livelihood, economy and sustainability
- Public perception and media / political interference

Effectiveness low





Vaccination (vs. stamping out)

Parameter	Vaccination	Stamping out
Cost	Low	High
Effectiveness	High	Low
Implementation	Easy	Difficult
Long term loss	Low	High
Farmer attitude	Positive	Negative
Farmer reporting	High	Low
Public attitude	Positive	Negative

Challenges for implementing vaccination

1. 2 types of vaccine: Homologous-Neethling strain and Heterologous- Sheep/Goat Pox. Homologous are more effective than Heterologous

2. All available vaccines are non-GMP and Safety tested.; possible low immune response

3. Storage, handling and administration procedures are strict; many causes of protection failure



4. Coverage; partial / too limited – Best option- all susceptible population. If limited to district, define clear borders->20km wide belt-zone. Before introduction of new animals; risk of new outbreaks

5. Regional & Preventive vaccination approach is more effective

High Effectiveness



Communication FAO & OIE to vets and farmers

LUMPY SKIN DISEASE

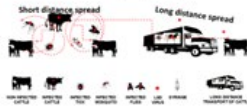
Lumpy skin disease (LSD)

- Affects only cattle and water buffalo.
- Does not affect humans.
- Seasonal outbreaks during the warmer months, when insects are most active and abundant.
- Causes important production losses due to sharp drop in milk production, fertility problems, abortions, damaged skins and hides, decreased weight gain, and sometimes death.
- Additional losses caused by cattle movement restrictions and trade.

How your animals can get infected?

- Mostly by biting insects like mosquitoes or stable flies and ticks.
- Through bringing in infected cattle from affected regions.
- Also possible via shared drinking troughs or feeding sites, milk, semen (natural breeding and artificial insemination), veterinary treatments (if needles are not changed between animals) and direct contact.

Schematic illustration of the spread of LSDV



Monitor your cattle and notify suspected cases

- During outbreaks or in areas at-risk, cattle should be monitored daily.
- Notify any suspicion immediately to your local veterinarian or the official Veterinary Services (telephone NUMBER TELEPHONE NUMBER), who will initiate actions to prevent further spread of the disease.
- When LSD is suspected, cattle movement should be stopped immediately.

How you can protect your farm?

- Through vaccination - Effective vaccines provide full protection within three weeks.
- Cattle should be vaccinated before the herd is infected.
 - Minor adverse reactions may follow vaccination:
 - Swelling at the vaccination site, which is not harmful and disappears within 1-2 weeks.
 - Short-lived fever associated to a slight decrease in milk production.
 - Some vaccines can rarely cause small nodules in the body or udder that disappear shortly.
 - Buy stock only from trusted sources. New animals should be examined prior to movement and on arrival, and should be kept in quarantine (i.e. separated from the herd) for 28 days. During an outbreak in the area, don't introduce new animals into your herd.
 - Regular application of a good insect repellent by dipping, spraying or using spot-on products.
 - Keep the farm free of breeding sites for insects, such as standing water and dung.
 - Farm visitors should be restricted to essential services. All visitor vehicles, equipment and boots should be cleaned before entering the property or shoe covers should be used.

How does LSD look like?

Infected animals show:

- High fever, loss of appetite and drop in milk production.
- Firm round skin lesions (nodules/lumps) of 1-5 cm (usually first noticed in the head and neck). In long-haired cattle, they are not easily noticed unless the skin is palpated or moistened.
- Number of nodules varies from a few (mild cases) to many covering the entire body (severe cases).
- Nodules may disappear with time, but usually the centre of the lesions sloughs off (scabs), leaving deep ulcers that attract insects.
- Ulcers in the muzzle, lips and inside the mouth and nose.
- Eye and nasal secretions and excessive salivation.
- Swollen lymph nodes.

Be aware that some infected animals may not show any clinical signs!



Ulcerative lesions in the muzzle



Ulcerative lesion in the test

Treatment

No effective treatment against LSD.

For additional information on the below aspects please refer to the FAO Manual on LSD for Veterinarians: <http://www.fao.org/3/a-17330e.pdf> [CHECK NEXT LINK IF YOU NEED THE MANUAL IN A DIFFERENT LANGUAGE: <http://www.fao.org/docstore/stand/stand/268360809498-823f-2006998479>]



Skin lesions with scabs, ulcers and scars



Severely affected cow with skin lesions covering the entire body, and enlarged lymph node

Contact information:

ENTER HERE THE CONTACT INFORMATION OF THE VETERINARY SERVICES, E.G. NAME, ADDRESS, TELEPHONE, EMAIL, ETC

Address:
Tel : +
e-mail:
Web:



Food and Agriculture Organization of the United Nations

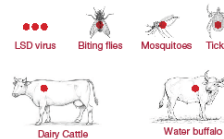
Lumpy skin disease a new threat to the region

Lumpy skin disease (LSD) is a viral disease of domestic cattle, water buffaloes and certain wild ruminants. Its incubation period is about 28 days but experimentally infected cattle may develop clinical signs as early as 6-9 days. This disease heavily impacts animal health and welfare and can lead to severe economic losses in affected farms.

LSD has recently spread to and within Asia, posing a threat to your country.

How do animals get infected?

- Mainly by blood-feeding arthropod vectors.
- Through bringing in infected cattle from affected regions.



When to suspect LSD?

- Ocular (eye) and nasal discharge – usually observed first.
- Decreased milk yield in lactating cattle.
- High fever that may exceed 41 °C or 106 °F.
- Enlarged subscapular and prefrontal lymph nodes (easily palpable).
- Appearance of firm cutaneous nodules of 2-5 cm in diameter, particularly on the head, neck, limbs, udder, genitalia and perineum within 48 hours of onset of the fever.
- Number of nodules varies from few in mild cases, to multiple lesions in severely affected animals.



What to do in case of LSD suspicion?

- Contact the Veterinary Services:
- Prevent further spread of the disease by asking the animal owners/keepers to:



Separate the suspected case(s) from the rest of the herd.



Separate the rest of the animals from neighbouring herd(s) by avoiding communal grazing



Stop cattle movement from/ to the farm



Limit visitors to essential services

- Carry out clinical examinations on the rest of the animals, in order to identify the disease at very early stages.
- Provide supportive treatment to affected animals to reduce the fever, maintain hydration and prevent secondary bacterial infections.
- A vaccine exists to protect the cattle.
Contact the Veterinary Services for more information on the vaccine.

For more information:

OIE regional webpage on LSD:
n-asia.oie.int/en/projects/lumpy-skin-disease-lsd/



WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future



Gaps in knowledge about the disease / potential research projects for NAHPRI

- The role of different potential insect vectors, including ticks, in different epidemiological settings and the persistence of LSDV in some of these potential vectors in inter-epidemic periods;
- The susceptibility of different wildlife species to LSDV and their role in the epidemiology of the disease;
- The proportion of animals that develop subclinical infections and their role in transmitting disease and infecting potential vectors;