

Emergence of lumpy skin disease in the Eastern Mediterranean Basin countries

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1. Introduction

1.1 Occurrence of lumpy skin disease in Middle East

Lumpy skin disease (LSD) is caused by the lumpy skin disease virus (i.e. capripoxvirus, poxviridae). The virus mainly affects cattle and Asian water buffaloes. LSD can cause devastating economic impacts. ¹ New outbreaks of LSD in previously free regions require immediate notification under the Terrestrial Animal Health Code of the World Organisation for

Animal Health (OIE).

LSD was first reported in Africa, where it crippled the production potential of cattle and compromised vulnerable livelihoods on the continent. LSD moved beyond Africa in 1989 when Israel confirmed its first LSD outbreak. In subsequent years Bahrain, Kuwait, Oman, Yemen and the West Bank also reported LSD incursion. Lebanon and Jordan joined LSD-affected countries in 2012 and 2013, and most recently Turkey reported the disease in October 2013 (see Table 1).

There is an imminent risk that LSD will (or has already) become endemic in some countries in the Middle East. Although LSD has not been reported in the Syrian Arab Republic – most likely due to the current armed conflict – the disease probably travelled through the Syrian Arab Republic to Turkey. LSD may also be in Iraq. Furthermore, the situation raises concerns that the disease may continue spreading: i) north and west from Turkey into Europe and the Caucasus; and ii) east to Central and South Asia.

LSD shows significant potential for major socio-economic impacts should it continue spreading: i) throughout newly affected countries; and ii) into their LSD-free neighbours. This is especially alarming

considering the area's substantial livestock population. Turkey maintains over 11.3 million heads of cattle. Iraq, Lebanon and the Syrian Arab Republic maintain 2.8 million heads, and the Islamic Republic of Iran maintains for approximately 8.5 million heads. Armenia, Azerbaijan and Georgia combined maintain 4million heads.

At-risk countries include the Russian Federation to the north and Bulgaria and Greece to the west. This is in line with the spread of other significant transboundary animal diseases (e.g. African swine fever, foot-and-mouth disease, sheep pox and goat pox) in the region. Moreover, capripoxviruses could be considered emerging disease threats because of global climate change and alterations to the trade patterns of animals and animal products. ²

1.2 Epidemiology

The morbidity rate for LSD ranges from 5 to 45 percent depending on the: i) distribution and abundance of insect vectors; ii) breed of cattle affected; and iii) general health and nutritional status of the animals in question. Occasional mortality rates from 10 to beyond 40 percent have been reported, but the rate of 1 to 5 percent is considered more usual.

Table 1. LSD outbreaks, as reported to OIE^{*}

Countries	2006	2007	2008	2009	2010	2011	2012	2013
Bahrain	present	present	0	present	0	0	0	0
Egypt	present	0	0	0	0	0	present	present
Israel	present	present	0	0	0	0	present	present
Jordan	0	0	0	0	0	0	0	present
Lebanon	0	0	0	0	0	0	present	present
Oman	present	0	0	present	present	present	present	0
West Bank	present	present	present	0	0	0	0	present
Turkey	0	0	0	0	0	0	0	present

* 0 = country reported zero cases for that year to OIE; present = country reported disease present that year to OIE

1.3 Transmission

Different types of biting and blood-feeding arthropods (including mosquitoes and flies^{3,4}) are likely responsible for the mechanical spread of the LSD virus⁵. Disease incidence is highest in wet/warm weather. Incidence decreases during the dry season, which is possibly linked to decreases in insect vector occurrence/numbers. Minor sources of infection could include direct and indirect contact (e.g. through infective-saliva contaminated feed and water). Other potential transmission routes include the milk of lactating cows and the semen of infected bulls, since the LSD virus can persist for extended periods of time in both^{6,7}.

1.4 Host susceptibility

Susceptibility and eventual disease severity depends on the dose and route of virus inoculation as well as the health and nutritional status of the affected animal. Considered at risk are all cattle breeds plus Asian water buffaloes (*Bos Bubalis*). *Bos taurus* cattle breeds are more susceptible than *Bos indicus* breeds, and young calves often experience more severe disease than adults. Although the incubation period under field conditions has not been reported, the onset of fever following inoculation is in 6–9 days. The first skin lesions appear at the inoculation site in 4–20 days.⁸ No carrier status is recognized in cattle following infection with LSD virus. Live virus can be detected up to 39 days post-infection in the dried crust of skin lesions on an infected animal⁹ and up to 18 days in scrapings from dried lesions of air-dried hides held at room temperature.¹⁰ The virus may be found in milk of infected animals; therefore, it should not be used as a supplement for susceptible animals.¹¹

1.5 Diagnosis

The manifestation of LSD may range from acute to subclinical (see Table 2).

1.6 Virus susceptibility

Disinfection is possible using ether (20 percent), chloroform, formalin (1 percent) and some detergents (e.g. sodium dodecyl sulphate; phenol [2 percent/15 minutes], sodium hypochlorite [2–3 percent], iodine compounds [1:33 dilution], Virkon® [2 percent] and quaternary ammonium compounds [0.5 percent]).¹²

1.7 Vaccine

Live, attenuated vaccines are commonly used against LSD. This is because immunity to capripoxviruses is mainly cell mediated and is better stimulated by the use of live vaccines. While effective, live vaccines occasionally cause serious side effects (e.g. intense local reaction at the vaccination site, which rarely develop into generalized infection and frequently cause a temporary decrease in milk production). Due to cell mediated immunity, low antibody responses are common after vaccination with attenuated live vaccines, even though vaccinated animals are fully protected.¹³ Inactivated vaccines do not provide long-term immunity; therefore, annual booster vaccinations are recommended. Vaccination has shown to reduce the negative economic impacts of LSD.¹⁴

Vaccines used presently in the Middle East include:

- homologous live attenuated vaccines containing Neethling strain (including Lumpy Skin Disease Vaccine for Cattle® (Onderstepoort Biological Product, South Africa); Lumpyvax®, Intervet, Namibia; New live vaccine, HerbivaLS® Deltamune/Ceva Santé Animale, South Africa); and
- sheep pox vaccines produced in the region (including Sheep-pox vaccine

RM 65 [Jordan Bio industries Centre, JOVAC] and the Tissue Culture Sheep Pox Vaccine [Kenyan S/GP 0240, VSVRI, Egypt]).

1.8 Laboratory

When disease is introduced for the first time, a fast and accurate laboratory confirmation of the tentative field diagnosis is required before beginning relatively expensive control and eradication measures. Virus isolation and molecular diagnostic tests play an important role in monitoring the spread of the capripoxviruses and controlling outbreaks in susceptible livestock. However, those laboratories which are poorly equipped or located in challenging field environments face difficulties accessing these molecular techniques that rely upon expensive equipment.

The development of a loop-mediated isothermal amplification (LAMP) assay for rapid detection of capripoxviruses has been shown to be highly specific with no apparent cross-reactivity to other related viruses (i.e. near neighbours) or viruses that cause similar clinical signs (i.e. look-a-like viruses). When compared to highly sensitive quantitative real-time polymerase chain reaction assay (PCR). LAMP and quantitative, real-time PCR exhibited similar analytical sensitivities. Overall agreement on diagnostic test results between the two assays was 90–95 percent for specificity and 89–100 percent for sensitivity. The LAMP assay is simple to use, inexpensive, highly sensitive and particularly well suited for the diagnosis of capripox in less well equipped laboratories and in rural settings where resources are limited.¹⁵

Serological surveys for LSD virus are constrained by the lack of suitable diagnostic tools. Unfortunately, there are no sufficiently sensitive and validated enzyme-linked immunosorbent assays (ELISAs) available

Table 2. Typical clinical signs for lumpy skin disease

Skin	Mucosal lining	Pregnant/lactating animals	Other clinical signs
Disseminated cutaneous papules (2–5 cm) throughout the full thickness of hide; necrotic centres (sitfasts), which may fall out, creating scars and holes in hide	Pox lesions may develop throughout mucosa linings of alimentary and respiratory tracts, including nasal turbinates, trachea	Reduction in milk yield by lactating cattle	Fever, depression, anorexia, decreased weight gain and emaciation
Papules most easily seen in hairless areas of perineum, udder, inner ear and muzzle, eyelids	Pox lesions on lung with marked generalized interlobular edema, resulting in primary and secondary pneumonia	Possible abortions	Excessive salivation, rhinitis and conjunctivitis, which may be mucopurulent
Enlarged superficial lymph nodes			Legs may be edematous; animal reluctant to move
Secondary bacterial infections			

for LSD virus. Although reliable, serum/virus neutralization tests are labour-intensive and time-consuming. This renders them unsuitable for large-scale testing. Moreover, since LSD immunity is predominantly cell-mediated, serological assays may not reliably detect antibody levels in vaccinated animals or animals with mild clinical disease. The Western blot is highly sensitive and specific, but it is expensive and difficult to perform.

1.9 Sample collection

- Samples for virus isolation and antigen-detection ELISA should be taken during the first week of signs, before neutralizing antibodies have developed. Samples for PCR can be collected after this time.
- In live animals, biopsy samples of skin nodules or lymph nodes can be used for PCR, virus isolation and antigen detection. Scabs, nodular fluid and skin scrapings may also be collected.
- LSD virus can be isolated from blood samples (collected into heparin or ethylenediaminetetraacetic acid) during the early, viraemic stage of disease; this is unlikely to be successful after generalised lesions have been present for more than 4 days.
- Samples of lesions, including tissues from surrounding areas, should be submitted for histopathology.
- Tissue and blood samples for virus isolation and antigen detection should be kept chilled and shipped to the laboratory under proper cold chain conditions. If samples must be sent long distances without refrigeration, large

pieces of tissue should be collected and the medium should contain 10 percent glycerol; the central part of the sample can be used for virus isolation.

Currently, there are two OIE Reference laboratories¹⁶ for LSD confirmation: the Onderstepoort Veterinary Institute in South Africa and the Institute for Animal Health in the United Kingdom of Great Britain and Northern Ireland.

1.10 Recent outbreaks in the region

Between 6 August and 9 October 2013, four LSD outbreaks were reported in Turkey. They occurred along the eastern length of the southern border with the Syrian Arab Republic, Iraq and the Islamic Republic of Iran. This outbreak followed the LSD outbreaks in Israel, Lebanon, the West Bank and Jordan, which were reported between July 2012 and September 2013 (Map A).

2. Risk assessment

2.1 Areas of risk

An urgent risk assessment for the region is required to help decision-makers understand:

1. where LSD outbreaks are occurring;
2. what drivers may encourage LSD movement;
3. the risk of continued spread within currently affected countries;
4. the risk of LSD spread from infected countries to non-infected countries; and

5. the likely impacts of LSD should movement occur.

Animal health authorities need this crucial assessment in order to plan, implement and manage subsequent activities to reduce the risk for spread and introduction of LSD in the region.

2.2 Regional practices

Communal grazing

LSD is occurring in the Middle East and Turkey in beef cattle raised in communal pastures and feedlots as well as in dairy cattle herds. Many countries in this region are working towards instituting: i) vaccination protocols; ii) quarantine measures; iii) national movement restrictions; iv) insect control; v) disinfection of infected premises; treatment of the affected animals with antipyretics and antibiotics for secondary bacterial infections; and in some cases v) culling of sick animals.

Uncontrolled movements of livestock (particularly nomads)

Uncontrolled livestock movements heighten the risk that LSD may move into additional areas of Turkey or LSD-free countries within the region. Examples include the documented, large, seasonal Kurdish transhumance movements in the southeast Anatolia region (see Map B). In addition, riverine agriculture and related activities at the deltas of the Tigris and Euphrates rivers in Iraq have a potential to be hot spots for vector transmission (Map C). There is an immediate risk of LSD incursion into the Islamic Republic of Iran and the trans-caucasus countries.

Map A. Lumpy skin disease confirmed outbreaks.

Observation dates from 01/07/2012 to 28/10/2013 (over estimated global cattle density).



3. Risk management options for at-risk countries

3.1 Sanitary prophylaxis

Free countries:

- enforce import restrictions on livestock, carcasses, hides, skins and semen;
- enhance awareness of the disease;
- enhance capacity for symptomatic surveillance for LSD cases;
- enhance laboratory capacity for LSD testing;
- enhance rapid reporting regionally and internationally; and
- develop a prevention and response plan to include good emergency management practices ¹⁷.

Infected countries:

- implement strict quarantine measures to avoid introduction of infected animals into safe herds;
- isolate animals and prohibit animal movement in the case of outbreaks;
- slaughter all sick and infected animals dispose properly of dead animals (e.g. incineration);
- clean and disinfect premises and equipment;
- control vectors in premises and on animals; and
- control vectors in ships and aircraft.

With the exception of vaccination, control measures are challenging to implement effectively.

3.2 Medical prophylaxis

At-risk, non infected countries should utilize:

- homologous live attenuated virus vaccine (Neethling strain; immunity lasts up to three years); or
- heterologous live attenuated virus vaccine: (Sheep or goat pox vaccine, but may cause local, sometimes severe, reactions).

Follow manufacturers instructions. Not advised in countries free from sheep and goat pox.

Map C. Euphrates and Tigris rivers.



Source: <http://en.wikipedia.org/wiki/File:Tigr-euph.png>

3.3 Regional response plan components

A regional response plan is urgently needed. The plan should incorporate the below-mentioned elements.

Information sharing within the country, regionally and internationally

- Increase awareness about this disease

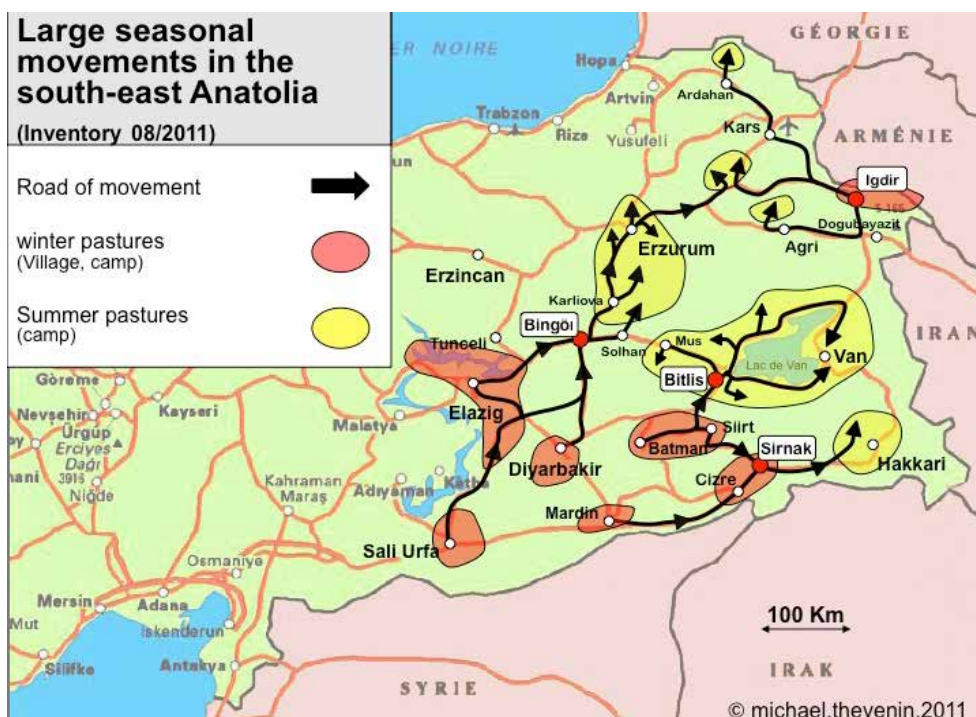
and differentials at the local cattle owner level through extension veterinarians and other mechanisms to reach those working daily with cattle and cattle owners and traders.

- Provide incentives to notify suspicion of the disease.

Disease notification

- Immediately notify OIE when LSD is suspected or diagnosed.

Map B. Large seasonal movements in southeast Anatolia.



Source: Thevenin Pastoralism: Research, Policy and Practice 2011 1:23 doi:10.1186/2041-7136-1-23



Strengthen local and regional surveillance and laboratory capacity and networks

- Identify/share standards for information collection and exchange from field contacts:
 - » Data collection
 - » Data reporting
 - » Data analysis
 - » Response
- Include surveillance support functions:
 - » Training and supervision
 - » Laboratory strengthening
 - » Communications
 - » Resource management
 - » Information collection – information must be timely, complete, regular and of high quality, to be used for early detection and prediction of epidemics, as well as to objectively assess the effectiveness of interventions during the epidemics and to provide efficient monitoring of established intervention programmes.
 - » Use surveillance information to guide decisions with the goal to understand the extent of the spread of the disease and to implement an effective and appropriate response, using control measures designed to stop the continued movement of the disease.¹⁸

Use of appropriate vaccine

- Identification of an effective vaccine to control LSD in a field setting is needed.
- Use of proper needle hygiene when vaccinating herds, to avoid iatrogenic spread by people vaccinating the animals.

Supportive care

- Antibiotics to prevent secondary bacterial infections

Vector Control

- Insecticide-treated cattle (ITC) can be effective, if re-treated between one and four weeks.¹⁹
- ITC is cheaper than vector control methods, such as aerial spraying and more environmentally friendly than

insecticidal ground spraying, game destruction or habitat clearance.

4. Conclusions

- The occurrence of LSD in Israel, Lebanon, Jordan, the West Bank and most recently in Turkey and likely Northern Iraq indicates **the potential for further spread of this emerging disease to other countries in the region and beyond** where the cattle population is susceptible.
- **An urgent risk assessment for the region is required** to help decision-makers understand the situation and plan response actions.
- Specific **risk management options** exist for at-risk countries, including sanitary prophylaxis and medical prophylaxis as well as the **urgent need for regional coordination of prevention and control of the disease**. Countries in the region should **develop and establish a regional response plan** to facilitate coordination, information exchange and experience sharing.
- **FAO stands ready to provide assistance to member countries** to help reduce the risk of disease spread and safeguard vulnerable, livestock-related livelihoods. **Assistance should be focused on but not be limited to: i) disease early warning; ii) laboratory capacity building; iii) risk management; iv) surveillance; and v) control.**
- **At-risk countries would benefit from knowledge sharing by relevant countries in the region**. FAO has the technical capacity, mandate and global network necessary to facilitate information exchange and promote collaboration.

5. References

¹ A recent study in Ethiopia found that the financial cost related to infected herds was estimated to be between USD 5–8 per head of local zebu and between USD 42–73 per head of Holstein Friesian crossbred cattle (Gari *et al.* 2001. Epidemiological aspects and financial impact of Lumpy Skin Disease in Ethiopia. *P.V.M.* 102: 274-283).

- ² Babiuk, S., Bowden, T. R., Boyle, D. B., Wallace, D. B. and Kitching, R. P. 2008. Capripoxviruses: An Emerging Worldwide Threat to Sheep, Goats and Cattle. *Transboundary and Emerging Diseases*. 55, 263–272 (available at <http://onlinelibrary.wiley.com/doi/10.1111/j.1865-1682.2008.01043.x/pdf>)
- ³ Chihota, C. M., L. F. Rennie, R. P. Kitching, and P. S. Mellor. 2001. Mechanical transmission of lumpy skin disease virus by *Aedes aegypti* (Diptera: Culicidae). *Epidemiol. Infect.* 126, 317–321.
- ⁴ Chihota, C. M., L. F. Rennie, R. P. Kitching, and P. S. Mellor. 2003. Attempted mechanical transmission of lumpy skin disease virus by biting insects. *Med. Vet. Entomol.* 17, 294–300.
- ⁵ It is important to note that a limited number of studies have been conducted on LSD virus transmission by arthropod vectors.
- ⁶ Irons, P. C., E. S. Tuppurainen, and E. H. Venter. 2005. Excretion of lumpy skin disease virus in bull semen. *Theriogenology*. 63, 1290–1297.
- ⁷ Osuagwu, U. I., V. Bagla, E. H. Venter, C. H. Annandale, and P. C. Irons. 2007. Absence of lumpy skin disease virus in semen of vaccinated bulls following vaccination and subsequent experimental infection. *Vaccine*. Vol. 25, 2238–2243.
- ⁸ Lumpy Skin Disease. (available at http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/LUMPY_SKIN_DISEASE_FINAL.pdf)
- ⁹ Onderstepoort J. *Vet Res.* 2005. Jun; 72(2): 153-64
- ¹⁰ Weiss, K.E. 1968. Lumpy skin disease. *Virology Monogr.* 3, 111-131.
- ¹¹ Davies, F.G. 1991. Lumpy skin disease, a Capripox Virus Infection in Cattle in Africa. FAO, Rome, Italy.
- ¹² http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/LUMPY_SKIN_DISEASE_FINAL.pdf
- ¹³ <http://www.discontools.eu/Diseases/Detail/86>
- ¹⁴ The annual vaccination programme conducted in Ethiopia for local zebu and Holstein Friesian crossbreds reduced financial losses caused by LSD by 17 and 31 percent per head, respectively (Gari *et al.* 2001. Epidemiological aspects and financial impact of Lumpy Skin Disease in Ethiopia. *P.V.M.* 102: 274-283).
- ¹⁵ <http://jcm.asm.org/content/50/5/1613.full>
- ¹⁶ <http://www.oie.int/?id=120?>
- ¹⁷ <http://www.fao.org/docrep/014/ba0137e/ba0137e00.pdf>
- ¹⁸ <http://www.who.int/csr/labepidemiology/projects/surveillance/en>
- ¹⁹ <http://www.ncbi.nlm.nih.gov/pubmed/19192613>; <http://sacemaquarterly.com/mathematical-modelling/modelling-the-control-of-trypanosomiasis-using-trypanocides-or-insecticide-treated-livestock.html>; <http://www.fao.org/docs/eims/upload/agrotech/1961/CheapSafeTsetseControl.pdf>



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Recommended citation

FAO. 2013. Emergence of lumpy skin disease in the Eastern Mediterranean Basin countries. *EMPRES WATCH*, Vol. 29, November 2013. Rome.

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