

Answers from Dr Nadav Galon to the questions raised during the LSD Coordination Meeting for South-East Asia on 11 June 2021

(Statements and opinions are those of the Expert individually and do not necessarily reflect or represent the views and opinions of the OIE)

1. What was the mode of spread from the Middle East/ Russia to Asia?

LSD spreads over long distances is strongly associated with the movement of infected cattle and potential transport of infected vectors, that further transmit the virus to naïve cattle.

2. From phylogenetic analysis, what is the strain of LSD virus circulating in this region?

LSD virus is relatively stable and has not changed drastically over the years. Phylogenetic analysis may be interesting in terms of molecular epidemiology. For the sake of vaccination and control purposes: the Neethling vaccine strain has been used for more than 60 years and it is still effective.

3. Are there any recent LSD cases in sheep and goat?

There were no reports of LSD in sheep and goats nor epidemiological involvement of sheep and goats, although in many LSD-infected countries, they live together and are in proximity with cattle.

4. What is the best disinfectant against LSD virus?

In general, disinfectants should be used to disinfect sheds and other places where infected animals are kept. However, survival of LSD virus in hot climate is low and there is limited effect on LSD control by disinfection. LSD is most successfully controlled by vaccination.

5. What is the risk of LSD to zoo animals?

In wildlife, clinical disease has been reported in springbok (*Antidorcas marsupialis*) in Namibia, oryx (*Oryx gazelle*) in South Africa and Arabian oryx (*Oryx leucoryx*) in Saudi Arabia (Greth et al., 1992; OIE, 2013). LSDV has been isolated on two separate occasions from springbok antelope in South Africa (Le Goff et al., 2009). The susceptibility of wild /zoo ruminants is not well-known and their possible role in the epidemiology of LSD is likely negligible.

6. If a few cattle are infected in a herd (e.g 4 cattle infected out of 20 animals), do we need to stamp out all the cattle in that herd including the one not showing the clinical signs?

It is a policy question. If this would help regaining freedom of disease and maintaining a trade advantage like export, culling of the whole group can be considered. At large, the effectiveness of culling for LSD control is low when compared with vaccination. It may be effective for a first incursion into a defined area and only if detected early enough with minimum spread with very low risk of repeated incursions. Culling may also be considered for welfare reasons if the animals are suffering.

7. What are the means of mechanical transmission of LSD virus? Is vector control effective in LSD control?

Mosquitos, flies, ticks and any blood-sucking arthropods may act as mechanical vectors to transmit LSD virus. Similarly, contaminated needles can transmit virus mechanically. Saliva of infected cattle in joint water and feed troughs may lead to transmission too.

The use of insect repellents or insecticides has limited effectiveness or will have only short effect as it can be washed by rain or when it comes in contact with water; and frequently biting insects will be active round the year. Their cost, toxicity and residues in milk and meat, as well as their effects on other insects like honey bees, must also be considered.

8. In practise, how can we conduct effective LSD surveillance?

Due to the highly characteristic clinical manifestation of LSD, a thorough physical examination carried out by experienced veterinarians is considered as an effective tool for active clinical surveillance. This involves the veterinary services designing targeted and often risk-based surveillance. This can be also applied to practically assess the effectiveness of LSD vaccines.

Passive surveillance relies mostly on the ability of the farmers, field vets and others who come into contact with cattle, to identify typical LSD clinical signs. Therefore, raising awareness to recognise LSD clinical signs and encouraging timely reporting is critical.

9. Is it safe to consume meat of LSD affected animals?

LSD is not a zoonosis and there is no risk of transmission to humans. As per Article 11.9.2 of the Terrestrial Animal Health Code, the skeletal muscle meat from LSD infected cattle is considered a safe commodity. Decision to condemn or consume meat from LSD- infected animals will be largely dependent on the national regulatory measures of the respective countries.

10. Do LSD-recovered animal become LSDV carrier?

There is no known carrier state.

Once an animal has recovered, it is well protected and cannot be the source of infection to other animals. In infected animals that do not show clinical signs, virus may remain in blood for few weeks and eventually disappear.

11. What have been the control measures applied effectively in countries that succeeded in controlling/eradicating LSD?

Vaccination of cattle plays a fundamental role for the control and eradication of LSD. To date, no country managed to control or eradicate LSD without vaccination. With a high vaccination coverage (>80%) in the Balkan, LSD outbreaks were controlled within few weeks to several months, depending on how fast the vaccinations campaigns were completed.

12. What kind of LSD vaccine are available? What are the differences between homologous vs heterologous LSD vaccines?

In accordance with Chapter 3.4.12 of the OIE Terrestrial Manual, the live attenuated strains of capripoxvirus have been used as vaccines to control LSD. The Capripoxviruses are cross-reactive within the genus and consequently, it is possible to protect cattle against LSD using strains of capripoxvirus derived from sheep or goats.

Homologous vaccines are based on the Neethling strain of LSD virus; while heterologous vaccines are based on sheep pox virus (SPPV) or goat pox virus (GTPV). Heterologous vaccines are currently cheaper than homologous vaccines and may be preferred in those countries with limited fund or that already have manufacturing capacity for these vaccines. However, the dose of heterologous vaccine needed to protect cattle against LSD is usually 5 to 10 times the dose used to protect small ruminants against sheep and goat pox virus. GTPV vaccine is found to provide equal protection to homologous

LSD vaccines and is good alternative in regions where both LSD and GTP occur (Gari et al., 2015). SPPV based vaccines may not be as good as the LSDV and GTPV vaccines.

13. When and how cattle should be vaccinated against LSD?

The recommendations of the vaccine manufacturer should always be followed.

Practical experience has shown that:

- ✓ Annual vaccination of the adult cattle will protect animals from LSD.
- ✓ Calves from vaccinated animals or naturally infected mothers should be vaccinated at the age of 3 to 4 months. Calves from un-vaccinated dams can be vaccinated even earlier.
- ✓ Newly purchased animals should be vaccinated 28 days before the introduction to the herd.
- ✓ Animals should be vaccinated 28 days before the transport or movement to another place.
- ✓ Same dosage and protocol should be applied to domestic buffaloes as for cattle.
- ✓ Pregnant cows can be safely vaccinated.

14. Is it safe to use live-attenuated vaccine on infected animals (with or without any clinical signs)?

Vaccination of animals with clinical signs is not needed as they will be naturally immunised; animals with no clinical signs could be vaccinated. There is no evidence that vaccination of incubating or sub-clinical animals would lead to severe disease. If vaccines are available, it is recommended to vaccinate all animals, except clear-clinical cases.

15. Can live attenuated vaccine regain its virulence or lead to recombination with field virus?

This has not happened or been suspected in many millions of animals vaccinated with the South African Neethling vaccines, over many years of use. The risk does exist in any live vaccine if the virus is not sufficiently attenuated. A study undertaken in Europe from 2016-2020 on three live attenuated LSD vaccines did not show regaining of LSD vaccine strain's virulence or recombination with field virus. One Croatian study reported that after passage of the vaccine virus in cattle, the genome of vaccine virus remained totally attenuated with 100% similarity to the original vaccine virus (Lojkic et al., 2018).

16. Are there any DIVA (Differentiating Infected from Vaccinated Animals) vaccine?

There is no DIVA vaccine available in the market or build in marker in the vaccines. There are PCR technologies which can detect the specific part of viral genomes absent in the vaccine strains but present in field virus strains, thus able to differentiate the disease induced by either vaccine or field virus strains.

17. Can we give LSD and FMD vaccination together?

The vaccination of two different vaccines at the same time in the same animal had been practiced for many years in many species including human. For all practical reasons, if you do not mix the substances, it makes sense that the immune system of a healthy animal will be capable of responding to two antigens at the same time. It is possible to vaccinate against both FMD and LSD at the same time, provided that: vaccines are not mixed at any stage, as FMD is inactivated and LSD is modified-live; using separate syringes and needles; and injected into the neck, but far enough between injection sites (preferably, to avoid mistakes, inject on different sides of the neck).

18. What do you think about use of inactivated vaccine in controlling LSD?

Inactivated vaccines are safe to use in LSD-free countries and may be used when there is risk of LSD introduction from the neighbouring countries. Inactivated vaccines generate a shorter duration of immunity than live attenuated vaccines. Therefore, initial vaccinations comprise two vaccinations one month apart and then revaccination every six months is required to maintain immunity (Hamdi et al., 2020).

19. In which context is preventive vaccination recommended in a LSD-free country?

Preventive vaccination should be considered after evaluation of the specific country situation and local context. If LSD is known or suspected to be widely present in a neighbouring country, initiating preventive vaccination along the borders along with implementation of active surveillance in the vaccinated herd and strict movement control of animals from these buffer areas to the interior part of the country should be considered.

20. Does the OIE have an emergency vaccine bank for LSD?

The OIE does not have a vaccine bank for LSD. The OIE can facilitate contact with OIE Reference Laboratories in South Africa and UK and a Collaborating Centre in Belgium (Validation, Quality Assessment and Quality Control of Diagnostic Assays and Vaccine for Vesicular Diseases in Europe).