



Preparedness for Lumpy Skin Disease

Dr Eeva Tuppurainen

Institute for International Animal Health/One Health

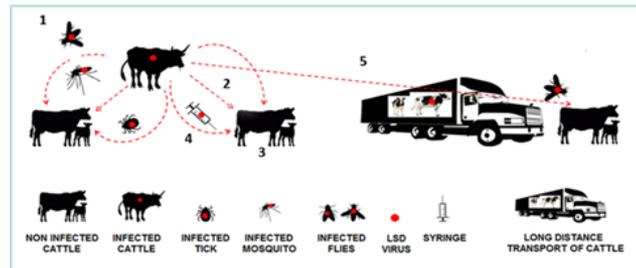
Friedrich-Loeffler-Institut
Federal Research Institute for Animal Health
Südufer 10 | 17493 Greifswald - Insel Riems
Tel: +49 38351 7 1242 | Fax: +49 38351 7 1226
<https://www.fli.de/>



21th December 2020

Brief recap on the LSD virus

- *Lumpy skin disease virus* - a member of the *Capripoxvirus* genus within the *Poxviridae* family (large and stable DNA virus)
- *Host range* - cattle and domestic water buffalo
- *Morbidity* 5-45% can be sometimes higher, *mortality* <10% - morbidity and severity of the clinical disease are much lower in buffalos than in cattle. The local cattle breeds less susceptible than European dairy breeds and cows in high production are usually more severely affected
- *Transmission*
 - Mechanical by blood-feeding and biting vectors
 - Direct and indirect contact
 - Intrauterine transmission and via contaminated semen
 - Iatrogenic
- *Immunity* - both humoral and cell-mediated - all vaccinated animals may not show detectable antibody levels although they would be fully protected
- No *carriers* but some animals can be infected without showing clinical signs

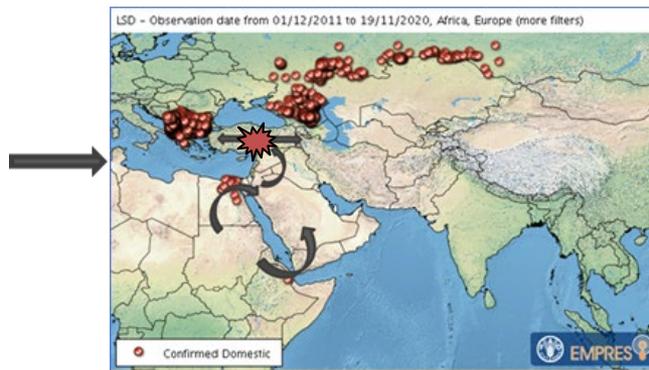
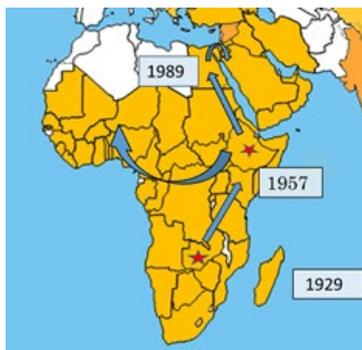
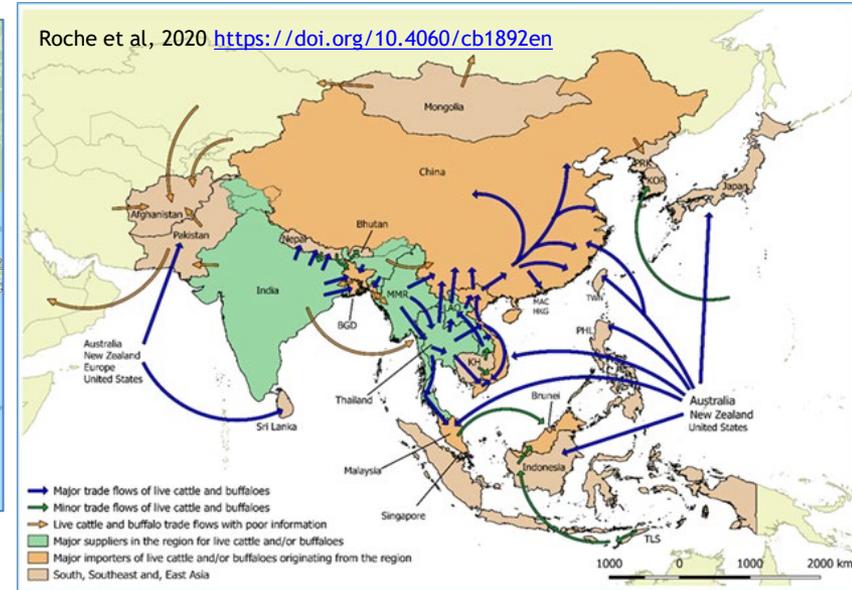


Spread of LSD to and within Asia

LSD in Asia Dec 2020



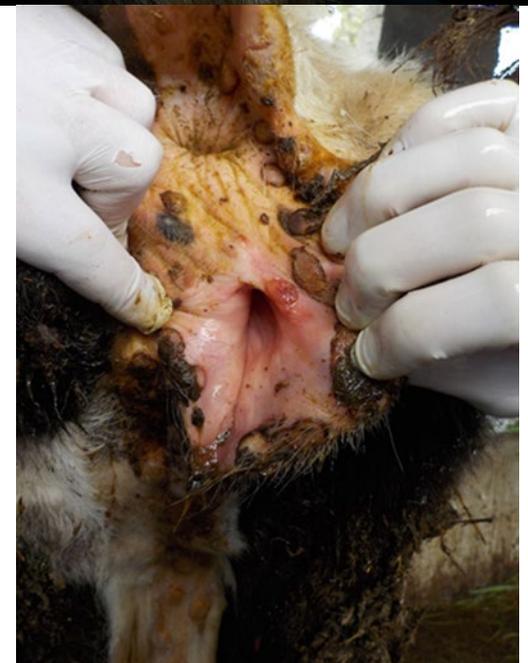
Cattle and buffalo trade patterns in Asia

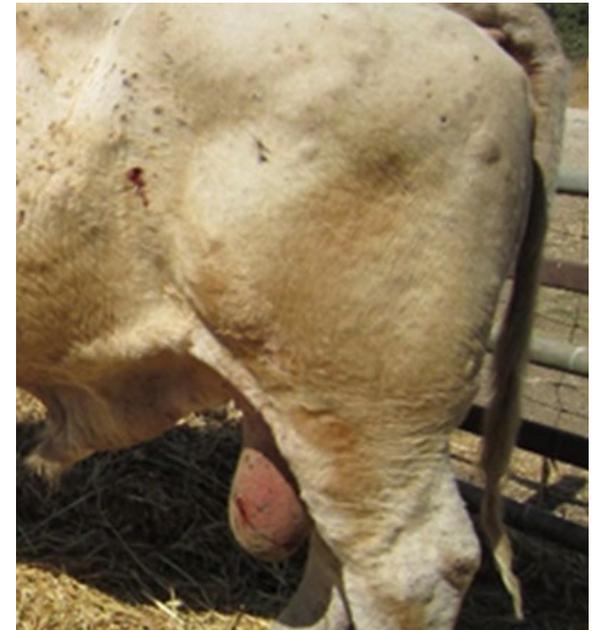
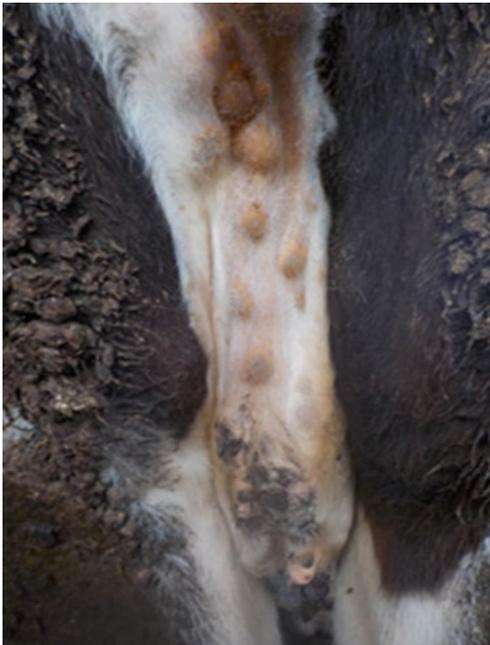
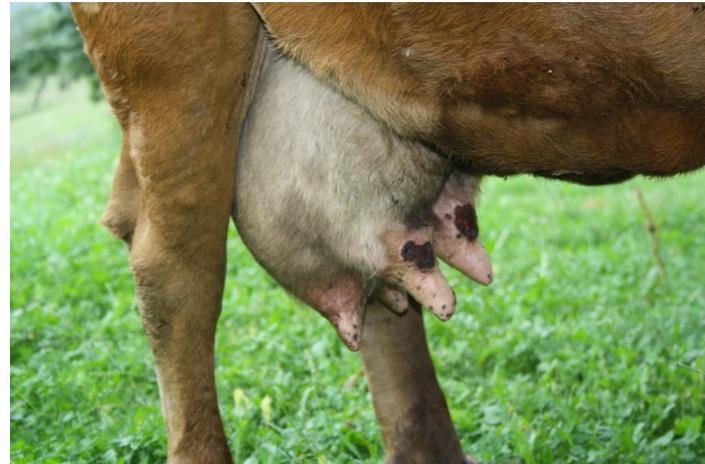


- Large scale spread started from the Middle East associated with the movement of immigrants and cattle to/via Turkey
- Number of Asian countries that have not reported any outbreaks is swiftly declining

For good preparedness

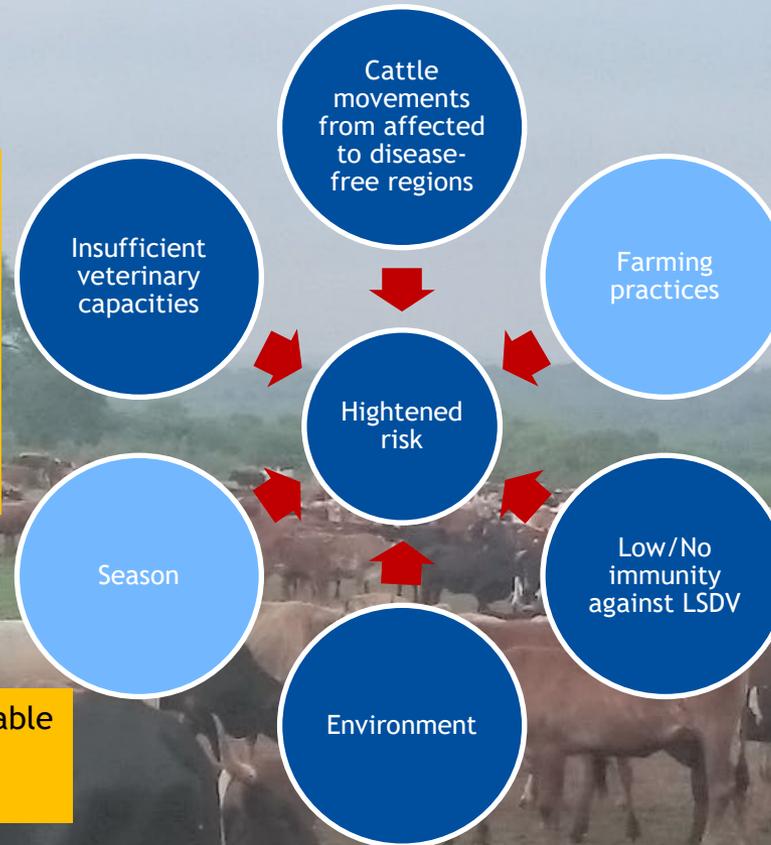
- You need to
- Know the facts about the virus
 - Mitigate the risks
 - Enhance awareness, surveillance and lab capacities for early detection
 - Act in time





Risk assessment

- Trade, grazing, nomadic and transhumance farming
- Legal and unauthorised transboundary animal movements
- Lack of testing regimen for imported animals



- Lack of veterinarians, paraveterinarians, means of transport, awareness
- Labs: Diagnostic tests, competent staff, funding, kits, reagents, materials, equipment
- Under-reporting and no compensation system for farmers

- Contacts with neighbouring herds
- Purchase of new animals from untrusted sources
- Use of a local breeding bull
- Cattle are not monitored on regular basis
- Shared veterinary or other equipments

- Temperature and humidity favorable for vectors
- High cattle movement activities

- Fully susceptible cattle population
- Cattle are vaccinated but not yet protected
- Vaccination has ceased
- Poor vaccination coverage
- No vaccination records kept

- High numbers vector
- Presence of suitable breeding sites for vectors (standing water and dunghills)
- Grasslands suitable for ticks
- Cattle transport routes

Requirements

Legal basis for disease control measures

High awareness levels

Surveillance for early detection

Farmers and other stakeholders must be willing to notify

Pre-prepared vaccination plans

Laboratories are well prepared

Animal health law, contingency plan and field manual give the framework for the control and eradication as a whole

Awareness campaigns suitable for target audience. Cattle farming stakeholders must be warned about the disease and they must recognize the typical clinical signs. Clinical manifestation of LSD is highly characteristic. Better awareness also helps farmers to protect their animals.

Passive and active clinical surveillance at high risk areas, target population and times, supported by laboratories. Can be combined with other compulsory animal health programmes.

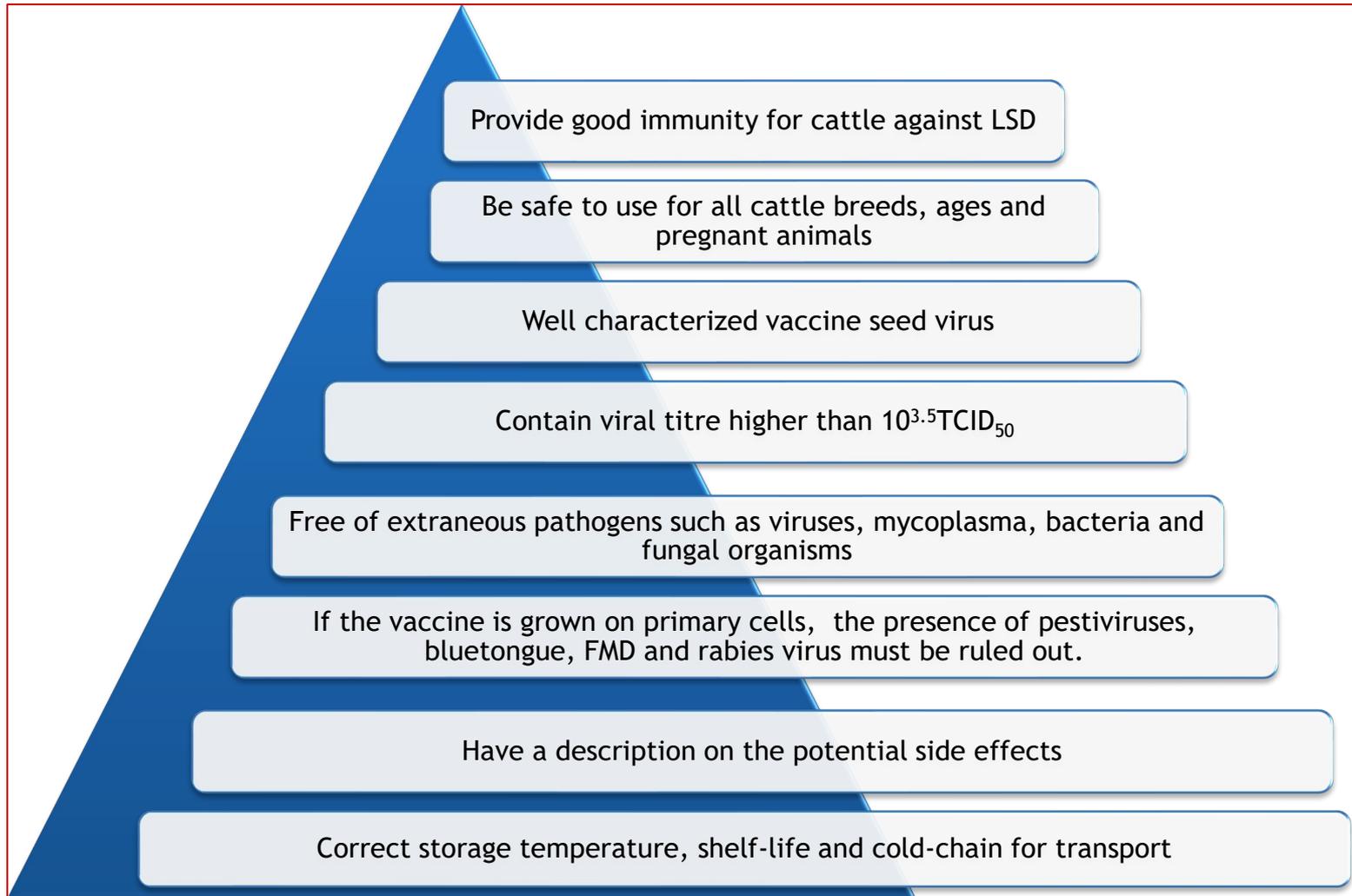
Prepare a tentative vaccination plan: what vaccine to use, where it can be bought, time for tendering, delivery and storage of vaccines and implementation of vaccination campaign

Laboratory testing: validated tests and estimated number of samples to be tested, equipment, identify the bottle necks

Vaccination

Vaccination of cattle plays a fundamental role for the control and eradication of LSD. To date, no country has been able to eradicate LSD without vaccination.

Technical requirements for a vaccine against LSD



Commercially available vaccines against LSD



Only live attenuated vaccines are currently available for LSD



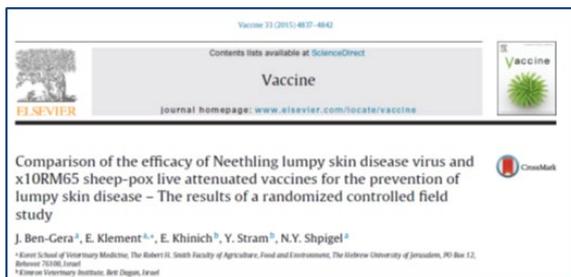
Both homologous and heterologous vaccines are used against LSD



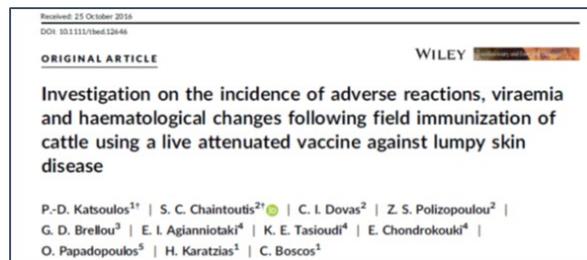
No 'Differentiating Infected from Vaccinated Animals' (DIVA) vaccine

Experiences on the use of the homologous vaccines in the Balkans

- With a high vaccination coverage (>80%) the Balkan LSD outbreaks were controlled within one to three months, depending on how fast the vaccinations campaigns were completed
- Stamping out policies varied from total to none
- Local reaction at the vaccination site, in some cases generalized skin lesions, so-called “Neethling disease” or a short drop in milk production



<https://doi.org/10.1016/j.vaccine.2015.07.071>



<https://doi.org/10.1111/tbed.12646>



DOI: 10.1016/j.prevetmed.2018.12.006

Heterologous vaccines against LSDV

- These vaccines contain either attenuated sheeppox virus (SPPV) or goatpox virus (GTPV).
- SPPV and GTPV vaccines are cheaper than LSDV vaccines.

- Vaccine product should be well characterized (identity check, titre).
- Protection against LSD should be evaluated using a vaccine challenge trial.



Inactivated vaccines against LSD

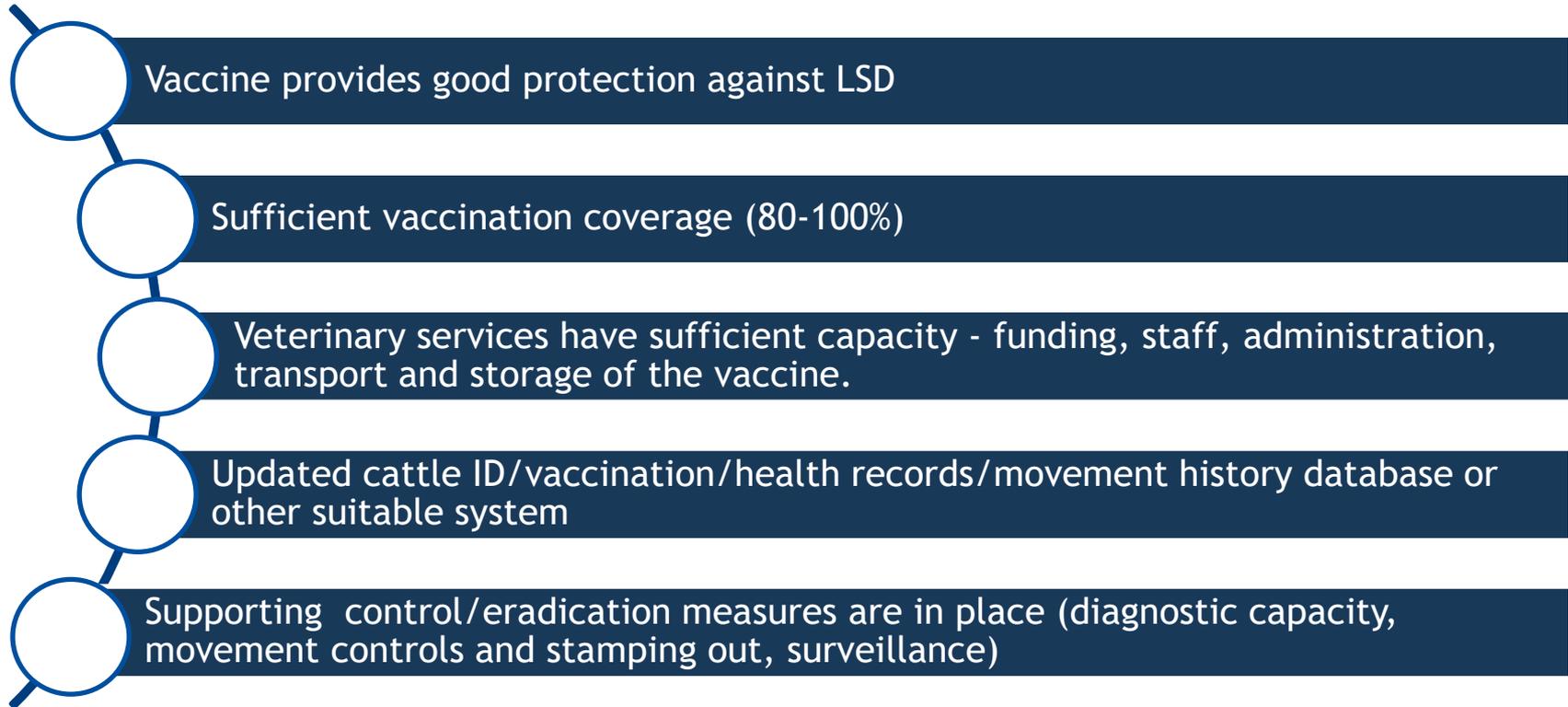
- Likely to enter the markets shortly.
- Vaccination strategy differs - two vaccinations one month apart initially and then a booster every six months
- Safe to use also in disease-free countries.
- Could be advantageous
 - If cattle are to be imported from disease-free countries into an infected region - animals could be protected by a killed vaccine and on arrival revaccinated with a live vaccine.
 - As a part of the eradication programme.
 - In disease-free but at-risk regions



Vaccination protocol and policy



Cornerstones of a successful vaccination campaign



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 (EFSA 2018).

Vaccination protocol

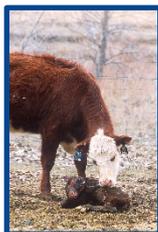
Cattle already showing clinical signs should not be vaccinated with a live vaccine.



Adults - annual vaccination



Calves from unvaccinated dams - can be vaccinated at any age



Calves from vaccinated or naturally infected mothers - at the age of 3 to 4 months



Unvaccinated cattle to be moved -
Vaccinate 28 days before the transport



Domestic buffaloes - same dosage and protocol as for bovines



Newly purchased animals -
Vaccinate 28 days before introduction to the herd

Vaccination of breeding animals



- Pregnant, healthy cows/heifers - can be safely vaccinated.
- Breeding bulls - vaccinated bulls did not excrete vaccine virus into semen and after challenged with a field virus, vaccination prevented the excretion of the challenge virus to the semen (Osuagwuh et al, 2007) - the experiment comprised only six bulls which may be an insufficient number to draw any final conclusions.

Available online at www.sciencedirect.com

 ELSEVIER

 ScienceDirect

Vaccine 25 (2007) 2238–2243

 vaccine

www.elsevier.com/locate/vaccine

Absence of lumpy skin disease virus in semen of vaccinated bulls following vaccination and subsequent experimental infection

U.I. Osuagwuh^a, V. Bagla^b, E.H. Venter^b, C.H. Annandale^a, P.C. Irons^{a,*}



Vaccine side effects caused by homologous vaccines

- Small local reaction at the vaccination site is acceptable
- Short fever peak and temporary drop in milk production.
- Generalized skin reaction, so-called “Neethling disease” - Appearance of generalized small skin lesions within two weeks after vaccination. These lesions disappear within 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.

LSD vaccine causes no side-effects if cattle are previously vaccinated with a SPP/GTP vaccine.

“Neethling disease” - Small-sized (<0.5 cm) cutaneous lumps were developed between days 8-18 p.v. at 9% of the vaccinated animals (19/215) (Katsoulos et al 2018).

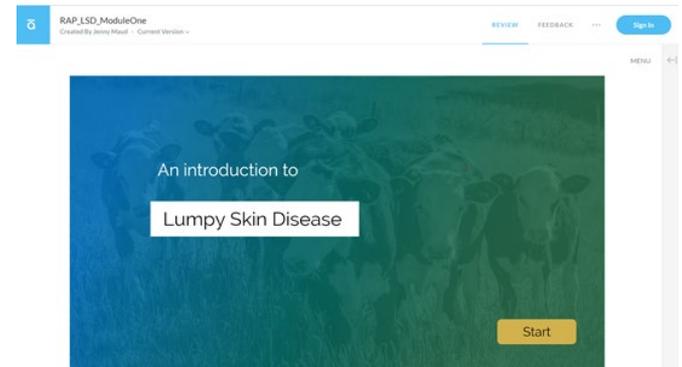
Can live attenuated vaccine regain its virulence?

- Europe 2016-2020: Three live attenuated LSD vaccines were used against LSD virus and no regaining of the virulence or recombination with the field virus have been reported.
- Croatian scientists - After a passage of the vaccine virus in cattle, the genome of the vaccine virus remained totally attenuated with 100% similarity to the original vaccine virus (Lojkić *et al.*, 2018).
- A recombination of the vaccine and field virus has been reported by Russian scientists (Sprygin *et al.* 2018). The most essential data pending - does the currently used vaccines provide protection against this recombinant?

NOTE: 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.

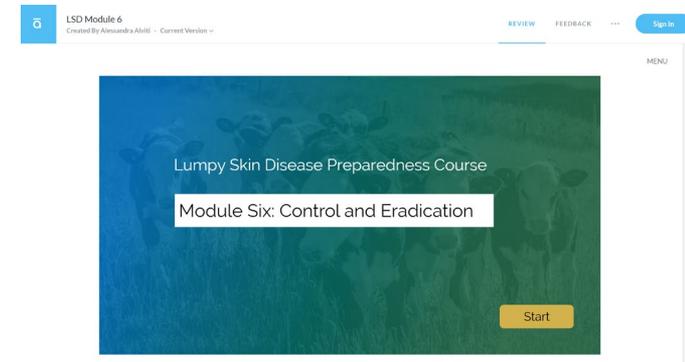
Virtual Learning - LSD Preparedness Course

- Organized by the **FAO** and the European Commission for the Control of Foot-and-Mouth Disease (**EuFMD**) under the umbrella of the Global Framework for the Progressive Control of Transboundary Animal Diseases (**GF-TADs**).
- Aims to provide with knowledge and skills required for designing of a science-based and feasible prevention, control and eradication programmes for LSD.
- Pilot course materials were developed by the FAO, EuFMD, the Friedrich-Loeffler-Institut (**FLI**) Germany experts assisted by other international LSD experts.
- The contents of the modules have been adjusted to different regions (Europe, Caucasus, Asia-Pacific, Africa).
- Asia-Pacific course starts on 7th Jan 2021



LSD Preparedness Course

- Two live webinars and six self-directed, very user-friendly interactive online modules
 - General overview - introductory module;
 - Clinical diagnosis;
 - Sampling and laboratory diagnosis;
 - Epidemiology and outbreak investigation;
 - Surveillance;
 - Control and eradication.
- Veterinarians, paraveterinarians, vet students
- 10-hour course, free of charge, certificate
- Additional strengths - throughout the course unique opportunity to discuss with highly experienced LSD experts and the modules have links to references and extra reading



Summary

- Regionally harmonized control and eradication of LSD (GF-TADs platform)
- If regaining LSD-free status is possible anymore, remains to be seen.
- Regional disease control is certainly possible and will allow safe trade and animal movements while respecting varying local circumstances in countries
- LSD and antimicrobial resistance (AMR) problem - It should be discussed if LSD would fit within the One Health concept because due to LSD outbreaks unnecessary use of antibiotics is likely to increase, with a risk of antibiotic residues ending up in human consumption in milk and meat.



Thank you for your attention!

Dr. Eeva Tuppurainen

Head of the Field Studies Group
Institute for International Animal Health/One Health

Friedrich-Loeffler-Institut
Bundesforschungsinstitut für Tiergesundheit
Federal Research Institute for Animal Health
Südufer 10 | 17493 Greifswald - Insel Riems
Tel: +49 38351 7 4992 | Fax: +49 38351 7 1226
<https://www.fli.de/>

eeva.tuppurainen@fli.de

