Vaccination against Lumpy skin disease virus

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Why to vaccinate?

- Feasible control varies between geographical regions and farming practices – North versus South
- In the field the first cases of LSD are not detected early enough for a stamping-out policy to be effective as a sole control measure
- Skin lesions contain such a high titres of virus that vectors get swiftly contaminated and start to transmit the disease
- Time window between infection and viraemia (1 to 5 days) during which there is no way to detect infected animals
- Early stages and mild cases difficult to recognize even for the most experienced vets
- Outbreaks are likely to start again in spring time - Skin lesions are well hidden under a long winter coat
- Free-ranging beef cattle versus dairy cattle
- Consequently a sufficient herd immunity needs to be in place!

Harmonized regional vaccination campaigns provide best protection

- Struggle to control cattle movements - Unauthorized cattle movements occur within affected countries and across the borders
- Farmers may own grazing lands and families are divided on the both sides of the borders and price of cattle determinates the direction of transboundary movements
- Transhumance and nomadic farming practices are difficult to suddenly halt and if prevented is likely to become swiftly an animal welfare issue
- High cattle density in the village and communal grazing limit the efficacy of the short distance movement restrictions due to vector transmission
- Cattle ID and vaccination record databases throughout the region are not yet leak-proof

Where to vaccinate

- In case a country is divided into vaccinated and non-vaccinated zones
- Regional vaccination should be preferred to ring-vaccination
- Limits of the vaccinated zones should be based on epidemiological and geographical parameters rather than the classical radius shape.
- Vaccinate around infected farms and the holdings around slaughterhouses and temporary slaughter plants, animal markets and cattle collection and resting places
- Protection and surveillance zones with radius (>50 km of diameter) appropriate for a vector-borne disease

Live versus inactivated pox vaccines

- Only live vaccines currently available against LSDV – all of them require authorisation by the local authority for use in cattle
- Inactivated vaccine in the pipeline
- No DIVA vaccines – serology is of no use in surveillance in vaccinated population
- A live pox vaccine generates more broad protective immunity than an inactivated one
- However, inactivated vaccines could be used for cattle imported from disease-free regions
- Vaccination with inactivated vaccine in a disease-free country of origin

Choosing a vaccine against LSDV

- Live homologous (attenuated LSDV containing) vaccines are known to provide good protection in cattle in case
- Protection provided by non-homologue (SPPV against LSDV) vaccines needs to be demonstrated
- SPPV/GTPV vaccines may be used for cattle against LSDV if combined with sufficient vaccination coverage (100%) and other appropriate control measures are in place
- **Importantly** only a vaccine with demonstrated efficacy should be used – vaccine challenge experiment has been carried out at CODA CERVA, including all commercially available vaccines against LSD
- SPPV/GTPV vaccine in regions where SPP and GTP are endemic

Two equally effective live attenuated LSDV vaccines

- LSDV containing vaccines:
  - LSDV Neethling strain by Onderstepoort Biological Products (OBP)
  - Attenuated LSDV field strain by MSD Animal Health
- Onset of vaccination campaigns may be delayed because
  - A tendering process prior to purchase of vaccine -Price varies (approximately € 1.4-1.8) according to ordered amounts
  - Delays by the manufacturers
- Feasible package size to suit the numbers of vaccinated animals to avoid waste of vaccines
  - OBP vaccine 25 and 50 doses vials
  - MSD Lumpyvax 10 and 100 doses vials
- Are the vaccines produced according to Good Manufacturing Process (GMP) standards?

Sheeppox and goatpox vaccines against LSD

- Gorgan goatpox vaccine (Lumpyshield, Jovac, Jordan) has been demonstrated to provide good protection against LSDV
- Sheeppox virus (SPPV) vaccines against LSDV:
  - Yugoslavian RM65 SPPV vaccine (at a 10 times stronger dose than used for sheep) is commonly used for cattle in the Middle East
  - Romanian SPPV vaccine for cattle in Egypt
  - Bakirköy SPPV (3 or 10 times the sheep dose) used in cattle in Turkey and in some northern Caucasus countries

LumpyShield®
Freeze dried live attenuated Capripox Virus strain Gorgan Vaccine
Protection With No Clinical Reactions

Newest vaccine – Lumpyshield (Attenuated Gorgan Goatpox strain)

- A commercially available GTPV vaccine, same strength for cattle and goats
- Good protection in cattle against highly virulent Ethiopian LSD field strain (Gari et al 2015)
- Efficacy has been evaluated by scientist at Coda Cerva – publication is ongoing
- Ideal product for those regions where both LSD and GTP coexist
- Practically no side effects in cattle
- One vaccine for both cattle and goats – reduces the price
- Price (enquiry 24/2/2017) 1US $/dose
- Why GTPV provides better protection against LSD than SPPV– likely be genetic

Vaccination strategy

- LSDV is stable and survives well in the environment – freezing winter temperatures below zero Celsius degree do **not** disinfect the country from LSDV
- Annual vaccinations
- Vaccination coverage needs to be kept at 100%
- New animals should be immunized before introduction to affected farms
- Calves from vaccinated/naturally infected mothers should be immunized at the age of 3 to 4 months – individually or during next round of vaccinations
- Calves from naïve mother can be vaccinated at any age
- Domestic buffaloes should be vaccinated

Vaccination of breeding animals

- Pregnant cows can be vaccinated
- Vaccinated bulls did not excrete vaccine virus into semen
- After a challenge with a virulent field virus vaccination prevented the excretion of the field virus to the semen

ELSEVIER
Available online at www.sciencedirect.com
ScienceDirect
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,*]

Adverse reactions

- Local reaction at the vaccination site should be accepted
- Attenuated LSDV vaccines cause a general reaction in a minority of vaccinated animals (Neethling disease)
- Attenuated SPPV and GTPV vaccines only rarely cause adverse reactions
- Adverse reactions caused by two LSD vaccines could be investigated in Croatia (no interference by the field strain)



Why clinical signs are often detected in vaccinated animals?

- Vaccination campaigns are started when the disease is already circulating in the country/territory
- Development of protection takes ~ three weeks during which time animals still may get infected by the field virus
- Insufficient vaccination coverage –pockets with unvaccinated animals left within vaccinated zones
- "Missing" of some animals during mass vaccination, particularly with free-ranging beef cattle
- Failure of the vaccine virus to protect or over-attenuated vaccine - Inappropriate storage or a failure of the cold-chain, exposure to direct sunlight
- Poorly administrated vaccine or an incorrect dosage (mass vaccinations, free-ranging beef cattle not used to handling)
- Interfering maternal antibodies in calves less than three to four months of age
- Needles not changed between animals - contaminated needles or diluents

Success of the vaccination campaign depends on

- Efficacy of the vaccine product and sufficient vaccination coverage (80-100%)
- Capacities of veterinary services to carry out vaccination campaign
- **Electronic database including cattle ID/ vaccination/health records/ cattle movement history**
- The other supporting control/eradication measures and surveillance programmes
- Control of cattle trade and movements
- Stamping-out policy in place
- Diagnostic capacity of national reference laboratory to investigate adverse reactions




Remaining questions

- Are annual vaccinations really required? Would vaccination every second year be sufficient?
- Can LSDV vaccine be administrated simultaneously with the other obligatory vaccines
- Does vaccination with attenuated LSDV interfere other cattle testing regimes (such as intradermal tuberculin testing)
- What would ideal timing to vaccinate those calves that born after the vaccination campaign – once a year campaign or individually when coming to age of 3 to 4 months

Thank you for your attention!

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