Food and Agriculture Organization of the United Nations

Vaccination against Lumpy skin disease virus

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Vaccination of the whole cattle population is strongly recommended 2

- In the real life, the first cases of LSD are never detected early enough for a stamping-out policy to be effective as a sole control measure
  - ✓ Farmers and cattle herders may not recognize the disease
  - ✓ Early stages and mild cases difficult to recognize, except in dairy cattle sharp drop in milk yield is noticed but may not be associated with LSD
  - ✓ Free-ranging beef cattle may conceal the infection for long until noticed particularly in the spring time, skin lesions may be well hidden under a long winter coat
  - ✓ Skin lesions contain such a high concentrations of virus that biting and blood-feeding vectors get swiftly contaminated and start to transmit the disease
  - ✓ Efficacy of movement restrictions is reduced as there is one to five days time window between infection and viraemia during which time there is practically no way to detect infected animal

Harmonized regional vaccination campaign provides best protection

- Challenging to effectively control cattle movements - Unauthorized cattle movements occur both within affected countries and across the borders
- Farmers may own grazing lands and families are divided on the both sides of the borders
- Transhumance and nomadic farming practices are difficult to suddenly halt and if prevented is likely to become swiftly an animal welfare issue
- Price of live cattle determines the direction of the movements
- Efficacy of the short distance movement restrictions is limited due to vector transmission, high cattle density in the village and communal grazing
- Cattle ID and vaccination record databases throughout the region are not yet perfect but could be easily updated during the vaccination campaign

Where to vaccinate – whole country or specific zones?

- Division to vaccinated and non-vaccinated zones requires updated cattle ID system, strict movement restrictions and control
- 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

Choosing a right vaccine product

- Live homologous (attenuated LSDV containing) vaccines are known to provide good protection in cattle
- 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
- SPPV/GTPV vaccines can be used in those regions where LSD, SPP and GTP overlap
- Usually a tendering prior to purchase of vaccine is required
- Price of LSDV vaccines approximately € 1.4-1.8, Lumpyshield $ 1 and sheeppox vaccines considerably cheaper)

Two equally effective live attenuated LSDV vaccines

- Both are widely used by affected countries
- There is practically no difference between these two products in efficacy or adverse reactions

- Both contain LSDV
  - LSDV Neethling strain by Onderstepoort Biological Products (OBP)
  - Attenuated LSDV field strain by MSD Animal Health
- The size of the package matters as opened and reconstituted vaccine bottle must be used within the same day
  - 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?

A new LSD vaccine produced by M.C.I. Santé

- Neethling strain LSDV vaccine
- Molecular characterization, challenge and safety trials carried our by the manufacturer
- As such a new vaccine it was not included in the challenge experiment carried out at Coda Cerva
- No field data is available on the occurrence of adverse effects in vaccinated animals compared to two other LSDV vaccines
- According to the manufacturer the price is in line with the SA vaccines
- Clear benefit - Produced according to GMP requirements
- Presented in 10 or 25 dosage vials

M.C.I. Santé Animale

BOVIVAX LSD
Vaccin lyophilisé à virus vivant atténué contre la Dermatose Nodulaire Contagieuse des bovins

Sheeppox vaccines against LSD

- 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
  - Russian vaccine?
- Lower price
- Vaccine efficacy is not as good as for LSD or Gorgan goatpox vaccines
- Can be used efficacy demonstrated using a challenge experiment

Attenuated Gorgan Goatpox strain

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- A commercially available vaccine for cattle against LSD
- Contains goatpox virus using the 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
- Ideal product for those regions where both LSD and GTP coexist
- Benefits:
  - Practically no side effects in cattle
  - One vaccine for both cattle and goats – reduces the price
  - Price (enquiry 24/2/2017) 1US $/dose

Vaccination strategy in a nutshell

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- LSDV is stable and survives well in the environment – it may be that vaccination need to be continued for years to come
- 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 using the cattle dose
- Vaccination 28 days before movement of live animals (seasonal grazing)

Vaccination of breeding animals

- Vaccination doesn't affect reproduction
- 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
- Vaccination doesn't affect artificial insemination

Vaccine adverse reactions

- In 2016 Croatia (free of disease) vaccinated naïve cattle population – reactions were detected only in 0.09% of vaccinated animals (EFSA, Scientific report March 2017)
  - within two weeks after vaccination
  - fever, local swelling at vaccination site and temporary drop in the milk yield
- Local reaction at the vaccination site should be accepted
- Attenuated LSDV vaccines may rarely cause a general reaction in vaccinated animals (Neethling disease) - May differ between different vaccine products depending on the level of attenuation of the vaccine virus!
- Attenuated SPPV and GTPV vaccines only rarely cause adverse reactions in cattle
- Revaccinations in 2017 are not likely to cause adverse reactions

Adverse effects by live LSDV vaccine

Why clinical signs are often detected in vaccinated animals?

- LSD is already circulating - Animals get infected by the field virus before fully protected by the vaccine
- Insufficient vaccination coverage and unvaccinated animals left within the vaccinated zones
- Vaccine product itself
  - Differences in the level of attenuation of different products (live pox vaccines)
  - Over-attenuated vaccine doesn't protect
  - Under-attenuated vaccine still causing clinical signs in cattle
  - Production failure such as low titre of the vaccine virus, not characterized seed virus, contamination, cold-chain failure during storage or transport , exposure to direct sunlight, best-by-date expired
  - Vaccines obtained from black markets by farmers
- Poor administration of the vaccine or an incorrect dosage
- Interfering maternal antibodies in calves originating from vaccinated or naturally infected mothers
- Contaminated needles or diluents – vaccinated animal gets a mixture of field and vaccine strains

Cornerstones of successful vaccination campaign

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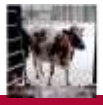
- Good efficacy of the vaccine product and sufficient vaccination coverage (80-100%)
- Sufficient capacities of veterinary services to carry out vaccination campaign – good effectiveness of the vaccination campaign
- Electronic database including cattle ID/ vaccination/health records/ cattle movement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

Reducing the costs of vaccination campaigns

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- How many years we need to vaccinate?
  - LSD situation in the neighbouring countries
  - Immune status of the cattle population in the country
  - Control of national and international cattle movements
- Are annual vaccinations really required? Could every second year vaccinations considered – with only new calves immunized?
- Can LSD vaccination campaign be combined with other obligatory vaccination schemes?
- Can LSD vaccination be combined with other disease surveillance testing regimes
  - Tuberculosis – LSD vaccination should be scheduled after TB ID testing – maybe on the second visit when TB results are read
  - Brucellosis surveillance - yes

Thank you for your attention! Questions warmly welcome!

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