LUMPY SKIN DISEASE – epidemiology and vaccines

Dr Eeva Tuppurainen, DVM, MSc, MRCVS

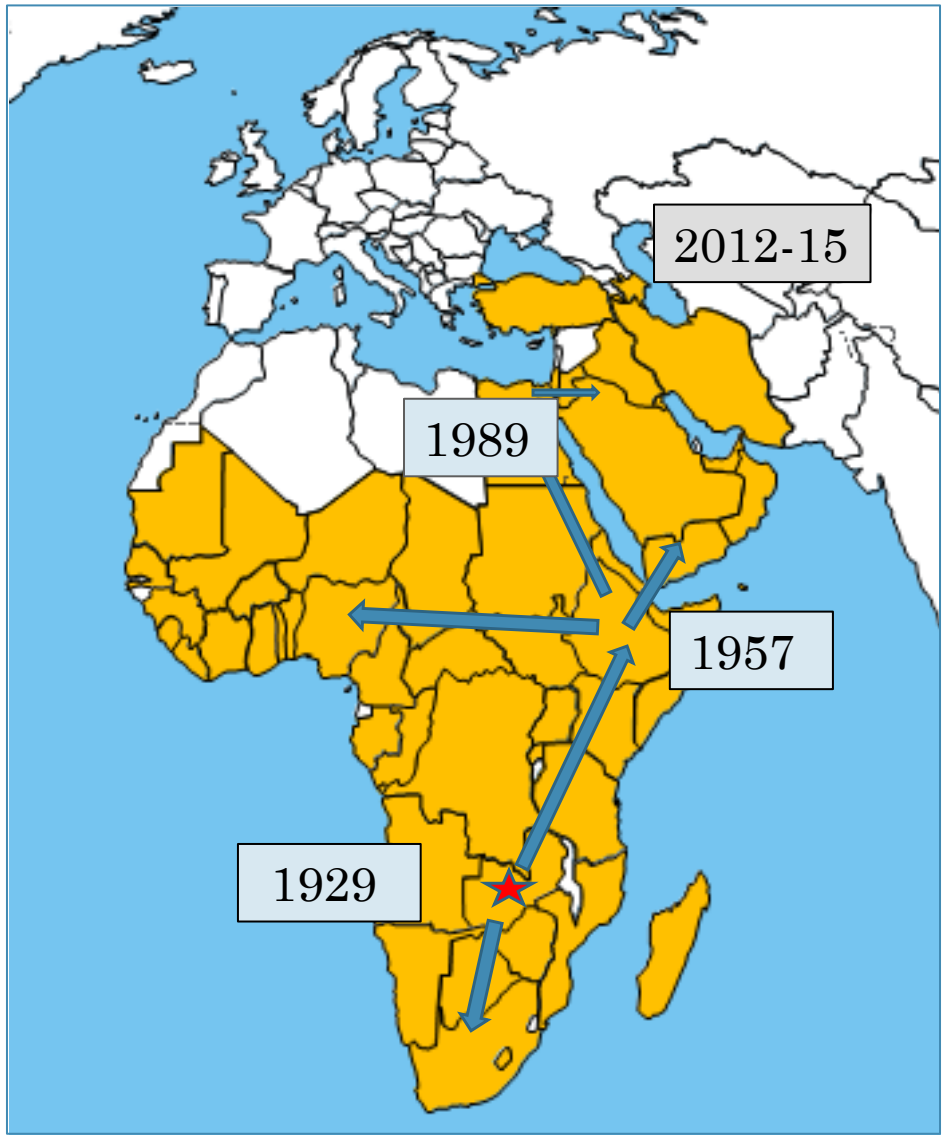
Introduction

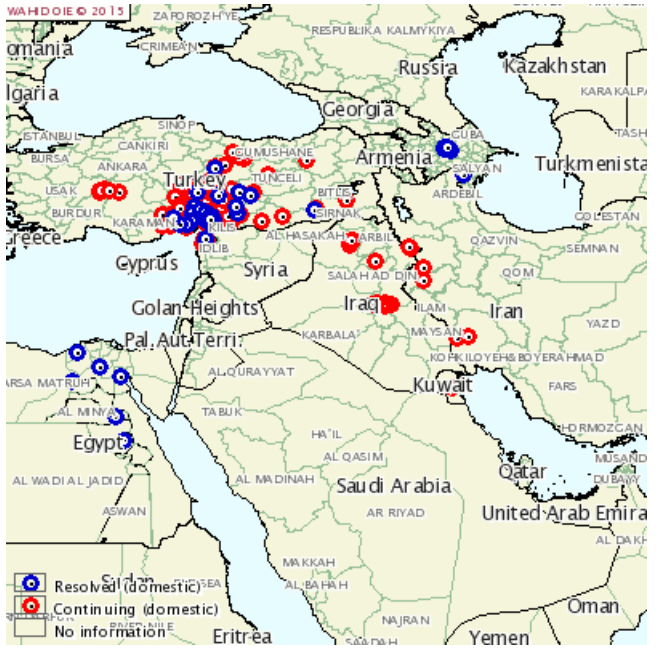
- Lumpy skin disease virus (LSDV) (*Capripoxvirus* genus, *Poxviridae*-family)
- Categorised as a notifiable disease by the OIE
  - international trade standards in Terrestrial Code (Chapter 11.12)
  - recommendations for diagnostic test and vaccines in the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Chapter 2.4.14)
- EU directives regulate
  - notification of the disease 82/894/EEC of 21 Dec 1982
  - control and eradication measures 92/119/EEC of 17 Dec 1992
  - intra-community trade in live animals and their products 90/425/EEC of 26 Jun 1990
- Until recently, one of the neglected diseases with restricted funding available – little research data available and a lot of scope for new research

Clinical signs of LSD are highly characteristic

- Circular skin lesions of 1 to 5 cm in diameter
- High fever
- Enlarged lymph nodes (particularly prescapular and precrural)
- Excessive salivation, eye and nasal discharge
- Lesions in the oral, nasal and ocular mucous membranes
- In one to two weeks the top of the lesion forms a scab which then sloughs off, leaving a raw ulcer, sometimes lesions remain for long (sitfasts)
- Swellings in the leg and lameness
- Oedema of the dewlap

Spread of LSDV





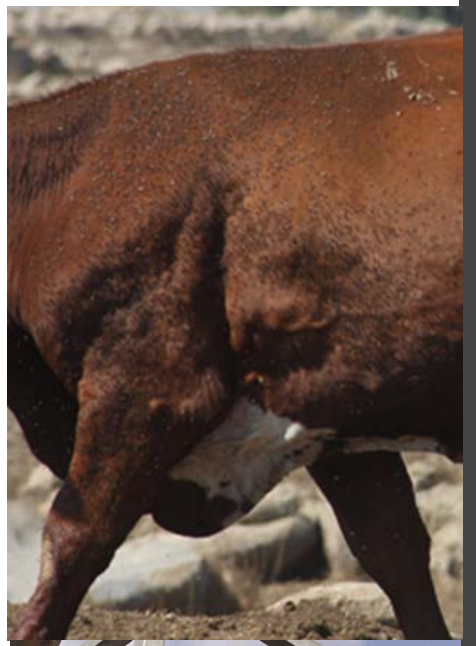
Map Outbreaks of Lumpy Skin Disease in Turkey as recorded in the ADNS system between 1 Jan 2014
10 km zones around them.

Epidemiology of LSDV

- LSDV infects mainly domestic cattle and Asian water buffaloes but presence of the virus has been confirmed in springbok, impala and giraffe showing clinical LSD, African buffaloes have been found to be seropositive
- Morbidity rate (calculated by monitoring clinical signs) varies between 5-45% and mortality is usually <10%
- Outbreaks may occur at anytime but are more common during warm and wet season, with high levels of arthropod activity
- After recovery, infected animals do not become carriers of the virus

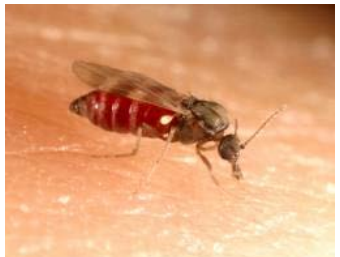
Modes of transmission

- Mechanical transmission by a wide variety of blood-feeding vectors (insects and ticks)
- Most important vector is likely to vary between different affected regions, depending on climate, season, temperature, humidity and vegetation
- By contaminated feed or water (common drinking troughs)
- Seminal transmission via natural mating or artificial insemination
- Trans-placental transmission
- Iatrogenic transmission: by contaminated needles during veterinary treatments or vaccination campaigns
- Is direct contact as ineffective as claimed??? Requires further investigations



Mechanical transmission by blood-feeding insects and ticks

- *Aedes aegypti* mosquito, stable fly *(Stomoxys calcitrans)*
- *Rhipicephalus* (and *Amblyomma*) male ticks
- Horn flies, horse flies, midges, others?
- Key questions: How long does the virus remain infective in arthropod mouthparts and can insect or ticks be biological vectors?
- Experimentally *Rhipicephalus (Boophilus) decoloratus* was able to transmit the virus via eggs to larvae which infected susceptible animal – doesn't mean that virus necessarily multiplies in ticks - contamination of the environment may occur
- Birds?



Epidemiological observations

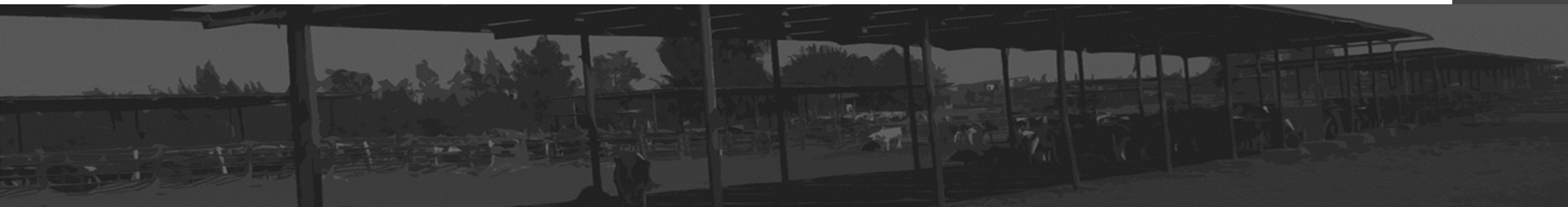
- In experimentally infected cattle only 50% are likely to show clinical disease although all animals become viraemic
- Viraemic cattle have been shown to mechanically transmit the disease via tick vectors
- In infected herds, the number of animals capable for transmitting the disease via arthropod vectors, is likely to be much more than those animals showing skin lesions
- Culling of only animals with skin lesions is not likely to effectively control the spread of the disease – should be combined with vaccination

LSD in Central and Southern Africa

- Typically LSD epidemics occur periodically with several quiescent years between –where does the virus survive between the outbreaks
- Likely to be associated with the building up of sufficient numbers of susceptible cattle
- Infected farms are often in widely scattered locations without known direct contact
- Index case can usually be linked with introduction of infected animal(s) into a naïve herd or near vicinity
- Close contact between cattle such as communal grazing and watering points, cattle markets, quarantine/slaughtering stations – a known risk factor
- Epidemiological circumstances are not identical in Africa and the Middle East region due to the differences in farming practises, climate, vegetation and presence of different vector species

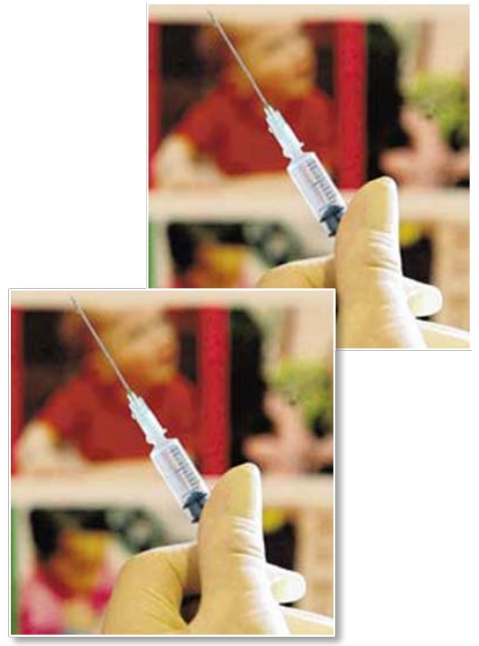
Currently available vaccines against LSDV

- Lumpy Skin Disease Vaccine by Onderstepoort Biological Products, SA (LSDV Neethling strain)
- Lumpyvax – Merck, Intervet, SA (attenuated LSDV field strain)
- Herbivac LS – Deltamune, SA (LSDV Neethling strain)
- Yugoslavian SPPV RM-65 (Jovac/Jordan, Abic/Israel) (10 x sheep dose)
- Bakirköy SPPV strain (in Turkey, 3 to 4 x sheep dose)
- Romanian SPPV strain
- KSGP O-240 and O-180 strains have been characterized as LSDV – these vaccines are not recommended for cattle against LSDV until safety and efficacy have been tested using challenge experiments



Successful LSD vaccination campaign

- Large scale annual vaccinations, homologous vaccine is preferred
- Ring-vaccination (radius 25-50 km) around infected zones and open temporary or permanent slaughter plants
- Sufficient herd immunity (80% coverage) needs to be created and maintained in large areas around infected zone and on the border lines
- Affordable/subsidized particularly for small-scale farmers and cattle owners, practising nomadic/transhumance farming
- In a face of an outbreak also pregnant animals should be vaccinated
- Calves from vaccinated cows: at the age of 4 to 6 months and from non-vaccinated cows as soon as possible



Efficacy of the currently available live vaccines

- In general, good protection in case a homologous vaccine is used
- SPPV/GTPV vaccines can be used with sufficient vaccination coverage (80-90%)
- Total protection is not provided for each individual
- Quality of different vaccines varies a lot and live vaccine is not stable in direct sunlight
- In late spring the efficacy of RM65 and Bakirköy SPP vaccines against LSDV will be evaluated by challenge experiments at the Coda Cerva
- Recently Ethiopian scientists (Gari *et. al.* Vaccine, in print) were able to demonstrate that Gorgan goatpox vaccine (Caprivac by Jovac) protected cattle against LSDV- the result will be further confirmed by the Coda-Cerva

Safety of the live vaccines

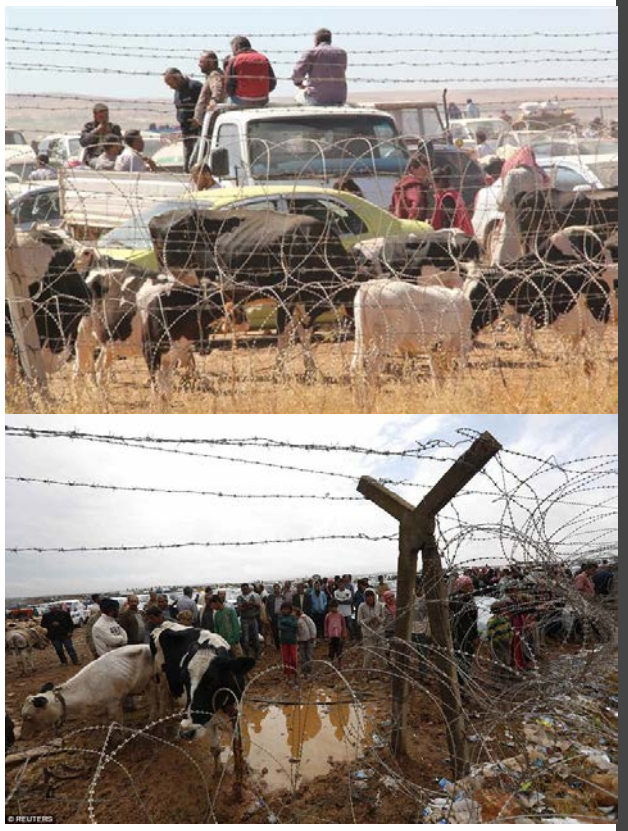
- Adverse reactions common after vaccination with live attenuated LSDV vaccines
- Local reaction at the vaccination site should be accepted
- Fever and temporary drop in milk yield
- Some animals (<10%) may show mild generalized disease
- SPPV vaccines rarely cause adverse reaction in cattle
- Cattle vaccinated with SPPV and then booster with LSDV vaccine show less severe reaction against the LSDV vaccine

Correct handling of the vaccine

- Live vaccine require maintenance of the cold-chain
- Keep the vaccine out of sun
- Opened bottles must be used within 6 hours and then discarded (without exception)
- Needle should be changed between animals (if possible)
- Farmers should be informed about adverse reactions and advised that black market vaccines may not be safe nor provide sufficient protection

Regional elimination of LSD

- Collapsed veterinary infrastructure at the war zones combined with a lack of medicines and vaccines, creates ideal setting for spreading of infectious diseases, affecting humans and animals
- The control of movements of refugees with unvaccinated cattle is impossible/a challenge
- Huge number of refugees put the neighbouring countries under intense economic pressure
- Although strict border control would hold, potentially infected animals left behind the border fences, serve as a source of infection by vectors, although just waiting for slaughter
- Regional elimination of LSDV is certainly possible but requires enforced efforts to set up trans-regional elimination programme, lead by the international organizations, strong commitment by the local governments and availability of sufficient funding



Thank you for your attention!

Dr Eeva Tuppurainen, DVM, MSc, MRCVS

tuppurainene@gmail.com

Tel +44 79 63828625