Vaccination against Bluetongue

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- Introduction
- Desired characteristics of BT vaccines
- BT Vaccines
  - Live attenuated
  - Inactivated
  - Experimental
- Field experiences
- Control of BT outbreak using vaccination
- Legal aspects of vaccines and vaccination
- Conclusions
Intro: Lifecycle of BTV

Transmission

BTV replication in Culicoides spp.

BTV replication in ruminants

Intro: Bluetongue virus
Desired characteristics of BT vaccines

- Should be effective against the relevant circulating serotype
- Allow animal movement of vaccinated animals out of the infected area
- Safe
- Prevention/reduction of clinical signs in cattle/goats
- Prevention/reduction of transmission
  - Reduce vireamia in target animal

BT vaccines: Live attenuated vaccines

Advantages
- Availability of vaccines against almost all serotypes (incl BTV-8)
- Long lasting protection after single shot vaccination
- Relatively cheap to produce in large quantities

Disadvantages
- Prolonged vireamia and spread of vaccine virus
- Mild clinical disease and risk of abortion
- Under attenuation (did lead to clinical signs after vaccination in Corsica & Sardegna (BTV-16))
- Reversion to virulence
- Possible reassortment with wild type BTV
- Currently no vaccines which are authorized in the EU or which are produced under GMP
BT vaccines: Live attenuated vaccines

- Data package to support marketing authorization of attenuated live vaccines is lacking
- Role of the vector in reversion to virulence and reassortment is unknown (tests to predict this are not available)
- Widespread experience with live vaccines in South Africa and some in Southern Europe. (Onderstepoort vaccines)
- Vaccination campaigns in the Balearic islands (2001 & 2003) are considered successful, have contributed to eradication

BT vaccines: Inactivated (whole virus) vaccines

- Advantages
  - Safe
  - Can be used in periods of high vector activity
  - Reduces viraemia

- Disadvantages
  - Only available for serotypes 2, 4
  - Booster injection needed
  - Shorter duration of immunity
  - No DIVA
### BT vaccines: Inactivated (whole virus) vaccines

- Inactivated vaccines have been used in vaccination campaigns (BTV-2 and BTV-4)
- Supportive experimental data on efficacy and safety is available for most vaccines
- Vaccines protect against clinical signs
- Reduction of viraemia has been demonstrated (cattle and goats)
- Field data are supportive for efficacy in reducing virus circulation but not inconclusive (Spain, Italy, France (Corsica), Portugal)

### BT vaccines: experimental vaccines

- **Virus Like Particles (VLP)**
  - Baculovirus constructs (serotypes 1, 2, 10, 13 and 17)
- **Live GMO vaccines**
  - Vaccinia virus expressing VP2 and VP5 (serotype 1)
  - Capripox virus expressing VP7 (potentially protecting against multiple serotypes)
  - Canarypox virus expressing VP2 and VP5 (BTV17)
- **Baculo expressed subunits VP2 and VP5 (BTV-10)** induce neutralizing antibodies
- Experimental vaccines have been described but so far are no serious candidates for vaccination campaigns.
- DIVA strategy possible
Control of BT outbreak using vaccination

- Vaccination against BT has to be approved by European commission
- Decision to vaccinate has to be supported by a risk benefit analysis

- Choice of vaccine
- Vaccination strategy depending on goal

Regulatory framework for emergency vaccines

- Preference to have emergency vaccines authorized at central European level (EMEA)
- In the April meeting CVMP has adopted:
  - reflection paper on “Minimum data requirements for an authorization under exceptional circumstances for vaccines for emergency against Bluetongue”
  - Concept paper on requirements for multi-strain dossiers sent out for consultation
- This will facilitate rapid development and approval of BT emergency vaccines for use in Europe
Legal aspects in relation to vaccines

- Vaccination against BT has to be approved by European commission (in principle there is a non vaccination policy)
- Few vaccines have been authorized (for use under exceptional circumstances) based on reduced data sets (France, Spain)
- Use of unauthorized vaccines can be allowed
  - Art 8 of Directive 2001/82/EC: if no alternative is available ie. for emergency vaccination

The need for authorised emergency vaccines

- FMD
- BTV
- AI
Multistrain dossier approach

- Restricted to epizootic diseases caused by highly antigenically variable viruses
  - Avian influenza (antigenic drift/shift)
  - Foot-and-Mouth Disease (quasispecies)
  - Bluetongue (multiple serotypes)
- Few vaccines currently authorised
- Multiple drivers for authorisation
  - National disease control authorities
  - Farmers
  - Consumers/Food chain
  - Food standards agencies

EFSA working group on Bluetongue

- will publish May 2007 a report to provide a scientific assessment:
  - update on development and experience of BT vaccine for different species (laboratory, field and future perspective)
  - of the vaccination against BTV serotypes that is carried out in MS and elsewhere
  - on the suitability of vaccination as the tool of choice to control BT of different serotypes and the most appropriate conditions for its use
  - on vaccination as an additional tool to facilitate trade of different ruminant species from BTV restricted zones under different conditions by different BTV serotypes, conditions for its use, and the waiting period after vaccination
**Conclusions**

- Vaccination is to be considered one of the tools to control BT outbreaks
- Vaccines work well to protect against or reduce clinical disease
- Use of currently available attenuated live vaccines is not recommended (safety)
- No inactivated BTV-8 vaccine available yet
- Regulatory framework for authorization of emergency vaccines is under development