

# Transmission of the virus (SBV)



**Stéphan Zientara**

UMR 1161 ANSES/INRA/ENVA

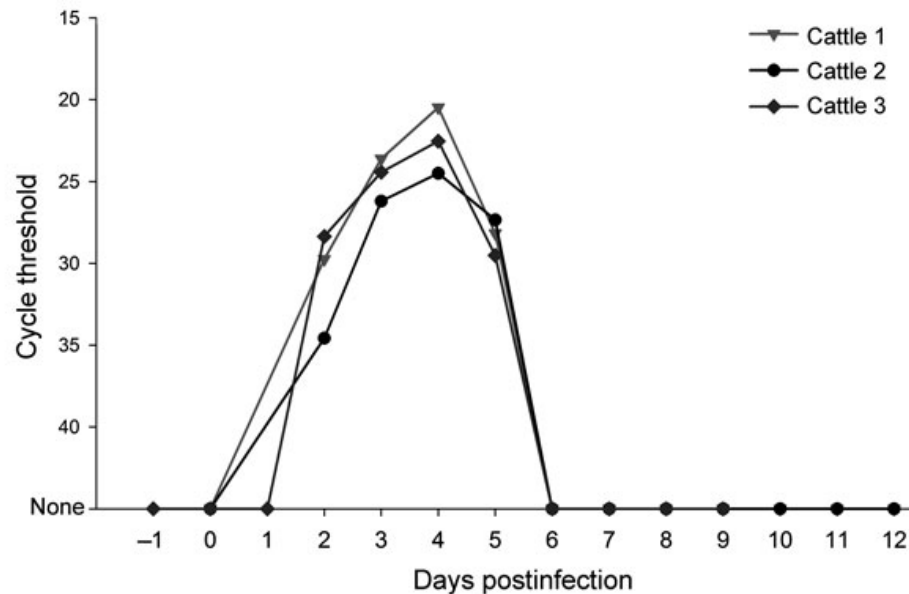
**April 2, 2012**



# Transmission routes

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- Direct transmission
- Vertical transmission
- Insect transmission



Detection of Schmallenberg virus genome in the blood of experimentally infected calves. The highest genome copy number was detected on postinoculation day 4.

BERND HOFFMANN<sup>1</sup>, MATTHIAS SCHEUCH<sup>1</sup>, DIRK HÖPER, RALF JUNGBLUT, MARK HOLSTEG, HORST SCHIRRMEIER, MICHAEL ESCHBAUMER, KATJA V. GOLLER, KERSTIN WERNIKE, MELINA FISCHER, ANGELE BREITHAUPT, THOMAS C. METTENLEITER, AND MARTIN BEER. 2012. Novel Orthobunyavirus in Cattle, Europe, 2011. *Emerg infectious Dis.* 18 (3), [http://wwwnc.cdc.gov/eid/article/18/3/11-1905\\_article.htm](http://wwwnc.cdc.gov/eid/article/18/3/11-1905_article.htm)

*Animal trial SBV: clinics*



**Martin Beer, FLI**

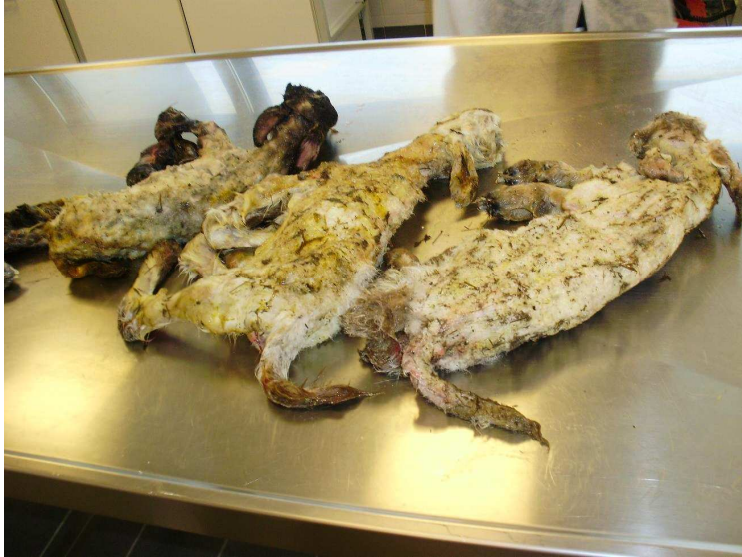
# Transmission routes

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- Vertical transmission
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# Clinical signs:



**First french outbreak of SBV in Moselle**

**general appearance:**

**Stiff neck**

**Arthrogryposis**

**“Shortening of tendon hocks”**

# Clinical signs:

sero-haemorrhagic liquid, abundant during decerebration



Haemorrhagic sinus

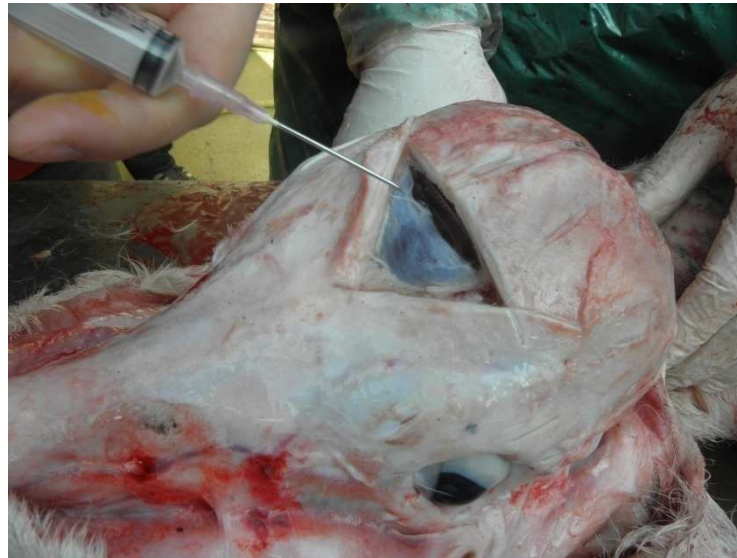


Head and jaw deformations



Sabine Pelzer  
Malzeville, France

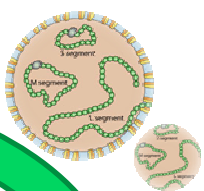
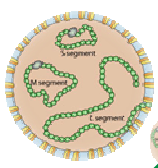




**Guillaume Belbis, ENVA**



**Culicoides spp.**



**Viremia 2-5 days**



± 150 days



± 150 days



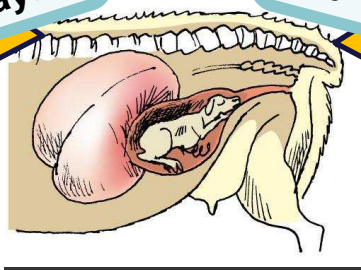
± 280 days



± 280 days

**Simbu 28-56 days**

**Simbu 80-150 days**



**NERVES**

**MUSCLES**



**CONGENITAL ABNORMALITIES**



<http://www.tierseucheninfo.niedersachsen.de>

## Cases with congenital defects:

### Positive samples are from:

- **CNS/Brain** (ct 14 to 39)
- **Blood** (some cases)
- Other organs
- (Meconium as alternative material)
- Amniotic fluid ! (low Ct-values)

Some animals are positive in blood samples  
(also Ct values below 30)

Relevance for transmission?



# Transmission routes



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- Direct transmission
- Vertical transmission
- Insect transmission

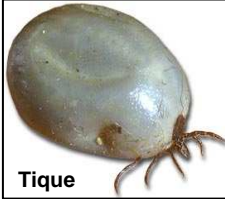



# Vectors of the *Bunyaviridae*




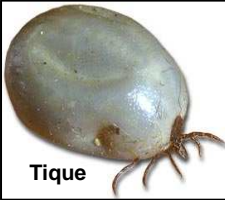
**Orthobunyavirus**

<b>Californie / Bunyamwera</b>	<b>Simbu</b>
 Aedes	




**Nairovirus**


 Tique	 Culicoïdes
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**Phlebovirus**



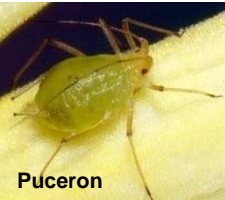
<b>Sandfly</b>	<b>Tick</b>
 Phlébotome  Culex  Aedes	 Tique

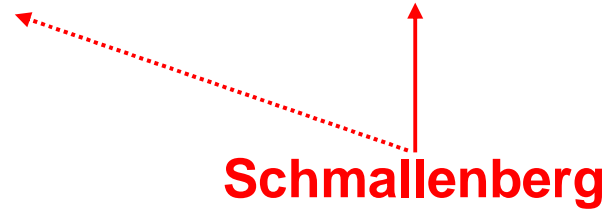
**Hantavirus**

<b>HFSR</b>	<b>HPS</b>
 Murinae	 Sigmondontinae  Campagnol



**Tospovirus**

 Thrips	 Thrips	 Puceron
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# Simbu serogroup viruses

## Entomology (culicoides)

- Shamonda

- Japan:
- Nigeria:

*C. spp (unspecified)*  
*C. imicola*

- Aino

- Japan

*C. oxystoma, C. punctatus*

- Akabane

- Oman, Israel, S.Africa:
- Zimbabwe :
- Australië
- Japan:

*C. imicola*  
*C. milnei*  
*C. brevitarsis, C. wadei*  
*C. oxystoma, C. arakawae, C. punctatus,*  
*C.sumatrae, C. Lunchiensis*



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#### Around the World

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*Culicoides obsoletus*

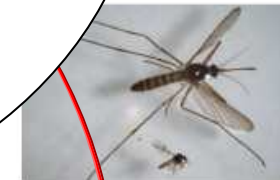
*Culicoides pulicaris*

*Culicoides dewulfi*

#### ANT

#### Schm

Researchers at the Institute of Tropical Medicine and the Belgian Veterinary and Agrochemical Research Center (ILVO) analyzed the heads of midges caught in September and October as part of a bluetongue surveillance project. (The researchers looked only at the heads because the virus must reach the salivary glands to be transmitted.) They detected the virus in *Culicoides obsoletus*, *C. dewulfi*, and *C. pulicaris*, three of the five species that have been shown to transmit bluetongue. The researchers say they are continuing their survey.



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**Tiny pest** A biting midge (bottom) is dwarfed by a mosquito.

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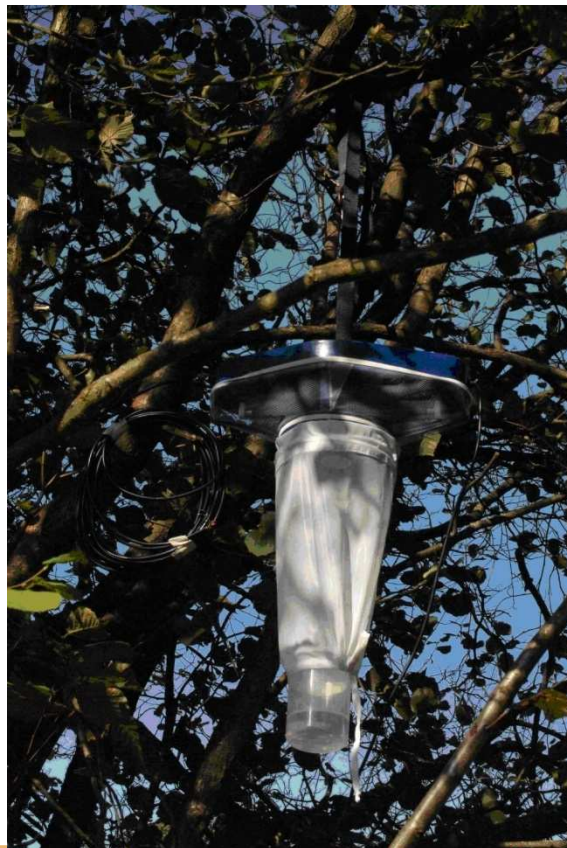


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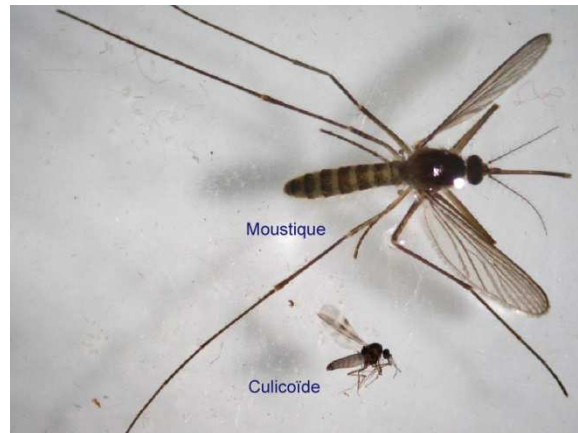




o In Belgium, *Culicoides* spp. have been monitored since 2007 through a surveillance program financed by the Belgian Federal Agency for the Safety of the Food Chain (FAVV-AFSCA).



- Midges captured by scientists of the Institute of Tropical Medicine (ITM, Antwerp) :
  - in September and October 2011 with an UV light trap
  - In Betekom (Province of Vlaams Brabant, Belgium)
  - Identified morphologically at species level
  - each identified morphologically at species level





# Trapping - Identification



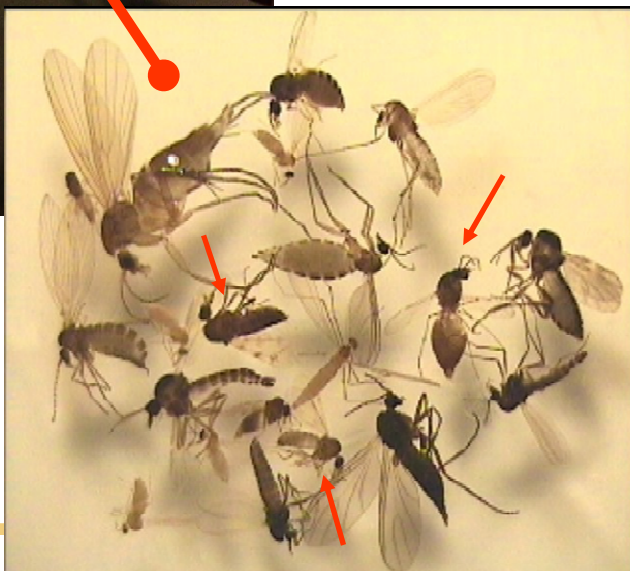




**Captures**



**screening and  
identification**



*Photos JC Delécolle (ULP)*

- 
- Pools of 10 heads of culicoides analysed by scientists of CODA-CERVA :
    - by RT-qPCRs detecting S and L segments of SBV according to protocols provided by FLI, Germany
    - Positive result of one pool consisting of *C. obsoletus* s.s. caught on 7 Sep 2011
    - Another positive pool consisted of *C. Dewulfi* caught on 4 Oct 2011
    - 2 positive pools of the 23 pools analysed

**B Cay, CODA-CERVA**

# Identification based on wing patterns

Reginald De Deken, Isra Deblauwe, Pieter Vantieghem, Maxime Madder, Dirk Geysen



*C. pulicaris*



*C. nubeculosus* or *riethi* (see scutellum)



*C. festivipennis*



*C. punctatus*



*C. obsoletus* or *scoticus* (see spermatheca)

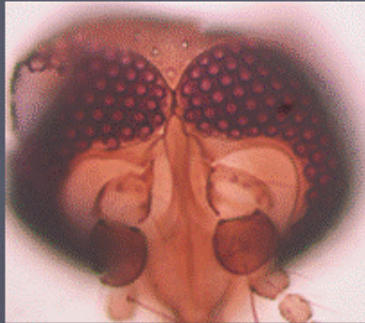


*C. achrayi* group



# Examples of identification problems

*C. obsoletus*



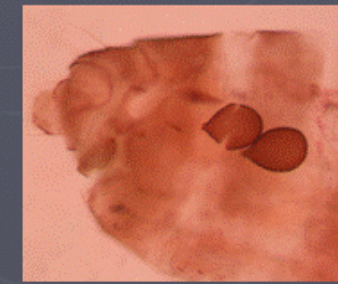
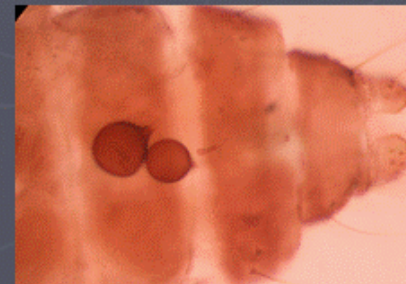
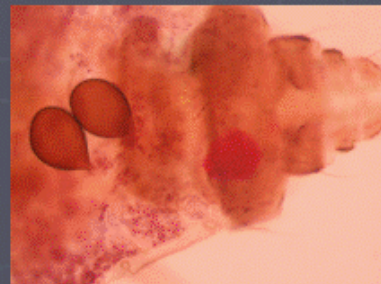
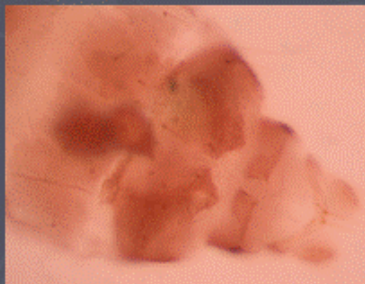
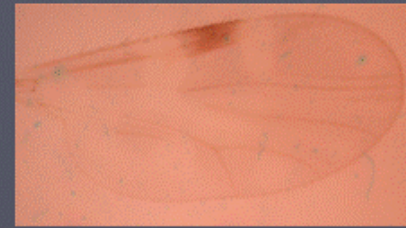
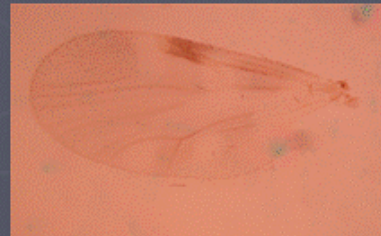
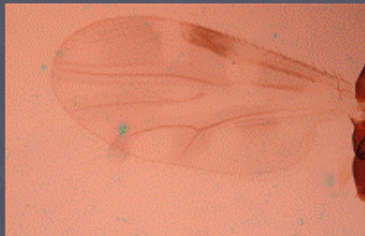
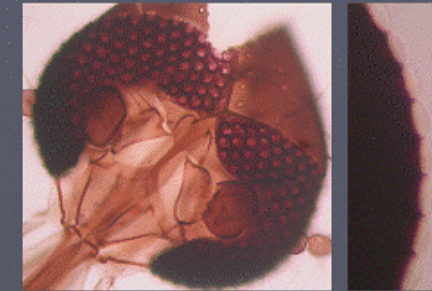
*C. scoticus*



*C. dewulfi*



*C. chiopterus*



# Detection of Schmallenberg virus in midges, March 2012

- Belgium
  - C. obsoletus s.s
  - C. Dewulfi
- **Denmark**
  - **Undefined midges captured in Oct 2011**



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## **Acknowledgements**

**Martin Beer, FLI, Germany**

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**<http://www.coda.be>**

**Reginald De Deken, Isra Deblauwe, Pieter Vantieghem,**  
**Maxime Madder, Dirk Geysen**

**Institute of Tropical Medicine Antwerp Belgium**  
**<http://www.itg.be>**

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**Thank you for your attention**