



**Veterinary
Laboratories
Agency**

Bluetongue in Deer

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Veterinary Deer Society Meeting

3rd – 4th April 2008

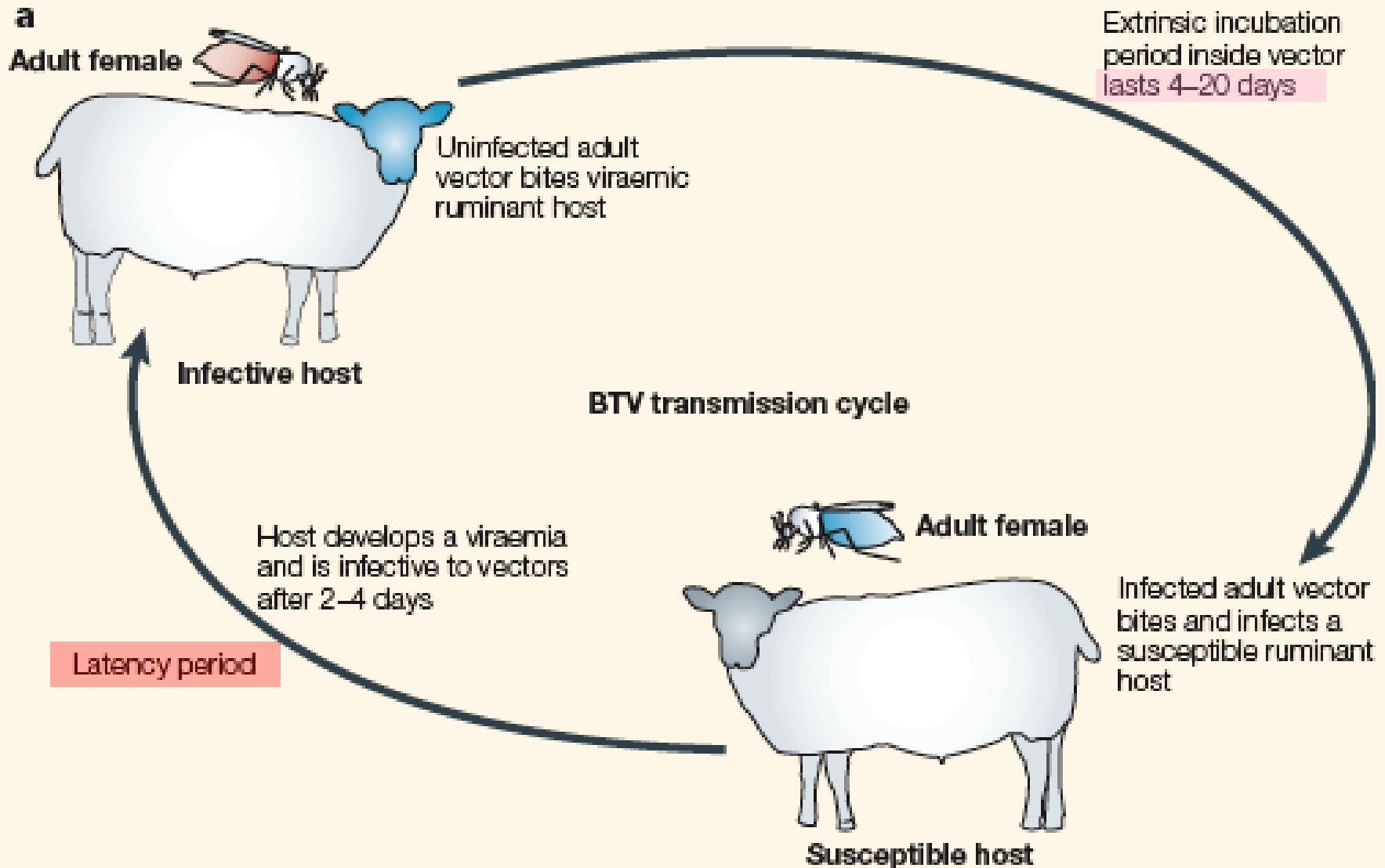
Bluetongue

- **Infectious, non-contagious disease of domestic and wild ruminants**
- **Caused by bluetongue viruses (BTV), a group of 24 serotypes of an RNA virus (1 – 24)**
- **Genus – *Orbivirus*, family - *Reoviridae***
- **Disease associated with midge species *Culicoides* vector in which the virus replicates**
- **Its distribution extends as a widening belt from the Equator**
- **Related viruses cause**
 - **African horse sickness (AHSV) - horses, donkeys, dogs**
 - **Epizootic haemorrhagic disease (EHDV) - deer, cattle**

Course of disease in sheep and cattle

- **Incubation period 5-9 days**
- **BTV circulates in bloodstream**
- **Lasts 3-5 days but can be up to 30 days in sheep, 60 days in cattle**
- **Damage to blood vessels and reduced blood clotting causes clinical signs**
- **Antibodies detected from 7 - 9 days post-infection**

BTV spread from animal to animal



Clinical signs - sheep

- **Fever – up to 42°C**
- **Ocular/nasal discharge**
- **Respiratory signs**
- **Conjunctivitis**
- **Dribbling saliva**
- **Oedema head, brisket and tongue**
- **Inflammation coronary bands, lameness**
- **Abortion, deformed lambs**
- **Death**
- **Some cases sub-clinical**





from Willem Wouda - Netherlands



‘Sore muzzle’



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from Willem Wouda - Netherlands



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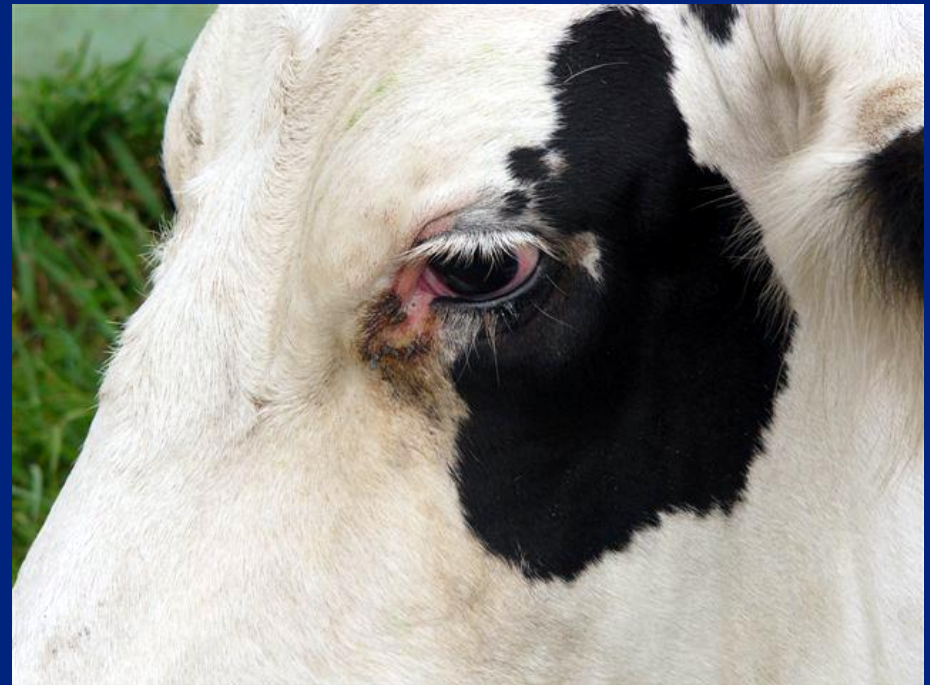


Clinical signs - cattle

- **Fever**
- **Reduced milk yield**
- **Lameness**
- **Salivation**
- **Mouth ulceration**
- **Conjunctivitis**
- **Teat lesions**
- **± Skin lesions**
- **Many cases sub-clinical**



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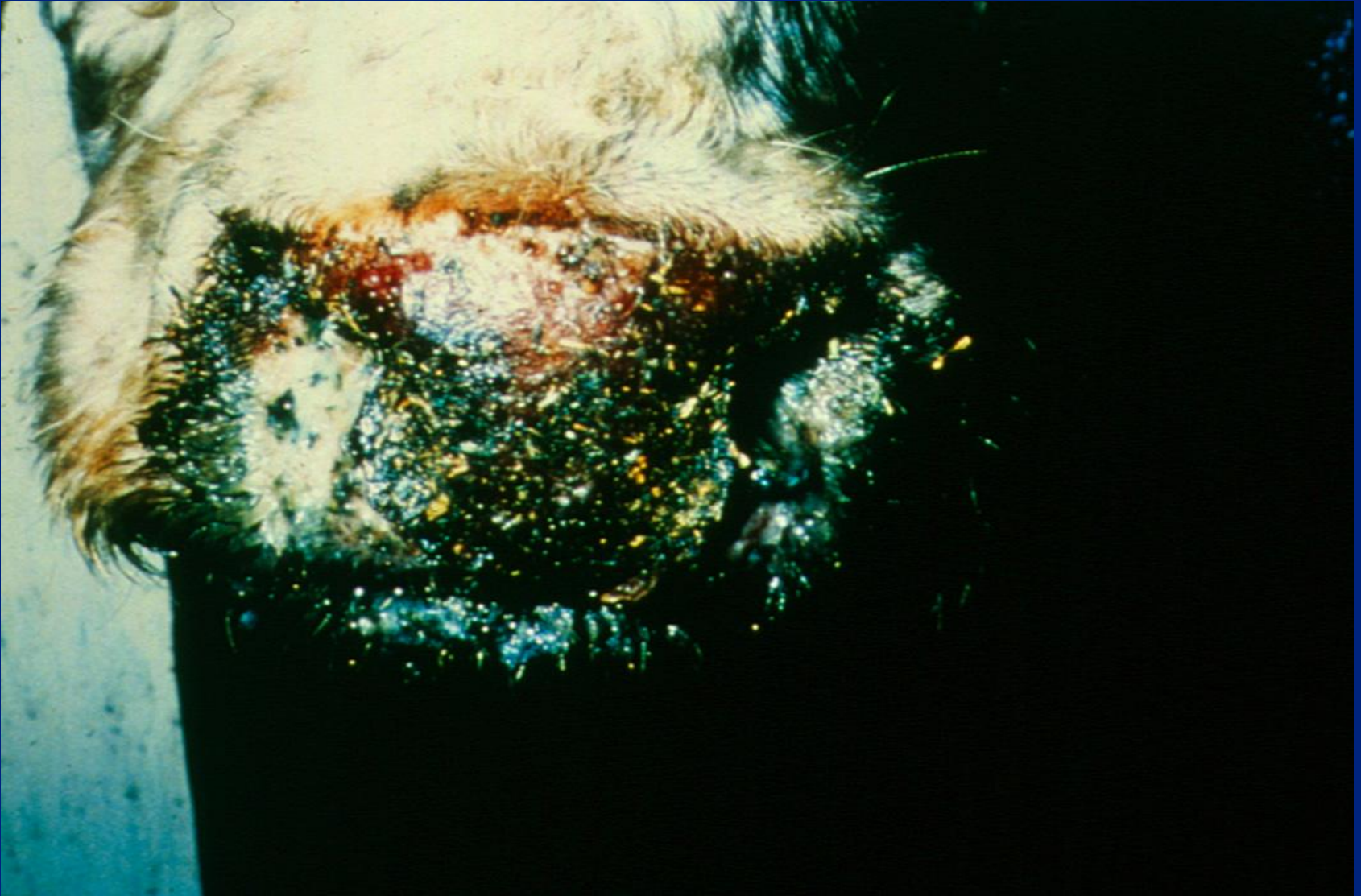




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‘Burnt muzzle’







Confirmation of diagnosis

- **Detection of virus in blood:- 7-10 ml of blood in EDTA for RT-PCR testing**
 - **sheep and cattle; antigen \approx three days post-infection**
- **Detection of antibodies in blood:- 7ml clotted blood**
 - **sheep; antibodies \approx seven days post-infection**
 - **cattle; antibodies \approx nine days post-infection**
- **Detection of virus in tissue:- spleen for RT-PCR testing**

Bluetongue and Epizootic haemorrhagic disease in North America

- Bluetongue (BTV) and Epizootic haemorrhagic disease (EHDV) causes disease in wild and farmed ruminants
- Both *culicoides* vector
- BT and EHD disease in wildlife clinically similar so referred to as Haemorrhagic disease (HD)
- BTV serotypes 2, 10, 11, 13, 17 and 1
- EHDV (1 – 10) serotypes 1 and 2

Bluetongue and Epizootic haemorrhagic disease in North America

Clinical signs in deer (White-tailed deer)

- **Sudden onset**
- **Stop feeding**
- **Lose fear of man**
- **Progressive weakness**
- **Often salivate excessively**
- **Rapid pulse and breathing**
- **Finally unconscious and death**

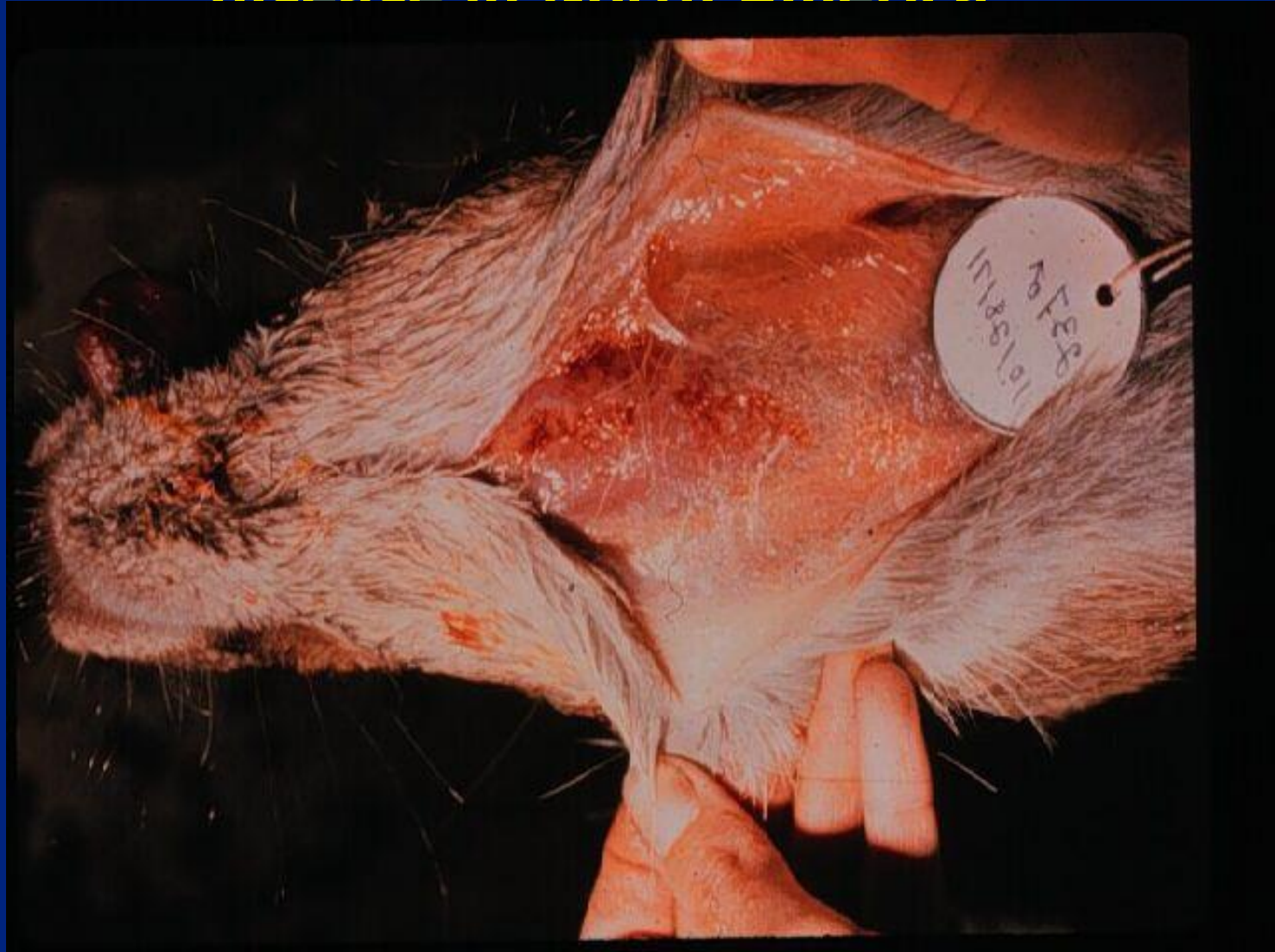
Pathology

- **Extensive haemorrhage; petechial to massive in size**
- **All organs can be involved**
- **Haemorrhage due to interference with blood clotting and degeneration of blood vessel walls.**

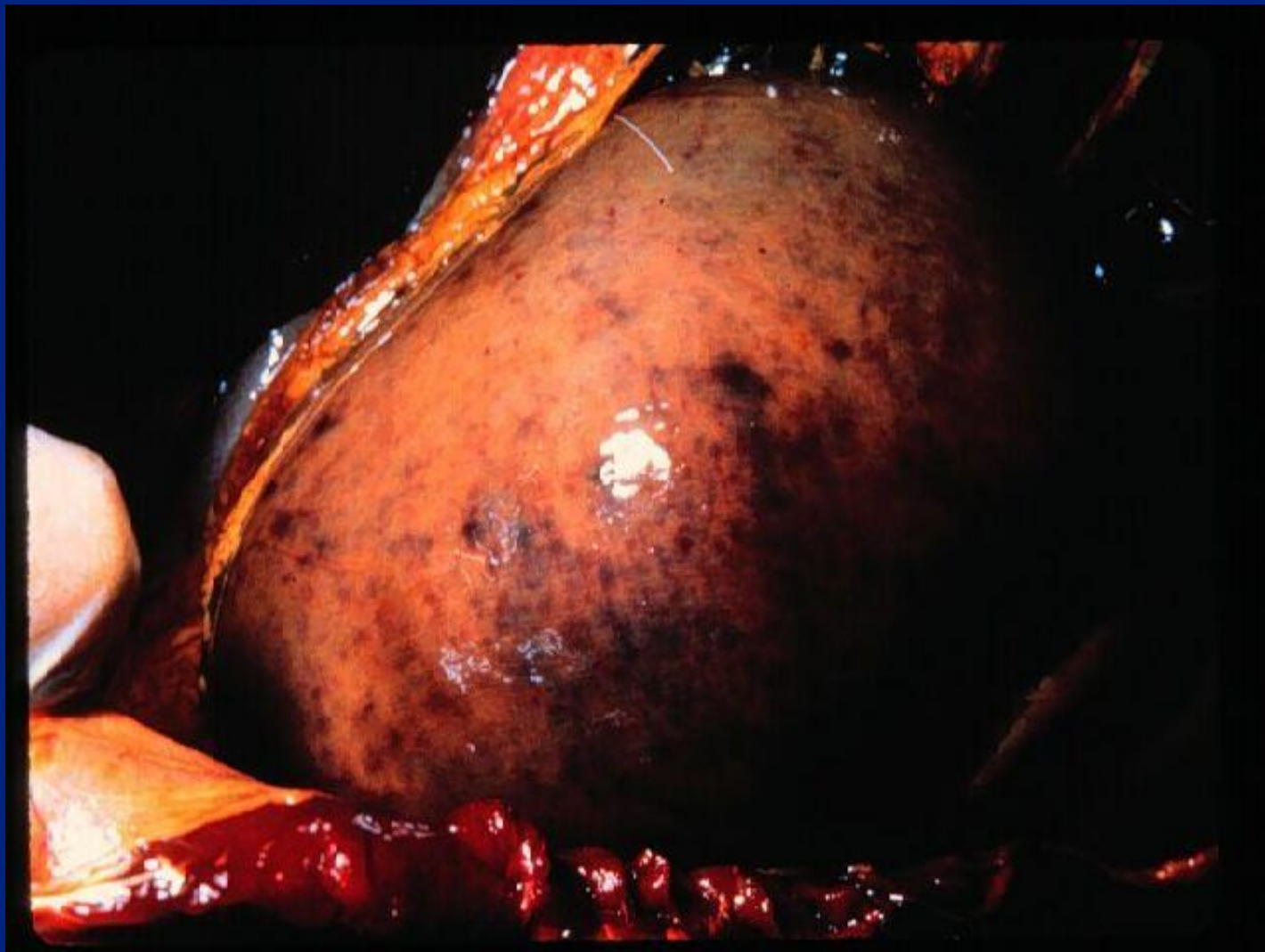
Bluetongue and Epizootic haemorrhagic disease in North America



Bluetongue and Epizootic haemorrhagic disease in North America



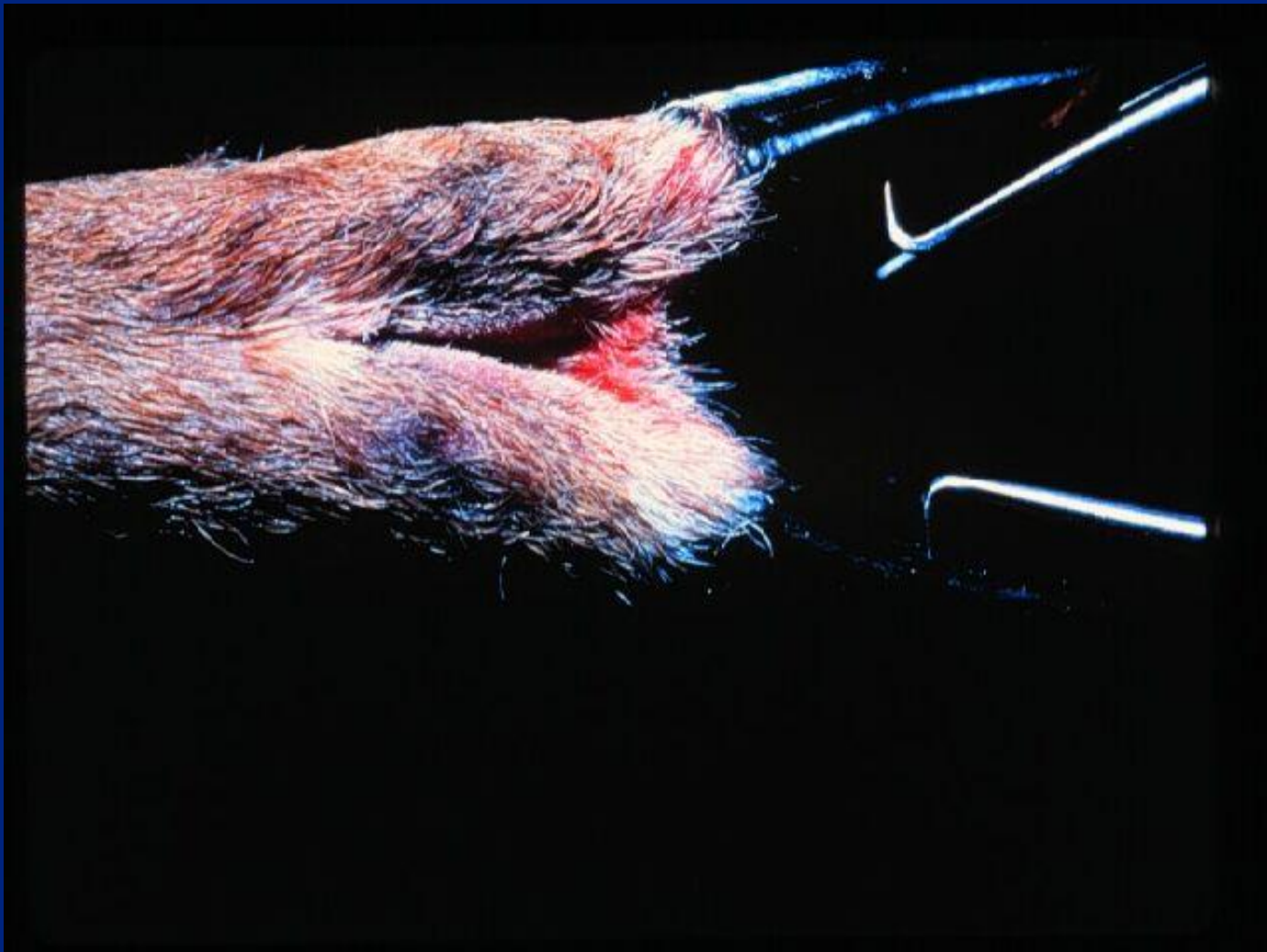
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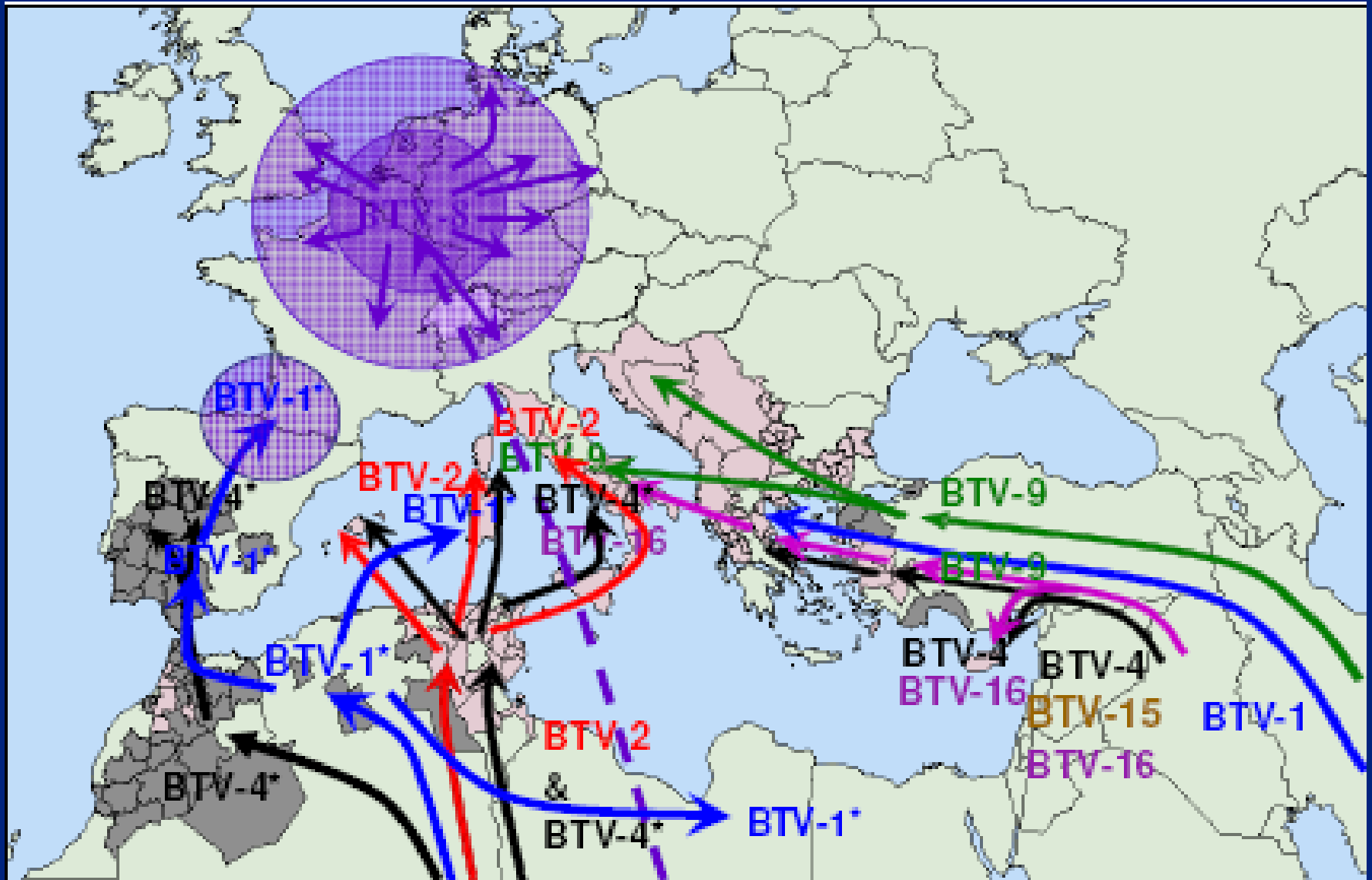
- Morbidity and mortality in mainly **white-tailed deer** (*Odocoileus virginianus*)
but also
 - mule deer** (*O. hemionus*)
 - elk** (*Cervus elaphus*)
 - muntjac** (*Muntiacus reevesi*)
 - pronghorn** (*Antilocapra americana*)
 - mountain goat** (*Oreamnos americanus*)
 - bighorn sheep** (*Ovis canadensis*)
- EHD no effect on **sheep**, mild disease in **cattle**
- BT similar signs in **white-tailed deer** and **sheep**

Bluetongue in deer in North America

Conclusions:-

- **BT can cause severe disease and death in deer, especially white-tailed deer**
- **Clinical signs and pathology similar to those seen in sheep**
- **BTV serotype 8 not present**
- **Could be a reservoir for BTV**

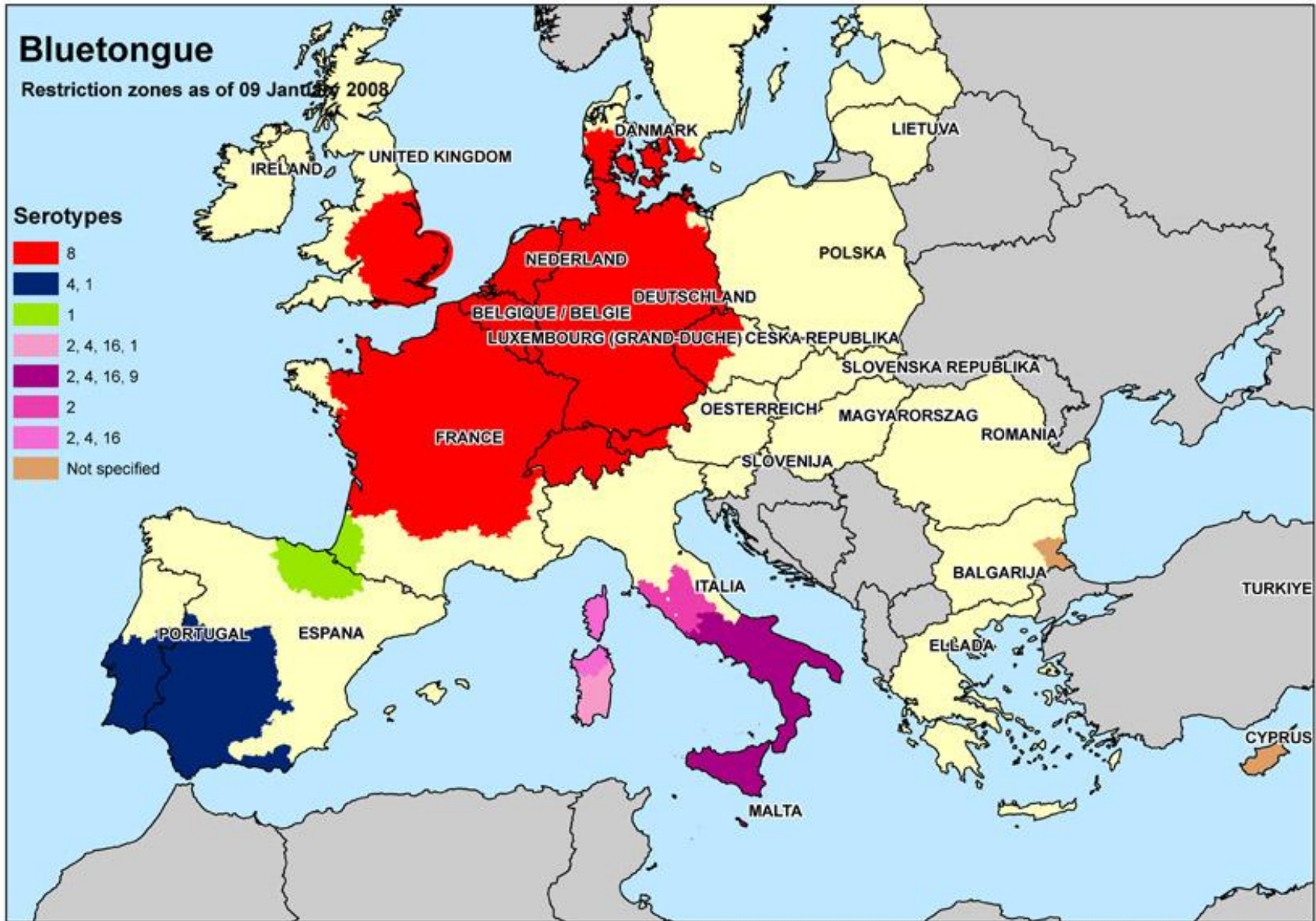
Spread of different BTV serotypes into Europe



BTV in Europe

- **BTV-1;** Spain, France and Sardinia
- **BTV-2;** Italy, Sardinia, Corsica
- **BTV-4;** Spain, Portugal, Italy, Sardinia, Corsica
- **BTV-8;** Germany, France, Belgium, Netherlands, Czech Republic, Austria, Switzerland, Great Britain, Italy
- **BTV-9;** Italy, Balkans
- **BTV-15;** Middle East
- **BTV-16;** Italy, Sardinia, Corsica

Bluetongue; Restriction zones 09/01/08



BTV serotype 4 in wildlife:- Spain (F. Ruiz-Fons; Macaulay Institute)

- **BTV serotype 4 entered Iberian peninsula in October 2004**
- **2003 - 2007; 2233 - red deer, 106 - fallow deer, 44 - roe deer, 72 - moufflon and 10 barbary sheep screened for anti-BTV antibodies by cELISA**
- **03/04 - 04/05; all seronegative**
- **05/06 - 06/07; 22% red deer, 35% fallow deer, 5% roe deer, 13% moufflon and 1/4 barbary sheep seropositive**
- **Higher seroprevalence in south and increasing with time**
- **No clinical disease in deer**

BTV serotype 8 in wildlife:- Germany, hunting season 2006/7

Federal State	Red Deer		Roe Deer		Moufflon		Others	
	+ve	-ve	+ve	-ve	+ve	-ve	+ve	-ve
Bavaria	-	318	-	-	-	-	-	-
Hesse	0	40	0	5	-	-	-	-
Lower Saxony	0	293	0	97	0	12	-	-
Northrhine-Westfalia	2	228	12	200	2	39	2	357
Rhineland-Palatinate	0	57	0	117	0	2	0	6
Saarland	0	13	-	-	-	-	0	10
Saxony Anhalt	0	67	-	-	-	-	-	-
Schleswig Holstein	-	-	-	-	-	-	0	18
Total	2	1016	12	419	2	53	2	391

BTV serotype 8 in wildlife:- Germany

- **2006/07 hunting season; Positive samples only recorded in federal state of Northrhine-Westfalia, in the area where livestock was most severely affected**
 - **Red deer; 0.9% - Nr-W, 0.2% - total**
 - **Roe deer; 6% - Nr-W, 2.9% - total**
 - **Moufflon; 5.1% - Nr-W, 3.8% - total**

- **2007/08 season preliminary estimation; similar number of bloods slightly higher % positives red deer, also sika but very limited in roe deer (Dr Walburga Lutz)**

BTV serotype 8 in wildlife:- Germany

Mouflon (*Ovis musimon*); stomatitis, glossitis, rumenitis, myocarditis

(Dr Martin Peters, SVUA Arnsberg)

- **Red deer; in one animal limited gross oral lesions reported**
- **Fallow; swollen muzzle, some carcass haemorrhage**
- **Roe deer; no gross lesions , some microscopic changes seen**
- **One bison (*Bison bonasus*); positive by ELISA and PCR**

BTV serotype 8:- Belgium A. Linden

- **2005; 262 wild red and roe deer tested cELISA (ID. VET) - all seronegative**
- **2006; 684 wild deer sampled - 0.58% positive**
- **329 spleens (2 from seropositive deer) screened by RT-PCR; all negative BTV antigen**
- **Samples from 25 of the 37 Cantonnements in Southern Belgium where wild deer present.**
- **102 other wild deer found dead or culled due to malaise examined, including a suspect roe deer but all negative by RT-PCR**

BTV serotype 8:- The Netherlands

- **2006;**

60 wild hunter-killed roe deer from the south of the country sampled

- **All seronegative for BTV antibodies by ELISA testing**

BTV serotype 8 in wildlife:-Europe

- **Very limited clinical disease reported in deer**
- **Seroconversion (“spillover”) in areas of high prevalence and disease in livestock**
- **However only low seroprevalence in deer detected so far**
- **Samples ? too small, not random to determine if any species more susceptible**
- **At present not an important reservoir for BTV**

Deer in Great Britain

- **Red deer:** Scottish Highlands, Lake district, northern England and Midlands, East Anglia, Sussex, New Forest, South West England
- **Roe deer:** northern England and Scotland, most of Southern England and spreading into the Midlands and Wales
- **Fallow:** widespread in England and Wales, scattered in Scotland
- **Sika:** widespread in Scotland and expanding eastwards, patchy in England
- **Muntjac:** south and central England and Wales, spreading out.
- **Chinese water deer:** East Anglia

Great Britain

- **England:- BT outbreak 2007, present within the bluetongue control area**
 - **red deer**
 - **roe deer**
 - **fallow deer**
 - **muntjac**

- **with possibly low numbers;**
 - **sika**
 - **Chinese water deer**

- **No clinical disease reported or confirmed**
- **No serosurveillance**

Family:- Cervidae

- Sub-family:- Cervinae (old world)
 - *Axis axis*; Axis deer, Chital
 - * **Cervus elaphus*; Red deer, wapiti, American elk
 - * *Cervus nippon*; Sika, Japanese deer
 - * *Dama dama*; Fallow deer
 - *Elaphodus cephalophus*; Tufted deer
 - *Elaphurus davidianus*; Pere David's deer
 - *Muntiacus* spp.
 - * * *Muntiacus reevesi*; Reeves's muntjac
 - *Przewalskium albirostris*; Thorold's deer, white-lipped deer
 - *Rucervus* spp.
 - *Rusa* spp.
 - Rusa timorensis*; Rusa

Family:- Cervidae

- **Sub-family:- Capreolinae (Odocoileinae) (new world)**
 - ***Alces* (moose)**
 - ***Blastocerus* (marsh deer)**
 - ****Capreolus* (roe deer)**
 - ***Hippocamelus* (guemals)**
 - ***Mazama* (brocket deer)**
 - ****Odocoileus* (mule deer and white-tailed deer)**
 - ***Ozotocerus* (Pampas deer)**
 - ***Pudu* (pudus)**
 - ***Rangifer* (caribou and reindeer)**

- **Sub-family:- Hydropotinae**
 - ****Hydropotes inermis* (water deer)**

Bluetongue in deer in Europe:-

Conclusions/Questions

- **Each serotype has a different pathogenicity**
- **Each serotype affects species differently**
- **Severity of disease appears dose related**
- **No clinical disease in deer so far with serotype 4 and very limited with serotype 8**
- **Roe deer same sub-family as white-tailed deer but as yet no evidence of increased susceptibility**
- **Other BT serotypes present in southern Europe**
- **Will wild deer have a significance as a potential reservoir once livestock are vaccinated?**
- **Surveillance?**
 - **Serosurveillance**
 - **Sampling (spleen) of suspect cases for PCR**

Acknowledgements and thanks

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- **Also everyone else, who provided material, I've omitted to mention**