

# The Deer Initiative

## Deer, Habitats and Impacts Conference March 2007

### Transmissible Spongiform Encephalopathies in deer

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#### Abstract

In Europe there is no evidence that deer are affected with any form of transmissible spongiform encephalopathy (TSE) disease. However, since the epidemic of bovine spongiform encephalopathy (BSE) it has become policy that all ruminants entering the human food chain should be free of TSE infection. It is also highly probably that deer were exposed to concentrate feed contaminated with BSE prior to the ban of meat and bone meal in all animal feeds. There is thus the theoretical possibility that deer have become infected with BSE.

Accordingly the Food Standards Agency (FSA) has commissioned a study to:

1. Establish if red deer can be infected with BSE
2. Provide a source of positive control material which can be used to validate appropriate surveillance methodologies.

The other concern regarding TSE infection of deer is chronic wasting disease (CWD) of North American cervids. Since it was first detected in the late 1960s it appears to have spread alarmingly to many states in the US as well as Canada, affecting both free living and captive populations. It has now been detected in the two species of *Odocoileus* (mule deer and white tailed deer), *Cervus elaphus canadensis* (Wapiti or elk) as well as *Alces alces* (Moose) and appears to be much more contagious than other forms of TSE infection. Active surveillance programmes across North America to monitor its prevalence in hunter shot deer have been introduced and in some states programmes have been initiated to reduce deer populations.

There is no evidence to suggest that CWD will transmit to domestic ruminants other than by direct inoculation into the brain, nor is there any evidence that it can be transmitted to humans.

Provided no live deer are imported from North America the risk of CWD being introduced into Europe is remote. However, the infecting agent is extremely difficult to inactivate and it would appear to be still infectious after years on pasture. It is therefore possible that infection could be transmitted on footwear or clothing by hunters. Thus, those who are involved in hunting deer on both sides of the Atlantic should be extremely careful to ensure that they do not transport

infection by this method. In the mean time the CWD epidemic in North America will be monitored and developments followed with interest.

### ***Experimental transmission of BSE to red deer***

Initially 18 calves were dosed by stomach tube with a massive dose (25 gm) of BSE infected cattle brains. Two groups of 6 animals were killed at 6 and 12 months post infection and examined in detail for evidence of infection, both with negative results. The remaining 6 animals will be kept under observation until clinical signs develop or the experiment is terminated. An additional 6 animals were challenged by intracerebral (ic) inoculation. After 24 months four of the ic challenged animals developed clinical signs with weight loss, ataxia and occasional "panic attacks" in one being the most obvious. These animals have been killed and examination of the tissues confirms that BSE had been transmitted to them.

The preliminary conclusion is that red deer are susceptible to ic challenge with BSE which was the anticipated result. The clinical signs observed are unusual and have not been observed in any farmed red deer thus it is unlikely that natural cases have occurred undetected in the UK. It is premature to make any conclusions regarding the susceptibility of deer to infection by the oral route as only 39 months have elapsed since challenge.

### ***Surveillance***

Surveillance for TSE infection in deer has already been initiated in some European countries. Germany has reported the examination of tissues from 8000 red, roe and fallow deer, Norway has examined some moose, red and roe deer and 600 reindeer, Switzerland 72 fallow and red, while in the UK limited examination of red and roe deer has been undertaken. All of the examined deer have given negative results. Although the numbers involved are too few to allow any conclusion, taken together with the experimental transmission results it would appear unlikely that BSE has transmitted to deer.

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## **Presentation**

### **Transmissible Spongiform Encephalopathies**

- Non-febrile, chronic, invariably fatal diseases
- Scrapie is prototypic disease
- Novel infectious agent(s)
- Oral infection most likely
- Variable transmission, infection & incubation rates
- Genetic susceptibility
- Variable clinical signs

## **Pathology**

- Vacuolated neuropil & neurones
- Neuronal degeneration
- Gliosis
- No known effective treatment

Immunohistochemical demonstration of abnormal prion protein is considered a definitive diagnosis.

## **TSE Surveillance In European Deer**

### **Germany**

8000 cervids examined by ELISA (red, roe and fallow deer)

### **Switzerland**

72 cervids examined by histopathology (fallow and red deer)

### **Norway**

Unspecified as yet numbers of moose, red and roe deer, plus 600 reindeer, examined by histopathology.

### **United Kingdom**

Some limited testing of red deer has been undertaken.  
Generation of positive control material to enable more accurate surveillance.

**No cases of TSE have been reported in European deer to date.**

## **Chronic Wasting Disease (Cwd) In Deer & Elk**

### **CWD – History**

- Reported late 1960's
- Classification-TSE 80's
- Origin?
- Confined to North America - just!
- Wild / free ranging population.

### **CWD - Clinical Features**

- Adults: 17 months to >15 years median 3-5 years
- No sex predilection
- No strict seasonality
- Clinical duration: days to >1 year - usually months
- Incubation period min:~ 17 months max: unknown.

## **CWD – Summary**

- Transmissible spongiform encephalopathy
- Affects elk, mule, white tailed deer & moose
- Only TSE maintained in a free ranging population
- Highly infectious disease
- *Cervus elaphus elaphus* is susceptible!
- Confined to North America – at present

Let's keep it that way!!

## **MRI/VLA Work In Progress**

### **Susceptibility of UK red deer (*Cervus elaphus elaphus*) to alimentary and intra-cerebral bovine spongiform encephalopathy transmission**

#### **Aims of Experiment**

- Examination of the susceptibility of red deer (*Cervus elaphus elaphus*) to BSE transmission
- Generation of positive control material to enable more accurate surveillance

#### **Experimental Design**

- Red deer calves (~6 weeks old, n = 18) challenged with 25g BSE positive cattle brain material by alimentary route
- 10 Environmental controls
- Animals culled at 6 and 12 months post-dosing: challenged (n = 6) environmental controls n = 2
- Remainder to progress to clinical phase: challenged (n = 6) environmental controls (n = 6).

#### **Preliminary results – from 6 & 12 month cull**

- Clinical signs – NONE
- Gross pathology – NEGATIVE
- Histopathology – NEGATIVE
- IHC on 6 tissues from each animal: obex, thoracic spinal cord, tonsil, retropharyngeal LN, mesenteric LN and ileal Payer's patch – NEGATIVE.

## Additional challenge

### - Intra-cerebral Challenge

- Six red deer
- 10 months old
- To progress to clinical signs.

### Preliminary Results

#### Four of six animals have reached clinical end point

Clinical signs:

- weight loss & reduced appetite
- lack of seasonal change of coat
- ataxia & general weakness
- change in character/more nervous of people
- 'panic attacks' resulting in self trauma.
- partial deficits in balance

Immunohistochemistry:

- Positive labelling of abnormal PrPd present in the central and peripheral nervous system.
- No labelling in any other tissues examined including lymphoreticular, muscle or kidney

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|---|---------------|-----------------------|---|
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### Speaker's biography

Hugh Reid is a veterinary graduate who has spent much of his career as a Veterinary Research Virologist investigating in particular those viruses which cause disease at the interphase between free living and domestic species. He has had a particular interest in the diseases of deer since he researched Malignant Catarrhal Fever of deer as well as other infectious diseases which have affected farmed deer. Most of his career was spent at the Moredun Research Institute in Edinburgh where he was Head of the Division of Virology until his retirement in 2002. Since then he has co-ordinated the TSE research programme at the Institute which has largely focussed into experimental scrapie and BSE in sheep and BSE infection of deer.