



EUROPEAN COMMISSION
HEALTH & CONSUMER PROTECTION DIRECTORATE-GENERAL

SCIENTIFIC OPINION ON
STUNNING METHODS AND BSE RISKS

**(THE RISK OF DISSEMINATION OF BRAIN PARTICLES INTO THE
BLOOD AND CARCASS WHEN APPLYING CERTAIN STUNNING
METHODS.)**

**ADOPTED BY THE SCIENTIFIC STEERING COMMITTEE
AT ITS MEETING OF 10-11 JANUARY 2002
FOLLOWING A PUBLIC CONSULTATION VIA INTERNET BETWEEN
10 SEPTEMBER AND 26 OCTOBER 2001**

A scientific report on stunning methods and BSE risks prepared by the TSE / BSE ad hoc group is currently being edited and will be put on internet as soon as available

I. MANDATE

Given that all healthy cattle over thirty months are subjected to rapid BSE test before being used for human consumption, the Scientific Steering Committee (SSC) is invited to:

- (1) List the tissues and organs [including whole head] that are at risk of being contaminated with CNS (Central Nervous System) material, for each of the stunning methods used for bovine, ovine and caprine animals in the European Union;
- (2) Rank the different stunning methods according to the risk and possible level of contamination;
- (3) Provide a justification of the proposed ranking on the basis of available scientific or technical evidence;
- (4) Indicate the level of risk to consumer health associated with each method, taking the age of the animal into consideration.

The SSC is also invited to carry out a reflection on alternative stunning methods, with due regard for animal welfare considerations.

II. BACKGROUND

The Scientific Steering Committee (SSC) adopted at its meeting of 6-7 September 2001 a preliminary opinion on *Stunning methods and BSE risks*. The document was put on Internet in September 2001 and all interested parties were invited to comment on its contents.

Comments have been received by the secretariat of the SSC:

1. From European Livestock and Meat Trading Union (UECBV)
2. From Danish Veterinary and Food Administration
3. From MATP (Movimento Anti-Touradas de Portugal, Movement against bull fights)
4. From the European Animal Protein Association (EAPA)
5. From Prof. Lücker (Faculty for veterinary medicine, University of Leipzig, Germany)
6. From Health and Safety Executive (Health Directorate, London).

These comments were discussed by the TSE/BSE ad hoc group at its meeting of 14 November 2001 and the SSC at its meeting of 29-30 November 2001. This final opinion takes account of the comments received.

III. SCOPE OF THE OPINION

The present opinion addresses the above questions. It is based upon the attached report prepared by the TSE/BSE *ad hoc* Group.

The stunning methods addressed are captive bolt stunner with pithing, captive bolt stunner without pithing, electronarcosis, non-penetrative stunner, pneumatic stunner that does not inject air and pneumatic stunner that injects air. It does not cover Kosher and Halal slaughter methods, which do not involve any

stunning. Neither does it evaluate the safety of meat from fighting bulls killed by a sword thrust between the skull and the neck vertebrae, which is also not a stunning method.

As there are no specific known data from the stunning of goats, wherever sheep are mentioned it will mean sheep and goats. TSE risks to abattoir workers and the environment (especially of the abattoir) are excluded from this discussion, as well as the possible contamination of the carcass resulting from operations subsequent to stunning (e.g. **sawing**, cleaning, cutting, etc.).

IV. OPINION

Subject to confirmatory research results, see below, the SSC answers the specific questions of the mandate as follows :

(1) Listing of the tissues and organs that are at risk to become contaminated with CNS material, for each of the most commonly applied stunning methods used at slaughter in the European Union.

If brain damage occurs and if brain particles are disseminated in the blood, the tissues and organs likely to be contaminated, in decreasing order of risk, are considered to be as follows, irrespective of the type of *penetrative* stunning:

Definite risks:

- Blood (the risk from contaminating blood depends on the time between stunning and collection of blood);
- Pulmonary arteries and lung;
- Right atrium and ventricle of the heart (in practice it may be difficult to distinguish levels of risk in heart and lungs unless macroscopically visible tissue pieces are present).

Absent, negligible or lower risks:

- Any other tissue.

The level of risk will vary according to the specific equipment used and criteria to be taken into account are: depth and velocity of penetration, amount of brain material damaged and possibly displaced, the location of the stun, etc.

Parts of the head may become contaminated during stunning and slaughter. The safety of ruminant heads is already addressed in the SSC opinion of 10-11 January 2001 on the TSE infectivity distribution in ruminant tissues (state of knowledge, December 2001).

It is noted also that blood collected at slaughter using penetrating stunning methods¹ may become contaminated with brain material exuding from the

¹ The SSC also considers that a residual risk may be carried over to animals on the same slaughter line that precede or follow the carcass of the incubating animal. This residual risk would result from the equipment if not decontaminated after each animal and from waste water, droplets, etc.

stun hole. This may be biologically significant if an animal has to be stunned twice particularly if a pneumatic gun is used that injects air under pressure.

(2) Ranking of the various stunning methods used at slaughter according to the risk for and possible level of contamination.

The ranking order of stunning methods in terms of decreasing risk for causing contamination² is the following one:

- Pneumatic stunner that injects air;
- Pneumatic stunner that does not inject air;
- Captive bolt stunner with pithing;
- Captive bolt stunner without pithing.

Negligible or absent risk can be expected from:

- Non-penetrative stunner
- Electro-narcosis.

(3) Justification of the proposed ranking on the basis of available scientific or technical evidence.

The justification for the proposed ranking is based partly upon the scientific publications and unpublished data listed in the attached report including data from slaughterhouse material and experimental studies and partly on a theoretical analysis of the blood circulation in ruminants.

(4) Level of risk to consumer health

Cattle

The risk of contamination of tissues and organs with BSE-infectivity from CNS material as a consequence of the stunning method used for cattle slaughtering depends on three factors:

- a) the amount of BSE-infectivity in the brain of the slaughtered animal;
- b) the extent of brain damage;
- c) the dissemination of brain particles in the animal body.

As to the factor under point a): The question of the importance of the stunning method used becomes clearly irrelevant if cattle brains can be assumed to be free from BSE-infectivity as it is the case for all cattle from GBR I countries or for all cattle under one year of age regardless of the GBR level of the country of origin. Moreover, when applied to cattle that have passed as BSE-free at a rapid post-mortem test or to cattle below 30

produced during slaughter. However, this aspect could be investigated in a research programme to produce data for analysis and peer review.

² no data are available on free bullet methods

months of age from any country, stunning methods others than stunning with a pneumatic gun that injects air under pressure or any stunning method accompanied by pithing are likely to result in a much lower or no significant risk of contamination with the BSE-agent.

As to the set of factors under the above points b and c): Collectively, the authors of the studies on stunning have shown in cattle a relatively high risk of brain damage and disseminating infectivity resulting from stunning with a pneumatic stun gun that injects air under pressure, particularly if air is injected over an extended period, or from any stunning method accompanied by pithing (at a lower but still significant level). However, there is no **clear-cut** evidence of such a risk from the other penetrative stunning methods though, on the basis of limited and preliminary data, it cannot be excluded for any form of penetrative stunning.

For those situations where dispersion of contaminated CNS material cannot be prevented (point c), the tissues and organs that are most at risk to be contaminated are listed in section (1) above.

Small ruminants

In sheep stunning with a cartridge activated captive bolt or by pneumatic stunning that injects air shows relatively high incidences of CNS embolism using either method but there is no evidence of embolism following electro-narcosis. It follows that if pithing is used following conventional captive bolt stunning in sheep or goats, the embolic effect would be unlikely to be less than for penetrating captive bolt stunning without pithing, and is likely to be greater.

Based on unpublished and in-press work it is concluded that the pneumatic stun gun that injects air produces less than half the incidence of emboli in sheep than is produced in cattle by the same method. Furthermore, in sheep stunned with a conventional cartridge operated penetrating captive bolt the incidence of cerebral embolism is no different from the incidence following pneumatic stunning that injects air.

For sheep and goats, should BSE be present under domestic conditions in these animals, the risk reduction by banning penetrative stunning would not result in significant additional safety because of the TSE pathogenesis pattern in small ruminants that causes infectivity to be present in peripheral tissues early in the incubation period³. Whatever the stunning method the risk to find the BSE agent in the tissues, on average, will rise with increasing age. For animals less than 1 year old the risk is estimated to be very low or low. It is not considered to be zero because occasionally scrapie has been observed in young animals below 12 months, and it is believed that BSE will behave similarly to scrapie in this respect.

³ Opinion on the safety of small ruminant products should BSE in small ruminants become probable / confirmed (adopted by the SSC at its meeting on 18-19 October 2001)

(5) On alternative methods to penetrative stunning

The attached report lists and briefly comments on a number of non-penetrative stunning methods.

V. FINAL COMMENTS AND RECOMMENDATIONS

The SSC further recommends:

- Because the recent studies have involved few observations, the SSC recommends that these be expanded as quickly as possible to improve the confidence in current results.

The SSC noted that, in its comments to the public consultation, the UECBV offered to perform field trials in order to find out whether penetrative stunning methods displace brain material into the blood. The SSC welcomes this offer and suggests that the trials be carried out in collaboration with research laboratories, which have no commercial interest in the outcome.

More in general, the SSC considers that further research on stunning methods and their effects in regard to embolism, especially in cattle should be undertaken.

- Very few reports have been found on the possible occurrence of neural embolism following stunning by electro-narcosis or the use of non-penetrating captive bolts but there is no reason to assume a risk of embolism under these conditions. However, new studies may be useful in order to verify the expectation that embolism of CNS tissue either does not occur or occurs with such a low frequency that any risks are negligible when these methods are used.
- Because little work has been done to verify that, in practice, the arterial circulation and organs other than the jugular venous blood, heart and lungs are devoid of risk, studies on this aspect should be extended.
- The SSC recommends that experts in the field of animal slaughter procedures be consulted to determine the effects of implementation of any advice emanating from this report. More precisely, the possible implications and drawbacks in terms of safety, meat hygiene and animal welfare of abandoning penetrative stunning in favour of other methods (e.g., mushroom head bolt stunning) should be checked.

It is important in this regard to consider the animal welfare issues⁴ related to each eventually authorised stunning method as well as the safety for workers and the commercial and practical implications of any proposed change from the present situation.

- A positive result of a BSE test in any case will result in condemnation of the carcasses, all organs and tissues including blood. This should include also any animal, organ or tissue that could be cross-contaminated such as pooled blood from several animals.

⁴ Animal welfare aspects of stunning methods are subject of opinions by SCAHAW.

- Consideration should be given to the possible risks that might emanate from using a potentially brain-contaminated penetrative stun gun on sequentially stunned animals.
- As the risk is age-dependent, the introduction of separate slaughter lines for younger and older animals should be considered where appropriate.
- The SSC finally recommends that the most recent scientific data, including on the pathogenesis of TSEs in ruminants, be analysed as soon as they become available in order to further refine current knowledge on the age at which different TSE agents can be expected to be present in CNS tissues of each ruminant species used for food.

The SSC noted that, in its comments, the UECBV offered to perform field trials in order to find out whether penetrative stunning methods displace brain material into the blood.

The SSC invites the UECBV to start these studies as soon as possible and to communicate the results to the Committee. It will then, if appropriate, amend the attached opinion.

Keywords: BSE, stunning, ruminants, brain material, skull, head, heart, lungs, blood, age, tests.