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C1 - Follow-up and dissemination of scientific opinions

OPINION ON

THE USE OF SMALL INCINERATORS FOR BSE RISK REDUCTION

SCIENTIFIC STEERING COMMITTEE

MEETING OF 16-17 JANUARY 2003

OPINION

On 17 May 2002, the Scientific Steering Committee (SSC) was invited by Commission Services to (i) evaluate a risk assessment[1] prepared for the UK's Spongiform Encephalopathy Advisory Committee (SEAC), on the potential risk arising from the use of small incinerators to dispose of specified risk materials and (ii) to advise on the safety with regard to TSE risks of the use of such small incinerators.

The details of the SSC's evaluation are provided in the attached report. The SSC concludes as follows:

(i) The SSC, at its meeting of 28th -29th June 2001, recommended "a framework for the assessment of the risk from different options for the safe disposal or use of meat and bone meal (MBM) and other products which might be contaminated with TSEs and other materials." This framework comprised five components:

(1) Identification and characterisation of the risk materials involved, the possible means for their transmission and potential at risk groups.

(2) The risk reduction achieved by the particular process.

(3) The degree to which the risks can be contained under both normal and emergency operating conditions. This inevitably includes consideration of the effectiveness of control measures.

(4) Identification of interdependent processes for example transport, storage, loading of any TSE related risk materials.

(5) The intended end-use of the products for example disposal, recycling etc.

The risk assessment prepared for SEAC focuses on the risks involved steps 1 and 2 in respect of BSE/TSEs only and is based on a visit to 10 incinerators out of a total of 263 in the UK of which 60% had after burners.

The risk assessment is also using a number of assumptions and data that may be valid for certain incinerator types under certain conditions, but are not necessarily applicable either for all types of materials to be disposed of, or to the whole range of types of small incinerators in use the EU and the UK.

(ii) Small incinerators are widely used to meet the needs of local communities. These incinerators vary greatly in their design, nature of use and performance characteristics and the quality of their management. As a consequence of this variability there are many uncertainties in identifying risks posed by small incinerators that are used to treat SRM materials and *each type should eventually receive its own assessment.* Also, general operating and control criteria should be established for safe incineration, a s it has been done for large incinerators.

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[1] DNV Consulting (Det Norske Veritas), 2001. Risk assessment of SRM incinerators. Prepared for the UK Ministry of Agriculture, Fisheries and Food. Revision 2 of the Draft report, February 2001. 24 pages.

Potential risk sources arising from the incineration process include: gaseous emissions and residual ash. Research is currently ongoing mimicking incineration of TSE-infected brain tissue to assess the infectivity clearance level under various scenarios[2]. However, there are no final reported measurements that enable the risk to be assessed from either the emissions or the ash from small incinerators. It has been argued that the protein content of the ash is a reasonable surrogate measure of the degree of risk deduction caused by the incineration process. This assumption is questionable in view of the resistance to heat of prions as compared to other proteins. Protein measurements in ash are however probably a useful general measure of the overall efficiency and reproducibility of the incineration process. Results in the aforementioned report[1] indicate a large degree of variability in performance among the small incinerators in the UK that have been evaluated. It is anticipated that small incinerators, used by other Member States will also show a considerable variation in performance. In evaluating the risk of small incinerators, consideration should be given to the risk of potential contamination of the ash and of the gaseous emissions.

In the absence of generally accepted and enforced performance standards for small incinerators handling SRMs each such facility therefore needs to be the subject of a specific risk assessment. The SSC considers that the standards set up by the new Waste Incinerator Directive (2000/76/EC) and in its opinion of June 1999 on waste disposal should serve as guidance.

In the absence of reliable data on the possible residual infectivity of the ash, it should be disposed of, i.e., in controlled landfills as described in the SSC opinion of June 1999 on safe disposal of waste.

The SSC finally wishes to emphasise the need for suitable monitoring methods in order that risks can be assessed readily for individual types of small incinerators.

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[2] P.Brown, pers.comm., December 2002. Publication in progress.

THE USE OF SMALL INCINERATORS FOR BSE RISK REDUCTION

REPORT

1. MANDATE

On 17 May 2002, the Scientific Steering Committee (SSC) was invited by Commission Services to (i) evaluate a risk assessment[3] prepared for the UK's Spongiform Encephalopathy Advisory Committee (SEAC), on the potential risk arising from the use of small incinerators to dispose of specified risk materials and (ii) to advise on the safety with regard to TSE risks of the use of such small incinerators.

The SSC appointed Prof.J.Bridges as rapporteur. His report was discussed and amended by the TSE/BSE ad hoc Group at its meeting of 9 January 2003 and by the SSC at its meeting of 16-17 January 2003.

2. CURRENT LEGISLATIVE FRAMEWORK

Until 2000, small incinerators were exempt from the emission limits set by the EC for MSW and hazardous waste incinerators with throughputs greater than 50 kg/hour. An "incineration plant" is defined by the new Incineration of Waste Directive (2000/76/EC) as "any stationary or mobile technical equipment dedicated to the thermal treatment of waste with or without recovery of the combustion heat generated". This definition would appear to exclude open burning of waste. The new Directive, which must be transposed into the legislation of each Member State by December 2002, replaces a range of previous directives on incineration. It applies to all new incinerator installations from December 28th 2002 and all existing installations from December 28th 2005. The principal aim of the Directive is to prevent and/or limit negative environmental effects due to emissions into air, soil, surface and ground water and the resulting risks to human health from the incineration and co-incineration of waste. It covers many aspects from a requirement for afterburners to airborne emission limits and criteria for the composition of residual ash. Previous EC legislation has exempted small incinerators (i.e. those operating at less than 50 kg per hour). The Waste Incinerator Directive (WID) (2000) allows such small incinerators to be exempt from licensing at the national level however they will still be subjected to the same onerous requirements of the WID as larger incinerators.

In the UK it is proposed that in future incinerators dealing with non-hazardous waste but with a throughput of less than 1 tonne per hour will be regulated by local authorities whereas those with a larger throughput will be regulated by the national authority. It is possible that different regulatory mechanisms may result in differences in the rigour with which the new standards are enforced. The position on the disposal of animal waste is complicated. Animal carcass incineration use not covered by the WID and therefore the existing regulatory framework (90/66/EEC which covers animal and public health requirements to ensure destruction of pathogens) will continue to be applied. A new Animal By-Products Regulation

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[3] DNV Consulting (Det Norske Veritas), 2001. Risk assessment of SRM incinerators. Prepared for the UK Ministry of Agriculture, Fisheries and Food. Revision 2 of the Draft report, February 2001. 24 pages.

(ABPR) will apply in Member States during the first part of 2003. The relationship to WID has been included in the ABPR. It is important that it does not result in less strict standards being applied for animal carcass incineration. In contrast to whole carcasses WID will apply to the burning of meat and bone meal, tallow or other material (even if they burn animal carcasses too). Additional specific directives will continue to apply to waste that could be contaminated with BSE/TSEs. (96/449/EC)

3. CURRENT USE OF SMALL INCINERATORS TO DISPOSE OF ANIMAL WASTE

Small incinerators are used for a variety of purposes and in a range of locations among Member States. Many are located alongside small abattoirs, knackers, hunt kennels, or laboratories. Thus they meet the needs of relatively small communities. Across Member States these small incinerators include a variety of designs and operating conditions (as indicated above in principle they will probably be required to meet specific standards for emissions and for the composition of the residual ash by December 28th 2005).

In the UK there are indications (see DNV Report 2001) that a considerable quantity of SRM which would have previously been sent for rendering is now being incinerated directly in small incinerators. Thus evaluation of the risks from such incinerators is of increasing importance.

4. RISK ASSESSMENT FOR SMALL INCINERATORS

The SSC, at its meeting of 28th -29th June 2001, recommended "a framework for the assessment of the risk from different options for the safe disposal or use of meat and bone meal (MBM) and other products which might be contaminated with TSEs and other materials.

This framework comprised five components:

(1) Identification and characterisation of the risk materials involved, the possible means for their transmission and potential at risk groups.

(2) The risk reduction achieved by the particular process.

(3) The degree to which the risks can be contained under both normal and emergency operating conditions. This inevitably includes consideration of the effectiveness of control measures.

(4) Identification of interdependent processes for example transport, storage, loading of any TSE related risk materials.

(5) The intended end-use of the products for example disposal, recycling etc.

Recently a report has been prepared by DNV consulting (2001) for the UK Ministry of Agriculture, Fisheries and Food (now known as DEFRA) that assesses the risks from small incinerators in the UK that receive SRMs. This report focuses on the risks involved steps 1 and 2 in respect of BSE/TSEs only. 10 incinerators out of a total of 263 in the UK were visited of which 60% had after burners.

(1) Nature of the materials handled

The DNV report 2001 starts with the assumption that "the materials incinerated at small abattoirs will be mainly SRM and bones from animals that are fit for human consumption. It may also include material from animals failed by meat inspectors. The likelihood of there being an animal

with significant BSE infectivity is very small and certainly much less than for the fallen stock handled by hunt kennels and knackers[4]. For this reason the study has concentrated on the latter type of operation".

The Report notes that "the material handled by both knacker and hunt kennels is highly variable and difficult to characterise". In terms of input the key factors to consider are:

- The number of adult bovines processed and the proportion of these carcasses that are likely to be infected.
- The extent of infectivity (in terms of human oral Infectious Units) that may occur (average and worst case).

In the DNV (2001) risk assessment only the BSE risk from processing bovine SRMs was considered. For quantitative risk assessment purposes the mean value of the oral ID_{50} for cattle was taken as 0.1 gram. A range of values was taken to cover uncertainty in the inter-species barrier from 10^4 to 1 (as recommended by the SSC 2000). In order to assess the likelihood that a particular carcass could be infected, UK and Swiss monitoring data was used. An incidence rate based on *Prionics* test findings of between 0.013 and 0.0025 was calculated. The DNV Report notes that prevalence rates are progressively reducing from these 1998/99 figures. Finally the report concludes that the SRM from an infected bovine could contribute 700 Infectious Units.

(2) Risk reduction due to incineration

Once a carcass/SRM has been introduced into a small incinerator there are two main sources for the potential release of BSE infectivity

(a) Airborne emissions

(b) Residual ash

There is no direct data on the TSE levels that may occur in those two media. The SSC however is aware of currently ongoing heat studies mimicking various incineration conditions and scenarios and aiming at assessing the TSE clearance efficacy of these processes (P.Brown, pers.comm., 16.01.03) on both the residual ash and the trapped emission gases.

In the absence of final data from such experiments for individual (small) incinerator types, the DNV Report (2001) assumes that measurement of the total protein content of ash is a relevant surrogate for BSE/TSE material. Protein content is a useful indicator of the general performance of an incinerator. However it is much more problematic whether it is also a valid marker for possible BSE/TSE contamination as it known that BSE/TSE are relatively heat resistant as compared to other proteins. Failure to detect certain amino acids present in prions is encouraging but the sensitivity limits for amino acids are relatively poor for reassurance purposes. Equally important, the data provided in the DNV report shows moderate split sample

[4] It may be mentioned that this assumption may be valid for the UK as a whole, but note necessarily for all other Member States.

variation but often substantial inter sampling variation (up to 600 fold). This indicates a wide span of performance standards among the small SRM incinerators in the UK and most likely across the whole of the EU. Typically performance was substantially poorer than is the case for larger incinerators. Unburned material is not uncommonly noted in the ash from small incinerators. If the reduction in protein content due to incineration is accepted as a valid indicator, typical infectivity reduction can be calculated to be of the order of 1600 (DNV Report 2001).

Incinerators are known to emit particulate matter from their stacks. Larger incinerators have much higher stacks to facilitate disposal of emissions, they also have gas cleaning equipment to minimise the emission of particulate matter, metals and acidic gases. Small incinerators generally do not have any gas cleaning equipment. It can be speculated (as in the DNV Report 2001) that unburned materials (and therefore potentially infections is much less likely to be emitted in the form of particulate matter than burnt material. Nonetheless there is no data to support this assumption.

(3) Other considerations

(a) Disposal of ash

In the case of small incinerators ash is often dispersed of locally to a trench, which is typically neither lined, nor is the residue buried deeply. In contrast for larger incinerators in the UK ash is normally disposed of to a contained landfill. The risk from disposal to a trench is difficult to gauge in the absence of reliable data on the possible infectivity of the ash.

(b) Management factors

Almost inevitably the level of expertise available for the management of small incinerators is highly variable because few such facilities can afford to employ specialists in incineration. This is also likely to be often the case for the inspectors as well. While such considerations cannot formally be taken into account in a risk assessment, they are not the less relevant factors that need to be considered in assessing the risk from a particular plant.

(c) Benchmarking

The DNV 2001 risk assessment relies greatly on the assumption that BSE/TSE contaminated material is very unlikely to be processed. The Report seeks to compare the risks from a small incinerator with that from large SRM incinerators which the author had assessed previously (DNV, 1997). It identifies that the risk is four-five –fold less from a typical small incinerator because the scale of activities is much lower. However it is noted that the amount of experimental data to back this conclusion is extremely limited and does not take into account either risks from the residual ash or any consequences of a substantially lower stack height limiting the dilution of the emitted particulate and gaseous matter.

5. FURTHER INVESTIGATIONS

In view of the uncertainty regarding the risks due to BSE/TSE contamination of the fly and bottom ash and airborne emissions it is recommended that further research is conducted to identify the residual risks (along with attendant uncertainties) from the burial of ash (without further treatment,) in uncontained sites. It is essential that suitable monitoring methods are developed.

6. LITERATURE

EC (European Commission), 1999. Opinion on The risks of non conventional transmissible agents, conventional infectious agents or other hazards such as toxic substances entering the human food or animal feed chains via raw material from fallen stock and dead animals (including also: ruminants, pigs, poultry, fish, wild/exotic/zoo animals, fur animals, cats, laboratory animals and fish) or via condemned materials. Adopted By the Scientific Steering Committee at its meeting of 24-25 June 1999 and re-edited at its meeting of 22-23 July 1999.

DNV Consulting (Det Norske Veritas), 1997. Risks from disposing of BSE infected cattle in animal carcass incinerators. Report prepared for the UK Environment Agency.

DNV Consulting (Det Norske Veritas), 2001. Risk assessment of SRM incinerators. Prepared for the UK Ministry of Agriculture, Fisheries and Food. Revision 2 of the Draft report, February 2001. 24 pages.

SEAC (Spongiform Encephalopathy Advisory Committee, UK), 2001. Public summary of the SEAC meeting of 25 April 2001.