Introduction

The 2001 FMD outbreak in Great Britain was quite different to the previous major outbreak in 1967 for several reasons. Firstly, the geographic spread of the outbreak would appear to have been exacerbated by the rapid and wide geographic spread of animal movements, especially of sheep, in which the early identification of disease was difficult on clinical signs alone. Secondly, in 2001, the issue of Bovine Spongiform Encephalopathy (BSE) and its impact on the disposal of cattle carcases was a key issue. Finally, environmental legislation and awareness has changed.

The pressing challenge during the outbreak was to match the limited disposal resource, and to develop new resources to meet the number of slaughtered animals, which needed to be disposed of within very tight time frames. The time from slaughter to final disposal had to be minimised to limit spread of the disease and to minimise any potential risk to human health or the environment from contamination of surface and groundwater, or air pollution.

Another key aspect was the need to address concerns relating to the risk of disease spread resulting from off-farm disposal and the requirement to develop robust biosecurity protocols that ensured the risk of virus spread during transport and subsequent disposal was minimised.

Changes since the 1967 outbreak that affected carcase disposal

There have been a number of significant changes that affected disposal operations during the 2001 outbreak in Great Britain compared to 1967. Although the cattle population has remained broadly similar since 1967 at 11 to 12 million, the sheep population has increased significantly from around 28 million ewes and lambs in 1967 to over 40 million for GB as a whole in 2001. At the same time the number of holdings has decreased and they have become larger; stocking rates have also increased. The distribution of pigs has also changed markedly during this period with a high concentration in the eastern arable counties of England and many fewer in the western, more grass dominated areas, of the country.

Patterns of farming and trading have also changed markedly since 1967. The impact of the rapid and widespread movement of sheep, particularly through markets, which had already taken place before the first case was confirmed, was not recognised until disease had already been spread widely throughout the country. The 2001 outbreak was in effect a series of interrelated epidemics originating from a single source and therefore disposal had to be organised to match this pattern.

<table>
<thead>
<tr>
<th></th>
<th>1967 FMD Outbreak (a)</th>
<th>2001 FMD Outbreak (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. premises</td>
<td>2,346</td>
<td>2,030</td>
</tr>
<tr>
<td>Cattle</td>
<td>211,825</td>
<td>306,053</td>
</tr>
<tr>
<td>Pigs</td>
<td>113,766</td>
<td>20,204</td>
</tr>
<tr>
<td>Sheep</td>
<td>108,345</td>
<td>954,139</td>
</tr>
<tr>
<td>Goats</td>
<td>51</td>
<td>882</td>
</tr>
<tr>
<td>Total animals</td>
<td>433,987</td>
<td>1,281,278</td>
</tr>
<tr>
<td>Av. no. animals slaughtered on each infected premises</td>
<td>184</td>
<td>631</td>
</tr>
</tbody>
</table>

(a) Source: The Northumberland Report
(b) Source: DEFRA Disease Control System 09 January 2002. Note figures are provisional and subject to change (figures include the four cases in Northern Ireland)
(c) In 1967 there were 2,364 outbreaks on 2,346 farms, 18 of which were infected on 2 occasions
(d) Infected premises only
(e) Total includes animals slaughtered as dangerous contacts.

Figure 1. Numbers of animals slaughtered on infected premises in the 1967 outbreak compared with numbers slaughtered in 2001
Farmers, their workers and their suppliers are also much more mobile, markedly increasing the risk of point to point transfer of the disease. Also, milk collection is now by bulk tankers which have to enter farmyards close to livestock housing thus further increasing the chances of virus spread, whereas in 1967 milk was mostly collected in churns from the roadside.

The net effect of the changes in livestock management has been that the average flock or herd culled during the 2001 outbreak has been nearly 3.5 times larger than in 1967 (see Figure 1). The contiguous cull policy significantly increased the burden of disposal compared to 1967, where only infected stock and dangerous contacts were slaughtered. It was this contiguous cull policy together with the culls in Cumbria and Dumfries allied with larger holdings and therefore flock/ herd size, that account for the major difference in the total numbers slaughtered for disease control purposes, in the two outbreaks (433,987 in 1967 compared with 4,042,166 in 2001).

Changes in environmental legislation also had a major effect on disposal. The need to seek ground water authorisations before either on-farm burial or on-farm pyre burning could take place introduced some procedural delays. More importantly the ground water authorisation risk analyses markedly reduced the number of sites on which either process could take place. This created a new disposal burden, not encountered in 1967, namely the disposal of large numbers of carcases off-farm by means of rendering, disposal in licensed landfill, mass burial or remote burning. All of these new routes increased the logistical problems of carcase handling, transport and disposal.

There were also justifiable concerns raised during the early stages of the outbreak that the transportation of carcases to off-farm disposal sites might give rise to an unacceptable risk of spreading disease. These concerns, together with the need to ensure that FMD could not be spread through exhaust gases or water treatment plants connected to rendering plants, required the development and rigorous enforcement of strict transport and site specific biosecurity protocols for each disposal site.

**Development of a Disposal Hierarchy**

An early priority in the outbreak was to agree a carcase disposal hierarchy between key stakeholders that took account of the need to protect public health, safeguard the environment and to ensure FMD disease control was not compromised. The cost of disposal was also a material but much less important factor. All groups agreed that rendering and fixed plant incineration were preferred methods of disposal but it was clear from the very outset that these resources were not immediately available and even when exploited to their full capacity could only partially meet the need for disposal.

Commercial licensed landfill was agreed to be the next best environmental solution to the disposal of carcases and there was confidence that disease risk from this route could be managed. However there were a number of legal, commercial and local community problems with the use of this route for FMD affected stock disposal. In effect these problems could not be addressed for the country as a whole, but licensed landfill did play a critical role in disposal.
role in the disposal of non-diseased stock slaughtered as part of the Livestock Welfare Disposal Scheme and for FMD stock in Cumbria. The most pressing problem in relation to the voluntary contracting of licensed landfill sites to meet either need was the opposition of local public, Local Authorities, MPs, pressure groups and farmers near the sites.

Pyre burning, used at the outset of the outbreak, caused increasing public, scientific and political concerns. The adverse public perception of pyres, allied with concerns about the emissions of dioxins and the health effects from inhalation of smoke, led to the increasing application of the precautionary principle in relation to pyre burning. They were eventually stopped on 7 May 2001 when the outbreak had subsided to about seven new cases a day.

Guidance from the Department of Health (DOH), issued at the end of April 2001, was that large pyres (1,000 or more cattle equivalents) should generally be built 3km or more from local communities (e.g. a village). Members of the public were also advised to avoid sustained exposure to smoke and irritants within the vicinity of pyres, particularly if suffering from asthma.

On-farm or mass burial was placed at the bottom of the disposal hierarchy principally due to the implied risks of firstly BSE and secondly the general risk to groundwater from burying animals. An assessment of risk due to BSE infectivity from the disposal of cattle due to FMD was commissioned by MAFF on 28 February 2001 and an initial appraisal was presented the following day. More detailed modelling was subsequently undertaken and presented to the Spongiform Encephalopathy Advisory Committee (SEAC) on 30 March 2001 and the final report was published on 24 April 2001.

The agreed generic disposal hierarchy for carcases, reflecting advice from all stakeholders, was published by the Department of Health on 24 April 2001 and is as follows:

In all cases, FMD carcases were given priority for rendering and over five-year-old cattle had priority for rendering or commercial incineration over sheep or pigs that could also be buried or landfilled. Meat and bone meal derived from non-pressure cooking rendering methods must be incinerated. Pressure cooking methods of rendering mean the resultant meat and bone meal can be either incinerated or sent to commercial landfill. These requirements were to minimise BSE risks and are not directly linked to eliminating FMD virus.

Disposal in Practice
The first case of the 2001 FMD outbreak was confirmed on 20 February 2001. With the exception of the carcases from the first case at the Essex slaughterhouse, which were rendered, disposal of the carcases slaughtered under disease control measures was by on-farm burial or pyre burning in accordance with the State Veterinary Service (SVS) guidance detailed in Chapter 3 of Veterinary Instructions, Procedures and Emergency Routines (VIPER). This guidance was that carcases should be disposed of by the most expeditious means available and

Figure 4. Contribution of different disposal routes during the 2001 outbreak
except in rare cases must be disposed of on the infected premises. Two methods were outlined as being suitable under the Animal By-Products Order 1999, on-farm burial or cremation. Detailed guidance and instruction on preparation of the sites and environmental issues formed part of these instructions.

Carcases from the early affected premises were generally disposed of by cremation on open pyres (the first pyre being lit on 25 February 2001) or by on-farm burial. A few carcasses from dangerous contacts were also disposed of in licensed landfill sites in the early period of the outbreak.

The number of cases increased exponentially from the beginning of March and it became clear that, logistically, on-farm burial and burning supplemented by the increasing rendering supply was failing to keep up with numbers slaughtered. Even when mass burn sites were established, the tide could not be turned. Allied to this, obtaining a supply of suitable fuels proved difficult and was subject to severe demand-led price inflation. Labour to build and supervise pyres also became a bottleneck.

Several local Disease Control Centre (DCC) managers started to search for suitable sites with appropriate geology, on which to set up mass burial sites. Watchtree (Great Orton), Cumbria was the first to be identified (23 March) followed by Birkshaw Forest, Dumfries, (24 March) Throckmorton, Worcestershire, (28 March), Eppynt (Sennybridge), Wales, (28 March), Widdrington, Northumberland, (30 March), Ash Moor in Devon, (3 April) and finally Tow Law, Durham, (5 April).

Work started on these sites immediately and in the case of Watchtree (Great Orton) the site was open and receiving stock on 26 March 2001; three days after pathfinding. In Cumbria, three licensed landfill sites were also used to accept carcasses, eventually receiving 69,000 tonnes of FMD carcasses. In theory licensed landfill capacity could have absorbed comfortably all the stock slaughtered both in the FMD outbreak and from the subsequent Livestock Welfare Disposal Scheme (LWDS). However, few licensed landfill operators were prepared to accept carcasses, and then, because of the potential BSE risk, only sheep and pigs.

To develop sufficient capacity to meet the peak demands of the outbreak Government would have been required to direct the landfill industry to take carcasses but there are risks associated with issuing directions. For example, directions provide the landfill operator with a defence against contravention of planning controls and this entails the risk of challenge under the Human Rights Act. There were also obvious disease risks in putting FMD infected stock into licensed landfill but the disease risk would have been no greater than using mass burial.

Rendering for FMD stock did not become available until 9 March 2001 thus, for the earliest stage of the outbreak, disposal was solely by on-farm burial or pyre burning. New rendering plants were contracted to FMD disposal as fast as could be achieved and a total of six were on stream by 29 March 2001, giving a potential weekly disposal capacity of 15,000 tonnes.

The peak of the outbreak occurred in the period 20 March to 20 April. At this time the number of cases per day accelerated from around 20 up to a peak of 50 and then declined. It was during this time that...
a massive effort was required, exploiting all available resources for disposals to catch up with the large lead generated by animals already slaughtered. Rigid application of the 24/48 hour culling policy where animals on an infected premises (IP) had to be slaughtered within 24 hours of report and those on all contiguous premises within 48 hours was generating huge numbers of carcases.

It was here that the exploitation of mass burial sites saved the campaign. Without use of massive industrial machinery, constant lorry flow from the farms and rapid disposal in large pits, the task would have become impossible. Use of mass burial allowed the slaughter to continue as planned (see figure 5). Failure of this disposal route would have made it impossible to continue the 24/48-hour slaughter policy.

The period from 20 March was when the pressures on disposal were most acute and military deployment, following earlier planning sorties, went from 0 to 2,000 in headquarters and the regions, supplying vital co-ordination and disciplined logistical support to the business of managing all post-slaughter disposal operations. At its peak in the week beginning 1 April 2001, the Joint Coordination Centre (JCC) records indicate that there were some 229,775 carcases awaiting disposal. Despite doubling and then re-doubling disposal resources, little if any impact was made on the backlog until week 8/9 of the outbreak. This marked a real turning point in the epidemic and by the week beginning 13 May 2001, disposal routes were able fully to cope with demand.

Disposal policy underwent a further change at 31 March with the ruling from Spongiform Encephalopathy Advisory Committee/Department of Health that for BSE risk reasons, it was considered inadvisable to bury over-five-year-old cattle on-farm or in mass burial sites. This class of stock had to be rendered, further complicating the logistics.

Managing disposals through the long tail of the outbreak required persistence. Pyre burning as a disposal route ceased on 7 May. On-farm burial had already been curtailed by the over-five-year-old cattle ban and by difficulties in gaining ground-water authorisations in many areas.

As numbers of cases began to decline it became more difficult to keep mass burial sites open and functioning effectively. Mass burial sites work best when being rapidly filled and then capped. They do not function well when the supply is reduced to one or two lorry loads a day. At the same time the environmental effects of mass burial sites, leachate production and odour, were beginning to be appreciated and were amplified by warmer weather.

Rendering became the main disposal route in this latter period but geographical location and the subsequent small peaks of disease (e.g. in Settle and Hexham) meant that the overspill from rendering almost always ended up in mass burial or the northern licensed...
landfill sites. The use of mass burial proved very difficult to sustain against concerted local opposition, made worse by local views that their sites should only accept carcases from the surrounding county. There was also criticism alleging that UK and EC environmental law was being breached. The use of these sites was discontinued in the autumn. Tow Law, the last site used, receiving its discontinued in the autumn. The use of these sites was also criticism alleging that UK and EC environmental law was being breached. The use of these sites was discontinued in the autumn. Tow Law, the last site used, receiving its final carcases on 14 October 2001.

Throughout the summer and autumn, although disposal was under control, a continuous juggling act was necessary to balance demand and supply. Under used resources such as the mass burial sites were closed to avoid nuisance and under-exploited rendering plants were returned to normal use. The hierarchy had by this time effectively lost on-farm burial and pyre burning as disposal routes. The remainder of the campaign was managed using rendering, limited air curtain burning (Figure 7) and the occasional incursion into northern mass burial and licensed landfill sites.

Incineration facilities capable of taking whole bovine carcases have limited capacity in the UK and were fully committed to the disposal of either BSE infected cattle, Specified Risk Material (SRM) or fallen stock. These plants were however used to dispose of small numbers of seropositive sheep at the end of the outbreak, once the large rendering plants were returned to normal use.

Impact of Disposal on Public Health & Environment

The Public Health Laboratory Service (PHLHS), Communicable Disease Surveillance Centre (CDSC) on behalf of the Department of Health, has co-ordinated a monitoring programme for the protection of public health during the FMD epidemic. In its third report it concluded that there was no evidence of transmission of the FMD virus to humans; no cases of gastrointestinal disease linked to animal disposals due to FMD has been reported from any areas affected by the outbreak; and a health impact assessment in North and East Devon found that pyres did not have any effect upon consultations or prescriptions for asthma or respiratory distress.

The Food Standards Agency implemented a programme of monitoring of dioxins and dioxin like products on herbage and in agricultural produce such as milk and eggs produced in the vicinity of pyres. They have advised that there are no implications for the human food chain from the consumption of milk or meat products produced near pyres.

The Environment Agency have also reviewed the environmental impact of disposal operations and in an interim report they have concluded that there was minimal adverse impact on the environment, in the short term, and no evidence of harm to public health from the FMD disposal activities.

Conclusions

- The Foot and Mouth epidemic of 2001 presented UK Governments and their Agricultural Departments with the most serious animal health challenge since the outbreak of 1967;
- Initially, disposal routes in GB were limited to on-farm burial and pyre burning. Concerns over impact on groundwater, the health risks from BSE prions and dioxin emissions and negative media impact severely curtailed these disposal routes;
- Rendering was quickly mobilised but the available capacity was limited to 15,000 tonnes per week and was insufficient to cope with the peak demand (estimated to be around 10,000 tonnes per day) for FMD carcases alone;
- Licensed commercial landfill was a key component of the disposal strategy, some 69,000 tonnes of FMD material having been disposed of by this route in Cumbria alone. Local objections and pressure from MP’s, Local Authorities and other action groups made the voluntary contracting of licensed landfills almost impossible in most areas;
- Mass burial sites were a new approach to disposal policy. The use of mass burial allowed the slaughter to continue as planned. Failure of this disposal route would have made it impossible to continue the 24/48-hour slaughter policy.

References

DNV Consulting (2001). Assessment of Risk due to BSE Infectivity from Disposal of Cattle due to FMD. (Jan 2002).
Introduction

In the 2001 Foot and Mouth Disease (FMD) outbreak the major cause of spread was through livestock movement and livestock contact. There was however, a significant spread caused by mechanical means. This can be prevented by timely and effective cleansing and disinfection, which will also minimise the chance of recrudescence of disease occurring when premises restock.

Principles of cleansing and disinfection

Slaughter and disposal removes the disease host- the infected animal. The aim of cleansing and disinfection on an infected premises is to contain and destroy foot and mouth virus in the environment in a cost-effective manner.

Killing the virus can be achieved by a number of methods. These should be considered both individually and in combination. All of the following methods have an impact on the survivability of the virus.

• **Time** - the likelihood of virus surviving beyond 12 months in the environment in natural conditions above freezing point is negligible;

• **Physical** - high temperatures and low humidity will destroy virus, primarily by desiccation;

• **Dilution** - washing down will reduce the levels of virus;

• **Chemical** - the use of acids, alkalis or approved proprietary disinfectants.

In all cases a combination of the above will be employed in the destruction of the virus as part of the cleansing and disinfection process.

The law

Article 11 of the Foot and Mouth Disease Order 1983 enables the Department to require the occupier of an infected place to carry out cleansing and disinfection of the premises at his own expense. However, the Department normally undertakes to carry out cleansing and disinfection without charge to the occupier.

In essence the Department pays for:

• preliminary cleansing and disinfection;

• full cleansing and disinfection after the premises have been prepared (preparation includes routine operations such as mucking out, removal of slurry from lagoons and pits for subsequent treatment, and clearing rubbish from the site);

• the cost of cleansing and disinfection of equipment and materials on the premises;

• the cost of manpower, equipment and supervision.

There are exceptions which are, in summary, slaughterhouses markets or fairgrounds, lairages and other places used by animals in the course of transit, (including wharves and train stations). These premises are required to be cleansed and disinfected at the cost of the owner.

Virus Survivability

Virus survivability in the 2001 outbreak showed a rapid deactivation over a relatively short period of time. Virus may remain infective in the environment for a considerable period, particularly in the presence of organic matter, such as soil, manure and dried animal excretions or in
inert material such as straw and hair.

The following factors determine virus survival time:

- **pH** - The virus is stable at pH 7.4 – 7.6 but will survive at pH 6.7 – 9.5 if the temperature is reduced to 4°C or lower. Below pH 5.0 or above pH 11.0 inactivation is rapid;

- **Temperature** - Raising temperature reduces survival time. Exposure to 56°C for 30 minutes is sufficient to destroy most strains;

- **Relative humidity** - Relative humidity below 60% will cause rapid deactivation.

**Preliminary cleansing and disinfection**

The level of virus is at its peak at, or just before, the point of slaughter and will diminish from that point. The preliminary disinfection is the first and major step in destroying the virus in the environment. This process is defined as being the time after slaughter but during and beyond disposal. Preliminary cleansing is the removal of carcases, body parts, blood etc and the preliminary disinfection is the application of an approved disinfectant.

The process should start at the time the animals are slaughtered, and be supervised by a Veterinary Officer or Animal Health Officer. The aim of preliminary cleansing and disinfection is to minimise the dispersion of foot and mouth virus by damping down all parts of the premises where the virus exists or is suspected of existing. All surfaces where diseased animals have been kept or housed as well as tracks, yards, handling systems and any other areas that have been directly or indirectly contaminated with virus should be subjected to preliminary disinfection. Particular attention must be paid to areas where livestock were collected for slaughter, slaughter sites and places where carcases have laid. The areas described should be liberally covered in an approved disinfectant, at approved dilution rates, to ensure all areas are thoroughly soaked but run-off does not occur. It is essential that no further work be carried out on site for 24 hours to allow this period of contact with the disinfectant.

**Secondary cleansing and disinfection**

Secondary cleansing and disinfection is expensive and labour intensive. It involves the use of disinfectants, an array of machinery and is likely to take time. It is important that due care and attention is paid to the safety of staff, and that the environmental impact and the overall cost are all taken into account, without compromising the standards of cleansing and disinfection to be achieved.

At the earliest opportunity a site evaluation should be carried out with the following objectives:

- to identify any buildings that cannot be effectively disinfected. This may be because they are unsafe for staff to work in, that they contain dangerous materials, such as asbestos, or are structurally unsound (Figure 1);

- to identify buildings, equipment or materials that cannot be effectively cleansed and disinfected without some repair prior to the start of the process;

- to identify which buildings have been infected and to what degree. It is clear the virus load will be heavier where infected animals had direct access compared to a building such as a tool shed or a loft that may have been inadvertently cross contaminated by personnel movements.

It is essential that good working relations with the farmer exist to obtain accurate, helpful and local information that will have a bearing on forthcoming operations. A detailed health and safety evaluation should also be carried out at this point if it has not been addressed earlier.

Having gathered the above information the officer responsible for the site is in a position to draw up a schedule of works which should detail:

- what action is required for each building on the premises and the extent to which cleansing and disinfection should be taken;

- the methods to be used.

(Pressure washing, dry cleaning, other methods);
The work is normally carried out either by the farmer or a DEFRA appointed contractor. In order that the environmental impact is minimised the schedule of works is routinely discussed with the Environment Agency, specifically to consider the disposal of wastewater, water containing disinfectant and treated slurry.

The secondary cleansing and disinfection can easily be broken into four stages:

1. All bedding, manure, slurry and rubbish should be removed from buildings, handling facilities, parlour etc. The buildings should then be washed and degreased to remove grease, dirt and manure from the walls, floor space, fixed equipment, feeders and troughs etc. In the majority of cases this is achieved using pressure washers. It is vital that all surfaces are visibly clean before progressing to further stages. Areas of broken concrete can, in most circumstances, be soaked in disinfectant but may occasionally have to be lifted, the area below treated and then repaired; the repairs would be the responsibility of the farmer. Rarely do the external surfaces of buildings require full cleansing and disinfection, though there are exceptions, for example, an outside wall which forms part of a handling facility or the ventilation ducts on intensive pig buildings, as these areas are likely to be heavily contaminated.

2. An approved disinfectant used at their approved rates should be applied to all surfaces to achieve the first cycle of disinfection. All disinfectants should be applied as per manufacturer’s instruction and due care paid to health and safety issues.

3. A seven day rest period follows. It is possible that repair or remediation work is carried out during this period providing great care is taken not to cross-contaminate any disinfected areas.

4. Finally, all surfaces are again subjected to disinfection to complete a second cycle of disinfection. It must be remembered that there are occasions, for example, intensive piggeries, where it may be necessary to carry out a further degreasing cycle before completing the final disinfection.

Cleansing and disinfection of field sites is achieved by applying the following procedures. It is vital that any field furniture is either disinfected and removed from the land or destroyed, and the land left for a minimum of 15 days to allow maximum exposure of contaminated surfaces to the elements. This may be aided by harrowing the field to disperse dung. Clearly any vehicles used to do this must be thoroughly disinfected prior to leaving the site.

Many farms have buildings, plant or areas that require special attention. Specific examples are sophisticated milking parlours, buildings of historic interest and traditional buildings (Figure 2). The list of examples is not exhaustive; the types of building and the issues they raise vary considerably throughout different areas of the country. The common thread is that they all needed to be effectively cleansed and disinfected before they can be re-stocked. In the recent outbreak the following methods were used to cleanse and disinfect sites of historic interest or traditional buildings:

- **Low pressure cleaning** - using water under low pressure, and hand brushing;

- **Dry cleaning** - using hard brushes, industrial vacuum cleaners and finally, using a slakelime solution. This in a very alkaline solution commonly used at pH12 on application;
• **Fumigation** - whereby buildings were cleaned, sealed and then fumigated using primarily formaldehyde;

• **Sealing the building** - serving an Article 38 prohibition notice to prevent restocking, typically for a period of 12 months.

The Department liaised with English Heritage on this issue and practical solutions were reached that did not compromise either the effectiveness of the cleansing and disinfection or the integrity and structure of the buildings being cleaned.

A large number of milking parlours are now highly sophisticated, with many electronic components. Both the internal parts (pipelines, vacuum lines, jars, clusters etc) and the external parts (feeders, bars, parlour fabric etc.) require cleansing and disinfection (Figure 3). In all circumstances the extent to which the parlour is contaminated must be assessed and the level of cleansing and disinfection required decided. Generally, all visible organic matter should be removed and feed removed from hoppers. The fabric of the parlour is washed down under low pressure and disinfected, as with other buildings. The internal areas of the parlour can be treated by circulating hot water and detergent through the system for extended periods and by repeating the process several times then introducing an approved disinfectant. There are occasions whereby stripping down the parlour becomes necessary.

### Biosecurity

Biosecurity of the site is vital throughout the above process to ensure that the virus is not reintroduced onto the premises or spread throughout it; the site officer is responsible for this. In general terms, access and egress is restricted to one entrance and all movements are controlled through that point (Figure 4). Movements are licensed and anyone or anything coming onto or leaving the site must be subjected to thorough cleansing and disinfection. In addition, as areas of the premises become clean they should be taped off and isolated to ensure cross-contamination does not occur. During cropping operations this was particularly important. A clean and specified route to the storage area was maintained and secondary cleansing and disinfection stopped. The site officer ensured that vehicles used in the operation were cleansed and disinfected before commencing operations and did not come into contact with any contaminated areas of the farm during cropping. Any contaminated storage facilities were subjected to full cleansing and disinfection and certified as clean before cropping licences were issued.

### Training

The scale of the 2001 outbreak dictated that additional staff had to be recruited. In order that cleansing and disinfection maintained momentum and that standards remained high it was necessary to recruit in the region of 600 extra personnel specifically to supervise these operations. Training was given at national level in locations throughout the country with the aim of standardising procedures, ensuring all staff had an adequate basic knowledge of the disease and control measures, with the emphasis placed on practical information required to allow the staff to work as cleansing and disinfection officers. Further training was conducted at local level.

### Summary

Cleansing and disinfection is a vital element in the control of foot and mouth disease in an outbreak. It is labour intensive, expensive and time consuming. It throws up an array of problems that need to be overcome to ensure the process is completed to high standards in a cost-effective manner. All personnel involved must be acutely aware of how easily contamination is spread and all precautions taken to avoid it, both in terms of spread within the premises and more importantly mechanical spread from the premises. The highest standards must be maintained otherwise recrudescence will occur. The only measure of effectiveness will be whether sentinel animals become infected or not.

At the time of writing there have been no cases of recrudescence.
MEASURES TO ALLEVIATE WELFARE PROBLEMS DURING THE FOOT AND MOUTH DISEASE OUTBREAK 2001 - LIVESTOCK WELFARE (DISPOSAL) SCHEME

Geraldine Whitmore, Veterinary Adviser, Animal Welfare Veterinary Division, Page Street

Background

With the number of reported cases of Foot and Mouth Disease (FMD) steadily rising during March 2001 and the limited scope for the movement of livestock, particularly sheep, it was apparent that further measures were required to assist livestock owners and keepers in alleviating welfare problems consequent to movement restrictions arising from the outbreak. Consequently a Livestock Welfare (Disposal) Scheme (LWDS) was introduced on 22 March 2002.

The scheme was intended as a last resort for farmers who were unable to safeguard the welfare of their livestock on farms under movement restriction due to FMD. The scheme aimed to alleviate the serious animal welfare problems in cases where farmers had exhausted all reasonable farm management procedures and were unable to move their animals from the premises.

The principal anticipated sources of livestock for the scheme were:

- hoggets on root crops or other winter keep which had been destined for export to the continent;
- livestock ready for slaughter within Infected Areas, which at the time were not permitted to move to slaughter;
- livestock which were destined to graze in areas now considered to be of lower disease risk and therefore no longer available to this stock, and;
- weaners or grower pigs which were destined for units now in Infected Areas and which movement controls no longer allowed.

It was apparent that there would be a flood of applications when the scheme began, as many farms had been unable to move livestock for four weeks. A method of prioritising cases was required. As State Veterinary Service (SVS) staff were needed at Animal Health Divisional Offices (AHDOs) to work on FMD, arrangements were made to utilise Agricultural Development and Advisory Service (ADAS) agricultural advisers to scrutinise and prioritise applications.

The scheme was to run in a broadly similar manner to the Pig Welfare Disposal Scheme (PWDS), which was introduced during the outbreak of Classical Swine Fever (CSF) in August 2000.

As with PWDS, the Intervention Board (IB) (now Rural Payments Agency (RPA)) ran the scheme on behalf of MAFF (later DEFRA) with the Newcastle office acting as the processing centre for farmers applications and payments, and the Reading office co-ordinating abattoirs, transport and disposal.

During CSF a single abattoir was used with designated vehicles cleansed and disinfected under supervision of staff from Bury St Edmunds Animal Health Divisional office (AHDO). In addition, all the carcases were moved, during supervision, to a single rendering plant dedicated to the scheme, where cleansing and disinfection of vehicles was supervised by staff from Stafford AHDO. This level of AHDO involvement was possible as the scheme was limited to pigs specifically affected by movement restrictions arising from CSF; the area from which scheme pigs would arrive was restricted to farms within the movement restriction zones in East Anglia. Movement restrictions for LWDS, movement restrictions were applicable to the entire country and even in areas where only Control Area status was applicable there were severe problems in relation to the movement of ‘tack’ sheep back to their premises of origin for lambing.

Procedures

IB issued notes to livestock farmers on 22 March 2001, with a telephone helpline manned seven days a week. Applications could be made by telephone, fax or post. The early period of the scheme was characterised by an avalanche of enquiries and applications. Figures
for the number of helpline calls taken, applications received and animals entered on the scheme are given at Table 1. By the end of April almost 1 million animals had been entered onto the scheme. During the same period 1.4 million animals were identified for slaughter due to the FMD outbreak.

As with PWDS, abattoirs had to be dedicated to the scheme, however carcase disposal clashed with the need to give priority to the disposal of FMD suspects and associated cull animals. In addition, the Bovine Spongiform Encephalopathy (BSE) concerns over the disposal of adult cattle necessitated incineration. In effect this meant that there were differential speeds for removal of the various species.

Livestock from premises under specific FMD restrictions, for example, premises situated within 3 km of an Infected Place (IP), which entered on the scheme had to be killed on-farm as movement off-farm to slaughter was not permitted until 2 May 2001. Livestock on premises within an Infected Area (IA), but not subject to specific FMD restrictions were not permitted to leave the IA for slaughter. If there was no abattoir within the IA for that species they also had to be killed on-farm. In addition, animals which were unfit to be transported but not otherwise unhealthy (e.g. breeding ewes close to lambing or recently lambed) had to be killed on-farm. Co-ordinating a veterinary surgeon to supervise humane killing, a killing team, haulage of carcases and the necessary disposal site provided to be a logistical nightmare.

It became apparent that some producers had made multiple applications and on 16 April an exercise to identify and remove duplicate applications was undertaken. Approximately 43% of applications for a total of 876,000 animals were found to be duplications, and one producer had registered the same batch of animals 14 times for the scheme. Following this exercise Private Veterinary Surgeons were asked to reassess those applications already received where livestock had not been removed under the scheme to ensure that, with the extra avenues now available for movement, including extra availability of slaughter for human consumption, that the scheme was being properly used as a last resort.

It was imperative that measures were taken to minimise the possibility of spreading FMD virus should any animals be incubating the disease. To limit the possibility a veterinary inspection was required of all livestock on the premises in the 24 hours prior to proposed transport. At abattoirs preferred methods of slaughter, to minimise potential virus spread, did not result in body fluid loss. In some abattoirs, these methods (principally electrical stunning and electrical killing) were reducing throughput. Thus, from 9 April instructions were issued permitting the use of sticking with careful collection and disposal of the blood to increase throughput.

The RSPCA had collected funds specifically to provide fodder to farmers during the crisis and were acting as a brokerage service for assistance pledged by other bodies including MAFF/DEFRA. From 28 April they provided assistance to applicants on a short-term basis to livestock, which were entered for the scheme. In some cases their assistance alleviated the welfare need to use the scheme, whilst in others it helped to lessen any welfare problems prior to livestock being removed.

On 2 May permission was granted to move animals from premises, subject to unlimited Form D restrictions, (restricted movement Table 1. Livestock Welfare (Disposal) Scheme - Monthly figures for helpline calls, applications received and animals entered.

<table>
<thead>
<tr>
<th>Month</th>
<th>Telephone calls¹</th>
<th>Applications received</th>
<th>Animals entered ²</th>
<th>Cumulative total</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 01</td>
<td>Data unavailable</td>
<td>Data unavailable</td>
<td>Data unavailable</td>
<td>Data unavailable</td>
</tr>
<tr>
<td>April 01</td>
<td>16,394</td>
<td>Data unavailable</td>
<td>1,476,530</td>
<td>1,476,530</td>
</tr>
<tr>
<td>May 01</td>
<td>17,662</td>
<td>9,120 ³</td>
<td>303,055</td>
<td>1,779,585</td>
</tr>
<tr>
<td>June 01</td>
<td>18,673</td>
<td>2,587</td>
<td>328,616</td>
<td>2,108,201</td>
</tr>
<tr>
<td>July 01</td>
<td>18,718</td>
<td>3,217</td>
<td>354,442</td>
<td>2,462,643</td>
</tr>
<tr>
<td>August 01</td>
<td>11,550</td>
<td>1,015</td>
<td>169,191</td>
<td>2,631,834</td>
</tr>
<tr>
<td>September 01</td>
<td>11,252</td>
<td>797</td>
<td>147,793</td>
<td>2,779,627</td>
</tr>
<tr>
<td>October 01</td>
<td>9,697</td>
<td>1,878</td>
<td>299,211</td>
<td>3,078,838</td>
</tr>
<tr>
<td>November 01</td>
<td>3,982</td>
<td>376</td>
<td>42,271</td>
<td>3,121,109</td>
</tr>
<tr>
<td>December 01</td>
<td>1,175</td>
<td>227</td>
<td>14,480</td>
<td>3,135,589</td>
</tr>
<tr>
<td>January 02</td>
<td>939</td>
<td>27</td>
<td>3,556</td>
<td>3,139,145</td>
</tr>
<tr>
<td>February 02</td>
<td>501</td>
<td>0</td>
<td>0</td>
<td>3,139,145</td>
</tr>
<tr>
<td>March 02</td>
<td>137</td>
<td>Scheme closed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ The number of calls between November and March include calls regarding the Light Lamb Scheme.
² These figures do not include the Light Lamb Scheme.
³ This figure includes applications received in March and April 2001.
of animals/vehicles/people on/off a premises on which animals have been exposed to infection), to an abattoir in the same IA provided that certain criteria were met. The use of Disease Control System (DCS) information by trained staff at Newcastle permitted identification of potential candidates. The final permission rested with the Divisional Veterinary Manager (DVM), who would be aware of any ongoing disease enquiries in the local area. In late July, in line with changes to permitted movements for animals for slaughter for human consumption, animals from premises within 3 km of an IP could move out of the IA provided 30 days had elapsed since the preliminary cleansing and disinfection of all IPs within 3 km of the premises from which movement was to occur.

With the increasing options for movement of livestock available to farmers the scale of fees payable for livestock entered were amended from 30 July. This resulted in a fall in applications. Table 2 itemises the categories and payments made for the various categories of animals eligible for the scheme. In addition, after the protracted difficulties of matching an owner’s application forms with the declaration from the Private Veterinary Surgeon, it was decided that all applications must be in one part and received by post.

In total 169,033 cattle, 1,587,364 sheep and 286,943 pigs and 5,429 goats and other species were removed. This last category included 1 camelid; 194 wild boar; 1,861 deer. Finally 10 ponies, 23,046 poultry and 30,000 fish were also removed in circumstances where their welfare was adversely affected by FMD movement restrictions.

**Light Lamb Scheme**

In order to pre-emptively provide a last resort for farmers where traditionally light weight lambs were sold, destined for live export, and to safeguard welfare the light lamb scheme was introduced with effect from the 3 September. In this respect the scheme was aimed at pre-emptively removing lambs before welfare problems occurred on farms as a result of the extra livestock.

Local Authority personnel issued licences for the movement of lambs to the designated abattoirs when requested by the applicant. Only where lambs were departing from a holding in an IA was pre-movement veterinary inspection required.

A flat rate payment of £10.00 per head was made for each eligible lamb submitted to the scheme. In total 525,508 lambs were removed on the scheme prior to its closure at the end of November 2001.

**Conclusion**

The Livestock Welfare (Disposal) Scheme built on the experience gained in running the Pig Welfare (Disposal) Scheme during the Classical Swine Fever outbreak in East Anglia during 2000. Lessons were learned during the course of LWDS in 2001 and these will be borne in mind should the need for a similar scheme arise again.

<table>
<thead>
<tr>
<th>Category</th>
<th>23 March</th>
<th>30 July</th>
<th>30 October</th>
<th>1 January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding Ewes (in lamb/lamb at foot)</td>
<td>£81.00</td>
<td>Cull rate</td>
<td>£30.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Rams</td>
<td>£81.00</td>
<td>Cull rate</td>
<td>£10.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Cull/draft ewes</td>
<td>£22.00</td>
<td>£18.00</td>
<td>£10.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Hoggets (in lamb or not)</td>
<td>120 p/kg 1/2 to max £45.00</td>
<td>£18.00</td>
<td>£10.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>New season’s lamb</td>
<td>£42.00</td>
<td>See weighted lamb rate</td>
<td>See weighted lamb rate</td>
<td>FCAD</td>
</tr>
<tr>
<td>Lambs less than 30 kg</td>
<td>Not applicable</td>
<td>35 p/kg capped at £10.00</td>
<td>£10.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Lambs more than 30 kg</td>
<td>Not applicable</td>
<td>70 p/kg capped at £25.00</td>
<td>£10.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Goats</td>
<td>70% of cull/breeding ewe rate</td>
<td>£10.00</td>
<td>FCAD</td>
<td></td>
</tr>
<tr>
<td>Clean cattle 7 to 30 months</td>
<td>80 p/kg, average batch weight</td>
<td>65 p/kg capped at £85.00</td>
<td>45 p/kg (killed on farm £240.00)</td>
<td>FCAD</td>
</tr>
<tr>
<td>Breeding cows / served or in-calf heifers</td>
<td>£900.00</td>
<td>Up to 4 years £700.00</td>
<td>£350.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Bulls</td>
<td>£900.00</td>
<td>OTMS rate</td>
<td>OTMS rate less £50.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Calves &lt; 7 mths</td>
<td>FCAD</td>
<td>FCAD</td>
<td>FCAD</td>
<td>FCAD</td>
</tr>
<tr>
<td>Clean cattle over thirty months</td>
<td>Pre FMD OTMS rate</td>
<td>Pre FMD OTMS rate</td>
<td>OTMS rate less</td>
<td>FCAD</td>
</tr>
<tr>
<td>or cull cows</td>
<td>averaged batch weight</td>
<td>averaged batch weight</td>
<td>OTMS rate</td>
<td>FCAD</td>
</tr>
<tr>
<td>Growing / finisher pigs</td>
<td>£15.00 per animal plus 55p/kg up to a maximum 100kg live weight average over batch</td>
<td>£12.00 per animal plus 55 p/kg capped at £45.00</td>
<td>58 p/kg (if killed on farm £55)</td>
<td>FCAD</td>
</tr>
<tr>
<td>Sows/boars</td>
<td>£75.00</td>
<td>£30.00</td>
<td>£15.00</td>
<td>FCAD</td>
</tr>
<tr>
<td>Others e.g. deer, poultry, wild boar</td>
<td>70% of valuation</td>
<td>70% of valuation</td>
<td>70% of meat valuation</td>
<td>FCAD</td>
</tr>
</tbody>
</table>

1 FCAD – Free Collection and Disposal.

Table 2: Classification of categories of animals eligible for the Livestock Welfare Disposal and payment rates during the operation of the Scheme.