

A farming perspective on the 2001 foot and mouth disease epidemic in the United Kingdom

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Summary

The outbreak of foot and mouth disease (FMD) that occurred in the United Kingdom (UK) in 2001 was the single largest epidemic of FMD the world had ever experienced. This outbreak raises important issues about future FMD control strategies, including the use of vaccination. The outbreak has also stimulated a wider debate in the UK on the role and direction of agriculture. The author presents the views of the National Farmers' Union of England and Wales on the handling of the outbreak by the UK Government and summarises some of the key lessons to be learned from a farming perspective.

Keywords

Animal movements – Compensation – Control – Foot and mouth disease – United Kingdom – Vaccination.

Introduction

On 20 February 2001, the United Kingdom (UK) Veterinary Authorities confirmed an outbreak of foot and mouth disease (FMD) which proved to be the single largest FMD epidemic the world had ever experienced. The outbreak was one of the most serious animal disease epidemics in the UK in modern times. The short-term impact of the epidemic on the UK livestock sector, already in a fragile economic and financial condition for various reasons, has been very serious. What the longer-term consequences for the UK livestock industry will be are more difficult to predict at this stage. The impact on the wider rural economy, for example in terms of damage to the tourism industry, has also been substantial. The outbreak has prompted an intense debate, both within the UK and in the European Union (EU) generally, about FMD control strategies, including the use of vaccination, should there be future outbreaks.

On 3 April 2002, at which date there had been no cases since 30 September 2001, 3.4 million sheep, just under 600,000 cattle, 144,000 pigs, just over 2,000 goats and around 1,000 deer had been slaughtered on 10,347 affected premises (1.3 million animals were slaughtered on infected premises, 1.5 million as dangerous contacts on contiguous premises, 1.3 million as dangerous contacts on non-contiguous premises and 0.13 million slaughtered on suspicion. These figures exclude animals slaughtered for animal welfare reasons). Commercially important export markets were closed until

22 October 2001 when the EU authorised the export of pig meat from certain areas of Great Britain. Export restrictions were progressively lifted over the following months. Overall, the National Farmers' Union (NFU) has estimated the direct and uncompensated financial impact on the UK livestock sector to be nearly £1 billion.

The scale and intensity of the epidemic, the strategy used to combat the disease and its impact on agriculture and on the wider rural economy has stimulated a much larger debate, not simply on possible alternative FMD control strategies in any future outbreak, but, more fundamentally, about the role and public expectations of agriculture and the future direction of agricultural policy in the UK and the EU. Following earlier food scares and animal disease outbreaks in the UK (salmonella in eggs, *Escherichia coli* O157, bovine spongiform encephalopathy [BSE], classical swine fever), the FMD outbreak further fuelled a debate over the strengths and weaknesses of 'modern' agriculture, not merely in the UK but across the EU generally. A Government-appointed Policy Commission on Farming and Food has considered many of these issues and has submitted a report to the Government. In addition, the Government has ordered an inquiry into the lessons to be learned from the FMD outbreak of 2001, and has asked the Royal Society to review scientific questions relating to the transmission, prevention and control of epidemic outbreaks of infectious diseases in livestock in the UK.

The foot and mouth disease outbreak

While the precise origin of the epidemic is not yet clearly established, it is highly likely that the virus – the particularly virulent FMD type O, PanAsia strain – entered the UK from another country, probably through an illegally imported contaminated food product. This incursion itself raises important issues about the effectiveness of veterinary controls at borders and the vulnerability of the country to imported diseases of both animals and plants. The NFU has therefore strongly advised the UK authorities to urgently carry out a review of the organisation, resourcing and overall effectiveness of the national import controls.

It is now clear that there was an initial delay before the suspected disease was reported and positively confirmed. By this time, the scale, pattern and speed of animal movements, especially of sheep, ensured that the disease had been disseminated and was already well-established before the Veterinary Authorities were able to implement movement and other disease control measures.

In hindsight, it is apparent that the UK Government and the Veterinary Authorities did not fully appreciate the nature, pattern and scale of livestock movements in the UK. As a result, the Government may not have fully foreseen the likely impact of these movements on the disease control programme. In the early stages of the outbreak, therefore, considerable veterinary resources had to be deployed to trace large numbers of widely dispersed animals, notably sheep, in order to establish the scale and pattern of infection and dangerous contacts.

While the Government has from time to time referred to the existence of a contingency plan to deal with an outbreak of FMD, the ferocity and speed of disease spread appeared to overwhelm the Veterinary Authorities at a very early stage. As a consequence, their task in recovering the situation had become immense.

The veterinary control strategy

From the outset of the disease outbreak, the veterinary strategy of the UK Government was based on 'stamping out', that is, the diagnosis and slaughter of infected animals and dangerous contacts, as quickly as possible. In the light of predictions by independent epidemiologists, based on computer-generated models, the strategy adopted by the Government was refined during late March 2001 and, in essence, came to be based on the slaughter of animals in four main categories, as follows:

- the slaughter of infected herds and flocks within 24 hours of reporting suspected disease

- the slaughter of susceptible animals on neighbouring farms within 48 hours (the 'contiguous cull')

- the rapid slaughter of dangerous contacts on non-contiguous farms

- in the heavily infected areas of north Cumbria (in northern England) and Dumfries and Galloway (in Scotland), this basic strategy was supplemented by the slaughter of all sheep and pigs within 3 km of infected premises.

Computer-based epidemiological models have highlighted the critical importance of achieving the 24 h/48 h slaughter targets in order to contain the outbreak and eradicate the disease (2, 3, 4, 5) (although in reality these targets were never fully met throughout the outbreak). When, in April 2001, the Government Chief Scientific Adviser presented data on the actual number of cases against the predictions of the models, these indicated that the, by then, improved performance in achieving the 24 h/48 h slaughter targets fitted closely the results forecast by the model. This gave grounds for optimism and appeared to vindicate the disease control strategy of the Government.

The contiguous cull, which, with the issue of vaccination, became a controversial element of the Government control strategy, involved the slaughter of very large numbers of animals, some of which may have been healthy at the time of slaughter and might never have become infected. In a comparatively small number of instances, the cull was resisted by some livestock keepers who contended that topography and the farming circumstances in their specific locale did not warrant the slaughter of their stock. They believed that the cull was draconian and pursued too rigidly (although the contiguous slaughter policy was refined in due course when veterinarians were empowered to exempt cattle from slaughter on neighbouring farms which they judged as presenting adequate biosecurity guarantees). From an overall epidemiological perspective, the scientific advisers of the UK Government were concerned that, by delaying the contiguous cull, these appeals in themselves created serious disease risks.

Overall, against the ferocity of the specific virus strain responsible for the 2001 outbreak, the rapid progression of the epidemic, the predictions of the epidemiological models, the risks inherent in delaying slaughter and the serious uncertainties surrounding the use of vaccination, the NFU believes that the Government had very little choice but to follow this strategy if it was to have any realistic hope of keeping the disease under control. The cost, however, has been very heavy in terms of the number of animals slaughtered, especially under the contiguous cull.

The controversy over the contiguous cull highlights the desirability of explaining clearly to farmers why such a cull was necessary in their particular case. Ideally, slaughter plans should include a risk assessment hierarchy which takes into account

local circumstances. In the actual circumstances of the UK outbreak, however, especially in the early phase of the outbreak, the Government was unwilling or unable to carry out a more targeted policy of identifying dangerous contacts.

Vaccination

Vaccination also became a controversial issue and, at times, an emotional debate amongst veterinarians, epidemiologists, various interest groups and the media. In April 2001, the Chief Scientist's Group recommended to the Government that, together with the continuing 24 h/48 h slaughter policy, a limited and targeted vaccination programme for cattle should be conducted in the county of Cumbria and, possibly, Devon. Most of these cattle were, at this time, being over-wintered in housed accommodation but were due shortly to be returned to pasture, raising fears about further disease spread as cattle came into contact with sheep. The European Commission authorised the protective vaccination of cattle in the counties of Cumbria and Devon (this was later extended to include the counties of Somerset, Cornwall and Dorset in the south-west of England).

In the event, the Government decided not to proceed with vaccination, although it continued to state that it remained an option and would be used where appropriate (the Government also considered the use of vaccination in the late summer and autumn of 2001 around clusters of cases in northern England, as well as pre-emptive vaccination of pigs but, again, decided not to adopt this method). Subsequent epidemiological analyses have indicated that vaccination would not have materially slowed down the progress of the epidemic, would not have been more effective than culling or have led to the slaughter of significantly fewer animals (2, 4, 5). This conclusion was reiterated by the Government Chief Scientific Adviser who, in an address to the NFU Council in October 2001, stated that computer simulations had shown that vaccination, as contemplated by the Government, would not have been as effective in eradicating disease as was thought in April 2001, and that the 24 h/48 h strategy had been more effective in this respect.

The role of the NFU in the Government decision not to use vaccination has been the subject of some discussion in the UK. The position of the NFU can be summarised as follows. During April 2001, when the Government was contemplating the use of vaccination, the NFU held a series of intensive technical discussions with the scientific advisers of the Government. The NFU insisted that the use of vaccination on a limited scale should be rapidly and thoroughly assessed. The Government scientific advisers were asked a number of questions which centred around the following broad issues:

- the effectiveness of a vaccination programme: how long would it take to establish resistance in cattle, sheep and pigs? Would 'carriers' become a problem?

- the impact on the UK livestock industry as a whole: would the use of vaccination shorten or prolong the epidemic? Would this mean the slaughter of fewer animals?

- was there an internationally-validated test to distinguish between infected and vaccinated animals?

- the commercial impact on those farms where vaccination was carried out: would they be able to sell products from vaccinated animals? Would they be able to sell vaccinated animals to farmers in other areas of the UK? Would they be able to sell the progeny of vaccinated animals?

In short, the NFU sought to establish the benefits and drawbacks arising from the use of vaccination in Cumbria and Devon before taking a firm view. With a number of specific questions posed by the NFU receiving inconclusive or ambivalent responses, the outcome of these discussions was that the Government scientific advisers were unable to give any clear indication – either to the NFU or to Government Ministers – that vaccination would lessen the overall impact of FMD.

Nevertheless, the position of the NFU throughout the outbreak remained that the decision as to whether or not to vaccinate, together with a continuing slaughter policy, must be taken by the Government on the basis of scientific advice and operational practicalities. In the event, the UK Government concluded that vaccination was not the appropriate response to the outbreak.

Handling of the foot and mouth disease outbreak by Government

Tackling the outbreak entailed a massive organisational, logistical and financial effort by the Government (both central and local Government), Government agencies, the military and farmers.

As indicated earlier, the successes, failings and lessons to be learned from this massive civil emergency exercise are the subject of a number of inquiries which are being conducted in the UK at the time of writing. Set out below are the observations and views of the NFU on the way in which the outbreak was handled and some of the lessons that can be learned.

While the seriousness of the FMD outbreak was fully appreciated by all from the outset, this was not so in regard to the scale of the epidemic. Initially, the response to the epidemic was handled solely by the State Veterinary Service, at the centre from its London offices and, on the ground, through the network of Animal Health Divisional Offices in Great Britain. However, it quickly became clear that existing veterinary, administrative and management resources and organisation were inadequate to cope with the rapidly spreading disease. In the early weeks of the outbreak, liaison and the co-ordination

of efforts across Government and, in turn, with the farming industry, were patchy at best. In some regions, there was no effective involvement of key stakeholders – for example, farmers – who would have been able to contribute to the effort to combat disease spread and to improve the communication of information, guidance and advice.

In the early stages, there were delays in performing key operations, such as diagnosis and confirmation of disease, tracing of dangerous contacts, slaughter of infected animals and dangerous contacts, and disposal of carcasses. In due course, the Government made three key decisions which swiftly and greatly improved the organisational, management and logistical response to the outbreak.

Firstly, the Government eventually realised that it would need to mobilise the logistical resources, expertise and discipline of the military in order to cope with the FMD outbreak. When the military were tasked from mid-March, there was an immediate positive impact.

Secondly, the Government appointed experienced civil service administrators as Regional Operations Directors. These individuals were authorised to take a strategic overview of the disease situation in their areas, to co-ordinate and direct the deployment of resources, to involve local stakeholders, to establish clear lines of accountability to and from the decision-making centre in London, and to ensure that the control strategy was being effectively pursued. In short, the Regional Operations Directors were able to establish and oversee a more structured and co-ordinated approach to tackling the outbreak.

Thirdly, following the political decision in March 2001 to co-ordinate activity amongst Government Ministers and their departments through a Cabinet Office Committee, a Joint Co-ordination Centre (JCC) was established in London to direct the operational response to the epidemic. The JCC brought together officials representing relevant Government departments and agencies, the military and the NFU. The mission of the JCC was 'to create and maintain an accurate ground picture, to create an all-informed network, and to facilitate the passage of information flows, information management and dissemination of instructions'.

At the veterinary level, the additional assistance of private veterinarians and veterinarians from a wide range of countries from within and outside the EU was sought and proved to be invaluable. The nominal maximum veterinary resource available during the outbreak reached 2,278 veterinarians, although, in practice, not all of these people worked each day on the FMD outbreak. Of this total resource, the maximum number of overseas veterinarians available was 33 from EU states and 117 from non-EU countries.

With these organisational and management changes, the battle against FMD began to gain momentum and to become much more effective.

Animal movements

As part of the veterinary response to the outbreak, a prohibition on the movement of livestock was implemented on 23 February 2001 (in hindsight, this animal movement ban should have been imposed on 20 February). Subsequently, a system of licences, issued by the authorities, was introduced to enable farmers to move animals under strictly defined conditions, commencing with the controlled movement of animals direct to slaughter from 2 March. Over time, these movement controls were revised and refined to enable controlled movements between geographically separated sites held by the same owner in the light of three main factors, as follows:

- the progress of the epidemic and the level and nature of biosecurity concerns
- the need to alleviate animal welfare problems
- the desire to restore as normal a pattern of farming activity as possible, without jeopardising biosecurity.

In general, farmers accepted the need for these restrictions and the associated movement licensing system implemented to prevent the spread of the virus. However, throughout, the system was complex and bureaucratic. A number of agencies were involved at various times and securing movement licences was a cumbersome and frustrating experience for farmers. In the later stages of the outbreak, the animal movement regime was based on the results of serology, making the speed and outcome of blood tests a crucial determinant for the restoration of some semblance of normal farming activity on livestock holdings. Particular problems, including operational problems with Government computer software, were encountered in operating the animal movement licensing system during the autumn of 2001.

The movement of other materials, such as silage, fodder and grain, was also subject to movement (and cleansing and disinfecting) controls.

Where farmers were unable, for disease control reasons, to move animals within their holdings either to commercial outlets (e.g. to slaughter) or, in the case of older cattle, to the 'Over Thirty Months Scheme' (one of the BSE control measures adopted in the UK), serious animal welfare problems rapidly developed as grazing and feed supplies were exhausted. The Government response to this situation was to introduce the Livestock Welfare Disposal Scheme (LWDS) on 23 March 2001 (on 3 March 2002, just over 2 million animals had been slaughtered under the LWDS). This scheme allowed movements direct to slaughter and provided for flat rate compensation payments to farmers. Products from LWDS animals were not subsequently allowed into the human food chain. Until late June 2001, when more generalised movement of animals out of infected areas to slaughter was allowed, and

later, during September, when farmers in 'high-risk' counties were prevented from sending non-slaughter animals outside their counties, the LWDS was a vital outlet. The operation of the LWDS was dogged by difficulties since the authorities seriously underestimated the level of demand by farmers to use the Scheme and because of inadequate co-ordination between administrators. This led to uncertainty, confusion and inadequate guidance to farmers.

Other operational issues

Other key disease control and prevention operations during the outbreak included the disposal of carcasses of animals slaughtered on infected and neighbouring farms or as dangerous contacts, and preliminary and secondary cleansing and disinfecting of infected premises.

During the early weeks of the outbreak, there were lengthy delays in the disposal of carcasses, especially in the heavily infected areas of Cumbria and Devon. This was not considered a threat to the disease control programme, since it was generally accepted that the rapid slaughter of infected animals and dangerous contacts was the priority above all else and that, following slaughter, the infectivity of carcasses diminishes quickly with the onset of *rigor mortis*. Nevertheless, in addition to the emotional trauma of having seen their herds and flocks destroyed, the distress and unpleasantness caused by undisposed carcasses were a cause of further stress to farmers and their families. It was not until early May 2001 that the then Minister of Agriculture announced that the backlog of animals awaiting disposal had been eliminated.

A range of carcass disposal options was available and eventually, the following hierarchy of options was established: rendering, incineration, landfill, burning and burial. In practice, in the early stages of the outbreak, burning on farms was used extensively. However, it soon became clear that the burning of large numbers of animals was an enormous logistical task, requiring substantial volumes of suitable incendiary material and giving rise to the subsequent problem of ash disposal. Furthermore, the burning of carcasses on open pyres was deeply disliked by both farmers and local residents. The television images of burning carcasses – broadcast around the world – may well have contributed to the wider economic damage, particularly to tourism, in both the affected rural areas and to the UK as a whole. Mass burial, the least expensive disposal route, was also unpopular and was frequently resisted by residents in the affected localities. Rendering, although an expensive disposal route, was the preferred option, but was constrained by limitations in rendering plant capacity. The decision to conduct emergency vaccination in the Netherlands was strongly influenced by the lack of rendering capacity which greatly limited the ability to slaughter and dispose of animals rapidly. Other disposal options, such as burial and burning, were not available in the Netherlands; all vaccinated animals

were subsequently slaughtered. Throughout the epidemic, decisions on disposal were also influenced by environmental and public health considerations.

A wide range of FMD control and clean-up operations required the involvement of commercial companies who made bids for tenders issued by the Government. Cleansing and disinfecting (C&D) of buildings and equipment on affected farms was one such operation. This was performed by both commercial operators and by farmers themselves. Following the slaughter of infected animals or dangerous contacts, preliminary C&D is a key disease control measure, while secondary C&D is necessary before farms can be restocked with animals. The issue of C&D became a matter of some controversy in the latter half of July 2001 when the Government became concerned about the rising costs of secondary C&D, with the implication that taxpayers were being exploited. Following a review by the Government of these costs, it became clear that, previously, there had been inconsistent guidance given to potential contractors on how invoices should be presented and costs itemised, as well as inadequate financial control. It transpired that the cost of secondary C&D performed by farmers was generally less than C&D operations carried out by commercial contractors.

Compensation

Legislation in the UK empowers Ministers to make compensation payments to owners of animals slaughtered as confirmed or suspect cases under a range of notifiable diseases, including FMD. In the first few weeks of the outbreak, valuers were appointed to value infected and suspect animals prior to slaughter and the subsequent payment of compensation. However, the Government came to the conclusion that the valuation procedure itself was causing delays in the slaughter process and, thus, jeopardising the disease control effort. This resulted in the introduction of a system of 'standard values' in late March 2001. This system of standard values was intended to accelerate valuations by setting rates for various categories of livestock (although farmers retained the right to have their animals valued by an independent valuer).

A feature of the FMD epidemic was a rising trend in valuations. This was in part due to the introduction of standard values, which, in practice, had an inflationary effect on valuations. In effect, standard values set a minimum base for valuers who frequently set valuations at higher levels, leading to an upwards trend. As livestock numbers dwindled in areas where there was extensive slaughtering, valuations reflected the expectation of high future costs of re-stocking. This phenomenon had been observed and remarked upon in the Northumberland Committee Report on the FMD outbreak in the UK in 1967 (1). An Appendix of that Report outlined a possible scheme to provide for supplementary valuation and compensation in extraordinary circumstances. In the event, these suggestions were never approved by the UK Government.

The future

The UK experience of the 2001 outbreak signals some important lessons to be learned, not only in relation to the response to any future FMD outbreak, but also in response to outbreaks of other infectious animal diseases.

The outbreak of FMD in the UK in 2001 highlights the need for some serious thinking, both in the UK itself and amongst the member states of the EU collectively, about attitudes to infectious animal diseases and the 'disease-free' concept. As a matter of principle, the NFU contends that it is desirable to attempt freedom from a potential epidemic and economically crippling disease if the means to do so are available. Leaving major infectious diseases such as FMD to be tackled on a 'fire brigade' basis infers the acceptance of the possibility of the permanent presence of virus in the livestock population, and therefore of a recurrence at any time.

Maintenance of disease-free status can realistically be achieved given appropriate national and on-farm biosecurity, disease surveillance, predictive modelling and sufficient resources to implement rapid and effective control strategies, including diagnosis and containment.

As indicated earlier, the global lesson to be learned from the 2001 outbreak is the focus of one of the official inquiries which the UK Government announced in August 2001. From a farming perspective, amongst key lessons to be learned, the NFU would highlight the following:

- the Government, in co-operation with key stakeholders, including the farming industry, must prepare and test realistic contingency plans to deal with animal disease outbreaks; these plans should be regularly reviewed and updated
- effective import controls should be implemented to provide a first line of defence against imported diseases
- an effective organisational response to disease outbreaks requires a clear command structure, close co-ordination and liaison amongst relevant government departments and agencies, clear recognition and acceptance of functional responsibilities by managers and other individuals and the early involvement of stakeholders
- the military should be involved at an early stage when complex emergencies require the co-ordinated and sustained application of its logistical expertise
- it is vital to ensure clear and constant communications between the policy-making centre, ground operations and farmers

- the Government must explain clearly the rationale for a chosen disease control strategy and the circumstances in which alternative strategies may or may not be appropriate

- the Government, together with other EU member states, must explore the circumstances in which vaccination against FMD may be used to advantage as part of alternative and more flexible FMD control strategies. In cooperation with the international scientific community, the Government must identify and commission the necessary scientific research and development which need to be undertaken to enable vaccines to be used reliably and without unacceptable adverse effects. There is a particular need for an internationally validated test to distinguish between infected and vaccinated animals

- more information and training in biosecurity measures should be made available to farmers and others in order to minimise disease risks

- animal movement controls must be practicable

- the UK State Veterinary Service must be given adequate resources to effectively carry out its functions during a serious disease epidemic

- the managerial, administrative and operational links between State Veterinarians and other management chains within the UK civil service should be reviewed so to ensure more effective liaison

- affordable and practicable electronic identification and traceability of sheep should be developed and delivered to the industry as a matter of urgency

- a system and procedure of valuations and payment of compensation should be devised which enables interim compensation to be paid during a serious disease epidemic, and for supplementary compensation when normal conditions are restored

- in addition to state-paid compensation for direct losses, other possible ways to offset consequential commercial losses and risks arising from disease outbreaks and control measures should be explored.

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L'épizootie de fièvre aphteuse survenue au Royaume-Uni en 2001 : la perspective des éleveurs

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Résumé

Aucune épizootie de fièvre aphteuse dans le monde n'a jamais atteint l'ampleur de celle survenue en 2001 au Royaume-Uni. Cet épisode soulève d'importantes questions relatives aux stratégies de prophylaxie qu'il convient désormais d'adopter contre cette maladie, y compris la vaccination. Il a également donné lieu à un débat approfondi au Royaume-Uni, concernant le rôle et le devenir de la filière agricole. L'auteur se fait l'interprète des points de vue du Syndicat national des agriculteurs (National Farmers' Union) d'Angleterre et du pays de Galles sur la gestion de l'épizootie par le gouvernement britannique et reprend les principaux enseignements qui peuvent en être tirés sur le plan de l'élevage.

Mots-clés

Déplacement des animaux – Fièvre aphteuse – Indemnisation – Prophylaxie – Royaume-Uni – Vaccination.



La epidemia de fiebre aftosa de 2001 en el Reino Unido desde el punto de vista de los productores

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Resumen

El brote de fiebre aftosa que asoló el Reino Unido en 2001 fue la epidemia aislada de fiebre aftosa de mayores proporciones que se ha producido en el mundo. Ese episodio plantea importantes cuestiones en torno a las futuras estrategias de control de la enfermedad, comprendido el uso de la vacunación. También ha inducido un debate a mayor escala en el Reino Unido acerca de las funciones y la futura evolución de la agricultura. El autor expone la opinión del sindicato nacional de agricultores (National Farmers' Union) de Inglaterra y Gales sobre la gestión del brote por parte del Gobierno británico, y resume algunas de las principales enseñanzas que cabe extraer de ese episodio desde el punto de vista de la explotación agropecuaria.

Palabras clave

Compensación – Control – Fiebre aftosa – Movimientos de animales – Reino Unido – Vacunación.



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