Academy of Medical Sciences response to the Royal Society Inquiry into Infectious Diseases In Livestock

The Academy welcomes the opportunity to respond to the request for detailed evidence. This response was prepared by a working group chaired by Professor Peter Lachmann FRS PMedSci. The other members were Professor Peter Biggs CBE FRS FMedSci, Sir Leszek Borysiewicz FMedSci, Professor Lance Lanyon CBE FMedSci, Professor Geoffrey Smith FMedSci. Issues of particular relevance to the Academy have been addressed. The response is set out under the headings as listed in the Inquiry's request for evidence.

1. The Diseases to Address

The list of diseases for consideration by the Inquiry is severely limited. They are all viral, include none with a zoonotic component and none which are treatable with antibiotics. We would favour augmenting this list with a parasitic/bacterial infection that can be treated and with an infection, possibly TB or Contagious Bovine Pleuro Pneumonia (CBPP), that can transmit to man. Such diseases are important for livestock and have implications for human health – both because of transmission to man and because of problems associated with veterinary antibiotic use. The potential consequences of veterinary antibiotic treatment (or chemoprophylaxis) on human health cannot be addressed with the examples so far selected by the Inquiry.

2. Disease-Free Status

Whether and how disease free status for a disease like foot and mouth disease can be achieved and maintained can be determined by scientific study but the desirability and practicality of doing so will be heavily influenced by political and economic considerations.

The real costs of periodic epidemics and the current eradication procedures needs to be compared with the costs of vaccination programmes and the costs which would result from the loss of disease-free status.

3. Surveillance and Diagnosis

Surveillance is the key to the control of infectious disease that has "the potential for very serious and rapid spread".

Both the State Veterinary Service and the Veterinary Investigation Centres have been severely weakened over the last 20 years. The State Veterinary Service has been greatly reduced in strength and adversely

restructured and the Veterinary Investigation Centres have been reduced in numbers and in their contact with the farming community. With the poor financial state of UK farming the presence of veterinarians on farms has been reduced. Surveillance has therefore become ineffective and is spread too thinly to be able to interface effectively with the medical public health services in times of crisis.

Active surveillance should be carried out by the State Veterinary Service together with the Veterinary Laboratory Agency (VLA) particularly the Veterinary Investigation Centres and Veterinary practitioners including DEFRA-appointed Local Veterinary Inspectors.

Local Veterinary Inspectors, or a cadre of them, should form the "front line". They should receive regular training and be kept well informed of the infectious disease status of countries that provide a threat. The state of vigilance in the UK currently appears lax compared to that of some of our trading partners. For example the current strain of foot and mouth disease virus gave rise to problems in South Africa. This did not lead to greater scrutiny of farm contacts of people arriving in the UK from South Africa - in contrast to the policy followed in the USA, Canada, Australia and Ireland.

While ports of entry are important, the abattoir as a point of entry to the food chain is of extreme importance.

A recent MAFF Review of Disease Surveillance highlighted the difficulties in identifying effective means of ensuring that appropriate surveillance methods are used. In order to reduce potential human exposure to pathogens it is essential that surveillance in abattoirs is far more systematic. The current ad hoc approach of sampling without having sampling targets for specific pathogens is considered to be inadequate.

The ability to integrate diagnosis in the field with a quality laboratory service is limited by the problem of staff shortages. Improved diagnostic aids for the field veterinarian– ideally simple and well-validated tests that can be used on the farm - would undoubtedly help.

4. Introduction or Re-Emergence of Disease

Surveillance needs to be more systematic if there is to be confidence that re-emerging diseases will be identified. Countries in continental Europe have had to adopt far more stringent screening in view of their land frontiers, and increasing transport of livestock means that some of their practises should now be considered in the United Kingdom. Much can be learnt from the USA which has active frontier control of imported farm products and questions people entering the country about their recent farm contacts.

The ability to prevent the introduction of a disease and quickly access epidemiological data in the event of an incident would benefit enormously from better databases and better demographics of livestock. The traceability of livestock and infections must be improved.

5. Novel Agents

Changes can occur in the virulence of micro-organisms, as happens with influenza virus and disease resulting from such changes is not easy to predict.

The identification of novel agents requires clinical awareness and a good, centrally co-ordinated, reporting system. There is a need to improve communication, not just between sectors of industry and government but particularly the interface between the surveillance for human disease and animal disease.

6. Modelling of Disease Spread

There is certainly a place for modelling but it is only one, albeit major, input to decision making. The precise evidence needed to underpin such models is dependent on the nature of the underlying agent, pre-existing disease resistance (including immunity), transmission (this might need to take account of the infectious dose and route, shedding rate and route and means of spread for the strain of organism involved in all species that can be infected) pathogen persistence etc. Each agent would have to be considered separately to avoid making unjustified assumptions. This information needs to be already available or produced rapidly when an outbreak occurs.

Overall there has been insufficient scenario planning. There are major strengths in this area in the UK but it is essential to put in place national programmes to ensure that those best able to do the planning are able to get timely and appropriate access to information. Modelling of the BSE outbreak is a sombre example where this failed to occur.

7. Control

Current methods are based predominantly on what was learnt from previous outbreaks and may not represent best practice based on robust scenario building. Future control methods should take into account improved vaccines and therapeutic opportunities and changes in practices since the last outbreak - particularly the increased movement of livestock and people. The loudly voiced public reaction to the images of culled animals and burning carcasses show that current control methods are not compatible with the public's ethical and environmental concerns.

Additional investment is required in modelling outbreaks and potential intervention methodologies. Investment is also needed in the development of vaccines and therapeutics.

In outbreaks it is important to recognise that different actions may be appropriate for different groups of animals, for instance to protect valuable breeding stocks.

8. Control if an outbreak occurs

The current situation is that the State Veterinary Service has been substantially reduced in size over the last 20 years and shows defensive,

rather than collaborative, characteristics, looking inward for solutions rather than outward to the wider academic/research community.

There is no single national surveillance organisation that can ensure optimal readiness for a new outbreak of infectious disease, either animal or human.

A useful model would be to have a core of Government-funded fulltime professionals in charge of surveillance who maintain constant communication with other Government departments and relevant organisations and with a wide spectrum of expertise in the many fields likely to be relevant to an anticipated threatening situation.

In this model the major responsibility of the core professionals, between crises, would be to ensure that there was an academic/scientific/ industrial hinterland of sufficient size and capability to provide expertise in all likely areas of threat and that lines of communication throughout this network were open; and that likely threats were anticipated and contingency plans constantly rehearsed in the light of advances in knowledge.

This organisation would ensure the existence of robust plans to mobilise manpower to deal quickly with an emergency on the ground; would assess the appropriateness of the contingency plans; and would provide the best possible scientific advice on immediate and long-term needs.

9. Vaccination

In many infectious diseases, particularly those due to viruses, vaccination is the most important control technique available. There is no reason to believe that vaccination of animals entering the food chain is likely to present any hazard to those eating the resulting food. Many vaccines are already used on livestock in day-to-day veterinary practice.

The general desirable attributes of vaccines are that they should be effective against all serotypes, prevent infection with the virus as it occurs naturally (or at least protect against shedding of virus), provide long lasting immunity, be easy to use and administer and inexpensive. The development of such vaccines requires detailed knowledge of the pathogenesis of the infection.

If a decision were taken to vaccinate all susceptible animals, this would provide a strong inducement for developing more effective vaccines. Vaccination techniques have improved greatly in recent years, with the advent of vaccines made by molecular biological techniques whether as proteins or as plasmids or as viral constructs. For example, the technique of priming with plasmid followed by boosting with a viral construct shows considerable promise. Molecular techniques have also made it easier to incorporate multiple variants of a virus in a single vaccine. However, the use of these modern vaccines in farm animals can be limited by cost and the problems of ensuring effective vaccine delivery.

An argument used against vaccination is that it is difficult to distinguish immune animals from viral carriers on the basis of antibody status. This argument has lost much of its force with the development of direct techniques for detecting the presence of pathogen specific nucleic acid, notably by PCR (polymerase chain reaction). The validation of PCR-based

diagnostic tests is clearly a matter of some urgency. Their use would also remove one of the objections raised against the use of passive immunisation to protect high value animals during an epidemic.

It should generally, also be possible to distinguish an immune response following vaccination from that following infection with the pathogen by measuring responses to specific antigens in the vaccine or pathogen.

Vaccination will be particularly important to protect rare breeds, zoological collections and other important groups of animals that are essential for maintaining genetic diversity.

Whatever policy is eventually undertaken it should be done in harmony with our European partners.

10. Animal Disease Research in the UK and Europe

The RAE exercise has shown that international assessors have a high regard for UK research. However there is a need for better organization, particularly co-operation between the universities and research establishments such as Compton, Pirbright and Moredun. A gulf remains between clinical veterinary research and medical research as was pointed out by the Selborne committee.

At present the veterinary science base for infectious disease research in the UK is too small and under funded. There is also a severe shortage of veterinary trained researchers in infectious disease at all levels and the base for selecting leaders in this area is inadequate. Particular areas of weakness are in veterinary microbiology, pathology and epidemiology.

There is also no strategic funding to address the assessed, national need. Funding made available by the major agencies like BBSRC, MAFF and the Wellcome Trust must be coordinated so that their individual and distinct funding priorities add up to a coherent, supportive research base for national competence in public interest veterinary medicine. Maintaining adequate experimental Veterinary/Animal Health Institutes is also essential.

11. Education and Training

The ability to understand and control infectious disease in animals is a strategic national requirement that has been ignored for too long. The disciplines on which a national policy depends (pathology, microbiology, virology, immunology, epidemiology and public health) are weak in the veterinary area. They need to be strengthened and coordinated.

Training in the veterinary sciences continues to be good and the majority of those entering the profession are of high quality; however, there are simply not enough personnel trained. Because of the structure of veterinary education and the dearth of attractive academic posts in the veterinary sciences it is not possible to recruit investigators to carry out the research that would be desirable to deliver all that society and government would wish, in terms of creating new knowledge and of turning that knowledge into beneficial applications.

The six UK Veterinary Schools (Bristol, Cambridge, Edinburgh, Glasgow, Liverpool and London) are each a component part of a large research-based university. They do not see themselves as having any proprietary rights over veterinary science neither do they consider that only veterinarians can do veterinary research. Indeed they recognise that a veterinary training is not the best preparation for many of the approaches needed in veterinary research.

However, the veterinary schools do see themselves as natural contributors to veterinary research and do consider that veterinarians have a unique contribution to make to research in this area. In this respect the veterinary schools are one of the most important recruiting grounds for the next generation of veterinary scientists.

The veterinary schools are also unique in being the only publicly funded organisations which both see clinical conditions and are committed to research into their causes and treatments. Continuity between those who encounter the disease and those responsible for developing strategies for controlling it is extremely important. Lack of confidence in each community in the other is particularly damaging.

Together the veterinary schools are the nation's largest employers of veterinary manpower. However, in total this means a national total of less than 400 research active academic staff of which only about 30 will be engaged in research in any infectious disease in production animals. This is an inadequate strategic national academic research base as has been recognised by the Wildy Report (1987) the Pickering Report (for the BBSRC) and the Selborne Report (1997).

The inadequacy of this academic research base does not reflect perversity on the part of the veterinary schools rather their inevitable response to their funding environment.

The prime determinant of academic staff numbers is the student intake which, since the Page Report (1990) has been unrelated to any perceived needs for veterinary manpower but rather to individual university's policy on desirable student intakes.

12. Research Funding

The number of staff engaged in infectious disease research reflects the needs of the curriculum and the funding available for such work rather than any concept of what would be desirable to provide a national resource in this area.

There is a fragmented and competitive, rather than collaborative, research funding structure in veterinary science, with no Research Council, or major panel within a Research Council, that specifically includes veterinary science as part of its mission. The result is a small research base in academic veterinary science/medicine. The veterinary schools are led by the poor research funding opportunities in "public interest veterinary medicine" to divert their energies towards teaching and towards providing, on a commercial basis, the clinical enterprises in which to teach and conduct clinical research, predominantly on companion animals.

Urgent consideration should be given to determining strategic national needs in terms of the academic/scientific/industrial research base to deal with a variety of threats including those of infectious disease in the nation's livestock. This consideration should extend to determining the areas of strategic national research importance; the manpower needs in these areas; and the best means whereby this national resource should be co-ordinated.

This will require:

i) support for the Selborne proposals for the veterinary schools to increase their research base in veterinary infectious disease; to develop within each school one of the platform technologies required to provide national competence in this area; and to institute specific post-graduate training in exotic and emerging disease.

ii) establishment within a Research Council of a major panel on infectious disease or on veterinary science including infectious disease. This panel should aim to support programmes of research which expand the research base in this area in such a way as to bridge the potential discontinuities between molecular bench science and field diagnosis/investigation.

Whether this could be better achieved by an Infectious Disease Research Panel or a Veterinary Science Panel needs to be decided.
