International Control of Cattle Disease*

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Introduction

An international approach to the control of cattle disease is becoming of increasing importance. The subject presents many problems for which solutions have yet to be fully developed. The formulation of correct solutions to these problems will hold the key to higher standards of world animal health and to the development of freer trade in livestock and livestock products on which the economic and social well-being of so many countries will depend.

After a brief glance at some of the historical factors which form the background of our present situation, I propose first to survey some of the problems which surround the application of appropriate precautions to trade in livestock and livestock products and then to study the efforts which have been made to lay the foundations of an international approach to the solution of these problems. Finally, I should like to look to the future, for which, despite the many difficulties, I see firm grounds for modest optimism.

Historical

Disease control problems associated with the movement of animals and their products have been with us from time immemorial. Man's efforts to solve these problems have met with varying success. It is surprising that, even in times when diagnostic aids were extremely limited, considerable progress was made in some regions to bring a number of major cattle diseases under control. During the last century, Europe suffered severe epidemics of rinderpest and bovine pleuro-pneumonia. These were eliminated by a successful use of controls on animal movement and a judicious application of a slaughter policy.

These early successes sprang from an inspired but nevertheless a practical approach.

Efforts to come to grips with these undoubted problems were manifold. In the United Kingdom Commissions to devise methods to deal with "imported plagues of cattle" were being set up as long ago as 1714 and 1746 saw the first Act of Parliament "for the suppression of cattle plague." In 1793 a Board of Agriculture was established, but this was more a private society than a government department. It was followed by a variety of other boards, societies and committees but all were inevitably more concerned with the recording of disease as and when it was identified rather than with the systematic elimination and control of the disease. Mainland Europe was in no better position. The knowledge and organization fundamental to success in these fields was yet to be acquired and developed.

In Europe, France led the way by establishing two veterinary schools, one at Lyons in 1762, the other at Alfort in 1766. Denmark, Germany, Austria and Hungary quickly followed this vital lead and in 1791 a veterinary school was established in London.

From these beginning stemmed the development of the primary essentials of disease control as we know it today—first the knowledge and techniques which are the basic tools needed for the control and elimination of disease and secondly the evolution of an organized veterinary profession capable of using those tools. The concept of a State Veterinary Service to assume central responsibility for the control of livestock disease was a later development. It was not until 1865 that the British State Veterinary Service was founded to set the scene in this country for the contemporary approach to these problems.

Disease Precautions and International Trade

I now turn to the complex question of the precautions which must be applied to bring about

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the practical reconcilation of the opposing considerations of essential protection from the spread of animal disease and the necessities of international trade in animals and animal products.

The experience of the last century, especially with regard to cattle plague, showed that the simple measure of restriction of movement of animals could have a striking effect in minimizing the spread of disease. There is the strongest incentive for any country, and especially for one enjoying, by an accident of geography, an island situation to carry the principle to its logical conclusion. A virtual ban on all importations can create an enclosed situation in which effort can be concentrated on the ultimate solution of national disease problems. But few countries can be entirely self sufficient in the field of livestock and livestock products and modern concepts of livestock improvement increasingly demand the admission of both new breeds and new genetic material for the improvement of indigenous breeds. Our present growing knowledge of cattle diseases enables us to assess with increasing accuracy the various risks involved. International trade in livestock and animal products will depend more and more upon the delicate evaluation of these risks.

In recent years, we in Britain have acquired a good deal of experience in this field. We have long faced the necessity of permitting significant imports of meat for our national sustenance and more recently have successfully pioneered methods of safely permitting imports of cattle from countries where disease continues to occur. This has been accomplished without jeopardizing our position as exporters of pedigree livestock and livestock semen to nations whose long histories of freedom from major animal disease rightly dictate the most stringent import policies.

Before I turn to more detailed problems I should like to expound a few simple principles. Any country (or group of countries acting in concert) wishing to import livestock or livestock products must consider - first the disease situation of the potential supplying country in relation to its own; secondly the veterinary organization available in that country to identify and combat disease; thirdly the steps taken by that country to prevent the introduction of the more serious diseases from outside its borders; and fourthly the nature of the disease precautions which must be applied to the importation.

May I illustrate the application of these principles by two examples from my own experience. Some ten years ago the British government recognized the need of its livestock industry to acquire new breeds of livestock from the European mainland which at that time suffered a continual recurrence of foot and mouth disease. After much discussion and cooperation with the French veterinary service precautions were devised which permitted importations to take place. Over the years, these precautions have proven themselves, and now substantially similar precautions have enabled a considerable volume of trade to develop in breeding stock to many parts of the world from different European sources. In the field of trade in fresh meat Britain has traditionally imported a significant proportion of essential supplies of beef from South American sources where the widespread incidence of foot and mouth disease clearly raised serious questions of disease risk. But the so-called "Bledisloe arrangements" first instituted between the wars and revised and strengthened after the British foot and mouth disease outbreak of 1967/68 are beginning to prove their value in reducing risks to an acceptable level. I cannot stress too strongly the importance in these arrangements of certification procedures and of mutual trust and reliance between veterinary services in the exporting and importing countries.

Reliable certification arrangements are of fundamental importance but importing states must exercise the greatest care and precision in framing their rules. On the one hand vagueness is sure to lead to misunderstanding. On the other, over-generalization can place the certifying veterinary service in an impossible position.

A certificate of "freedom from infectious and contagious disease" has a comforting ring about it for the importing state but it is a virtual impossibility for any veterinarian to put his name to such a declaration, especially in relation to an area or region. A carefully and realistically drafted schedule of compulsorily notifiable disease can be of inestimable value to exporters and importers alike.

When we talk of infectious disease we are usually referring to bacterial or viral infections and these present many problems. Most of these diseases can be detected in their clinical or sub-clinical forms in the field, or with the aid of biological and/or laboratory tests. The spectacular diseases should not generally present difficulties - a clinical case should be readily apparent and suitable tests, reinforced by quarantine, if necessary in company with susceptible control animals, should provide effective safeguards.

The clinical examination of the herd of origin by a veterinarian authorized by the government of the exporting country is usually the first pre-requisite.

The sampling and testing of the animal to be exported and possibly its contacts, is the next essential. The choice of tests, and the *modus operandi*, should be agreed by the two countries concerned taking into account the relative animal disease positions in both countries.

The laboratory testing of samples is one of the important warranties on which international trade in livestock depends. When we consider the various tests employed we must have standardization of techniques and of interpretations, with international acceptance of these standards. Thus if one laboratory reports that an animal has been tested for a disease with negative results then any country should immediately know the criteria on which this laboratory diagnosis was given.

Similarly the type of the test must be mutually agreed. For example at one time the only acceptable test for blue-tongue was a biological test in sheep, a costly and time-consuming operation, but latterly the more sophisticated fluroescent antibody and complement fixation tests have become available and are being accepted. Exchange of information at research level may well lead to the development of other acceptable tests.

Having decided the type of test the next problem is to agree the criteria of interpretation. For example, with sero-agglutination testing for leptospirosis it is generally accepted that a 50% agglutination at a titre of 1/400 or more is indicative of active or latent infection. What is not so generally accepted is the level at which a negative result may be given with confidence. This is often a matter of negotiation between the veterinary services of the different countries and it is perhaps one providing scope for general international agreement.

When, we consider insidious diseases such as Enzootic Bovine Leucosis, we are faced with a different problem. Because of an indeterminate incubation period, its presence in a herd or even in a country may not be known. Trade in animals susceptible to such diseases, or in their semen or other products derived from them, will depend largely upon the results of testing according to the specification of the importing country, on the history of the herd of origin, possibly over a long period, and on clinical examination and certification by veterinarians of the exporting country. This inevitable reliance on certification and testing procedures again underlines the vital importance of mutual confidence between state veterinary services.

The Problem of Transit

In the days when sea travel or overland transportation were the only means of transit there was a built-in quarantine period during the actual journey. Diseases such as foot-and-mouth disease, rinderpest, or contagious bovine pleuro-pneumonia soon became evident during transit. With the availability of air transportation we have shortened traveling time to such an extent that an animal incubating a disease could well leave the exporting country before it was feasible to detect the disease by any test or clinical examination; and yet the animal could be clinically infected soon after arrival. It is of particular importance that airports through which animals are imported are officially approved, and are equipped with, or are linked to, a suitable quarantine facility.

With the improvement in transport it is now relatively simple to convey an animal from one part of the world to another, and from one environment to another, which may be significantly different. Such rapid changes of environment may have important epidemiological implications. It may be found that a disease which is sub-clinical in a tropical area assumed epidemic or endemic proportions when introduced into a temperate zone, or vice versa. This happened with rinderpest in equatorial Africa when it was introduced from Egypt over 100 years ago, and the persistent epidemic nature of the sequelae is common knowledge.

Virus diseases transmitted by insect vectors raise special problems. In the case of a disease such as blue tongue which may be carried by some species without clinical signs, a complete prohibition on imports may well be unavoidable in the present state of knowledge.

Animal Products

International trade in animals, and especially cattle, has principally been concerned with the provision of meat for human consumption or with provision of genetic potential to the livestock industry. With modern methods of refrigeration and other processing of meat, movement of live animals for slaughter has been largely replaced by trade in meat. This, however, presents very significant disease considerations which must be taken into account. The disease position of the exporting country is again highly relevant. The ante-mortem inspection, the hygienic slaughtering and handling of the carcass is equally important. Once again the veracity of the certification is the principal safeguard. There are, however, additional problems with this trade. Meat, of course, does not necessarily show visible signs of disease and biological testing of meat is not a feasible proposition. We thus have the utmost dependency

upon certification and upon adequate surveillance at customs frontiers.

These comments in relation to meat apply equally to any of the vast number of animal products regularly traded between one country and another. As long ago as 1769 my own country banned importation of skins and hides from certain countries in an endeavor to keep out rinderpest. Similar restrictions are still in force. Restrictions are formulated in respect of different products from different countries in accordance with the existing disease situations and manner in which the product is prepared.

Insofar as importation of genetic potential is concerned, there is now an increasing international trade in semen, and especially in bovine semen. This is a trade in which the certification is of utmost importance. It is possible to store semen so that certification of the donor animal and its contacts can be given before, during and after the actual collecting period. The storage period can extend for many months or even years and if necessary the semen can be used on test animals before release. This arrangement provides a considerable degree of disease security.

A more recent development is the trasnportation of fertilized ova, either *in vitro*, or in a receptor animal. *In vitro* fertilized ova from cattle can remain viable for up to six days and give a conception rate of 60-70%. *In vivo*, the receptor animal has usually been the bovine. Recipient heifers have been regularly exported from this country to New Zealand. This, of course, involves the movement of a large animal with all its problems. One of the most intriguing developments is that the rabbit has been used as a receptor animal thus giving a convenient little "package" into which to transport the fertilized ova. But at the same time conception rate from ova transported by rabbits has been higher than that from ova carried in bovines. This is presumably because the rabbit, being a different species, is less receptive to ova having a low viability. It also may prove to be invaluable in screening the ova in respect of disease; the rabbit is believed to be immune to foot-and-mouth disease and probably from many other cattle diseases, thus if fertilized ova from a foot-and-mouth disease infected animal were placed in a rabbit it may well be that the ova would survive but not the virus. This, of course, is pure conjecture and much research will be needed into this aspect. The techniques of transplantation will also require further investigation as surgical implantation into the Fallopian tube appears to be at present about three times as efficient as transplantation by the vaginal route.

International Cooperation

I have already stressed the need for international exchange of information, acceptance of standards and cooperation at all levels.

In this context the date, 27 May 1921, represents an important milestone. On that day an "International Conference for the study of Contagious Diseases of Animals" was convened in Paris. The recommendations of this conference led to an "International Agreement for the Creation at Paris of an International Office for dealing with Contagious Diseases of Animals" and on 25 January 1924 representatives from 26 states set their signatures to the agreement in which they agreed, to "Institute and to coordinate all research or investigation concerning the pathology or prophylaxis of contagious diseases of animals which call for international collaboration"; they agreed to "Collect and notify to the governments and to their sanitary services the facts and documents of general interest concerning the progress of contagious diseases of animals and the means employed for fighting them"; and finally, they agreed to "Study the drafts of International Agreements concerning veterinary police measures and to put at the disposal of the powers signatory to the agreements the means of controlling the execution of such agreements." Thus, the "Office International des Epizootics" was conceived.

The importance and value of the organization then instituted has grown steadily over the years. The membership of the office now stands at over 90 countries and the staff of the office in Paris provide an unfailing service for the dissemination of information on the incidence of significant animal disease throughout the world. Studies initiated by the office have made contribution to the fight against animal disease in many sectors and the annual session of the Committee of the Office in Paris provides a forum for the exchange of information and opinion in all fields of veterinary science related to epizootic disease.

The momentum of international cooperation for the eradication of disease has gradually increased over the years.

A striking example of what can be achieved is seen in the work of the Joint Campaign against Rinderpest in Africa launched in 1962. This campaign has involved the veterinary and agricultural services of all countries in the Organization of African Unity along the equatorial zone, with much outside help from countries such as France, Germany, the United States of America

and Great Britain and from the Food Agricultural Organization of the United Nations. 120 million head of cattle have been vaccinated and the disease has been virtually eradicated from many of the countries in which formerly it had been endemic.

In December 1953 under the auspices of the Food and Agriculture Organization of the United Nations there was established in Rome a European Commission for the Control of Foot-and-Mouth Disease. The objects of the commission were to promote national and international action with respect to control measures against foot-and-mouth disease in Europe. The commission faced two immediate and pressing problems. Within Europe foot-and-mouth disease was then endemic and the immediate task was to secure action, throughout Europe, to remedy that situation. Moreover, almost immediately, Europe was faced with the threat of the introduction of entirely new types of foot-and-mouth disease virus from the African Continent, through the Middle East and from parts of Russia. The achievement in both these fields is a complete vindication of the international approach to such problems. With regard to the problem of the endemic state of foot-and-mouth disease in Europe, progress was initially slow but within the last ten years there has been a complete transformation of the European scene from the point of view of this disease. In 1957, the commission outlined a program for the systematic elimination of the disease. This program envisaged a progression from a state of endemic disease, through universal prophylactic vaccination, to the introduction of a policy of stamping out by slaughter supplemented by vaccination, and finally to a state where vaccination could be abandoned and the stamping out policy would rule alone. That final stage has not yet been reached but the disease statistics speak for themselves. As recently as 1965 there were no fewer than 23,000 outbreaks of foot-and-mouth disease in the six countries of the present European communities. In 1971 this number had fallen to a mere 55.

In dealing with the threatened invasion by exotic types of foot-and-mouth disease virus from Africa and the East emergency funds were subscribed, from all quarters of the European Continent, on the basis of the size of the livestock population at risk in each of the countries. This money was devoted to the creation of buffer zones in Anatolia and in the Balkan areas. There can be no doubt that these measures have protected the whole of Europe from a significant disease risk. Unfortunately there have been recent outbreaks of the exotic A22 foot-and-mouth disease in Greece. The entire resources of the commission have been mobilized to assist in the eradication of this new risk.

Developments of this kind have not been confined to the European Continent. In the Americas a similar problem has to be faced. While North America and the Carribean enjoy freedom from the scourge of foot-and-mouth disease, in the greater part of the South American Continent an endemic disease situation exists. Under the auspices of the Pan American Health Organization, inter-American cooperation on foot-and-mouth disease and zoonoses control has been established. The fruits of this cooperation are already beginning to be seen in a reduced incidence of disease and there is every hope that continued cooperation and effort will eventually see the eradication of foot-and-mouth disease and other animal scourges from the whole of the American Continent.

Welfare

The welfare of livestock while being transported within and between countries must never be overlooked. In the international sphere, the Council of Europe pioneered an international convention on this subject.

International Acceptance of Control and Certification

For the free movement of international trade in livestock and meat the ultimate aim must be the agreement of internationally accepted standards of control and certification. Much international work has been done in this field. The implications of this work are vital not only for the developed countries of the world but for those many developing countries in which the output of their livestock industry is their earliest and most important potential asset for international trade.

In the field of certification both public and animal health considerations apply. Much important work has been done and is in train to bring about the ultimate harmonization of public health requirements. On the world scale, one of the chief fields of this activity has been in the Committees of the FAO Codex Alimentarius.

In the field of animal disease important preliminary work has been done by the OIE in Paris who have evolved a draft International Zoosanitary Code. While this comprises a series of recommended standard precautions and acknowledges the freedom of each importing state to modify these requirements in the light of its own disease situation in comparison with that of an exporting country, it undoubtedly forms a

preliminary basis on which future international work can hope to build.

The European Commission for the Control of Foot-and-Mouth Disease at its annual session in Rome earlier this year laid down recommendations for the application of common standards for the importation of meat from disease-free areas in countries where exotic strains of foot-and-mouth disease are endemic, and also for the importation of meat from countries where non-exotic strains of foot-and-mouth disease continue to occur. If this work leads to the acceptance of common standards for the safe acceptance of meat from areas from which, at present, imports are largely barred, this should prove to be a major advance of great benefit to the whole world. I commend the report of this year's session of the commission for study by all who have an interest in this field.

I cannot conclude this talk without some reference to the impending accession of the UK to the European communities. The enlargement of the community will offer an unprecedented opportunity for the development of an area in which ten nations of the world can cooperate to achieve uniform and high standards of animal health. This must be to the advantage of all.

Conclusion

In conclusion, may I sum up in this way. Until comparatively recently, lack of knowledge stood in the way of soundly based action to bring many animal diseases under control. Growing knowledge tended to place increasing restriction on the movement of livestock and livestock products. We are now entering a new period in which greater knowledge of epidemiology and the emergence of more satisfactory tests will bring a greater liberalization of trade. The key to this potential advance lies in international cooperation in all branches and at all levels of veterinary science. I believe the foundations for this cooperation have already been laid.

Milk Replacers: Evaluation and Use
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or the veterinarian who is trying to evaluate a feed, this portion is often quite uninformative. In general, the ingredients are listed in the order of their predominance in the feed. However, this is a legal requirement in only one state, California. Most feed manufacturers appear to follow this custom even when it is not a mandatory requirement. Most ingredient lists that we have examined specify dried skim milk, dried buttermilk, whey and animal fat as the first or major ingredients, but no idea is given of the percentage of each. Thus, it is difficult to predict product quality from the ingredient list.

There are several reasons for these practices. First, the manufacturer does not want to give competitors his exact formula. Second, ingredient composition may vary with the availability of components. Third, the methods used in processing may alter digestibility. The reputable manufacturers are trying to produce a good product that will support calf growth with a minimum amount of digestive upset and at a reasonably low cost. They are, of course, not intentionally adding poorly utilized components. The content and production methods of good milk replacers are, therefore, a balance between what a manufacturer knows or believes the calf requires and cost. You must determine which milk replacers are the best for a particular calf raising operation. Through careful consideration of this material some inferior milk replacers may be identified, with other observation of the calves' performance may be required for evaluation.

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