

Consumer attitudes to vaccination of food-producing animals

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Summary

The 2001 outbreak of foot and mouth disease in the United Kingdom was unprecedented, with the need to develop a vaccination policy at the height of the epidemic. The extent of consumer concerns about eating products derived from vaccinated animals was unknown as survey results were equivocal. A recent survey on avian influenza reveals that the European public are well informed about the disease and its control, but over 50% of respondents would be reluctant to consume meat from vaccinated birds. There is little specific information available on consumer views about routine vaccination for other diseases. Their concerns appear to increase in an emergency situation when there is heightened awareness through the media. With the development of newer types of vaccines consumers will need more assurance about the safety and use of these products. This article examines these issues and makes practical recommendations for ensuring public confidence when emergency vaccination for disease control is proposed.

Keywords

Avian influenza – Consumer attitudes – Consumer concern – Food safety – Foot and mouth disease – Lessons learned – Public confidence – Vaccination.

Introduction

It is difficult to obtain detailed information on consumer attitudes to eating products from food-producing animals which have been vaccinated, especially as there is limited information in the literature. A compounding problem is that consumers often only consider the issue when there is heightened media interest and emergency vaccination is to be used in the face of an outbreak of an epizootic disease such as foot and mouth disease (FMD) or avian influenza (AI). The FMD outbreak in the United Kingdom (UK) in 2001 and the current situation with respect to AI along with a number of recent surveys provide some indication of consumer attitudes.

Foot and mouth disease vaccination

The 2001 outbreak

The UK outbreak of FMD began in February 2001. The final case occurred on 30 September 2001, just over seven months after the commencement of the outbreak. The last remaining FMD-infected area was pronounced clear on the 4 December 2001. In January 2002, the World Organisation for Animal Health (OIE) declared the UK free of FMD without vaccination. The UK approach prior to the FMD outbreak in 2001 was to rely on a traditional

stamping out policy. Field instructions for vaccination were available prior to the outbreak but only as an outline procedure which had not been publicised or discussed with stakeholders.

Vaccination was considered during the first weeks of the outbreak but was thought to be impractical due to the widespread dissemination of infection throughout the country. Vaccination was subsequently considered throughout the epidemic and on at least ten specific occasions. Apart from a proposal to vaccinate cattle in Cumbria and Devon (which was accepted but ultimately not carried out – see next paragraph) vaccination was ruled out for a number of reasons. It was recognised that the eradication of FMD in most areas could be achieved quickly and most effectively with minimal disruption through culling and tighter biosecurity.

The vaccination of cattle in Cumbria and possibly Devon was under active consideration from the end of March. These were areas where the concentration of disease and the local farm structure made it difficult to control the disease without large-scale slaughter of exposed animals. The proposed vaccination was intended to protect cattle which were due to move out of the winter housing onto spring pasture. The potential loss of particularly large numbers of animals and the difficulties in disposing of carcasses made vaccination an important option in these two areas.

The government accepted the case for an emergency vaccination programme and on 28 March 2001, the UK obtained authority (Decision 2001/257/EC) from the European Commission in Brussels to apply emergency vaccination in Cumbria and Devon. It was clear, however, that any vaccination programme could only succeed with substantial support from the key stakeholders, including farmers, veterinarians, consumers, retailers and food manufacturers. By the end of April it was evident that the level of support for vaccination was insufficient and with the reducing number of cases in Cumbria and Devon the justification for vaccination was less compelling.

Stakeholder concerns

Stakeholders were consulted throughout the discussions on vaccination but attempting to obtain their support at the height of the epidemic was difficult. Food safety was not considered to be a specific issue but it was recognised that vaccination could result in problems if consumer perceptions about the safety of milk and meat changed after vaccination was introduced. If consumer fears about vaccination gained any credence some sections of the food industry considered that this could lead to a two-tier market in meat and dairy products.

The food industry was concerned over the sale of produce from vaccinated animals, particularly the marketing of the produce post vaccination. The overall message from the food retailers was that they would expect to continue stocking meat and milk from pooled milk supplies which included product from vaccinated herds provided public confidence remained.

Retailers provided assurances about the marketing of products from vaccinated animals but indicated they would need to reconsider their position if consumer resistance was encountered. The key consideration for retailers was public confidence. If that were to disappear and customers were to demand that product be labelled to identify whether it was from vaccinated or unvaccinated animals the retailers would need to respond. In these circumstances retailers might decide to source their milk and meat only from unvaccinated herds. Many considered these fears to be exaggerated but possible consumer reactions in the midst of an outbreak are difficult to predict so there could be no certainty about the results.

Food safety issues

Early in the outbreak the UK Food Standards Agency (FSA) issued guidance on the safety of eating meat and milk from animals vaccinated against FMD. This guidance referred to the UK Veterinary Products Committee (VPC) safety assessments of the O1 Manisa vaccine (available from the International Vaccine Bank), which already had a UK marketing authorisation at the time of the outbreak.

A commercially available FMD vaccine was purchased during the outbreak as a precautionary measure in the event that large-scale vaccination was required at a later stage. This vaccine had been assessed by the VPC for safety, quality and efficacy and had received a UK marketing authorisation from the Veterinary Medicines Directorate (VMD). Unfortunately, due to time constraints the final potency testing required under the terms of the licence were not conducted in the early stages of the outbreak. If the vaccine had been used in the earlier stages of the epidemic it would have been released as an unauthorised medicine. Legally it would not have been the same product as that holding the marketing authorisation and it could not have been labelled with the same trade name. In the event, potency testing was completed later in the year and a full marketing authorisation was issued.

In the case of an unauthorised product, assurances would need to be sought from the manufacturer that the manufacturing process was the same as for the authorised product and that for all practical purposes the unauthorised product would be the same as the authorised product. Provided appropriate assurances were received from the manufacturer the use of the vaccine would pose no problems.

Vaccination against other diseases

Avian influenza

The UK has recently ordered 10 million doses of AI vaccine for potential use in poultry and other captive birds. The vaccines could be used against both the H5 and H7 strains. These vaccines have a provisional marketing authorisation from the VMD which confirms their safety and quality. Purchasing these vaccines is a precautionary measure taken as part of the contingency plan that has been established in the light of the uncertainties which exist about the future spread and nature of the virus. Vaccination would only be used if risk assessment and scientific evidence indicated that it would help to prevent the spread of disease. Stakeholders have agreed that preventative vaccination of poultry is not the most effective defence against AI because currently available vaccines have a number of disadvantages.

The European Medicines Agency has recently recommended that three AI vaccines should be given marketing authorisations under exceptional circumstances. This provides for an accelerated assessment because with the current concerns about the AI situation in both birds and humans there is an urgent need for authorised vaccines to be available as part of disease control campaigns. Their use entails specific obligations (which will be reviewed annually) that are intended to provide additional assurance in relation to the products and to ensure a programme of active pharmacovigilance should the vaccines be used in the field. These vaccines will only be used as part of disease control programmes in compliance with European Union (EU) legislation. Authorisation of these products will provide assurances to national authorities of the quality of the vaccines.

Other diseases

There are increasing threats from other diseases, many of which pose a risk to humans as well as animals. From a public health perspective AI poses a major risk, but with climate change and globalisation other potential zoonoses such as Rift Valley fever may also constitute a threat to Europe. Foot and mouth disease, classical swine fever (CSF), African swine fever, and swine vesicular disease, all have the potential to create economic problems. The recent incursion of bluetongue into northern Europe (France, Germany, the Netherlands and Belgium) demonstrates how a disease situation can change rapidly. For some of these diseases no vaccines exist, whilst in other cases they exist but have not been licensed or authorised for use.

Authorisation of vaccines

Emergency vaccination strategies must be acceptable to stakeholders, who will want assurances that the vaccines to be used at the very least meet regulatory requirements. European legislation requires that veterinary medicinal products must be authorised by means of a marketing authorisation. Minimum requirements (in terms of quality, safety and efficacy) that medicines must meet to obtain an authorisation are specified. The existence of a marketing authorisation confirms that the vaccine is safe in terms of animal and human health and that it works.

If there is no authorised vaccine for use against the disease concerned there is an exemption in European legislation from the requirement for an authorisation when a product is to be used in the event of a 'serious disease epidemic'. The European Commission must be informed of the detailed conditions of use. The term 'serious disease epidemic' is not defined in the legislation but clearly applies to outbreaks of FMD and other epizootic diseases. In these circumstances stakeholders will require assurances that the product is safe and of high quality and that there are no risks to consumers from products derived from vaccinated animals.

Consumer attitudes in general

Public concern

There has been a dramatic increase in public concern over food safety during the past decade, partly due to the number of food safety crises that have occurred, such as those surrounding BSE, salmonella, *Escherichia coli* O157 and dioxin. In the EU there is concern over the use of genetically modified products, eating food from animals treated with antibiotics and the impact on human health of the development of resistance to antibiotics and anthelmintics used in animals. As a consequence there is increasing public awareness and demand for high standards, with consumers expecting food to be safe and free of toxic substances, contaminants, additives, pesticide residues and veterinary medicinal residues.

As awareness of food safety grows amongst the public there is a greater need to provide assurances about safety and quality. Perceptions of the extent and prevalence of food safety hazards are constantly changing. Many food safety hazards are well defined, but there remain differences of opinion and a lack of understanding about the degree of risk posed by specific situations, such as emergency vaccination, or by possible new hazards, especially those related to new and advanced vaccines. It is natural for consumers to feel some scepticism towards new and unfamiliar vaccines or situations when the perceived risk may be different from the actual risk.

Special Eurobarometer on risk issues

In 2005 the EU Directorate-General for Health and Consumer Protection and the European Food Safety Authority (EFSA) commissioned a survey in all EU Member States to assess how people perceive risk, focusing in particular on food safety. The survey results, published as a Special Eurobarometer on risk issues in 2006 (2) indicate that when people are asked to specifically cite any problems or risks associated with food, many things spontaneously come to mind but without any sense of unanimity. Food poisoning comes to mind most often (16%), followed by chemicals (14%) and obesity (13%). For 7% of respondents food did not present any risks or problems at all.

The report notes, however, that attitudes changed when consumers were reminded of the possible risks associated with food: concerns then appeared to be quite widespread. The main finding in the report is that people do not differentiate greatly between the various types of risks, although they are more likely to worry about risks caused by external factors over which they have no control. At the top end of the 'worry' scale, consumers express concern regarding external factors that are clearly identified as dangerous (pesticide residues, new viruses such as AI, residues in meats, contamination of food by bacteria, unhygienic conditions outside the home). In the mid-range, one finds other external factors such as environmental pollutants (e.g. mercury), genetically manipulated organisms, food additives, animal welfare and bovine spongiform encephalopathy (BSE).

The fear of being endangered by food contaminated by toxic substances, viruses, bacteria, and to a lesser extent by prions, is widespread among Europeans. On average, around a quarter of EU citizens are very worried about food contamination. The level of worry does not vary much between the food contamination issues included in the survey. However, it is interesting to note from the report that 'close to three out of ten Europeans state that they are "very worried" about new viruses like AI and a further 38% are "fairly worried" about this'. The report notes that survey participants gave these answers in response to a question that did not specifically focus on the way new viruses were transmitted, but talked about emerging viruses in general. This suggests that it is not a particular method of transmission that worries the public, it is simply that they feel threatened by the existence of new 'unknown' viruses, whatever the means of transmission.

The report does not contain specific comments about the vaccination of food-producing animals but it provides background information to explain why there could be consumer concern about vaccination in certain circumstances. The report indicates that when confronted

with possible risks associated with food, consumers identify a wide range of concerns and tend to worry most about those factors which they cannot themselves control. It is clear that European consumers would be concerned about the potential impact of vaccination if they had no control over the products and particularly if products from vaccinated animals were not labelled as such, thereby leaving them without the choice of whether or not to eat them. To overcome these fears consumers need information which is reliable and from a trusted source.

Consumer attitudes to vaccination

Survey in 2001

The decision on whether to vaccinate in 2001 was linked to the attitude of consumers to food products from FMD vaccinated animals. Various surveys conducted throughout the 2001 crisis provided equivocal answers. Only by testing consumer behaviour in the market place could a definitive view be obtained. The FSA made it clear by its announcement in late April that food products from FMD vaccinated animals posed no additional risks to food safety. Consumer organisations also concluded that it was unlikely to be an issue for consumer choice and that special labelling was not required. The Soil Association (a UK environmental organisation promoting sustainable, organic farming) and organic producers supported this view.

Small-scale surveys into public opinion in the UK during 2001 indicated that most respondents considered that an alternative to extensive culling in the case of an FMD outbreak was needed. There was a widespread feeling that consideration should be given to a vaccination strategy if it was practical and could be made to work. Whilst most consumers preferred vaccination as a method of avoiding extensive and widespread culling it would be necessary to convince people that it could work and to overcome their reservations about eating meat and other products from vaccinated animals.

Most consumers interviewed had some reservations about the idea of eating meat from vaccinated animals and needed assurances that meat would be safe to eat. Even so some retained doubts about the long-term safety of meat from vaccinated animals, which is due partly to the impact of the BSE crisis and the long incubation periods for prion disease in animals and humans. It was mainly mothers with younger children who were most resistant to eating products from vaccinated animals. Most indicated that given the option they would take meat from unvaccinated animals if the meat were labelled 'vaccinated' or

'non-vaccinated'. To overcome these doubts it would be necessary to demonstrate safety and also put the vaccination in context, i.e. remind consumers that vaccines are regularly used to control endemic diseases.

The advice from the FSA emphasised that produce from animals routinely vaccinated against other diseases could be safely eaten and that FMD vaccination was no different. Some of the respondents accepted that meat from Argentina probably originated from vaccinated animals and that it was consumed in the UK. Some consumers believed that produce from FMD vaccinated animals was safe but preferred not to consume them if given the choice. Consumer nervousness is a real risk when vaccination is introduced with full media coverage in an emergency situation. This in turn creates fears that retailers would not purchase products of vaccinated livestock, resulting in the animals becoming valueless.

Scoping study into public perceptions

A small scoping study (1) was conducted in 2003 into public perceptions concerning animal vaccination, using the 2001 FMD outbreak as a case study. The study had three components:

- an examination of press coverage of the issue of vaccination during the epidemic
- data collection from subsets of the lay public likely to represent differing viewpoints on animal vaccination
- an examination of the concerns expressed by food manufacturers (including farmers) and distributors about the use of vaccination and how these relate to what they believe their customers, both domestic and commercial, would want or would reject.

The study established seven focus groups whose members were drawn from different backgrounds and were predicted to have different reactions to the epidemic. The author of the report recognised that focus group methodology typically does not permit tests of the representativeness of the findings for the population as a whole or discrete subsets of it, but the report indicated that the object of a focus group methodology was to capture some of the diversity and complexity of views surrounding the issue.

It was clear from the focus groups that there was considerable diversity in public understanding of vaccination. Interestingly, consumers in the focus groups did not indicate that they would have rejected products from vaccinated animals (and food manufacturers did not mention consumer rejection as a possible reason for not vaccinating). This contrasts with the consumer survey carried out during the epidemic, which suggested that the

public would reject food products from vaccinated animals. It may be that the public are more likely to suppose that they would accept such food after the event but they may be more cautious during a major outbreak.

A range of general conclusions and lessons were described in the study report. Those in relation to vaccination are listed below:

- explaining complex scientific arguments to the public or to special interest groups in the middle of a crisis is not feasible. This should be anticipated and the foundations of understanding the rationale for, and limitations of, vaccination should be established with the public prior to the next epidemic;
- informing the public requires their active engagement in the process of gaining knowledge;
- there was evidence that the lay public interprets issues concerning animal vaccination in terms of understandings of how human vaccination is used. This accounts for some of the difficulties in understanding the 'vaccinate to kill' option. The anchoring of understanding of animal vaccination in human vaccination could be used as the basis for developing future information provision;
- there was no evidence from the focus groups that the public would be unwilling to purchase or consume meat products from vaccinated animals. The press coverage echoed the FSA advice that such food stuffs would be safe to eat.

Eurobarometer survey into avian influenza

The Eurobarometer survey conducted in March and April 2006 (3) questioned over 25,000 EU citizens on AI, in particular the risks it could pose to human health and how it spreads. The study revealed that most EU citizens are well informed about AI but when it came to food safety those surveyed were less sure. Whilst over 60% knew that properly cooked poultry meat and eggs could not transmit the virus, only 47% believed it was true that meat from vaccinated birds was not dangerous. It is of concern that over 50% of those questioned did not believe that eating meat from vaccinated birds carries no risk to human health. There was a marked difference between consumers in different countries, with those showing the highest awareness of the true facts coming from countries where outbreaks have occurred.

Research requirements

The European Technology Platform for Global Animal Health published a strategic research agenda (SRA) in 2006 (4). The SRA identified many of the consumer concerns about technology and the use of veterinary medicines

(including vaccines) that have already been discussed in this paper. It was considered important to investigate the background of these concerns by developing an understanding of public perception and societal views on a range of issues such as risk, benefits, products based on new technology, new control measures and ethics. There appears to be a seemingly large information gap between public perception and the scientific situation in reality.

It is important to be aware of how society will view advances in technology and the use of new technologies. Not addressing these issues will lead to misunderstanding and mistrust. The actual rather than the perceived risk for new technologies or existing technologies to control animal diseases must be discussed with the wider public to ensure social acceptance. A number of studies into public engagement and understanding have been carried out in the past. The SRA recognised that societal studies were needed to assess the impact of new technologies or alternative eradication programmes which use veterinary medicines.

The SRA identified a need to evaluate the most effective ways to present new technology and new programmes to the public. An evaluation of the risk communication and science strategies available to present new information would be of considerable assistance in the development of publicly acceptable evidence-based policies to control epizootic diseases.

Current developments in the United Kingdom

Many lessons have been learned since 2001, not least of which is that the issue of vaccination should be settled at an early stage in the contingency planning process. Since January 2003, there have been extensive discussions and regular meetings with UK stakeholders to discuss the implications of emergency vaccination and to obtain support from the whole of the food chain should emergency vaccination be required in future. Initially these discussions related to FMD, but a similar process is now in place for AI. There are understandable concerns about the marketing of products post vaccination.

A statement summarising the situation on the use of FMD vaccination as part of disease control strategies has been produced by the UK government in cooperation with consumer organisations. In the statement the FSA confirmed that the consumption of products from animals treated with authorised FMD vaccines 'would not have any implications for food safety'. Furthermore BEUC, the European Consumers' Organisation, also stated in December 2004 that, 'from the perspective of consumer organisations there is no safety concern with products from emergency vaccinated animals'. Consumer organisations in the UK have confirmed that they support this view.

The statement records that discussion with retailers has confirmed that meat and milk from vaccinated animals would not be separately identified, indeed there is no reason to do so. Vaccination is now accepted as one of the important options available in fighting an FMD outbreak and its implications are now seen as practical ones regarding the handling and marketing of products from vaccinated animals rather than ones of the acceptability of those products to retailers and consumer groups.

Conclusions

A review of the available literature does not provide a great deal of specific information on consumer attitudes to vaccination of food-producing animals. Experiences in the FMD crisis and subsequently with AI indicate that there is potential public concern over the consumption of products from animals vaccinated as a control measure during a major outbreak of disease. This contrasts with the apparent lack of concern about routine vaccination against a wide range of diseases in most food-producing species. This is not unexpected as there is little public discussion on vaccination of food-producing animals during periods when there are no active national vaccination campaigns. Furthermore, the public generally identifies with vaccination in a favourable manner due to the benefits to human health and the positive impact of vaccination in companion animals.

An analysis of a number of linked surveys indicates that consumers are most concerned when actions take place outside their own control and where they have no choice. It would also appear that in the height of an epidemic there is increased sensitivity to the potential impact of the control measures. Even though the media often reflects the advice from the food safety authorities, the fact that the subject of food safety is constantly raised impacts on public consciousness and often leads to increased concern of the unknown.

Whilst many aspects of the safety of vaccines are a scientific issue, public perception is equally important in the policy-making process, especially if the issue has a high political impact. The discussions around vaccination against FMD, CSF and AI show that there are potentially non-scientific concerns over vaccination. Many agree on the value of existing or new vaccines but the main obstacle to their success may be the issue of public acceptance. Lack of societal acceptance can also be a barrier to the development and use of new technologies to control disease.

It is important to anticipate this type of debate and to ensure that understanding and agreement is reached before vaccination is used to control outbreaks of epizootic

disease. A number of important steps can be taken to maintain public confidence. These include:

- developing a vaccination policy for inclusion in the contingency plans before an outbreak occurs and identifying the circumstances in which vaccine will be used
- discussing the vaccination policy with all stakeholders
- obtaining public support for the control policy
- ensuring that vaccines to be used have a licence or marketing authorisation for use in the country concerned
- providing and discussing safety information with all stakeholders if an unauthorised vaccine needs to be used in an emergency
- avoiding a two-tier system by not separately identifying products from vaccinated and unvaccinated sources and issuing clear statements that products from vaccinated animals will be used as part of the general food supply
- providing unequivocal and authoritative assurance that vaccination poses no threat to human health and that products from vaccinated animals are safe to eat
- ensuring that national and international independent bodies that are respected by the consumer issue statements to reassure consumers that the consumption of products from vaccinated animals poses no risk to human health
- ensuring that any statements are endorsed by the producer, retailer and consumer organisations

- developing a communication strategy involving all stakeholders to ensure that consistent messages on vaccination are provided by all stakeholders before and during an outbreak in which emergency vaccination may be used

- implementing a concerted campaign organised by the government and the industry to convey the safety messages whenever emergency vaccination is to be used to control a disease outbreak.

Public disapproval of control measures such as mass slaughter to control epizootic diseases will continue to contribute to a drive for vaccination as an alternative measure. As vaccination is seen as ethically and morally acceptable public acceptance of such a measure would be high. However, the results of surveys are equivocal and it is not always clear that consumers are willing to eat products from vaccinated animals. It is essential to have a clear and agreed policy on the use of vaccines against FMD and other diseases that can cause serious economic problems. Clear advice to consumers by respected independent bodies such as the FSA in the UK and EFSA is critical to ensure a successful vaccination policy. Consumer confidence is essential for any emergency vaccination programme and a major public relations programme would be needed.



Comportement des consommateurs à l'égard de la vaccination des animaux destinés à l'alimentation humaine

J.M. Scudamore

Résumé

L'épisode de fièvre aphteuse survenu en 2001 au Royaume-Uni a mis en évidence la nécessité de mettre en œuvre une politique de vaccination à l'acmé de l'épizootie. En raison de l'ambiguïté des résultats des enquêtes d'opinion réalisées jusqu'alors, il était impossible d'apprécier le degré de méfiance des consommateurs à l'égard des aliments issus d'animaux vaccinés. Une enquête récente sur l'influenza aviaire a révélé que si les consommateurs européens sont bien informés au sujet de la maladie et des méthodes de lutte applicables, plus de 50 % des personnes interrogées ne sont pas disposées à consommer de la viande issue de volailles vaccinées. Il n'y a pas d'informations précises sur l'opinion des consommateurs à l'égard de la vaccination régulière visant d'autres maladies. Les préoccupations du public semblent s'accroître pendant les périodes de crise, qui ont une plus forte couverture médiatique. Le développement de nouveaux types de vaccins doit s'accompagner de mesures

visant à rassurer les consommateurs quant à l'innocuité et à l'utilisation de ces produits. L'auteur examine ces questions et fait quelques recommandations pratiques sur les moyens de rassurer le public en cas d'application de la vaccination d'urgence pour lutter contre les maladies animales.

Mots-clés

Attitude des consommateurs – Confiance du public – Influenza aviaire – Leçon de l'expérience – Préoccupation des consommateurs – Sécurité sanitaire des aliments – Vaccination.



Actitud del consumidor frente a la vacunación de animales destinados al consumo humano

J.M. Scudamore

Resumen

El brote de fiebre aftosa que en 2001 asoló el Reino Unido fue un episodio sin precedentes, frente al cual hubo que obtener una vacuna justo en el momento álgido de la epidemia. Dados los resultados poco claros de las encuestas, no fue posible determinar el grado de preocupación de los consumidores por el hecho de ingerir alimentos procedentes de animales vacunados. De una reciente encuesta relativa a la influenza aviar se desprende que el gran público europeo está bien informado sobre la enfermedad y su control, aunque más del 50% de los encuestados serían reacios a consumir carne procedente de aves vacunadas. No existe mucha información específica sobre la opinión de los consumidores acerca de la vacunación sistemática contra otras enfermedades. Su inquietud parece acrecentarse en las situaciones de emergencia, cuando los medios de comunicación ofrecen abundante información sobre el tema. Con la aparición de nuevos tipos de vacuna, será preciso ofrecer al consumidor más garantías sobre el uso y la inocuidad de tales productos. Además de examinar todas estas cuestiones, el autor formula recomendaciones prácticas para ofrecer al gran público las debidas garantías a la hora de proponer una vacunación de emergencia con fines zoonosarios.

Palabras clave

Actitud del consumidor – Confianza del gran público – Enseñanzas extraídas – Fiebre aftosa – Influenza aviar – Inocuidad de los alimentos – Preocupación del consumidor – Vacunación.



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