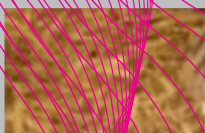
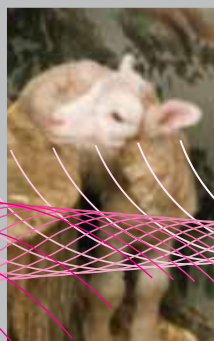
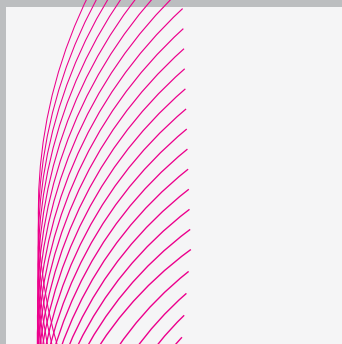




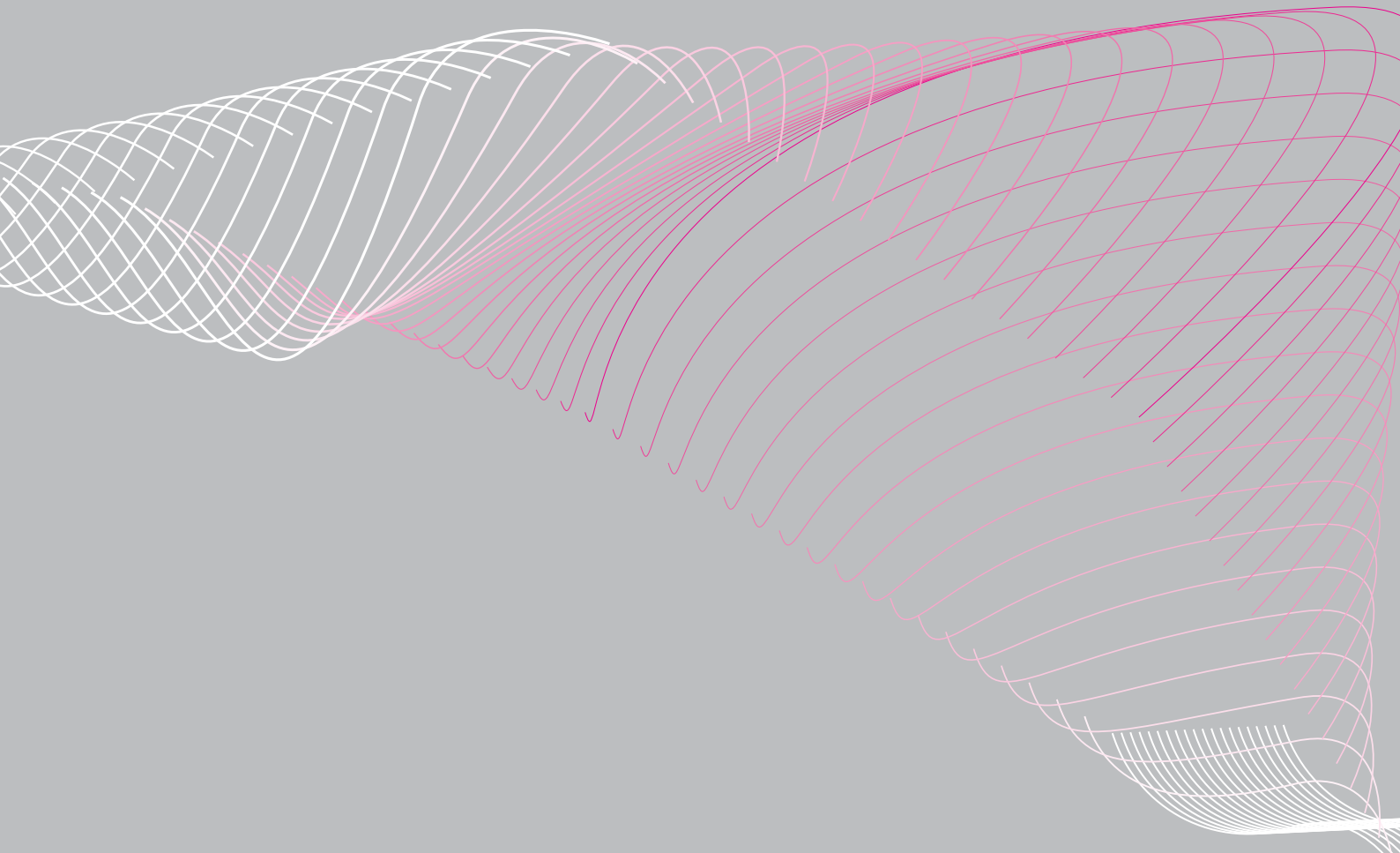
PART E CONCLUSIONS AND
RECOMMENDATIONS

Chapter 10:
Conclusions and
Recommendations





Chapter 10: Conclusions and Recommendations

- 10.1 The Outbreak in Perspective
 - 10.2 Identification and Control of Outbreaks
 - 10.3 Risk Perception, Risk Assessment and Risk Management
 - 10.4 Regulation, Inspection and Standards
 - 10.5 Awareness, Education and Training
 - 10.6 Further Research
 - 10.7 The Broader Context
 - 10.8 References
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Introduction

In this chapter we draw together the conclusions and recommendations of the Investigation. Our recommendations are summarised in Table 10.1. The judgements, conclusions and recommendations we have made that follow are based on evidence we have received. This evidence is presented in the earlier chapters of the Report, in the appendices and in background information which is accessible from the Griffin Investigation website.

We recommend that a multi-agency implementation committee be set up, co-ordinated by the Health Protection Agency (HPA), to ensure that the recommendations as specified in Table 10.1 are implemented.

10.1 The Outbreak in Perspective

In Chapter 7, **we conclude** that the Surrey 2009 *E. coli* O157 outbreak associated with animal contact at Godstone Farm was not exceptional, other than in terms of its size. This outbreak illustrates two important lessons, which we consider to be generally applicable with respect to Open Farms, rather than specific to this location and circumstances.

First, even with the earliest possible identification and control of the outbreak, around half of the cases of symptomatic infection in this outbreak would have already occurred even before any restriction or closure. This would still have been the largest recorded *E. coli* O157 outbreak ever to have occurred from animal contact in the UK. **We conclude** that this emphasises the importance, not only of prompt identification and control of outbreaks, but also of measures to reduce the risk of acquiring *E. coli* O157 infection on a day-to-day and season-to-season basis.

Second, the time course of the Godstone Farm outbreak clearly demonstrates that handwashing alone cannot be relied upon to prevent outbreaks of *E. coli* O157 infection acquired by contact with animals or their faeces. **We conclude** that there is a need to introduce measures to reduce the chance of contact with faecal matter as a primary measure. In addition, **we conclude** that there needs to be greater awareness of the risks of animal contact among farm owners, regulatory authorities and visitors to Open Farms.

While we have identified specific avoidable deficiencies in the management and control of the Surrey 2009 outbreak locally, we have also discovered the complexity of the regulatory regime relating to Open Farms. **We conclude** that a strategy of robust 'joined-up regulation' would provide more effective oversight of safety and provide opportunities for reducing the inspection burden.

10.2 Identification and Control of Outbreaks

At the time of the Godstone Farm outbreak, *E. coli* O157 infection was not a statutorily notifiable disease. However, since the introduction of the Health Protection (Notifications) Regulations on 6 April 2010, infectious bloody diarrhoea and haemolytic uraemic syndrome (HUS) are both notifiable diseases.

This change is welcome but will result in improved case-ascertainment and early identification of outbreaks only if the following **recommendations** are followed:

- General practitioners and all front line health professionals should suspect *E. coli* O157 infection in any child with bloody diarrhoea
- Clinical laboratories should report all presumptive cases of *E. coli* O157 infection promptly to the local Health Protection Unit (HPU)
- HPUs should ensure that the HPA's standard questionnaire is used to interview all cases of *E. coli* O157 infection and that this is sent promptly to the HPA Centre for Infections (Cfi).

In Chapter 7, we note that in the very early stages of the Godstone Farm *E. coli* O157 incident, there was uncertainty and confusion about the size of the outbreak. **We conclude** that this uncertainty could and should have been avoided, both by proper functionality of HPZone (Chapter 2) and by robust handover arrangements, and that, had these deficiencies not occurred, the outbreak associated with Godstone Farm could have been identified earlier.

We recommend that HPU staff are required to log every case of *E. coli* O157 on HPZone as a matter of urgency and routine, and that the technical functionality of HPZone is reviewed. **We also recommend** that all HPUs and Environmental Health Departments (EHDs) should have robust handover arrangements in place, during working hours and out of hours, to ensure that details of recently reported *E. coli* O157 cases are communicated to the relevant staff.

In Chapter 7, **we conclude** that the convening of the outbreak control team (OCT) was exceptionally late in the course of the Godstone Farm outbreak. This delay is unacceptable, even taking into account the deficiencies in the flow of information that delayed initial recognition of the outbreak. **We further conclude** that, had the OCT been convened earlier, there would have been a more timely assessment of the public health risks and, almost certainly, more effective control of the outbreak.

We conclude that the failure to convene the OCT on 1 September, when both the HPU and EHD were aware of a cluster of four linked cases, represents a failure of public health leadership, and that the main responsibility for this failure lies with the HPU. **We also conclude** that the decision by the OCT that there was no ongoing risk was premature. The decision not to reconvene until 18 September shows a failure to appreciate the seriousness of the situation.

We recommend that an OCT should be convened by the consultant in communicable disease control (CCDC) as soon as two or more presumptive cases of *E. coli* O157 infection from different households but with a potential common link are identified. **We recommend** that the first OCT meeting should specifically assess the ongoing risk to the public based on:

- The possibility that there may be a preventable ongoing source of infection that may affect others
- The size and vulnerability of the population at risk
- The risk of secondary spread to household contacts
- The risk of secondary spread to other contacts, particularly children in pre-school childcare settings and in primary schools
- The availability of effective control measures.

We recommend that the first OCT meeting should review and decide what control measures are available, which activities should be ceased or closed, and who will be responsible for ensuring decisions are implemented.

We conclude that GPs and hospital clinicians serving the catchment area of Godstone Farm, including paediatric renal unit staff, should have been alerted much earlier to the occurrence of the

outbreak. **We recommend** that the first OCT meeting should discuss and agree an appropriate communication strategy for professional colleagues, the public and the media.

We recommend that the OCT should ensure that hypotheses with a clear focus on identifying the source and mechanism of spread of the infection are tested, wherever possible, by means of an analytical epidemiological investigation, and that this is carried out as a matter of urgency.

We conclude that there were unacceptable delays, both in carrying out this systematic epidemiological investigation of the Godstone Farm outbreak, and in initiating strict control measures at Godstone Farm. **We conclude** that, if action had been taken sooner to stop all contact with ruminants, a substantial number of *E. coli* O157 cases could have been prevented.

We recommend that animal contact, especially with ruminants, should be prioritised as the activity to be closed at the earliest suspicion of a farm-related *E. coli* O157 outbreak.

We note that circular HSG(93)56 appears not to have been revised since 1993 and we understand that the Faculty of Public Health and the HPA have recently written to the Department of Health (DH) to seek clarification. **We conclude** that it would assist future joint working if it were brought up to date. **We recommend** that HSG(93)56 should be revised to bring it up to date and jointly circulated to all local authorities (LAs).

We have been advised by the Chartered Institute of Environmental Health (CIEH) that structures within LA EHDs are changing rapidly and the post of Chief Environmental Health Officer (CEHO) often no longer exists. **We recommend** that to ensure swift and appropriately resourced response to an outbreak every LA should ensure that a senior post has been identified with responsibility for managing the LA's participation in outbreak control.

10.3 Risk Perception, Risk Assessment and Risk Management

As discussed in more detail in Chapter 8, the Health and Safety Executive (HSE) and Local Authorities Co-ordinators of Regulatory Services (LACORS) consider the risk of *E. coli* O157 infection among visitors to Open Farms to be 'low', and as such, insufficiently large to warrant additional action. **We conclude** that this perception of 'low' risk is potentially misleading and **we recommend** that it should be reassessed for several reasons:

- Although previous outbreaks associated with animal contact have generally been small, many sporadic cases of *E. coli* infection may be related to animal contact. The size of the problem may thus be underestimated
- While fatalities due to *E. coli* O157 infection contracted through animal contact have, thankfully, been few, the potential for very small numbers of organisms to cause serious illness and life-limiting conditions such as kidney failure, particularly in young children, should be taken into account in addition to the risk of death
- The Godstone Farm outbreak illustrates the potential for a single source to generate large numbers of cases over a short time period. During the two-week period when infected children visited the farm, the attack rate per child visit was about one in 100, a level that would clearly be considered as totally unacceptable, as detailed and discussed in Chapters 7 and 8

- The life-threatening complications (HUS) arising from the Godstone Farm outbreak were sufficiently common to saturate specialist clinical renal services for the whole of London and South East England
- Another outbreak on this scale would have serious consequences both for the economic viability of the Open Farm industry and for the credibility of the regulatory authorities.

We conclude that whereas the HSE believed that the existing regulatory strategy was the right one, it should have sought confirmation of whether the strategy was effective in controlling the numbers of *E. coli* O157 infections on Open Farms. Furthermore, there is currently no system of reporting in place from the LA to the HSE which would have assisted the HSE in this regard. While we recognise the considerable pressures on the HSE and the need to prioritise regulatory action, **we conclude** that the level of risk was not acceptable and that good practices in the Open Farm industry should have been more actively pursued by the regulators.

It is currently very difficult for families to make their own informed decisions about the risks posed by visiting an Open Farm. **We conclude** that public education on the risks of infection from *E. coli* O157 and the measures parents can take to protect their families is vitally important for their informed choice, and **we recommend** that public education on the risks of infections acquired by animal contact needs to be reinforced, both before and during the farm visit.

We conclude that the time course of the Godstone Farm outbreak clearly demonstrates that in the circumstances handwashing alone is insufficient to prevent outbreaks of *E. coli* O157 infection acquired by contact with animals or their faeces. Therefore, **we recommend** that parents of children visiting Open Farms are clearly informed, before entering animal contact areas, that:

- It is the parent or carer's choice whether their child is allowed to touch or feed the animals
- Touching or feeding farm animals can be a source of life-threatening infection, particularly in young children
- The only way to eliminate this risk entirely is for children to avoid contact with animals and their faeces
- It is primarily the parent or carer's responsibility to supervise the washing of their children's hands immediately after leaving the animal contact area, before eating or drinking on the farm, and after removing footwear
- Sanitising hand gels are not a substitute for thorough handwashing, but can be used after handwashing.

In addition to making such recommendations, we also wish to emphasise that owners/managers of Open Farms have a duty of care to their visitors who have an expectation to be in a safe environment.

We recommend that:

- Primary control measures should be aimed at preventing faeces and faecal material passing on to the public rather than aimed at the public washing off faeces. Reducing faecal contamination should primarily be the responsibility of the farm operator
- Handwashing, however remains the principal control measure available to the public and must be actively encouraged by the farm operator; a multi layered approach is the safest way of reducing harm. The farm operator, the public and the regulator all have a role to play in controlling the risk of infection

- To support effective handwashing, facilities should be directly located at areas of high risk, such as animal contact. Facilities should provide warm water, soap and paper towels and be at the correct heights for adults and children to use. Visitors should be prompted to wash their hands. Animal contact areas should be supervised, and staff should be trained in how to promote handwashing. Sanitising gels may be used only after thorough handwashing.

The Committee has searched for international standards and identified relevant guidance on the risk of *E. coli* O157 and Open Farms issued by the United States Centers for Disease Control and Prevention, by South Australia, by the Ontario Farm Animal Council and by some countries in northern Europe (see Chapter 4). While the guidance by HSE in AIS23 is to be commended so far as it goes, following consideration of these documents and evidence given elsewhere, **we conclude** that more should be done to reduce the risk as low as is reasonably practical. In particular, **we conclude** that for farm operators to use handwashing as a primary control measure at Open Farms is a misdirected approach and **we recommend** that operators of Open Farms should ensure that the layout and design of public areas on the farm are such that visitor contact with animal faeces is minimised or eliminated, in order to minimise exposure to *E. coli* O157.

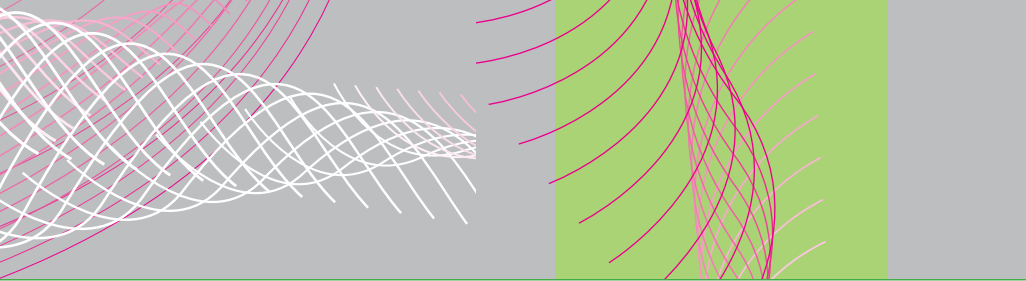
We conclude that the arrangements that we have been shown for ensuring that health and safety standards at Open Farms are being met are insufficiently rigorous to enable families to be confident that safe practices are in place. In Chapter 8, **we recommend** a number of operational changes that should be addressed as a matter of urgency to ensure the risk of infection with *E. coli* O157 at Open Farms is kept to a minimum, and thus to allow the public safely to enjoy and benefit from the experience of farm visits. These could form the basis of a code of good practice.

We conclude that an accreditation scheme, led by the farming industry, but based on a code of good practice agreed with the regulatory authorities, would assist the public in understanding which farm premises were operating to a known standard.

We note with concern that the Godstone Farm outbreak occurred on premises which were probably operating at or above the average health and safety standards for the sector, yet the owners and the regulators had failed to identify potentially remediable hazards despite a regular programme of previous inspections. **We conclude** that:

- The Godstone Farm operator, while somewhat familiar with the nature of the hazard and associated risks, and well meant, relied overmuch on the actions of the public, primarily through handwashing, and regarded the Tandridge EHD's reports as an endorsement of their procedures
- Godstone Farm showed little evidence that they appreciated the importance of their own actions in controlling the risks, and were not proactive in seeking out best practice on limiting the exposure of visitors to infection by *E. coli* O157. This is particularly surprising given the Farm's experience of an earlier *E. coli* O157 outbreak on the Farm in 2000
- The failure to provide suitable training to staff members renders Godstone Farm poorly placed to identify hazards on the Farm and to enact suitable control measures, as required under health and safety law
- The existing regulatory regime is insufficiently robust to ensure that a similar outbreak will not occur at an Open Farm in the near future.

We recommend that the LA processes of risk assessment be reviewed. This review should take place within the context of the inspection process and the regulatory framework. Where the level of public risk is considered high, it is reasonable for the regulator to have a higher expectation that procedures will be documented and that those procedures will be evidence of a robust system.



We heard evidence that inspection visits to Open Farms were often timed for periods of low activity in order to reduce the regulatory burden. **We conclude** that the potential for monitoring and controlling the public risk could be maximised if inspection visits were scheduled for times when the public risk can be predicted to be at its highest level. Protecting the public from harm should take precedence over reducing the regulatory burden for the farm operator.

We conclude that disparities between the findings of Tandridge EHD and HSE inspectors who visited Godstone Farm highlight flaws in the regulatory process. It appears to us that the current HSE policy of reducing the number of inspection visits and building on the use of industry awareness days now provides HSE inspectors with far fewer opportunities to observe current industry practices.

We recommend that HSE should review whether current inspection policy provides the HSE with sufficient knowledge of the Open Farm industry to be able to identify emerging risks; and whether the HSE strategy of using the AIS23 guidance document to provide management of the risks of *E. coli* O157 infection can be validated by information gained from the farming industry, the LA regulatory system, the HPA and the DH.

10.4 Regulation, Inspection and Standards

In Chapter 8, **we conclude** that current arrangements for regulatory oversight of Open Farms are insufficient to provide the public with the level of protection that they could reasonably expect, and that the existing regulatory regime is insufficiently robust in practice to guarantee that a similar outbreak will not occur at an Open Farm again in the near future. In Chapter 9, **we conclude** that if future outbreaks are to be prevented, a more rigorous approach towards securing compliance with standards will be needed by operators and regulators alike.

The issue of how a consistent, effective regulatory approach to Open Farms should be maintained, and how the regulators seek assurance that it is consistent and effective, needs to be addressed. **We recommend** this be done by the HSE and LACORS, taking the industry's views into account.

In Chapter 9, **we conclude** that the lack of a clear definition of Open Farms, and the lack of a national registration scheme, are impediments to effective regulation of this evolving sector, and could compromise the credibility of the regulatory system if further outbreaks of *E. coli* O157 or other infections were to occur and be traced to animal contact on Open Farms.

We conclude that to facilitate effective inspection and awareness raising programmes, the authorities need to develop a practical definition of Open Farms that takes risks as well as activities into account. The definition we have used for the scope of our investigation may be a useful starting point. **We recommend** that this issue be pursued in consultation with leading agricultural industry representatives.

Licensing may ultimately be the right way ahead for the UK's Open Farm industry but we are not recommending it at this time. **We conclude** that a less burdensome measure – registration – will meet the regulatory need for information about these businesses, and that an approved code of practice (ACoP) will bring clarity, certainty and enforceability of standards from which improvements should follow. **We recommend** that in addition to working out a definition the several bodies with regulatory or representative interests in Open Farms should collaborate to establish a register, sharing any data that is available to them separately.

We conclude that it would be well worth fostering the development of a scheme that would allow the management of risks to health and safety at Open Farms to be independently audited and assured, on an annual basis. Therefore, **we recommend** that the industry pursue this, as their own idea, and that the authorities help and encourage leading representatives of the Open Farm sector in fostering the development of a robust accreditation scheme for inspection of standards at Open Farms.

The regulatory option that has been applied so far to Open Farms relies on non-statutory guidance (primarily the HSE document AIS23) and compliance of farm operators with general duties and regulations such as the Control of Substances Hazardous to Health Regulations (COSHH). While the guidance in AIS23 is to be commended as far as it goes, **we conclude** that more needs to be done to reduce the risk of infection on Open Farms as low as is reasonably practicable.

We conclude that the content of *all* existing guidance touching on human health and safety at Open Farms (and other settings where the public come into contact with farm animals) needs to be reviewed, improved and clarified where necessary. This is primarily the business of the regulatory authorities and **we recommend** that the HSE and LACORS pursue this, developing appropriate control measures in close consultation with the HPA, the Department for Environment, Food and Rural Affairs (Defra) and leading, knowledgeable representatives of the industry.

However, we do not regard a review of guidance alone as a sufficient response to the lessons of the 2009 outbreaks. It should be the starting point for a more fundamental strengthening of the regulatory regime, but we do not see a need for yet more regulations.

We conclude that if a code of practice dealing comprehensively with the *E. coli* O157 risk were to be developed for approval by the HSE, there would be clear benefits of clarity and certainty about standards for Open Farm operators, enforcing authorities and members of the public and that this would be in line with principles of Better Regulation.

We recommend that the HSE should take the lead in developing a code of practice for subsequent approval, involving the HPA and other relevant authorities, in close consultation with leading representatives of the industry.

We conclude that a more rigorous approach to securing compliance needs to be taken by both operators and inspectors, within such a strengthened regulatory framework. A strategy of 'joined-up regulation' between the relevant agencies would provide more effective oversight of the operators' control of safety and provide opportunities for reducing the inspection burden on operators.

We conclude that strengthening a management commitment to developing and sharing knowledge of best practices with other agencies would enhance the regulatory system. The partnership agreement between the HSE and LAs (LACORS) provides a strong foundation for future collaborative regulation of risks from *E. coli* O157 on farms, and **we recommend** that HSE and LACORS continue their collaboration with these objectives in mind.

We conclude that, provided EHOs acquire the competences required to inspect Open Farms effectively, with ready access to the HSE's expertise when needed (discussed in section 10.5.2 below), there is no advantage to be had from the HSE becoming responsible for Open Farms.

In general, **we recommend** that all the agencies involved should explore ways of working together in regulating Open Farms, clarifying mutual understanding of roles and relationships and, where necessary cementing these with agreements, such as the partnership agreement referred to above, or through memoranda of understanding.



10.5 Awareness, Education and Training

10.5.1 Public Awareness

The majority of the parents who gave evidence stated they were largely unaware of the risks of *E. coli* O157 infections through animal contact or farm visits. They were attending for a fun day out and their perception was that the risk that they and members of their family would be exposed to was minimal. It was also evident to the Investigation that exposure to livestock faeces is common among the causes of human *E. coli* O157 infection, and some of the sporadic infections whose source cannot be identified are probably due to livestock exposure.

We conclude that there is generally a low level of understanding of the risk of *E. coli* O157 infection from contact with farm animals or the farm environment. This view is supported by work carried out by the University of Aberdeen through interviews with countryside visitors in different parts of the UK. **We also conclude** that more needs to be done to raise public awareness of the risks of *E. coli* O157 from animal contact and that this would substantially reduce the risks across the wide variety of circumstances where the public may be exposed to *E. coli* O157.

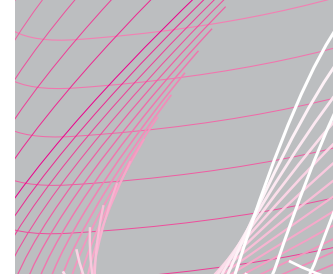
It is our view that there is no simple means to raise public awareness but we considered that the evidence of the charity Haemolytic Uraemic Syndrome Help (HUSH) and research by University of Aberdeen which found that awareness is somewhat higher in Scotland both indicate that it is a feasible objective. All stakeholders, be they farmers, countryside residents, countryside visitors, regulators or the media need to acknowledge their part in this process.

We conclude that the media have a key role to play in ensuring the following messages are simply communicated:

- *E. coli* O157 is frequently carried in the gut of animals, especially cattle, sheep and goats and other ruminants, and will be excreted in faeces
- *E. coli* O157 has been detected in samples of saliva from ruminants
- Infection by *E. coli* O157 may arise from contaminated food, water, from direct contact with animals or their environments
- Children and the elderly are especially vulnerable and deaths have occurred from infection by *E. coli* O157
- Infection from *E. coli* O157 may be reduced when visiting the countryside or agricultural environments by avoiding any contact with animal faeces, and by ensuring that good hygiene practices are in place and are scrupulously followed.

We recommend that Open Farm operators do more to raise public awareness of the risks when arriving at a farm attraction and use a variety of means to communicate this information. The responsibility of the accompanying adult should be spelled out, emphasising the parent/carer's decision to allow children to have animal contact.

By chance the Investigation discovered that in June 2003, in connection with its 'Farm Safe' programme, the HSE had posted on its website a four-minute video called Open Farms Healthy Children, which specifically addressed *E. coli* O157. This may still be found on the website (www.hse.gov.uk) but no witnesses drew it to our attention and none of the operators we met had ever seen it. We also found that the HSE's publication *Farmwise - your essential guide to health and safety in Agriculture* (a free



68-page advisory leaflet reference INDG 427 revised 5/09 and available online) contains a reference to a package of HSE agricultural DVDs called Kidsafe (reference ISBN 978 0 7176 6221 0).

We conclude that if funding is available to promote health and safety at farms there is a place for an up-to-date video or DVD, perhaps produced by an educational body such as Farming and Countryside Education (FACE), that could be shown to visitors as part of an induction to what they will see at a farm attraction and communicate risks and precautions in an acceptable, non-frightening way. **We recommend** that the authorities concerned should give this serious consideration together with the industry.

10.5.2 Professional Education and Training

A common theme that emerged from interviews with parents was the lack of urgency with which GPs regarded symptoms of bloody diarrhoea and stomach cramps (Chapter 6). Acute bloody diarrhoea is a rare event in previously healthy children, but should be considered as a medical emergency.

We conclude that there needs to be greater awareness among GPs of the importance of symptoms of bloody diarrhoea and stomach cramps in young children and of the need to refer patients to hospital as soon as possible when the risk of *E. coli* O157 infection is high or its consequences are likely to be severe.

We recommend that the HPA considers ways to increase awareness among GPs of the importance and seriousness of acute bloody diarrhoea in previously healthy children. We recommend that GPs refer children with acute, painful, bloody diarrhoea urgently to hospital both to ensure appropriate clinical management and to reduce the risk of spread within the household.

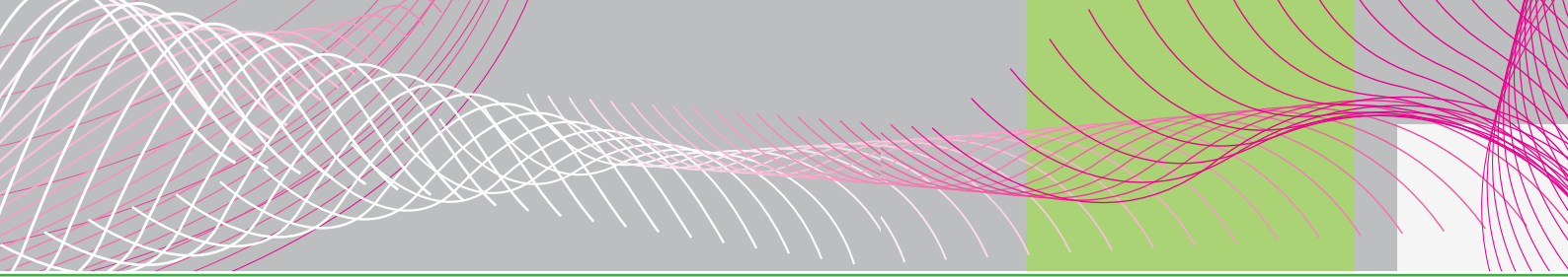
Given the complexity of roles, responsibilities and regulations relating to inspection and potential closure of Open Farms, **we conclude** that greater clarity is needed on how prohibition and closure powers should be used by environmental health officers (EHOs) under existing public health and health and safety laws. **We recommend** that the regulatory authorities communicate the practical options clearly to inspectors.

We conclude that adequate inspection of Open Farms by LAs, under current legislation, is dependent upon EHOs acquiring the competencies required for this specialist activity, and **we recommend** that the regulatory authorities develop training in these competences for EHOs. **We also recommend** that staff training in conducting risk assessments should be reviewed, and that the benefits of 'on the job' training with inspectors who hold agricultural expertise should be considered. **We recommend** that the authorities pursue this with the CIEH or other training organisations that have the capacity to offer such training.

Additionally, **we recommend** that HSE and LACORS publicise the availability of expert advice on agricultural health and safety and the microbiological hazards likely to be present on farms, and that sharing of expertise across LAs should be encouraged, through the identification of 'lead inspectors' with specialist knowledge of Open Farms.

10.5.3 Education of Farm Operators and their Staff

HSE Safety and Health Awareness Days (SHADs) are practical demonstrations on the everyday hazards that farmers face. These are a very positive aspect of the work of the HSE and there would be benefit in expanding their focus to encompass Open Farm operators.



HSE currently has an interactive Risk Assessment Tool, free to users, which can help guide farmers through the areas to be considered in carrying out a risk assessment. This type of tool would be very useful if it could be expanded to give more detail to farmers operating leisure attractions and Open Farms.

Training of farm owners and staff for ALL types of farms and ALL types of visits through the FACE-run accreditation scheme, the Countryside Educational Visits Accreditation Scheme (CEVAS), should be considered.

The HSE has suggested to the Investigation that relevant guidance is contained in the Advisory Committee on Dangerous Pathogens (ACDP) document *Infection at work: Controlling the Risks – a guide for employers and the self employed on identifying, assessing and controlling the risks of infection in the workplace*. This document provides good general advice to form the basis for specific risk assessment. **We recommend** that a single integrated framework is assembled for use by Open Farm operators and that training is made available to support risk assessment.

10.6 Further Research

We recommend the development of research in the following areas:

10.6.1 Microbiological Investigations

In Chapter 5 it is apparent from microbiological testing that the strain of *E. coli* O157 associated with the outbreak had genes for verocytotoxin (VT) 2, was of phage type (PT) 21/28 and was present in a high proportion of animals. More detailed analysis by variable number tandem repeat (VNTR) and pulsed field gel electrophoresis (PFGE) confirmed an outbreak strain. We heard no evidence that this strain of *E. coli* O157 was particularly unusual but we know of research that has suggested a subpopulation of *E. coli* O157 (referred to as clade 8) may be associated with more severe human disease (1).

While we consider that it is a long term goal to understand the virulence mechanisms of *E. coli* O157 it is important that the isolates of *E. coli* O157 recovered from Godstone Farm are examined to show whether they too belong to clade 8. We also know that the complete genome sequence of *E. coli* O157:H7 has been available since 2001 (2). It is important that the UK reference laboratories share their epidemiological information and collections of *E. coli* O157 isolates to facilitate the sequencing of representative isolates and, through the availability of complete genome sequences, to facilitate collaborative research into the questions of what is the molecular basis for the organism's virulence and its ability to spread among animal populations. The answers may ultimately be relevant to the development of diagnostics, therapeutics or vaccines.

We recommend that HPA examines representative *E. coli* O157 isolates from Godstone Farm to determine their molecular characteristics.

We recommend that the UK research funding bodies consider funding collaborative applications from the reference laboratories, research microbiologists and epidemiologists to examine *E. coli* O157 isolates and the molecular basis for their virulence which underpins their ability to spread among animal populations.

10.6.2 Clinical Investigations

Rapid identification and control of outbreaks of *E. coli* O157 infection are crucial in limiting the impact of community-acquired outbreaks upon affected individuals and their families, and on primary, secondary and tertiary health services.

We recommend that research into rapid methods of microbiological diagnosis and rapid detection of acute kidney failure and coagulopathy, is encouraged. Clinical research into predicting which children with *E. coli* O157 infection will develop HUS and into the use of monoclonal antibody directed against verocytotoxins should be given high priority.

10.6.3 Epidemiological Investigations

The large size of the Surrey 2009 outbreak offers an unusual opportunity to investigate the epidemiology of *E. coli* O157 infection and, particularly, its relationship to animal contact. A point of particular interest, from both biomedical and policy perspectives, is whether previous animal exposure might protect against symptomatic infection in the context of an established outbreak. This could be evaluated by detailed analysis of the case-control data from the Godstone Farm outbreak. Additionally, the large numbers of affected cases illustrate the full spectrum of disease and its complications, and may be informative for a health economic assessment.

We recommend that a detailed analysis of the epidemiological and microbiological data from Godstone Farm outbreak is completed and published in the scientific literature.

We recommend that a full health economic assessment of the Surrey 2009 outbreak should be carried out and considered in relation to the costs of prevention borne by farm industry, their insurers and regulatory authorities and the benefits to these groups and the general public.

Outbreak reports are a valuable learning opportunity and often identify new hazards or make useful recommendations. **We recommend** that the HPA devises a system for ensuring that OCT reports relating to outbreaks of *E. coli* O157 are properly collated and widely disseminated.

10.6.4 Veterinary Investigations

A five-point plan has been developed from Defra-commissioned research to reduce the carriage of *E. coli* O157 (3). This plan identifies the provision of dry and clean bedding, and maintaining animals in stable rearing groups as the two most important measures. We were also impressed by the use of vaccines to reduce both the numbers of positive animals and the levels of *E. coli* O157 being shed. The vaccine approach for control is one that has been pursued in cattle in North American feedlots.

We consider that while vaccine control of *E. coli* O157 is not immediately applicable in the UK, such control may be of considerable relevance to the agricultural industry and the wider issue of *E. coli* O157 control. We are also concerned to establish if the identification of 'super-shedder' animals on Open Farms may be explored with the five-point plan as a means of reducing the likelihood for the spread of *E. coli* O157.

We recommend that Defra studies the feasibility for vaccine control of *E. coli* O157 in the UK, and identifies the obstacles to implementation.

We recommend that Defra commissions studies to identify whether the microbiological testing of cattle, sheep and goats with an enumeration of *E. coli* O157 and the implementation of farm hygiene practices is a practical means for reducing the risk of *E. coli* O157 on Open Farms.

10.7 The Broader Context

In this section, we review how our conclusions and recommendations compare with those of other recent reports on *E. coli* O157 outbreaks in the UK, and consider how the principles of risk management that we have discussed for Open Farms may apply more generally to recreational use of the rural environment.

The OCT report from the outbreak in the South West Region 2009 (Chapter 1) recommends improvements to documentation of affected cases, to inter-agency working, and to national guidance on testing of cases and contacts. The OCT considered that greater clarity was needed on the definition of a petting (open) farm, on standards of good practice, and on criteria for reopening after closure of a farm during an outbreak of infectious disease. These three issues have been addressed in greater detail in our recommendations.

The difficulty in establishing criteria for reopening, in a setting where risk can never be fully eliminated, was also highlighted in the OCT report of the outbreak in Yorkshire and the Humber (Chapter 1). Lack of a national set of criteria led to a need for rapid local assessment which placed strains on the resources of the LA. In line with our recommendations, this OCT saw value in mutual support among EHDs, across LA boundaries, and sought clarity both nationally and at a local level on risk assessment and the enforcement powers available to LAs in the context of Open Farms.

The OCT report relating to the outbreak in the North West Region 2009 (Chapter 1) focused its recommendation on the prevention of faecal contamination in public areas, as a pre-requisite for controlling the risk from *E. coli* O157 on Open Farms. They pointed out that if the public environment is contaminated, there will be a greater reliance on secondary control measures such as handwashing. **We concur** strongly with this view, as the Godstone Farm outbreak demonstrates clearly that reliance on handwashing alone is insufficient to prevent transmission of infection when there is close contact between children and ruminant animals.

It is evident to the Investigation that exposure to livestock faeces is common among the causes of human *E. coli* O157 infection. Indeed, we heard that many of the sporadic infections (1,000+ in UK per annum) whose source cannot be identified may be due to livestock exposure. During the course of our work, we have focused our attention on Open Farms as exemplified by Godstone Farm. However, we have described in Chapter 3 the circumstances where the general public is brought into direct contact with animals and these should not be forgotten, particularly in view of the complicated regulatory arrangements that are currently in place for their regulation (Chapter 4). There are also circumstances where farms do not invite the public to have animal contact but where animal contact may be incidental.

The Scottish Task Force on *E. coli* O157 (4), which reported in June 2001, took a broad perspective in an attempt to understand why cases of this infection had been more numerous in Scotland than in other parts of the UK. Among their varied recommendations are several which are relevant to animal exposure and the rural environment.

We concur with the Scottish Task Force Report (4) that the starting point must be to assume that all ruminant animals are maintaining and excreting *E. coli* O157 and that risk assessments and any preventative or remedial actions have to be based on this assumption. The Scottish Task Force Report has a series of recommendations for access and use of rural land. **These recommendations are to be commended.**

We are aware of some concerns expressed in the media that it is feasible for *E. coli* O157 to persist for longer than three weeks on land. However, we agree with the comments made by the Chair of

the Scottish Task Force which were that the recommendations were intended to be practical and proportionate. We are additionally aware that some organisations have adopted the three-week period as their operational standard. Although there is some suggestion of infection having arisen after contact with agricultural land despite adherence to the three-week recommendation, **we conclude** that the three-week period should be reinforced as a benchmark. However, **we recommend** that HPA investigates the circumstances where *E. coli* O157 infection arises after contact with animal pasture to determine whether a period of three weeks is sufficient to control the risk of infection.

In May 2009, the US Centers for Disease Control and Prevention (CDC) published a *Compendium of Measures to Prevent Disease Associated with Animals in Public Settings* (5), which offers a more general perspective on prevention of zoonotic infections. This report considers education to be essential to reducing risks associated with animal contact in public settings. The Scottish Task Force Report (6) also has a series of recommendations and a concluding chapter on public awareness and education.

We concur with both reports that educational messages need to be clear and concise, appropriately targeted in terms of format and reinforced at the point of exposure. **We also commend** the recommendations of the CDC report on design of animal contact areas.

The Report of the Public Enquiry into the September 2005 outbreak of *E. coli* O157 in South Wales, published in 2009 (6), although primarily addressing foodborne transmission, makes two research recommendations, which we endorse. The first is to validate VNTR typing of *E. coli* O157 as a more rapid and less labour-intensive laboratory method than PFGE. The second is to investigate the feasibility of identifying 'super-shedder' cattle, as a potential means of reducing the likelihood of spreading *E. coli* O157 infection to other cattle, and thereby to the food chain.

This second recommendation serves to emphasise that the primary source of this organism, even in foodborne or waterborne outbreaks, is ruminant animals and their faeces. In this report, we have argued that the risk of *E. coli* O157 infection from animal contact is avoidable, and we believe that if no action is taken there will be further outbreaks of this life-threatening disease.

10.8 References

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4. Scottish Task Force on *E. coli* O157. Final report, June 2001. Available on: www.food.gov.uk/multimedia/pdfs/ecolitaskfinreport.pdf
5. Centers for Disease Control and Prevention. Compendium of measures to prevent disease associated with animals in public settings, 2009. Morbidity & Mortality Weekly Report 2009;58 (RR-5):1-21.
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Table 10.1: Summary of recommendations

Summary of Top Six Recommendations:

- Farm operators should ensure that the layout and design of public areas are such that visitor contact with animal faecal matter (particularly ruminant) is minimised or eliminated
- There is a need to raise public awareness of the potential infection risks when arriving at a farm attraction, emphasising the parent/carer's decision to allow children to have animal contact
- There should be a reassessment of the risk of *E. coli* O157 infection as 'low'. Its probability may be low but the impact is high and the consequences very severe
- An Approved Code of Practice (ACoP) should be developed for the Open Farm industry, involving relevant authorities and in close consultation with leading representatives of the industry to underpin the industry's initiative in establishing an accreditation scheme
- The regulatory agencies and others should explore ways of working together in regulating Open Farms clarifying roles, responsibilities and relationships
- Research should be pursued to assist clinicians in the rapid diagnosis of *E. coli* O157 and the identification of and treatment for children likely to develop severe complications of the infection. Research should also be undertaken aimed at preventing or limiting carriage of the organism in animals.

No.	Recommendation	Responsible authority(ies)
	Identification and Control of Outbreaks	
1	All healthcare practitioners at initial point of care or referral of a child with bloody diarrhoea should suspect <i>E. coli</i> O157 infection and should refer the patient to specialist care as soon as possible. This is particularly important in the outbreak situation	NHS (clinical services)
2	Clinical laboratories should report all presumptive cases of <i>E. coli</i> O157 infection promptly to the local HPU	NHS (laboratories)
3	HPUs should ensure that the HPA's standard questionnaire is used to interview all cases of <i>E. coli</i> O157 infection and that this is sent promptly to the HPA Centre for Infections	HPA (HPUs)
4	HPU staff should be required to log every case of <i>E. coli</i> O157 on HPZone as a matter of urgency and routine, and the technical functionality of HPZone should be reviewed	HPA (HPUs)
5	All HPUs and EHDs should have robust handover arrangements in place, during working hours and out of hours, to ensure that details of recently reported <i>E. coli</i> O157 cases are communicated to the relevant staff	HPA (HPUs), LAs (EHDs)
6	An OCT should be called by the CCDC as soon as two or more presumptive cases of <i>E. coli</i> O157 infection from different households but with a potential common link are identified	HPA (CsCDC)
7	The first OCT meeting should specifically assess the ongoing risk to the public, consider what control measures are available, decide which activities should be prohibited or improved, and should identify who is responsible for ensuring each of its decisions are implemented	HPA (OCTs)
8	The OCT should ensure that hypotheses with a clear focus on identifying the source and mechanism of spread of the infection are tested, wherever possible, by means of an analytical epidemiological investigation, and that this is carried out as a matter of urgency	HPA (OCTs)

No.	Recommendation	Responsible authority(ies)
9	The first OCT meeting should discuss and agree an appropriate communication strategy for professional colleagues, the public and the media	HPA (OCTs)
10	Animal contact, especially with ruminants, should be prioritised as the activity to be closed at the earliest suspicion of a farm-related <i>E. coli</i> O157 outbreak	HPA (OCTs), LAs (EHDs)
11	HSG(93)56 (<i>Public health: responsibilities of the NHS and the roles of others</i>) should be revised to bring it up to date and jointly circulated to all local authorities	DH
12	Every LA should ensure that a senior post has been identified with responsibility for managing the LA's participation in outbreak control	LAs
Risk Perception, Risk Assessment and Risk Management		
13	There should be a reassessment of the risk of <i>E. coli</i> O157 infection as 'low'. Its probability may be low but the impact is high and the consequences very severe	HSE, HPA
14	Public education on the risks of infections acquired by animal contact needs to be reinforced, both before and during the farm visit	HPA, DH, farm owners
15	<p>Parents of children visiting Open Farms are clearly informed, before entering animal contact areas, that:</p> <ul style="list-style-type: none"> • Touching or feeding farm animals can be a source of life-threatening infection, particularly in young children • The only way to eliminate this risk entirely is for children to avoid contact with animals and their faeces • It is the parent or carer's choice whether their child is allowed to touch or feed the animals • It is primarily the parent or carer's responsibility to supervise the washing of their children's hands immediately after leaving the animal contact area, before eating or drinking on the farm and after removing footwear • Sanitising hand gels do not provide adequate protection alone. They are not a substitute for thorough handwashing but can be of value if used as an additional measure 	Farm owners, HSE/ LAs

No.	Recommendation	Responsible authority(ies)
16	<p>In discharging their duty of care to visitors, owners/managers of Open Farms should note that:</p> <ul style="list-style-type: none"> • The farm operator, the public and the regulator all have a role to play in controlling the risk of infection • Primary control measures should be aimed at preventing public contact with faecal matter, rather than at the public washing off the faeces. This should primarily be the responsibility of the farm operator • Handwashing must be actively encouraged as the principal control measure available to the public, in order to further reduce the possibility of contamination • To support effective handwashing, facilities should be directly located at areas of high risk, such as animal contact. Facilities should provide warm water, soap and paper towels and be at the correct heights for adults and children to use • Animal contact areas should be supervised and visitors should be prompted to wash their hands. Staff should be trained in how to promote handwashing, and should advise the public that sanitising gels should only be used only as an additional measure 	Farm owners, HSE, LAs
17	Operational changes are to be addressed as a matter of urgency to ensure the risk of infection with <i>E. coli</i> O157 at Open Farms is kept to a minimum. Operators of Open Farms should ensure that the layout and design of public areas on the farm are such that visitor contact with animal faecal matter is minimised or eliminated	Farm owners, HSE, LAs
18	The LA processes of risk assessment should be reviewed and this should take place within the context of the inspection process and the regulatory framework. A single integrated framework should be assembled for use by Open Farm operators and training made available to support risk assessment	HSE, LAs, supported by HPA, farm owners
19	A review should be carried out to establish whether current inspection policy provides the HSE with sufficient knowledge of the Open Farm industry to be able to identify emerging risks; and whether the HSE strategy of using the AIS23 guidance document to provide management of the risks of <i>E. coli</i> O157 infection can be validated by information gained from the farming industry, the LA regulatory system, the HPA and the DH	HSE

No.	Recommendation	Responsible authority(ies)
	Regulation, Inspection and Standards	
20	Consider how a consistent, effective regulatory approach to Open Farms should be maintained, and how the regulators seek assurance that it is consistent and effective, taking the industry's views into account	HSE, LACORS
21	Agree a working definition of an Open Farm in consultation with leading agricultural industry representatives	HSE, HPA, Defra (AH), Industry reps
22	Bodies with regulatory or representative interests in Open Farms should collaborate to establish a register, sharing any data that is available to them separately	HSE, LACORS, Defra (AH), supported by HPA, NFAN, NFU
23	Authorities should help and encourage leading representatives of the Open Farm sector in fostering the development of a robust accreditation scheme for self-regulation of standards at Open Farms	HSE, LACORS, HPA, Industry reps
24	The content of all existing guidance touching on human health and safety at Open Farms needs to be reviewed, improved and clarified where necessary	HSE, LACORS, Defra, HPA, Industry reps
25	HSE should take the lead in developing an Approved Code of Practice (ACoP) for the Open Farm industry	HSE lead with Industry reps
26	Clarify how prohibition and closure powers under both health and safety and public health laws should be used by EHOs and give clear advice to inspectors about the practical options relating to closure of farm premises	HSE, LACORS
27	Review and revise staff training in conducting risk assessments, and consider the benefits of 'on the job' training with inspectors who hold agricultural expertise. Develop training in competences for EHOs involved in inspection of farm premises, in liaison with the CIEH or other training organisations that have the capacity to offer such training	LACORS, LAs, HSE, CIEH
28	Publicise the availability of expert advice on agricultural health and safety and the microbiological hazards likely to be present on farms, and encourage sharing of expertise across LAs through the identification of 'lead inspectors' with specialist knowledge of Open Farms	LACORS
29	HSE and LACORS should continue their collaboration to provide a strong foundation for future regulation of risks from <i>E. coli</i> O157 on Open Farms	HSE, LACORS
30	Explore and clarify ways of working together in regulating Open Farms, and develop mutual understanding of roles, responsibilities and relationships	LACORS lead with LAs, HSE, HPA Defra/AH
	Awareness, Education and Training	
31	Clearly publicise the risk of infection caused by <i>E. coli</i> O157, emphasising that: <ul style="list-style-type: none"> • <i>E. coli</i> O157 is frequently carried by animals, especially cattle, sheep and goats and other ruminants • Infection by <i>E. coli</i> O157 may arise from contaminated food, water, from direct contact with animals or their environments • Children and the elderly are especially vulnerable and that deaths have occurred from infection by <i>E. coli</i> O157 • Infection from <i>E. coli</i> O157 may be reduced when visiting the countryside or agricultural environments by avoiding any contact with animal faecal matter and by ensuring that good hygiene practices are in place and followed 	Mass media, HPA, DH, DCFS

No.	Recommendation	Responsible authority(ies)
32	Raise public awareness of the risks when arriving at a farm attraction and use a variety of means to communicate this information. The responsibility of the accompanying adult should be spelt out, emphasising the parent/carer's decision to allow children to have animal contact	Farm owners
33	Explore ways to help farm operators communicate information on infection risks to visitors using a multi-media approach	Industry reps, HSE, HPA, FACE
34	Consider ways to increase awareness among GPs and all front line healthcare practitioners of the importance and seriousness of acute bloody diarrhoea in previously healthy children	HPA (Primary Care Unit), DH
	Further Research	
35	Examine <i>E. coli</i> O157 isolates from Godstone Farm to determine their molecular characteristics	HPA
36	Encourage the funding of collaborative applications from reference laboratories, research microbiologists and epidemiologists to examine <i>E. coli</i> O157 isolates and the molecular basis for their virulence	Research councils and government departments
37	Encourage research into rapid methods of microbiological diagnosis and rapid detection of renal failure and coagulopathy. High priority should be given to clinical research into predicting which children with <i>E. coli</i> O157 infection will develop acute kidney failure and into the use of monoclonal antibody directed against verocytotoxins	Medical research funding agencies, clinical research networks
38	Complete and publish a detailed analysis of the epidemiological and microbiological data from the Godstone Farm outbreak in the scientific literature	HPA
39	Carry out a full health economic assessment of the Surrey 2009 outbreak. Consider the costs of prevention to be borne by the farm industry, their insurers and the regulatory authorities and the benefits to these groups and the general public	HPA, DH, Defra
40	Devise a system for ensuring that OCT reports relating to outbreaks of <i>E. coli</i> O157 are properly collated and widely disseminated	HPA
41	Study the feasibility of vaccine control of <i>E. coli</i> O157 in ruminant animals in the UK, and identify the obstacles to its implementation	Defra
42	Commission studies to identify whether the microbiological testing of cattle, sheep and goats with an enumeration of <i>E. coli</i> O157 and the implementation of farm hygiene practices is a practical means for reducing the risk of <i>E. coli</i> O157 on Open Farms	Defra
43	Investigate the circumstances where <i>E. coli</i> O157 infection arises after contact with animal pasture, to determine if a period of three weeks is sufficient to control the risk of infection	VLA, HPA