

# Essential veterinary education in food safety, food hygiene and biosecurity: a global perspective

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## Summary

A big challenge for veterinary educators is to stimulate interest in public health medicine and make the curriculum interesting, and relevant, to veterinary students. Veterinary public health encompasses many areas, including zoonosis control, food safety, animal health and biosecurity, animals as sentinels of environmental hazards and the contribution of animal waste to pollution of food and water, so there is no shortage of ammunition for the veterinary educator in the competition for students' attention. Veterinary educators, not the students, will have failed if graduates complete their studies without being convinced of the importance and relevance of veterinary public health.

## Keywords

Animal welfare – Controls – Food safety – Molecular epidemiology – Outbreak investigation – Pre-harvest – Post-harvest – Process controls – Surveillance – Zoonoses control.

## Introduction

Increasingly, veterinary undergraduates and postgraduates in both developed and developing countries are focusing on the individual care of ill animals, with an interest in companion animals and equines predominating in many veterinary schools. Many students are motivated by the veterinarians they see around them, or those they see on television, who are portrayed as working in idyllic mixed practice, or those working in highly specialised referral clinics. There is a big challenge for veterinary educators to stimulate interest in public health medicine and make the curriculum interesting, and relevant, to veterinary students. The many areas that veterinary public health encompasses are described in this article, with further details of specific requirements in the European Union (EU) included in the Appendix. Veterinary educators must succeed in convincing students of the importance and relevance of veterinary public health. If graduates complete their studies without having acquired adequate understanding of this important area,

the failure will lie with the trainers, not with the students themselves.

## Zoonosis control

Most food-borne infectious agents are zoonotic and effective control in the food chain requires that the incidence in animals be reduced (4). The health of consumers is inextricably linked to the health of food-producing animals and the importance of herd and flock health cannot be underestimated. In most countries, campylobacter and salmonella species dominate the food-borne disease statistics and the incidence will only be reduced by sequential incremental risk reduction strategies along the food chain (15). An understanding of the epidemiology of all the food-borne zoonotic agents is essential to inform control strategies and interventions. Increasing liberalisation of trade, and increasing competition in the international market place, have meant that live animals, animal feed, food ingredients and

products are now sourced on a global stage, affording the opportunity for zoonotic pathogens to be disseminated widely. The pathogens of public health importance may vary in different jurisdictions, because disease prevalence, epidemiology, livestock reservoirs and husbandry practices will differ, but the consequences of failure by the veterinary profession to become fully engaged in tackling these zoonotic agents are similar in terms of the burden of resulting human ill-health associated with both sporadic cases and outbreaks of human disease.

A series of human food scares originating in livestock, culminating in the bovine spongiform encephalopathy (BSE) epidemic that first emerged in the United Kingdom in the 1980s, not only affected human health but damaged consumer confidence in the safety of the food supply, in the commitment of the industry to produce safe food, and in the ability of the competent authorities, including the veterinary profession, to address the issues effectively (7). In terms of food safety and the need for enhanced veterinary involvement the BSE epidemic has been a major milestone (3). The associated impact on consumer confidence, regulatory control and global trade has been unprecedented. As the profession charged with safeguarding the health of food animals, and thereby consumer health, veterinarians have to ask themselves 'how did we let this happen?' The BSE debacle is an ideal case study for emphasising the importance of veterinary vigilance and zoonosis control in identifying emerging public health threats associated with animals (3).

## Surveillance and molecular epidemiology

Veterinary graduates need to be competent in the fields of epidemiology and modern molecular diagnostics. Enhanced surveillance capabilities are required to establish public health priorities, detect, delineate and investigate outbreaks, evaluate interventions and provide a detection service compatible with a modern food industry operating 'just-in-time' delivery systems in a global market place (14, 15). In most jurisdictions multidisciplinary teams, including veterinarians, microbiologists and epidemiologists, participate in outbreak investigations and increasingly international networks are facilitating the identification of globally distributed contaminated product (13). Positioning the veterinarian in the role of 'disease detective', hunting down dangerous microbes and tracking them back through the food chain to their source, or forward to identify foods in the market place that must be recalled to prevent human illness, raises the profile of the public health veterinarian. It demonstrates the importance, the excitement, and the challenge of this area of activity, which can easily rival colic surgery, small animal oncology or the care of exotic species. Molecular typing of organisms

has been given the higher profile name 'forensic microbiology', which generates more enthusiasm for the subject amongst students. An ability to understand and use the information from genotyping, and to undertake case control and cohort studies, needs to be part of the armoury of the veterinary investigator (14).

The public health veterinarian needs to be proficient in setting up surveillance systems to monitor trends, establish priorities, inform policy-makers and control interventions. Veterinarians need to be aware of the need for consistency if the data sets collected are to be useful, compatible and comparable with other systems globally. Informatics and bionumerics must now be included on the veterinary curriculum. An integrated approach to surveillance of both environmental and communicable disease hazards is required if consumers are to be reassured that their health is being protected. Effective surveillance, of animals, of food and of humans, is essential and forms part of the foundation of any consumer protection strategy (15).

## Pre-harvest food safety

Reducing the microbial load entering the food chain by implementing herd, flock and shoal health initiatives reduces the challenge on food safety management systems and controls in food processing plants, commercial catering establishments and in domestic kitchens. Intensification of farming systems creates increasing opportunities for disease spread but can also present the opportunity to control the feed, water and environment to ensure disease incidence is reduced to a minimum. Veterinary students need to be able to address local (on farm), regional, national and international issues to improve the health status of livestock. There is a role for the use of antimicrobials and other pharmaceutical agents in livestock production, but they are not a replacement for good husbandry practices and veterinarians must be aware of when, and how, they should be used appropriately to avoid residues in the food chain and the generation of organisms resistant to antimicrobials (1, 16, 18). Veterinarians need to be aware of the high profile work undertaken internationally in the area of veterinary public health, e.g. the World Organisation for Animal Health (OIE) collects and analyses the latest scientific information on animal disease control and makes this information available to its Member Countries and Territories to help them improve the methods used to control and eradicate these diseases in their jurisdictions. The OIE also provides technical assistance to those countries that require help with the control and eradication of zoonotic and other animal diseases. 'Trade, not Aid' is essential for the future of many developing countries and a good animal health status is necessary in these countries to maintain food security, both to feed their own citizens and to meet the standards necessary to gain access to international markets.

## Post-harvest food safety and process controls

The traditional role of the veterinarian in meat inspection, both ante-mortem and post-mortem, is transforming in many jurisdictions as food production and processing are becoming more complex, and veterinary educators must adapt their teaching accordingly (9). However, it remains important to ensure that only clinically healthy animals are slaughtered and diseased animals are not allowed into the food chain. The role of veterinarians is two-fold here: they must protect consumer health and identify animal health issues that need to be addressed on farm. In post-mortem inspections, many of the visual inspection approaches and compulsory incisions that have been mandatory in many jurisdictions in the past, are now under review and are being enhanced, or replaced, by microbial monitoring to validate the hygiene measures (6). The onus is on the meat businesses to produce safe food and to present carcasses for inspection that are fit for human consumption.

Changing consumer lifestyles are creating a demand for more ready-to-cook, and ready-to-eat meals, and this is adding more steps to the food chain, presenting more opportunities for things to go wrong. The increasing competitive commercial environment is driving the need for efficiency, leading to consolidation and economies of scale that result in the mass production of increasing volumes at all stages of the food chain. In this environment, the consequences of a contamination incident can have devastating effects on health (with people often falling ill over large geographical areas) and cause massive damage to the reputation of food companies and brand names. Reputations and brands that take years to build can be irreparably damaged over night by being associated with a food scare or adverse health effects.

Food safety is not rocket science but veterinarians need skills to influence human behaviour if many of the factors leading to outbreaks of human disease are to be managed effectively. There are several factors that continually contribute to the occurrence of outbreaks of food-borne disease and often several of these occur simultaneously, thus amplifying outbreaks. These factors include: contaminated raw ingredients (including water), inadequate refrigeration or storage, insufficient cooking, cross-contamination between raw and cooked food, poor personal hygiene of staff, poor general hygiene on premises, and untrained staff. The tragedy is that although these bad practices continuously contribute to illness and deaths they are all easily preventable.

Robust food safety management systems with adequate process controls are essential and the public health veterinarian can play a huge role in the prevention of outbreaks, but to do this they require knowledge of good

manufacturing practice and hazard analysis and critical control points (HACCP). HACCP systems are not a replacement for other food hygiene requirements but a part of a package of food hygiene measures that contribute to ensuring safe food. Prior to establishing HACCP, good food hygiene standards must already be in place, particularly in the following areas:

- infrastructural and equipment requirements
- food safety specifications for raw materials
- the safe handling of food (including packaging and transport)
- sanitation (cleaning and disinfection)
- water quality
- maintenance of the cold chain
- the health of staff
- personal hygiene
- training
- food waste handling
- pest control.

These standards are designed to control hazards in a general way and they are clearly prescribed in the Codex Alimentarius. In the education of veterinarians, so that students can see the relevance of appropriate food safety management systems and process controls, examples of where process failures contributed to outbreaks of zoonotic disease should be highlighted (7). In 2008, two cooked meat plants were in the limelight: one in Canada that produced product contaminated with *Listeria monocytogenes* which resulted in 26 deaths, and another in Ireland which caused an outbreak of *Salmonella agona* which resulted in over 160 laboratory confirmed infections in people in seven countries of the EU (12).

Many of the modern cooked meat facilities can cook in excess of 1,000 metric tons of meat per week, which in terms of sandwich fillers, or pizza toppings, is the equivalent of approximately 20 million individual servings, emphasising the importance of robust process controls to ensure the output is always safe.

## Veterinary public health in the media

When veterinary public health issues are in the media veterinarians are reminded of the importance of their work. If food can travel rapidly throughout the world, it is nothing compared with the speed at which information, or mis-information, can spread worldwide. With global news

channels, satellite television, the internet, and text messaging services operating 24 hours a day, seven days a week, it takes moments for information to be disseminated worldwide. There is no shortage of media coverage of zoonotic outbreaks and contamination incidents and it is useful for veterinary schools to monitor the media through electronic bulletin boards and highlight these incidents for the students to emphasise the topical nature, and the relevance, of veterinary public health. The media is regularly ahead of the risk managers and surveillance scientists in highlighting a problem, and many public health bodies monitor the global media as part of their early warning systems. Public perception is often informed by sensational news coverage and items are placed higher on the agendas of policy-makers as a result of the intensity of the media coverage of an issue. Policy-makers and regulators are not consistent in how they address risk along the food chain or in society at large, and often their response is in proportion to the media coverage rather than the risk to public health.

For example, in 1999 a small amount of animal feed in Belgium was contaminated by dioxin and an inability to identify which farms received this feed and to locate the livestock and products derived from them in the food chain led to a massive crisis in the Belgian food industry. This caused a food scare involving all Belgian eggs, meat and dairy products and resulted in the destruction of huge stocks of food and massive disruptions to trade across Europe. The lack of traceability allowed the dioxin crisis to develop and expand throughout the whole food chain. The Belgian Ministers of Health and Agriculture had to resign and finally the entire Government fell. The EU banned certain products from Belgium and the United States of America (USA) banned certain food lines from the entire EU. The whole episode cost the Belgian food industry 1.5 billion euros, yet there were no associated adverse human health effects (2). A similar dioxin contamination incident in Ireland in December 2008 led to the global recall of all Irish pork products. Pigs had been fed bread which had been contaminated by dioxins from illegal transformer oil that had fueled a dryer used in recycling the bread into pig rations. The complexity of the modern pork supply chain, particularly in secondary processing where product from several processors is often mingled, resulted in an inability to identify and trace the product that had been manufactured using meat from pigs from farms where the contaminated ration had been used and this led to a total recall rather than a limited recall (5).

## Principles, concepts and methods of risk analysis

'Risk analysis' is now part of the jargon of veterinary public health and the student should be familiar with its three

components: risk assessment, risk management and risk communication. In the past, food safety policy was not risk-based and as a result equal risks along the food chain were not treated with equivalent interventions. In an attempt to improve this situation countries are developing risk assessment infrastructures to provide the scientific evidence to inform policy. The Codex Alimentarius uses risk analysis as the basis of most of its standards. In the EU most member states have independent food safety agencies and a pan-EU agency, the European Food Safety Authority, also exists, with a remit to undertake risk assessment and risk communication for all EU member states. In the USA the Healthy People 2010 Initiative, announced in 1997, called for all federal agencies with risk management responsibilities for food safety to establish the Interagency Risk Assessment Consortium. The Consortium is charged with advancing the science of microbial risk assessment by encouraging research to develop predictive models and other tools. To date, the government in the USA has completed a risk analysis on *Salmonella enteritidis* in eggs and egg products, *Escherichia coli* O157:H7 in ground beef, and *Listeria monocytogenes* in a variety of ready-to-eat foods, and it has entered into a cooperative agreement with Harvard University for a risk assessment of the transmission of BSE by foods. In Canada, the department of health (Health Canada) provides tools and guidance materials to help other federal departments assess the risks to human health posed by contaminated sites. Other jurisdictions have similar arrangements to undertake scientific risk assessments and many use the guidelines of the Codex Alimentarius as a basis.

Veterinarians need to be aware that science is only part of the story and that risk managers consider additional factors in reaching their decisions, these include economic implications, trade issues, ethical concerns, relative risk, risk/benefit profiles, and the consumer and political acceptability of decisions. Furthermore, risk managers do not look at individual risks in isolation, as often occurs with risk assessors. They must consider the fact that resources are finite and must be spent where they will deliver the best return. In making risk management decisions, the most vulnerable populations should be borne in mind. The populations most likely to suffer from food-borne morbidity and mortality are the frail elderly, pregnant women, immune-compromised individuals and children (especially children under five years of age). The Food and Drug Administration in the USA reports that most serious illnesses and deaths associated with salmonellosis occur among the immune-suppressed. Pregnant women account for 27% of all cases of infection with *Listeria monocytogenes*, while 70% of all non-perinatal infections occur in immune-suppressed patients (19) or frail individuals, as was exemplified by both the 2006 outbreak in the Czech Republic (17) and the 2008 outbreak in Canada. Food poisoning can be a mild illness for a robust adult but can be life threatening for an

infant or a frail elderly person or somebody with a concurrent morbidity. There cannot be degrees of safety and food has to be safe for everyone, including the weakest consumers.

There is no such thing as zero risk and many products, such as meat, may contain harmful germs, and those preparing meals need to be aware of this and handle the food appropriately. Many veterinarians are great communicators and can translate complex scientific issues into something comprehensible by the general public. Veterinarians competent in communication can play a role in communicating residual risks to consumers or explaining risks, or non-risks, associated with zoonotic agents but also with genetically modified organisms, radiation, nanotechnology, etc. Role-play on risk communication, particularly in crisis management situations, should be part of every veterinary public health curriculum.

## Animal welfare

High animal welfare standards are an integral part of good animal husbandry. The adverse treatment of livestock during rearing, transport or slaughter cannot be tolerated by any veterinarian and any form of cruelty is unacceptable. Stressed animals are less likely to thrive and stress facilitates disease transmission. It needs to be emphasised that the public believes that veterinarians are the custodians of animal health and welfare and will hold them accountable if untoward treatment of animals is identified. Consumers across many jurisdictions are concerned about animal welfare and this influences their purchasing patterns. A You Tube video showing cruelty to cows in the lairage of a slaughterhouse in the USA led, in February 2008, to a meatpacker being forced by the Department of Agriculture to make the largest meat recall in the history of the USA: 143 million pounds of ground mince.

## Protection of water supplies and the environment

Water-borne outbreaks of zoonotic disease are becoming increasingly common and incidents of contamination of the public water supplies are well documented. Veterinarians need to be aware of the large numbers of people that can be exposed when drinking water is contaminated. In April 1993 an outbreak of cryptosporidiosis in the greater Milwaukee area in the USA was estimated to have caused about 403,000 people to fall ill with gastroenteritis among a population of 1.6 million;

about 4,400 people were hospitalised and about 100 people died (10). In May 2000, in Eastern Canada (Walkerton, Ontario), heavy rainfall washed livestock faecal material into a water supply, causing an outbreak of *E. coli* O157:H7 that affected 2,300 people and resulted in seven deaths (8).

With global warming, potable water is becoming a scarce commodity. Large outbreaks of zoonotic infection are occurring with increasing regularity and are now often associated with contaminated water being used to irrigate vegetables, e.g. in 2006 an outbreak of *E. coli* O157:H7 affecting 26 states in the USA (200 cases; 3 deaths) was associated with contaminated spinach originating in California.

## Trade-disrupting diseases

Veterinarians need to be aware of the consequences of outbreaks of those non-zoonotic diseases which, although they pose no risk to human health, disrupt the trade in food and damage both commercial interests and consumer confidence (e.g. foot and mouth disease, swine fever, bluetongue and avian influenza).

## Criminal activity and bioterrorism

In 2005, in one of the largest food recalls ever to take place in the EU, processed food containing chilli contaminated with the carcinogenic dye Sudan Red was taken off the market in several countries (7). The Sudan Red was added by four spice-exporting companies in India to brighten the colour of the chilli, creating the impression that the product was fresher than it actually was. There were no adverse human health effects but consumer confidence was damaged and this incident demonstrated that there is the potential for large sections of the food chain to become contaminated as a result of the global sourcing of ingredients used in processed foods. The 2008 melamine contamination of dairy products in China did cause human illness, with over 300,000 babies falling ill, 53,000 hospitalised and 6 deaths (December 2008). These two incidents were linked to chemical rather than bacterial contamination, but they highlight how vulnerable the food chain is to deliberate contamination. In the USA, the legislation designed to prevent such contamination is contained in the Bioterrorism Act (2002). The Act stipulates the legal requirements for registering food facilities (both domestic and foreign), notifying the Food and Drug Administration of food shipments, and creating and maintaining records to determine the immediate previous sources and the subsequent recipients of food.

# National and international legislation

## Legislation governing food safety and animal health

Veterinarians need to be knowledgeable about the legal frameworks that govern food safety and animal health in their jurisdiction and globally. The most comprehensive multilateral agreement is the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) of the World Trade Organization (WTO). Another WTO agreement, the Agreement on Technical Barriers to Trade (TBT Agreement) states that technical regulations (e.g. those relating to packaging and labelling) imposed by countries should not be more restrictive on imported products than they are on domestically produced products. The TBT Agreement also encourages the adoption of international standards. In the pursuance of harmonisation the SPS Agreement has chosen the Codex standards, including those related to food additives, veterinary drugs and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygienic practices.

Numerous opportunities exist to harmonise food safety legislation both at the national and international level. The process is not without its challenges, because food safety legislation can vary greatly between countries, but more and more governments are aligning their regulations with those of other countries. For example, in 1996, Australia and New Zealand decided to work towards harmonising many food standards in order to reduce regulatory trade barriers and industry costs. In 1998, the USA and Canada signed an agreement under which certain food safety standards could be harmonised. In 2000, the States and Territories of Australia formally agreed to a national food safety regulatory system (11). In the EU, the Hygiene Package, which came into effect in January 2006, replaced seventeen Food Hygiene Directives with five Regulations and has simplified EU food legislation.

## Legislation governing educational requirements for official veterinarians

What level of knowledge in the different areas of veterinary public health is it necessary for a veterinary student to reach? A good model for the topics to be covered in a veterinary public health syllabus is illustrated in EU Regulation No. 854/2004. Chapter IV Section A 2 of this

Regulation, as reproduced in the Appendix, outlines the knowledge that an official veterinary surgeon (OVS) must have. The Regulation suggests that candidates for the position of OVS may acquire this knowledge as part of their basic veterinary training or through training undertaken, or professional experience acquired, after qualifying as a veterinarian. The national competent authorities may arrange for a test to assess the candidate's knowledge unless they are satisfied that a candidate has acquired all the required knowledge as part of their primary veterinary degree or through a postgraduate qualification. A further requirement in the Regulation is for each new official veterinarian to undergo practical training for a probationary period of at least 200 hours before starting to work independently. During this period the probationer is to work under the supervision of existing official veterinarians and the practical training is to include the auditing of food safety management systems. Therefore, the level of knowledge necessary for newly graduated veterinarians should be sufficient to prepare them, if they so desire, to engage in the practical training to become an OVS.

## Conclusion

The public health veterinarian needs a range of competencies, and these are best taught by emphasising the connections that exist between veterinary public health and the many and varied other subjects in the veterinary curriculum. Veterinary public health should not be taught in isolation. Highlighting the relevance of different subjects to veterinary public health and vice versa, helps maintain students' interest and enables them to better understand the importance of clinical and laboratory work to public health protection. The challenge for educators is to enthuse students by making the subject vibrant and stimulating.



## Les fondamentaux de l'enseignement vétérinaire dans les domaines de la sécurité sanitaire des aliments, de l'innocuité des denrées alimentaires et de la biosécurité : une perspective mondiale

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### Résumé

Les enseignants vétérinaires ont à relever l'immense défi d'intéresser leurs étudiants à la médecine de santé publique, en faisant en sorte que cette discipline d'enseignement les captive et leur paraisse pertinente. La santé publique vétérinaire présente de nombreuses composantes, dont la lutte contre les zoonoses, la sécurité sanitaire des aliments, la santé animale et la biosécurité, l'utilisation des animaux comme sentinelles des dangers environnementaux et le rôle des déjections animales dans la contamination des aliments et de l'eau ; l'enseignant vétérinaire ne manque donc pas d'atouts pour attirer l'attention des étudiants. Si les jeunes diplômés achèvent leur formation sans être persuadés de l'importance et de la pertinence de la santé publique vétérinaire, ce sera l'échec des enseignants et non des étudiants eux-mêmes.

### Mots-clés

Bien-être animal – Contrôle – Contrôle après abattage – Contrôle avant l'abattage – Contrôle des processus de production – Enquête sur les foyers – Épidémiologie moléculaire – Lutte contre les zoonoses – Sécurité sanitaire des aliments – Surveillance.



## Enseñanza veterinaria básica en materia de inocuidad e higiene de los alimentos y seguridad biológica: una perspectiva mundial

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### Resumen

Uno de los grandes retos que tienen planteados los profesores de veterinaria es el de suscitar interés por los aspectos médicos de la salud pública y lograr que los programas de estudios resulten interesantes y pertinentes para los estudiantes. La salud pública veterinaria abarca tal número de temas (lucha contra las zoonosis, inocuidad de los alimentos, sanidad animal, seguridad biológica, uso de animales como detectores de peligros ambientales, contribución de los residuos de origen animal a la contaminación del agua y los alimentos, etc.) que al profesor de veterinaria nunca le faltará munición en su combate por atraer la atención de los estudiantes. Serán los profesores, y no los alumnos, quienes hayan fracasado si los segundos, al acabar sus estudios, aún no han entendido la importancia y pertinencia de la salud pública veterinaria.

### Palabras clave

Bienestar animal – Control de zoonosis – Controles – Controles de proceso – Epidemiología molecular – Inocuidad de los alimentos – Investigación de brotes – Medida posterior al sacrificio – Medida previa al sacrificio – Vigilancia.



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# Appendix

## European Union Regulation No. 854/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption

### Section 3 of Annex 1

#### Chapter IV – Professional qualifications

##### A. Official veterinarians

1. The competent authority may appoint only veterinarians who have passed a test meeting the requirements of paragraph 2 as official veterinarians.

2. The competent authority must make arrangement for the test. The test is to confirm knowledge of the following subjects to the extent necessary depending on the veterinarian's background and qualifications:

- a) national and international legislation on veterinary public health, food safety, animal health and welfare and pharmaceutical substances
- b) principles of the common agricultural policy, market measures, export refunds and fraud detection (including the global context: WTO, SPS, Codex Alimentarius, OIE)
- c) essentials of food processing and technology
- d) principles, concepts and methods of good manufacturing practice and quality management
- e) pre-harvest quality management (good farming practices)
- f) promotion and use of food hygiene and food related safety (good hygiene practices)
- g) principles, concepts and methods of risk-analysis
- h) principles, concepts and methods of HACCP, use of HACCP throughout the food production food chain
- i) prevention and control of food-borne hazards related to human health
- j) population dynamics of infection and intoxication
- k) diagnostic epidemiology
- l) monitoring and surveillance systems
- m) auditing and regulatory assessment of food safety management systems
- n) principles and diagnostic applications of modern testing methods
- o) information and communication technology as related to veterinary public health
- p) data-handling and applications of biostatistics
- q) investigation of outbreaks of food-borne diseases in humans
- r) relevant aspects concerning TSEs
- s) animal welfare at the level of production, transport and slaughter
- t) environmental issues related to food production (including waste management)
- u) precautionary principle and consumer concerns
- v) principles of training of personnel working in the production chain.

*Source:* Regulation (EC) No. 854/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption. *Off. J. Eur. Union*, **L139**, 206.



