

Toward Harmonization of the European Food Hygiene/Veterinary Public Health Curriculum

Frans J.M. Smulders ■ Sava Buncic ■ Karsten Fehlhaber ■ Robert J. Huey ■ Hannu Korkeala ■ Miguel Prieto ■ Iva Steinhauserova

ABSTRACT

Prompted by developments in the agri-food industry and associated recent changes in European legislation, the responsibilities of veterinarians professionally active in veterinary public health (VPH), and particularly in food hygiene (FH), have increasingly shifted from the traditional end-product control toward longitudinally integrated safety assurance. This necessitates the restructuring of university training programs to provide starting competence in this area for veterinary graduates or a sub-population of them. To date, there are substantial differences in Europe in the way in which graduate programs in FH/VPH are structured and in the time allocated to this important curricular group of subjects. Having recognized this, the European Association of Establishments for Veterinary Education (EAEVE) recently instituted a working group to analyze the current situation, with a view to produce standard operating procedures allowing fair and transparent evaluations of universities/faculties constituting its membership and in concurrence with explicit European legislation on the professional qualifications deemed necessary for this veterinary discipline. This article summarizes the main conclusions and recommendations of the working group and seeks to contribute to the international efforts to optimize veterinary training in FH/VPH.

Key words: food hygiene, veterinary public health, graduate education, European harmonization

INTRODUCTION

In successive framework programs issued in the 1990s, the European Union continually stressed the importance of strengthening the scientific and technological basis for the European industry by pursuing the harmonization of educational systems, instituting various programs targeted at education, and making considerable funds available for international training activities with a European dimension. As early as 1992, within the framework of one of these programs (ERASMUS/TEMPUS), an international group of veterinary food hygienists from Spain, Italy, United Kingdom, Finland, Poland, Hungary, and the Netherlands convened to define the common terms of reference and to identify the major elements that provide the basis for a realistic analysis of the various curricular structures and components of graduate veterinary education.¹ The group disbanded, however, without having had sufficient opportunity to thoroughly discuss the relevance of various curriculum components, let alone having reached consensus on how European veterinary curricula should be redesigned and interrelated. It appeared that such an outcome was related to differences in individual faculties' organization and policies, which in turn were largely influenced by national politics and traditions.

Although the structure and organization of veterinary education within the EU is the responsibility of individual member states, they need to comply with European legislation (as per Article 165 of the Treaty on the Functioning

of the European Union).² For veterinary faculties to seek automatic recognition of their diplomas throughout the EU, their curricula would have to more specifically comply with European Directive 2005/36/EC,³ which includes requirements for education in general. Article 38.3 of this directive describes the requirements for veterinary education. Annex V.4., "Veterinary Surgeon" (under section 5.4.1, "Knowledge and Skills") of this same directive, states that the following must be ensured: "knowledge and experience may be acquired in a manner which will enable veterinary surgeons to perform all their duties."³(p.120) Thus, the directive stipulates that all students should be educated in all major veterinary areas so to provide graduates with a general qualification. It dictates that, besides obvious basic subjects such as physics, chemistry, and biology, the curriculum should include the following groups of more specific subjects: (1) basic sciences, (2) clinical sciences, (3) animal production, and (4) food hygiene. The mandatory elements to be included in the food hygiene group of subjects are further described only in general terms: "inspection and control of animal foodstuffs or foodstuffs of animal origin," "food hygiene and technology," and "practical work (including at places where slaughtering and processing of foodstuffs take place)."³(p.44) Although not specifically included in section 5.4.1, the associated legislation should be an important part of all elements of the food hygiene group of subjects. However, how this minimum package is fleshed out by the inclusion of specific curricular components is interpreted differently by the various veterinary faculties in Europe.

It is essential that all veterinary faculties recognize their responsibility to educate food hygienists, as their expertise and know-how are needed by society in dealing

The opinions expressed in this article, though based on work commissioned by EAEVE, are the professional views of the authors and do not necessarily represent the official view of EAEVE.

with food safety and environmental health issues. Consequently, making enough resources available for this part of the curriculum is of vital importance.

As veterinary training is very expensive and time-consuming, the various establishments for veterinary education seem well-advised to consider more seriously how the results of their efforts could be more widely exploited to the benefit of society and in the interest of their graduates. By increasing public awareness of the extent and versatility of veterinary education, investments in this training will be justified and the social significance of the profession will once more be acknowledged. The area of food hygiene/veterinary public health (FH/VPH) in particular represents the most convincing argument to this effect. However, remarkably, the role of FH in many veterinary curricula in Europe has been downplayed rather than emphasized in past decades.⁴ However, there is absolutely no justification for reserving only minimal resources for or providing graduates with only elementary skills in FH/VPH. It is also rather naïve to assume that “Day One” skills for an FH veterinarian can be achieved by merely offering lectures on theoretical aspects, without coupling such lectures with practicals, excursions, and (extramural) internships, in which students are taught in small groups using a problem-based approach.^{4,5} Refraining from the latter approach will inevitably lead to Day One insecurities (i.e., junior veterinarians being rightfully criticized for their relative incompetence).

It seems that the versatile veterinary education needed by today’s society will be realized only if the aforementioned approach is adopted by veterinary faculties. Such considerations have already prompted the University of Veterinary and Pharmaceutical Sciences at Brno to institute two veterinary faculties approved by the European Association of Establishments for Veterinary Education (EAEVE): (1) the Faculty of Veterinary Medicine and (2) the Faculty of Veterinary Hygiene and Ecology. The main difference between the two is that the former offers curricula with around 10% and the latter with more than 20% FH/VPH groups of subjects.⁶

The EU did institute an advisory committee on veterinary training (ACVT) to more closely monitor the performance of individual member states, but subsequently ACVT has delegated those tasks to the EAEVE.⁷ Since its establishment in 1988, a total of 97 veterinary training establishments have become members and have requested evaluations by visitation teams consisting of experts in the aforementioned veterinary disciplines. To support the evaluations, EAEVE and the Federation of Veterinarians of Europe (FVE) have established basic standard operating procedures (SOPs) which vary in their degree of detail. The latest version of the SOPs is based on Directive 2005/36/EC and the wording is taken verbatim from Article 38.3 (§ f) of the directive. Hence, the requirements—to be monitored by evaluators of the FH/VPH group of subjects, during their site visits—have been defined as “Adequate knowledge of the hygiene and technology involved in the production, manufacture and putting into circulation of animal foodstuffs or food stuffs of animal origin intended for human consumption ... including the relevant legislation”^{3(p.44)} (the final clause refers to § g of Article 38.3).

Arguably, this definition is of little assistance as long as the term “adequate” is not further specified in terms of: (1) generally accepted curricular elements; (2) weight of their various constituting components; and (3) mode of knowledge transfer. As a consequence, much of the evaluation is actually left in the hands of the individual experts. Understandably, it is not always entirely clear how and on what basis an individual evaluator identifies issues that are to be given priority. Hence, the absence of more detailed, properly discussed, and agreed-upon evaluation guidelines is frustrating for the visiting experts as well as for the host faculties when conducting self-evaluation exercises and assessing if their chosen approach is up to par.

Having been involved in evaluations of numerous faculties, we have prompted EAEVE to consider making more detailed guidelines available. Subsequently, we were invited to constitute a working group (WG) so as to elaborate draft guidelines to remedy the current undesirable situation. This article includes its major observations, recommendations, and underpinning arguments for consideration by its peers worldwide.

SPECIFIC QUALIFICATIONS OF THE FH/VPH PROFESSIONAL AS STIPULATED IN EUROPEAN LAW

In 2000, several FH/VPH specialists took the initiative of founding the European College of Veterinary Public Health (ECVPH)⁸ under the aegis of the European Board of Veterinary Specialization (EBVS). Over subsequent years, ECVPH has been further developing (including clearly defining) the objectives and the requirements for candidates to receive the Diplomate status in either of its subsections: Food Science or Population Medicine. Through the activities of various WGs, the essential elements that represent VPH in professional terms were carefully identified, and the ECVPH received full recognition by EBVS in May 2011.

In the mid-twentieth century, the term “veterinary public health” was applied to a range of activities involving veterinary skills that were directed toward solving community problems of health and disease in man.^{9(p.4)} This connotation of the term suggests that educators are well-advised to pursue the development of curricula in which the various constituting elements are presented in an integrated manner. This ideally implies securing the involvement of fellow educators from other departments who are specialized in relevant VPH-associated areas as a team approach, or at least building on the results of their previous efforts in the curriculum. As logical as this may seem, it is no small feat to pursue an inter-institutional or inter-departmental approach with the curricular structure that is currently in place at faculties in some European countries.

The ECVPH—its intrinsic focus being on post-graduate training and operating in a truly European fashion—was approached by the European Commission to share its views on what elements should constitute the professional requirements for official veterinarians (as defined in Regulation (EC) No 854/2004; see Appendix 1) in a control function, the elements of which were in the process of being formulated by European legislators. The

majority of ECVPH's views were indeed adopted by the European Commission and have meanwhile been stipulated in Regulation (EC) No 854/2004 (chapter IV).¹⁰ Qualifications are listed in the form of 22 points (see Appendix 1), which largely reflect the aforementioned philosophy. It is most significant to note that now, that is, since this regulation has been issued, definitions on which FH/VPH elements of veterinary education should be concentrated are specified. As a consequence, it is no longer up to individual member states to follow their own strategies entirely in the education of official veterinarians. Also, it should be stressed that FH/VPH is the only veterinary discipline for which this is the case. It should be noted, however, that the indicated qualification requirements (Annex I, section III, chapter IV) are limited to the fresh meat area and do not relate to other foods, although the definition of official veterinarian as given in article 2 of Regulation (EC) No 854/2004 implies involvement in ensuring the hygiene of all foods.¹⁰

On the other hand, it is understandable that any legislative definition of the qualifications and competencies that are required for official veterinarians (including those in Appendix 1) can only reflect the public health and food safety-related problems, scientific knowledge, and control strategies that existed at the time when the legislation was formulated. As the latter aspects always—sometimes rather rapidly—evolve further over time (see below), it is logical that the legislative definitions need to be revisited periodically and updated as necessary. For example, extensive activities of both the European Commission and the European Food Safety Authority are ongoing as this article is being prepared, with the aim of modernization of meat inspection and with the possibility that related legislation framework could require modification in the relatively near future. However, it should be noted that due to remit and time-related constraints, we have not considered which of the 22 points does or would require updating.

It should also be noted that Regulation (EC) No 854/2004 defines the ultimate knowledge required at post-graduate level, and decidedly does not imply that all the points should necessarily be dealt with in full detail during graduate veterinary training. Yet, it should equally be noted that establishments for veterinary education must now: (1) make sure that the scientific basis (Day One skills) is provided for all students and for all listed FH/VPH content areas (see Tables 1–5); and (2) clearly identify where post-graduate training should take over.

Ultimately, the responsibility for empowering graduates to engage as official veterinarians lies with the competent authorities (i.e., the local regulatory agencies). The prerequisites include graduate candidates spending a specified work period supervised by experienced professionals, more specifically fulfilling at least 200 hours of practical training, and passing a test certifying their competence.¹⁰ How much of the training is provided through graduate or post-graduate courses still varies between some member states. For example, in Austria, a complementary graduate tracking approach for an interested student sub-population is offered, which allows a significant reduction in the amount of post-graduate training, while in Finland, Spain, and the Czech Republic, universities

are requested by the competent authorities to ensure that all elements are taught in sufficient depth via the graduate curriculum.

THE SIGNIFICANCE OF FH/VPH AS AN ESSENTIAL COMPONENT OF THE VETERINARY CURRICULUM AND THE RATIONALE FOR SHAPING UP

FH/VPH and its Significance in Society

The main objectives of VPH are to contribute to consumer protection via food safety assurance while ensuring animal health and welfare, to warrant and control the proper use of veterinary drugs, and to address environmental issues associated with the food chain. Thus, the primary target groups of graduate education in FH/VPH are veterinary students seeking to pursue a career in food control as well as those aspiring to become active in food animal practice.

In general, the prestige and broad societal acceptance of the veterinary profession were not gained until after veterinarians, from the mid 1800s onward, were recognized as significant contributors to public health assurance. Nevertheless, the disputes of competence in the area of FH of animal origin—primarily between the medical and the veterinary professions—continued and were not settled in favor of the latter until the late nineteenth century.^{11(p.183–4)} Since then, veterinarians have been pioneers of FH.

Food safety plays an increasingly important role in our society. Food-borne disease outbreaks have become larger and more difficult to solve, and the number of cases of food-borne diseases is increasing. Also, the use of chemicals and drugs in primary production contributes to the occurrence of their residues in foods, which raises concerns over their direct and/or indirect harmful effects on human health.⁴ Food safety issues are a matter of frequent, high-profile discussions in public media and so, understandably, have acquired a central role in national politics on a global scale. Incidentally, consumer perception of food-related risks is highly influenced by the quantity and quality of information provided through public media (as demonstrated by recent food-borne outbreaks in Europe). Here too, expert veterinarians play an important role in ensuring that reliable information is provided.

Evolution of the Traditional Approach to Meat Inspection

In the past, the task of controlling whether and how the conversion of animal to food met FH/VPH requirements, as indicated above, were allocated exclusively to veterinarians. This related particularly to traditional meat inspection, which indeed had an impressive historical record of successfully detecting and eliminating causative agents of classical zoonotic diseases from the food chain. However, nowadays, the public health relevance of many classical zoonoses has faded in Europe because most of these were eradicated or are now very rare, while meat inspection (using macroscopic techniques) has proved to be unable to detect the hazards that cause food-borne diseases of current concern (e.g., *Salmonella*, *Campylobacter*,

Verocytotoxin-producing *Escherichia coli* [VTEC], *Toxoplasma gondii*). The latter hazards can be controlled only through a range of preventative technology or a process of hygiene-based measures applied in a coordinated way and at multiple steps in the meat chain. This essentially represents a “meat safety assurance” approach, which differs fundamentally from the traditional routines as defined by classical meat inspection concepts. The aforementioned changes have led to a situation where the traditional meat inspection practices—still largely followed today—are, arguably, primarily beneficial for the detection of animal health hazards and for observing indicators of poor animal welfare, rather than serving a principal public health purpose.

These changes are also reflected in the everyday work of veterinary meat inspectors. For example, in 1990, Finnish meat inspection veterinarians spent only 40% of their total weekly working hours on classical meat inspection.¹² The time spent by veterinary meat inspectors on hygiene control of slaughterhouse and cutting plants has, however, increased during the past decades, which has positively increased the challenge of their work and job motivation.^{12,13}

Incidentally, modern veterinary food control should address all foods and not necessarily be restricted to meat inspection. Although this primarily relates to foods of animal origin (e.g., milk and dairy products, honey, or fish and fish products, the inspection of which has traditionally been carried out by the official veterinarian in countries such as Germany and Spain), the theoretical knowledge and associated practical skills of veterinarians, more particularly in regard to the epidemiology of zoonoses and food-borne pathogens, could and should be used to the fullest irrespective of the food’s origin.

Evolution of FH/VPH Education in the Regulatory and International Settings

Current EU legislation stipulates that food operators are primarily responsible for the safety of their products. Logically, this implies that they are responsible for all aspects of the involved processes, which is confirmed by the fact that the Good Manufacturing Practice/Good Hygiene Practice (GMP/GHP) and Hazard Analysis Critical Control Point (HACCP) based food safety system, covering the entire producer’s operation, is owned by the operator. With this approach, the regulatory controls largely relate to two main aspects: (1) setting targets for the product that the food operator has to achieve and (2) conducting verification and auditing that the operator’s food safety system works properly and that the food safety targets have been achieved.

This change in approach inherently means that both the nature of the regulatory controls and the skills of the regulatory controller have to be adapted accordingly. In the new situation, the official veterinarians can no longer claim all the controllers’ positions simply by referring to the law; they have no inherited rights to public health tasks that are on offer today. Rather, veterinarians have to prove anew that they are up to new regulatory tasks. Unless veterinarians convincingly show that their competence represents significant added value over and beyond the minimum legal requirements on food control, other

professions already associated with the food chain will have little difficulty taking over. This development has once again kindled a dispute between various professional groups about whether or not veterinarians are optimally equipped for performing all necessary control tasks. Thus, unless the veterinary profession is willing to give up its significant role in public health assurance, it seems well-advised to shape up in those areas where competence may be lacking and prove its own capacity to provide consumers with the assurance and reassurance that they are demanding. This will only be successfully achieved when veterinarians follow a preventive medicine approach at the animal-population level, base their considerations and decisions on risk analysis, become effective in auditing food safety systems in the context of the food chain (inherently complex and multidisciplinary), and remain aware of the social, trade, and political consequences of their decisions.

In the first global conference on veterinary education, “Evolving Veterinary Education for a Safer World,” organized by the World Organisation for Animal Health (OIE), the participants’ primary recommendation was that “the OIE develop for veterinary education a core curriculum model that includes those key competencies of veterinarians ... and takes into account new threats, opportunities and societal expectations.”¹⁴ The recommendations went on to encourage the OIE, World Veterinary Association (WVA), and other veterinary associations such as EAEVE to examine “how the veterinary curriculum can best meet societal expectations at a global level and convince governments that veterinary education is a Global Public Good.” In particular, public health (zoonoses, food safety, food security) and biodiversity were highlighted as providing socio-economic benefits to society.¹⁴ There are great, global challenges currently facing the profession. On one hand, veterinarians have to meet their responsibilities toward global food security (which is closely linked to food safety) for an expected world population of 9 billion by 2050. On the other hand, they have to be appropriately engaged in the One Health concept that follows world globalization, including a high-speed spread of animal and human disease due to extensive, high-speed traffic of humans, animals, and goods.

THE OUTPUT OF EAEVE’S WORKING GROUP ON THE FH/VPH CURRICULUM

Major Observations on Deficiencies

The main concern of the WG was to correct the omission in Annex 1 of the EAEVE and FVE evaluation SOP document (“Main Indicators”),¹⁵ which contained no recommendation on total teaching hours required for FH/VPH. The FH/VPH area was the only discipline in 2009 for which there were no EAEVE and FVE recommendations.

In addition, Annex 4 of the EAEVE and FVE evaluation SOP document (Day One skills) contained no points under “General Professional Skills and Attributes,” only one point under “Underpinning Knowledge and Understanding,” and only one point under “Practical Competences relating to Food Hygiene” (i.e., 2.2.9: VPH issues including zoonoses and 2.3.17: performing ante-mortem and

post-mortem examination of food animals and correctly identifying conditions affecting the quality and safety of products of animal origin).

The WG was also aware of the work of the OIE *ad hoc* group on veterinary education, who, in their December 2010 considerations (published in the OIE Terrestrial Animal Health Standards Commission),^{16,17} laid out the minimum competencies expected of Day One graduates to ensure the delivery of high quality national veterinary services. Under “General Competencies of Requirements for Food Hygiene and Safety,” the following was included: (1) on-farm food safety practices, (2) traceability, (3) drug and chemical use and residue testing programs, (4) slaughter inspection (including ante-mortem, post-mortem, humane slaughter, and hygienic dressing), and (5) integration between animal health controls and veterinary public health (i.e., the role of veterinarians together with physicians, public health practitioners, and risk analysts to ensure healthy, hazard free food).

In its draft document the WG emphasized the important role that food hygiene plays within the veterinary curriculum in providing a public good to society. This is a particularly important strength within the veterinary curriculum, especially for many countries where the continued financing of veterinary education is dependent on the public good which ultimately relies heavily on the generation of expert official veterinarians. It should be emphasized that the disciplines that are taught within food hygiene are required to protect the consumer.

In addition, the discipline of FH represents the profession’s contribution to the growing worldwide concern for food security and underpins the profession’s commitment to One Health: preventive medicine is a key element of food hygiene. Finally, it was acknowledged that environmental issues play an important role in our society and are related to food production, including, for instance, issues related to the need for pure water for humans and animals, and should thus be dealt with in the veterinary curriculum.

The Approach of the FH/VPH Working Group

During its initial meeting (Vienna, March 2011), the WG scrutinized a comprehensive list of topical issues drawn up over the past decade by the academic teachership of the German-speaking European countries. The list was subsequently narrowed down to the absolute essentials. Whereas the WG was aware that teaching FH in many European faculties goes well beyond what is described in the following tables (considered an added benefit), it also acknowledged that there may be national priorities, that might inspire slight alterations of the proposed curriculum design if they are supported by valid arguments. Around 90% of the overall teaching time available for FH/VPH should be spent on the essential elements listed in the Tables 1–5 and representing the minimum requirements (i.e., a consensus view of what is considered acceptable and achievable in the graduate training of the European veterinarian).

After the WG’s initial meeting, the first draft of the document was presented during an international seminar on the European FH/VPH curriculum (Leipzig, April 2011), in which representatives of 13 faculties across Europe

(from Austria, Belgium, Denmark, Finland, Germany, Serbia, Sweden, Switzerland, and the Netherlands) participated. It should be stressed that participants were specifically requested to share their professional opinion as experts and teachers, rather than to safeguard national or faculty interests. The final version (as presented in Tables 1–5), drafted in accordance with the valuable suggestions that were made, was unanimously endorsed by the conference, and after its recirculation to the WG members for final consultation, was submitted to EAEVE and presented at its general assembly (Lyon, May 2011).¹⁸

Proposed Minimum Requirements for the European FH/VPH Curriculum

Tables 1–5 include the curricular FH/VPH components (content areas) that are considered essential, the associated learning objectives (Day One skills), and the content standards (major elements to be covered). Each of the tables includes the weighted time as a percentage (i.e., the proportion of the total time to be spent on each area within the FH/VPH part of the veterinary curriculum). In addition, the bullet points a through v (as stipulated in Regulation (EC) No 854/2004; see Appendix 1) that are addressed by the suggested major elements to be covered are indicated in the table legends.

As the tables illustrate, only a limited number of professional qualifications (i.e., bullet points: k, o, p, and v in Appendix 1) are not specifically addressed in the curriculum draft outlines. Whereas the former three (k, o, and p) are primarily the responsibility of university staff involved in teaching epidemiology, veterinary state medicine, and public health and biomathematics, respectively, the latter qualification (v) remains the primary responsibility of the competent authority.

Stressing Particularly Important Points

A thorough knowledge in veterinary biosciences and production animal medicine provides a solid basis for FH training. Veterinarians, with their strong emphasis on biomedicine and focus on the pathogenesis and epidemiology of (zoonotic) diseases and toxicology, as well as their understanding of food production and hygiene, should stand out as experts in (veterinary) public health and in solving problems concerning the food chain. Obviously, this assumption will only remain valid if the entire food production chain is comprehensively considered in veterinary education and, indeed, this is a prominent feature of the curriculum in some veterinary faculties in Europe. Therefore, it cannot be stressed enough that such a longitudinal approach remains in place, or is introduced in curricula when missing.

The optimal and most effective place for FH training in the veterinary curriculum is at the final stage, that is, after graduate students have been confronted with clinics and have a better understanding of animal disease, basic epidemiology, and on-farm disease-prevention options. The extent of the FH training (in terms of proportion of the total veterinary curriculum) should range from a minimum of 12% to 15%, depending on national, regional, or faculty interests and preferences. All elements listed should be provided both in theory (i.e., lectures and seminars) and, wherever it is meaningful to do so, via practicals, (extramural) internships, and excursions.

Table 1: Outline draft for the following content areas: Food microbiology, food spoilage, and biological /chemical food safety hazards (to cover 30% of the total time available for the FH/VPH curriculum)

Content area	Learning objectives (Day One skills)	Content standard (major elements to be covered)
1. Food microbiology*	To be capable of participating in the microbiological examinations relevant for foods, from sampling to interpretation of results, along the whole food chain	<p>Understanding of:</p> <ul style="list-style-type: none"> • Microbiology in the food chain • Microbiological contamination of food • Factors influencing survival, growth, and inactivation of microorganisms • Microbial identification and typing • Basic genotypic and phenotypic characteristics of microorganisms • Starter and protective cultures • Probiotics, prebiotics, and competitive exclusion • In addition, commodity specific (e.g., milk, meat, fish, eggs) microbiology aspects
2. Food spoilage*	<p>To be capable of recognizing food spoilage and advising on preventive measures</p> <p>To be capable of making decisions based on the relevant legislation</p>	<p>Understanding of:</p> <ul style="list-style-type: none"> • Types of microorganisms and their activities causing spoilage • Enzyme activities involved in spoilage • Spoilage of foods due to parasites and pests • Spoilage caused by physical-chemical processes and physical-chemical processes associated with microbial spoilage
3. Biological food safety hazards in the context of 'Longitudinally Integrated Safety Assurance' (USA) of foods, including pre-harvest, harvest, and post-harvest*	<p>To be capable of recognizing the major biological hazards associated with foods</p> <p>To be capable of advising food processors on biological hazard prevention and control</p>	<p>Understanding of:</p> <ul style="list-style-type: none"> • Zoonosis • Bacterial food borne infections and intoxications • Viral foodborne infections • Protozoan zoonotic and/or foodborne parasites • Other zoonotic and/or foodborne parasites • Public health aspects of prion-caused diseases • Mycotoxins • Biogenic amines • Natural toxins in food (e.g., toxic fish, shellfish poisoning) • Transferable antimicrobial resistance in microbiota
4. Chemical food safety hazards†	<p>To be capable of advising on the prevention of contamination of foods with residues of Veterinary Medicinal Products</p> <p>To be capable of assisting other professionals in the prevention of other chemical contamination of foods if/where needed</p>	<p>Understanding of:</p> <ul style="list-style-type: none"> • Prevention and control of biological food safety hazards to protect human health <p>Understanding of:</p> <ul style="list-style-type: none"> • Investigations of outbreaks of related food-borne diseases in humans <p>Understanding of:</p> <ul style="list-style-type: none"> • Basic principles of chemical contamination along the food chain • Groups and categories of food-relevant substances • Environmental contamination and main principles of the protection • Legislation on residues and contaminants <p>Understanding of:</p> <ul style="list-style-type: none"> • Prevention and control of chemical safety hazards to protect human health <p>Understanding of:</p> <ul style="list-style-type: none"> • Investigations of outbreaks of related food-borne diseases in humans

FH/VPH = food hygiene/veterinary public health

* The content standards related to this content area address bullet points i, l, t, q, n, and r of the "Professional Qualifications" in Regulation (EC) No 854/2004 (see Appendix 1).

† The content standards related to this content area address bullet points j, n, and t of the "Professional Qualifications" in Regulation (EC) No 854/2004 (see Appendix 1).

Table 2: Outline draft for the following content area: Food preservation and technology (to cover 15% of the total time available for the FH/VPH curriculum)

Content area	Learning objectives (Day One skills)	Content standard (major elements to be covered)
5. Food preservation and technology*	Capable of identifying risks and risk reducing options associated with various food preservation and processing methods	Understanding of: <ul style="list-style-type: none"> • Main methods used in food preservation and technology including packaging • Product quality and food safety effects and goals of the main preservation/technology processes, and their balancing • Hurdle concept • Processing hygiene

FH/VPH = food hygiene/veterinary public health

* The content standards related to this content area address bullet point c of the "Professional Qualifications" in Regulation (EC) No 854/2004.

Table 3: Outline draft for the following content area: Meat inspection (to cover 15% of the total time available for the FH/VPH curriculum)

Content area	Learning objectives (Day One skills)	Content standard (major elements to be covered)
6. Meat inspection*	<p>Capable of performing ante-mortem and post-mortem inspection of food animals, correctly identifying conditions affecting the quality and safety of the meat, and deciding on its disposition</p> <p>Capable of evaluating the hygienic status of slaughterhouse plants, personnel, and processes</p>	<p>Understanding, for the main production animal species and partly subject to national priorities, of:</p> <ul style="list-style-type: none"> • The role, aims, and objectives of meat hygiene • Basic principles of meat hygiene • Slaughter hygiene • Hygiene and technology of meat production • Meat hygiene legislation • The aims, objectives, and methods of ante-mortem examination, including the following: <ul style="list-style-type: none"> ○ Animal welfare during transport, in the lairage, and at slaughter ○ The relationship between animal welfare and meat quality/food safety ○ Food chain information analysis ○ Hygienic status of animals ○ Risk categorization of animals and logistic slaughter • The aims, objectives, and methods of post-mortem examination including the following: <ul style="list-style-type: none"> ○ Detection of zoonotic/foodborne hazards in slaughtered animals ○ Hygienic status of meat ○ Decontamination strategies at abattoir level ○ Judgment of the fitness of meat for human consumption ○ Post-mortem findings as indicators of poor animal welfare • Meat certification including for import and export • Quality assurance systems in meat production enterprises

FH/VPH = food hygiene/veterinary public health

* The content standards related to this content area address bullet points s and t of the "Professional Qualifications" in Regulation (EC) No 854/2004.

Establishments for veterinary education provide graduates with the scientific basis (Day One skills), allowing them to undertake a career in VPH after they have engaged in the necessary post-graduate training, which should be provided by the competent authority as stipulated in European legislation (see Appendix 1). Thus, the primary responsibility for assessing whether the training of the official veterinarian, as required by the 22 points listed in Appendix 1, has been undertaken in sufficient depth lies with the competent authority and not with the veter-

inary faculty. In case the level of knowledge is sub-optimal, additional training is to be offered. Should the competent authority consider it desirable or more efficient to largely delegate such (in essence post-graduate) training to establishments for veterinary education (i.e., to be included in the regular graduate training program), it is stressed that the suggested 12% to 15% minimum training will not suffice. This will inevitably lead to a, perhaps unfair, criticism that veterinary faculties deliver relatively incompetent graduates.

Table 4: Outline draft for the following content areas: Food analysis and official controls (to cover 20% of the total time available for the FH/VPH curriculum)

Content area	Learning objectives (Day One skills)	Content standard (major elements to be covered)
7. Food analysis*	<p>Capable of performing analysis of food and identifying conditions affecting quality and safety.</p> <p>Capable of evaluating the hygienic status of food premises, personnel, and processes</p>	<p>Understanding of analysis of a range of fresh and processed foods, especially of animal origin</p> <p>Understanding of analysis related to milking hygiene, milk, and dairy foods</p>
8. Official controls of food*	<p>Capable of interpreting information and results of laboratory analysis including evidences indicating possible fraud (e.g., labeling) and making related decisions</p> <p>Capable of observing possible non-compliances in food production and making related decisions</p> <p>Capable of applying relevant legislation to support and justify those decisions</p>	<p>Understanding the process of making food hygiene and safety-related decisions based on relevant legislation</p> <p>Understanding the role and the objectives of veterinary decisions at national and international level</p> <p>Understanding the role of international organizations in food law and food standards and risk analysis</p>

FH/VPH = food hygiene/veterinary public health

* The content standards related to this content area address bullet points a and b of the "Professional Qualifications" in Regulation (EC) No 854/2004 (see Appendix 1).

Table 5: Outline draft for the following content area: Risk-based approach to ensuring food safety and quality (to cover 20% of the total time available for the FH/VPH curriculum)

Content area	Learning objectives (Day One skills)	Content standard (major elements to be covered)
9. Risk-based approach to ensuring food safety and quality*	<p>Capable of designing and implementing a risk based food management system at various points of the food chain based on GFP/GMP/GHP and HACCP principles</p>	<p>Understanding of the food safety and quality risks and inspecting, auditing, and enforcing compliance with food safety and quality requirements</p> <p>Understanding and applying a risk analysis approach according to CAC principles</p> <p>Understand principles of the food safety and quality risk management systems based on GFP/GMP/GHP and HACCP principles and their assessment.</p> <p>Monitoring and control of zoonoses and food-borne infections/intoxications in all stages of the food chain including feed</p>

FH/VPH = food hygiene/veterinary public health; GFP = Good Farming Practice; GMP = Good Manufacturing Practice; GHP = Good Hygiene Practice; HACCP = Hazard Analysis Critical Control Point; CAC = Codex Alimentarius Commission

* The content standards related to this content area address bullet points d, e, f, g, h, and u of the "Professional Qualifications" in Regulation (EC) No 854/2004 (see Appendix 1).

The WG recognized that in some European countries there appears to be insufficient practical training in food microbiology. As their scope and methodology fundamentally differ, general veterinary microbiology cannot substitute for food microbiology, and the latter should preferably be taught by a specialized food microbiologist.

Finally, in accordance with further developments in the FH/VPH area (see Evolution of the Traditional Approach to Meat Inspection, above), the guidance document should be periodically updated when necessary.

CONCLUDING REMARKS

For the veterinary profession in Europe to maintain its reputation of significantly contributing to public health assurance it is essential that the establishments for veterinary education critically review their curricula in accordance with current societal demands. This inevitably includes upgrading the position of this important curricular element and ensuring that a minimum European standard along the lines described in this article is achieved at each faculty so as to guarantee that new graduates possess the starting competence to engage in a FH/VPH career in any European country.

Furthermore, in view of the legally established liberty of the free movement of veterinary professionals across the EU, it is important for the reputation of our profession that the European legislator make additional legal arrangements to ensure that only graduates from those establishments of veterinary education whose curricula verifiably adhere to clearly defined minimum requirements are recognized within the EU as being competent in various subjects and disciplines such as FH/VPH.

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REFERENCES

- 1 Smulders FJM. Veterinary public health and food science in Europe: the current status on university education, continuing professional development and specialisation. In: Smulders FJM, editor. *Veterinary aspects of meat production, processing and inspection: an update of recent developments in Europe*. Utrecht, the Netherlands: ECCEAMST; 1999. p. 387–402.
- 2 European Union. Consolidated version of the Treaty on the Functioning of the European Union. 2008 [cited 2012 Mar 1]. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:en:PDF>.
- 3 European Directive 2005/36/EC of the European Parliament and the Council of 7 September 2005 on the recognition of professional qualifications. Official J of EU [Internet]. 2005;30(9):L 255/27, L255/44 L255/120 [cited 2011 Sep 6]. Available from: <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:255:0022:0142:EN:PDF>.
- 4 Korkeala H, Lindström M, Fredriksson-Ahomaa M. Food hygienic research and education in veterinary schools: the presence and the future. *Arch Lebensmittelhyg*. 2003;54(5-6):146–50.
- 5 Maijala R, Korkeala H. Reviewing the undergraduate veterinary curriculum in Finland for control tasks in veterinary public health. *J Vet Med Educ*. 2008;35(2):241–54. <http://dx.doi.org/10.3138/jvme.35.2.241>. Medline:18723811
- 6 Večerek V. Two differentiated programs of veterinary medical education at the university of veterinary and pharmaceutical sciences in the Czech Republic. *J Vet Med Educ*. 2006;33(2):197–205. <http://dx.doi.org/10.3138/jvme.33.2.197>. Medline:16849296
- 7 European Association of Establishments for Veterinary Education (EAEVE). About EAEVE; History and aims [Internet]. Vienna: EAEVE; 2012 [cited 2011 Sep 6]. Available from: www.eaeve.org.
- 8 European College of Veterinary Public Health (ECVPH). About ECVPH [Internet]. ECVPH; 2011 [cited 2011 Sep 6]. Available from: www.ecvph.org.

- 9 Schwabe CW. *Veterinary medicine and human health*. 2nd ed. Baltimore: Williams & Wilkins; 1969.
- 10 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. Chapter IV, Professional qualifications. Official J of EU. 2004;25(6):L155/206.
- 11 Koolmees PA. *Symbols of public hygiene*. Rotterdam: Erasmus; 1997. Dutch, with a summary in English.
- 12 Rahkio M, Uutela A, Korkeala H. Motivation and characterization of Finnish meat inspection veterinarians. *Acta Vet Scand*. 1995;36(4):563–70. Medline:8669383
- 13 Lundén J, Björkroth J, Korkeala H. Meat inspection education in Finnish veterinary curriculum. *J Vet Med Educ*. 2007;34(2):205–11. <http://dx.doi.org/10.3138/jvme.34.2.205>. Medline:17446650
- 14 World Organisation for Animal Health (OIE). Evolving veterinary education for a safer world recommendation [Internet]. Paris; 2009 Oct [cited 2011 Sep 6]. Available from: <http://www.oie.int/doc/ged/D6709.PDF>.
- 15 European Association of Establishments for Veterinary Education (EAEVE). Guidelines, requirements and main indicators for stage one (Ia) and stage two (Ib) [Internet]. Hanover; 2009 May [cited 2011 Sep 6]. Available from: http://www.eaeve.org/fileadmin/downloads/sop/SOP_ANNEX1to2_Hanover09.pdf.
- 16 World Organisation for Animal Health (OIE). Evolving veterinary education for a safer world [Internet]. Paris; 2011 Oct 12–14 [cited 2011 Sep 6]. Available from: http://www.oie.int/vademecum/eng/PDF_WORD_Vademecum/SERVICES_VETERINAIRES_FINAL/Slide%2010/EN/Recommandations_EN.pdf.
- 17 World Organisation for Animal Health (OIE). Report of the meeting of the *ad hoc* group on veterinary education [Internet]. Paris; 2010 Dec 15–17 [cited 2011 Sep 6]. Available from: http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/docs/pdf/Annex37_Vet_education_AHG_Dec2010.pdf.
- 18 Smulders FJM. Towards harmonisation of the European veterinary food hygiene/veterinary public health curriculum. 2011 [cited 2011 Sep 6]. Available from: <http://www.eaeve.org/publications.html>.

AUTHOR INFORMATION

Frans J.M. Smulders, DVM, PhD, Dr. h.c., Dipl. ECVPH, is Professor of Meat Hygiene, Meat Technology, and Food Science, Department of Farm Animals and Veterinary Public Health, University of Veterinary Medicine, Veterinärplatz 1, A 1210 Vienna, Austria. E-mail: frans.smulders@vetmeduni.ac.at. He is former President of ECVPH (2000–2003) and member of the Scientific Committee of the European Food Safety Authority (EFSA). His institute's research activities concentrate on safety and quality assurance of meat and

meat products. He has published over 200 peer-reviewed scientific publications in the international literature.

Sava Buncic, DVM, MScVM, PhD, Dipl. ECVPH, is Professor of Meat Hygiene and Safety, Department of Veterinary Medicine, Faculty of Agriculture, University of Novi Sad, Trg D, Obradovica 8, 21000 Novi Sad, Serbia. E-mail: buncic_sava@hotmail.com. He is former Chair of the Education Committee of the European College of Veterinary Public Health (ECVPH) and member of the BIOHAZ Expert Panel of the European Food Safety Authority (EFSA). His research group's focus is on food (especially meat) hygiene and safety and related bacterial pathogens. He has published 110 peer-reviewed scientific publications.

Karsten Fehlhäber, DVM, Dr. habil., Dr. h.c., Dipl. ECVPH, is Professor of Food Hygiene and Consumer Protection and Director of the Institute of Food Hygiene, Institute of Food Hygiene, Faculty of Veterinary Medicine, University of Leipzig, An den Tierkliniken 1, D 04103 Leipzig, Germany. E-mail: fehlahaber@vetmed.uni-leipzig.de. He has published 126 scientific papers in peer-reviewed journals and edited for/contributed to 18 textbooks.

Robert J. Huey, TD, MVB, DVPH (MH), MRCVS is Vice-President of FVE, Federation of Veterinarians of Europe, Rue Defacqz 1, BE-1000, Brussels, Belgium. E-mail: robert.huey@dardni.gov.uk. He is past-President of both the Union of European Veterinary Hygienists (UEVH) and the UK's Veterinary Public Health Association. He is currently Deputy-Chief Veterinary Officer for Northern Ireland (responsible for implementation of Official Controls in VPH, epizootic disease control, trade, and food animal identification). He is co-author of the textbook Meat Hygiene.

APPENDIX: REGULATION (EC) NO 854/2004 (EC, 2004), 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 arrangements 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 community legislation on veterinary public health, food safety, animal health, animal 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 food technology;
- d) principles, concepts and methods of Good Manufacturing Practice and quality management;
- e) pre-harvest quality management (Good Farming Practices);

Hannu Korkeala, DVM, PhD, Ms Soc Sci, Dipl. ECVPH, is Professor of Food Hygiene at the Centre of Excellence in Microbial Food Safety Research of the Academy of Finland at the Faculty of Veterinary Medicine, University of Helsinki, P.O. Box 66, 00014 Helsinki University, Finland. E-mail: hannu.korkeala@helsinki.fi. He leads a research group focusing on the diagnostics, epidemiology, and genomics of psychrotrophic and spore-forming food borne bacteria. He has published 220 scientific papers in peer-reviewed journals.

Miguel Prieto, DVM, PhD, Dipl. ECVPH is Professor of Food Safety and Microbiology, Institute of Food Science and Technology, Department of Food Hygiene and Technology Faculty of Veterinary Medicine, University of León, E-24071 León, Spain. E-mail: miguel.prieto@unileon.es. He is Senior Researcher at the above institute. He is a member of the BIOHAZ Expert Panel of the European Food Safety Authority (EFSA). He has published more than 50 scientific publications in peer-reviewed journals.

Iva Steinhäuserová, DVM, CSc, Dipl. ECVPH, is Professor and Head of the Institute of Meat Hygiene and Technology, Department of Meat Hygiene and Technology, Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences Brno, Palackého 1–3, 612 42, Brno, Czech Republic. E-mail: steinhäuserovai@vfu.cz. She is Vice-Rector for Education of the Faculty of Veterinary Hygiene and Ecology. She leads a research group focusing on the diagnostics, typing, and epidemiology of selected food borne bacteria. She has published 40 scientific papers in peer-reviewed journals.

- f) promotion and use of food hygiene, 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 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 application of biostatistics;
- q) investigations 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, and
- v) principles of training of personnel working in the production chain.

Candidates may acquire the required knowledge as part of their basic veterinary training, or through training undertaken, or professional experience required, after qualifying as veterinarians. The competent authority may arrange for different tests to take account of candidates' background. However, when the competent authority is satisfied that the candidate has acquired all the required knowledge as part of a university degree, or through continuing education resulting in a postgraduate qualification, it may waive the requirement for a test.

- § 3. The veterinarian is to have aptitude for multi-disciplinary cooperation.
- § 4. In addition, each official veterinarian is 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 in slaughterhouses, cutting plants, inspection posts for fresh meat and on holdings. The training is to concern the auditing of food safety management systems in particular.

- § 5. The official veterinarian is to maintain up-to-date knowledge and to keep abreast of new developments through regular continuing education activities and professional literature. The official veterinarian is, wherever possible, to undertake annual continuing education activities.
- § 6. Veterinarians already appointed as official veterinarians must have adequate knowledge of the subjects mentioned in paragraph 2. Where necessary, they are to acquire this knowledge through continuing education activities. The competent authority is to make adequate provision in this regard.
- § 7. Notwithstanding paragraphs 1 to 6, Member States may lay down specific rules for official veterinarians working on a part-time basis who are responsible for inspecting small businesses.

WTO = World Trade Organisation; SPS = Sanitary and Phytosanitary Agreement (issued by WTO); OIE = World Organisation for Animal Health (Office International des Épizooties)