



European College of Veterinary Public Health

LIST OF RESOURCES FOR RESIDENTS

(as of July 2022)

This list of resources is a general guideline to help residents with their study during the residency and to prepare for the qualifying examination. It is not an exhaustive list of references and residents are required to keep up-to-date and reflect on the latest scientific and legal developments in the field.

During their study, residents are advised to focus on “the big picture” and interlink knowledge in a One Health and European context. It is also advised that, when studying the principles behind the European legislation, to read the preamble to the Regulations.

Suggested reading list and source of information:

- Palmer R. “Oxford Textbook of Zoonoses: Biology, Clinical Practice, and Public Health Control” (Second Edition). New York: Oxford UP, 2011.
- Shakespeare M. “Zoonoses”. Second edition London. Pharmaceutical Press, 2009.

- Dikeman M. and Devine C. “Encyclopedia of Meat Sciences” (Second Edition). Elsevier, 2014.
- Dewulf J. and Van Immerseel F. “Biosecurity in animal production & veterinary medicine. From principles to practice”. CABI, 2019.
- Kirkwood B. and Sterne J. “Essential medical statistics” (Second Edition). Wiley-Blackwell, 2003.
- Dohoo I., Martin W., Stryhn H. “Veterinary Epidemiologic Research” (Second Edition). VER Inc., 2009.
- Pfeiffer D. “Veterinary Epidemiology: An Introduction” (First Edition). Wiley-Blackwell, 2009.
- Jay J., Loessner M., Golden D. “Modern Food Microbiology” (Seventh Edition). Springer, 2005.
- Thrusfield M and Christley R. “Veterinary Epidemiology” (Fourth Edition). Wiley-Blackwell, 2018.
- Adams M., Moss M., McClure P. “Food Microbiology” (Fourth Edition). Royal Society of Chemistry, 2016.
- Petrie A. and Watson P. “Statistics for veterinary and animal science” (Third Edition). Chichester, West Sussex: Wiley-Blackwell, 2013.
- Ninios T. et al. “Meat Inspection and Control in the Slaughterhouse” (First Edition). Wiley-Blackwell, 2017.
- Rushton J. “The economics of animal health and production”. Wallingford, UK: CABI, 2009.
- Hoffmann S. and Scallan E. “Chapter 2: Epidemiology, Cost, and Risk Analysis of Foodborne Disease”. Foodborne Diseases (Third Edition). Academic Press, 2017.
- Cormick G. “The Science of Communicating Science. The Ultimate Guide”. CABI, 2019.
- Gastel B. and Day A. “How to write and publish a scientific paper” (Eight Edition). Greenwood Publishing Group, 2011.
- Rahman M. “Handbook of Food Preservation” (Second Edition). CRC Press, 2007.
- OIE. Terrestrial Animal Health Code (2021). Sections 1 to 7. <https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/>
- OIE. Aquatic Animal Health Code (2021). Sections 1 to 7. <https://www.oie.int/en/what-we-do/standards/codes-and-manuals/aquatic-code-online-access/>

- WTO Agreements Series Sanitary and Phytosanitary Measures.
https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm
- All relevant EFSA topics can be searched at:
 - <https://www.efsa.europa.eu/en/topics>
 - https://ec.europa.eu/food/safety_en
 - https://ec.europa.eu/food/safety/biological-safety/food-borne-diseases-zoonoses_en
 - https://ec.europa.eu/health/antimicrobial-resistance/eu-action-on-antimicrobial-resistance_en
- Relevant European legislation can be searched at <https://eur-lex.europa.eu/homepage.html>
- Topics related to the European Centre for Disease Prevention and Control (ECDC) can be searched at:
<https://www.ecdc.europa.eu/en>

Part 1 (Core) – Cluster A Foundation of VPH (20 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
A 1	Foodborne and non-foodborne zoonoses	Introductory aetiology; Infectious and non-infectious zoonotic diseases; Occurrence and transmission; Diagnostics and control; Prevention; Basics of biosecurity in primary production; Interrelation of pathogens; Hosts and environment (including climate); Endemic and epidemic infections with zoonotic potential; Role of animals in the transmission and epidemiological aspects of zoonotic pathogens.	4	<p>EFSA homepages on biological hazards https://www.efsa.europa.eu/en/topics/topic/biological-hazards and animal health https://www.efsa.europa.eu/en/topics/topic/animal-health</p> <p>ECDC homepage on zoonoses and related diseases (the later gives a good overview of non-food borne zoonoses) https://www.ecdc.europa.eu/en/zoonoses</p> <p>Palmer, Stephen R. Oxford Textbook of Zoonoses: Biology, Clinical Practice, and Public Health Control. Second ed. New York: Oxford UP, 2011. Print. Oxford Textbooks in Public Health</p> <p>Shakespeare, Martin. Zoonoses. Second ed. London: Pharmaceutical, 2009</p> <p>The last 5 years of the European Union One Health Zoonoses Reports available on the EFSA website</p> <p>The last 5 years of the European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks published on the EFSA website</p> <p>Destro, and Ribeiro, Mt, Vb. Chapter "Foodborne Zoonoses." (2014). Encyclopaedia of Meat Sciences (Second Edition)</p> <p>Edited by Jeroen Dewulf & Filip Van Immerseel. Biosecurity in animal production & veterinary medicine. From principles to practice. CABI, 2019</p> <p>OIE and WHO disease factsheets (found on respective websites)</p> <p>Modern Food Microbiology (2005) Chapter 22 Introduction to Foodborne Pathogens</p>
A 2	Animal welfare	Animal production systems related to VPH; Optimisation of animal welfare during production, transport	3	<p>Animal welfare legislation of livestock at the farm, during transport and at slaughter can be found at https://eur-lex.europa.eu/homepage.html</p>

		<p>and slaughter; Welfare assessment of herds; Welfare aspects in relation to production systems; Welfare of companion animals; Welfare aspects in animal breeding.</p>	<p>DG Sante homepage on animal welfare - https://ec.europa.eu/food/animals/animal-welfare_en and on the EFSA homepage on Animal welfare https://www.efsa.europa.eu/en/topics/topic/animal-welfare</p> <p>EFSA Scientific Opinion concerning a Multifactorial approach on the use of animal and non-animal-based measures to assess the welfare of pigs (2013) http://www.efsa.europa.eu/en/efsajournal/pub/3702</p> <p>EFSA Scientific Opinion on the use of animal-based measures to assess welfare in pigs (2012) http://www.efsa.europa.eu/en/efsajournal/pub/2512</p> <p>EFSA Scientific Opinion Concerning the Welfare of Animals during Transport (2011) http://www.efsa.europa.eu/en/efsajournal/pub/1966</p> <p>EFSA Scientific Opinion: the risks of poor welfare in intensive calf farming systems (2006) http://www.efsa.europa.eu/en/efsajournal/pub/366</p> <p>EFSA Scientific Opinion on the welfare of cattle kept for beef production and the welfare in intensive calf farming systems (2012) http://www.efsa.europa.eu/en/efsajournal/pub/2669</p> <p>EFSA Scientific Opinion on the use of animal-based measures to assess welfare of dairy cows (2012). https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2012.2554</p> <p>Report on the application of Directive 2007/43/EC and its influence on the welfare of chickens kept for meat production, as well as the development of welfare indicators. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0181</p> <p>Report on the impact of genetic selection on the welfare of chickens kept for meat production. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016DC0182</p> <p>EFSA Opinion (2005): The welfare aspects of various systems of keeping laying hens. https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2005.197 FVE Position Paper on Moving towards more animal welfare friendly systems for laying hens</p> <p>Companion Animals: WSAVA Animal Welfare Guidelines for companion animal practitioners and veterinary teams:</p>
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				<p>https://wsava.org/wp-content/uploads/2019/12/WSAVA-Animal-Welfare-Guidelines-2018.pdf. Includes a useful toolkit on pg 75-76 with additional resources</p> <ul style="list-style-type: none"> - WelfareQuality project (www.welfarequality.net) <p>FVE Position Paper on dangerous dogs</p>
A 3	Population Medicine [P]	<p>Concept of Population; Principles of sampling; Causation vs association; Measures of disease frequency (incidence, prevalence); Risk factors and confounding factors; Statistical significance vs biological significance; Measures of association; 2X2 table analysis; Transmission models such as SIR; Diagnostic validation; Observational study design.</p>	6	<p>Thrusfield M. (2005) Ch 2, Ch 13, Ch 14 Association; Ch 12 Presenting numerical data; Ch 14 Demonstrating association; Ch 15 Observational studies; Ch 17 Diagnostic testing; Ch 15 Observational studies.</p> <p>Kirkwood and Sterne (2003) Medical statistics (second edition) The 2X2 Table and measures of exposure effect (8); Ch. 17 Chi-squared tests for 2X2 and larger contingency tables.</p> <p>Dohoo, Martin, Stryhn. Veterinary Epidemiologic Research. 2nd Edition.</p> <p>Veterinary Epidemiology: An Introduction 1st Edition by Dirk Pfeiffer. ISBN-13: 978-1405176941 ISBN-10: 1405176946</p>
A 4	Food Science [P]	<p>Food Chain; Food Safety aspects of animal feeding; Food production systems; Food technology in relation to public health; Food microbiology; Food preservation; Food matrix; Biological and chemical hazards; Carry-over.</p>	4	<p>Dikeman & Devine, <i>Encyclopedia of Meat Sciences</i> (Second Edition), 2014, C. Reinhardt, B. Faris, Nutrition of meat animals, Ruminants, Editor(s).</p> <p>D. L. VanOverbeke, J. K. Ahola Quality management Farm Level: Safety and Quality of Beef Encyclopaedia of Meat Sciences (Second Edition) 2014.</p> <p>Guides to good practice in feed production (community/ country/ EU level): https://ec.europa.eu/food/safety/animal-feed/feed-hygiene/guides-good-practice_en</p> <p>Jay, James, M. Loessner, and Golden. <i>Modern Food Microbiology.</i> (2005) Section - Food Protection and Some Properties of Psychrotrophs, Thermophiles, and Radiation-Resistant Bacteria.</p>

				<p>Jay, James, M. Loessner, and Martin Golden. Modern Food Microbiology. Boston, MA: Springer US,(2005) Section 'Habitats, Taxonomy, and Growth Parameters'.</p> <p>H.W. Ockerman, L. Basu, PRESERVATION METHODS OF ANIMAL PRODUCTS, Encyclopaedia of Meat Sciences (Second Edition), 2014.</p>
A5	Food Safety and Control [P]	<p>Principles of food safety legislation on international and EU level;</p> <p>Responsibility of food business and competent authorities;</p> <p>Self-control and Food Safety Management System;</p> <p>Food Inspection;</p> <p>Alternative approaches;</p> <p>Hurdle systems.</p>	2	<p>White Paper on food safety. https://op.europa.eu/en/publication-detail/-/publication/6d4b523b-dad8-4449-b2b4-9fa9b0d6e2be</p> <p>The general principles of Food law. Green paper by European Commission. Access: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:1997:0176:FIN:EN:PDF</p> <p>Principles of Food Safety. European Commission: https://ec.europa.eu/food/sites/food/files/safety/docs/gfl_white-paper_food-safety_2000_en.pdf</p> <p>General Food Law 178/2002. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32002R0178</p> <p>Reg. (EC) 2017/625 repeals Reg. 882/2004 & 854/2004 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0625</p> <p>Reg (EC) 852/2004 on the hygiene of foodstuffs. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02004R0852-20090420</p> <p>Reg (EC) 853/2004 on hygiene rules for foods from animal origin. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:139:0055:0205:EN:PDF</p> <p>Reg (EC) 2015/1375 laying down specific rules on official controls for Trichinella in meat. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R1375</p> <p>Reg (EC) 1169/2011 on the provision of food information to consumers. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32011R1169</p>
A6	Non-infectious hazards in food [P]	<p>Chemical residuals and contaminants in the environment-feed-food chain;</p>	1	<p>EFSA homepage - https://www.efsa.europa.eu/en/topics/topic/chemicals-food</p> <p>Reports on the results from the monitoring of veterinary medicinal product residues and other substances in live animals and animal products; EFSA Supporting Publications.</p>

		Biotoxins.	<p>Reg (EU) No 37/2010: Max. limits for residues of vet. medicinal products in food-producing animals and animal products: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:015:0001:0072:EN:PDF</p> <p>Reg (EC) No 396/2005:Max. residue levels for pesticides in or on food and feed of plant/animal origin https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32005R0396</p> <p>Reg (EC) No 470/2009: veterinary medicinal products https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32009R0470</p> <p>Reg (EC) No 1881/2006: Max. limits for presence of certain contaminants in animal products https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:364:0005:0024:EN:PDF</p> <p>Jay, James, M. Loessner, and Golden. Modern Food Microbiology.(2005) Chapter Mycotoxins</p> <p>Dikeman & Devine, <i>Encyclopedia of Meat Sciences</i> (Second Edition), 2014. Chapter Environmental contaminants</p> <p>Thompson LA, Darwish WS. (2019) Environmental Chemical Contaminants in Food: Review of a Global Problem. J Toxicol.. . doi:10.1155/2019/2345283</p> <p>Adams, Moss, McClure. Food Microbiology. 4th Edition</p> <p>CX/MRL 2-2018, maximum residue limits and risk management recommendations for residues of veterinary drugs in foods. https://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?Ink=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCXM%2B2%252FMRL2e.pdf</p>
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Part 1 (Core) – Cluster B Evidence-based principles (24 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
B1	Biostatistics [P]	Experimental study design; Sampling; types of data (discrete, ordinal, continuous); Choice of appropriate statistical tests; Estimation of population parameters; Confidence intervals; Principles of regression analysis.	10	Petrie, A., & Watson, P. (2013). Statistics for veterinary and animal science (Third ed.). Chichester, West Sussex: Wiley-Blackwell. Ch 6 to11. Dohoo, Martin, Stryhn. Veterinary Epidemiologic Research. 2 nd Edition.
B2	Information systems [P]	Database development and management; Scientific literature data bases; Early warning systems (Promed, RASFF); Information management.	2	Promed, TRACES, WAHID, RASFF, EWRS, EPIS, ADIS ComBase, geographic information system (GIS) Scientific literature databases (Pubmed, EMBASE, Scopus, NHS-EED, CAB)
B3	Systematic review [P]	Systematic review methodology; Question framing, search frame, inclusion and exclusion criteria; Publication bias; Quality assessment; Data collection; Evidence synthesis; Quantitative summaries (principles of meta analysis);	7	PRISMA guidelines (http://prisma-statement.org/) Application of systematic review methodology to food and feed safety assessments to support decision making, 2010. EFSA Journal 2010; 8(6):1637. EFSA Journal 2010; 8(6):1637. Frontiers Scoping Reviews, Systematic Reviews, and Meta-Analysis: Applications in Veterinary Medicine Veterinary Science (frontiersin.org)

		EFSA guidance document on systematic review.		
B4	Scientific communication and leadership [P]	Scientific writing; Scientific communication; Presentation techniques; Project management; Basic skills in rhetoric negotiation; Management of interpersonal conflicts.	5	<p>Cormick, The Science of Communicating Science. The Ultimate Guide. CABI, 2019.</p> <p>Gastel, B & Day, R.A. How to write and publish a scientific paper. 8th Ed. Greenwood Publishing Group.</p> <p>Risk Communication guidelines by EFSA. A joint initiative of the European Food Safety Authority and national food safety organisations in Europe. Available at https://www.efsa.europa.eu/sites/default/files/corporate_publications/files/riskcommguidelines170524.pdf</p> <p>WHO and FAO, 2016. Risk Communication Applied To Food Safety Handbook [ISBN 978 92 4 154944 8 (WHO); ISBN 978-92-5-109313-9 (FAO); ISSN 2415-1173]</p>

Part 1 (Core) – Cluster C Implementation of VPH (16 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
C1	Ethics in VPH	Ethics in science; Specific ethical issues in VPH; Good scientific practice; Conflict of interest; Professional ethics; Ethics in decision making and veterinary practice; Role of VPH specialist in society.	2	<p>Helpful overview can found at FVE homepage on ethics guidelines https://fve.org/?s=Ethics and the https://fve.org/european-code-of-conduct-2019/</p> <p>Animal Ethics Dilemma (http://www.aedilemma.net/) explaining different approaches to ethical questions (contractarian, utilitarian, relational, animal rights, respect for nature); 3Rs (for details see e.g. webpage of the European Commission)</p>
C2	Science based policy making [P]	Concepts and role of VPH in one health; Eco-health; Role of and output from international organisations in the area	3	<p>Browsing websites of international organizations (e.g. FAO, WHO, WTO, etc.) to understand their origin, raison d'être, and current activities</p> <p>FAO technical paper on evidence informed food safety policies and risk management decisions (2013) http://www.fao.org/3/i3944e/i3944e.pdf</p>

		<p>of food safety; Food security; Animal health; Zoonoses (e.g. WTO, SPS-agreement, WHO, FAO, OIE, Codex Alimentarius, JECFA); Precautionary principle; Concepts & philosophy of EU legislation; Independent scientific assessment (e.g. EFSA and its panels); Interoperability and interdisciplinary cooperation; Responsibility of the private sector; Good practices in all stages of production and supply chains.</p>		<p>Food Safety Policy, Science, and Risk Assessment: Strengthening the Connection Workshop Proceedings (2001) Institute of Medicine (US) Food Forum. https://www.ncbi.nlm.nih.gov/books/NBK223240/</p> <p>EU White paper on Food Safety (2000) and General Food Law Reg (EC) 178/2002</p> <p>WTO, The WTO Agreements Series Sanitary and Phytosanitary Measures. ISBN 978-92-870-3803-6; ISSN 1020-4768. Also at: https://www.wto.org/english/res_e/booksp_e/agrmtseries4_sps_e.pdf</p> <p>CAC/GL 53-2003. Guidelines on the judgement of equivalence of sanitary measures associated with food inspection and certification systems</p> <p>FAO (2020). Climate change: unpacking the burden on food safety. (Chapter 1, Section III: Interlinkages between food security and food safety)</p> <p>Food Safety in the European Union and Member States: principles, organization, and structure. “EU Food Safety Almanac in english language (2021)” ISBN: 978-3-948484-21-7; ISSN: 2363-6572. Also available online at https://www.bfr.bund.de/en/publication/eu_almanac-192693.html</p> <p>WVA Position on the Global Climate Change Emergency</p> <p>WVA Position of Food Security and Nutrition</p>
C3	Applied economics [P]	<p>General concepts for assessing costs and benefit of interventions related to VPH along the food chain; Micro vs. macro-economy; Disease burden measures (YLL, DALY, QUALY).</p>	3	<p>Rushton J. The economics of animal health and production. Wallingford, UK: CABI Publishing; 2009. pp. 364</p> <p>S. Hoffmann, E. Scallan, <i>Foodborne diseases</i> (2017) Chapter 2 - Epidemiology, Cost, and Risk Analysis of Foodborne Disease.</p> <p>Dikeman M, Devine C, <i>Encyclopedia of Meat Sciences</i> (Second Edition), Academic Press, 2014, N.C. Speer, Economics Meat Business and Public Policy.</p>
C4	Risk analysis	<p>Principles and concepts of risk analysis; International regulations (WTO, SPS);</p>	3	<p>EFSA reports on microbial risk assessments (2016) https://www.efsa.europa.eu/en/efsajournal/pub/s0507 and risk assessment terminology https://www.efsa.europa.eu/en/efsajournal/pub/2664</p>

		Technical standards (Codex, OIE); Risk assessment approaches; Management; Communication.		<p>OIE Handbook on Import Risk Analysis for animals and animal products. Vol. 1</p> <p>FAO, 2007. Food safety risk analysis A guide for national food safety authorities. ISBN 978-92-5-105604-2. Also available at: http://www.fao.org/3/a0822e/a0822e.pdf</p> <p>CAC/GL 30-1999 (Adopted 1999. Amendments 2012, 2014). Principles and guidelines for the conduct of microbiological risk assessment</p> <p>CAC/GL 77 - 2011, Guidelines for risk analysis of foodborne antimicrobial resistance</p> <p>CXG 92-2019, Guidelines for rapid risk analysis following instances of detection of contaminants in food where there is no regulatory level</p> <p>CAC/GL 44-2003 (Adopted in 2003. Amendments 2008, 2011), Principles for the risk analysis of foods derived from modern biotechnology</p> <p>CAC/GL 62-2007, Working principles for risk analysis for food safety for application by governments</p> <p>CAC/GL 80-2013, Guidelines on the application of risk assessment for feed</p>
C5	Applied social sciences [P]	Understanding stakeholders and consumer behaviour; Communication with media, stakeholders, target-oriented communication (risk managers, media, the public, stakeholders); Risk perception; Dealing with expert opinion.	2	<p>Cormick, The Science of Communicating Science. The Ultimate Guide. CABI, 2019.</p> <p>Frontiers Qualitative Research for One Health: From Methodological Principles to Impactful Applications Veterinary Science (frontiersin.org)</p> <p>Frontiers Participatory Epidemiology: Principles, Practice, Utility, and Lessons Learnt Veterinary Science (frontiersin.org)</p>
C6	Surveillance and monitoring	Principles (e.g. active and passive approaches) and applications	3	<p>FAO. 2014. Risk-based disease surveillance – A manual for veterinarians on the design and analysis of surveillance for demonstration of freedom from disease. FAO Animal Production and Health Manual No. 17. Rome, Italy.</p>

		(freedom from disease, early detection, rapid alert); Risk-based approaches.		<p>OIE Terrestrial Code chapter 1.4: https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_surveillance_general.htm</p> <p>OIE Terrestrial Code chapter 1.5: https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/</p> <p>OIE Aquatic Code chapter 1.4: https://www.oie.int/en/what-we-do/standards/codes-and-manuals/aquatic-code-online-access/?id=169&L=1&htmfile=chapitre_aqua_ani_surveillance.htm</p>
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Part 2 (Food Science) – Cluster A Food hygiene, foodborne and waterborne hazards (14 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
A1	Biological hazards in the food safety context	Aetiology; Epidemiology; Prevention and control of foodborne diseases.	5	<p>Adams, Moss, McClure. Food Microbiology. 4th Ed. Published by the Royal Society of Chemistry.</p> <p>Food and Drug Administration. Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins. Second Edition, 2012.</p>
A2	Detection of microorganisms in the food chain [P]	Examination, diagnostics and monitoring of microbial contamination of food of animal origin or related to animals; Bacterial, viral and parasitic aetiology; Sampling, testing and VPH relevance of contamination in water systems and plants; Classical food microbiology; Relevance of and systems for typing methods; Microbial ecology of foodborne pathogens	3	<p>Adams, Moss, McClure. Food Microbiology. 4th Ed. Published by the Royal Society of Chemistry</p> <p>Regulation EC on microbiological criteria for foodstuffs No 2073/2005</p> <p>Whole genome sequencing: Brown et al., https://doi.org/10.1089/fpd.2019.2662 Collineau et al., https://doi.org/10.3389/fmicb.2019.01107 Ronholm et al., https://doi.org/10.1128/CMR.00056-16</p> <p>MALDI-TOF MS Pavlovic et al., 10.2174/1874285801307010135 - FT-IR spectroscopy</p> <p>Valand et al., https://doi.org/10.1080/19440049.2019.1675909</p> <p>Perez-Rodriguez and Valero. Predictive Microbiology in Foods. ISBN 978-1-4614-5520-2</p>

		and spoilage microorganisms.		
A3	Chemical hazards in the food context	Residues of veterinary medicinal products; Residues of pesticides Dioxins, PCBs, PAHs, radionuclides, mycotoxins, shellfish biotoxins; Toxicological aspects (e.g. ADI ArfD); Human health effects; Mechanisms of action, prevention and control; EU and Codex legislation (e.g. MRLs); Pre- and post-harvest food safety.	4	Adams, Moss, McClure. Food Microbiology. 4 th Ed. Published by the Royal Society of Chemistry. Brimer, L. Chemical food safety (2011). ISBN 9781845936761. DOI 10.1079/9781845936761.0000 Food and Drug Administration. Bad Bug Book, Foodborne Pathogenic Microorganisms and Natural Toxins. Second Edition, 2012. FAO (2020). Climate change: unpacking the burden on food safety. (CHAPTERS 2.B, 2.C, 2.D, 2.E, 2.F)
A4	Antimicrobial resistance	Occurrence; Sources/ attribution; Diagnostics; Impact; Transmission; Epidemiological aspects.	2	José-Luis Capelo-Martínez, Gilberto Igrejas. Antibiotic Drug Resistance. Print ISBN:9781119282525, Online ISBN:9781119282549, DOI:10.1002/9781119282549. 2020 John Wiley & Sons, Inc. FAO (2020). Climate change: unpacking the burden on food safety. (CHAPTER 2.A, Section IV: Antimicrobial resistance) FVE position on selective dry cow treatment in dairy cows EPRUMA Best-practice framework for the use of antibiotics in food-producing animals in the EU WVA Policy on responsible use of antimicrobials Global repository of available guidelines for responsible use of antimicrobials in animal health

Part 2 (Food Science) – Cluster B Food control, surveillance and risk analysis (14 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
B1	Hygiene and sanitation in the food chain	Management of hygiene and sanitation in the food chain; Personal hygiene; Cleaning/disinfection; Pest control; GHP, CIP, HACCP; All prerequisites for establishing an effective HACCP.	3	Handbook of hygiene control in the food industry, Edited by H. L. M. Lelieveld, M. A. Mostert and J. Holah, Woodhead Publishing Limited, ISBN-13: 978-1-85573-957-4, 978-1-84569-053-3, ISBN-10: 1-85573-957-7, 1-84569-053-2. CAC/RCP 1-1969, Rev.4- 2003. Recommended international code of practice general principles of food hygiene.
B2	Food safety risk analysis [P]	Codex risk analysis principles and terminology; Microbiological predictive modelling; ALOP principle, concept FSO, PC, Performance Objectives (PO).	3	ICMSF (2006). A simplified guide to understanding and using Food Safety Objectives and Performance Objectives. http://www.fao.org/3/a0822e/a0822e.pdf Food safety risk analysis – a guide to national authorities, FAO 2007
B3	International, EU and national food regulatory aspects	Basic food legislation related to food quality, food safety, food standards, consumer protection, animal welfare, environmental aspects; Interrelation EU/national legislation; Legal foundation of EFSA.	2	EU White paper on Food Safety (2000) and General Food Law Reg (EC) 178/2002 Food Hygiene EU legislation All relevant EFSA topics can be searched at https://www.efsa.europa.eu/en/topics All relevant European legislation can be searched at https://eur-lex.europa.eu/homepage.html
B4	Inspection of food of animal origin	Classical and alternative ante-mortem and post-mortem meat inspection;	3	Meat Inspection and Control in the Slaughterhouse by Thimjos Ninios et al. Wiley-Blackwell; 1st edition; ISBN-13: 978-1118525869; ISBN-10: 1118525868 All relevant EFSA topics can be searched at https://www.efsa.europa.eu/en/topics

		<p>Inspection of other products of animal origin (incl. meat products, milk and milk products, eggs and egg products, fish and shellfish);</p> <p>Inspection of conditions of public health relevance in the food chain including primary production;</p> <p>Responsibilities of the OV's;</p> <p>EFSA opinions on these subjects.</p>		<p>All relevant European legislation can be searched at https://eur-lex.europa.eu/homepage.html</p>
B5	Investigating and managing foodborne outbreaks	<p>Outbreak detection;</p> <p>Outbreak management (response teams);</p> <p>Backwards and forwards tracing;</p> <p>Identification of the vehicle and the source;</p> <p>Sampling strategies;</p> <p>Molecular epidemiology;</p> <p>Questionnaires;</p> <p>Role of epidemiology and food safety sector to identify the source and vehicle predict the epidemic and optimise control/intervention measures; Approaches for evaluation and intervention, crisis management and communication.</p>	3	<p>Foodborne disease outbreaks: guidelines for investigation and control. World Health Organization (2008). ISBN 9789241547222.</p> <p>Microbial source tracking: Allard, 2018 (https://doi.org/10.1016/j.copbio.2017.11.002)</p>

Part 2 (Food Science) – Cluster C Hygiene and technology of food production, processing and distribution (12 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
C1	Food quality control [P]	Good Practices for quality and safety management and control along the food chain (feed, pre-harvest, slaughter hygiene, postharvest); TQM, GMP, HACCP, relevant ISO Standards; Auditing; Meat quality attributes including biochemical and sensorial; Basic aspects of meat biochemistry; Factors affecting meat/milk/egg quality.	5	HACCP: A Practical Approach, 3rd edition. ISBN-13: 978-1461450276, ISBN-10: 9781461450276 The science of meat quality” edited by Chris R. Kerth, Wiley-Blackwell (with special attention to Chapters 5, 6, 7, 9, 11, 13, and 14) CAC/RCP 1-1969, Rev.4- 2003. Recommended international code of practice general principles of food hygiene.
C2	Food hygiene and technology [P]	Basics of food technology in view of food quality, hygiene and safety; Preservation techniques Packaging, modified atmosphere, curing, fermentation, heat treatment, irradiation; Antimicrobial treatment, cold preservation, curing, fermentation, high pressure, other emerging food preservation and sanitation methods;	7	Adams, Moss, McClure. Food Microbiology. 4 th Ed. Published by Royal Society of Chemistry. “Handbook of Food Preservation” edited by M. Shafiur Rahman, CRC Press (with special attention to Chapters 1, 9, 10, 13, 14, 23, 24, 26, 32, and 34). Remenant et al., 2015. Bacterial spoilers of food: behaviour, fitness and functional properties, Food Microbiology 45 (2015) 45-53

		Post-mortem biochemistry and factors affecting meat quality characteristics; Meat quality attributes including biochemical and sensorial.		
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Part 2 (Food Science) – Cluster D Trade, one health, eco-medicine and models (5 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
D1	Trade, food security and one health	Food safety aspects of international trade of animal feed and food; Animal health and food safety (FAO literature); Global food availability and food safety; Role of WHO, FAO, Codex Alimentarius.	2	The WTO Agreements Series Sanitary and Phytosanitary Measures. Also available at https://www.wto.org/english/res_e/booksp_e/agrmntseries4_sps_e.pdf Sustainable Development Goals of the United Nations, Agenda 2030; European Green Deal Review on trends in food safety and food security: King et al., 2017 (https://doi.org/10.1016/j.tifs.2017.08.014) AVMA FVE CVMA – The role of veterinarians in advancing One Health – a global public good WVA Position on Zoonoses Emergence in Relation to Wildlife Disruption and Trade
D2	Environmental hygiene in the animal production food chain	Environmental hygiene including water hygiene and waste management in the animal production food chain.	2	Handbook of hygiene control in the food industry, Edited by H. L. M. Lelieveld, M. A. Mostert and J. Holah, Woodhead Publishing Limited, ISBN-13: 978-1-85573-957-4, 978-1-84569-053-3, ISBN-10: 1-85573-957-7, 1-84569-053-2.
D3	Mathematical models in Food Safety	Application case studies (focus on FS): research or management question, conceptual model, predictive microbiology, shelf life, inactivation; Dose-response models for hazard	1	Update on microbiological food safety databases, software, and mathematical models: Plaza-Rodriguez et al., 2018 https://doi.org/10.1016/j.cofs.2017.12.002 Lin et al., 2016: Math. Modelling and simulation in animal health (https://doi.org/10.1111/jvp.12311)

		characterisation Compartmental models (toxicokinetic).		
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Part 2 (Population Medicine) – Cluster A Epidemiology and risk assessment (17 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
A1	Experimental studies [P]	Application case studies from different areas in VPH: research question/hypothesis, study types, study units, outcome, factors/covariates, randomisation, blocking, blinding, sources of bias, assumptions (e.g. independence of observations), data collection, pooled samples, time series data, data coding, data consistency, missing data, limits of detection, limits of quantification, parameter estimation, interpretation and communication of results, good practice guidelines for study conduct and study reporting.	4	Dohoo, Martin, Stryhn. Veterinary Epidemiologic Research. 2nd Ed. The REFLECT statement: methods and processes of creating reporting guidelines for randomized controlled trials for livestock and food safety Veterinary Epidemiology, 4th Edition Michael Thrusfield, Robert Christley (With) ISBN: 978-1-118-28028-7 April 2018 Wiley-Blackwell
A2	Observational studies [P]	Application case studies from different areas in VPH: research question/hypothesis,	7	Dohoo, Martin, Stryhn. Veterinary Epidemiologic Research. 2 nd Ed. STROBE [The Strengthening the Reporting of Observational Studies in Epidemiology] Statement: guidelines for reporting observational studies.

		<p>study types (e.g. randomised clinical trials, clinical epidemiology, case control, nested case control, cohort, cross-sectional, cross-over, intervention study), study units, outcome, factors/covariates, randomisation, blocking, blinding, sources of bias, assumptions (e.g. independence of observations), survival time data, data coding, data consistency, missing data, limits of detection, limits of quantification, parameter estimation, interpretation and communication of results, good practice guidelines for observational studies and validation studies (study conduct and study reporting).</p>		<p>Frontiers Sample Size Estimation in Veterinary Epidemiologic Research Veterinary Science (frontiersin.org)</p> <p>Veterinary Epidemiology, 4th Edition Michael Thrusfield, Robert Christley (With) ISBN: 978-1-118-28028-7 April 2018 Wiley-Blackwell 888 Pages</p> <p>EFSA Scientific Com guidance on integrating evidence from epidemiological studies for use in EFSA scientific assessments - https://doi.org/10.2903/j.efsa.2020.6221. The document has been out for public consultation autumn 2020, but not yet finalized as of July 2021.</p>
A3	Risk assessment methodology [P]	<p>Application case studies from different areas in VPH: risk question, scenario models, modular models, scope of models, qualitative vs. quantitative risk models,</p>	3	<p>World Health Organization (2012). Rapid Risk Assessment of Acute Public Health Events.</p> <p>OIE Terrestrial Code chapter 2.1: https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmlfile=chapitre_import_risk_analysis.htm</p> <p>OIE terrestrial code chapter 2.2.</p>

		deterministic vs. stochastic (probabilistic) models, variability & uncertainty, deriving model parameters from data, model assumptions, default parameter values, model documentation, interpretation and communication of results under uncertainties.		https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_securite_marchandise.htm OIE Aquatic Code chapter 2.1: https://www.oie.int/en/what-we-do/standards/codes-and-manuals/aquatic-code-online-access/?id=169&L=1&htmfile=chapitre_import_risk_analysis.htm
A4	Mathematical models in PM [P]	Application case studies (focus on PM): research or management question, conceptual model, modelling approaches, SIR, differential equations, models for transmission and spread and control of infectious agents	3	Dohoo, Martin, Stryhn. Veterinary Epidemiologic Research. 2 nd Ed. (chapter 27) Frontiers A Practical Introduction to Mechanistic Modelling of Disease Transmission in Veterinary Science Veterinary Science (frontiersin.org) Saegerman et al, 2011. The use of modelling to evaluate and adapt strategies for animal disease control, OIE Revue Scientifique et Technique Garner et al, 2007 Evaluating alternative approaches to managing animal disease outbreaks – the role of modelling in policy formation: https://www.izs.it/vet_italiana/2007/43_2/10Garner285_298.pdf

Part 2 (Population Medicine) – Cluster B Risk management (14 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
B1	Disease Control [P]	Concepts, principles and applications of disease control programmes, good hygiene practices in primary production, biosecurity, sanitation	4	Edited by Jeroen Dewulf & Filip Van Immerseel. Biosecurity in animal production and veterinary medicine. From principles to practice. CABI, 2019. OIE Terrestrial Code. Chapters on disease control (in general), and for specific diseases. EU Animal Health Law (Preambles): Regulation (EU) 2016/429

		and disinfection procedures, programmes on regional, national and herd-level, control of vector-borne diseases, integrated control programmes, success monitoring, organisation and responsibilities, herd health programmes.		https://ec.europa.eu/food/animals/animal-health/animal-health-law_en AVMA FVE CVMA – The global controls of dog-mediated rabies: a One Health imperative FVE position on <i>Echinococcus multilocularis</i> in a “one health” perspective WVA Position Statement on Leishmaniosis
B2	Animal health economics	Application case studies (focus on PM): normative ex-ante analysis and empirical ex-post analysis, including disease loss estimations, cost-benefit calculations, decision support modelling, decision tree analysis, basic knowledge in decision analysis.	4	Jonathan Rushton 2011: Economics of Animal Health and Production practical and theoretical guide Review paper: Animal health economics – where have we come from and where do we go next? https://www.cabi.org/cabreviews/FullTextPDF/2007/20073191022.pdf
B3	Science based policymaking	Further selective studies: issues related to Population Medicine and epidemiology for policy makers, EU and national legislation, regarding animal health and welfare, as well as public health and food safety, impact assessment.	3	Food Safety Policy, Science, and Risk Assessment: Strengthening the Connection: Workshop Proceedings. Institute of Medicine (US) Food Forum. Washington (DC): National Academies Press (US) ; 2001. Evidence-Based Policy Making: From Data To Decision-Making. Global Governance Programme Robert Schuman Centre for Advanced Studies European University Institute Via Boccaccio, 121 50133 Florence Italy. Perspectives From the Science-Policy Interface in Animal Health and Welfare Simon J. More* Front. Vet. Sci., 08 November 2019 https://doi.org/10.3389/fvets.2019.00382
B4	Quality and food safety	Application case studies with focus on PM: Concepts, principles and	3	OIE terrestrial code chapter 2.2. https://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmfile=chapitre_securite_marchandise.htm

	assurance systems	applications of pre-harvest quality management programmes (including good manufacturing practice codes, HACCP, total quality management, ISO standards).		<p>The FAO/ WHO international Food Safety authorities network in review Foodborne pathogens and disease. Volume 16, Number 7, 2019 Mary Ann Liebert, Inc. DOI: 10.1089/fpd.2018.2582</p> <p>EU Commission DG SANTE homepage on food safety - Food safety in the EU (https://europa.eu/european-union/topics/food-safety_en) and documents referred to therein. (E.g., ENSURING FOOD IS SAFE The veterinary and phytosanitary system of the European Union explained – a good big picture but somewhat superficial overview).</p>
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Part 2 (Population Medicine) – Cluster C Monitoring and surveillance (14 ECTS)

CLUSTER	TITLE	KEYWORDS	ECTS	RESOURCES
C1	Epidemic livestock diseases	Infectious aetiology, occurrence and transmission, diagnostics and control, prevention of major epidemic diseases with potential impact on food security.	3	<p>OIE disease factsheets https://www.oie.int/en/the-oies-newly-updated-fact-sheets-are-now-available-online/</p> <p>OIE terrestrial and aquatic code</p> <p>EU animal health law (Regulation (EU) 2016/429)</p> <p>FAO homepage on transboundary animal diseases http://www.fao.org/emergencies/emergency-types/transboundary-animal-diseases/en/. Gives useful overviews.</p>
C2	Outbreak investigation	Routes of disease transmission in livestock populations, outbreak investigation and hazard identification, principles and concepts of molecular epidemiology.	4	<p>FAO homepage on transboundary animal diseases http://www.fao.org/emergencies/emergency-types/transboundary-animal-diseases/en/</p> <p>The ECDC homepage on outbreaks have useful information on current outbreaks and epidemic intelligence.</p> <p>European Centre for Disease Prevention and Control. ECDC strategic framework for the integration of molecular and genomic typing into European surveillance and multi-country outbreak investigations – 2019–2021. Stockholm: ECDC; 2019. https://rr-asia.oie.int/wp-content/uploads/2020/02/manual_outbreak-investigation.pdf</p>

C3	Monitoring and surveillance systems	Design, implementation and evaluation of monitoring and surveillance systems regarding animal diseases (including epidemic infections, animal zoonoses and food-borne diseases), risk based surveillance, syndromic surveillance.	4	<p>Hoinville et al., 2013. Proposed terms and concepts for describing and evaluating animal health surveillance systems. Preventive Veterinary Medicine, 112: 1-12.</p> <p>Vial, F., Berezowski, J., 2015. A practical approach to designing syndromic surveillance systems for livestock and poultry. Preventive Veterinary Medicine, 120(1): 27-38.</p> <p>OIE Terrestrial Code Chapter 1 on Surveillance.</p> <p>A useful textbook is Animal Disease Surveillance and survey systems. (Eds MD Salman) 2003, Iowa, Stae Press, Blackwell publishing, Ames, Iowa, USA.</p>
C4	Animal movement and spatial epidemiology	Concepts, principles and implications for VPH of special epidemiological approaches including spatial epidemiology, GIS, network analysis, movement of live animals and animal products, animal identification and tracing systems, legislation for animal movements, animal identification and tracking, implications for VPH.	3	<p>Pfeiffer et al. Spatial analysis in epidemiology. 2004. [book available for download on Research Gate].</p> <p>OIE Terrestrial Handbook Chapter on Animal Identification and Traceability Systems.</p> <p>Frontiers An Introductory Framework for Choosing Spatiotemporal Analytical Tools in Population-Level Eco-Epidemiological Research Veterinary Science (frontiersin.org)</p> <p>Pfeiffer D, Robinson TP, Stevenson M, Stevens KB, Rogers DJ, Clements AC. Spatial analysis in epidemiology. Oxford: Oxford university press; 2008 Sep 1;</p> <p>Edited By Andrew B. Lawson, Sudipto Banerjee, Robert P. Haining, Maria Dolores Ugarte. The role of spatial analysis in risk-based animal disease management. In: Handbook of Spatial Epidemiology. CRC Press/Taylor and Francis 2016;</p> <p>Pfeiffer DU, Stevens KB. Spatial and temporal epidemiological analysis in the Big Data era. Preventive veterinary medicine. 2015 Nov 1;122(1-2):213-20;</p> <p>Moyen N, Ahmed G, Gupta S, Tenzin T, Khan R, Khan T, Debnath N, Yamage M, Pfeiffer DU, Fournie G. A large-scale study of a poultry trading network in Bangladesh: implications for control and surveillance of avian influenza viruses. BMC veterinary research. 2018 Dec;14(1):1-2;</p> <p>Ortiz-Pelaez A, Pfeiffer DU, Tempia S, Otieno FT, Aden HH, Costagli R. Risk mapping of Rinderpest sero-prevalence in Central and Southern Somalia based on spatial and network risk factors. BMC veterinary research. 2010 Dec;6(1):1-4;</p>

			<p>Ortiz-Peláez A., Pfeiffer D.U., Soares-Magalhães R.J., Guitian F.J., 2006. Use of social network analysis to characterize the pattern of animal movements in the initial phases of the 2001 foot-and-mouth disease epidemic in the UK. Preventive Veterinary Medicine 76 (2006) 40-55;</p> <p>Dubé C, Ribble C, Kelton D, McNab B. Introduction to network analysis and its implications for animal disease modelling. Revue Scientifique et Technique-OIE. 2011 Aug 1;30(2):425;</p> <p>Dean AS, Fournié G, Kulo AE, Boukaya GA, Schelling E, Bonfoh B. Potential risk of regional disease spread in West Africa through cross-border cattle trade. PloS one. 2013 Oct 9;8(10):e75570;</p> <p>Marquetoux N, Stevenson MA, Wilson P, Ridler A, Heuer C. Using social network analysis to inform disease control interventions. Preventive Veterinary Medicine. 2016 Apr 1;126:94-104;</p> <p>Lentz HH, Koher A, Hövel P, Gethmann J, Sauter-Louis C, Selhorst T, Conraths FJ. Disease spread through animal movements: a static and temporal network analysis of pig trade in Germany. PloS one. 2016 May 6;11(5):e0155196;</p> <p>Chaters GL, Johnson PC, Cleaveland S, Crispell J, De Glanville WA, Doherty T, Matthews L, Mohr S, Nyasebwa OM, Rossi G, Salvador LC. Analysing livestock network data for infectious disease control: an argument for routine data collection in emerging economies. Philosophical Transactions of the Royal Society B. 2019 Jul 8;374(1776):20180264;</p>
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The list will be reviewed by the Education Committee and residents' representatives on a three-year basis.

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