Appendix K

Domain weights and content distribution

ECBHM
European College of Bovine Health Management

Content Domains

Herd Health: 30-36%

- Basic understanding and application of **breeding and genetics**
  - Genetic improvement of stock
  - Hereditary and congenital diseases
- Describe, analyze and advise on bovine **nutrition** for relevant production systems
  - Knowledge of anatomy, physiology and principles of normal digestion
  - Knowledge of basic nutritional requirements of the cow at different ages and stages of production
  - Understand common feeding concepts and principles of diet formulation
  - Knowledge of common dietary constituents used in compounding rations and commonly used methods of conservation
  - Analyze basic nutrition parameters, identify problems and improve rations
  - Collect and interpret appropriate samples related to nutrition and metabolism
  - Knowledge of commonly seen diseases with nutritional causes
  - Knowledge of nutritional deficiencies - signs, epidemiology, diagnosis, correction and prevention
- Describe, analyze and advise on commonly encountered **housing and feeding systems** for cattle and identify associated risk factors for animal health and welfare
  - Dairy
  - Cow/calf/suckler herds
  - Beef fattening units
  - Feedlots
  - Veal
- Design **farm-specific herd health monitoring programs** for the prevalent health issues in Europe, involving adult cattle and calves
  - Define key outcomes
  - Obtain relevant data
  - Manage and interpret data
  - Use of sensor technology and artificial intelligence
- **Manage herd problems** in cattle, involving both endemic and epidemic or (re-)emerging disease
  - Reproduction
  - Mastitis
  - Lameness
  - Infectious disease

    - Metabolic disorders
    - Toxicology
    - Calf and youngstock health
- Understand and apply the principles of **biosecurity** tailored to the farm and at a larger (inter)national level
    - Cleaning and disinfection (including spectra of disinfectants)
    - Control of human and animal trade/movement
    - Purchase management and quarantine
    - Principles of infectious disease management
    - Transportation of samples
- Understand principles of **ancillary disciplines**
    - Microbiology
    - Pharmacology / pharmacokinetics
    - Biochemistry (e.g. water analysis)
    - Appropriate tests available for common diseases (including principles of sensitivity and specificity)
- Understand the basic principles of **vaccinology, immunology and immunomodulation**
    - Knowledge of vaccine types, advantages/disadvantages
    - Basic insights in immune response depending on vaccine type used: Th1 vs Th2
    - Calculate a cost-benefit analysis of implementing vaccination programmes
    - Knowledge of EU regulation of vaccines
    - Knowledge of vaccination programs for important diseases
    - Design/evaluate vaccination protocols in an evidence-based manner
    - Knowledge of existing immunomodulative products, especially those marketed

Individual Medicine & Surgery: 22-28%

- Apply **medical imaging** techniques on farm
    - Understand imaging techniques which are typically available on farm
    - Perform and interpret advanced but not specialized imaging
- Appropriately use and advise on **pain medications and anesthetic techniques**
    - Principles of pain detection and management
    - Effects and side effects of NSAID, GCS, sedatives, anesthetics
    - Sedation of calves and adult cattle
    - General anaesthesia in calves and adult cattle
    - Procedures of regional and local anaesthesia
    - Legal requirements (EU)
- Perform advanced (non-specialist) **surgery** in cattle and have knowledge of advanced therapeutic and surgical techniques
    - Laparotomy
    - Abomasal surgery (conventional and via laparoscopy)
    - Umbilical surgery
    - Intestinal surgery
    - Enucleation

    - Dehorning and castration
    - Udder and teat surgery
    - Claw and limb surgery (tenotomy, amputation, fracture repair, management of tendon and joint diseases)
    - Reproductive surgery (i.e. caesarean section)
- Perform **necropsy** using a methodical approach and take appropriate samples for diagnostic purposes
    - Perform a protocolized field necropsy, including appropriate sampling
    - Identify gross pathologies
    - Understand the biohazard/public health implications of necropsies
- Understand principles of **ancillary disciplines**
    - Microbiology
    - Pharmacology / pharmacokinetics
    - Biochemistry (e.g. water analysis)
    - Appropriate tests available for common diseases (including principles of sensitivity and specificity)
- Understand the basic principles of **vaccinology, immunology and immunomodulation**
    - Knowledge of vaccine types, advantages/disadvantages
    - Basic insights in immune response depending on vaccine type used: Th1 vs Th2
    - Calculate a cost-benefit analysis of implementing vaccination programmes
    - Knowledge of EU regulation of vaccines
    - Knowledge of vaccination programs for important diseases
    - Design/evaluate vaccination protocols in an evidence-based manner
    - Knowledge of existing immunomodulative products, especially those marketed
- Understand, recognize, diagnose and treat **individual cattle diseases** and estimate their importance to herd health
    - Common diseases
    - Novel diseases
    - Rare diseases
    - (Re)emerging diseases
    - Diseases relevant to herd health

Epidemiology, Evidence-Based Veterinary Medicine and Economics: 21-27%

- Interpret and apply scientific literature
    - Evaluate a scientific paper on quality of evidence and translate its content to field applications
    - Effectively communicate results of paper
    - Demonstrate knowledge of recent literature
- Understand and contribute to **animal health economics**
    - Understand the impact of herd health, diseases and animal welfare on farm finances, productivity and public health
    - Understand financial implications of intervention measures and prevention

    - Perform a cost-benefit analysis, economic analysis of production results
- Understand and implement the principles of **evidence-based veterinary medicine**
    - Understand the principles of and the reasons for conducting clinical audits at the farm practice level
    - Define appropriate research questions, search literature for evidence, summarize findings based on level of evidence and advise accordingly
- Understand **epidemiological principles** and apply to **data analysis**
    - Frequency data, incidence and prevalence
    - Sample size, association vs causation, confounding, bias, odds ratios, relative risk, attributable risk, sampling strategies
    - Study design
    - Statistical tests - choosing an appropriate test
    - Interpretation of tests results (Se, SP, PPV, NPV)
- Use and interpret **diagnostic tests** and procedures for individual animal and herd diagnosis and application as part of a herd health program (e.g. purchase control)
    - Take appropriate samples
    - Select most appropriate test(s)
    - Describe tests strengths and weaknesses
    - Interpret routine laboratory diagnostics (haematology and clinical pathology)
    - Interpret routine analysis of different body fluids (peritoneal fluid, milk, synovial fluid, cerebrospinal fluid, urine, rumen fluid)

Legislation, One Health and Animal Welfare: 17-23%

- Advise, promote and improve **animal welfare** (beyond the legal minimal EU requirements)
    - Legislation and codes of practice affecting cattle welfare
    - Interaction with stakeholders involved in cattle welfare
    - Normal behavioural patterns and their alteration by stress, pain and disease
    - Welfare in relation to stockmanship, housing nutrition and breeding
    - Design tailored monitoring programs
    - Impact of biotechnology on welfare
- Be aware of relevant current **EU legislation** and be able to translate into practical situations
    - Cattle health and welfare
    - Rearing
    - Slaughter and euthanasia
    - Drug use
    - Biosecurity and regulated animal diseases
- Diagnose, advise on and control **zoonotic disease** and other **public health concerns** related to animal contact or consumption of products
    - Knowledge of public health dangers related to cattle and their products: meat, milk, animal contact
    - Relevant legislation for zoonotic diseases

    - Basic knowledge of the clinical signs of zoonotic diseases (from cattle) in humans
- Effectively **communicate** with a variety of stakeholders and influence human behaviour
    - Define appropriate communication strategies for different circumstances
    - Knowledge of factors affecting human behaviour and strategies for influencing behaviour change
    - Effectively communicate with veterinary specialists, first line practitioners, farmers, farm advisers, consumers and stakeholders from the cattle industry
- Knowledge of **sustainable farming systems/practices** associated with climate change mitigation and increased biodiversity
- Measure **antimicrobial use** (including but not limited to antibiotics, chemotherapeutics and anti-parasitic drugs) and apply the principles of rational antimicrobial use
    - Knowledge of current recommendation of the prudent use of drugs
    - Basic knowledge of potential for residues in animal products and the environment
    - Understand the basics of bacterial culturing, microbial identification and antimicrobial susceptibility testing
    - Understand the basics of efficacy testing of antiparasitic drugs
    - Knowledge of application of drugs to minimize development of resistance
    - Knowledge of methods of quantification of antimicrobial use (dose based vs. mass based)
    - Knowledge of variations in antimicrobial use in different cattle industries and different EU countries
    - Basic knowledge of the potential role of the cattle sector in resistance selection in humans