

WORKSHOP REPORT

Aquatic Animal Health Education

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Collaborating Organisations: Associazione Piscicoltori Italiani (API); EAFP; European Association of Establishments for Veterinary Education (EAEVE); Federation of Veterinarians in Europe (FVE); European College of Aquatic Animal Health (ECAAH); International Partnership for Aquatic Veterinary Education (i-PAVE); World Aquatic Veterinary Medical Association (WAVMA).

An overview of efforts and needs for well-trained global aquatic animal health workforce

D. Scarfe

Aquatic animals need veterinary care as any other animal species but sometimes this care is inadequately managed. The role of veterinarians in conventional farmed animal health prevention and control are undoubtedly some of the activities most commonly recognised to the veterinary profession. Although poultry, swine, beef, and other terrestrial animals have been historically considered as the main source for animal protein production, it is very important to highlight that nowadays, fisheries and aquaculture represent a substantial sources of animal protein for human consumption. Global fisheries have reached a non-sustainable breakpoint and, in this scenario, aquaculture emerges as the sustainable alternative for animal

protein production for the future. Animal health and welfare, and particularly the control of impact of the diseases in finfish, crustacean and mollusc farming still represents a very important challenge for aquatic animal veterinarians. The ornamental fish sector is also a relevant area, and untapped resource for aquatic animal professionals. However, these needs are not followed by the same level of veterinary services required, indicating that there is still a lot of work to be done in this direction. Disease control and prevention, and aquatic animal health promotion across these different areas is a very challenging task for the future, and represent a tremendous source of opportunity for aquatic veterinarians.

A well-trained and equipped veterinary workforce is required, to integrate veterinarians, para-veterinarians and other animal health support professionals in fully functioning

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disease diagnostic laboratory services and in appropriate government/industry infrastructure. An efficient collaboration between public/private partnerships is highly required. With this common objective, several international partners, such as WVA, CIVMA, OIE, COPEVET, AAVEE, NAVMEC and EAEVE, are working together to guarantee that the education of the future veterinarians might meet the contemporary societal needs, incorporate novel areas, techniques and technologies and harmonise and standardise veterinary education through accreditation processes with a primary focus on “Day-1” basic competencies of the one hundred thousand specialised aquatic veterinarians required in the future. To reach these goals, it is also very important to know the profile of the veterinarians currently working in aquatic veterinary medicine, including their knowledge, experience, and skills. It is also fundamental to identify how veterinary schools address aquatic veterinary medicine training, the level of knowledge and technical skills provided in each curricular path. Currently, there are more than 14 different aquatic veterinary organisations in the world, working together towards the curricular inclusion of aquatic animal medicine and in the veterinary specialisation path. Specialists in aquatic medicine can be found in specific directories such as AquaVetMed.info, which shows a progressive increase of professionals included in the database.

Concerning training at the vet schools, a very important point is to assess the requirements for the different competences but also in evaluation and finally also recognition and certification of individual competencies. This scheme was adopted in the WAVMA Certified Aquatic

Veterinarian (CertAqV) Program (www.wavma.org/CertAqV-Pgm). The CertAqV program is appealing to veterinarians worldwide and also assesses basic competency for servicing clients and industries, and is often proposed as a model for veterinary curricula revisions and is satisfying several national and International (OIE) regulations. A survey launched in 2014/2015 by AVMA/AAVMC in accredited veterinary schools, mostly from USA and Canada, revealed that many of them had at least one course or significant number of courses about aquatic animals. A similar exercise was done in 2016 by FVE and EAEVE also showing similar relevant results. Knowledge on aquatic veterinary medicine was also minimally included in NAVLE, and in regulatory education programs in the USA, such as NVAP. I-PAVE was launched as a charitable partnership between international organisations of veterinary associations, schools, involving sponsors to partner on providing educational programs for veterinarians, students and para-veterinarians around the world.

Available training and education opportunities for aquatic animal health professionals in Europe

F. Padros

In the specific area of aquatic animal health and welfare, veterinarians and para-veterinarians play a main role and for this reason, special attention to their education and training should be paid. Veterinarians in Europe are educated EHEA and the Bologna Process. The same scheme is adopted by 49 countries, including EU, non-EU and some other non-European countries. It is important to highlight that the veterinary profession is developed under specific EU regulations (EU Directives 2005/36/

EC and 2013/55/EU), as for other regulated professions. In addition, there is a list of competences and subjects necessary to accomplish the requirements of the Animal Health Law (Regulation (EU) 2016/429 on transmissible animal diseases), usually implemented under national and regional specific regulations on higher level education. However, there is still room for harmonisation between the different countries. Concerning the Bachelor's degree on veterinary sciences / medicine, two main institutions play a major role: FVE, as the official representative body for the veterinary profession in Europe and EAEVE, as the official accreditation authority for veterinary education establishments within Europe. Both institutions are particularly aware about the current and future needs for well-trained aquatic veterinary workforce. An extensive study on this area Lateridou et al., 2018 indicated that over 95% of the veterinary courses incorporate teaching in aquatic animals. Almost half of the establishments provide teaching in aquatic animal veterinary medicine as separate subjects, while more than 40% provide such training as elective option in their undergraduate curricula, or as postgraduate opportunities to enhance Day-1 competences. Results indicated some variability, with most establishments informing about a total number of 15-50 hours of core/obligatory subjects, and between 26-50 hours for elective subjects. These results indicate that at least, a certain basis on aquatic animal veterinary medicine is present in the educational background of the undergraduated students in Europe.

After graduating, veterinarians can choose to start their career as professionals, searching for a job or following specialisation tracks. Differently to other areas involving classical veteri-

nary activities, jobs related to aquatic animal veterinary science and medicine usually requires a higher level of training and experience in this field. Some companies and employers may offer internal specific in-house training and employees also gain invaluable work experience through daily practice, usually assisted by more experienced colleagues. Skills mature with work experience and curricular robustness is further supported through the attendance to professional events (conferences, workshops) or to specific external courses organised through a variety of ad hoc initiatives. Specific postgraduate education is traditionally structured as Master degree, and PhD for those willing to follow advanced research and/or teaching tracks. Several Master programs are available across EU countries, focusing on aquatic animal health and welfare for veterinarians and paraveterinarians, but also more generic Master programs which include some specific modules on aquatic medicine. The specialisation track could be completed by the ECAAH, a college of EBVS, the organisation assessing veterinary specialties in Europe with 27 veterinary specialist Colleges and 38 distinct specialties. ECAAH (<https://ecaah.org/>) is a relatively young college, with activities started in 2013 and in May 2015 received the formal registration in EBVS, starting to grow through the progressive incorporation of *de facto* members, approval of training centres and the creation of committees. In 2020, the first applications for residents were received and nowadays, eight residents are following standard and alternative programmes.

Finally, a recognition to the role of the EAFP is also needed, not only for the promotion of the research and exchange of knowledge in fish and shellfish pathology, but also because the

promotion of training activities amongst their members and particularly for the early career/young trainees.

European aquatic veterinary medicine training programs connecting blue and green through One Health approach

D. Iatridou

The veterinary profession highlights 'One Health and sustainability' as one of its core priorities for the next five years. Fostering One Health education and interdisciplinary collaboration in practice are pivotal in implementing overall goals of the new FVE Strategy in the coming years^{1,2}.

Aquatic animal veterinary medicine is one of the areas, which FVE has paid special attention over the last years. The need for adequate veterinary education and knowledge of the field is particularly highlighted within several statements, such as the conclusions from the "*International Conference on Health and Welfare of fish as a critical success factor for European aquaculture*" that was organised by FVE and the Irish Presidency of the Council of the European Union in May 2013 and the recommendations of the FVE working group on Aquatic Animal Health and Aquaculture in 2014. Following those recommendations and in order for FVE to gain a better understanding of the undergraduate veterinary curricula in Europe, a survey was launched in close collaboration with the European Association of Establishments of Veterinary Education with a view to investigate whether undergraduate veterinary students are prepared to deal with the particular needs of the fast-growing aquatic animal sector (Iatridou et al., 2018). The results show that fish

medicine is very well integrated in the European veterinary curricula, while the great majority of establishments incorporate such teaching within their core curriculum. Competences in aquatic animal medicine are additionally part of many core subjects taught to veterinary students, such as anatomy; physiology; welfare; prevention, diagnosis and treatment - including responsible use of medicines; food safety and public health - including zoonoses; One Health. Aquatic animals need veterinary care as all other animal species do, while veterinarians receive a holistic training in veterinary medicine, which ensures the development of the necessary competences for starting in entry roles in the aquatic animal sector. Nevertheless, veterinarians entering the aquatic animal sector should enhance their competences and expertise via life-long learning or further specialisation.

Additionally, the aquatic animal sector needs to engage with both qualified veterinarians and a variety of other professionals. Interdisciplinary collaboration in practice is a core principle of the One Health concept, which recognises that animals, humans and the environment are interconnected. A pan-European survey (Iatridou et al., 2021) investigated recently the implementation of interdisciplinary collaboration in teaching and in research by veterinary education establishments, the hurdles towards implementation of such a model of education and the expected benefits for students, professionals and the society. Although the outcomes are not specific for the sector, it is obvious that this is a concept relevant to teaching of aquatic animal veterinary medicine as well. Aquaculture and overall aquatic animal health sector encompass human, animal and environmental interconnections in a most prominent way.

Therefore, the integration of the holistic One Health concept in education by fostering interdisciplinary collaboration from university as recommended by FVE¹ would be of explicit value for addressing efficiently the current challenges in aquatic animal health practice.

EAEVE Accreditation of Veterinary Education Establishments

A. Bravo

EAEVE is the oldest Quality Assurance (QA) accrediting agency of VEEs (i.e. Faculties/Schools of Veterinary Medicine) in Europe which is a full member of the European Association for QA in Higher Education (ENQA) and EQAR.

EAEVE has 108 VEEs members from 39 countries, 101 of them are full members that sit in Europe (77 of them in the EU), and 7 associate members outside Europe. Each VEE must follow the EAEVE accreditation process named the European System of Evaluation of Veterinary Training (ESEVT). This is the only Europe-wide (veterinary) profession specific evaluation system carried out by EAEVE in cooperation with FVE. The ESEVT evaluate undergraduate veterinary education to ensure harmonisation of a comparably high standard of veterinary education, fundamental for trustiness in veterinary services.

ESEVT is based on the principles of EU Directives regulating qualification of veterinarians and the ESG 2015 (European Guidelines for QA in the European Higher Education Area). The ESEVT is based on the application of Standard Operating Procedures (SOP) for the evaluations, which is regularly updated by EAEVE and FVE in order to ensure compliance with

developments in veterinary science and EU laws. ESEVT's principal aim is setting standards, and evaluating the VEE against them to ensure that the VEE is well managed, has adequate financing to sustain its educational, research and social commitments, has appropriate resources of staff, facilities and animals, provides an up-to-date professional curriculum and an appropriate learning environment, operates a fair and reliable assessment system as well as an *ad hoc* Quality Assurance and quality enhancement mechanisms. This way, compliance of a VEE with all the ESEVT standards guarantees that its graduates acquire the relevant knowledge, skills and competencies required for the entry-level of a veterinarian.

ECOVE is a joint committee of EAEVE and FVE that acts as an independent body responsible for taking the final outcome on each accreditation developed by the ESEVT.

The ESEVT is a QA accreditation procedure, competency-based, developed through a visitation every 7 years together with periodic Interim Report in-between visitations provided by the VEEs.

According to the SOP, each VEE has to go through the accreditation process as follows: (1) The preparation of the Self Evaluation Report (SER) by the VEE, (2) The examination of School's Self Evaluation Report by a team of 7 experts plus a coordinator who represents the agency, (3) The 5 days on-site visit to the VEE and report to ECOVE by the team of experts, (4). The final decision by ECOVE on the ESEVT status of the VEE. For the sake of transparency, the SER and the complete visitation report are published on the Website of EAEVE, of the

given VEE, and of DEQAR (EQAR Database). ESEVT is gaining more acknowledgement at national level in the EU and non-EU countries since it has well-described standards, its completion is done by independent and trained experts and the SOP is permanently improved; moreover, the ESEVT has shown to be an efficient, economical and easy-going profession-specific system of accreditation of VEEs to convince the local authorities to fund the correction of the identified deficiencies, to convince the local staff to amend the curriculum and to improve the veterinary education and adapt it to the requirements of the society.

Credentialing Programs Recognizing Day-1 and Advanced Competencies in Aquatic Veterinary Medicine.

D. Palić

Tens of thousands aquatic veterinarians and paraveterinary professionals will be required to fulfil the future needs in aquatic animal health and welfare management and therefore, training of these professionals is paramount. In any educational process, quality assurance is essential to build and maintain the trust in the conferred degree. International credentialing and certification programs offered by WAVMA and ECAAH, as well as several national programs, currently support aquatic veterinary educational standards. WAVMA has been running a global veterinary certification program (CertAqV) since 2013, with more than 150 professionals already certified or under evaluation. At the European level, the ECAAH currently has 47 diplomates and around 10 residents following residency programs. Different national programs add to the overall number of accredited members and people involved in training programs.

Importantly, credentialing programs adopt the OIE focus on Day-1 competences. They describe the knowledge, skills, attributes and aptitude required of graduating veterinarians to ensure that they are prepared for their first role in the profession. In other words, they can practice independently and perform entry-level national veterinary services.

Particularly, WAVMA addresses Day-1 competency in aquatic veterinary medicine by the identification of 9 core pre-clinical and clinical competence areas, the establishment of knowledge, skills and Experience (KSE) and assessment (KSA) requirements. Further, it identifies sources of KSEs through academic courses, continuing education and professional developments, recognises them, and supplements those specific elements required by the professional profile that were not included in the veterinary curricula. Under this scheme, it is necessary to register in the program and have a mentor. To be further endorsed by the mentor, the candidate needs to demonstrate existing KSE, or follow 1 year of activities to complete the KSE requirements from each of the nine areas and pass a peer-review evaluation done by at least two additional CertAqV members. After this process, if the candidate is in possession of a veterinary degree, then a CertAqV certification is issued by the WAVMA executive board. This certification also requires periodical renewal (every 5 years) and requires and additional recognition of a minimum of 50 hours of CEPD and clinical experience (clinical cases or activities based in professional performances). WAVMA CertAqV scheme is targeted to veterinarians worldwide, as a way to supplement their background and also certifying basic and advanced competency in aquatic animal

veterinary medicine, according national and international regulatory boards for potential clients or employers. CertAqV is also following a Developing a Curriculum (DACUM) validation process through the analysis of Aquatic animal veterinarians as a profession.

The scheme used by the ECAAH is slightly different as it follows the guidelines of EBVS. During the initial college set-up (5 years), diplomates could be certified as founding diplomates or *de facto* diplomates according their scientific and professional background and following very demanding criteria described in the college P&P's. However, primary path to becoming the ECAAH Diplomate is through a residency program in previously approved centers, or alternative residency program. Either way, the candidate is expected to pass a final exam after this residency period and receive a title of European Veterinary Specialist in Aquatic Animal Health®. In exceptional cases, veterinarians internationally recognised in the field of the College and with professional and educational profiles equivalent to those required for *de facto* diplomates (previously validated by the credentials committee), can apply to sit the College's examination without prior completion of a residency program. As in WAVMA, re-certification of Diplomates is compulsory every 5 years.

The Way Forward: Paths Toward Ensuring a Well-educated Aquatic Animal Health Workforce

A. Fabris

In conclusion, education and training of Aquatic Animal Health professionals should be based in the three following objectives:

1. Identify the needs for a well-trained Aquatic Veterinary Workforce. To fulfil this objective, it is desirable an open visibility on the web of all the worldwide available courses and other educational and training opportunities for veterinarians willing to become specialised in aquatic animal medicine. It is also desirable to increase the visibility of the different organisations involved in aquatic veterinary training, the range of their educational and training activities and also the information on how to access these organisations and to participate in each of them.

2. Determine and verify what subject-matter, knowledge or competences veterinarians and other para-veterinary professionals involved in the field of aquatic animal health need to develop in order to be prepared for different roles of this sector. When it comes to veterinary qualifications, it is important to define what is the necessary level of competence undergraduate, i.e., Day-1 competences, and what should be part of postgraduate specialisation at intermediate or Board-certified experts.

To better understand opportunities and competencies needed by future veterinarians and para-veterinarians, a continuous dialogue between training agencies (i.e. Universities) and the production sector is essential.

3. Encourage the organisation of more joint seminars that will bring together veterinarians and veterinary para-professionals and additionally call for more collaboration between the existing educational institutions on aquatic animal veterinary medicine. i-PAVE – International Partnership for Aquatic Veterinary Education seems a very promising meeting point. To achieve the final objective, that is

to say to ensure availability of thousands of well-trained veterinarians and veterinary paraprofessionals in the future, all these initiatives should also receive the attention and the economic support from the different public and private institutions.

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