

Aquamedicine – History and Status in Norway

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Acuamedicina. Historia y estatus en Noruega

ABSTRACT

This work presents a brief analysis about history and the most important characteristics of Aquamedicine in Norway, emphasizing the role that it exercises the veterinarian and the importance of this branch of science in the production of animal protein for human consumption.

Key words: Aquamedicine, History and Present, Norway

RESUMEN

El siguiente trabajo presenta un análisis sucinto de la historia y las características más resaltantes de la Acuamedicina en Noruega, haciendo énfasis en el rol que en ella ejerce el Médico Veterinario y la importancia de esta rama de la ciencia en la producción de proteínas de origen animal para la alimentación humana.

Palabras Clave: Acuamedicina, Historia y Actualidad, Noruega

Introduction

During recent years global aquaculture has become an important food-producing sector that provides proteins for a growing human population. Fish is an excellent source of protein with high biological value, and aquaculture therefore contributes to food security in both developed and developing countries. Fish farming also creates jobs and incomes, and makes valuable contribution to local and national economies through products and services on national and international markets. Aquaculture is consequently important for social wellbeing of many people.

The potential for increase in agriculture and captive fisheries seems limited. The supply of aquatic protein from farmed fish will therefore be even more important in the future. An expansion of aquaculture, both as industry and as small-scale aquaculture, is therefore expected in many countries.

The expansion of aquaculture is based on modern technology for production of fish in fresh water as well as sea water. Improvements in feeding and breeding of certain fish species have been important for the success story. The challenge is to produce

healthy fish in a way which is socially and environmentally sustainable. Aquaculture is expected to increase as part of the food-producing sector. It is consequently crucial for the future development of fish farming that sustainability and fish health is given high priority by authorities and by the industry.

Norway is one of the countries with an increasing production of farmed fish, mainly salmonid fish like Atlantic salmon. The success is based on natural and geographical advantages like a long coastal line and with fjords and islands providing good and sheltered areas for fish farming in sea water. Furthermore, the development of new technologies for production, feeding and breeding has been based on scientific competence and transfer of this competence from universities and research institutes to the local producers. Finally, aquamedicine, including diagnostics, prevention and treatment of fish diseases, was included as a basic and applied science from the very beginning of the aquaculture era in Norway.

Aquamedicine

Diseases may have significant consequences for aquaculture production both on a local, regional and national level. The economic losses due to disease may be due to reduced production, but also caused by increased cost for labour and medication. Some diseases may also cause restrictions on trade with fish and fish products with reduced income from export as a consequence. Diseases may also spread to populations of wild fish with great societal consequences. Few infectious diseases in fish have a zoonotic potential and the food safety aspects of fish diseases may seem to be moderate. However, antibiotics and other chemicals are used therapeutically during outbreaks of fish diseases, and both residues and antimicrobial resistances are undesired effects of diseases with impact on human health.

Responsibility

Biosecurity in aquamedicine is a responsibility of both governmental authorities and the aquaculture industry. Good cooperation between those two, and

clear roles of responsibilities is crucial for optimal effect of biosecurity measures.

Governments should provide legislation as a fundamental instrument in management of diseases. In Norway, fish disease legislation was established as early as 1968 in order to protect fresh water species. In addition to anadromous and catadromous fish species, freshwater crayfish was included. The first Fish Disease Act was adopted at the beginning of the aquaculture industry era. Disease notification, restrictions on trade or movement, decontamination and disposal of material, cleaning and disinfection were elements included in the act, as well as systems for diagnostics, surveillance and prevention of diseases in aquatic animals.

Experience after the first decades with aquaculture has documented the benefits of the fish disease legislation for the development of aquaculture. During the expansion and growth of the industry the legislation has been improved and several new regulations have been included. Legal steps as part of disease control may have severe impact on the economy of fish farms and society. It is therefore crucial that the disease act and the regulations have a scientific basis.

Organization

Governments have also the responsibility for the establishment of an efficient organization with clear roles for each level. In Norway, the governmental organization has three levels, a political level in the Ministry of Trade, Industry and Fisheries, an executive level in the Food Safety Authority and a scientific level in research institutions with responsibilities for different scientific topics, including health and diseases of aquatic animals.

The research institutions produce new knowledge and maintain competence which is applied both by the authorities and the industry. In addition, the Norwegian Veterinary Institute which is the governmental fish disease laboratory, is the national reference laboratory for important fish diseases, including exotic diseases.

The executive authority in Norway, named the Norwegian Food Safety Authority, is a directorate with

responsibilities for the whole food chain, from plants, via feed, terrestrial and aquatic animals to food for humans. This directorate implements all regulations in the legislation related to diseases in fish and other aquatic organisms.

Competence

Governmental research laboratory

Aquaculture is a new industry in most countries, including Norway. Production and distribution of competence has been crucial for the success of the industry. A part of the competence in fish diseases is located in the Norwegian Veterinary Institute which serves the authorities and industry with science-based competence and capacity both in disease diagnostic, surveillance and prevention. Pathology, microbiology, parasitology and epidemiology are central areas in this work. The staff comprises scientists and technical personnel with different basic education, including veterinary medicine, biology and engineering.

The Norwegian Veterinary Institute has a central laboratory with reference functions, but is also located in districts with aquaculture where regional laboratories near the fish farms serve as an important resource.

In addition to the governmental fish disease institutions there are private laboratories serving the industry. Some of these are specialized for mass analyses and are also used by governmental services.

The university

Education on university level has been crucial for the development of the Norwegian aquaculture industry. The first lectures for veterinary students were given to students at the Norwegian School of Veterinary Science in the beginning of the seventies. In 1980 a position as professor was established, first as a part time duty. With the expansion of the aquaculture industry and especially due to the increased prevalence and incidence of fish diseases, aquamedicine became an increasingly important part of the curriculum.

Diseases in farmed fish, especially salmonid fish, is now included as part of the education in a similar way as diseases in terrestrial animals. That means that anatomy, physiology and other subjects of fish like microbiology, immunology and pharmacology is taught together with the same subjects of production animals and companion animals. The integration of fish diseases as equivalent to diseases in warm-blooded animals has been successful.

The clinical education in aquamedicine is partly done on fish farms where students stay for some time and get education in solving practical problems in therapy and prevention. Students graduating from the university have therefore a basic competence on diseases in fish, and after graduation they are qualified for fish health positions in the public and private sector.

Aquamedicine is also a subject in universities teaching biology. Two universities in Norway have established courses in aquamedicine as part of their curriculum. Students graduating are named fish health biologists. They have more knowledge about marine biology than veterinarians. On the other hand, veterinarians seem to have more competence in subjects like pathology and epidemiology.

Prescription of drugs to animals have for years been exclusive rights for veterinarians. Fish health biologists requested the same right for their profession. This question was debated for several years until a political decision was made authorizing fish health biologists to prescribe antibiotics and other drugs to fish and other aquatic animals.

Today, there is a general agreement that both veterinarians and fish health biologists contribute with valuable competence in the efforts of maintaining a good health in the large farmed fish population. The two groups often work together with mutual respect of their respective competence.

Research

The competence in aquamedicine was limited in the beginning of the seventies when the aquaculture era started in Norway. A thesis on an outbreak of an

infectious disease in pike had been published and defended successfully already in mid 1920ties, but this was an exception and not a rule. Diseases in fish were most often a phenomenon and not a problem, and research in ichthyology was consequently concentrated more on biology and less on pathology.

During a period of 40 years there has been a significant production of scientific literature about fish diseases from Norwegian universities and research institutes. In terrestrial animals, institutions in many countries participate in the production of new knowledge about diseases. In aquaculture, Norwegian scientists had to take a great responsibility for basic as well as applied research. New fish diseases are discovered and diagnosed every year, and the etiology and pathogenesis must be elucidated before recommendations regarding treatment and prevention can be given. Co-operation between scientists in microbiology, parasitology, pathology and epidemiology is crucial for the outcome of the research. This cooperation includes researchers in the same institution. However, more and more publications are a result of the work of scientists from different institutions, often from different countries.

The main focus during the first years of the 40 year period was applied research with the aim to solve practical problems in farms producing salmonid fish. More basic research was soon added and new and advanced techniques in scientific studies were introduced. Furthermore, research in marine species like cod and halibut and even cleaner fish was included. Even species used for experimental studies, like zebra fish, were subject to studies in the universities, whereas research institutes in general gave priority to fish species which were used for economic purposes.

Several financial resources provided the economical fundament for the research. The governmental institutions had basic grants for research and competence building, the National Research Council contributed significantly and the industry understood that economic support to scientific studies was good

investments. Even international funding became important as financial source for the research projects.

Organizations and associations

Scientific meetings have been an essential part of the professional development of aquamedicine in Norway. A research program launched in the 1980ties called Healthy Fish had an annual meeting on the agenda. The meetings were initially for the scientists. Other professionals in the public or private sector soon experienced these meetings as a valuable source for the latest information. The Healthy Fish meetings soon became an annual event for many groups working with disease problems in the aquaculture industry. Professionals with different background could meet and exchange information, and young scientists could present their first scientific results and get feedback from more experienced colleagues. Several national associations were established for the aquaculture industry, and existing associations included aquaculture as part of their responsibility. The Norwegian Veterinary Association has subgroups for different areas. In 1990 The Association of Aquaveterinarians was organized under the umbrella of the mother association. This association has responsibilities both for collegial matters as well as maintenance and development of competence among the members. The courses for members are organized in cooperation with a similar association for fish health biologists.

On the international arena, the World Animal Health Organization (OIE), www.oie.int, plays a central role in the international cooperation. Development of regulations and guidelines which can be used by national authorities is an important part of the work of OIE. These documents include codes for safe trade as well as manuals for laboratory analyses for diagnostic of diseases in fish and other aquatic organisms. Norwegian scientists have contributed in the development of the Commission for aquatic animals, and the president of that commission was for several years a Norwegian veterinarian. The Norwegian Veterinary Institute is also an OIE reference laboratory for several diseases in aquatic animals.

Conclusion

Aquaculture in fresh water as well as sea-water is an important part of the global protein production. The fish and other aquatic organisms may suffer from diseases with negative consequences for the industry and the society. Veterinarians in public and private positions have a central role in reducing the negative effects of disease.

The development of a sustainable aquaculture industry in Norway has been based on a broad specter of scientific areas, including competence about diseases. This science-based knowledge has been distributed and used in the field with positive effects on health status and economy.

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