Historical perspective of the origins and development of international veterinary public health in the World Health Organisation*

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Summary: The World Health Organisation (WHO) worked vigorously to implement and develop veterinary public health (VPH) activities during the first twenty years of its existence. These activities have continued and expanded into new fields in subsequent years, and will no doubt continue.

The initial challenge was to establish the importance and usefulness of the veterinary profession to human medical and public health problems. Collaborative actions and coordinated research on the major zoonoses, food hygiene and comparative medicine helped to achieve this result along with programmes applying this knowledge in member nations, and particularly developing countries which comprise the vast majority of world population.

The VPH discipline must now take into account and adapt its efforts to the ever-changing social and economic conditions affecting human health. The veterinary profession can help to improve human health, and VPH structures offer an effective channel for doing so.

KEYWORDS: Brucellosis - Comparative medicine - Epidemiology - Food hygiene - Rabies - Veterinary public health - World Health Organisation - Zoonoses.

I. HISTORICAL PERSPECTIVES (1948-1968)

Veterinary public health (VPH) developed at the international level over a relatively short time, roughly from 1948 to 1968. Although this was a very active period, the origins of VPH (and other fields of this kind) have been neglected and often forgotten in the onrush of progress. However, the success of the first twenty years of VPH activities in the World Health Organisation (WHO) ensured their firm establishment.

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in the programme of the Organisation. In addition, as VPH came into being while many of us were being trained, it may be of some interest to begin this account by recalling the personal dimension, for VPH has transformed and shaped the careers of many veterinarians throughout the world.

After my veterinary studies were completed in 1940, I prepared for public health work by obtaining a degree of Master of Public Health (MPH) at the University of Pennsylvania Graduate School of Medicine in 1942. My fellow students included nine physicians with whom I followed all the same courses in paediatrics, clinical medicine, statistics, environmental health and other specialised areas. I was so completely integrated with the medical doctors that I was asked to write my Master’s thesis on the basic immunisation of children with pertussis, diphtheria and tetanus toxoid.

This training was of great benefit to me when I became the only veterinarian on the staff of WHO in 1949. My task was to head the newly established veterinary section in the Division of Communicable Diseases, and I thus had the opportunity to inaugurate and develop the field embracing veterinary contributions to public health. My contacts with the Office International des Epizooties (OIE) also date from this period. In 1950, I attended the annual General Session of the OIE as the official WHO representative.

Mention should be made of several individuals who were prominent in the early development of VPH. They are Dr J.H. Steele who worked in the United States Public Health Services and Dr B. Blood who was employed by the Pan American Sanitary Bureau (PASB; now called the Pan American Health Organisation, the WHO Regional Office for the Americas) and who established the Pan American Zoonoses Centre in Azul, Argentina. A later recruit to the field of veterinary public health, Professor C.W. Schwabe of the University of California School of Veterinary Medicine in Davis, California, has written a splendid book on Veterinary medicine and human health (2). Dr M. Abdussalam, Dr Z. Matyás and Dr K. Bögel, who succeeded me as heads of the VPH unit in WHO, have excellently supervised the continued growth and development of VPH activities in WHO until the present day.

WHAT IS VETERINARY PUBLIC HEALTH?

Veterinary public health (VPH) deals with the contributions of veterinary medicine to public health. It is concerned, in the first instance, with the control and elimination of zoonoses (diseases transmitted between humans and animals), and also with the following areas of activity: food hygiene (production, processing and distribution of foods of animal origin); environmental contamination and degradation by animal wastes and animal products; comparative medicine (e.g. studies in animals on naturally appearing cancer, cardiovascular disease, metabolic and other disorders encountered in humans); laboratory animal medicine; education and training in VPH and communication with the public; reproduction biology; aspects of mental and societal health (ownership of pets, concerns of animal welfare); and emergency veterinary functions in natural disasters (earthquakes, floods, etc.) and other catastrophes.

To meet responsibilities in all the above fields is of course a tall order, and yet public health veterinarians are often called upon to act on any number of these questions. They should, therefore, have at least a working knowledge of these fields, and should also know how to go about seeking help if necessary. Because of the limited
numbers of personnel in VPH units, priorities must be established for action between and within the different sectors. In WHO the first priority was – and remains – the zoonoses. Milk and meat hygiene have also received considerable attention, as have the fields of comparative medicine and veterinary education. All of these fields will be described briefly from an historical point of view, in an account which relies heavily on WHO publications describing the first twenty years of activities in the VPH sections for which the author was responsible.

Much of the work in the early years of WHO was undertaken in close cooperation with the United Nations Food and Agriculture Organisation (FAO), which was concerned with the improvement of agricultural production and methods, and the raising of levels of nutrition, particularly among rural populations. The FAO therefore had a direct interest in the diseases of livestock and in the quality of foods of animal origin. The two organisations established close relations for work to combat certain zoonoses and on milk and meat hygiene. Certain joint expert committees, reference laboratories and other activities to which both organisations contributed are described below.

Rabies and brucellosis were the first zoonoses to be singled out for WHO attention soon after the organisation was established; standard methods for dealing with these and other zoonoses – Q fever, hydatidosis, leptospirosis and bovine tuberculosis – were elaborated jointly with FAO and other official or private agencies. Surveys undertaken to determine the incidence and prevalence of certain diseases helped in planning control measures and, more generally, brought some of the problems into clearer perspective and provided a more balanced picture of their relative importance in different parts of the world. Unsolved problems in the diagnosis, treatment and control of various diseases were determined as a preliminary to concerted efforts by research laboratories in many countries. Expert committees, conferences and seminars were used to assess progress and disseminate information, and assistance was given in the training of scientific and auxiliary workers.

**ZOONOSES**

Rabies was discussed at the 1st World Health Assembly in 1948, and six months later the Executive Board instructed the Director General to undertake a study of current methods of treatment and control as a first step towards clarifying the confusion which then existed. The results of the study were reviewed by an Expert Committee on Rabies which met in 1950, and issued a report recommending methods of rabies prophylaxis in humans and animals on the basis of information then available, but pointed to the need for research on some fundamental questions:

- the improvement and standardisation of laboratory methods
- potency tests for vaccines
- the paralysis-producing factor (or factors) in vaccines
- the local treatment of wounds
- new vaccines
- the importance and effect on control programmes of rabies in wild animals.
It was also agreed that the value of serum in human prophylaxis should be assessed in field trials.

Clearly, none of these problems could be successfully tackled in any one laboratory or country. During the following three years, a coordinated series of research projects was carried out, with the help of members of the Expert Committee and other scientists, by nine laboratories in seven countries, aided by small grants from WHO. These projects included field trials on the use of hyperimmune serum in persons severely exposed to rabies (Iran), experiments on the local treatment of wounds (Spain), field trials of new vaccines for the control of rabies in animals (Malaya and Israel), standardisation of potency tests for vaccines and sera (France and the United States of America), and studies for modified schedules of serum and vaccine for prophylaxis in humans which would give better protection with less risk of paralytic accidents (France, India, Iran, Israel, Spain and the United States of America).

In 1953, an Expert Committee reviewed the coordinated research of the previous three years and made recommendations of considerable importance. These included the use of chick-embryo vaccines for the vaccination of animals against rabies, improved potency tests for vaccines, better definition of the indications for post-exposure treatment in humans, arrangements for the transfer of animals between countries, and more effective methods of diagnosis. Further research was considered necessary on other problems of rabies control, and these were studied during the next three years.

The WHO also organised regional meetings on rabies. The first was held in 1952 at the Pasteur Institute in Coonoor, India, for rabies workers in the South-East Asia, Western Pacific and Eastern Mediterranean regions, and included lectures, discussions, demonstrations and training in the latest laboratory techniques. Some of the papers on diagnosis, vaccine and serum production and potency testing presented at that meeting were later expanded and published in 1954 in a WHO monograph entitled *Laboratory techniques in rabies*, to serve as a guide for laboratories. This work is now in its fourth edition (1992). A similar meeting was held in Muguga, Kenya in 1955 and a training course for Latin American countries was held in Caracas, Venezuela in 1957.

The measures and techniques recommended in the first two reports and in the monograph were widely adopted; in addition, WHO assisted by making strains of viruses and sera available to national laboratories, and by giving technical guidance. In these ways technical collaboration between many laboratories became possible for work on a range of problems.

In 1956, the Expert Committee reviewed the cumulative results of these efforts and issued a series of recommendations, some of which represented clear departures from previously accepted ideas of rabies control. The recommendations included:

- the combined use of serum and vaccine in treating persons severely exposed to rabies
- the infiltration of serum in the local treatment of wounds
- the prevention and treatment of side-effects of serum and vaccine
- the pre-exposure immunisation of persons repeatedly at risk of bites from rabid animals
- the use of vaccines in different species and age-groups of animals in control campaigns
- simplified forms for case reporting and case histories to improve statistics, and for evaluating control procedures
- the establishment and use of an international standard serum and a reference vaccine.

The field trials included in the research disclosed some weaknesses of procedure, and these were corrected.

Measures against rabies became more effective as a result of these activities. But other important problems, of less immediate urgency, awaited solution, such as the epidemiology of rabies in wild animals, more accurate laboratory methods, further improved vaccines and reduced schedules for their use, and techniques for quicker diagnosis. In time, these problems too were dealt with systematically.

Two features of this early work deserve special note. The first is the role played by WHO as a coordinator of research, which enabled the Organisation to enlist the help of laboratories throughout the world in a common united effort to tackle problems which could not be handled adequately in any single laboratory or country. The second is that this coordination, and its results, were secured at relatively small cost to the WHO.

During the next ten years (1958-1968), work continued along the lines mentioned above. Progress was recorded in the local treatment of wounds, basic knowledge of the rabies virus itself, diagnostic procedures and wildlife rabies. Two Expert Committee meetings and two specialised scientific groups were convened, and measures against rabies were updated. The WHO established three International Reference Centres for Rabies (Paris, Coonoor in India and the Wistar Institute in Philadelphia). Three international seminars were held in Moscow, Paris and Buenos Aires, and training courses were organised in a number of countries.

BRUCELLOSIS

When WHO commenced work in this field, bovine brucellosis control was fairly advanced in some countries, although several problems of diagnosis and vaccination required clarification. With regard to brucellosis in sheep and goats, however, very few advances had been made in treating the disease or preventing transmission to humans since the work of the British Malta Fever Commission at the beginning of the century.

These facts were discussed at the First World Health Assembly in 1948 and led to a brucellosis programme designed to meet the needs of most countries. The main items of the programme were:

- surveys of the prevalence in humans and animals
- improvement of statistics
- epidemiological studies on transmission
– standardisation of the sero-agglutination test and of diagnosis for humans and animals

– the simplification of bacteriological techniques for the culture and typing of *Brucella*

– critical studies on human therapy

– the use of known effective measures for the control of brucellosis in animals and for preventing its spread to humans.

This programme clearly required the collaboration of national and international public health and agricultural authorities. The first step was therefore to coordinate the work of the WHO, FAO and OIE, the principal international agencies concerned with the human and veterinary aspects of brucellosis. Joint FAO/WHO Expert Committees on Brucellosis were convened in 1950 and 1952 and recommendations were made on the principal problems mentioned above. An international standard serum against *Brucella abortus* was established to harmonise diagnostic procedures. One of the chief steps taken in implementing these recommendations was the designation of FAO/WHO Brucellosis Centres in different parts of the world. By the end of 1957, there were fifteen such Centres: seven in Europe, three in the Americas, two in the Western Pacific and one each in the African, South-East Asia and Eastern Mediterranean regions. These Centres performed the following tasks:

– preparation and testing of standard antigens, vaccines and other biological products

– promotion of studies on brucellosis prevalence in humans and animals, and programmes of brucellosis control in animals

– research on special problems

– diagnostic training and information for their own and nearby countries.

Advances during the following ten years concerned diagnostic procedures, the characterisation and speciation of *Brucella* strains, and the notable development of Rev. 1 vaccine for use in sheep and goats. The Joint FAO/WHO Expert Committee on Brucellosis met in 1963 to review progress and outline future research needs. The control of *B. melitensis* infection in the Mediterranean area was given particular attention.

LEPTOSPIROSIS

For many years the study of leptospirosis focused on rodents, particularly rats, mice and other field rodents which contaminate swamps and inundated areas such as rice fields. The role of dogs in the spread of *Leptospira icterohaemorrhagiae* and of "canicola fever" was known, but its importance was difficult to assess. Later it became apparent that leptospirosis was widespread in domestic animals, including the principal livestock species — cattle, swine, horses, sheep and goats.

The first problem was to identify the immunological types of *Leptospira*, about which there was much confusion. A Study Group on Leptospirosis was convened in 1955 to decide on provisional classification of the various types of leptospirae and on standardised laboratory methods for their study. On the recommendation of the
Group, WHO/FAO Reference Leptospirosis Laboratories were set up in different parts of the world to assist in the diagnosis and typing of the organisms. By the end of 1957, six such centres — in Australia, Italy, Japan, the Netherlands, the United Kingdom and the United States of America — were engaged in studies on leptospiroa and in fostering surveys in different countries. They undertook to prepare reference standard sera which were supplied upon request to other interested laboratories. They also sought to establish a manageable diagnostic procedure for use by hospitals and laboratories in the routine diagnosis of the disease in humans and animals.

Surveys revealed that leptospirosis was widespread, and over 100 serotypes were identified. Two additional WHO/FAO Reference Leptospirosis Laboratories were designated (in Israel and Japan), and the eight centres continued work on diagnostic and typing methods, pathogenesis, epidemiology, immunisation and therapy.

**HYDATIDOSIS**

Hydatid disease affects human populations, particularly in South America and in Mediterranean countries. As hydatidosis is usually transmitted to humans by dogs, the work assisted by the WHO (especially in South America through the PASB, the WHO Regional Office for the Americas) focused on control in dogs. The use of arecoline as an anthelmintic in dogs, aimed at eliminating the tapeworm *Echinococcus granulosis*, was for many years the standard procedure in field control. But several years of field campaigns showed that arecoline was difficult to apply, and its results were not altogether satisfactory.

The WHO therefore undertook to coordinate basic research to discover a more effective anthelmintic, and also an effective ovicide. Laboratories in New Zealand, Alaska, Lebanon and Latin America, and the International Hydatidology Association, collaborated in this effort.

Some progress was made in the search for an arecoline substitute. Buramidine hydrochloride proved effective as a taeniacide in dogs, but not as an ovicide. Further work was therefore recommended. With the development of an *in vitro* method of cultivating the cestode and maintaining the larval stages in the laboratory, physiological and immunological studies of the parasite could be conducted without the danger of maintaining the parasite in dogs. Reference preparations and other problems were discussed at two meetings of research workers.

**Q FEVER**

In the early 1950s serious epidemics of Q fever occurred in several countries such as Italy, Greece and Turkey, but its extent and importance in other parts of the world were largely unknown. The WHO therefore initiated a world-wide survey in 1952, with the collaboration of diagnostic laboratories in some thirty countries. The WHO supplied the antigen needed for the tests and established the technical procedure for the survey, which lasted two years. The results showed that Q fever occurred in 51 countries throughout the world, and clearly implicated domestic livestock, particularly cattle, sheep and goats, as the principal reservoirs of the disease. During the survey, some laboratories became acquainted for the first time with diagnostic procedures
common to viral and rickettsial diseases, and have since included this group of infections in their routine diagnostic work. Some of the epidemiological problems of Q fever were clarified.

BOVINE TUBERCULOSIS

Bovine tuberculosis was discussed by a Joint WHO/FAO Expert Group on Zoonoses in 1950. The diversity of tuberculins and tuberculin testing procedures raised technical problems in dealing with this disease. The WHO and FAO, in collaboration with the OIE, undertook work on the biological standardisation of tuberculins in veterinary medicine, which led to the adoption of international standard tuberculins of the mammalian and avian types.

The phenomenon of non-specific reactors to tuberculin caused problems in veterinary work for many years. The WHO Tuberculosis Research Office in Copenhagen maintained contact with the Central Veterinary Laboratory at Weybridge, England, on this matter, and WHO tuberculosis teams also collaborated with FAO veterinarians in the field to study the problem in different areas.

OTHER ZOONOSES

In 1950, the WHO/FAO Expert Group on Zoonoses defined measures in agriculture and industry for the control of anthrax, and encouraged the development of rapid diagnostic tests for the disease suitable for use in the field and in abattoirs.

Outbreaks of psittacosis in the 1930s showed that the causative organism was not confined to psittacine birds but was also found in pigeons, turkeys, chickens and other birds. The results of a survey conducted by the WHO soon after its establishment were taken into account in the recommendations made by the WHO/FAO Expert Group on Zoonoses to change the approach to control of the disease, hitherto confined to restrictive legislation on psittacine birds. The epidemiology and life cycles of toxoplasmosis and nematode Toxocara were studied and control measures were identified.

The arthropod-borne encephalitides (which include Japanese B encephalitis, Murray Valley encephalitis and the equine encephalitides) required definition. Virus strains and vectors were collected and classified in Africa, Asia and South America, where bird and animal populations were the principal reservoirs. The WHO coordinated research in various laboratories.

In 1957, with the help of veterinary services and WHO Influenza Centres, twenty-five countries undertook studies on the possible role played by swine and horses in the epidemiology of influenza. During the 1960s, work was intensified on the epizootiology of animal influenza and its relationship with human infection. Results revealed hitherto unsuspected connections between equine, avian and human strains, apart from the already well-known human and swine strains. It was shown that avian influenza affected a large variety of domestic and migrating avian species including chickens, ducks, turkeys, quail, pheasants, hens, geese and terns. These findings
ultimately proved of great importance in understanding the epidemiology of human influenza and the role played by lower animals, particularly avians, in contributing to the emergence of new strains which can cause epidemics and pandemics.

MEAT AND MILK HYGIENE

In 1954 a Joint FAO/WHO Expert Committee on Meat Hygiene issued recommendations that would be applicable to countries at different stages of technical development. The Committee stressed the need to improve the reporting and investigation of food poisoning outbreaks, particularly those caused by meat. Abattoir hygiene, meat inspection (including laboratory investigations) and the sanitation of retail shops also received attention. The WHO and FAO published a monograph on meat hygiene which reviewed in detail the epidemiology of meat-borne diseases, ante-mortem care, slaughter, post-mortem inspection procedures, problems of the processing and marketing of meat, and meat hygiene problems in tropical areas. Detailed plans for abattoir construction and laboratory procedures for the examination of meat were also included and these have now been widely applied in many countries. In collaboration with WHO, the FAO worked on the preparation of a monograph on abattoirs suitable for rural areas. The FAO, the United Nations International Children’s Emergency Fund (UNICEF) and WHO jointly ran courses on milk hygiene to help in the development of dairy livestock, sterilised and dried milk, and milk by-products, and in the use of new pasteurisation plants. Such courses were arranged for European, Eastern Mediterranean, South-East Asian and Latin American countries. A monograph on milk pasteurisation was published by FAO and WHO. A Joint FAO/WHO Expert Committee on Milk Hygiene made recommendations in 1956 on the production, collection, transport, processing and distribution of milk and also reviewed principles of milk hygiene legislation and identified subjects for further study. The Committees on meat and milk hygiene met again in 1959 and 1961 respectively. Food microbiology in general was reviewed in 1967 and principles for the development of microbiological standards for foodstuffs were defined. Regional conferences and courses on meat and milk hygiene were organised in various countries and monographs were published on these subjects.

OTHER ASPECTS OF VPH

An Advisory Group on VPH met in 1955 and gave useful advice on incorporating VPH work into the responsibilities of national, provincial and local health administrations. As in most branches of public health, the lack of properly trained personnel was a major difficulty. Fellowships were therefore made available and work began on incorporating VPH into the undergraduate curricula of veterinary schools and into post-graduate courses at schools of public health.

VETERINARY EDUCATION

As veterinarians for both public health and livestock production programmes were in great demand, veterinary schools were founded in several countries. However, only limited material resources and trained personnel were available. Facilities at some
of the older schools were strained by the admission of much larger numbers of students. The teaching of veterinary public health was particularly hampered by the shortage of trained teachers.

In 1960, the FAO and WHO jointly organised an international meeting in London to assess the need for international action and assistance in veterinary education. Subsequently, two joint FAO/WHO meetings of experts on veterinary education (in 1962 and 1963) considered the requirements of countries at varying stages of development, and also the minimum acceptable standards of education and training for veterinarians and auxiliary personnel. Their findings and recommendations were discussed at a second international meeting on veterinary education in 1965 in Copenhagen.

Both FAO and WHO provided assistance in the training of teachers for veterinary schools and supplied internationally recruited teachers for short periods, as well as essential teaching equipment. The assistance offered by the WHO was directed particularly at strengthening teaching in veterinary public health. In the American region, three seminars were held on the teaching of public health and preventive medicine in schools of veterinary medicine (in Kansas City, Mexico D.F. and Lima). Consultants, fellowships, supplies and equipment were also provided. This assistance to the region, along with encouragement at the national level, resulted in the training of 386 full-time public health veterinarians in 1966, compared with sixty-five in 1957. Advice and assistance were also provided to schools of public health in the teaching of veterinary public health at the post-graduate level.

A World directory of veterinary schools was compiled and published in 1963 and a second revised edition appeared in 1967, now updated by the World Veterinary Association (3).

**COMPARATIVE MEDICINE**

**Cardiovascular disease**

The WHO coordinated and provided assistance for comparative studies on cardiovascular diseases in animals with a view towards improving the knowledge of similar conditions in humans. During the 1950s, degenerative arterial lesions were studied in various animal species. The best models for human atherosclerosis of the aorta and coronary vessels are pigs and certain non-human primates, while some birds also develop lesions similar to those in humans. Atherosclerosis of the cerebral arteries was also found to be common in older pigs, and often there are associated brain infarcts. In addition, comparative studies were carried out on congenital and clotting defects, the effect of social stress and certain dietetic factors on the development of atherosclerosis, hypertension and valvular disease. A bibliography on atherosclerosis in animals was prepared by the WHO and distributed to research workers.

**Cancer**

Studies in comparative oncology were directed along two main lines: the histopathological and clinical investigation of animal cancers and the development of an agreed classification and nomenclature, integrated as far as possible with that being established for human tumours; and the collection of epidemiological information on animal tumours.
In cooperation with centres for human tumours, work on the first aspect was performed by the WHO International Reference Centre for Comparative Oncology in Washington and a series of collaborating centres. With regard to epidemiological studies, information was gathered from various sources on the prevalence of particular types of tumours of special comparative interest, and veterinary schools were encouraged to establish modern methods for recording clinical and pathological data suitable for computer analysis.

The WHO has also supported aetiological studies on certain animal cancers. It was long known that the prevalence of the various types of cancer and the anatomical sites affected differ greatly from one species to another, and studies of the exogenous and endogenous factors associated with these patterns of incidence produce valuable information with possible implications for human cancers. A bibliography on the epidemiology of cancer in animals was prepared by the WHO and distributed to research workers.

The type of animal cancer in which most progress has been made is leukaemia. A WHO-assisted study produced evidence that the disease in cats is caused by a virus resembling that known to cause the disease in mice. Studies on leukaemia in cows gave only equivocal evidence of a virus aetiology, but this was later confirmed. The WHO sponsored several meetings to coordinate research on leukaemia in animals and humans.

Professor I. Beveridge of the Cambridge University Veterinary School in England greatly assisted WHO as a consultant for this work.

II. VPH IN THE WORLD HEALTH ORGANISATION SINCE 1968

In making historical assessments, as we move closer to contemporary developments it becomes more difficult to offer a "detached" account. This is certainly the case if one considers VPH during the past two decades. The history of this period may, indeed, be described as a complex of interacting factors rather than a record of results. The present trends in VPH are reviewed by Bögel (1), and it may therefore suffice to limit our discussion to the major orientations of VPH in the recent past, based on the viewpoint of a WHO coordinator.

INTERACTION IN RESEARCH

Whereas the 1950s and 1960s were characterised by the development and standardisation of diagnostic tests, the improvement of disease surveillance and the development of cell culture and other improved vaccines, the 1970s were marked by new intersectoral approaches which took advantage of new biologicals and methods.

The European Conference on Surveillance and Control of Rabies, held in 1968, initiated a new era of close cooperation among research workers. The WHO provided the basis for the coordination and harmonisation of such research. Thus, over fifteen laboratories in nine countries worked on various components of wildlife rabies and its control, e.g. epidemiology, virology, wildlife ecology, vaccinology, community cooperation and intensified surveillance. Over a period of fifteen years, this work
gradually resulted in the first application in the natural environment of a live vaccine to eliminate a disease in its reservoir, and thus to protect humans.

From 1968 to 1976 WHO organised over twenty-five meetings of research workers to assess and promote this work. Since then, a network of WHO Collaborating Centres has taken over much of the coordinating burden, but international impetus is still required for cross-border collaboration in rabies surveillance and control, e.g. daily operations at the district level. It should be noted that the Commission of the European Communities (CEC), by providing substantial support in vaccine provision, has become an important source of programme support within and beyond its borders. Research associated with this development has influenced many other areas such as dog ecology, epidemiology in general, population sciences and programme management.

Similarly, towards the end of the 1960s the VPH unit arranged for comprehensive programmes of comparative virology, which at one time involved over 130 laboratories grouped into 15 teams specialised in various virus groups. Similar programmes were also conducted on comparative mycoplasmology, leukosis and comparative oncology, and influenza ecology.

The organisation of these research groups on a global basis gave an enormous boost to science and VPH itself. However, only some of these remained part of VPH in WHO. Several groups merged with other programmes or became independent scientific organisations such as the International Organisation for Mycoplasmology, or the World Committee for Comparative Leukaemia Research. The Programme on Comparative Virology was partly absorbed by the International Committee for Taxonomy of Viruses, although one WHO collaborating centre remained for information services in this field.

More recently, and as knowledge has accrued, additional international teams of scientists have been formed for rather specific aspects of disease prevention and control. Today thirty-four working groups are associated with WHO/VPH.

The most recent achievements of these teams would require a long list. However, reference may be made to a few of the most impressive results:

1968


1969

Large-scale field application of Rev. 1 brucellosis vaccine in sheep and goats in Mongolia. Initiation of world-wide networks for research in comparative virology and in animal mycoplasmology. Establishment of American rabies surveillance system.

1970

Effective application of single-shot vaccination in animals. Discovery of characterisation and significance of *Brucella canis*. Development of influenza virus reservoirs in avians, particularly ducks. Evidence of transmission of human pandemic influenza strain to pigs. Comparative studies of fourteen laboratories on *Salmonella* isolation technique.
1971


1972

Enzyme-linked immunosorbent assay (ELISA) test in rabies. Establishment of the role of mustelids in wildlife rabies reservoirs. Human vaccine against brucellosis prepared from purified protein fraction. Incidence of leptospirosis in sugar cane workers shown to be effectively reduced by rodent depopulation. Epidemiological evidence for the cause of Hong Kong influenza pandemic (1968-1971) as being genetic recombination of influenza viruses rather than mutation.

1973

Establishment of the model of annual turnover of fox populations in relation to rabies and rabies control. Identification of bait uptake pattern in foxes under field conditions. Establishment of the role of fever and artificial sunlight in congenital defects and lowering of resistance to infection in laboratory animals.

1974


1976-1981


1982-1987

Development and application of methodologies in the study of dog ecology in developing countries. Characterisation of ‘new’ bat lyssavirus (type 4) and studies on heterospecific immune response against this virus in persons receiving rabies vaccine (lyssavirus type 1). Evidence of avian influenza viruses causing outbreaks of severe disease in mammals — pigs, seals, mink and whales. Initiation of research network on animal production hygiene.

1988-1991

Establishment of the role of effective community participation in dog rabies control and comparison of strategies of vaccine delivery. New strategies of dog population

It is obvious that VPH, along with its development of technical guidance in disease control, encountered problems related to intersectoral and interdisciplinary cooperation and its broad area of management. Thus, VPH was forced to devote an increasing part of its resources to systems research in association with population veterinary medicine and epidemiology. This relates in particular to the following section.

**INTERACTION IN EDUCATION AND TRAINING**

Whereas education and training have always been a component of VPH, this area acquired an almost predominant position during the 1970s when the active cooperation of scientists world-wide revealed the enormous gaps and the difficulty in transferring knowledge and tools to the developing countries. Technology transfer has become particularly difficult as the majority of developing countries began to train their own academic specialists in their professional life and thus to provide personnel eager to apply their knowledge.

In the 1970s, international projects of technical cooperation with developing countries were a logical consequence of general international policies and trends. Most of these projects contained training components, though these were generally oriented towards specific training (e.g. in laboratory tools) rather than general veterinary education.

The 1980s were focused on the development of new policies for education and training for the veterinary profession as a whole. For this purpose, guidelines were prepared on many aspects of VPH from disease control and food hygiene to management and laboratory procedures. With the collaboration of FAO and the World Veterinary Association, VPH/WHO initiated surveys and promotion of continuing education in developing countries.

Just as anatomy and histology are essential for the understanding of an individual organism, so epidemiology, ethology and ecology are fundamental subjects for a new understanding of population veterinary medicine. VPH is currently involved in this development and is trying to build on the experience of the recent past in order to provide a new orientation for veterinary education.

These developments are closely related to other rising health professions, as discussed in the next section.

**INTERACTION IN DISEASE CONTROL PROGRAMMES**

The involvement of VPH in disease control provides a continuous record of impressive achievements. The interaction with a number of emerging, complementary and interacting disciplines has become a new challenge to the veterinary profession
and in particular to VPH. As was the case previously in the domain of husbandry (animal production and health), veterinarians have begun to feel the limits of their knowledge and skills in new, highly specialised areas and in the management of programmes. Such border areas of our discipline have rapidly been occupied by other disciplines.

In general, the interaction with other disciplines has conferred enormous advantages upon people and upon VPH. It has led to progress in fields such as environmental toxicology, animal population ecology, pharmacology, vaccinology and other new biotechnologies. It is important that veterinarians in these fields have remained at the ground level, i.e. acquiring new technologies but applying them to the fundamental tasks of veterinarians in animal production and health. Accordingly, VPH-oriented field programmes have profited greatly from this interdisciplinary challenge.

The 1970s may be seen as a period of new movement towards self-reliance and self-sufficiency in developing countries. Technical assistance projects occupied VPH to an increasing extent, and food hygiene had already become a predominant task. The number of meetings and achievements related to standardisation and harmonisation in food hygiene demonstrate the extended concept of VPH. The Codex Alimentarius and the international harmonisation of FAO and WHO activities are characteristic of the period.

**CONCLUSION**

Some VPH officers may draw somewhat different conclusions regarding food hygiene, as far as certain infectious diseases are concerned. It appears that the profession has become largely absorbed in the hygiene of food processing and final product safety, and grossly neglected the basic veterinary problems of food hygiene in animal production. Only the further observation of these developments will enable a correct assessment of the recent past. However, it seems that the majority of veterinary food hygienists have lost their direct association with animal production and slaughter hygiene. Obviously, negative developments in mass animal production and slaughter technologies at the expense of human health would otherwise not have been tolerated. Of course there are many exceptions to this self-criticism, particularly with respect to milk hygiene.

VPH is gradually overcoming this difficulty, and only the future will show whether or not we will be able to restore VPH to a position where its competence will be fully recognised. In the field of food hygiene, VPH appears to be in a period of rapid and vital transition. New efforts are under way in epidemiology and other aspects of population veterinary medicine. This, and increasingly lively discussion on ethical issues, should provide the veterinary profession with reasons for optimism.

Résumé : Pendant les deux premières décennies de son existence, l'Organisation Mondiale de la Santé (OMS) a mené une action vigoureuse pour mettre en place et développer les activités de santé publique vétérinaire (SPV). Au cours des années suivantes, ces activités se sont maintenues et même étendues à de nouveaux domaines. Ce développement se poursuivra sans doute dans le futur.

Le premier objectif était de démontrer l'importance et l'utilité de la profession vétérinaire pour la médecine générale et la santé publique. Les actions conjointes et la recherche coordonnée portant sur les zoonoses majeures, l'hygiène alimentaire et la médecine comparée, ont contribué à atteindre ce résultat ; c'est le cas également des programmes qui appliquent ces connaissances dans les pays membres, particulièrement les pays en développement qui représentent la vaste majorité de la population mondiale.

Dorénavant, la discipline de SPV devra prendre en compte les conditions sociales et économiques extrêmement mouvantes qui affectent la santé humaine et s'y adapter. La profession vétérinaire peut être d'un grand secours pour la santé humaine, et les structures de SPV offrent un cadre concret à cette action.


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Resumen: Durante las dos primeras décadas de su existencia, la Organización Mundial de la Salud (OMS) hizo esfuerzos intensos para la creación y el desarrollo de actividades de salud pública veterinaria (SPV). Estas actividades se mantuvieron y extendieron hacia nuevos sectores, y seguirán seguramente haciéndolo en el futuro.

El desafío inicial era demostrar la importancia y utilidad de la profesión veterinaria frente a los problemas de medicina humana y salud pública. Las acciones en colaboración e investigaciones coordinadas sobre zoonosis mayores, protección alimentaria y medicina comparada contribuyeron a cumplir con este objetivo, así como los programas que aplican estos conocimientos a los países miembros, en particular los países en desarrollo que representan la gran mayorìa de la población mundial.

La disciplina de salud pública veterinaria deberá ahora tomar en cuenta y adaptar sus esfuerzos a las condiciones socio-económicas de los países, cuya permanente mutación afecta la salud humana. La profesión veterinaria puede ayudar a mejorar la salud humana, y las estructuras de SPV ofrecen a esta vocación un canal concreto de acción.

REFERENCES

