History of the scientific relationships of veterinary public health

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Summary: The origin of veterinary public health (VPH), as the term is understood today, dates back to the late 1940s and early 1950s with the creation of new responsibilities and a broader range of career openings for veterinarians within some public health agencies, especially in disease intelligence aspects of the newly developing science of epidemiology. Other well-established scientific relationships of veterinary medicine to human health (e.g. food safety, pathogenic microbiology, comparative pathology) experienced renewed vigour as a result of these innovations, the latter also in connection with VPH-facilitated development and support of a new veterinary clinical practice specialty of laboratory animal biology and medicine. Through these expanded interprofessional and intersectoral communication, liaison and cooperation channels, new academic programmes arose within veterinary schools. These programmes brought a number of innovations to the world of veterinary medicine, including newly developed methodologies. A variety of new biomedical research career roles for veterinarians within both veterinary and other medically oriented institutions were identified and filled during this overall process. Also related to these developments was the identification of new roles for veterinarians in environmental science research and practice, beyond those traditionally associated with veterinary food hygiene. Proposals have since been made for significant new intersectoral functions for agriculture-based governmental Veterinary Services in connection with these new aspects of environmental science and with the aims of recent primary health care programmes within public health.

KEYWORDS: Comparative medicine - Disease management - Environmental monitoring - Epidemiology - Food safety - Intersectoral cooperation - Primary health care - Public health - Veterinary public health.

INTRODUCTION

This paper will consider briefly some historical aspects of scientific relationships between veterinary medicine and public health in modern times.

While the special umbrella term “veterinary public health” (VPH) originated within the Centers for Disease Control (CDC), then known as the “Communicable Disease Centers”, of the U.S. Public Health Service (USPHS) only in the late 1940s, and was adopted soon after by the newly formed World Health Organisation (WHO), a number of the scientific relationships it reflects or fosters began considerably earlier

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(7, 10, 19). Some of these relationships (e.g. pathogenic microbiology, food safety, comparative pathology) had seen significant development, chiefly within Europe, during the late nineteenth and early twentieth centuries, and then experienced periods of relative stagnation during and between the two world wars. In part, this developmental plateau reflected not only the redirection of priorities during the two global conflicts, but also the blows dealt to veterinary medicine in general by the success of the internal combustion engine, and the effects on agriculture of the worldwide economic depression of the late 1920s and 1930s.

There are, of course, other important applications of veterinary science to progress in human medicine and improvements in public health (these are summarised in Table I) which greatly pre-date these relatively modern events (7, 10). Tables I and II also indicate the ways in which these applications fitted into the historical evolution of veterinary concerns for public health once a separation emerged between veterinary practice and human medical practice.

However, the main intent here is to outline the development since World War II of some of the principal scientific consequences of VPH, and to identify some of the other scientific linkages between veterinary medicine and human health which are facilitated by VPH in its more modern guise. Most specifically, this will concern epidemiology, comparative biomedicine, environmental science and what shall be termed “disease management science”. The history of some broadly applied aspects of VPH technology (e.g. in food safety, zoonoses control and other specific action programmes), will be considered by D. Grossklaus et al. later in this issue.

The present concept of an interprofessional field of “veterinary public health” derives mostly from the visionary yet realistic perception of J.H. Steele, the first appointee to a new veterinary public health officer cadre created within the USPHS after World War II. Steele clearly saw the way in which overall veterinary capabilities and opportunities within public health agencies of government could be harnessed to create a profession much more broadly based than its veterinary food hygiene/sanitary police precursors. A similar role for veterinary medicine soon developed within the WHO under the guidance of M. Kaplan, who later was to become the veterinary profession’s preeminent international statesman. For a number of years after retiring from the WHO (where he had ultimately held a high administrative post under the Director General), Kaplan served as the Secretary General of the Pugwash Conferences of Science and World Affairs, a globally influential “think tank” of leading scientists. In both cases, the key to considerably expanded interprofessional relationships was the creation of varied career niches for suitably trained veterinarians within the USPHS and the WHO. (That is, veterinarians were no longer arbitrarily barred from public health department and ministry positions for which they were individually qualified. These were in addition, of course, to the main, much larger cadres of veterinarians located within the conventional Veterinary Services of the US Department of Agriculture and the UN Food and Agricultural Organisation.) This, in turn, reflected the prior acceptance and promotion within public health schools and agencies of an overall view of public health as necessarily a team enterprise. Had these initiatives not been taken inside public health organisations, the subsequent development of VPH would surely not have been possible.

These innovations in Washington and Geneva, closely linked to the post-war recognition by a number of American research physicians of the need for a specialty
<table>
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<tr>
<th>Type of interaction</th>
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<tr>
<td>Comparative clinical medicine</td>
<td>c. 200 BC – earliest distinctions between <em>iatros</em> and <em>hippiatros</em>; first century BC – Heraclides of Tarentum last important comparative healer-investigator in Alexandria</td>
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<td>Comparative anatomy</td>
<td>As basis for understanding internal human structure from early Egyptian civilisation until Galen in second century AD; break until resumed at Salerno in twelfth century; sole source until human dissections by De Luzzi in fourteenth century and Vesalius in sixteenth century</td>
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<tr>
<td>Comparative physiology</td>
<td>As basis for understanding human internal functions from early Egypt until Galen; interruption, then major resumption with Harvey in seventeenth century and until present day</td>
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<td>Comparative phatology (investigative medicine)</td>
<td>Results from some animal necropsies recorded in Hippocratic Corpus and in connection with equine practice in works of Apsyrtos of Nicomedia (fourth century AD) preserved in <em>Hippiatrika</em> (as compared to first human necropsy by Da Varigna in fourteenth century); major advances following establishment of first veterinary colleges in mid-eighteenth century and through the monumental aetiological discoveries of the Microbiological Revolution; relative stagnation until significant rebirth following World War II and creation of a field of laboratory animal biology and medicine and associated events</td>
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<td>Comparative population medicine (veterinary public health)</td>
<td>Clearly stated concepts of contagion with respect to animal diseases, and initiation of quarantine (and slaughter of ill minority to protect well majority) as intervention strategies in Rome from first century BC (comparable concepts in human medicine with Fracastoro in sixteenth century); meat (then milk) hygiene as a founding cornerstone of public health in the nineteenth century and up until World War I; relative stagnation in public health interactions through the end of World War II; then accelerated resumption with major veterinary inputs also into epidemiology, control of zoonoses and more generally</td>
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within veterinary practice to cover laboratory animals, fostered the beginnings of a significant modern rebirth of “one medicine”. This concept had been recognised only imperfectly and episodically by a small minority of medically-trained persons throughout history, and had been left to languish again after a significant renaissance at the onset of the “Microbiological Revolution”.

It has been the author’s privilege over the last few decades — through the three editions of Veterinary Medicine and Human Health (6, 10) and through the development of new academic and veterinary service delivery programmes — to work with numerous others in exploiting the potential of the “one medicine” approach to help achieve a better world.

**EPIDEMIOLOGY**

The evident complexities of man-animal relationships, animal economy and ecology and a comparative approach to medicine have all drawn the veterinarian towards more holistic and population-level perceptions of the causality and consequences of disease than most physicians experience in their own training and practice. Yet prior to the end of World War II, little recognition or advantage had been taken of these veterinary attributes.

For, indeed, once the implications of the Microbiological Revolution (Table II) had been reasonably understood and Koch’s postulates accepted as the means to demonstrate specific living agents as the necessary causes of many diseases, practitioners of both human and veterinary medicine, and the public, confidently sat back to enjoy the spectacle of the medical millennium. But, soon afterwards, carefully planned long-term studies on a wide range of infections — carried out by K.F. Meyer and a few other investigators equally adept in both field and laboratory work — demonstrated important exceptions, inconsistencies and other anomalies both in attempts to fulfil Koch’s postulates and, more importantly, in the sufficiency of specific agents as “causes” of disease within individuals and populations (Table II). With the systematisation of such findings — plus new theoretical insights, from J. Gordon, R. Dubos, E. Pavlovsky, R. Audy and a number of others — there arose a new theory of disease causality more holistically sufficient than one which relied solely on certain specific aetiological agents. This new theory, while fully embracing the necessity of living and non-living agents in the occurrence of many kinds of diseases, saw these agents as acting only in conjunction with other (sometimes indirect) causal factors of host, environmental and/or managemental origin, i.e. as part of an ecologically sufficient “web of causation”. This theory was initially summarised from a veterinary perspective by the author (6).

Finally, the extrapolation of such lines of causal thinking to cover non-infectious diseases as well — chiefly by J. Gordon at Harvard University — led to the full conceptualisation and rudimentary development of a new investigatory tactic of epidemiological diagnosis (Table II). J.H. Steele was a student of J. Gordon, and it was the author’s good fortune also to have been a student and research assistant of Gordon.

But this embryonic tactic of epidemiological diagnosis did not acquire major implications for medical research as a full complement to clinical diagnosis and
laboratory diagnosis, until it began to be linked meaningfully to new non-experimental study designs and biometric tools capable of evaluating the insights it produced. The set of biometric methods involved was borrowed partly from the social sciences, particularly through the efforts of another of Gordon’s students and his academic successor at Harvard, B. MacMahon.

Thus, while veterinary medicine contributed importantly to the early stages of this new conceptual understanding of disease causality, it remained the task of public health epidemiologists (in connection with studies on chronic degenerative and other presumably non-infectious diseases of people) to evolve an analytical methodology. This can be said to have commenced practically only in 1960, with the appearance of MacMahon, Pugh and Ipsen’s *Epidemiologic Methods* (4).

A number of veterinarians were soon involved in introducing this important new tactic in disease investigation to veterinary medicine. In 1962, I was asked to establish a Department of Epidemiology and Biostatistics in the School of Public Health of the American University of Beirut and, four years later, the first such department within a school of veterinary medicine, at the University of California at Davis. From the mid-1960s onwards, my colleagues and I attempted simply to forge closer links between these two newly-evolving sets of ideas and methods of research (the medical ecological and the quantitatively analytical) and the delivery of practical veterinary services. It was hoped that services delivery in agricultural veterinary practice could thus begin to extricate itself from its “discontinuity crises” (10, 11) both at the governmental level of disease control practice and at the individual farm level.

The key to success, we felt — and the sole original contribution of any real importance in what we attempted at Davis then — was the further melding of this combined approach to disease causality to a third new development which had emerged by then in population medicine, namely epidemiological surveillance (12), i.e. an ongoing multi-faceted system for producing “information for action”. (Although active field surveys — pioneered mostly by veterinarians — are key components of surveillance programmes, many older veterinarians still think, possibly because of the similarity of terms, that epidemiological surveillance is synonymous with surveys, which, of course, it is not.)

After the end of World War II, A. Langmuir and his medical and new veterinary colleagues in the CDC had put together the requisites for organised systems of surveillance as the basis for the traditional and quite limited demands of public health practice. But for many years these CDC efforts lacked any analytical epidemiological component. Consequently, in human medicine, these three streams of epidemiological progress remained, and still remain, fairly separated from one another. At Davis, we simply attempted to tie this more scientific type of field research to practice at the population level, something which had not been done before (9, 12). In these attempts, we began to define population-level veterinary practice as a kind of ongoing field-level research (10).

The main point to note, however, in this consideration of the science relationships of VPH is that it was the new post-World War II type of public health-oriented veterinarians who helped to develop the concept of a modern science of epidemiology, and subsequently to introduce it into other aspects of veterinary research and practice.

Hundreds of veterinarians who have obtained post-graduate training in epidemiology programmes now help to provide staff for governmental Veterinary
**TABLE II**

*Historical evolution of veterinary practice*

(3, 10)

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<th>Disciplinary matrix: shared beliefs/practices/structures</th>
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<tr>
<td>Phase</td>
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<tr>
<td><strong>Theory of disease causality</strong></td>
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<td>Healing magic</td>
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<tr>
<td><strong>Comparative medicine and local actions</strong> (3000 BC-200 BC)</td>
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<td>Equine medicine &amp; military (herd) actions (200 BC-1762 AD)</td>
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<td>Veterinary sanitary police (1762-1883)</td>
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<tr>
<td>Phase</td>
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<td><strong>Surveillance &amp; selective actions (1966-present)</strong></td>
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(a) Intrinsic factors (humoral imbalances) became the dominant theory of disease causality in human but not veterinary medicine. There was no comparable recognition of contagions in human medicine until the sixteenth century.

(b) Quarantine was not used as a disease intervention tactic in human medicine until the fifteenth century.
Services throughout the world and, in some places where a "critical mass" of such field epidemiologists exists, these Services are beginning to take bold new initiatives. From the University of California MPVM (Master of Preventive Veterinary Medicine) and PhD programmes alone, more than 600 veterinarians trained in quantitative epidemiology now serve in over 70 countries. The efforts of these and other individuals within governmental Veterinary Services are currently enabling the mass campaign infrastructures (Table II) of the last one hundred years to be replaced (along with their fragmented administrative structure and inherent discontinuity) by a readily sustainable and steadily improvable surveillance-based infrastructure. Specific disease campaigns and many other types of temporary programmes can then be grafted onto this new infrastructure as required, and discontinued when no longer needed. In addition to such efforts within the main agriculture-based veterinary services of a number of countries, many other veterinarians within the United States, who qualified as epidemiologists, have served within public health departments (e.g. as chief public health epidemiologists in thirteen of the fifty American states, as well as in a variety of other positions in public health epidemiology or related areas within both government and academia).

Other more general benefits of these recent developments of epidemiology within veterinary medicine include:

- far greater precision by veterinarians, especially by authors of papers, in the usage of terms expressing morbidity and mortality, in addition to their awareness of the need for denominators with such data (i.e. rates);
- much-improved conceptual and methodological understanding of how to make meaningful population-level inferences from small data sets, resulting from the introduction of controlled trials to replace uncontrolled trials and often erroneous inferences from proportional morbidity and mortality ratios (which, with case reports, comprised most of the clinical literature of medicine 25 years ago);
- a wider understanding and use of the case-control study format in clinical research;
- a better understanding by more researchers and disease control officials (but as yet very few clinicians) of the mathematical properties of serological and other diagnostic tests (especially the frequently poor definition of test specificity and the meaning and consequences of test predictability);
- the general recognition that disease incidence at the population level is determined not only by the action of specific agents but also by the interaction of host, environmental and management variables (11).

These advances each represent substantial gains resulting in a far more valuable literature and a better comprehension of medical realities and possibilities.

As more veterinarians are trained at higher levels in analytical epidemiology, and because of the wide range of opportunities to creatively explore the relationships of epidemiology to practice within veterinary medicine (in comparison to those within human medicine), in the future we can expect to see innovative leadership in evolving new approaches to population-level medical practice return, once again, largely into veterinary hands. For it is already true, as stated by L. Terry, former Surgeon General of the USPHS, that "we in the public health profession [...] owe to veterinarians, wholly or in generous measure, a number of basic ideas upon which our profession is built" (10).
COMPARATIVE BIOMEDICINE

Let us now consider other ways in which this expanded format for VPH (both within public health agencies and outside) has helped revitalise "one medicine" more generally since World War II, and what this might augur for the future. Within (and/or under the VPH auspices of) the WHO and the USPHS, other new career niches for suitably oriented and prepared veterinarians have been created in research and practice, and fresh opportunities for similarly productive veterinary inputs across a wide range of biomedical activities in other institutions and organisations have followed these VPH initiatives (10).

These events have mostly concerned two related avenues of interaction between human and veterinary medicine, one quite old (Table I) and the other only a few decades old, namely comparative pathological/medical research per se and the practice of laboratory animal medicine as a veterinary clinical specialty in support of research. The first of these interprofessional fields flourished during much of the nineteenth century, but afterwards experienced a pronounced hiatus (7, 10) especially in the interwar period, partly for the reasons already indicated.

This most recent breakdown was accompanied by a rapid loss of awareness among physicians trained after the Microbiological Revolution of the fact that, no matter who performs it, most research in the biomedical sciences lies — by definition — within the subfield of veterinary medicine. That is, we must distinguish clearly between the professions of veterinary medicine and human medicine and the subfields of veterinary medicine and human medicine (in which many non-veterinarians and many non-physicians, respectively, participate). Neglect of this obvious fact caused the chasm in effective research interaction between the two professions to again become very wide in some countries. Most journals where both medical professions had published together for several decades — with such titles as "comparative pathology" and "comparative medicine" — ceased to exist, along with international congresses with similar "one medicine" orientations.

At the same time most experimental research by physicians for the next 30 or so years reflected the "guinea pig era". This approach was characterised by a limited range of studies restricted almost entirely to (often very artificially) induced "replicas" of human diseases in the very narrow range of (not especially rationally selected) rodent species which could be readily housed in mostly urban laboratories (7, 10).

Problems due to concomitant diseases and other confounding variables were frequently encountered in such restricted research endeavours, prompting initiatives by some research physicians to stimulate formation of laboratory animal medicine as a veterinary practice specialty in support of biomedical research (10). Some of the most important initiatives in this field took place within the National Institutes of Health of the USPHS, as it availed itself of the potential afforded by its new veterinarian career cadre. At the same time, within a small number of medical schools, the few veterinarians already experienced with these kinds of animal subjects and problems were provided opportunities to initiate, with USPHS grant support, the first organised post-graduate education programmes in laboratory animal medicine (some also incorporating the concomitant training of veterinarians in various avenues of deliberately comparative medical research). The VPH unit of the WHO undertook to initiate and support similar efforts internationally. Thus VPH, as a public health
agency activity, also acted here as the catalyst for other scientific interactions of considerable breadth and importance.

However, with respect to knowledge about disease mechanisms \textit{per se}, the past extent of dependence of human medical progress upon animal medicine has been only partially as a result of the fact that, for ethical reasons, diseases cannot be induced in, nor other deliberate experiments carried out on people. As at the commencement of the Microbiological Revolution, direct observations upon a wide range of \textit{spontaneously occurring diseases} of diverse animal species provided an unprecedentedly varied natural laboratory in which nature's own experiments constantly take place – experiments which may be observed and learned from only by \textit{those trained and situated to do so} (7, 10).

Thus, this rapid creation of a field of laboratory animal biology and medicine within veterinary practice, supported in several important ways by the USPHS and the WHO, not only provided for the first time informed clinical and other support to medical research on conventional “laboratory animals”, but also reopened this additional interprofessional window which was needed to identify, from the vast natural laboratory of pathozoology, a wider and wider range of new, rationally-selected “animal models” for particular human diseases. These developments permitted a quantum leap in the efficacy and promise of much biomedical research, particularly on degenerative and other diseases of presumably non-infectious aetiology.

By 1972 these VPH-stimulated changes had already resulted in new career positions being created, within American colleges of human medicine alone, for 346 veterinarians (10). (While 160 of these veterinarians in the 111 American medical schools operating at the time were wholly or partially laboratory animal biology and medicine clinicians, the remaining 186 held other exclusively academic positions within a wide variety of medical school research and/or teaching programmes.) These changes also encouraged new forms of specialisation by research veterinarians in organ-system biomedicine, or other distinct areas, with their stated objectives as the furtherance of human or general medical knowledge, rather than solely veterinary medical knowledge. By virtue of the uniqueness of their motives, backgrounds and perceptions, these groups of veterinarians, and others, are also assuming an increasingly constructive mediating role vis-a-vis growing public concerns about animal welfare and the true dependence – far greater than publicly understood – of continuing medical progress upon animal observations and experiments (while, at the same time, seeking to find viable alternatives to experimental animal use wherever these can be envisaged) (10).

The exigencies and immediate consequences of World War II probably constituted the major initial impetus for the creative thinking which prompted some of these rational breaches of the previously-existing barriers between areas of professional “territory”, and of the attendant scientific isolationism which had been reconstructed during the interwar period. There are equally compelling reasons today for similarly enlightened interprofessional initiatives elsewhere, especially in poorer countries with very limited resources (5, 8, 13). A small but highly trained VPH cadre within public health agencies at national and local levels has shown itself – as within the WHO – to be an indispensable tool in communications and liaison, and in the initiation and support of progress in research, setting standards, and other activities (10). Such initiatives will be able to do even more in the future if they are more strongly promoted in a wider range of countries.
ENVIROMENTAL SCIENCE

In a similar way — also, largely under initial VPH auspices — new scientific links have been forged and revealed, since World War II, in health-related areas of environmental science extending far beyond the most wide-reaching demands of the traditional veterinary concern for food safety (10). In the United States, veterinary participation from within (or with the support of) the USPHS, has been appreciable in such areas as air pollution, radiological health, other agricultural and industrial hazards and space research. This was partly through the secondment of suitably trained and oriented public health service veterinary officers to other governmental branches such as the Environmental Protection Agency, the National Aeronautics and Space Administration (NASA) and the Department of Energy (10).

But the single area of environmental science with the most varied social implications is the biological monitoring of air, water and food-chain contamination by a wide range of actual or potential pollutants which may pose risks for human health. This form of biological monitoring deserves particular mention here although, so far, it has seen only scanty application, mainly as an unexpected offshoot of purely veterinary activities directed elsewhere. There is enormous potential for better organised intersectoral cooperation in this avenue of veterinary service which is closely linked to other VPH and purely veterinary activities.

Such multi-focus efforts within government livestock disease control agencies (which will also help to further other key veterinary and public health objectives) are merely awaiting more imaginative initiatives (10). These would strengthen livestock disease surveillance systems (including by securing additional unconventional, non-agricultural funding for them) while, at the same time, defining an important new environmental science role for agriculture-based and/or public health-based governmental Veterinary Services. This could mean considerably expanded roles for veterinarians working within abattoirs and creameries on veterinary food hygiene and epidemiological surveillance. Abattoir-based components of livestock disease surveillance systems (with animal traceback and analytical capacities) have yet to be fully implemented (partially for budgetary reasons), and organised systems have not yet been devised to effectively monitor the geographical distribution, concentration and biological uptake of pollutants (i.e. to identify and delineate their possible pathogenic consequences to people). Circumstances will inevitably prohibit direct monitoring of the human population.

Here again, as in research, animals can provide an indispensable surrogate for humans and have already served that role remarkably well (10), although in a completely unorganised fashion (it is usually only by chance that potentially dangerous environmental situations have been noted in this way). This dual use of livestock disease surveillance systems (for their original, and for this additional purpose) would merely require new relationships in government for intersectoral cooperation (IC) and funding.

Samples of animal blood are already being collected routinely from abattoir animals and bulk milk samples from creameries. Hair, bone and other tissues could also be collected more routinely from abattoirs and from carcasses of stray dogs and cats euthanised in municipal animal control shelters. See chapter 22 of Veterinary Medicine and Human Health for a detailed exposition of this subject (10). Some
samples already undergo examination, but usually simply to screen individual animals for human consumption, or to test for a range of purely animal health hazards. However, they could also be tested as indicators of environmental (air, water and vegetation) pollution hazardous to humans inhabiting the same areas as these animals. The development of such expanded monitoring systems could serve to open up new sources of government funding which could reinforce more immediate and traditional veterinary interests, while employing existing veterinary infrastructures to achieve vastly expanded social goals.

**DISEASE MANAGEMENT SCIENCE**

The main point to stress, again, is that VPH is inherently an intersectoral activity involving the interests and cooperation of more than one branch of government. Thus, a select veterinary public health officer cadre, as in the WHO, can open up and constantly enlarge a number of two-way liaison and communication channels. These channels have already demonstrated their indispensable worth to society in individual countries. For this reason, we should perhaps conclude this historical survey by looking at some other possibilities for intersectoral cooperation (IC) within what shall be termed, for want of a better name, “disease management science”.

Long before the formulation by the WHO of its current primary health care (PHC) approach, some international health planners had espoused the general virtues of IC for economic, scientific and/or logistic reasons. It was seen particularly as an expeditious way of promoting better knowledge and behaviour on health matters through existing channels of public communication and education, or sometimes through the participation of requisite but unconventional types of personnel. Funding authorities have also seen IC as a way of sharing the substantial capital costs for unspecialised physical facilities, e.g. warehouses.

But national health ministry administrators have almost always taken a narrow view of even such limited suggestions for intersectoral cooperation. IC has been seen by them as a “one way street” along which various “others” might be induced to further their PHC (or other) objectives, ignoring such potential advantages as health service assistance to socially valuable development programmes provided by other cooperating governmental services.

Yet, while some limited IC objectives are often broached — although seldom fully realised — for PHC (e.g. educational outreach), other more logical and creative aspects of cooperation in the health sphere have not even been suggested by most international, national or regional PHC planners. Some of these aspects have, however, been pointed to or advocated by other WHO and similar expert bodies (14, 15, 16, 17, 18, 19) as well as by individuals conversant with a spectrum of multi-sectoral needs and aware of the too-limited resources within each individual sector (8, 10). For example, as early as 1962 the WHO Expert Committee on Health Laboratory Services (15) was recommending medical-veterinary IC in all countries, including the sharing of facilities in diagnostic laboratories, especially rare specialist personnel, expensive equipment and other unique capabilities.
These and other new forms of cooperation between human health services and veterinary services form the most obvious and urgent of the many virtually overlooked potentials for IC in PHC in poorer countries – pastoral Africa, especially. Such opportunities exist in all countries but are especially needed today in the very poorest countries, including those predominantly pastoral countries which comprise most of the UN-designated Least Developed Countries (LDCs). Some of the most attractive of these IC opportunities have to do with cooperation in PHC delivery at the grassroots level (5, 13).

UNICEF and WHO envisaged the Expanded Programme of Immunisation (EPI) – adopted by the 27th World Health Assembly in 1974 – as an especially “high yield” initial focus (together, in some areas, with mass oral rehydration therapy) upon which other elements of PHC might then be grafted. One very important but completely overlooked fact in EPI efforts (especially those directed towards very remote but numerous pastoral populations) is that veterinary mass immunisation initiatives, which frequently pre-date EPI (e.g. JP-15, JP-28, Pan African Rinderpest Campaign), have already achieved the major educational goal of convincing millions of rural people, especially cattle-culture pastoralists, that immunisation per se is a useful and desirable thing. This had resulted in the widespread situation in pastoral Africa – pointed out almost two decades ago by British anthropologist J. Buxton (2) – that “[among African pastoralist Mandari] animals rather than humans [...] benefit most from any scientific medical treatment. Herders who have never visited a government dressing station, still less a hospital bring their cattle for inoculation”.

This pastoral community acceptance is an educational achievement which veterinary services could readily share to good advantage with health authorities through IC.

One of the greatest technical difficulties in establishing and maintaining EPI programmes, and parallel veterinary programmes, is the provision of properly functioning cold chains to keep heat-labile vaccines under adequate refrigeration, from the point of manufacture to administration in the field. This is a major PHC problem today even under some urban and most settled rural conditions – far easier situations than those involved in reaching pastoral populations. In Ghana, for example, it was noted in “a general appraisal of the [EPI] situation in 1983 [...] that vaccination was not being achieved on a wide scale because of failings in the cold chain at most of the stations, especially those in the [rural] northern parts of the country” (1).

In 1982 the WHO Expert Committee on Bacterial and Viral Zoonoses (8, 17) recommended that joint operation of difficult-to-maintain cold chains by health services and veterinary services be considered by many countries. Yet it appears that, to date, the only deliberate efforts to initiate this new and laudable form of IC have taken place in southern Sudan (13). Since 1984, a pre-existing and well-run provincial veterinary cold depot in Wau (capital of Bahr el Ghazal province), has been shared routinely with the provincial medical department. From this foundation, a locally-instigated instance of voluntary one-directional IC on the part of the Veterinary Services, UNICEF personnel negotiated an agreement on considerably extended cold chain IC between these two provincial departments (13).

The key to this successful initiative was the equal value of benefits to the programmes of both departments. Through this innovative agreement, which also concerned the future joint use of certain field personnel and additional facilities, as well as veterinary educational extension to pastoralists, EPI was able to extend beyond
the provincial capitals to the smaller district towns, and then on to the grass-roots "cattle camps", where most of the population of this vast area actually live. Veterinary Services had reached these scattered mobile peoples some years earlier with their own mass immunisation programmes promoted and assisted by the Organisation of African Unity (OAU), but public health authorities had never even attempted to do so.

In other words, in return for existing and extended veterinary cooperation in maintaining viable vaccines — and in reaching this pastoral population already desirous of cattle immunisation — the UNICEF/WHO-assisted EPI programme in Bahr el Ghazal province offered reciprocal assistance to the less well-financed veterinary programme in several practical ways, e.g.:

- use of a regular UNICEF plane service for transport of veterinary vaccines from Khartoum to Wau;
- maintenance services for laid-up veterinary four-wheel drive vehicles in another UNICEF-supported repair shop run by its provincial water project;
- repairs and assistance in maintenance of veterinary department district-level kerosene deep freezes (henceforth shared by EPI);
- EPI-supplied refrigeration and other equipment (including generators) to provide back-up to existing veterinary cold-chain equipment at all levels.

In each instance, this proferred reciprocity would help the veterinary department beyond some continuing or intermittent impasse to the successful conclusion of its own immunisation programmes.

Even under severe civil war conditions, vaccination IC implemented among Sudanese Mandari pastoralists near Juba (5) resulted in full immunisation of over 50% of pastoral Mandari children, a figure considerably in excess of the Sudanese national average achieved by EPI for the urban and rural populations during the entire life of the programme. At the same time, approximately 58% of Mandari cattle were immunised against rinderpest and contagious bovine pleuropneumonia (CBPP), a more than ten-fold increase in the overall level of about 5% success previously recorded for vaccination against CBPP throughout the whole Southern Region of the Sudan.

CONCLUSION

It is difficult to overestimate the full implications for human health and general well-being of the permanent world-wide establishment of this latest and largely VPH-instigated revival and expansion of "one medicine" at the population level of medical practice. This is especially true in view of the totally refreshing communications and liaison possibilities — the "two way window" and productive channels for fruitful interprofessional contacts and interactions — which VPH has been able to open up and foster within public health, medical research and veterinary organisations which have embraced its philosophy. On the veterinary side, VPH has stimulated a re-emergence from intellectual isolation, defined and demonstrated new professional possibilities in the social services and identified many new productive careers for veterinarians in health science. Unfortunately, the number of countries in which many
of the fruits of this exciting and valuable cross-professional and intersectoral redirection of efforts have been realised is still too small. In fact, there are some countries where they have yet to be explored. This is especially tragic in poorer countries, which are struggling to utilise very limited human and other resources most effectively, and where IC efforts (like VPH in general), are especially urgent both within government and elsewhere.

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HISTOIRE DES RELATIONS ENTRE LA SANTÉ PUBLIQUE VÉTÉRINAIRE ET LES AUTRES SCIENCES. – C.W. Schwabe.

Résumé: L'origine de la santé publique vétérinaire (SPV), dans l'acception actuelle du terme, remonte aux années 1945-1955 avec la création de nouvelles responsabilités et d'une diversification des débouchés offerts aux vétérinaires par les organismes de santé publique. Cette ouverture concerne notamment les aspects de la compréhension des maladies liés aux récents développements de l'épidémiologie. Des relations scientifiques entre la médecine vétérinaire et la santé humaine étaient déjà bien établies dans d'autres domaines, tels que l'hygiène alimentaire, la pathogénie microbienne et la pathologie comparée. Elles ont connu un regain d'intérêt à la suite des progrès réalisés dans chacun de ces domaines, la pathologie comparée bénéficiant à son tour des développements de la SPV et des apports des nouvelles spécialisations cliniques vétérinaires, en biologie et médecine des animaux de laboratoire. L'intensification des échanges interprofessionnels et intersectoriels ainsi que l'établissement de réseaux de liaison et de coopération, ont donné naissance à de nouveaux programmes de formation dans les écoles vétérinaires. Ces programmes ont apporté un certain nombre d'innovations en médecine vétérinaire, et permis de développer de nouvelles méthodologies. Ces changements ont permis d'identifier et de créer de nouveaux postes en recherche biomédicale pour les vétérinaires, au sein d'institutions vétérinaires ou médicales. Ils ont aussi permis de déterminer le rôle que peuvent jouer les vétérinaires dans les recherches et les actions liées à la protection de l'environnement, bien au-delà de celui qui les associait traditionnellement à l'hygiène alimentaire. Des propositions ont été avancées par la suite, dans le but de donner aux Services vétérinaires gouvernementaux des fonctions intersectorielles liées à ces nouveaux aspects des sciences de l'environnement et à la vocation des récents programmes de santé primaire au sein de la santé publique.


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HISTORIA DE LAS RELACIONES ENTRE SALUD PÚBLICA VETERINARIA Y LAS DEMÁS CIENCIAS. – C.W. Schwabe.

Resumen: La salud pública veterinaria, en el sentido actual del término, se origina en los años 1945-1955, cuando se crearon en los organismos de salud pública, nuevas responsabilidades para los médicos veterinarios y una diversificación
de sus posibilidades de carrera, especialmente en los aspectos que se refieren a la comprensión de las enfermedades, de la epidemiología, ciencia que se está desarrollando recientemente. Otras relaciones científicas existentes entre medicina veterinaria y salud pública (en particular, tratándose de protección de alimentos, de patogenia microbiana o de patología comparada), conocieron un renaciente impetu como consecuencia de estas innovaciones; este impetu está también relacionado con el desarrollo de la SPV y el apoyo brindado por una nueva especialización clínica veterinaria, en biología y medicina de animales de laboratorio. La ampliación de intercambios interprofesionales e intersectoriales, y de canales de cooperación y conexión, resultó en la creación de nuevos programas académicos en las escuelas de veterinaria, los cuales a su vez aportaron varias innovaciones al mundo de la medicina veterinaria, incluyendo nuevas metodologías. Ese proceso global permitió identificar y atribuir variados puestos de investigación biomédica para veterinarios, en instituciones veterinarias o médicas. También permitió determinar el papel que pueden asumir los veterinarios en las investigaciones y acciones relativas a la protección del medio ambiente, y que rebasan el que tradicionalmente los limitaba a la protección de alimentos. Seguidamente se hicieron propuestas para otorgar a los Servicios veterinarios gubernamentales del sector agrícola nuevas funciones intersectoriales en conexión con los últimos progresos de las ciencias ambientales y con los objetivos de los recientes programas de atención primaria de salud en el ámbito de la salud pública.


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REFERENCES


