History of veterinary public health in Europe in the 19th Century

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Summary: An account is given of early discoveries concerning the nature of diseases of animals. These discoveries laid the foundations for the development of veterinary public health services in Europe. Special reference is made to developments in Germany.

KEYWORDS: Europe - Germany - Public Health - Veterinary history - Veterinary services.

INTRODUCTION

In Baillière's Comprehensive Veterinary Dictionary (1), the term "public health" is defined as "the field of human medicine which is concerned with safeguarding and improving the physical, mental and social well-being of the community as a whole". The dictionary adds: "There are marginal roles for veterinarians in this service, especially in the area of zoonoses", also stating that "veterinary public health [is] the part played by veterinarians in human public health, resulting chiefly in the recognition and control of zoonotic diseases."

This paper will examine concisely, rather than comprehensively, events in the nineteenth century which influenced the development of veterinary public health (VPH), as defined above. Like every historical appraisal, this account is necessarily influenced by the subjective opinions of the author.

ROOTS OF VPH - ANCIENT AND MODERN

Recognition of the link between animal and human disease is, in essence, as old as civilisation itself. Even in ancient times, anthrax, for example, was recognised as a widespread threat, fatal for humans and animals. It was one of the seven plagues of Egypt recorded in the Old Testament of the Bible (Exodus 9:3 and 9:9) as follows: "Behold, the hand of the Lord is upon thy cattle which are in the field, upon the horses, the asses, the camels, the oxen and the sheep: there shall be a very grievous murrain", and: "It shall become a boil breaking forth with blains upon man and upon beast, throughout all the land of Egypt".


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However, it was not until much more recent times that significant efforts were made to research these links and to develop a concerted approach to identification, prevention and treatment.

In a speech commemorating the bicentenary of the death of Claude Bourgelat (1721-1779) — who, in 1762, founded the first veterinary school in the world — the French President of the time, Valéry Giscard d'Estaing, summarised the situation as follows: “The birth of veterinary science constituted a victory over traditional patterns of thinking. An outstanding vision and strength of character was required to promote such an initiative despite opposition” (2). Giscard also pointed out that veterinary medicine is one of the sciences which the world has France to thank for, and he called on veterinarians to meet the challenges of their increasing importance in the society of the future. This was not the first time that France had claimed this breakthrough: a postage stamp was issued in 1951 stating that France was the “cradle of veterinary medicine” (2, 3).

In 1765 Bourgelat founded a second veterinary school at Alfort, near Paris. The rulers and governments of other countries noted the opening of these two schools, and because they were desirous of researching and controlling the growing problem of animal diseases, other schools soon followed. A chronological list of schools founded in the pre-1850s “empirical period” of veterinary medicine has been compiled by von den Driesch (4).

INCREASED PREVALENCE OF DISEASE

The main reason for the greatly increased prevalence of animal diseases in the seventeenth and eighteenth centuries was the large number of wars fought during this period (9).

It is difficult, now, to comprehend the major role which these wars played in the spread of epizootics throughout Europe. Rinderpest, anthrax and swine erysipelas, in particular, destroyed populations of domestic animals, bringing agriculture to the verge of collapse on many occasions, and inflicting hunger on the people.

In the late eighteenth century, livestock losses from rinderpest, reported from Holland, East Friesland, Denmark and Hungary, increased considerably. The first inoculations against the disease were attempted at that time (9). Total losses of cattle in Europe during the eighteenth century have been estimated by Müssemeier at one hundred million (8).

In the nineteenth century, there were a great deal of hygiene risks due to a massive increase in population, migration from the country into towns and an increase in animal populations (9). The achievements of European scientists, which created the basis of our present public veterinary services, have been reflected in the absence of major epidemics and massive losses of animals since the beginning of the twentieth century. The last major pandemic occurred among the Napoleonic Army, which crossed into Russia at a strength of 600,000 men, and returned to France with only a few thousand. Only a small number had been killed in combat, the remainder died from hunger, cold and an unpredictable prevalence of typhus, dysentery and spotted fever (9).
CARCASS DISPOSAL AND HYGIENE

One of the most prominent threats to public health from animals in the nineteenth century was anthrax, which was particularly dangerous in view of its high contagiousness, incurring an exceptionally high mortality rate. The main reason for its spread was the lack of rapid, safe carcass disposal, because of the established practice of knackers (who removed and sold the skins from animal carcasses) and the lack of scientific knowledge. These factors meant that carcass disposal constituted a major problem for animal hygiene until fairly recent times.

The knackers' trade developed slowly and had an interesting and erratic history. The trade persisted in all countries — like the last vestiges of a medieval age — until the first legislation on the disposal of animal carcasses was introduced. For approximately two hundred years, knackers were accorded an inferior status, until adequately-equipped carcass disposal plants were developed. They were precluded from honorary office and segregated in inns; as late as 1800, the cups from which knackers drank in inns were kept chained to the wall. Their infamy derived from the substances they had to handle as well as the fact that many were also engaged as executioners, hangmen and torturers, professions which similarly branded them as outcasts.

Appropriately, the knackers' yards were located as far as possible outside towns. It was customary to abandon the skinned carcass to birds of prey and scavenging animals, until only the bones remained. This practice had appalling consequences; Nusshag (9) cites the knacker's yard at Montflaucon, near Paris, as a particularly bad example. Even in the middle of last century, the carcasses of some 10,000 horses and 30,000 small animals were being left out in the open every year. This provided food for hundreds of thousands of rats, and from time to time the horse carcasses had to be piled up and burnt.

Condemned material from slaughterhouses was merely tipped into open trenches, and the smell was so great that horses drawing knackers' carts refused to go near the places. It took a cholera epidemic in the middle of the nineteenth century to bring about change, although the old traditions persisted on a small scale in Germany until the 1920s in places which had no carcass disposal plant. Provided that the trenches were sufficiently deep and were not flooded with ground water, there could be no hygiene objection to the burying of animal carcasses. However, there were hygiene risks associated with unsupervised burial in inappropriate places.

The great poet Johann Wolfgang Goethe exercised the function of Minister of State under Grand Duke Carl August of Sachsen-Weimar-Eisenach, founding a small veterinary school at Jena, in 1816, which operated for thirty years (11). In December 1831, a few months before his death, Goethe issued instructions to those in charge of the Jena Veterinary School to the effect that special attention should be paid to the burial of anatomical specimens, to ensure that the trenches and gardens of the school did not become overfilled, and were filled in promptly to be replaced by a new burial place. From the instructions contained in this manuscript and from his tribute paid to the personnel of this institution in a Jena newspaper, one can see how deeply the poet was concerned about hygiene problems and carcass disposal in his capacity as an official of a small principality (11).
During the nineteenth century, abolition of the legal discrimination against knackers by city councils, recognition of full citizens' rights, the improved knowledge gained from microbiological research and the provision of facilities for processing animal carcasses, coupled with legislation for registration and supervision, created basic conditions for the development of VPH, i.e. components of zoonoses control, food hygiene and environmental health as well as animal protection and welfare.

ROLE OF ANTHRAX RESEARCH ON VPH IN EUROPE

The history of anthrax research shows that it was possible in the nineteenth century to create in Europe the basis for discovering the aetiology, transmission, pathogenesis and control of the disease through international scientific research in microbiology, epidemiology and animal hygiene. Collaboration between French and German veterinarians and doctors played a decisive part in this research.

Once the Prussian government had recognised the need for district and departmental veterinarians to have higher scientific training, young men who had completed their secondary school education were enabled to study veterinary medicine with the aid of handsome grants. C.J. Fuchs (1801-1871) was one of those who accepted the offer, and studied veterinary medicine in Berlin. After completing his studies, Fuchs spent three years as a practitioner in Zülpich, then served as district veterinarian for Schleiden (Aachen region), and finally returned to the Berlin school as a tutor.

During this latter period, he described how he had been called upon to deal with an anthrax outbreak near Berlin in 1842. He collected some blood from a cow which had just died from anthrax, and took the sample home to examine it the next day under a microscope. A striking feature was the large number of granulated threads which were not motile; there was no sign of life in the blood sample. Fuchs had evidently seen sporulated anthrax bacilli, but he did not grasp the significance of his discovery, and did not publish this until 1862, and then without any claim to priority. Since at that time spore formation by anthrax bacilli was still unknown (9), Fuchs was the first to see and describe it.

However, the kudos for discovering and publishing the first report of a causal agent of disease, Bacillus anthracis, went to Alois Pollender and Friedrich Brauell. Pollender (1800-1879) was a Public Health Officer in Wipperfurth near Cologne, and Brauell (1803-1883) was Professor of Veterinary Medicine in Dorpat (now Tartu, Estonia) and had previously been employed in Vilna (Vilnius) and Kazan.

Earlier, Eloy Barthelemy (1785-1851), of Alfort, had recorded anthrax infection in horses which had been fed anthrax specimens (12). Anthrax was also reported by the veterinarian Ellert in Sangerhausen, Thuringia, in 1836, to have been transmitted to sheep by the bite of a dog which had eaten meat taken from an anthrax carcass. In 1841 the district veterinarian Drosse reported that a knacker had died a few days after carrying on his back the skin of a cow which had died from anthrax. After these reports, there was no longer any doubt that anthrax was transmitted by a living organism.

The history of the detection of anthrax bacilli in the blood of animals exemplifies the rapid scientific progress in the mid-1800s. Three scientists detected the bacillus independently of each other: Pollender, Brauell and Delafond (13).
A veterinary assistant working with Brauell contracted fatal anthrax from opening an infected animal. A blood sample taken from the vena cava showed the presence of anthrax rods. This sample was capable of infecting several cattle, the blood of which also contained anthrax bacilli. This was the decisive fact and confirmation. Brauell subsequently became the first specialist in the bacteriology of infectious diseases.

In 1857, Brauell stated that finding the anthrax agent was an important diagnostic development, and the identification of bacteria could be recommended as an aid to the diagnosis of other infectious diseases (9).

The third research worker who participated in the discovery of the anthrax bacillus was Henri Mamert Onesime Delafond (1805-1861), Director of the Alfort Veterinary School. As early as 1843 he had written about anthrax, and he found the anthrax agent in the blood of a sick sheep on 15 August 1856, in the same year as Brauell. He tested his discovery and the diagnostic reliability of the presence of the agent on seventy naturally-infected and fifty-five experimentally-infected animals. In conducting this work, Delafond was the first to use rabbits as experimental animals.

Ignorance of the published literature combined with jealousy to fuel a controversy over priority for the discovery of the anthrax bacillus. The facts are that results of the work performed by Pollender in 1849 were published in 1855, while Brauell published in 1856, and Delafond in 1860 (10).

DEVELOPMENT OF DIAGNOSTIC TESTS AND IMMUNISATION PROCEDURES

The first pure culture of an infectious agent on artificial culture medium was obtained by Louis Pasteur (1822-1895). In 1861, he demonstrated that sterile fluid, or fluid rendered sterile by heating, remained free of organisms indefinitely if protected from subsequent contamination by micro-organisms. The infectious agent propagated by Pasteur on nutrient medium was the anthrax bacillus, which was impressive because of its size. Significantly, during the time of microbiological discoveries in the nineteenth century, it took the joint efforts of various disciplines (doctors, veterinarians and chemists) to acquire the basic knowledge about the course, symptoms and pathology of anthrax, as well as the nature and manipulation of the causal agent, and the treatment and control of the disease. This work provided the basis for the field of activity now known as VPH.

Another of the achievements made by Pasteur was the modification of the procedure for vaccinia inoculation against smallpox, developed a century earlier by E. Jenner (1749-1823). Pasteur used a strain of virus attenuated by passage in laboratory animals, and also applied the procedure to immunisation against rabies (7).

Pasteur also discovered the causal agents of malignant oedema, purulent wound infection (1878) and fowl cholera (1880) and obtained pure cultures of them, making these diseases available for scientific study. The liquid media employed by Pasteur failed to permit separate growth of individual bacteria inoculated into the media.
If the sample under test contained other, contaminating bacteria, mixed cultures resulted, and a pure culture of a given species was obtained only by chance.

It was Robert Koch (1843-1910), then District Doctor of Wollstein (Posen region), who mastered the preparation of pure cultures. His well-known work on anthrax was encouraged by the district veterinarian (1876). Koch used gelatin (liquid when warmed, solid when cooled) as culture medium. The specimen was inoculated into liquid gelatin, and the mixture poured onto a glass plate, covered with a bell jar. The causal agent grew within the solidified gelatin as individual colonies. Agar was introduced as a more efficient bacteriological culture medium by Angelina Hess in 1882. Koch’s glass plates were replaced by R.J. Petri with glass dishes covered by a flat glass lid, known henceforth as Petri dishes.

The staining of organic substances with aniline dyes, described by Weigert in 1877, was applied to bacterial staining by Koch. Paul Ehrlich (1854-1917) suggested fixing bacteria on glass slides, using heat to render them visible. Koch successfully applied this technique to research into the control of diseases of man and animals, and it played an important part in the discovery of the tubercle bacillus (acid-fast rods) in 1882.

In 1896 Pfeiffer discovered specific antibodies in laboratory animals inoculated with the cholera agent, and created the basis of serological diagnosis. Simultaneously, Gruber, Durham and Widal developed a serum test subsequently referred to as agglutination. This facilitated the successful diagnosis of infections and differentiation of bacteria. The technique was applied in veterinary medicine particularly for detecting glanders, pullorum disease and brucellosis.

Precipitation was discovered by Kraus in 1897, and was simplified by A. Ascoli to such an extent that practising veterinarians could use it to diagnose anthrax. Another aid was the development of a simple capsular stain for anthrax bacilli by A. Olt (1865-1955). Without these two procedures it would have been impossible to conduct the subsequent successful campaign against anthrax in Europe.

The complement fixation phenomenon discovered by Bordet and Gengou was applied by Wassermann in 1906 to the diagnosis of syphilis. By using graded amounts of complement, Schütz and Schubert (1908) developed a complement fixation test for glanders. The use of this test aided the eradication of the disease within a few years, and its use was extended to dourine and other infections.

In 1890 E. von Behring (1854-1917) and the Japanese Kitasato (1853-1931) discovered the presence of antitoxic protective substances in the blood of animals immunised against diphtheria ant tetanus. Such antitoxic serum had a therapeutic effect when inoculated into infected patients in sufficiently high doses. In healthy human beings and animals, the serum provided only brief protection.

In 1897 G. Lorenz (1845-1927), the provincial veterinarian in Hesse (Germany), developed the practice of simultaneous immunisation against swine erysipelas, which has also found application in human medicine. Lorenz’s method consisted of inoculating erysipelas immune serum, followed by live erysipelas bacteria. This double inoculation has also been applied to anthrax and some other animal diseases under the name “serovaccination”.

Clarification of the nature of infectious diseases in the nineteenth century opened the way to their effective control. Human and veterinary public health, as defined
today, owe their origin and effectiveness to the work of nineteenth century scientists, and it is worth recalling that the discovery of the causal agent of foot and mouth disease (FMD) in 1897 by F. Loeffler (1852-1915) and P. Frosch (1860-1928) opened a new era in microbiology, which still continues with research on viruses pathogenic for animals.

ROLE OF LEGISLATION IN VPH

At the time there were no universally valid laws or regulations in Europe for controlling animal diseases, although a few German provinces did have local legislation to avert disease risks associated with large concentrations of animals. The dangerous diseases of the time were mange and glanders in horses, and contagious bovine pleuropneumonia (CBPP) and advanced tuberculosis in cattle.

Even when state and provincial legislation for the control of diseases of animals became available, the local authorities had scanty resources to enforce it. Animal disease control in Prussia was elementary up to the end of the eighteenth century (6). The King issued regulations or "letters patent" for controlling diseases of animals, and the local authorities issued "rescripts" (decrees). In 1806 these covered rabies, anthrax, rinderpest, CBPP and pox diseases. Between 1820 and 1840, regulations concerning FMD, equine mange and dourine were introduced.

Control of animal diseases was the responsibility of doctors employed by the "health police". Once the veterinary schools began to produce graduates, their practice was confined to curative tasks. Not until 1817 did the Prussian government employ a few veterinarians for official, but very restricted duties. A Royal Order of 13 July 1817 created the Institute of Prussian District Veterinarians. There was considerable resistance to the establishment of a veterinary authority. Not until 1905 was a veterinary authority established in Prussia, with provision of pensions and care of dependants. The situation developed in a similar way in other German States, such as Bavaria and Württemberg (6).

Once the government realised that no state assistance could be provided without thorough research into the nature of animal diseases, professorships of Veterinary Medicine were introduced in the Universities. However, the actual instruction was provided by teachers from other disciplines. Many years passed before veterinary schools were founded.

GROWTH OF VETERINARY SERVICES AND SCHOOLS

In 1929, Froehner (5) published an interesting account of the history of veterinary services in Prussia. The course of events applies in general to Europe as a whole, if national divergences are overlooked.

Up to the end of the eighteenth century, a tentative form of animal disease control existed in Prussia, partly under central and partly under provincial administration, and based upon intuition. The many edicts and instructions for disease control remained largely ineffective. There was no mention of veterinarians in these official documents.
During a second period, which lasted until 1840 (6), there was a progressive "veterinary police", but it had no links with the Institute of Prussian District Veterinarians, once this had been established. The first modern animal disease legislation (6) was a Prussian letter patent and instruction dated 2 April 1803 against rinderpest, for it contains the term "Viehartz" (cattle doctor), although only in the list of persons obliged to notify disease. In subsequent orders concerning animal disease control, there was still no mention of veterinarians. According to the Prussian regulation of 8 August 1835, rabies was to be dealt with by the district doctor, while the veterinarian was entrusted only with the care of animals bitten by rabid dogs. In the case of anthrax, the official veterinarian had no part to play in diagnosis.

The third period of animal disease control in Prussia commenced in 1869 (6), when there was a decisive change in the specification of official veterinarians for supervising cattle markets and border crossings, and for the detection and control of animal diseases occurring inland. However, the official doctor was still entrusted with duties for the control of animal diseases.

In the fourth stage of development in Prussia, which lasted until the beginning of the twentieth century (6), two important laws were passed: the Rinderpest Law of 9 June 1869, and the Prussian Animal Disease Law of 25 June 1875. These specified that upon receiving a report of disease, the police were to summon a competent veterinarian, and to inform the official veterinarian.

In most of the veterinary schools, veterinary police measures were taught from the very beginning (from 1821 in the case of Berlin). Particularly active in this field was Friedrich Müssemeier (1876-1957), who produced a splendid book in the year of his death (8) on animal disease control in Germany. This presents the results of long and comprehensive experience in veterinary legislation and veterinary police measures, as head of the veterinary administration of the Prussian Ministry of Agriculture.

In his brilliant and concise account of the veterinary profession and its origins, Kitt (7) stated that the greatest results were achieved by applying the techniques of discovery and investigation developed by Pasteur in France and by Koch, Ehrlich, von Behring and Schaudinn in Germany, who laid the foundations for medical science and present-day bacteriology, protozoology and serology. While Kitt placed the emphasis on these events, the influence of other events within each country should not be underestimated.

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Editorial note

In many countries, special training and post-graduate education, including examinations, have been instituted during the twentieth century for veterinarians entering civil services with executive functions. The following is given as an example for the United Kingdom:

Approval for a Diploma in Veterinary State Medicine, which included duties now known as VPH, was gained by the Royal College of Veterinary Surgeons in 1913, and regulations for the new diploma were published in 1915. Candidates were required to have been exercising for at least six months the duties of veterinary inspection in
the administration of a State Department, County Council, Municipality or Urban Authority employing one or more full-time veterinary officers. They had to pass written and oral examinations. However, because of the First World War, the first diploma was not granted until 1920. This diploma is now known as the Diploma in VPH (Meat Hygiene).

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HISTOIRE DE LA SANTÉ PUBLIQUE VÉTÉRINAIRE EN EUROPE AU XIXᵉ SIÉCLE. – W. Schönherr.

Résumé: L’auteur expose les premières découvertes concernant la nature de certaines maladies animales. Ces découvertes ont été à l’origine du développement ultérieur des Services de santé publique vétérinaire en Europe. L’auteur traite plus particulièrement de ce développement en Allemagne.

MOTS-CLÉS : Allemagne - Europe - Histoire de la médecine vétérinaire - Santé publique - Services vétérinaires.

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HISTORIA DE LA SALUD PÚBLICA VETERINARIA EN EUROPA EN EL SIGLO XIX. – W. Schönherr.

Resumen: El autor expone los primeros descubrimientos relativos a la naturaleza de las enfermedades de los animales. Estos descubrimientos establecieron las bases del desarrollo ulterior de los Servicios de salud pública veterinaria en Europa. El autor trata más específicamente de este desarrollo en Alemania.

PALABRAS CLAVE: Alemania - Europa - Historia de la medicina veterinaria - Salud pública - Servicios veterinarios.

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REFERENCES


