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Early methods for the surveillance and control of glanders in Europe *

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Summary: *From the many existing documents on the history of glanders, it is possible to detail the practical measures adopted for disease surveillance and control from antiquity until the 19th century, principally in European countries.*

Surveillance is based on clinical diagnosis, post-mortem examination, animal inoculation and knowledge of the conditions under which infection occurred: aetiology, pathogenesis, susceptible species, virulent material, mode of infection, incubation period, etc. The historical data are assembled and compared, with comments on each of these points.

Control is based on the application of general disease control measures and attempts at vaccination and treatment. A study of these procedures enables a comparison of their efficacy and a description of the major steps in their implementation.

KEYWORDS: Disease control – Europe – Glanders – History – Horse diseases – Surveillance – Zoonoses.

INTRODUCTION

Glanders is one of the diseases of horses for which we possess abundant information from ancient times. This is due to the high mortality of glanders in this species, which was of crucial economic and military importance until the start of the 20th century, and the risk of transmission of the disease to human beings. As in previous articles on diseases of animals (2, 3, 4), the author does not intend to rewrite this history, but to examine the most interesting technical and scientific aspects.

This account is confined to an analysis of the methods used by different populations, over the course of time, to recognise horses affected by glanders and to prevent the occurrence and spread of the disease. This analysis will reveal convergences and divergences of opinion on these topics at different stages in history.

This study will be limited to former methods of surveillance and control, prior to the 20th century, when glanders practically disappeared except in some African and Asian countries.

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SURVEILLANCE OF GLANDERS

Surveillance of a disease of animals cannot be accomplished without a **knowledge of diagnosis and the conditions under which infection occurs**: aetiology, pathogenesis, susceptible species, infective material, incubation period, etc. Surveillance also requires a **notification and alerting system** when an epidemic occurs. These aspects were all taken into consideration in the case of glanders and will be examined individually.

Diagnosis of glanders

Naturally, this consists mainly of clinical diagnosis of the disease, although reference will also be made to methods used for post-mortem and laboratory diagnosis.

Clinical diagnosis

The earliest information on clinical diagnosis of glanders comes from Greco-Roman antiquity. It was not until the 17th century that the disease was described with precision in Europe; earlier, according to Reynal, the only valuable information on diseases of animals was collated by monks who studied the ancient literature (14).

Aristotle (384-322 BC) seems to be the first writer to have described glanders, in donkeys, in his *Historia animalium* (VIII, 25): 'The disease originates in the region of the head, and a thick and reddish discharge comes from the nostrils' (11, 17).

Subsequent descriptions were provided in the *Hippiatrika* of Apsyrte (4th century) and Hierocles (5th century), and by Vegetius (5th century). Apsyrte distinguished acute and chronic forms of glanders, differing in contagiousness (14). This significant distinction was repeated 1,400 years later, and led to serious errors (see below). Vegetius described more precisely seven clinical forms of *malleus*, all of which occurred in cattle, except for the sixth form (*malleus subcutaneus*), which may have been cutaneous equine glanders. Vegetius regarded this form as very contagious (1, 11).

In the 14th century, Arab authors described a disease of horses (*kould*), which actually comprised three distinct conditions: glanders, adenitis (strangles) and epizootic lymphangitis (10). In 1682, Jacques Labessie de Solleysel gave a detailed description of the pulmonary form of the disease. However, he believed that the cutaneous form (farcy) was a different disease, although very similar, stating that farcy was a 'first cousin' of glanders (13). More than a century passed before the Danish veterinarians Abildgaard and Viborg recognised that the pulmonary and cutaneous forms were both manifestations of glanders, the infectiousness of which was demonstrated by Viborg in 1797. Meanwhile, other accounts of the disease had been provided by E.G. Lafosse (1749), a French farrier, and his son P.E. Lafosse, a veterinarian (1792). Both unfortunately supported the idea that certain forms of 'falsely-named' (i.e. chronic) glanders were not contagious (see below). The Director of the newly-founded Veterinary School at Alfort, Professor Chabert, also provided an excellent description of glanders in 1782, initially claiming the disease to be infectious (17) and later denying this (19).

Post-mortem diagnosis

Descriptions of the post-mortem lesions of glanders were often provided at the same time as those of lesions observed in the living animal. Clinical descriptions of different forms of the disease provided in *Hippiatrika* (see above) included visceral, articular and cutaneous lesions. The same applied in the following century, when observers variously separated or united the lesions which they found in the upper respiratory tract, lungs,

kidneys or skin: i.e. adenitis, lymphangitis or ulceration. Some likened glanders to syphilis, while others located the seat of the disease in the nose, brain, spinal cord, etc. (19). There was no genuine scientific study of the lesions until the 19th century. Much was written about the disease by French and German pathological anatomists, such as Dupuy (1829) and Hausmann (1831). In 1840, Rayer published in his new journal *Archives de médecine comparée* a statement that the nodular lesions of glanders and tuberculosis were quite different (19). Krutzer and Dittrich (1851) continued this work, while asserting that glanders and tuberculosis were similar, until Virchow (1854) distinguished glanders nodules from those of syphilis and tuberculosis, but unfortunately confused them with granulomatous tumours (10). In 1881, Rabe published a detailed account of the various localisations of glanders lesions on mucous membranes and skin (13).

Experimental diagnosis and reproduction of the disease

Discovery of the causal agent of glanders by Löffler and Schütz (1882), the preparation of mallein by Helman in St Petersburg (1890), and the use of mallein by Kalning in an intradermal diagnostic test (1891) opened the way to experimental diagnosis (8, 10, 13). Previously, the only procedure which can be considered as experimental diagnosis was the inoculation of suspect nasal discharge into laboratory animals. For a long time, the chosen species was the dog (proposed by Galtier) and later the guinea-pig (8, 12). However, these inoculations for diagnostic purposes were preceded by experimental reproduction of the disease in other species. Thus, according to Viborg (1797), glanders was transmissible by direct contact with glanders pus, which resulted in purulent ulcers of mucous membranes and glanderous inflammation of the lungs, while inoculation of pus onto the skin surface resulted in farcy (13). Many others confirmed these findings, notably Galtier and Dupuy, but some gave credence to the failure of Godin (1815) to transmit the disease and denied its contagiousness (13). Between 1825 and 1835, two totally opposed concepts vied for attention: that of the 'contagionists' (led by the Lyons Veterinary School in France, Youatts and Percival in Britain, and Volpi in Italy) and those who held glanders to be of spontaneous origin. The latter, following the theories of Lafosse (senior and junior) and then of Vial de Saint Bel, were led in France by several teachers at the Alfort school (Bouley, Delafond, Renault), in Germany by Hering and Bruckmüller, in Italy by Ercolani, etc. (13). In 1837 a French physician, Rayer, definitively demonstrated the contagious nature of human glanders for horses, having been persuaded with others (e.g. Elliotson, Osiander, Schilling, Vogeli) by the initial experiments of Travers and Coleman in 1826 (10). By inoculating a healthy horse with pus from a groom with glanders, Rayer showed that the disease developed in the inoculated animal, which subsequently died (13, 18). This demonstration, which was strongly contested at first by colleagues at the *Académie française de médecine*, marked a major turning point in the history of the fight against glanders. Later, and before the discovery of the glanders bacillus, suspect discharges were inoculated into horses to detect glanders: in positive cases, such 'autoinoculated' animals reacted by developing a characteristic ulcerative lesion at the point of subcutaneous injection (9). Not until the discovery of the glanders bacillus was it possible to distinguish this lesion from that of 'pseudo-glanders' (melioidosis), which produces crossed serological reactions in the complement fixation test.

Conditions of infection

This section will include, in somewhat arbitrary order, all the information available in historical texts which, at the time, established the conditions (aetiology, pathogenesis, susceptible species, virulent material, mode of infection, incubation period, etc.) under which glanders occurred.

Aetiology and pathogenesis

Before the discovery of the glanders bacillus, *Pseudomonas mallei*, a wide range of theories had been propounded concerning the causes of this disease.

In Greece, Apsyrte and Hierocles believed that glanders resulted from corruption of the air (*aeris corruptio*) and the absence of a gall bladder in horses (12)! According to Apsyrte, the lack of a gall bladder resulted in an excess flow of bile into arteries on either side of the spine – producing a harmful moistness which affected the spinal cord – and thence to the brain (9). In the Middle Ages, glanders was attributed to various extrinsic factors, such as fatigue, hunger, thirst, insect bites and frustrated sexual desires (10). In 1664, Solleysel mentioned for the first time, in his book *Le parfait mareschal*, a venom (of glanders) which could be transmitted over a short distance to infect, by contaminating the air, all animals living under the same roof (20). In 1782 and 1783, Chabert and Vitet (see below) regarded glanders as contagious. In 1797, Viborg confirmed the transmissible nature of the disease, stating that the cause was a contagious poison, the nature of which was unknown (13). This perspicacity contrasted with the confusion which still reigned in the middle of the 19th century, despite the demonstration in 1826 that glanders was inoculable. Many authorities at the Alfort school, still convinced of the spontaneous nature of glanders, attributed a complex aetiology to the disease. According to Renault, there was resorption of pus by the body, or 'metastatic pyaemia'. Bouley believed that the body was exhausted by poor hygiene associated with excessive work, while Chabert wrote that glanders was not contagious, but arose from individual predisposition, inadequate feeding, poor working and housing conditions, etc. (19). This uncertainty was reflected in the *Eléments de pathologie vétérinaire* (Alfort, 1828) by Professor Vatel, which stated that glanders was a 'nasal phthisis' and queried the contagious nature of the disease. Vatel recommended precautions to ensure that healthy horses did not come into contact with sick animals. Ravitch, in 1862, attributed glanders lesions to venous and lymphatic thrombosis (13). Virchow, in 1863, believed that a neoplastic process led to granuloma formation (which he confused with glanders lesions) due to horses inhaling an 'acrid and irritant agent'. Among German authors, Leisering was perhaps the closest to the truth when he stated in 1862 that glanders developed under the influence of a direct contagion carried by inspired air. Finally, Chauveau (1866) suspected the special nature of the glanders 'poison', fourteen years before the causal bacterium was isolated (17).

Susceptible species

Glanders attacks mainly solipeds (horses, donkeys, mules) but many other species, including human beings, are naturally susceptible. Glanders was perhaps the sixth plague of Egypt, described as follows in the Old Testament Book of Exodus (Chapter 9, verse 9): '*Erunt enim in hominibus et jumentis ulcera et vesicae turgentes; facta que sunt ulcera vesicarum turgentium in hominibus et jumentis*' ['it shall be a boil breaking forth with blains upon man, and upon beast']. This may be true, although other authors have suggested that this may be a description of smallpox, ulcers, anthrax or myiasis (warbles) (1).

Farriers of Byzantium recognised the specific susceptibility of solipeds and human beings, but proof of transmissibility between the two types of species was not provided until much later. The contagious nature of glanders was supported particularly by the Lyons school: this was taught by Gronier in his *materia medica* course (1814). In 1816, Gohier provided experimental proof of the transmission of acute glanders (5). In 1820, the veterinarian Jean Hameau reported to the *Société de Médecine* the case of a young

colleague who died of glanders after removing pus from the nose of a horse (20). This contagiousness for human beings of horses with glanders was confirmed, during the same period, in Austria, France (Lorin) and Germany (Schilling). Reverse transmission was demonstrated experimentally by Travers and Coleman (1826), and Rayer (1837; see above). In 1863, Saint Cyr of the Lyons school provided experimental evidence of the transmissibility of chronic glanders (5).

After this demonstration, the work of 'contagionists', which had been momentarily disturbed by those advocating a spontaneous origin, finally overshadowed the latter with the demonstration of the susceptibility to experimental inoculation of rabbits, guinea-pigs, goats, sheep, cats, dogs, etc. Galtier (1897) concluded that glanders was maintained and spread by solipeds, with the acute form occurring in donkeys, acute or subacute forms in mules and (usually) the chronic form in horses (8).

The contagiousness of glanders for human beings, which was denied by the Alfort school and by numerous military veterinarians educated there, had disastrous consequences for horse breeding (8, 13), resulting in the 'finest collections of glanderous and farcinous subjects imaginable', according to Tabourin (19). This error also proved fatal for several French veterinarians. The most famous victim was Vial de Saint Bel, Director of the Equitation School at Lyons and founder, in 1791, of the Royal Veterinary College in London under the name of Vial de Sainbel or Professor Sanbel. He became infected and died of glanders on 18 August 1793, having maintained throughout his career that the disease was not contagious (18, 20). Benoist, a fourth-year student at Alfort, died in 1836 (Fig. 1), Coindet in 1844, Richard in 1866, Dezoteux in 1877, etc. These deaths were reported to the French Government from 1844 onwards. On 10 June 1844, Arago stated before the Chamber of Deputies (which was debating closure of the Lyons Veterinary School) that if the conclusions of Professor Gohier of Lyons had been made public, fatal cases of human glanders could have been averted.

Virulent material and mode of infection

While the *Hippiatrika* of the 4th and 5th centuries recognised the contagiousness of glanderous animals and recommended that they be segregated, these authorities provided very little information on the nature of virulent materials and merely invoked 'corruption of the air' (12). However, Vegetius considered that – in addition to affected animals – buildings, pastures and drinking troughs could be sources of contagion (11). These ideas were repeated during the centuries which followed. In 1250 Jordanus Ruffus (also known as Giordano Rufo), Marshal of the Royal Household of Frederick II, reaffirmed the contagiousness of glanders, citing Arab and Roman texts (20). However, he failed to make a connexion between the disease in horses and that in knights returning from the Crusades: some of these knights, who had drunk the blood of glanderous horses or had eaten the meat of their carcasses, died covered with ulcers (10). In 1682, Solleysel confirmed and supplemented these observations when he wrote that glanders was more easily communicable than any other disease, because not only did horses in close proximity to an affected horse develop the disease, but the air became corrupt and was capable of communicating the disease to all those under the same roof (13). The Lyons physician, Louis Vitet, in the second volume of his *Médecine vétérinaire* published in 1783, reaffirmed the contagiousness of glanders and farcy by stating that glanders was most contagious in hot stables, when a large number of horses was brought together. It was sufficient for a man, dog or other animal to touch a glanderous horse in order to subsequently communicate glanders to healthy horses. The air alone was capable of transmitting glanders over a certain distance. In 1797, the work of Viborg clearly

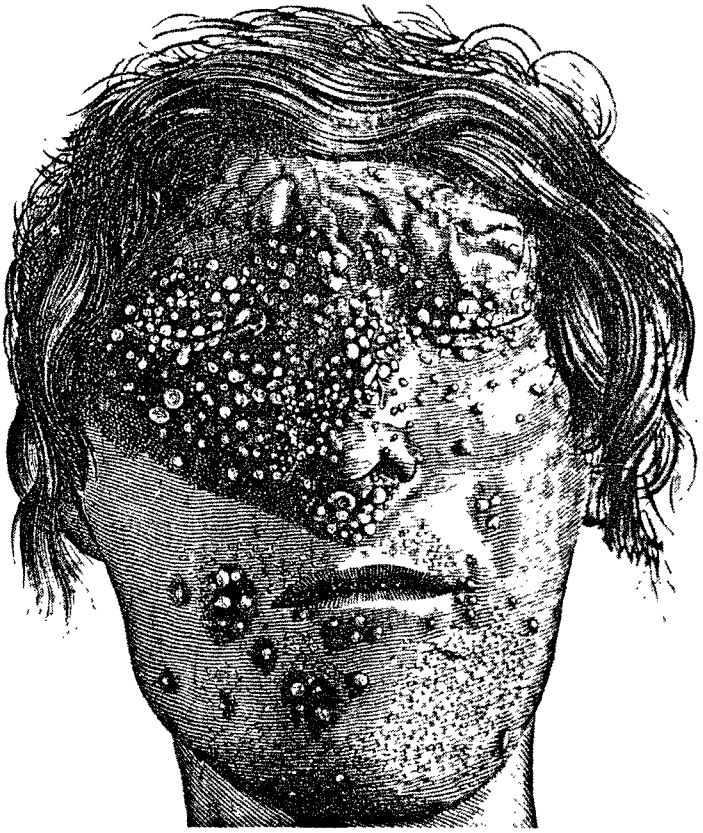

FIG. 1

Student of the Alfort Veterinary School who died of glanders in 1836

(Reproduced from *Des miasmes aux virus*, by J. Theodorides [17])

demonstrated the nature of the virulent material: glanderous pus. Contact with a healthy animal led to the appearance of mucosal ulcers and pulmonary glanders, and farcy was produced when pus was inoculated onto the skin surface. Viborg also reported that saliva, mixed with nasal mucus within the pharynx, could be virulent (8). Under natural conditions, the contagion took place through transpiration and through the intermediary of manure, harnesses, fodder waste and straw left in the manger (13). Gaspard de Saulnier also believed that virulent material could be carried by harnesses, coverings, mangers and hay racks (13). In 1813, Gohier recommended to his students that after treating the nasal passages of a glanderous horse, they should wash their hands before treating a healthy horse (19). Meat was also suspect, and a decree of the Council of State of the King of France (16 July 1784) prohibited the sale of meat from horses slaughtered because of glanders (6). Coleman, followed by Renault, succeeded in transmitting glanders to donkeys and horses by inoculating blood from an animal with glanders (8, 19).

Incubation period

Considering the many uncertainties about the contagiousness of glanders, it is understandable that information on the incubation period of the disease was rare and inadequate. This lack is further complicated by the very early distinction between acute and chronic forms, and by the belief that either form could change into the other over the course of time. Bouley tried to reconcile the theories of contagion and spontaneous generation (8). Viborg (1797) gave some indication of the incubation period by recommending that a horse which had apparently recovered should not mix with other horses for six months. Another indication of the generally acknowledged incubation period can be deduced from the duration of observation of animals exposed to infection. In France, the observation period was set at two months by a regulation of 1882 (implementing a law dated 21 July 1881), extending to a year in the case of animals with symptoms or reacting to mallein. This period was similar in most European countries, except for the Netherlands, where it was only 30 days (13). However, according to Galtier (1897), the incubation period actually varied between 2 and 12 days, and the exaggerated figure of 30 days arose from the difficulty in recognising early symptoms (8).

Systems for reporting or alerting

There seems to have been no recommendations in antiquity for reporting glanders as such.

In France, a decree dated 16 July 1784 consolidated earlier decrees. The first Article of this decree rendered compulsory the reporting to the local authority of any case of contagious disease (anthrax, mange, sheep pox, rabies, **glanders** and **farcy**), failure being punished by a fine of 500 livres (6). Hence both forms of the disease, glanders and farcy, were regarded as contagious. To enforce the decree, Article 10 encouraged potential informers by offering them one third of the fine imposed on the contravenor, plus a 'sum proportional to the merit of the denouncement' (4)!

CONTROL OF GLANDERS

As mentioned in previous articles (2, 3, 4), detailed research on the aetiology of infectious diseases had to await the development of microbiology. However, at no time has there been any obstacle to proposals for effective means of protection against such diseases. It is therefore of special interest to examine the measures proposed in the case of a disease as old as glanders.

The two conventional approaches to preventing contagious diseases (hygienic and medical) are outlined below, followed by a consideration of treatment methods.

General disease control measures

These measures involve hygienic precautions aimed at eliminating the causal agent.

General hygiene

In ancient times, the belief that contagion was transmitted by 'corruption of the air' presupposed that healthy animals would be exempt. This idea found support in the fact that some cases of glanders recovered spontaneously. The situation was

summarised by Galtier (1897) as follows: 'It is known that certain diseases in animals can be overcome solely by the reaction of the organism, particularly when the animals are kept in good hygienic conditions, at rest and **inhaling pure air**, etc.' (8).

Segregation of animals

From the early centuries of the Christian era, Apsyrte and then Vegetius, aware of the contagiousness of glanders, recommended the segregation of affected animals (17). This recommendation was not always sufficiently understood, notably by Jordanus Ruffus (see above) who, in 1250, advised putting glanderous horses to graze with others 'in order to get rid of their discharges' (20)! By contrast, Solleysel (1664) ordered the segregation of sick animals from the earliest signs of the disease and forbade these animals to use the same drinking trough as healthy horses (20). This wise advice was taken up in Europe in the 18th century, notably in France by the decree of 16 July 1784, Article 4 of which compelled owners to mark and segregate animals affected, or suspected of being affected, with glanders, while Article 7 prohibited the sale or display for sale of such animals. Viborg (1797) recommended that horses should not be admitted to stables for six months following recovery from glanders (see above), and drew attention to the high contagiousness of occult forms of the disease (13). However, such prudent recommendations were not officially adopted until the indecision concerning the contagious nature of the disease, which prevailed between 1825 and 1892, was finally resolved. The main source of contagion was identified in Belgium as horses lodged in public stables by horse dealers; the latter were careful to mask any nasal discharge. Attempts made to stop this practice were not successful until 1860 (12).

Quarantine

There seems to have been no provision, in the period under study, for quarantine of horses to prevent the introduction of glanders into a country. Nevertheless, animals showing symptoms of glanders were usually slaughtered upon arrival in Europe (in France under the decree of 21 July 1881) and suspect animals were placed 'under surveillance' for two months (6).

Destruction of reservoirs and vectors

Because solipeds seemed to be the sole reservoir and vector of glanders, these were the object of slaughter arrangements initiated in the 18th century, notably in Luxemburg by order of Emperor Charles VI. This Order of 22 August 1730, confirmed on 10 June 1778, requested all officials and justices in towns and villages to seek out glanderous horses and have them put to death without being skinned, burying them four feet deep in the earth (19). In Lyons in 1782, Vitet (see above) proposed that affected horses be killed and buried deeply under well-packed clay to avert contagion. Vitet clearly anticipated the reticence of horse breeders leading to difficulties in international collaboration to control the disease, when he wrote: 'All things considered, it seems to me that, to destroy the glanders virus, all nations should agree to destroy at the same time all glanderous horses, and horses suspected of being infected. Such a project will be difficult to implement because owners of glanderous horses will attempt to avoid a death warrant'. Definitive official arrangements were not made until the following century, when nearly all European countries complied: Austria (Law of 20 February 1880), Belgium (15 September 1883), Denmark (14 April 1893), France (21 July 1881), Germany (23 June 1880), Great Britain (26 September 1892), the Netherlands (20 May 1890), Romania (27 May 1882), Sweden

(23 September 1887), etc. (13). The invention of mallein in 1890 facilitated and accelerated procedures for the slaughter of infected animals. In the Mezöhegyes region of Hungary alone, 20,000 horses were killed (10).

Destruction of virulent materials

In ancient times, glanders was attributed to corruption of the air and no preventive measures seemed to be possible, except the destruction of carcasses considered to be the source of this 'corruption'. For this reason, during an invasion by Hun horsemen, Vegetius recommended that horses which died from the disease be buried in a special place, access to which was subsequently barred (8, 11). In the 18th century, more information was gained on the modes of contagion. The 1730 Order of Emperor Charles VI (see above) specified that infected stables should be dressed with quicklime, and that mangers and hay racks used by glanderous horses be burnt (19). Viborg (1797) stated that the 'contagious poison' which he held to be responsible for glanders could be destroyed by drying or heating to 64-65°C, and recommended that hot water be used for disinfecting stables (13).

Annulment of sale

As early as 2000 BC in the Hammurabi Code, annulment of sale due to illness was prescribed in the case of slaves ('male or female, if affected by an infirmity during the month after purchase'). This was probably also a condition for the sale of horses, provisions for which were made in the same Code, and then in contracts adopted by the Egyptians (7). The practice was also established in Ancient Greece, for Dion Chrysostome stated that, according to Athenian law, 'a vendor was liable to take back a sick horse' (11). Similarly, the Justinian Code applied the same rules to trade in both horses and slaves. Earlier texts were assembled in 710 in *De jumentis vendundis*, which specified that those who sold horses were obliged to declare any diseases in the animals, and the vendor was compelled to annul the sale or offer a reduction in price (*quanti minoris*) (11): '*morbi antem vitiive causa inemptis faciendis in sex mensibus, vel quo minoris cum venirent fuerint, in anno judicium dabimus*' ['In the case of illness or other defect, for a period of six months following sale, the dealer may be forced to take back the horses or, within one year after sale, to return monies received in excess of the true value of the horses at the time of sale']. However, no list of diseases leading to annulment was specified in this law, although diseases of slaves were listed.

The Celtic laws of Wales (published for the last time in the year 940) provided for a guarantee period of three months in the case of the horse disease accompanied by nasal discharge (*yzgyfaint*) (11). Later, most European laws considered that any contagious disease of animals could annul a sale, and three such diseases were specifically incorporated into the French law of 20 May 1838: glanders and farcy (in horses, donkeys and mules); and sheep pox (14).

Medical prophylaxis

Once again, it is in ancient times that the most detailed preventive 'recipes' may be found. Those of Theomnestes in the year 450 were of remarkable precision: 'towards 14 April, when the animals have passed a day at pasture, insufflate into the nostrils with the aid of a small reed the following mixture, pulverised and passed through a fine sieve: one ounce of root of live oak, pepper and origanum, mixed in equal parts, and a half ounce of iris leaves and wild cucumber. Hold the head up for half an hour and then

untether the horse to graze for 3 days, so that all "humour" which has accumulated in the head during winter shall be evacuated. In this way, the animals will not develop *malleus*' (16).

Subsequent preventive remedies were also based on a mixture of plants. Up to the end of the 19th century, horses which had been in contact with glanderous horses were protected by fumigation of boiled mallow and by setons inserted into the chest (19). It was not until the glanders bacillus was isolated in 1882 that the first attempts at vaccination could be made. Various procedures were tried without success: vaccination of horses with a strain of bacillus attenuated by successive passages in cats (Sacharoff), vaccination of dogs by inoculation of repeated small doses of the bacilli (Strauss), vaccination of rabbits by repeated injections of live bacilli or sterilised cultures (Finger), etc.

These failures, together with the failure of mallein injection (Nocard, Schindelka) could be explained, according to Galtier, by the re-inoculable and auto-inoculable nature of glanders (8). Subsequent experiments to protect horses with serum from immunised cattle gave unsatisfactory results (8). When attempts at vaccination eventually began to succeed, these experiments were abandoned because they induced a positive reaction to the mallein test, which necessitated slaughter of the animal.

Treatment

'The treatment of *malleus* in horses and other pack animals having an undivided hoof by means of fumigations is an ancient invention' according to Apsyrte, writing in the 4th century. Apsyrte advised that a horse with signs of pulmonary involvement should be made to inhale origanum vapour, particularly mountain origanum, once daily for three days, and no longer. The head of the animal was covered with a cloth and was maintained above a new earthenware pot in which the aromatic plant was being burnt over a charcoal fire. This pharmaceutical form of dry fumigation was continued by Pelagone and Hierocles. The latter also took the precaution of covering the eyes, to prevent irritation by the fumes (16).

Apsyrte also recommended treating *malleus* by subcutaneous insertion of a 'troche' (an irritant foreign body which provoked a fixation abscess), even specifying the weight of the irritant agent (hellebore) to be introduced under the chest skin; this weight was expressed in Egyptian 'staters', indicating (according to Sevilla) that Apsyrte had adopted the recommendation of earlier writers (16). Arab writers of the 14th century treated the various forms of *kould* (including glanders) by cauterising the lesions. In the Middle Ages in Europe, special prayers and incantations ('Morth-Segen') were used in attempts to prevent the disease. Surgical excision or cauterisation of lesions was also practised, as well as castration, bleeding, etc. (10). In 1149, the Abbess of Bingen, Saint Hildegarde, treated diseases of horses and donkeys by prayer but also specified, in her two books *Physica* and *Causae et curae*, the treating of 'nasal discharge with cough' by applying nettle leaves (10, 11). No subsequent suggestions for treating glanders were recorded until the 18th century. The treatment proposed by Ernsting (of Brunswick) based on seeds of *Philandrium aquaticum* (fennel) was rejected by Lafosse (senior) in 1749 as ineffective. The latter recommended opening the nasal cavities, a method taken up by Bartlet in 1754 and Brogniez in 1849 (15, 19). In 1765, Bourgelat, under pressure from his superiors, examined the value of a secret electuary advocated by Baron Von Sind, Master of the Horse to the Elector of Cologne. An experiment was conducted by housing eight treated and eight untreated horses on either side of eight sick animals. The results were evidently negative (or, according to Gronier, the experiment was never

done) because they were not published. Viborg accused the Baron Von Sind of a scientific fraud (19).

In the 19th century, the concept of spontaneous origin encouraged veterinarians to try more sophisticated treatments, which (according to Mammerickx) gave useless results and merely favoured the survival of dangerous animals (12).

By the end of the century, treatment of glanders was prohibited in favour of slaughter and carcass destruction (French Law of 12 July 1881). Nevertheless, a number of veterinarians could not resist the temptation to treat the disease, and Professor Galtier of the Lyons veterinary school stated in 1897 that, because it seemed that affected horses could recover spontaneously or with the aid of appropriate treatment, it was appropriate to summarise the results obtained, particularly by intratracheal administration of 5-30 g of iodine-iodate solution (recommended by Levi and Neiman), phenol or thymol (recommended by Brusasco), etc. (8). Among the treatments regarded as effective by Galtier was subcutaneous injection of phenol plus mercurial compounds (Sokoloff), or creosote oil (Nourry, Michel), and particularly mallein injections (Helman, Semmer, Itzkovitch, Pilavios, Johne, Schindelka, etc.).

CONCLUSION

As stated in the Introduction, the amount of attention directed to diseases of horses in general, and to glanders in particular, reflects the importance of horses throughout the history of humanity. This attention resulted in steps taken towards surveillance and control, particularly those wisely specified in the Byzantine era. Why, then, did certain equestrian experts in the 18th and 19th centuries, and some of their veterinary successors, become blind to the point of denying the contagious nature of glanders for horses and human beings? Was this due to the difficulty of diagnosing the disease because of the two clinical forms, acute and chronic? Or was it due to violent passions which accompanied debates between 'scholars', leading to entrenched and dogmatic attitudes? Both reasons probably concurred in greatly retarding the knowledge of glanders, and the development of effective measures against the disease. Whatever the reason, this unhappy course of circumstances had severe consequences for horse breeding and for the economy of many countries, and condemned many persons to one of the most cruel forms of death.

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LES ANCIENNES MÉTHODES DE SURVEILLANCE ET DE CONTRÔLE DE LA MORVE EN EUROPE *. – J. Blancou.

Résumé *: A partir des nombreux documents existants sur l'histoire de la morve, il est possible de décrire avec précision quelles ont été, de l'Antiquité au XIX^e^ siècle, les modalités pratiques de surveillance et de contrôle de cette affection, principalement dans les pays européens.*

La surveillance est basée sur un diagnostic clinique, nécropsique et expérimental de la maladie ainsi que sur la connaissance des conditions de l'infection : étiologie, pathogénie, espèces sensibles, matières virulentes, mode de contagion, durée d'incubation, etc. Les données historiques sont rassemblées, comparées et commentées pour chacun de ces points.

Le contrôle est fondé sur l'application des mesures de prophylaxie sanitaires ou médicales : tentatives de vaccination et de traitement. L'étude de ces méthodes permet de comparer leur efficacité et de décrire les grandes étapes de leur mise en œuvre.

MOTS-CLÉS : Contrôle – Europe – Histoire – Maladies du cheval – Morve – Surveillance – Zoonoses.

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LOS ANTIGUOS MÉTODOS DE VIGILANCIA Y CONTROL DEL MUERMO EN EUROPA. – J. Blancou.

Resumen*: En base a la numerosa documentación existente sobre la historia del muermo, se pueden describir las modalidades prácticas de vigilancia y control de la enfermedad, desde la Antigüedad hasta el siglo XIX, principalmente en los países europeos.*

La vigilancia se basa en el diagnóstico clínico, postmortem y experimental de la enfermedad, así como en un conocimiento de las condiciones de la infección: etiología, patogenia, especies susceptibles, material virulento, modo de contagio, período de incubación, etc. Los datos históricos relativos a cada uno de estos aspectos son expuestos, comparados y comentados.

El control se fundamenta en las medidas sanitarias o médicas de prevención: se trata de los ensayos de vacunación o de tratamiento. El examen de estos métodos permite comparar su eficacia y describir las principales etapas de su implementación.

PALABRAS CLAVE: Control – Enfermedades del caballo – Europa – Historia – Muermo – Vigilancia – Zoonosis.

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REFERENCES

1. BELITZ W. (1927). – Wiederkäuer und ihre Krankheiten im Altertum. *Veterinärhistorisches Jahrbuch*, **3**, 1-128.
2. BLANCOU J. (1994). – Early methods for the surveillance and control of rabies in animals. *In* Early methods of animal disease control. *Rev. sci. tech. Off. int. Epiz.*, **13** (2), 361-372.
3. BLANCOU J. (1994). – Les anciennes méthodes de surveillance et de contrôle de la tuberculose animale. *Rec. Méd. vét.*, **145** (2), 89-95.
4. BLANCOU J. (1994). – Les anciennes méthodes de surveillance et de contrôle de la peste bovine. *Rev. Elev. Méd. vét. Pays trop.*, **145** (in press).
5. BOST J. (1992). – Lyon, berceau des sciences vétérinaires. Editions lyonnaises d'art et d'histoire, Lyons, 220 pp.
6. CONTE A. (1895). – Police sanitaire des animaux. Baillière & fils, Paris, 508 pp.
7. FROEHNER F. (1924 & 1925). – Haustiere im mittelalterlichen Gerichtsverfahren. *Veterinärhistorische Mitteilungen*, **4**, 43-44; **5**, 5-7; **5**, 9-11.
8. GALTIER M.V. (1897). – Traité des maladies contagieuses et de la police sanitaire des animaux domestiques, 3rd Ed. Asselin & Houzeau, Paris, 1,280 pp.
9. GAUTHIER A. (1884). – Histoire de la médecine vétérinaire dans l'Antiquité. *In* Histoire de la médecine (M.J.F. Hecker, ed.). *Rec. Méd. vét. prat.*, **28**, 592-616.
10. KARASSZON D. (1988). – A concise history of veterinary medicine. Akadémiai Kiadó, Budapest, 458 pp.
11. LECLAINCHE E. (1936). – Histoire de la médecine vétérinaire. Office du Livre, Toulouse, 812 pp.
12. MAMMERICKX M. (1967). – Histoire de la médecine vétérinaire belge. Mémoire de l'Académie royale de médecine de Belgique, II^{e} série *in-8°*, tome V, n° 4. Académie royale de médecine de Belgique, Brussels, 283-284.
13. NOCARD E. & LECLAINCHE E. (1898). – Les maladies microbiennes des animaux, 2nd Ed. Masson & Cie, Paris, 956 pp.
14. REYNAL J. (1873). – Traité de la police sanitaire des animaux domestiques. Asselin, Paris, 1,012 pp.
15. RUCKEBUSCH Y. (1982). – An historical profile of veterinary pharmacology and therapeutics, *J. vet. Pharmacol. Therap.*, **5**, 1-20.
16. SEVILLA H.J. (1936). – Notes d'histoire sur l'Art vétérinaire antique. Les formes pharmaceutiques des hippiatres grecs. *Rec. Méd. vét.*, **112**, 535-551.
17. THEODORIDES J. (1991). – Des miasmes aux virus – Histoire des maladies infectieuses. Editions Louis Pariente, Paris, 377 pp.
18. THEODORIDES J. (1991). – Un grand médecin : Pierre-François Olive Rayer (1793-1867) pionnier de l'étude des zoonoses et fondateur de la pathologie comparée. *Bull. Acad. Vét. de France*, **64**, 93-100.
19. THEVES G. (1993). – La morve au Luxembourg et ailleurs, du XVIII^{e} siècle à la fin du XIX^{e} siècle, ou le cheminement ardu des idées sur une maladie animale et humaine. *Ann. Méd. vét.*, **137**, 469-481.
20. WILKINSON L. (1992). – Animals and disease. An introduction to the history of comparative medicine. Cambridge University Press, Cambridge, New York, Port Chester, Melbourne & Sydney, 272 pp.