

GLANDERS: MEDICINE AND VETERINARY MEDICINE IN COMMON PURSUIT OF A CONTAGIOUS DISEASE

by

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TODAY, GLANDERS is a disease rarely heard of in Western Europe, Britain, and North America; but a hundred years ago the annual total of cases of glanders in the horse, published by the Board of Agriculture, exceeded 2,000,¹ and British veterinarians were all too familiar with the disease. Moreover, transmission to man took place with distressing regularity, and the outcome was nearly always fatal.² In 1908, William Hunting, Chief Veterinary Inspector to the London County Council, wrote: "Glanders in man is such a loathsome and fatal disease as to deserve more attention than it receives. . . . If the medical profession called for the suppression of glanders as loudly as they did for the extermination of rabies, prevention in all animals would be accelerated. Hydrophobia in man ceased when we had stamped out rabies in dogs, and glanders in man will only cease when the disease no longer exists among horses".³

Historically, the juxtaposition with rabies is apt. Over the centuries the number of animals of the equine species, and of men, whether infected naturally or in the laboratory, killed by glanders have probably equalled or even outweighed those who have succumbed to rabies. In times of war, from the Middle Ages onwards and as late as World War I,⁴ losses of horses through glanders in the armed forces of all nations must have been always an important and influential factor.⁵ Yet in historical terms the literature on rabies is copious, while glanders has remained very much a neglected subject. Whereas the drama and unpredictability surrounding the clinical manifestations of rabies have frequently attracted the attention of medical and lay historians alike, glanders has remained ignored by most historians even in the context of the

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¹ John M'Fadyean, 'Glanders: The Harben Lectures for 1904, I, II and III', *J. State Med.*, 1905, 13: 1–18; 65–78; 125–135; see p. 125.

² The Registrar-General reported 78 deaths during the twenty years between 1883 and 1902. *Ibid.*, p. 134.

³ William Hunting, *Glanders: a clinical treatise*, London, H. & W. Brown, 1908.

⁴ Serious outbreaks among army remounts during World War I were reported from South Africa, Canada, Persia, Russia, etc.; see L. J. Blenkinsop and J. W. Rainey (editors), *History of the Great War based on official documents: veterinary services*, London, HMSO, 1925.

⁵ In his 'preface', E. G. Lafosse wrote in *Traité sur le véritable siège de la morve des chevaux, et les moyens d'y remédier*, Paris, David & Gonichon, 1749: "It is a well established fact that the great and terrible ravages of glanders are found in the armies; it is certain that during all the wars under which Europe has laboured for 200 years, a very considerable number of horses has been lost through this disease."

major wars of the past.⁶ Nevertheless, there can be little doubt that losses through glanders in all the major wars in Europe and elsewhere, from the Crusades and throughout the troubled Middle Ages,⁷ must have been considerable, and a factor to be reckoned with by the warring nations; but the practical difficulties preventing retrospective exploration of its effects are self-evident.

However, the history of glanders and its bibliography is worth a second glance for other reasons. During the eighteenth century it reflected not only the ideas, old and new, which the century of the Enlightenment brought to bear on infectious disease problems in general; but it can also serve to illustrate important facets of many events which in one way or another influenced the early development of veterinary education on the European continent and in the British Isles. This development continued uninterrupted throughout the nineteenth century; but from 1820 onwards, the glanders literature reflects a major new departure and the rise of an entirely new discipline, made possible by the growing interest in veterinary science and its interrelationship with medicine. The nineteenth century saw the tremendous advance of a comparative medicine of infectious disease, which by the end of the century had not only yielded factual knowledge of a number of disease agents, but also spawned such secondary but no less important related concepts as natural and acquired immunity, vaccines, and toxins and anti-toxins.

A major stumbling-block in any historical treatment of glanders is the difficulty of diagnosis. In man, its clinical presentation has been easily confused with a number of other diseases, prominent among them tuberculosis and pyaemia.⁸ Even in horses diagnosis, before the advent of the mallein test,⁹ was difficult in all but the most acute cases. It is perhaps not surprising that in previous centuries reputable authors frequently described a number of varieties of glanders of which only one (if that) was true glanders, thus lending an air of authority to the general confusion.¹⁰ Confusion there was. Caused by *Pseudomonas mallei*,¹¹ the disease exists in a subcutaneous form

⁶ William H. McNeill, in *Plagues and peoples*, Oxford, Basil Blackwell, 1977, while primarily interested in the epidemics of humankind, finds room to discuss in passing some zoonotics, among them rabies and rinderpest, but remains silent on glanders.

⁷ Smithcors has pointed out that the routes of the Crusades may have been responsible for the early emergence of veterinary literature in Italy. J. F. Smithcors, *Evolution of the veterinary art*, Kansas City, Missouri, Veterinary Medicine Publishing Company, 1957, p. 130.

⁸ This may also account for the fact that the transmissibility of glanders to man was discovered only belatedly, and not generally accepted until well into the nineteenth century.

⁹ The mallein test was developed in the 1890s after Kalning in Riga and Helmann in Dorpat, and Leonard Pearson in the United States prepared mallein in 1890, after the pattern of Koch's tuberculin. See [-] Schneidemühl, 'Ueber die frühzeitige Erkennung der Tuberculose und des Rotzes bei Thieren durch Tuberkulin-bezw. Mallein-Injectionen', *Dt. med. Wschr.*, 1891, 17: 1260–1262, see p. 1261; and W. E. Jennings, 'Glanders' in *Diseases transmitted from animals to man*, compiled and edited by Thomas G. Hull, Springfield, Ill., C. C. Thomas, 1963, p. 265. According to Saunders (op. cit., note 126 below), Kalning worked in Dorpat and Helmann in St. Petersburg at the time.

¹⁰ In addition to tuberculosis and pyaemia, glanders has also over the centuries been frequently confused with ozaena and strangles, see F. Smith, *The early history of veterinary literature and its British development*, vol. I, 1919; reprinted London, J. A. Allen, 1976.

¹¹ After the bacillus was first described in 1882, it has suffered a number of changes of nomenclature and classification, from *Bacillus mallei* via the genera of *Actinobacillus*, *Pfeifferella*, *Malleomyces*, *Loefflerella*, and *Acinetobacter* to its present position as *Pseudomonas mallei*. See T. J. Mackie and J. E. M'Cartney (editors), *Medical microbiology*, 13th ed., Edinburgh, Churchill Livingstone, 1978, p. 343; and G. S. Wilson

(farcy) and a pulmonary form (glanders). Their common aetiology was first demonstrated at the end of the eighteenth century by E. Viborg,¹² who was able to show that inoculation with matter from farcy buds could induce glanders in horses and asses. But if we take the comparison with rabies back to the earliest surviving descriptions of animal disease, we find that Aristotle, that mainstay of early and incomplete descriptions, probably described, equally incompletely, both rabies and glanders. His remarks on rabies have been quoted, if not *ad nauseam*, at least at tediously regular intervals.¹³ In the same book¹⁴ Aristotle wrote of a disease of the equine species: “The ass suffers chiefly from one particular disease which they call ‘melis’. It arrives first in the head, and a clammy humour runs down the nostrils, thick and red; if it stays in the head the animal may recover, but if it descends into the lungs the animal will die. . . .” This has been generally regarded as the first surviving description of glanders.¹⁵ In the Latin versions of subsequent authors “melis” became “malleus” and as such eventually a generic term for epizootics. Vegetius¹⁶ in the fifth century used it of epizootic diseases of both cattle and horses; among the seven varieties of malleus in the equine species mentioned by Vegetius, veterinary historians have identified *morbus humidus* with glanders and *morbus farcimosus* with farcy.¹⁷

Apsyrtus, whose letters to friends, veterinarians, and military officers were written in the third century and later included in the *Hippiatrica* manuscripts compiled in Byzantium during the tenth century,¹⁸ described four kinds of “malis” of equines. What he called the “dry” variety may well have been farcy; as for glanders, opinions have differed as to whether it should be identified with the “moist” or the “articular” “malis” described by Apsyrtus.¹⁹

If such probings of the fragments remaining of the works of classical authors serve to illustrate the uncertainty of terminology and retrospective diagnosis rather than to provide unequivocal information, the evidence would seem to favour the view that

and A. Miles, *Topley and Wilson's Principles of bacteriology, virology and immunity*, 6th ed., vols. 1 and 2, Frome and London, Edward Arnold, 1975, pp. 814, 821.

¹² Erik Viborg, ‘Kort Efterretning om Snive, Hestekopper og Qvaerke, oplyst ved nyere anstillede Forsøg, med disse Sygdoms-Smitter’, *Phys. oecon. med. chir. Bibliothek for Danmark og Norge*, 1795, 4: 113–161; 211–258; 6: 313–361.

¹³ See, for example, *Med. Hist.*, 1977, 21: p. 17.

¹⁴ J. A. Smith and W. D. Ross (editors), *The works of Aristotle, translated into English*, 11 vols., Oxford, Clarendon Press, 1908–31; vol. IV, *Historia animalium*, by D’Arcy Wentworth Thompson, Bk. VIII, 605^a.

¹⁵ A number of authors credit Hippocrates with mention of glanders a century before Aristotle (see, for example, Jennings, *op. cit.*, note 9 above, p. 264, and M’Fadyean, *op. cit.*, note 1 above, p. 2), but this would appear to be due to confusion of the Hippocratic Corpus with the work of one Ippocras who wrote in Persia, and probably in Sanskrit, a veterinary work on the horse in the sixth century; see Smith, *op. cit.*, note 10 above, vol. I, pp. 71–73.

¹⁶ Vegetius Rhenanus, *Artis veterinariae, sive mulomedicinae*, Basle, J. F. Emmeus, 1528, cap. III–IX. Cf. K. D. Fischer (editor), *Pelagonius. Ars veterinaria*, Leipzig, Teubner, 1980, pp. 94f.

¹⁷ M’Fadyean (following Bass), *op. cit.*, note 1 above, p. 2. Smith, *op. cit.*, note 10 above, vol. I, p. 22, laconically remarks: “. . . such symptoms as are recorded are somewhat fantastic, but farcy, mange and stranglers are readily recognised”.

¹⁸ Smith has tried to unravel the origins of the *Hippiatrica* at length, *ibid.*, vol. I, p. 39.

¹⁹ M’Fadyean (following Bass) thinks it probable that “moist” was glanders and “dry” farcy (*op. cit.*, note 1 above, p. 2). Smith, on the other hand, carefully analysing the symptoms mentioned, thought the “articular” kind might be acute glanders, while farcy should more likely be identified with Apsyrtus’ “subcutaneous” malleus.

glanders and farcy existed in classical times. There has even been a suggestion that glanders may have been recorded during the century preceding the birth of Aristotle. In a paper published in 1962,²⁰ Eby and Evjen made an attempt to identify the Plague of Athens, as recorded by Thucydides, with an outbreak of glanders, rather than the smallpox, typhus, measles, bubonic plague, typhoid fever, and ergot poisoning severally suggested by other authors. Although the symptoms reported by Thucydides could conceivably have been caused by glanders, the authors themselves point out that he made no mention of a simultaneous affliction of horses and asses, while he referred to the behaviour of birds and dogs at the time. A factor weighing more seriously against Eby and Evjen's theory would seem to be the fact that at no other time has glanders been known to cause extensive outbreaks in man. On the contrary, one reason its transmission to man was overlooked for so long and became accepted medical knowledge only well into the nineteenth century²¹ was probably the sporadic manner of its occurrence even among grooms and laboratory workers in constant contact with glandered material. If *Pseudomonas mallei* had become adapted to growth in man on such a scale by 400 B.C. it would seem unlikely that the fact could have been overlooked for more than 2,000 years.

As with most infectious diseases, so also in the case of glanders; our interpretation of the observations and opinions of classical authors must always retain elements of conjecture. But if this is true of the descriptions of individual diseases offered, in the area of general animal hygiene and prevention of epizootics among domestic animals, the writings of Vegetius and of Apsyrtus were conceptually quite advanced. Writing of the disease we now assume to have been glanders, both Apsyrtus and Vegetius recognized its contagiousness and recommended strict isolation of affected animals to prevent spread of the infection.²² Vegetius wrote about a century later than Apsyrtus and went considerably further with regard to the measures he thought necessary to arrest the spread of contagion. He recommended isolation of suspected animals as well as of those with the frank disease, and was even in favour of burying the carcasses of glandered animals well away from pastures used by healthy ones.²³

The first printed edition of Vegetius' veterinary work appeared in Basle in 1528.²⁴ Six years later, in 1534, Fitzherbert²⁵ mentioned glanders ("glaunders") and farcy

²⁰ C. H. Eby and H. D. Evjen, 'The plague at Athens: new oar in muddied waters', *J. Hist. Med.*, 1962, 17: 258-263.

²¹ Cf. note 8 above; Eby and Evjen's one example of an "epidemic" among humans appears to stem from an (undocumented) remark to the effect that "Such an epidemic occurred among soldiers and civilians following the Russian Revolution in 1917" in L. A. Merrill and D. M. Campbell, *Veterinary military history of the United States*, 2 vols., Chicago, Veterinary Magazine Corp., 1935, p. 165.

²² Apsyrtus' assertion that "moist malis" is "easily curable" would seem to favour Smith's interpretation rather than M'Fadyean's, and suggest that if Apsyrtus described glanders it was as "articulate malis"; Smith, *op. cit.*, note 10 above, vol. I, p. 46.

²³ M'Fadyean wrote: "In this, Vegetius, no doubt, went beyond the necessities of the case, but in his estimate of the risks of contagion from living diseased animals he appears to have been more than a thousand years in advance of his time", *op. cit.*, note 1 above, p. 3.

²⁴ Cf. note 16 above.

²⁵ Fitzherbert has often been identified with Sir Anthony Fitzherbert, a justice of the Court of Common Pleas during the reign of Henry VIII, but Smith makes out a convincing case for the author to be identified with Sir Anthony's eldest brother, John, lord of the Manor of Norbury, who took a life-long interest in all aspects of agriculture and husbandry. Smith, *op. cit.*, note 10 above, vol. I, p. 129.

("farcyon") in his *Boke on husbandry*.²⁶ It is probably the first account written in English to recognize the contagious nature of farcy, but apart from this makes no great claim to accuracy; thus true glanders would seem to have less in common with Fitzherbert's "glaunders" than with what he referred to as "mournynge on the chyne".²⁷ On the European continent glanders was also being recognized as contagious by Fayser and by Seuter in the sixteenth century; Fayser referred to the transmission of farcy from horse to horse, and Seuter warned that contagion could remain active in infected stables for long periods.²⁸ During the following two centuries there was to be little change, let alone improvement, on the views of these authors and on Vegetius, on whose recently printed writings they may all have leaned. The only exception was the remarkably clear account of glanders written in the seventeenth century by Jacques Labessie de Solleysel.²⁹

Writing in the 1660s, Solleysel adhered to the conventions of his times in the matter of superstitious considerations. He was very much preoccupied with the effects of the various phases of the moon, and wrote: "Farcy which appears during the waxing of the moon is more serious and less easy to cure than that which erupts during its waning, because the humours are less abundant and weaker, the same applies to glanders and leg sores."³⁰ Solleysel does not otherwise explicitly connect farcy with glanders,³¹ and although he warned that farcy could be transmitted to healthy horses by contact with infected animals, he also believed that it could be caused by excessive feeding on oats.³² It is Solleysel's description of glanders which commands our admiration. He stressed the importance of involvement of the lungs in true glanders, he insisted that afflicted horses should be kept separated from healthy ones, and he was aware of the dangers of ingestion through drinking-water and of contagion through

²⁶ *The boke of husbandry*, by mayster Fitzherbarde . . . after he had exercysed husbandry, with greate experyence, 40 yeres. In: *Certain ancient tracts concerning the management of landed property reprinted*, London, C. Bathurst, 1767. *The boke of husbandry* was first printed about 1534.

²⁷ This was probably a corruption of MORTECHIEN (mort d'eschine), commonly used in the sixteenth century, when it was also believed that the morbidity of glanders had its seat in the spine. Among the afflictions Shakespeare ascribed to Petruccio's horse was ". . . possessed of the glanders and like to mose in the chine" (*The Taming of the Shrew*, Act III, Scene 2; first printed 1594).

²⁸ Johann Fayser, *Hippiatria, grundlicher Bericht und aller ordennlichste Beschreibung der bewerten Rossartzney*, Augsburg, M. Manger for G. Willer, 1576. M'Fadyean quotes Fayser and Seuter, as he does many others, without giving any explicit references.

²⁹ Solleysel (1617–1680) was a self-taught horseman and veterinarian. He had been master of the horse to the French ambassador negotiating the Peace of Westphalia in 1648, and ended his days as instructor at the Paris academy where the art of horsemanship was taught to members of the French aristocracy (he literally ended his days there, collapsing in the exercising ring). His work on glanders is perhaps the most celebrated and most frequently quoted by veterinary historians, although Schwabe's claim that he broke important new ground "by experimentally transmitting glanders from horse to horse" would appear to rest on a misreading of Garrison, cf. C. W. Schwabe, *Cattle, priests and progress in medicine*, Minneapolis, University of Minnesota Press, 1978, p. 156; and F. H. Garrison, *An introduction to the history of medicine*, 4th ed., Philadelphia, Saunders, 1929, pp. 271, 274.

³⁰ J. L. de Solleysel, *Le parfait marèschal*, Paris, G. Clouzier, 1679, p. 409. This is the final edition prepared by Solleysel himself, cf. note 34 below. The first edition was published in 1664.

³¹ In an edition published in 1718, nearly forty years after Solleysel's death, the anonymous editor has added, in the chapter on farcy, that in serious cases, if farcy persists for three or four months, "there is reason to fear the development of glanders". *Le parfait marèschal*, 1718, p. 411. That sentence is not found in Solleysel's own last edition, op. cit., note 30 above.

³² *Ibid.*, p. 408.

rubbing and other contact with glandered horses in the same stable. He wrote: "This is the most contagious distemper to which horses are obnoxious, for not only it communicates its venom at a small distance, but it infects the very air, and seizes on all horses that are under the same roof with him that languishes under it. And therefore as soon as you perceive the least sign of the glanders, you must separate the sick horse from all his companions, and not suffer him to drink out of the same pail with 'em; . . ." ³³

Solleysel's excellent advice may have been heeded at the time;³⁴ but during the eighteenth century, glanders, like other infectious diseases, came in for a great deal more attention than it had received in previous centuries, and not all of the additions to the literature improved the sum of medical and veterinary knowledge. The prominent place afforded glanders in much of the copious literature on horses, their physiology and diseases, even before the advent of the veterinary schools, leaves little doubt of the threat it must have always posed in an era so dependent on the horse, in times of both war and peace. But from the publication of Solleysel's first edition in 1664 until the end of the eighteenth century, there was little improvement on his views. At best, writers on glanders leaned heavily on Solleysel; those who did not fared rather worse and re-introduced the superstitions and confusions of earlier centuries.

Gaspard de Saunier,³⁵ whose treatise was printed in The Hague in 1734, copied shamelessly from Solleysel the best part of his chapter on glanders, i.e. eminently reasonable directions for isolation and slaughter of infected animals, and for disinfection of stables previously used by them. For the rest, he distinguished between three different kinds of glanders and six kinds of farcy, but like Solleysel did not connect the two diseases in any real sense.³⁶

In England at this time, i.e. the first half of the eighteenth century, veterinary medicine, if such it could be called, was often in the hands of the surgeons attached to regiments on active duty or, in the case of major disastrous epizootics, Court surgeons might be consulted.³⁷ One surgeon who recorded his views and translated his army experiences into print was William Gibson. We have examples of his work published at an interval of thirty years, and in the case of some diseases, although by no means all, his knowledge improved with the years. He never recognized the identity of the contagious material in glanders and farcy. The latter he had seen in his regimental

³³ This contemporary translation is by Sir William Hope, who had known and been taught by Solleysel, and who prefaced his English edition with a tribute to the late master, and his portrait, see J. L. de Solleysel, *The compleat horseman, By Sir William Hope . . . made English . . .*, London, M. Gillyflower. 1696.

³⁴ The popularity of his work caused it to be pirated to such an extent that he felt compelled, at the end of his life, to publish a final edition to correct the many errors perpetrated by the pirate publishers. In his foreword to this final edition, Solleysel makes no attempt to disguise his dismay at the activities of the unscrupulous publishers whose "teachings serve rather to kill the horses than to cure them".

³⁵ Gaspard de Saunier, *La parfaite connoissance des chevaux, . . . par J. de Saunier, . . . continuée et donnée au public par son fils, Gaspard de Saunier*, The Hague, A. Moetjens, 1734.

³⁶ For nasal catarrh in the horse, de Saunier recommends a decoction prepared by boiling two newborn puppies in eight pints of white wine with an ounce of pepper, an ounce of ginger and four ounces of sugar.

³⁷ When the first wave of rinderpest reached the British Isles in 1714, Thomas Bates (d. 1760), surgeon to the court of George I, handled the outbreak with exemplary fortitude. Thomas Bates, 'A brief account of the contagious disease which raged among the milch cows near London in the year 1714 and of the methods that were taken for suppressing it', *Phil. Trans.*, 1718, 30: 872-885.

horses, but nevertheless thought it was rarely, if ever, spread by contagion. In his first edition he had similar views on glanders,³⁸ but by 1751³⁹ he had come to recognize its infectious nature, and to urge measures of isolation and disinfection. Then, long before there was any general attempt to take advantage of comparisons between infections of animals and man, this army surgeon with responsibility for both horses and men⁴⁰ devoted space to a comparison of susceptibilities to infection in man and horses, and gave examples of physicians contaminated during examinations, although he never actually suggested the possibility of transmission of glanders to man.⁴¹ Unlike many of his contemporaries, Gibson was able to distinguish between glanders and ozaena, but Sir Frederick Smith has pointed out that, on the other hand, his description of “consumption”⁴² incorporates features of glanders and internal strangles.

About the time of Gibson’s death, across the Channel the subject of glanders was becoming caught up in the controversy surrounding one of the major advances of the century of the Enlightenment, which spawned so much literary and scientific activity. Between August 1761, when Louis XV granted its Royal Charter, and February 1762⁴³ when its doors were officially opened to students, Claude Bourgelat installed Europe’s first veterinary school at Lyons, where he had been running a riding academy since 1740. Bourgelat was a representative figure of the French Enlightenment, well connected, corresponding with d’Alembert and with Voltaire, and with useful support at Court.⁴⁴ Born into a family tradition of legal service, he was educated with a view to practising law; but his enthusiasm for horsemanship combined with his reservations concerning the execution of the law⁴⁵ to deflect him towards the veterinary art. When in 1740 he acquired the old academy of equitation in his native city of Lyons, he began by educating riding masters; but he soon saw the need for a new breed of practitioners

³⁸ William Gibson, *The farrier’s new guide*, London, W. Taylor, 1720. This edition carries as its frontispiece the frequently used graphic presentation of a horse and its diseases seen in the previous century in the work of Solleysel (Fig. 1). Its earliest use appears to have been in broadsheets printed in Italy in the sixteenth century with a text of disease descriptions and suggested cures (H. J. M. Symons, Wellcome Institute Library, personal communication).

³⁹ William Gibson, *A new treatise on the diseases of horses*, London, A. Millar, 1751. The publication date was posthumous. Gibson, born about 1680, died on 5 October 1750; the author’s preface is dated 1 October 1750.

⁴⁰ Having first served with Colonel Tyrell’s Regiment of Foot, Gibson was later with the 16th Dragoons. See Smith, *op. cit.*, note 10 above, vol. II, p. 11.

⁴¹ Gibson, *op. cit.*, note 39 above, pp. 411–412.

⁴² *Ibid.*, pp. 267–269.

⁴³ E. Leclainche, *Histoire de la médecine vétérinaire*, Toulouse, Office du livre, 1936. In this otherwise excellent and authoritative account of the evolution of veterinary education, Leclainche gives the date of opening both as 1762 (p. 240) and 1763 (pp. 254, 237). Comparison with other works, and the fact that the bicentenary of the school was duly celebrated at Lyons in May 1962, would suggest that 13 February 1762 is the correct date for the opening.

⁴⁴ According to C. H. Eby, Bourgelat (1712–1779) made the most of his connexions and the intrigues surrounding the Court of Louis XV to keep himself in control and to prevent Ph. E. Lafosse (1739–1820) from gaining official recognition, specifically from obtaining the directorship of the second veterinary school at Alfort. C. H. Eby, ‘Lafosse and his book’, *Record (Friends of the Library of Washington State Univ.)*, 1960, pp. 39–43.

⁴⁵ Bourgelat seems to have been a man of integrity who became disenchanted with the legal profession when he won a case he felt was unjustified. He then spent a period in the corps of gallant *mousquetaires* before becoming the dedicated, if self-styled, director of the first veterinary schools.

of a specialized profession, that of veterinary medicine. It is sometimes suggested that the first veterinary schools grew out of the need for qualified intervention during the devastating cattle epizootics which swept through Europe during the eighteenth century.⁴⁶ If such considerations contributed to Bourgelat's initial efforts, and to the political support he received, he soon abandoned any pretence of concern for cattle to concentrate on his chosen species, the equines.⁴⁷ By 1760, he had brought himself and his academy to a standard of knowledge and equipment which warranted the establishment of Europe's first veterinary school; it opened, with official sanction, on 13 February 1762.⁴⁸

On its own terms, it was a success, and was followed three years later by a similar school outside Paris at Alfort,⁴⁹ where a small chateau formed the nucleus of a second teaching establishment, also to be run under the directorship of Bourgelat, to the dismay of a certain Philippe Etienne Lafosse.⁵⁰ Lafosse and his father had been the main critics of Bourgelat since the opening of the Lyons school; they considered him insufficiently versed in his subject, especially in the study of the classical authors.⁵¹ The younger Lafosse had considered himself the ideal choice to lead the Alfort school, and was bitterly disappointed not to have been selected. The writings published by Bourgelat and by the two Lafosses, father and son, during the latter half of the eighteenth century reflect their rivalry and acrimonious disputes. The literature on glanders is no exception.

The elder Lafosse, Etienne Guillaume, of whose life we know little,⁵² published a

⁴⁶ Outbreaks of rinderpest on an alarming scale intensified the many problems with which European countries had to contend between 1710 and 1780. Foot-and-mouth disease and bovine pleuropneumonia were frequently present at the same time, and historically there is much diagnostic confusion. Rinderpest has received the better part of historians' attention, see, for example, George Fleming, *Animal plagues: their history, nature and prevention*, London, Chapman & Hall, 1871; and C. F. Mullett, 'The cattle distemper in mid-eighteenth century England', *Agric. Hist.*, 1946, 20: 144–165.

⁴⁷ The Danish medical student P. C. Abildgaard, who arrived at the Lyons school in September 1763, was seriously concerned at the school's educational bias in favour of the horse at the expense of cattle and their diseases. See H. C. Bendixen, 'The Royal Veterinary School in Copenhagen. Highlights from the time of Peter Chr. Abildgaard and Erik Nissen Viborg', *Hist. med. vet.*, 1976, 1: 70–77; and C. Hannaway, 'Veterinary medicine and rural health care in pre-revolutionary France', *Bull. Hist. Med.*, 1977, 51: 431–447. The problem accentuated the need for a third veterinary school in the cattle lands of south-west France, a need which was met belatedly in 1828. For the history of this school at Toulouse see M. R. M. Clair, *Histoire de la création de l'École Nationale Vétérinaire de Toulouse*, Toulouse, Imp. Ouvrière, 1965.

⁴⁸ Cf. note 43 above.

⁴⁹ Now very much part of greater Paris, Alfort has its own metro station and can be reached in less than thirty minutes from the Place de la Bastille. For the history of this second school, see A. Railliet and L. Moulé, *Histoire de l'École d'Alfort*, Paris, Asselin & Houzeau, 1908.

⁵⁰ Philippe Etienne Lafosse was the scion of a family whose members had for generations held appointments as equerries and farriers at the courts of Louis XIV and XV. His father supervised both his instruction in liberal arts and human anatomy and his practical training in the stable and smithy. In spite of their own broad background, both father and son held reactionary views regarding veterinary education which they felt should aim at producing practical farriers rather than scientifically competent veterinary surgeons. See Leclainche, *op. cit.*, note 43 above, p. 242.

⁵¹ This criticism was justified. As a friend of d'Alembert and contributor to his *Encyclopédie*, Bourgelat was totally committed to the new philosophical approach and its pursuit of truth through the study of nature. The literature of past centuries should be ignored and not be allowed to interfere with the free spirit of the philosophers, see Leclainche, *op. cit.*, note 43 above, p. 241.

⁵² His date of birth is unknown, but we know that he died in Paris in January 1765, on the eve of the opening of the school at Alfort. See G. W. Schrader and E. Hering, *Biographisch-literarisches Lexicon der Thierärzte aller Zeiten und Länder*, Stuttgart, Ebner & Seubert, 1863.



Figure 2. Plate from Ph. E. Lafosse, *Guide du maréchal*, 1792 (footnote 56). In addition to anatomical details relevant to glanders, Fig. E shows an iron vaporizer recommended by Lafosse for the application of medication through the nostrils. (Reproduced by courtesy of the Wellcome Trustees.)



Figure 3. Copperplate illustration from Schilling's paper of 1821 (footnote 88) showing the extent of the patient's facial glanders lesions. (Reproduced by courtesy of the Royal Society of Medicine.)

tract on glanders more than ten years before the opening of the school at Lyons propelled Bourgelat into the spotlight and the full force of the dislike of both Lafosses. With hindsight, it is not an impressive document, and insofar as it reflects the opinions of the time⁵³ it bears witness to a lamentable rejection of the views pioneered by Solleysel a century earlier. In a foreword Lafosse assures his readers that he has examined carefully all the classical authors, and that nowhere has he found any mention of glanders until the fifteenth century, when the disease first made its appearance “at the siege of Naples, after the arrival of the Spaniards from their discovery of America . . .”. He then proceeds to discuss the “erroneous and bizarre” ideas of Solleysel, pouring scorn on the latter’s statement concerning the involvement of the lungs, and sometimes the liver and kidneys, in advanced cases. The elder Lafosse believed that glanders was a local disease of the nasal membrane, and that any other lesions were secondary phenomena unconnected with the original “contagion” which was confined to the nasal membrane and its glands. Lafosse based his observations on a number of autopsies where he found no lesions other than in the nose; in all probability the horses he examined were not all glandered.⁵⁴ As a result of his investigations, Lafosse came to the conclusion that glanders could be cured by trephining and draining of the discharge, or by injecting “convenient remedies” into the nasal cavities (Fig. 2).

The younger Lafosse began writing on glanders while his father was still alive.⁵⁵ In subsequent years he widened his scope and published a *Guide du maréchal*⁵⁶ and a *Cours d’Hippiatrique*.⁵⁷ Both volumes were impressive, representative of the best of the knowledge of the time; but they were more than that. They were moves in a game which Lafosse never won, his bid for at least a share in, if not absolute control of, the shaping of the rapidly growing structure of veterinary education in France, soon to become the model for similar ventures elsewhere.⁵⁸ The *Cours d’Hippiatrique* is unfortunately now a very rare book, but the *Guide du maréchal*, although less lavishly produced and illustrated, serves well enough to convince us of the care and comprehensiveness of the teaching offered by Lafosse in direct competition with Bourgelat’s state schools. His *forte* was anatomy; his chapter on glanders reads as a curious attempt to vindicate his father’s earlier account and at the same time add new and honest knowledge to make it more accurate. In trying to corroborate his father’s

⁵³ Lafosse, *op. cit.*, note 5 above, was published under the auspices of, and with the full approbation of, the Paris Academy of Sciences, see its postscript, pp. 20–24.

⁵⁴ M’Fadyean, *op. cit.*, note 1 above, wrote in 1904: “No case of glanders with lesions elsewhere than in the lungs, and with these organs healthy, has ever been recorded” (p. 71). And in a Fellowship thesis prepared for the Royal College of Veterinary Surgeons James Webb wrote in 1897: “. . . I have made many post mortem examinations of horses that were affected with supposed farcy only, but in all I found the lungs showed the characteristics of glanders.”

⁵⁵ According to Schrader and Hering, *op. cit.*, note 52 above, he first submitted a dissertation on glanders to the Academy of Sciences in April 1761.

⁵⁶ The edition here used is: Ph. E. Lafosse, *Guide du maréchal*, Paris, Lacombe, 1792.

⁵⁷ See Eby, *op. cit.*, note 44 above.

⁵⁸ In Italy veterinary schools opened at Turin in 1769, at Padua in 1774, and at Milan and Modena in 1791; in Germany, at Göttingen in 1771 and in Hanover in 1778; Denmark got its veterinary school in Copenhagen in 1773; and Sweden followed with one in Skara in 1775; England did not have its first school until 1791–92 in London. See Leclainche, *op. cit.*, note 43 above, p. 237.

trenchant if erroneous views on the pathogenesis of glanders, Lafosse the younger reverts to the confusions of earlier centuries and distinguishes between a number of varieties of glanders, some of which he considers contagious, others not. In addition to true glanders, it would seem that he includes strangles, simple nasal catarrh, pneumonia, and broken wind.⁵⁹

By way of contrast, his arch-rival Bourgelat, untrammelled by immersion in the classical literature and unhampered by filial piety, wrote on glanders without constraint, and leaning on Solleysel. The result was not a great deal more illuminating. His attempts to explain the crucial difference between the “flux” in the relatively “benign” diseases such as strangles and catarrh, and the “glanderous ferment” with its deleterious effect due to “acrid particles”, led him to invoke the action of “molecules which push continuously and successively against those in front of them”. He also wrote that the actual amount of nasal discharge depended on the multiplication of the “acrimonious virus”; but the context leaves no reason to believe that he had any real understanding of the phrases he was using.⁶⁰

Although Lafosse continued his campaign,⁶¹ Bourgelat’s position was secure and the skirmishes did not prevent the French schools from rapidly becoming models for similar establishments throughout the length and breadth of Europe, from Italy to Scandinavia, and from the German States to St. Petersburg.⁶² Interested governments and universities soon began sending students to Lyons and to Alfort,⁶³ and as a result first-hand accounts appeared of the new system, reflecting both its advantages and its shortcomings.

Among the early arrivals in Lyons was P. C. Abildgaard, who after his return to Denmark was to establish the first veterinary college in Copenhagen, and guide it through its politically fraught early years.⁶⁴ Abildgaard arrived in Lyons in September 1763, and almost left in despair a few months later. He wrote home to his mentors, who were hoping the course would enable him to control cattle epizootics at home, of

⁵⁹ Lafosse, *op. cit.*, note 56 above, p. 131.

⁶⁰ C. Bourgelat, *Elémens d’hippiatrique ou nouveaux principes sur la connoissance et sur la médecine des chevaux*, Lyons, Henri Declaustre/Frères Duplain, 1750–1753, vol. II, part 2, 1753, pp. 278–279.

⁶¹ Lafosse even opened an amphitheatre of his own where he offered lectures free to students in an attempt to win their support, see Eby, *op. cit.*, note 44 above. His barrage of unqualified criticism directed at the school as a whole did not spare Philibert Chabert (1737–1814), an unassuming farrier and one-time assistant of the elder Lafosse who became instructor in shoeing at Alfort in 1766 and who at Bourgelat’s death in 1779 succeeded him as director of the school. Chabert also left an early and accurate description of glanders as a contagious disease (*Mem. med. phys. med.*, in: *Hist. Soc. Roy. Med.*, 1779, Paris, Didot, 1782, pp. 361–391), but later let himself be influenced to adopt the view that the disease was not contagious, a view which was to cost the French armies dearly during the Napoleonic wars.

⁶² Leclainche, *op. cit.*, note 43 above, p. 237.

⁶³ After the opening of the school at Alfort in 1766 it seems very soon to have gained ascendancy over the senior establishment at Lyons, perhaps because Bourgelat moved there, and also because it was closer to the capital. The government spent more freely on the Alfort school than on the Lyons one, although the discrepancy was eventually removed. See L. F. Grogner, *Notice historique et raisonnée sur C. Bourgelat*, Paris, Mme. Huzard, 1805, pp. 204–208.

⁶⁴ Peter Christian Abildgaard (1740–1801) was apprenticed to an apothecary at the age of sixteen, and later studied medicine, qualifying in 1768. Upon his return from Lyons in 1766, he turned his attention to rinderpest which presented a serious threat to the Danish cattle population at the time. Political problems and intrigues delayed plans for a veterinary school in Copenhagen until 1773, when a modest beginning was made with a staff of one, i.e. Abildgaard. Bendixen, *op. cit.*, note 47 above.

the school's one-sided concern with horses to the exclusion of other domestic animals, and of the emphasis placed on farriery. He was prevailed upon to stay, and later realized that the thorough instruction in farriery would be of use in his activities at the veterinary college.

Before the Danish school had lived through its precarious first decade,⁶⁵ Abildgaard managed to attract a young and versatile follower, who not only helped him to put the school on its feet, but also joined him in research projects and literary activities.⁶⁶ This was Erik Viborg, who in 1795⁶⁷ published an account of glanders which was to ensure him a lasting and enviable reputation in veterinary literature. Hunting wrote in 1908: "Viborg, in 1797, knew practically all that was known about glanders up to the time of the discovery of the *Bacillus mallei*."⁶⁸ Hunting's praise was justified, with one reservation. Viborg, who had spent much time and effort in experimental work with glanders, was fortunate in never observing its transmission to man; and to the end of his life he resisted the idea of its transmissibility to the human species.⁶⁹ In all other respects he was correct; he proved conclusively that farcy and glanders were caused by the same agent, and that the discharge from horses suffering from glanders and farcy contained a specific "virus" which could be destroyed by heat, and which was otherwise capable of carrying the infection in harness and utensils, and in forage left in mangers previously used by glandered animals. From his first paragraph Viborg made it clear that he believed firmly in the contagious nature of what he called the "poison of glanders"; but, like many of his contemporaries, he was puzzled by cases occurring in horses which had had no apparent contact with infected animals. Viborg wrote: "How the poison of glanders can be provoked by such apparently contradictory causes cannot be explained on the basis of current knowledge. Only when more light is shed on the nature of the contagion in glanders can we hope for such developments . . ."⁷⁰

Viborg qualified in veterinary medicine in Copenhagen, and not until the eve of his

⁶⁵ The school's difficulties were both political and financial, but the situation was eased when it received its Royal Charter and state support in July 1777, *ibid.*, p. 73.

⁶⁶ Erik Nissen Viborg (1759–1822) began by following in his father's footsteps studying theology, but he soon yielded to a growing interest in the sciences. Throughout his life he maintained a special affinity for applied botany, but from the day he joined Abildgaard at the veterinary college first as a student in 1781 and from 1783 as a staff member, his prime commitment was to the new school and its teaching and research activities.

⁶⁷ The date 1797 quoted in most of the subsequent literature applies to the articles on glanders and farcy published in German in *Abhandlungen für Thierärzte und Oekonomen I–V*; Viborg had first published his experiments and conclusions in *op. cit.*, note 12 above.

⁶⁸ Hunting, *op. cit.*, note 3 above, p. 10.

⁶⁹ Abstract in: *Bul. sci. Med.*, 1827, 10: 373, of E. Viborg, 'De la non-contagion de la morve des chevaux pour les hommes', publ. posthumously in *Bibl. Laeger*, 1825, p. 252.

⁷⁰ Viborg, *op. cit.*, note 12 above, pp. 157–158. Among those struggling with the same problems in Britain were James White (?–1825), an early graduate of the London Veterinary College, and his contemporary there, Thomas Peall (?–1825). They both experimented with the transmission of farcy and glanders during their student years at the college, and both later included their observations in books, see J. White, *A complete system of veterinary medicine*, London, J. Badcock, 1804, vol. I, pp. 103–116; and Thomas Peall, *Observations, chiefly practical, on some more common diseases of the horse . . .*, Cork, John Bolster, 1814, pp. 111–152. They were students of Edward Coleman (1765–1839), whose long period as head of the London Veterinary College was fraught with controversy. See Smith, *op. cit.*, note 10 above, vol. III, pp. 13–31.

appointment to a chair there in 1790 did he travel abroad. By contrast, Abildgaard, the pioneer, had studied medicine at Copenhagen for less than two years when he left for Lyons in September 1763. Although Bourgelat, when inaugurating the schools, had considered this a desirable background for his students, he soon changed his mind. This may have been in part in deference to the views expressed by his arch-rivals, the Lafosses, who considered the main function of veterinary schools to be the preparation of good farriers; but there is evidence that other factors played a part.

In 1772, when the Lyons school was approaching its tenth anniversary, Cicognini, then head of the faculty of medicine at Milan, wrote to Bourgelat inquiring about the possibility of sending two students to France, and explaining that he thought it would be appropriate to select young men who had already had a thorough grounding in medicine. Reasonable as this might seem, Cicognini's letter occasioned a veritable outburst from Bourgelat, who wrote back bitterly: "The choice of well born young gentlemen, such as surgeons or physicians, would be unlikely to benefit either your institution or ours. So far among those sent here by foreign nations, I have known only three to succeed. . . . All the others have been . . . a total loss . . . such have been their excesses and their debauchery that our minister has decided . . . that it is essential for us to choose by preference children of the common folk, sons of honest farriers, as long as they are able to read and write . . .".⁷¹

In Britain, in spite of an obvious need, veterinary education developed more slowly and tentatively than across the Channel. Much of the early spadework was done by the Odiham Agricultural Society with Thomas Burgess, later Bishop of Salisbury, as the driving force behind the initial efforts.⁷² James Clark,⁷³ justly famed for his volume on veterinary hygiene, expressed his admiration for the French initiative in veterinary education, and recommended the creation of similar institutions in England: "In France, a regular academy for the instruction of young farriers has been instituted. The attempt is laudable, and worthy of imitation . . .".⁷⁴ His admiration of French initiatives extended to the works of Lafosse, whose views on glanders he adopted without reservation.⁷⁵

His unqualified acceptance of French ideas was not shared by another English writer in the late eighteenth century, John Lawrence,⁷⁶ whose *Philosophical and practical treatise on horses* first appeared in 1796. A man of means but an autodidact in the field of veterinary medicine, his knowledge of horsemanship, his common sense, and his increasing obsession with kindness to animals could not compensate for his

⁷¹ This correspondence is quoted in full by Leclainche, op. cit., note 43 above, pp. 243–244.

⁷² See L. P. Pugh, *From farriery to veterinary medicine, 1785–1795*, Cambridge, Heffer, 1962.

⁷³ Nothing is known of James Clark's life history, not even the dates of his birth and death; he was "Farrier" to the King for Scotland, and may have held a teaching position; Smith, op. cit., note 10 above, vol. II, pp. 111–130.

⁷⁴ James Clark, *A treatise on the prevention of diseases incidental to horses from bad management in regard to stables, food, water, air, exercise . . .*, Edinburgh, 1788, p. 4.

⁷⁵ Smith, op. cit., note 10 above, having praised Clark as "the great figure of the eighteenth century", admits that his views on farcy and glanders are "most disappointing" (vol. II, pp. 111–126).

⁷⁶ John Lawrence of Bury St. Edmunds (1753–1839). According to Smithcors (op. cit., note 7 above, p. 279) he was "one of the more intelligent and conservative British writers of the early nineteenth century . . .". The *Dictionary of national biography* quotes an obituary (*Sporting Magazine*, May 1839, p. 63) to the effect that he was "certainly an eccentric, but if the shell was husky, the kernel was sound".

lack of basic veterinary knowledge. His humane attitudes led him to oppose the experimental work of Lafosse, Bourgelat, and Vial de Sainbel (cf. below), whom he accused collectively of being “. . . not unfrequently governed by a rage for experiment”, concluding with the piously chauvinistic thought that “. . . in my opinion there is more solid and useful knowledge to be drawn from the English, than the French veterinary writers. . . . In whatever they have failed, the defect may be fairly attributed to their late despotic system of government, which devoured the finest country, and stifled the energies of the most emulous and enterprising people on earth. A country and a people, under the cheering auspices of liberty, must infallibly excel in all things.”⁷⁷ So much for pre- and post-revolutionary France, compared to the relative stability of Georgian England. Nor was he impressed by the French literature on glanders, but wrote: “. . . As to the numerous attempts hitherto made in the French schools to cure the glanders, I must own, I see nothing to wonder at in their ill success. It appears evident to me (I say this after good advice) that many of those hectic patients died of the doctor.”⁷⁸

Meanwhile, the slow development of English veterinary education continued. After the initial efforts of the Odiham Agricultural Society, more politically minded factions became interested;⁷⁹ above all, John Hunter gave continued and loyal support to the project, and his death at a critical time during the early struggles of the infant London Veterinary College came as a sad and potentially crippling blow.⁸⁰ Having said all this, one is bound then to admit that, for better or worse, the controversial architect of the initial courses, given between 1791 and 1793, was a Frenchman, one Charles Vial de Sainbel.⁸¹ During his ill-starred career in France, Sainbel had made a number of observations concerning glanders which have come down to us in an essay published posthumously in London in 1795. Sainbel was not impressed by the works of Lafosse, on which he wrote: “I fear he has left us little to rely on: we are still miserably ignorant as to the cause and nature of this specific virulence . . .”.⁸² Sainbel added little to the views on the nature of the contagion in glanders which had already been expressed by Solleysel more than a century earlier; inexplicably, he stated that the disease was not transmissible by “. . . inoculating the body with the morbid matter”.⁸³

Perhaps Sainbel’s main interest for the history of glanders lies in the manner of his

⁷⁷ John Lawrence, *Philosophical and practical treatise on horses*, London, Longman, 1796, p. 41.

⁷⁸ *Ibid.*, p. 43.

⁷⁹ In addition to the thorough account given by Pugh (op. cit., note 72 above), this development is also described at length by Smith, op. cit., note 10 above, vol. II, pp. 180–184.

⁸⁰ *Ibid.*, pp. 204–206.

⁸¹ Sainbel’s motives in coming to England to espouse the cause of veterinary education appear to have been not altogether altruistic. Born near Lyons and entering the veterinary school there at the age of nineteen, he was known in France as Benoit Vial. He proved unable to hold down any appointment for any length of time in his native country, and according to the register of his alma mater he eventually “went to London where he wished to form an establishment; has there taken the ostentatious and false name of Saint-Bel”. *Ibid.*, vol. II, pp. 184–203.

⁸² *The works of Charles Vial de Sainbel, professor of veterinary medicine, to which is prefixed a short account of his life including also the origin of the veterinary college of London*, London, Martin & Bain, 1795, p. 52.

⁸³ *Ibid.*, p. 54.

death, little more than two years after the inauguration of the veterinary college. After his customary round of the patients in the stables of the college, which no doubt included glandered horses, he was taken ill one Sunday afternoon in August 1793. Barely three weeks later he died, in circumstances which prompted the attending physicians to have him buried without delay in a lead coffin; they suspected he might have died of plague.⁸⁴ Nearly a century later, Hunting observed that the symptoms described would suggest that the illness from which Vial de Sainbel died was glanders.⁸⁵ This interpretation is now generally accepted.

It is hardly surprising that Sainbel's illness was not recognized as glanders at the time. Until the end of the eighteenth century, there is nowhere in the extant literature any suggestion of transmission of glanders to man. On the other hand, it occurred on the threshold of an age which, in the teeth of distressing evidence, was finally to recognize the transmissibility of glanders to man. From the early years of the nineteenth century, there appeared in various journals reports of cases which could have been farcy and glanders in man. In 1812 a Dr. Lorin, surgeon to a French regiment, diagnosed farcy in two members of his regiment who had incurred minor injuries to their hands while operating on horses with farcy. By removing the small tumours formed at the sites of injury, Lorin was able to cure both patients.⁸⁶

Two years earlier, the transmission of glanders from horse to man had been observed and recorded, albeit in unpublished form, in France by Jean Hameau, whose observation rested unsung in manuscript form in the archives of the Société de Médecine de Bordeaux. It finally appeared in print in part 2 of Hameau's *Étude sur les virus* which was first printed (although written twelve years earlier) in 1847, a perceptive and unjustly ignored theoretical precursor of the bacteriological tenets explored by Koch and Pasteur later in the century.⁸⁷

A detailed report of a case which ended tragically was written by a Dr. Schilling of Berlin, and published in *Rust's Magazin für die gesammte Heilkunde* in 1821. Dr. Schilling's patient died after six weeks of feeling unwell but continuing to work – looking after glandered horses – and a few days of final acute illness. Dr. Schilling carried out an autopsy “with the utmost care” and inoculated two rabbits with material from pustules on the body. After a week, one rabbit died, the other was destroyed; both were found to have pustules in various organs, while there was little necrosis in the nose. No horses or mules were inoculated.⁸⁸ The paper is accompanied

⁸⁴ The episode, and the state of body, was graphically described by Bracy Clark, who with complete disregard for the safety of himself and others insisted on making an impression in plaster of Paris of the face of his dead friend. Bracy Clark, ‘Vial de St. Bel and the early history of the London Veterinary College’, *Edinb. vet. Rev.*, 1861, 3: 133–137.

⁸⁵ W. Hunting, ‘Charles Vial de St. Bel’, *Vet. Rec.*, 1891–2, 4: 130–133.

⁸⁶ [–] Lorin, ‘Observations sur la communication du farcin des chevaux aux hommes’, *J. med. chir. pharm.*, 1812, 23: 136–137.

⁸⁷ See J. Théodoridès, ‘Un précurseur girondin de la pathologie infectieuse: Jean Hameau (1779–1851)’, *C. r. 104^e Congr. nat. Soc. savant.*, Bordeaux, 1979: 81–95. I am indebted to Dr. Théodoridès for drawing my attention to Hameau.

⁸⁸ [–] Schilling, ‘Merkwürdige Krankheits- und Sections-Geschichte einer wahrscheinlich durch Uebertragung eines thierischen Giftes erzeugten Brandrose’, *Rust's Magazin für die gesammte Heilkunde*, 1821, 11: 480–503.

by a beautifully executed copperplate illustrating the distressing facial manifestations observed in his patient (Fig. 3). The title of the paper is carefully worded, leaving room for any doubts remaining in the mind of the reader or, for that matter, of the author, who also adds a further reservation: "One might also pose the question: were those horses [attended by the patient during the period leading to his illness] suffering only from glanders, or were any of them coincidentally carriers of the contagion of anthrax . . ." ⁸⁹

While not treated as explicitly, the problem had been noted elsewhere at the time of Hameau's observation. Schilling quotes a contemporary textbook by Waldinger, published in Vienna in 1810, in which Waldinger wrote: ". . . when opening carcasses of horses suffering from glanders or farcy, the utmost care must be taken in the case of accidents not to introduce any pus into any wound, as this could lead to the most melancholy consequences and even death" ⁹⁰ At a time when a number of authors still maintained that glanders could not be transmitted to man, ⁹¹ and that such illnesses and deaths as occurred in persons associated with horses suffering from farcy or glanders were far more likely to have been caused by pyaemia or septicaemia, the editor added a warning postscript to Schilling's paper: "Nevertheless, both of the latest cases described here and the earlier observations by Veith and by Waldinger seem to me sufficient evidence that the poison of glanders can be transmitted to man, with highly dangerous and deadly results." ⁹²

Less than ten years later, in London, appeared a more definitive treatment of the subject. Its author was John Elliotson, who at this time was Physician to, and Lecturer on the Practice of Medicine at, St. Thomas's Hospital. ⁹³ In 1830 Elliotson was at the height of his powers; and on 1 June he read to the Medical and Chirurgical Society of London a paper, 'On the glanders in the human subject', which in its published form ⁹⁴ was soon quoted by authors at home and abroad. Within a short space of time, two cases had been seen at St. Thomas's of patients dying in distressing circumstances, after great prostration, with abscesses on the extremities, pustules on the face, and what appeared to be gangrene of the nose, with profuse discharge of pus from the nostrils. Elliotson was satisfied that what he called a "morbid poison" was responsible, but in spite of exhaustive interviews with friends and relatives of the patients he had been unable to establish any source of contagion. With the practised lecturer's sense of the dramatic he then described how, seeing the headline 'Fatal case of acute glanders in the human subject' on the cover of the *Medical Gazette* for 4 July, ⁹⁵ "It instantly flashed upon my mind that this must be what I sought." ⁹⁶ Further

⁸⁹ *Ibid.*, p. 499.

⁹⁰ *Ibid.*, p. 501.

⁹¹ As indeed did Viborg to the end of his life, cf. note 69 above. The capricious and unpredictable nature of glanders transmission to man has never been satisfactorily explained.

⁹² *Op. cit.*, note 88 above, p. 509.

⁹³ John Elliotson (1791–1868) was then at the zenith of his career, when every volume of the *Lancet* reported copiously on his cases, lectures, and opinions. It was before, from the mid-1830s onwards, he became increasingly involved in and impressed by the practice of hypnotism and mesmerism. The uncritical enthusiasm with which Elliotson embraced these concepts introduced from abroad progressively clouded his mind and harmed his reputation; *Lancet* obituary, 1868, ii: 202–204.

⁹⁴ John Elliotson, 'On the glanders in the human subject', *Med.-chir. Trans.*, 1830, 16: 171–218.

⁹⁵ This was a paper by Andrew Brown, 'Fatal case of glanders in the human subject', *Lond. med. Gaz.*,

inquiries revealed that his patients had indeed been in contact with glandered horses.

Pursuing the matter, Elliotson then discovered that at London's Veterinary College as early as 1817, a student had accidentally inoculated himself through injury while dissecting the head of a horse dead of glanders. An ulcer developed at the site of the injury, later abscesses formed on other extremities, and the patient died. An ass was inoculated with material taken from an abscess on the arm of the deceased, and developed fatal glanders. In spite of this evidence, the head of the Veterinary College, the controversial Edward Coleman,⁹⁷ and Benjamin Travers, F.R.S., surgeon at St. Thomas's, agreed that the late Mr. Turner had died of "constitutional irritation" and not of glanders, which they maintained was not transmissible to man. They did, however, admit that the "poison of glanders retains its properties after passing through the human system".⁹⁸ Elliotson, of course, drew a different conclusion, and the *Lancet* commented acidly on Travers's interpretation of the results: "... he, with a singular degree of blindness, or prejudice, regarded them as cases of mere irritation, and not of specific disease; did not appear, when he saw the two patients in St. Thomas's Hospital, to have the least idea that they were labouring under a similar affection".⁹⁹

One can only regret that his self-destructive crusade for the lost cause of mesmerism prevented a man of Elliotson's ability from making further contributions to the practice and teaching of clinical medicine which he had until then pursued so successfully. While he became increasingly discredited and died a disappointed man, his paper on glanders became a point of reference for a number of related studies whose authors seized the opportunity Elliotson had so carelessly left behind. Together with contemporary studies on rabies and anthrax, this work was to lay the foundations for a comparative approach to the many problems associated with infectious diseases of animals and man; problems which were only then coming within the range of a new breed of experimentalists who were helped both by a revolution in microscopical techniques¹⁰⁰ and by the opportunities afforded by the growing number of veterinary schools throughout Europe. The early prejudices concerning background upheld by Bourgelat and his contemporaries were at last forgotten, and young physicians frequently decided to obtain veterinary qualifications in a deliberate move to equip themselves with a broader background suitable for a comprehensively comparative approach to medical problems. Among the first in this new generation of doubly

1829, 4: 134–137. Brown was at the time surgeon to the 2nd Dragoon Guards and had observed the disease in a corporal while on duty at Caher Barracks. The corporal had had sole charge of a glandered horse until the onset of his illness.

⁹⁶ Elliotson, *op. cit.*, note 94 above, p. 181.

⁹⁷ Edward Coleman, F.R.S. (1765–1839); for the details of his career see Smith, *op. cit.*, note 10 above, vol. III, pp. 13–31.

⁹⁸ Benjamin Travers, *An inquiry concerning the disturbed state of the vital functions, usually denominated constitutional irritation*, London, Longman, 1826, p. 350. Garrison, *op. cit.*, note 29 above, says of Travers: "He was one of those who followed Broussais in regarding constitutional irritation as a cause of disease, especially in the nervous system", p. 481.

⁹⁹ *Lancet*, 1830–31, t: 215.

¹⁰⁰ See S. Bradbury, 'The quality of the image produced by the compound microscope: 1700–1840', in: S. Bradbury and G. L'E. Turner (editors), *Historical aspects of microscopy*, Cambridge, Heffer, 1967.

qualified investigators was K. H. Hertwig. Having qualified in medicine at Breslau, he travelled to Vienna, Munich, and Berlin in search of additional veterinary education, and eventually held a chair at Berlin's veterinary college. Initially, the spur to his interest in veterinary matters may have been his preoccupation with rabies, on which he wrote extensively in the 1820s;¹⁰¹ but in 1834 he followed up Elliotson's paper with a report of a number of transmissions of farcy and glanders to man. All the cases occurred in or around the Berlin veterinary school, the patients being either veterinary students or grooms employed in the stables.¹⁰² In spite of his well-documented interest in animal experimentation, Hertwig does not appear to have attempted to inoculate any animals with material from his patients.

Three years later, in the wards of the Charité Hospital in Paris, Pierre François Olive Rayer treated a groom who died of an acute disease which appeared to have much in common with glanders in the horse. The post-mortem findings also showed pathological changes similar to those associated with the disease in the equine species. Remembering Elliotson's paper, and informed that the groom had slept in the stable with a glandered mare, Rayer introduced pustular matter from the patient into the nostrils of a sound horse which developed typical glanders. Not long afterwards, Rayer saw a second case of human glanders in the same ward, and then wrote a monograph on farcy and glanders in the human subject.¹⁰³ Three years later he compiled, with Gilbert Breschet, a comparative study of glanders in man, equines, and other mammals.¹⁰⁴ In 1840, Rayer began publishing a journal which unfortunately did not survive its first year, the *Archives de Médecine comparée*; among Rayer's own contributions the volume included a report of a recent outbreak of foot-and-mouth disease,¹⁰⁵ and also a comparative study of pulmonary tuberculosis in animals and man.¹⁰⁶

Théodoridès has pointed out that since the age of twenty-five Rayer had been committed to the study of comparative pathology and that his "entire *oeuvre* is suffused with the concept of the universality of the sciences concerned with organized

¹⁰¹ See, for example, K. H. Hertwig, 'Beiträge zur nähern Kenntniss der Wutkrankheit oder Tollheit der Hunde', *Hufeland's Journal der practischen Arzneykunde und Wundarzneykunst*, 1828, 67: 3–173. This paper contains reports of attempts to transmit rabies by implantation of nervous tissue from rabid animals into healthy ones; the results were negative.

¹⁰² K. H. Hertwig, 'Uebertragung thierischer Ansteckungsstoffe auf Menschen', *Med. Zeitung*, 1834, 3: 215–221.

¹⁰³ P. Rayer, *De la morve et du farcin chez l'homme*, Paris, J.-B. Baillière, 1837. Rayer's experimental observations were confirmed less than ten years later in France by Audouard; see P. Chabbert, 'Maxence Audouard (1776–1856)', *C. r. 96^e Cong. nat. Soc. savant.*, Toulouse, 1971, Sect. Sci., t. I, Paris, 1974, pp. 83–97. I am grateful to Dr. J. Théodoridès for drawing my attention to Audouard's work.

¹⁰⁴ G. Breschet and P. Rayer, 'De la morve chez l'homme, des solipèdes et quelques autres mammifères', *C. r. hebd. Séanc. Acad. Sci., Paris*, 1840, 10: 209–223. The reading of this paper at the Académie des Sciences on 10 February 1840 led to a disagreement with Magendie.

¹⁰⁵ P. Rayer, 'Sur l'épizootie qui a régné à Paris, dans les derniers mois de 1838 et pendant le 1^{er} semestre de 1839', *Arch. méd. comp.*, 1843, 1: 155–171.

¹⁰⁶ P. Rayer, 'Fragment d'une étude comparative de la phthisie pulmonaire chez l'homme et chez les animaux', *ibid.*, 189–219; here Rayer distinguished clearly between nodules of glanderous and of tubercular origin which had been confused by contemporary veterinarians who regarded glanders as an equine form of tuberculosis. Villemin, who was later in the century to make definitive contributions to the study of tuberculosis, was a pupil of Rayer.

beings".¹⁰⁷ Lacking formal veterinary qualifications, Rayer frequently consulted veterinarians and personally dissected glandered horses.¹⁰⁸ His attempt to publish a journal devoted to comparative pathology may have been short-lived; but his influence during the first years of the Société de Biologie and its journal should not be underestimated, and it was a fitting tribute when a chair of comparative medicine and experimental pathology was created for him in 1862. When Rayer died in 1867, the comparative pathology of infectious diseases was poised for an explosive development, and both in France and elsewhere the future of the subject was ensured through the works of a new generation of remarkable men whose backgrounds and activities reflected the complexity of the new discipline and the diversity of skills and knowledge required in order to gain insight into the agents and the disease processes associated with infectious diseases of animals and man. While Rayer's erstwhile pupil, Davaine, continued the work on anthrax he had first begun under Rayer,¹⁰⁹ glanders reverted to the attention of the veterinary schools, and that of Jean-Baptiste Auguste Chauveau in particular.

Although Bourgelat's uncompromising attitude to the medical profession had disappeared, and Hertwig was only one of many medical men who were welcomed in the veterinary schools, Chauveau was everything Bourgelat could have hoped for. The son of a farrier, he could be expected to bring the right attitude of mind to the study of veterinary medicine when he entered the school at Alfort at the age of seventeen in 1844. But Chauveau had very much more to contribute. His vitality matched his intellectual vigour, and from the time he first set foot in the Alfort school until he died, replete with honours, the Grand Old Man of French comparative pathology, in Paris at the age of ninety in 1917, he enriched and developed his chosen subjects.¹¹⁰ At the age of fifty, he even provided a neat counterpoint to the many physicians who in the nineteenth century added veterinary qualifications to their medical ones. In 1969, Bost and Branco found, in the archives of the medical faculty of Paris, the thesis which earned Chauveau a doctorate in medicine in Paris in 1877.¹¹¹

Arloing has described how, in the climate created by the first successes of Pasteur¹¹² and by the early work on anthrax,¹¹³ Chauveau, indignant at the negative attitudes surrounding him at Lyons,¹¹⁴ was stimulated by a visit in the company of Bouley to the

¹⁰⁷ J. Théodoridès, 'P. F. O. Rayer (1793–1867), son oeuvre et son influence', in: *Congr. int. Storia Med.* (XXI, Siena, 1968), Rome, E. Cossidente, 1970, pp. 1566–1573.

¹⁰⁸ For this purpose he journeyed across Paris to the slaughterhouses at Montfaçon; two of his students later wrote dissertations on aspects of glanders, see Raoul Caveribert, 'La vie et l'oeuvre de Rayer (1793–1867)', thesis, Paris, 1931.

¹⁰⁹ See P. Rayer, 'Inoculation du sang de rate', *C. r. Séanc. Soc. Biol.*, 1850, 2: 141–144, see p. 143.

¹¹⁰ Upon graduation from Alfort, Chauveau went straight into the anatomy department at Lyons in 1848. Over the years his interests included comparative anatomy, the physiology of the heart, thermodynamics of muscle functions, and a number of other problems in physiology and pathology.

¹¹¹ J. Bost and C. de Lourdes Branco, 'Chaveau, docteur en médecine', *Bull. Soc. Sci. vét. Lyon.*, 1969, no. 4: 319–322.

¹¹² L. Pasteur, 'Mémoire sur la fermentation appelée lactique', *C. r. hebd. Séanc. Acad. Sci., Paris*, 1857, 45: 913–916.

¹¹³ See W. Bulloch, *The history of bacteriology*, London, Oxford University Press, 1938, pp. 179–182.

¹¹⁴ At this time, reactionary elements both within the veterinary school and the medical faculty at Lyons favoured the theory of spontaneous generation of disease agents. F. Arloing, *Inauguration du monument J.-B.-A. Chauveau à l'école nationale vétérinaire de Lyon*, Toulouse, J. Bonnet, 1927, p. 32.

England of the great cattle plague of 1865, which offered much irrefutable evidence concerning the pathways of epizootic contagion. Arloing wrote: "At his return, the physiologist had become pathologist and, above all, a student of pathogenesis."¹¹⁵ In reality, Chauveau's conversion to comparative pathology had begun two years earlier, when the Académie de Médecine received Bouley's report on what he called horse-pox.¹¹⁶ Bouley's paper sparked off an immediate, heated, and prolonged discussion concerning all aspects of the respective origins and identities of variola and vaccinia. Later in the same year, 1863, the Medical Science Society at Lyons set up a commission under the chairmanship of Chauveau with the aim of establishing experimentally the relationship between variola and vaccinia. The commission reported to the Académie de Médecine in 1865. It had then concluded unequivocally that, although variola in man could be transmitted to horses and cattle as easily as vaccinia, the manifestations produced by the two kinds of contagion were essentially different.¹¹⁷

From this time onwards, Chauveau was totally committed to the study of comparative pathology of infectious diseases, with particular emphasis on the question of the nature of the contagious principles. His point of departure was, naturally enough, vaccinia and variola; being a veterinarian working within a busy veterinary school, it seemed logical to draw on the contagion of glanders (and of sheep-pox) for comparison. His series of diffusion experiments, published in 1868,¹¹⁸ showed conclusively that the active principles of vaccinia and variola as well as of glanders were particulate and not dissolved in the serum. The same technique was used, simultaneously and independently, in experiments designed to examine the nature of the infection in rinderpest.¹¹⁹ Soon afterwards were developed the first bacteria-proof filters, and the laborious procedures of diffusion were replaced by more easily reproducible methods of filtration which were eventually to lend themselves to standardization.¹²⁰ Directly and indirectly, the methods of diffusion and filtration proved to be valuable aids in the search for specific disease agents which was finally successful from 1880 onwards, when Robert Koch had perfected his methods of pure culture and staining techniques, and formulated the eponymous postulates. The bacillus of glanders was isolated by

¹¹⁵ Ibid.

¹¹⁶ H. Bouley, in: 'Discussion sur l'origine de la vaccine', *Bull. Acad. Méd.*, 1863, **29**: 140–166; see p. 149.

¹¹⁷ A. Chauveau, 'Recherches expérimentales de la Société des sciences médicales de Lyon sur les relations qui existent entre la variole et la vaccine', *ibid.*, 1865, **30**: 808–816.

¹¹⁸ For the paper involving glanders, see A. Chauveau, 'Nature des virus. Détermination expérimentale des éléments qui constituent le principe virulent dans le pus varioleux et le pus morveux', *C. r. hebdomadaire. Séances Acad. Sci., Paris*, 1868, **66**: 359–363.

¹¹⁹ J. Burdon-Sanderson, Introductory report on 'The intimate pathology of contagion', in Appendix to *12th Annual Report of the Medical Committee of the Privy Council*, London, Eyre & Spottiswoode, 1869. Two years later, Burdon-Sanderson accepted an appointment as the first Professor Superintendent of the Brown Animal Sanatory Institution. In spite of the high incidence of glanders in London at the end of the nineteenth century (cf. M'Fadyean, *op. cit.*, note 1 above, pp. 125–126), it seems little work on the disease was done there, apart from diagnostic cultivation of the bacillus by Sherrington in 1891; see Sir Graham Wilson, 'The Brown Animal Sanatory Institution', *J. Hyg. Camb.*, 1979, **82**: 155–176; 337–352; 501–521; **83**: 171–197; see **82**, p. 350.

¹²⁰ The development of filtration and ultrafiltration techniques in relation to bacteriology and virology is described in chapter 2 of A. P. Waterson and Lise Wilkinson, *An introduction to the history of virology*, Cambridge University Press, 1978.

Loeffler and Schütz in 1882,¹²¹ the same year that Robert Koch isolated the tubercle bacillus in the same institute in Berlin;¹²² and also by Bouchard and his associates in France.¹²³

It is a measure of the importance of glanders a hundred years ago that its bacillus was isolated among the very first¹²⁴ in the long and rapid succession of disease agents identified during the last two decades of the nineteenth century. Not long afterwards, Koch discovered tuberculin;¹²⁵ and the hunt was on for a similar substance in the case of glanders. It was prepared, independently, by Kalning¹²⁶ and by Helmann¹²⁷ in 1891 in what were then universities within Imperial Russia, at Dorpat and at St. Petersburg, respectively. Unhappily, they both died of glanders during their further researches, within a year of the initial discovery, and they were not alone in their plight. Hunting wrote in 1908: "During the years 1891–92, no less than seven European scientists working at glanders lost their lives through accidental infection."¹²⁸

The preparation of mallein may be seen as a corollary of Koch's development of tuberculin, and was doubtless directly inspired by it; there are references to this effect in the contemporary literature. Thus Schneidemühl wrote of mallein in 1891: "Also in the early diagnosis of a second disease which is occasionally even more dangerous to man and animals than tuberculosis, i.e. glanders of the horse, have we made substantial advances using a similar method."¹²⁹ Like tuberculin, mallein was initially regarded as a much-needed prophylactic; like tuberculin, it confounded the early high hopes, but in its turn it formed the basis of a valuable diagnostic test which made eventual control of the disease possible.¹³⁰ The study of mallein was taken up in many European countries. The brothers Babes – Victor the pathologist and his less well-known brother Aurel, one of the early biochemists who had trained in Bunsen's laboratories in Heidelberg – worked in Bucharest's Institute of Pathology and Bacteriology. They compared extracts of glanders material with tuberculin, and unlike many of their contemporaries survived their work on glanders.¹³¹ In 1892,

¹²¹ See [-] Struck, 'I. Vorläufige Mittheilung über die Arbeiten des Kaiserl. Gesundheitsamtes, welche zur Entdeckung des Bacillus der Rotzkrankheit geführt haben', *Dt. med. Wschr.*, 1882, 8: 707–708.

¹²² R. Koch, 'Die Aetiologie der Tuberkulose', *Berl. klin. Wschr.*, 1882, 19: 221–230.

¹²³ Ch. Bouchard, [-] Capiton and [-] Charrin, 'Sur la culture du microbe de la morve et sur la transmission de cette maladie à l'aide des liquides de cultures', *Bull. Acad. Méd.*, 1882, 11: 1485–1486.

¹²⁴ Bulloch has pointed out that until Koch had perfected the pure culture method by 1881, the existence of bacteriological agents had been "probable or certain" only for anthrax and relapsing fever. After 1881 there was a steady stream of isolations, see Bulloch, op. cit., note 113 above, p. 237.

¹²⁵ R. Koch, 'An address on bacteriological research', *Br. med. J.*, 1890, ii: 380–383; and R. Koch, 'A further communication on a remedy for tuberculosis', *ibid.*, 1193–1195. See also H. Schadewaldt, 'Die Entdeckung des Tuberkulins', *Dt. med. Wschr.*, 1975, 100: 1925–1932.

¹²⁶ O. Kalning, 'K diagnozu sapa' [On the diagnosis of glanders], *Arkh. Vet. Nauk.*, 1891, 21 (sect. V): 113–116 (quoted from L. Z. Saunders, *Veterinary pathology in Russia 1860–1930*, Ithaca, N.Y., and London, Cornell University Press, 1980).

¹²⁷ Kh. Helmann, 'Diagnoz sapa posredstvom podkozhnavo vpriskivaniya vityazkhi sapnikh batsill' [Diagnosis of glanders by means of subcutaneous injections of extract of glanders bacilli], *Vestnik Obshchoi Vet.*, 1891, 3: 67–70; quoted as above.

¹²⁸ Hunting, op. cit., note 3 above, p. 13.

¹²⁹ Schneidemühl, op. cit., note 9 above, p. 1261.

¹³⁰ W. Hunting and J. M'Fadyean, 'Mallein as an aid to the diagnosis of glanders', *J. comp. Path. Ther.*, 1892, 5: 316–338.

¹³¹ Victor Babes, 1854–1926; Aurel Babes, 1853–1925.

Aurel Babes published promising results with a substance he called “morvine”, to distinguish it from the slightly different mallein of Helmann, and reported it to be an effective vaccine, and even in an exceptional case to have cured a glandered horse.¹³² These results were never confirmed; but in France, as in England (cf. note 130), interest in mallein as a diagnostic tool continued to grow, and in Paris it was soon manufactured commercially at the Institut Pasteur.¹³³

The parallel drawn between tuberculin and mallein reflects the way the two diseases were at the forefront of the rapidly developing comparative pathology of infectious diseases at the end of the nineteenth century; it is also an indication of the magnitude of the problem of glanders at this time. In the Harben Lectures for 1904, M’Fadyean quoted Board of Agriculture statistics for the last quarter of the nineteenth century which illustrated the fluctuations in the continued presence of the infection among horses in Great Britain. In 1874, reported cases numbered a relative low of 636. Five years later, it had risen to 1,367, increasing steadily during the following twelve months to 2,110 in 1880. After another low of 946 in 1885, the incidence rose to the high total of 3,001 reported cases in 1892, just as the mallein test was being perfected and brought into use; but although subsequent years saw another decrease it was not to last, and M’Fadyean noted that in 1903 the annual total had leaped to 2,499 cases, and at the time he was speaking the incidence was still rising.¹³⁴

M’Fadyean’s account is lucid and dispassionate and firmly concludes that the only way to eradicate the disease in man is by stamping it out among the equine species. His statistics clearly showed that although in previous centuries glanders was regarded as the scourge of armies and cavalry regiments in times of war, it had been a peacetime disease of far greater prevalence than might have been, or indeed had been, suspected before the mallein test provided the means of examining the extent of infection among apparently healthy horses in infected studs and stables. Moreover, M’Fadyean pointed out that the vast majority of these peacetime cases, nearly ninety per cent of all reported cases, were found in the area of Metropolitan London. On the other hand, the movement of animals whose infection became apparent only after arrival at their destination remained a problem both during the Boer War¹³⁵ and other campaigns. Hunting wrote in 1908: “Our minor wars in Egypt, Abyssinia and Afghanistan were all attended by glanders to an extent which interfered with efficiency. The United States are said to have introduced glanders into Mexico and Cuba with their army horses. The South African War, where 240,000 horses perished, was not only accompanied by the prevalence of glanders, but left the whole country infected. The disease was carried to South Africa from home, from America and Australia, and possibly from Europe, by the remounts.”¹³⁶

¹³² A. Babes, ‘Note sur une substance isolée des cultures du bacille de la morve’, *Arch. méd. exp. anat. path.*, 1892, 4: 450–457.

¹³³ See, for example, E. Nocard, ‘The value of mallein as a means of diagnosis in doubtful cases of glanders’, *J. comp. Path. Ther.*, 1895, 8: 227–233.

¹³⁴ M’Fadyean, *op. cit.*, note 1 above, p. 125.

¹³⁵ See accounts in Thelma Gutsche, *There was a man: the life and times of Sir Arnold Theiler*, Cape Town, Howard & Timmins, 1979.

¹³⁶ Hunting, *op. cit.*, note 3 above, see p. 13.

In Britain, the first Glanders and Farcy Order of the Board of Agriculture came into effect in 1894. In spite of its directions for slaughter and isolation, compensation, and restrictions on movement of suspected animals,¹³⁷ and in spite of the pleas of M'Fadyean and of Hunting, the problem of glanders still loomed large when World War I broke out in 1914. The previous year the *Journal of comparative Pathology and Therapeutics* which M'Fadyean had founded in 1888 contained a harrowing account of human glanders by one of the few patients who survived an attack.¹³⁸ At the onset of his illness, S. H. Gaiger was serving as a veterinarian in the Indian Civil Veterinary Department at the Punjab Veterinary College in Lahore. He appeared to have been infected while making diagnostic cultures from an abscess on the skin of an Arab pony which was not at first suspected of being glandered. After more than two years and forty-five operations, including the amputation of his left arm, Gaiger considered himself to have fully recovered; but in 1916 he was able to write another sober and dispassionate instalment of the gruesome story, when, following an attack of tertian malaria, he suffered a relapse, proving that his recovery had been only apparent. However, by January 1916, he appeared to have finally overcome the infection and, undaunted, joined an expedition investigating a serious scourge of sheep in the Peruvian Andes. From 1926 he held a chair of animal pathology at Liverpool University, but died at the early age of fifty in 1934.¹³⁹

By the time Gaiger, the survivor, moved to Liverpool, glanders had disappeared from Britain and northern Europe; by 1939 it had been eradicated in most parts of western Europe, the U.S.A., and Canada. It is still present in parts of eastern Europe, and in Asia, Africa, and the Middle East, but with reduced frequency.¹⁴⁰ Unlike rabies, glanders is not carried by any species of wild animals; like smallpox, it should therefore lend itself to eventual complete eradication. In a world beset with many more acute problems it would be over-optimistic to expect an early solution to the particular one of the presence of glanders. Nevertheless, given the mallein test and steady improvement in veterinary services in the less developed countries, glanders may yet one day disappear as undramatically and unheralded as it has existed for the better part of our history.

SUMMARY

Glanders is a disease primarily of the equine species which is occasionally transmitted to man. In past ages when man was utterly dependent on the horse both in times of war and of peace, the ravages of glanders represented a very considerable problem especially in mounted regiments, although its transmissibility to man was observed only in the nineteenth century. The literature on glanders is therefore extensive and reflects the development of an independent science of veterinary medicine and later, during the nineteenth century, the emergence of a comparative pathology of infectious diseases.

¹³⁷ M'Fadyean gives details of the order (it was revised in 1907), op. cit., note 1 above, pp. 128–129.

¹³⁸ S. H. Gaiger, 'Glanders in man', *J. comp. Path. Ther.*, 1913, 26: 223–236; also 1916, 29: 26–46.

¹³⁹ 'Death of Professor S. H. Gaiger, F.R.C.V.S.', *Vet. Rec.*, 1934, 14: 1527–1529.

¹⁴⁰ See Topley and Wilson, op. cit., note 11 above, p. 1855; also *Black's veterinary dictionary*, 13th ed., London, Adam & Charles, 1979, article: Glanders.