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Animals in the history of human and veterinary medicine

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Introduction

Medicine is, by definition, a human-led endeavour. While animals have always suffered from disease, they only became participants in human and veterinary medicine when humans began to pay attention to their health and attempt to learn about and intervene in it. Historical analysis shows that this occurred particularly when human interests were threatened by the state of animal health, and when humans perceived benefits to arise from understanding and manipulating it. As objects of medicine, animals were refashioned into tools and targets of disease investigation, regulation and management. Their bodies, minds and lived experiences were profoundly affected by these transformations. However, animals were not only shaped by human/veterinary medicine; they also shaped it. Through their selection and use as raw material for experiments, they moulded the development of medical science. As a result of the investigations performed upon them and in their ability to spread diseases to humans, they altered the state of human health, while as victims of disease they influenced animal health practices, policies and the people concerned with them.

The histories of animals and human/veterinary medicine are therefore deeply intertwined. The purpose of this chapter is to review what is known about their shared histories, to reflect on authors' approaches to the subject, and to identify some promising lines of recent and future enquiry. Focusing particularly on nineteenth and twentieth-century Western Europe and North America, it proceeds by discussing three animal roles that feature repeatedly in histories of human and veterinary medicine: as experimental material, transmitters of disease to humans, and victims of disease. The first role was co-constitutive with human medicine, the third with veterinary medicine, and the second straddled their boundaries. Each will be explored in turn. Taking up Hilda Kean's argument that while animals shape history, their contributions are only revealed by the humans that

generate narratives about them,ⁱ this account also identifies the contemporary agendas that inspired and shaped historians' narratives.ⁱⁱ

Although historically, animals and medicine were intimately linked, the same cannot be said for the scholarly fields devoted to their investigation. In fact there is a striking disconnect between medical history and animal-human history. Each has its own journals, societies, methods, intellectual priorities, traditions and historiographies, which delineate authors' interests in, and approaches to, animals in medicine. To date, the subject has attracted far more attention from medical than human-animal historians, which is surprising when one considers the extent to which animals shaped and were shaped by medicine.ⁱⁱⁱ Its neglect within human-animal history cannot be attributed to a lack of resources, because as subjects of newspaper reporting, government statistics, policy documents, veterinary case books, scientific journal articles, medical textbooks, and museum display, animals left rich traces on the medical historical record.^{iv} Rather, it may reflect human-animal historians' preferences for studying wild and pet animals rather than the rodents, horses and farmed livestock that were important to medicine, and for focusing on the symbolic aspects of animals rather than the material properties on which medicine depended.^v

In comparison, medical historians have placed a greater emphasis on the materiality of animals and devoted considerable attention to horses, livestock and rodents. Whereas scholars in human-animal studies agonize long and hard about whether animals, as products of nature, can exert agency over human culture, medical historians see no contradiction in regarding them as 'biotechnologies' positioned between nature and culture.^{vi} As early converts to Latour's Actor-Network Theory,^{vii} they readily acknowledge that animals – along with other material objects – possess agency, but unlike human-animal historians, they have not debated the nature of that agency,^{viii} and remain largely untouched by the latter's efforts to bring animals from the margins to the centre of historical analysis.^{ix} Nor have animals benefitted from democratising tendencies within medical history, which have inspired the foregrounding of experiences of other marginalized groups such as working class

women, ethnic minorities and colonised peoples.^x Consequently, while medical historians recognise the importance of animals, they usually treat them not as subjects with their own histories but as passive participants in human histories. The conclusion identifies some recent exceptions to this medical historical approach, and offers suggestions for how to build upon them in order to develop a richer, more wide-ranging account of animals within medical/veterinary history.

Experimental material

The most widely-recognized role that animals performed within medical history was that of experimental material. Historians have written extensively about how scientists manipulated animals within their laboratories in order to illuminate the structure and function of healthy bodies, the nature and causes of disease, and how to prevent and manage it both medically and surgically.^{xi} They generally assume that the goal of such experiments was to advance human health, and that the status of the animal subject was that of human proxy or 'model'. They also identify many criticisms that resulted from using animals for experimental purposes, and efforts to control or minimize that use.^{xii}

Present-day agendas are partly responsible for the attention devoted to this subject. Recurrent debates about the validity of animal experiments have inspired interest in previous controversies, while the significance of animal experiments to medical science today has encouraged historians to investigate how this situation arose. Investigations have been aided by the rich resources generated by past debates and scientific enquiries. In the majority of historical writings, animals feature as shadowy, passive canvases on which medical scientists built knowledge, disciplines and reputations. Their 'disappearance' reflects how scientists de-constituted their bodies into anatomical components and physiological forces.^{xiii} However, some authors award them greater prominence by analysing how scientists and anti-vivisectionists felt about animals, how scientists sourced,

maintained, fashioned and manipulated them; and how animals influenced scientific objectives, methods and results.^{xiv}

The use of animals for experimental purposes dates back to Greek times, but only became a mainstream feature of medical science during the nineteenth and twentieth centuries, particularly in Western Europe and North America. One key historical development was the emergence of experimental physiology as a field of scientific enquiry.^{xv} Typically, its scientists sought to determine how bodies worked by manipulating or disrupting particular functions and observing the results in experimental animals.^{xvi} This was a distinctively different approach to the 'hospital medicine' favoured by clinicians, who sought to learn about disease by observing patients in life and dissecting their bodies after death. Experimental physiology therefore effected the 'disappearance' of patients as well as the dismembering of animal bodies.^{xvii}

Experimental physiology emerged first in France at the turn of the nineteenth century, both within veterinary schools – which had facilities for experimenting on horses^{xviii} – and in the Paris school of medicine, which offered training in surgical skills that some doctors subsequently applied to experimental animals.^{xix} It then spread to Germany, where experiments were characterised by the diversity of the species employed.^{xx} For Claude Bernard (1813-78), the leading French advocate of experimental physiology, animal experiments were entirely justified because human experiments were unethical, and the mere observation of human bodies could not reveal their functions.^{xxi} He claimed that 'to learn how man and animals live, we cannot avoid seeing great numbers of them die'.^{xxii} The experiences of experimental animals themselves were unimportant, for the scientist 'no longer hears the cry of animals, he no longer sees the blood that flows, he sees only his idea and perceives only organisms concealing problems which he intends to solve'.^{xxiii} Somewhat different opinions were voiced in Britain during the 1820s following a visit by Bernard's teacher, François Magendie (1783-1855), who performed experimental demonstrations on dogs. Spokespeople for the incipient movement for the protection of animals from cruelty criticised the suffering he inflicted,

while the Scottish anatomist, Charles Bell – who claimed priority over Magendie in discovering the function of the spinal nerve roots – asserted that bodily function could be worked out equally well through the dissection of dead animals.^{xxiv}

These sentiments were one reason why experimental physiology was slow to take off in Britain compared to France and Germany. However, by the 1870s it had won several influential exponents, notably Michael Foster, who established a research school at Cambridge University, and John Burdon Sanderson, the first Professor-Superintendent of the Brown Institute of Comparative Pathology in London, and from 1874, Professor of Physiology at University College London. To train beginners in the skills required for animal experiment they and their physiologist colleagues published in 1873 a *Handbook for the Physiological Laboratory*. Its descriptions were graphic (for example in outlining physiological changes witnessed during animal asphyxiation), and it made few references to anaesthesia.^{xxv}

The *Handbook* inspired the emergence of anti-vivisectionist organisations which incorporated men and women of diverse political views who claimed to speak for animals and actively opposed experiments upon them. They directed their efforts primarily at dogs: the experimental frog had few defenders.^{xxvi} They questioned the necessity for experiment, its morality and scientific utility. Imagining their pet dogs, and – in the case of women – themselves as patients undergoing similar treatment at the hands of male doctors, they condemned the scientists responsible, and voiced fears that they would extend their experimental activities to vulnerable humans, notably women and working class men. The controversy culminated in legal restrictions to the performance of animal experiments in Britain under the 1876 Cruelty to Animals Act.^{xxvii} Similar protests emerged a little later in the USA, and caused editors of scientific journals to take preventive action. Through amending the content of articles received for publication they sought to disguise the details of experiments performed upon animals in order to defuse anti-vivisectionist critique.^{xxviii}

The emergence of bacteriology under Louis Pasteur (1822-95), Robert Koch (1843-1910) and others, was another key context in which animals were transformed into medical experimental material.^{xxix} Inspired by the notion that infectious diseases were caused by germs, medical scientists used a range of animal species to culture, isolate and identify them, and to develop, test and standardize protective vaccines and sera. Experiments usually proceeded by injecting or inoculating animals and then killing them and subjecting their bodily tissues and fluids to pathological and bacteriological analysis.^{xxx} Bruno Latour conceptualizes these developments in terms of the recruitment of non-human and human agents into networks, which Pasteur used to dominate nature within the laboratory and thereby generate a new role for bacteriology within society. As laboratory experimental material and farmyard recipients of anthrax vaccination, animals were crucial to this process and thereby bridged the realms of nature and culture.^{xxxi}

The use of experimental animals as sources of biological material for use in humans actually predated bacteriology. Edward Jenner had shown in 1796 that humans inoculated with lymph taken from the pustules of cows suffering from cowpox were immune to smallpox infection. Although this method – the original ‘vaccination’ – won the support of government and the mainstream medical establishment, it also caused considerable alarm, which persisted throughout the century and fuelled opposition to compulsory smallpox vaccination. Critics highlighted its transgression of the human-animal boundary, and voiced fears about its brutalising effects and possible transmission of disease. From the 1880s, bacteriological methods were applied to the collection of cowpox lymph. Large numbers of calves were purchased and housed in experimental vaccination stations. Scientists made multiple wounds on their bellies, inoculated them with smallpox lymph, extracted fluid from the blisters that developed, and treated it with glycerine to kill extraneous bacteria.^{xxxii}

This development foreshadowed the production of serum from horse bodies, for the purpose of protecting human bodies against diphtheria, tetanus and other infectious diseases. At the turn of the 20th century, serum production became an industrialized process in which horses were

employed as 'manufacturing units' and had large quantities of blood extracted repeatedly from their bodies.^{xxxiii} Smaller animals such as guinea pigs were used to ensure the safety and standardize the quality of sera, and subsequently other biological products such as hormones and insulin that were developed in the 1920s and 30s.^{xxxiv} As their manufacture expanded, so, too, did demand for experimental animals. In early twentieth century Britain, the usual supplies of rodents from fancy breeders were quickly exhausted and the quality of experimental results declined. Stray dogs could not be used, as the 1906 Dogs Act (which was passed partly due to fears that lost pets might be used for experiments) prevented the police from handing them over to scientists. This situation spurred scientists to develop and co-ordinate more reliable supplies of higher quality animals, and on occasions to breed their own.^{xxxv} Trade in animals developed on a large scale from the 1950s and fuelled their use for screening and for clinical trials of drugs produced by the burgeoning pharmaceutical industry. Animals thereby supported and were increasingly consumed by 'big biomedical science'.^{xxxvi}

Several authors have explored the social historical process by which certain animals came to be regarded as the 'right tools for the job' of experimental research.^{xxxvii} Initially, cost and ease of acquisition were important, as was the biology of the animal: did it permit experimenters who possessed certain skill-sets to investigate their chosen problems? Was it sufficiently close to human biology to permit the extrapolation of findings across species, and was the animal physically and temperamentally suited to experimental use?^{xxxviii} To enable extrapolation to humans, human diseases were induced artificially in animals. However, the biological resemblance of these animal 'models' to humans was often contested. While scientists' criticisms centred on the validity of particular models, anti-vivisectionists challenged the underpinning principle that animals could act as human proxies.^{xxxix}

As experiments proceeded during the late 19th and early 20th centuries, scientists gathered more data about the bodies and habits of their selected species, and learned how to manipulate them

through inbreeding to better to suit their purposes.^{xi} This was a self-reinforcing process that ‘locked in’ scientists to using particular species for particular lines of scientific enquiry: xenopus toads to diagnose pregnancy, frogs to study muscular action, guinea pigs for scurvy, mice for cancer, and rats for behavioural psychology.^{xii} At the same time, the expansion and specialisation of biomedical science led scientists seek out new medical and surgical ‘jobs’ to which animal ‘tools’ could be applied. Rats and mice were particularly ‘versatile’. Through inbreeding, strain selection, and latterly by genetic manipulations, they were further refashioned and standardized to better suit scientists’ needs.^{xiii}

Scientists’ utilitarian attitudes to experimental animals did not necessarily exclude more affective relationships with them. In testifying before the Royal Commission that gave rise to the 1876 Cruelty to Animals Act, several British scientists expressed their personal fondness for dogs but were still prepared to experiment on them for the greater good. They saw no contradiction between loving their pet dogs and experimenting on other dogs: how they treated them revolved around the question of how dogs could best serve mankind.^{xliii} Likewise, at the turn of the twentieth century, the Russian physiologist Ivan Pavlov surgically refashioned dogs into ‘particular kinds of "machines" designed and produced in the laboratory to generate particular kinds of facts.’^{xliv} However, his scientific assistants also named their dogs and recognized their distinctive personalities, which could influence physiological functioning and hence responses to experiments.^{xlv}

In Britain and the USA during the late 19th and early 20th centuries, physiologists began to invoke animal emotions as an explanation for experimental results and to adjust their experimental practices in efforts to accommodate and control them, for example by handling animals frequently to accustom them to humans.^{xlvi} British scientists also grew concerned with how the laboratory’s physical and social environment might affect the experimental performance of animals. During the 1950s they articulated this concern using the prevailing language of stress, and used it as a basis for developing a new science of animal welfare, which sought more reliable scientific results through

the redesign of laboratories and animal houses, and the professionalization of their staff. In turning ethical concern for animals into a scientific necessity, animal welfare science refashioned scientists' relationships with experimental animals and the animals' lived experiences.^{xlvii}

However, the field was unable to dispel attacks by the later twentieth-century movements for animal liberation and animal rights, which opposed animal experimentation on principle.^{xlviii} Targets included the 1984 transplantation by Californian doctors of a baboon heart into a baby girl dying of heart failure. While researchers rejected the allegation that xenotransplantation was unacceptable, they decided that for ethical and other reasons, future organs should be sourced from pigs rather than primates.^{xlix} This was not the first time that human-animal relationships had influenced the choice of experimental animal. In 1950s Switzerland, scientists investigating new forms of fracture repair initially performed clinical research on dogs. However, they soon turned to sheep, because, although biologically, sheep had dissimilar metabolisms to dogs and were more difficult to fashion into experimental surgical material, scientists found it easier to maintain emotional distance from them.^l

Disease transmitters

The histories of human and veterinary medicine come together in the exploration of a second important role played by animals: that of disease transmitter to humans. The diseases in question are known as 'zoonoses' on account of their ability to spread between humans and animal.

Biologically, zoonoses have always existed. However, western medical scientists and governments began to perceive them as particularly pressing problems during the later nineteenth century, when the new science of bacteriology identified their common microbial causes in humans and animals,^{li} and when the increasing movement of animals and their products by railways and steamships generated new opportunities for disease to spread.^{lii} They responded by incorporating zoonotic

diseases within the new research and policy domains of ‘comparative pathology,’ and ‘veterinary public health,’ respectively.^{liii}

These domains generated rich documentary records that are readily accessible to historians.

Inspired by the late twentieth century resurgence of zoonotic disease, and the discoveries that HIV/AIDS evolved from a disease of non-human African primates, SARS from a disease of civets, and new variant CJD from ‘mad cow disease’ or BSE,^{liv} scholars have used these resources to investigate antecedents to present-day concerns. Their accounts usually focus on research and policy, and reduce animals to the bodily products that were implicated in the spread of disease to humans: meat, milk, wool, faeces and saliva. In revealing the types of zoonotic diseases that humans perceived as problems at particular points in time, these accounts cast valuable light on how animals influenced human health, and how humans lived with and depended on animals.

The most problematic zoonotic diseases of the late nineteenth century were anthrax, glanders, tuberculosis and rabies. In humans, anthrax presented as ‘woolsorters disease’ (a fatal pneumonia associated with the growing textile industry) and ‘malignant pustule’ (a skin disease). Its increasing incidence resulted from the growth of the global wool trade, which exposed Western wool workers to spores contained in the fleeces of Asian and South African sheep.^{lv} Glanders was a fatal respiratory disease spread by horses to humans who worked closely with them, such as grooms. It was particularly a problem in cities like London, where stables were expanding in size and number to accommodate the increasing numbers of horses needed to serve growing human populations.^{lvi}

Suspicion that tuberculosis could spread from cows to humans via meat predated Robert Koch’s 1882 claim that the same bacterium was responsible for disease in both species. Subsequently, milk was identified as a dangerous substance. In Britain, the consumption of both products was increasing due to growing affluence, the development of the railway milk trade, and the popularity of dairy farming, to which farmers turned in response to a collapse in arable prices. Another factor which contributed to the spread of tuberculosis between cows, and from cows to humans, was the

tendency (especially in cities) to house dairy cows indoors within poorly ventilated sheds. Efforts to understand and control tuberculosis in cows were riven by rival claims to expertise over their diseased bodies. Veterinarians asserted their knowledge of tuberculosis in cows, while public health doctors professed a superior understanding of the risk of spread to humans. In their efforts to win government recognition and employment, all displayed greater concern about the threat that cows posed to public health than working class consumers, for whom price and availability of meat trumped quality.^{lvii}

Rabies is a rare example of a disease studied both by medical historians and human-animal historians.^{lviii} Although it rarely killed humans, rabies aroused disproportionate fear and attention owing the horrific manner of death and its potential conveyance by 'man's best friend'. Nineteenth-century rabies scares coincided with the evolution of pet keeping and the pedigree dog fancy. By transforming dogs into bestial killers, the disease challenged human efforts to reshape and domesticate them. In blaming urban street dogs for rabies spread, commentators drew on wider fears of their human equivalents, the undisciplined, threatening lower and criminal classes. Efforts to control rabies through the enforced muzzling of dogs reveal marked contrasts in how public health doctors and dog owners perceived them. For the former, dogs were potential conduits of disease, therefore they and their owners had to be disciplined. For the latter, dogs were family members whose control by government amounted to unjustifiable state intervention in the private sphere.^{lix}

The significance of these zoonotic diseases waned during the early twentieth century owing to the success of policies applied to their control. Despite much controversy, the muzzling of dogs, along with leashing, licensing, and (from the 1930s) vaccination led to the decline of rabies.^{lx} Anthrax was managed through the disinfection of fleeces and livestock vaccination. Mallein and tuberculin were used to identify and remove horses and cows infected with glanders and tuberculosis respectively,

while milk supplies were made safe through pasteurisation.^{lxi} However, new zoonotic diseases then emerged in response to the changing ways in which humans farmed and slaughtered livestock.

Starting in the inter-war years, and accelerating after the Second World War, economic pressures and scientific and technical breakthroughs encouraged a trend towards larger farms in which animals were kept within more confined spaces. These conditions facilitated the spread of campylobacter and salmonella bacteria, which caused few symptoms in animals but potentially severe food poisoning in humans. Further spread occurred as a result of unhygienic animal carcass handling within increasingly industrialized slaughterhouses.^{lxii} One response to this and to other problems of health and productivity within intensive farming systems was the liberal use of antibiotics, but from the 1960s this generated fears that bacterial resistance would develop and threaten human health.^{lxiii} Intensive farming was also blamed for the BSE epidemic that emerged in 1980s Britain. It transpired that in a cost-saving attempt to improve livestock productivity, ruminant tissues containing the BSE agent had been recycled into meat and bone meal and fed back to cows. Herbivores were thereby turned into carnivores, and the humans that consumed them exposed to the risk of new variant CJD.^{lxiv} While BSE has all but disappeared, the other diseases remain, and form a conduit for ongoing concerns about how animals are treated on farms.^{lxv}

Disease victims

A third, much-studied role performed by animals within the history of human/veterinary medicine was that of disease victim. Like the other roles, it was created by humans. Animals became victims not because of their biological vulnerability to disease, but because humans noticed, cared, and were motivated to take action against it. The more highly they valued animals, and the greater the risk and impact of animal diseases, the more likely they were to intervene. They managed disease victims in two distinctive ways: through public policies that counteracted the spread of infectious diseases among animal populations, and through private interventions in the health of particular

animals, flocks or herds. Historical analysis focusses largely on the former, because in contrast to the latter, public policies targeted high-profile diseases and inspired well-documented controversies. Historians have used these documents to illuminate wider developments in international trade, agriculture, colonialism, understandings of disease, the growth of government and its use of expertise. Unfortunately, in so doing, they rather overlook the effects of these policies and diseases on animals themselves.^{lxvi}

Policies for the control of contagious animal diseases emerged in the eighteenth century in response to the highly fatal, contagious cattle plague or rinderpest, which swept across Western Europe. They were extended in the later nineteenth century, when increased animal movements associated with colonial expansion, military campaigns, the development of railways and steamships, and the feeding of rapidly expanding urban populations, enabled this and other diseases to spread. Cattle plague invaded Asia, Europe and Africa, and there was a marked increase in the incidence of contagious bovine pleuro-pneumonia, foot and mouth disease, sheep scab, Texas Fever (in North America), and trypanosomiasis, horse sickness and East Coast Fever (in Southern Africa). Similar 'stamping out' principles were applied in all cases. Derived from efforts to counteract earlier epidemics of human bubonic plague, they focused on the bodies of animals that were vulnerable to – or capable of transmitting infection. Horses and livestock were quarantined or slaughtered, and restrictions placed upon their movements on and off infected farms and in the surrounding area. Where parasites were implicated, animals were forcibly dipped in chemical solutions and limits placed on their use of grazing pastures.^{lxvii}

The alarm that these diseases inspired, and the many wide-ranging, costly efforts to control them indicate how heavily humans relied on healthy animals for food, draught power, military power, economic investments, income-generators and cultural capital. Ambitious veterinarians sought to capitalize on this reliance by lobbying for government employment in the making and implementation of animal health policy. However, diseased animal bodies frequently eluded their

control. This was partly because owners and carers evaded government regulations, and also because disease manifested unexpectedly in animals. At the turn of the twentieth century, each additional disease that the British government elected to control brought new difficulties for vets as animals' variable symptoms, post-mortem appearances and unexpected vulnerabilities to infection undermined veterinary diagnoses and epidemiological predictions.^{lxviii} In certain countries, from the late nineteenth century, vaccines and sera were developed and adopted as substitutes, replacements or antecedents to the stamping out policy. They were used particularly where diseases were prevalent, and where – as in colonial contexts – resistant publics and a lack of veterinary manpower prevented governments from exerting substantial control over animal bodies.^{lxix}

In their efforts to manage contagious animal diseases, governments attached little significance to the health of individual animals, whose status mattered only insofar as it indicated the health of other animals. Policies aimed not to cure or protect individuals, but to contain and ideally eradicate infection from animal populations, regions and nations. To this end, individual animal bodies were manipulated, medicated or destroyed. While disease control policies were ostensibly fashioned in accordance with economic logic and the biological properties of disease, they actually reinforced existing hierarchies in the value placed upon animals (and their owners). Animals belonging to wealthy elites were protected at the expense of those owned by grass roots and (in colonial contexts) indigenous producers. The inequalities inherent in these policies were recognized at the time, and led to frequent controversy and occasional rebellion.^{lxx} While some historians have chosen to celebrate their eventual success,^{lxxi} it is important to recollect the costs they inflicted on both animals and humans.

These costs were demonstrated most forcefully by the 2001 UK epidemic of foot and mouth disease. This was a highly contagious and largely non-fatal condition that had entered the country only once in the previous 33 years. When deciding how to contain its rapid spread, the government rejected vaccination because under international trading rules, a lengthy trade ban would apply to those

larger farmers who exported to FMD-free countries. Instead, it opted to 'stamp out' disease using compulsory slaughter on an unprecedented scale. The policy brought death to over 10 million sheep and cows and untold distress to their owners and carers. Government decision-making was supported by epidemiological models which reduced animals to mere abstractions. However the processes of slaughtering and disposal – which were depicted graphically in the local, national and international media - made their corporeal realities impossible to ignore. Human and material resources proved inadequate to the task, and the delays that set in enabled the further spread of disease. When disease was finally stamped out, commentators highlighted the absence of animals: the silent farmyards and the empty fields.^{lxxii}

Animal victims of less dramatic diseases such as endemic respiratory and gastro-intestinal infections, mastitis, lameness and infertility, were generally ignored by the state. Both in the pre-modern and modern eras, decisions upon their management fell to owners and carers. These humans could choose to save money or prevent suffering by destroying sick animals; they could cut their losses by selling sick animals to unsuspecting buyers, or they could transform animals into patients by attempting their treatment. The treatments they applied are richly documented within Byzantine^{lxxiii} and Arabic^{lxxiv} manuscripts, popular almanacs and published manuals,^{lxxv} farriers' and vets' tools and case books,^{lxxvi} bills and veterinary practice records,^{lxxvii} and oral histories.^{lxxviii} Prior to the twentieth century, medical interventions were frequent, varied and heroic. Animals were bled, dosed with medicine balls, drenches and drinks, given enemas, and rubbed with lotions, liniments and caustic substances that were intended to raise blisters on the skin. Their births were assisted, their wounds dressed and fractures set. To manage lameness, horses' hooves were reshod and their lower limbs subjected to surgical interventions that included the use of hot irons to cauterize tendons. To increase their productivity and manageability, horses and farmed livestock were routinely castrated. During the mid-twentieth-century, drugs prepared by pharmaceutical companies (most notably antibiotics) began to replace home-made and patent remedies.^{lxxix} In addition, developments in

anaesthesia – which did not become a routine veterinary practice for decades after its 1840s discovery – enabled more extensive surgical interventions such as orthopaedic operations.^{lxxx}

Many of these interventions appear brutal in retrospect, and may have enhanced rather than diminished animal suffering. However, rather than attributing them to the ignorance and callousness of animal healers in an age less enlightened than our own, it is important to evaluate them according to the standards of the time. Animal healing often drew on the rationales and practices of human medicine. Interventions were supported by custom, experience and prevailing understandings of disease. While there were complaints about the ignorance and cruelty of animal healers, these should not be taken at face value because healers operated within a fiercely competitive ‘veterinary marketplace’ in which they sought to advance their own profiles by denigrating their rivals.^{lxxxi} This was a common strategy amongst veterinary surgeons, who emerged as a new body of healers in the late eighteenth and early nineteenth century. Evidence suggests that in the nineteenth century, their claims to superiority were overstated, and that there was considerable overlap between their practices and those of unqualified healers. Vets continued to face competition from ‘castrators’ and unqualified charity workers well into the twentieth century.^{lxxxii}

In deciding whether to transform animal disease victims into patients, and how to manage their diseases, animal carers and health experts were influenced by the functions that animals performed for humans, and the social, economic and cultural value awarded to them.^{lxxxiii} Human dependence on horses for sport, transport and military strength meant that they formed the dominant species of animal patient until displaced by the internal combustion engine. Farmed livestock became particularly important during and after the Second World War, when food shortages and post-war reconstruction placed a premium upon their health. The individual attention they received diminished as farms grew larger, and health interventions were redirected towards the flock or herd. As suppliers of meat and milk, cows generally received more attention than pigs, sheep, and especially chickens. The treatment of these sick animals had utilitarian objectives. By contrast, the

treatment of pets - which became particularly important patients during the later twentieth century - was guided by an affective 'economy of love' that reflected their movement into the home and status as family members.^{lxxxiv}

Reflection

As this chapter demonstrates, there is an extensive body of literature that addresses the history of animals in human and veterinary medicine. Written largely by medical historians, it is shaped by the quantity and accessibility of archival sources, the authors' disciplinary perspectives, and by contemporary problems in health and medicine that encouraged them to select certain topics and modes of enquiry. In focussing particularly on three key roles played by animals – as experimental material, transmitters of disease to humans, and victims of animal disease – this literature offers important insights into the history of human-animal relationships and the ways in which animals shaped and were shaped by human/veterinary medicine. The chapter will conclude by highlighting some of the problems with it, recent attempts to address them, and where the future of the field might lie.

It is, of course, impossible for historians to escape the influence of the present on the writing of the past. There are obvious reasons why historians investigate well-documented subjects, and it cannot be denied that historically animals did play important roles as experimental material, transmitters of disease to humans, and victims of animal disease. However, in deciding to focus their attention upon these roles, and in the manner in which they portray them, medical historians display a human-centred perspective that runs counter to the agendas of much human-animal history.^{lxxxv} When considering the transformation of animals into medical objects, such historians focus on the achievement of human ends: experimental animals were fashioned into 'laboratory models' of diseased humans in order to advance human health; animals that transmitted disease were targeted

because of the risks they posed to human health; and animal disease victims attracted attention because they disrupted human utilitarian and affective relationships with them.

While this perspective reflects the views of many human historical actors, it tends to overlook the animals themselves, and what disease, its investigation and management meant for them. It also neglects to consider contexts in which humans regarded animals not simply as passive objects of human intervention but as active medical subjects, and it over-simplifies what, at the time, was often a very complex set of health relationships between humans and non-human animals, that were not confined to the contexts of laboratory experiments, zoonotic disease control and the management of animal patients. Recent scholarship is just beginning to illustrate these claims. For example, several authors have shown that while dogs did indeed ‘model’ for humans in laboratory investigations into insulin treatment, orthopaedic surgery and transplant surgery, later in the twentieth century, clinical trials and experiences in humans were used to inform the application of these measures within the expanding field of pet medicine. In these circumstances, human animals effectively acted as ‘models’ for dog diseases.^{lxxxvi} One animal species could also model for others, like ferrets employed by British scientists in the 1920s for the testing of dog distemper vaccine. In the same context, dogs simultaneously performed roles as experimental material and patients.^{lxxxvii}

In the mid-twentieth century study of zoonotic malaria, scientists in the USA constructed humans and monkeys not as disease victims and transmitters, but as parasitic ‘co-hosts’ whose disease relationships they viewed as constitutive with their evolutionary relationships, each shedding light on the other.^{lxxxviii} Concurrently, in using birds to ‘model’ malaria in humans, other scientists pushed beyond a simple focus on disease transmission to explore the more complex relationships between parasites, hosts and their environments. Here, they made a virtue of the fact that their experimental models were not standardized but rather highly variable, like the humans they modelled.^{lxxxix}

Meanwhile, in the context of post-World War Two global health, animals with zoonotic diseases were subjected to health interventions not simply because of their ability to transmit diseases to

humans, but because they themselves were sick, and therefore less capable of producing meat and milk for consumption by humans.^{xc}

Also, animal diseases did not have to be zoonotic for them to influence human health. During the 1880s, efforts to counteract rickets that developed spontaneously in lions and monkeys housed within the London Zoological Gardens shaped ideas about human rickets,^{xcⁱ} while the effects of myxomatosis on rabbit populations in the 1950s led investigators to suggest how human evolution had been moulded by past disease encounters with disease.^{xcⁱⁱ} Inferences could be drawn in the opposite direction. Charles Darwin used studies of asylum patients to interpret animal emotions,^{xcⁱⁱⁱ} while British asylum doctor Walter Lauder Lindsay studied asylum patients to learn about animal behaviour, and animal behaviour to learn about asylum patients.^{xc^{iv}} Such investigations both reflected and reconfigured perceived boundaries between human and non-human animals.

In addition, recent scholarship reveals how animals actively moulded their construction and management as patients. In the nineteenth century London Zoological Gardens, elite medical men who attempted to use the stethoscope, apply anaesthesia and perform minor operations were impeded by their animal patients' propensities to struggle and bite.^{xc^v} Elsewhere, animals encouraged clinical interventions by exhibiting disease symptoms that attracted the attention of carers and veterinary surgeons. For example in the 1960s, the failure of American house cats to urinate in places designated by humans led their carers to present them at veterinary clinics. This forced vets who had previously taken little interest in cats to perform investigations that led to the identification of a 'Feline Urological Syndrome'.^{xc^{vi}} Likewise, following the veterinary repair of their fractured limbs, pet dogs sometimes exhibited pain behaviours that, in causing their carers to seek veterinary aid, challenged veterinarians' faith in radiographic images as an 'objective' indicator of animal clinical status.^{xc^{vii}} Interestingly, accounts of these developments have been written primarily by veterinarians-turned-historians, whose historical writing has perhaps been informed by their rich personal experiences of the agency that animals can exert within clinical encounters.

In transcending the dominant anthropocentric framework of medical history, these novel lines of enquiry reveal the variety of historically neglected roles that animals played within the history of human/veterinary medicine in addition to those of experimental material, disease transmitters and disease victims. In the few examples outlined above, animals featured as beneficiaries of therapies 'modelled' on humans, as shapers of human nutritional status and food production systems, as forgers of disease categories and health interventions, as sources of comparative and evolutionary thinking across species, and as shapers and products of their (diseased) environments. These findings suggest the need to move beyond the standard historical categories into which medical historians have placed animals, and to think more imaginatively about their contributions to human/veterinary medicine.

This need is reinforced by the present-day human health agenda known as 'One Health.' Since its emergence in the early twenty first century, One Health has pursued an expansive vision of improving health and wellbeing through studying problems at the interface of humans, animals and their environments.^{xcviii} Advocates justify its integrated approach by reference to multiple present-day connections between human and animal health, ranging from the joint threats posed by climate change, food insecurity and emerging diseases, to the ways in which spontaneous instances of animal disease can elucidate analogous diseases in humans, and human surgical advances inform treatment of pets. In highlighting the richness of human-animal health connections, and the fact that many health problems do not privilege humans but are shared across species, this agenda throws into sharp relief the narrowness of historians' anthropocentric approaches to animals in human/veterinary medicine and the need for fresh thinking about them.

Adopting a more animal-centred approach would not only generate new historical perspectives on animals but also on medicine. In pushing scholars to move beyond the much-studied fields of experimental medicine and government policy to consider the more-than-human dimensions of pathology, epidemiology, parasitology, psychiatry and other areas of medicine, which were pursued

not just in laboratories but also in fields, zoos, asylums and dairies, it promises to disrupt established ideas about what constituted human medicine and its relationships with veterinary medicine.^{xcix} To develop this line of analysis it is important to bring human-animal history and medical history closer together. Medical historians' concern with the materiality of animal bodies and their skill in interpreting the traces that animals left on the medical historical record can complement and be complemented by human-animal historians' interest in animal agency, animal experiences and subjectivities. Although requiring both sets of scholars to move beyond the constraints of their disciplinary frameworks and to question their preconceptions about the nature of history, a combined approach to the subject promises more than the sum of its parts. Ranging widely across domesticated and wild animal species, it would enable the development of a rich medical history of animals and a truly animal history of medicine.

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