Introduction

Human–Animal Relationships and the Need for Veterinary Medicine

The word "veterinary" can be traced back in time to the Latin *veterinum*, which meant "beast of burden." Of course, "veterinary" has come to include many types of animals, not only beasts of burden, and the history of animal healers and veterinarians is a rich one. This book is a synthesis of broad themes, not a catalogue of every important event or individual in veterinary history; indeed, that would be impossible in a concise history. Yet there are so many fascinating stories we want to tell from all around the world. In India, sacred animals (especially cattle) warranted special feeding and care; what happened when the British colonizers arrived (1800s), with their habit of eating beef? In eighteenth-century Spain, horses were more valuable than men on the battlefield; while in France, Charles Vial de St. Bel, first director of the London veterinary school, died in agony of glanders (a horse disease). The model of veterinary education still used today developed amidst the violence of the French and American revolutions (late 1700s), and veterinarians found themselves at the forefront of wars and imperial invasions for the next 150 years. Human–animal relationships and the need for animal healers have reflected the impacts of environmental changes, cultural encounters, food production, international trade, economic developments, and imperialism and colonialism. By focusing on the uses of animals for food, transport, the military, and companionship, we situate our history of veterinary medicine over the past 500 years within these broader perspectives while highlighting some of the stories and experiences that make this history so interesting.

"Veterinary medicine" can be defined as the diagnosis and treatment of animal health problems in the context of human–animal relationships. Therefore, we use a broad definition of "veterinary medicine" to include many types of animal healing throughout history. In each place and time, a veterinary marketplace existed that could include formally educated veterinarians, botanical healers, castrators, disease specialists, and many other types of animal healers (including the animal's owner). Today's veterinarians work in the spotlight of local and global social concerns. Whether an urban "pet vet,"

https://doi.org/10.1017/9781108354929.002 Published online by Cambridge University Press

a manager of huge cattle populations on feedlots, a wildlife conservationist, medical researcher, or the last resort for a farmer with a sick animal, veterinarians mediate between the interests of animals and their owners, animal producers, consumers, and government authorities. It is a complex task, requiring more than just technical skills and knowledge. Like other animal healers through the centuries, today's veterinarians must understand the sociocultural and economic pressures driving (or limiting) their activities. For them, history is a guide that deepens their understanding of veterinary medicine today. We organize the chapters of this book around different problems and how people have responded to them over time: keeping animals alive and well in (sometimes) dangerous places and situations; communicating with individuals in multiple cultures; and working within political, economic, and social opportunities and constraints. Our goals are twofold: to frame veterinary history in the larger social and cultural context of global and world history, and to help students think critically about their profession and the broad scope of the sciences that inform it, from anatomy to epidemiology.

History also offers windows into how animals themselves have functioned as important actors in human history, and how their roles have affected the development of veterinary healing and medicine through time. Animals have shaped the human-built environment around the world: animals' needs determined the geographical spread of agricultural societies and structured cities while their labor powered industrialization, human migrations, and wars. Animal behaviors, as well as human interactions with them, have both guided and limited their healers' work. Therefore, every chapter will include attention to animals' behaviors, social lives, ecology, and environments as well as human sociocultural contexts. We also integrate the ever-changing philosophical thinking about human–animal relationships and how this impacted the treatment of animals. This contributes to our "new veterinary history" approach, which reflects relatively recent changes in the scholarship. The history of veterinary medicine is based on texts from antiquity onward, and scholars around the world specialize in translating and analyzing these classic texts. Over the past twenty-five years, professionally trained social historians have joined veterinary writers. They have built on and revised existing veterinary history, adding critical analysis to translations and narratives, broadening the focus beyond a handful of professional veterinarians and well-known scientists, and adopting new sources and methods from anthropology, environmental history, and global history. One milestone in global history, the beginning of the exchange between the Old and New Worlds, sets our choice of time period to begin around 1500. Although the scope of this book dictates narrowing the time period to the past 500 years, we next outline some of the major themes in earlier human–animal healing that inform this book.

Early Animal Healing

Domestication

The story of veterinary medicine begins with the age-old human problem: food. For thousands of years, humans fed themselves by hunting wild animals and gathering plants. Domesticating plants and animals yielded more food than the foraging way of life, resulting in denser human populations in permanent agricultural settlements. Domestication may be defined as selectively taming, feeding, and breeding animals in captivity, thereby modifying them from their wild ancestors for the benefit of humans. (Experts believe domestication started in the Middle East around 10,000 BCE.) On prehistoric farms, domesticated animals replaced wild animals as the main source of animal protein. Milking sheep, goats, bovines, or camels kept for several years produced much more food than when they were hunted and eaten as meat. Livestock also provided manure for fertilizer, contributing to higher crop yields.

Animals' superior muscle power created bigger fields and revolutionized agriculture. With the invention of the yoke, collar, hame, and harness, the power of oxen and horses could be applied to ploughing more soil for growing crops. The breast-strap or breast-collar, invented in China in the period 481–221 BCE, became known throughout Central Asia by the seventh century and was introduced to Europe by the eighth century. This preceded the horse collar, which is a part of a horse harness that is used to distribute the load around a horse's neck and shoulders when pulling a wagon or plough. A yoke is a wooden beam normally used between a pair of oxen or other animals to enable them to pull together on a load when working in pairs, as oxen usually do. There are several types of yokes used in different cultures, and for different types of oxen, horses, mules, donkeys, and water buffalo. When the horse was harnessed in the collar, the horse could apply 50 percent more power to a task than could an ox within the same time period, due to the horse's greater speed. For this reason, oxen were largely replaced by horses, a technological change that produced more food, boosted economies, and reduced reliance on subsistence farming. All these technologies not only increased the efficiency of agriculture (to feed rapidly growing human populations) but also increased the importance and value of the animals using them.

Domestication shaped the development of human societies in other ways. Taming horses, donkeys, and camels made it possible to transport people and heavy goods overland for long distances. Next to transport, horses became crucial in warfare, and their essential military role lasted into the twentieth century. First, horses were ridden bareback; later, they were yoked to wagons and battle chariots, which changed warfare in the Near East, the Mediterranean, and China dramatically. For instance, the Hyksos with their

horse-drawn chariots conquered Egypt in 1674 BCE. Similarly, Attila the Hun invaded the Roman Empire with his horsemen. In South Asia, elephants were crucial beasts of war due to their strength, size, and ability to endure harsh conditions and attacks. Next to large mammals, small animals such as chickens, ducks, geese, guinea fowls, other birds, and insects (honeybees) were domesticated because of their usefulness for human societies. Some wolves co-evolved with humans, becoming dogs that worked as hunting companions and guards or supplied food or companionship. Cats began to live near human settlements to hunt mice and rats eating grain. Domestication meant increasing human control over nature, enabling the growth of ever-larger human populations.

Veterinary medicine is as old as the process of domesticating and utilizing these animals. Provision of veterinary care seems obvious because these animals were so valuable to agrarian societies. To secure and sustain food production, prehistoric farmers and shepherds worked to keep their horses, camels, elephants, sheep, goats, bovines, and pigs healthy. Traces of veterinary activities can be found in prehistory. For example, in 2018 paleo-pathologists found evidence for trepanation in a cow's skull from the Neolithic period found in France. Castration of bulls, healed broken legs in cattle, dog breeding, and crossbreeding horses and donkeys have also been well documented in the literature. Such ancient veterinary activities were performed by experts, probably mainly farmers and shepherds themselves. Disease in humans as well as in animals was probably considered the result of magical forces, a supernatural intervention, or a divine castigation. Thus, treatment of humans and animals was based on a combination of ritual healing and medical or surgical therapies that corresponded to theories about disease causation

Traces of Veterinary Medicine in Antiquity: Keeping Animals Healthy

We define these early veterinary activities broadly as keeping animals healthy (the formal veterinary profession only developed much later, as we discuss in Chapter 3). Archaeological and written sources, including bones, statuettes, murals, mosaics, and reliefs, show that animal diseases were a major problem for ancient societies. In 2015, archaeologists analyzed bones of cattle from the Middle East dating to 8,000 years ago and found the bones to be infected with bovine tuberculosis. The oldest written account of an animal disease is about rabies (caused by infected domesticated dogs). This infectious (zoonotic) disease, which is lethal for humans if not treated, was already feared in antiquity. One part of the legal code of Eshnunna, from ancient Mesopotamia (Tell Asmar in present-day Iraq) dated in the twentieth century BCE, states that the owner of a rabid dog had to pay a fine if his dog bit a

human and caused death because the owner did not control his dog. Controlling diseases in animals used for food, transport, and agriculture was essential to the success of domestication, and human intervention in animal health is as old as domestication.

History helps us to interpret the activities of past peoples; histories show the continuity of change over time and the fact that past events could have created very different outcomes. For example, domestication progressed most rapidly in particular regions due to a combination of environmental and social developments. The existence of several domesticable species in the environment was crucial, but so was the development of social patterns that encouraged people to seek more efficient food production. Fast-forwarding several millennia, we see that we are shaped by the past but that nothing has been *inevitable*. Wars, famines, natural disasters: all these events affected different societies in different ways.

We must also remember these lessons of history when we explore veterinary history. Animal healing has a long history, but, of course, we can recover only a small part of it because many texts and other sources have not survived. A popular theme within veterinary history has been the search for the oldest known veterinarian in the ancient Middle East; however, from our point of view, this is a futile undertaking because animal healing was so obviously widespread by this time. We may never obtain the full picture of ancient animal healing. What we can do is to situate the surviving historical sources within the social activities and cultural beliefs of the time. We can gain some insight into how people and animals lived so long ago, and that insight has great value today. This new model of veterinary history focuses not just on "finding the first," but on understanding "the most": the histories of how the common people and their animals lived.

This new model of veterinary history also incorporates a global history approach, because most Western-based veterinary historians' works have not included information from unfamiliar cultures, especially those in Asia and Africa. But to explore early veterinary activities, we must investigate places such as ancient India, where Vedic tradition says that both human and animal medicine arose from observing how animals and birds healed themselves. Veterinary activities were part of the ancient *Ayurveda*, or science of life. During the Vedic period (c. 1500–500 BCE), cattle played important roles as sacred animals and prized possessions, and early animal hospitals and sanctuaries were dedicated to cattle. Early treatises also focused on the Asian elephant (prized in warfare and for transportation), but healing practices were well developed for many species. At this time, veterinary activities were financed by the state, and the emperor Ashoka the Great sponsored the early Ayurvedic veterinary hospitals (still visible in edicts engraved on pillars and rocks). Ashoka's motivation was reportedly spiritual: the practice of *dharma* linked human and animal welfare. Thus, these ancient institutionalized

veterinary activities arose in a sacred society where early veterinary and medical practice was connected to sacred rituals and spiritual beliefs. Ayurvedic theories on physiology and health and disease spread from India into China via Buddhist texts and were successively linked to indigenous perceptions of human and animal bodies within a religious context.

Medical and veterinary practices in the ancient Arab and Mediterranean worlds were likewise related to religious rituals at first. Priest-physicians working in healing temples created theories of health and disease that guided their activities in human and animal healing. Although religion and rituals continued to play a role in medical treatments, a secular medicine based on natural theories of health and disease also emerged. Regular horse-doctors (ἱππιατρός or hippiatros) in ancient Greece appeared as early as 130 BCE, with one treatise naming "Metrodoros" as a hippiatros. The most renowned early Greek horse-doctor was probably Apsyrtos from Bithynia (c. 280–337 CE), who served in the cavalry of Constantine the Great and whose writings were praised for centuries. Apsyrtos outlined a coherent system of belief about animal diseases and based treatments on his theories. For example, he observed the contagious nature of anthrax, farcy, and glanders and as a result recommended isolation for sick animals.

During the Roman Empire, professional animal healers, responsible mainly for the health of equines, were known as *veterinarius* and *mulomedicus*. The Roman scholar Publius Vegetius Renatus (c. 385 CE) used the term "veterinarian" in his writings; Arabic scholars translated this to "*bitar*" or "*baytār*," meaning a surgeon of animals (especially horses). And this observation demonstrates another theme important in this book: both animals and medical knowledge about them traveled between very different cultures, often due to the activities of trading (economics) or conquest (war). This was certainly the case in Iberia (medieval Spain and Portugal), which Muslim armies invaded to establish the Islamic Al-Andalus region (711–1492), thereby bringing people, animals, and the learned traditions of Northern Africa and the Middle East into contact with Europe. The word for professional animal healers in medieval Iberia, *albeitar,* was derived from "*baytār*," and this was only the Western appendage of a much larger intellectual empire that extended into central Asia. The early development of veterinary specialization accelerated during the ancient period, when large groups of animals were used in agriculture, in armies, and in supplying the needs of enlarging human settlements.

Veterinary Activities in the Middle Ages: Translation and Exchange

Past historians of Europe characterized the centuries between c. 500 and 1000 CE as the Dark Ages, characterized by warfare, famine, and a decline in intellectual developments (including those associated with medicine and

https://doi.org/10.1017/9781108354929.002 Published online by Cambridge University Press

healing). Today we understand that the centers of intellectual development did not disappear; they shifted East and were thriving there by the time of the Iberian invasion in 711. Constantinople, the capital of the Byzantine Empire, was a center of scientific knowledge (further described in Chapter 1) during this time. Later, the Islamic Golden Age (786–1258) included probably the greatest assemblage of scholars from around the world, based on the House of Wisdom (established 825), the great library of Baghdad. Veterinary knowledge was also significantly advanced by the scholars of the Mamluk Sultanate based in Cairo, Egypt (1250–1517).

Islamic human and veterinary medicine, based on the sacred idea that humans and animals were interrelated, became the most advanced model worldwide for centuries. Influential veterinary contributions were made by Ibn Akhī Ḥizām, commander and stable master to caliph Al-Mu ʻtadid (who reigned from 892–902). He wrote *Kitāb al-Furūsiyya wa ʻl-Bayṭara* (*Book of horsemanship and hippiatry*). Later, Ahmad ibn al-Hasan included horse, cattle, sheep, and camel medicine in his *Kitāb al-Baiṭara* (c. 1209). A very important medieval source for spreading veterinary knowledge was the tenth-century *Hippiatrica*. This Byzantine compilation by an unknown editor was based on Greek and Roman texts on horse medicine from late antiquity, among others from Xenophon, Pelagonius, and Apsyrtos. The *Hippiatrica* was often copied and referred to for centuries. It contains no overall medical theory or etiology, but instead emphasizes practical treatment of injuries, lameness, colic, cough, glanders, and parasites.

Animal and human health were closely related at this time. Around the world, most people lived in small shelters, houses, or stables with horses, cows, goats, or sheep. Such animals carried diseases that could infect humans, either directly or through the bites of external parasites such as fleas. In hindsight, it can be concluded that these circumstances were ideal for spreading zoonotic diseases. Wars also spread diseases. An important example from this time period was the eight crusades during which Europeans invaded the Arabic and Mediterranean regions. With them came diseases adapted to Western European human and animal populations. The invaders themselves suffered from poor food and water, lack of personal hygiene, and stress, which must have weakened resistance among high concentrations of people in a new and strange environment. Such favorable circumstances for the transmission of infectious diseases took their toll on the crusading armies. Dysentery, cholera, typhoid fever, leprosy, and bubonic plague ran rampant in the armies and occupied regions. The thousands of animals on both sides suffered from similar conditions, circulating diseases such as glanders among high concentrations of animals with weakened resistance. Military horse-doctors were skilled in wound treatment but often remained practically powerless against such infectious animal diseases.

Animals' key military roles meant that knowledge about animal healing was often sponsored by expanding regimes and quickly translated. During the eleventh through the thirteenth centuries, Islamic medical and veterinary knowledge spread northward into Europe from the Mediterranean. The Islamic works were translated back into Latin, and from there into Italian, Spanish, French, German, English – thus circulating both Islamic and ancient veterinary knowledge. A few important works appeared from Christian Europe also. Giordano Ruffo's *De medicina equorum* was apparently not derived from older Byzantine or Arabic sources but is mainly based on his own observations and experience. It was quickly translated into European languages and remained a standard veterinary text for centuries. The same happened with *Marescalcia* from the veterinarian Laurentius Rusius, who worked in Rome in the period 1320–1370, and *El libro de menescalcia et de albeyteria* written by Juan Alvarez de Salamiellas between 1340 and 1360.

In Europe, the Middle East, and Asia, veterinary knowledge continued to circulate with human invasions and migrations. The Mongols, by enfolding other cultures' knowledge and technologies into their vast empire, had helped collapse the geographic and intellectual distances between the ancient civilizations of China, Persia, Arabia, and the West. After the conquest of Constantinople in 1453 by the Ottoman Turks and the consequent fall of the Byzantine Empire, many scholars fled to Italy where they contributed to the Renaissance (c. 1350–1600), a golden age in European cultural history. With a new focus on humans as individual and unique beings (humanism), the Renaissance also included changes in understanding animals and the animal body. This was reflected in art and in a new critical approach to anatomy (see Chapter 1). People, animals, ideas, and the everyday practices of animal husbandry traveled and encountered each other.

These circulations of veterinary knowledge and practice intensified when people from the Eastern and Western Hemispheres (the Old World and New World) contacted each other around 1500. Not only knowledge but also animals, microorganisms, and parasites themselves traveled and altered the disease ecologies of both animal and human populations. These transformations may have intensified the need for animal owners to act as healers or to consult professional healers (we take up this topic in Chapter 2). The central question for anyone concerned with practical veterinary health (and scholarly treatise-writers) was, How and why did animals get sick?

Theories of Disease and Types of Healing

Although animal healing also addresses injuries and other problems, we will focus on disease for a moment. Disease has been central to the history of human–animal relationships, and people have understood the causes and

processes of disease in different ways at different times. The way we understand many diseases today, using sciences such as bacteriology and virology, is quite recent: only 80 to 150 years old. And our knowledge is constantly changing, even at a basic scientific level (think of prions, only discovered in the 1990s). As we will see in this book, an understanding of diseases did *not* begin with bacteriology in the late 1800s. Many disease causation theories, and the diagnostic and treatment techniques arising from them, dated back thousands of years to animal domestication. By 1500, healers of animals and humans had several logical and well-established theories of disease from which to choose; and they selected treatments based on their ideas of disease causation and experiences. Some persist in one form or another today. While this pre-modern period arguably yielded mixed results, animal healers, then and now, used the tools that were available according to the beliefs of the time – just as we do today.

Although no organizational scheme is perfect, we can place animal healing methods into five categories of systems: (1) *self-healing*, or methods of instinctual healing on the part of the animal; (2) *mystical* (religious, spiritual, or magical); (3) *empirical* (therapy based on educated guess); (4) *ethnoveterinary medicine* (traditional methods used by laypeople and professionals); and (5) *contemporary veterinary medicine* ("modern" Western professional veterinary medicine that has developed during the past two centuries, based on sciences such as bacteriology. Except for self-healing, *all these healing systems were based on theories and observations of how the animal's body worked and what caused the animal's illness or injury.* In other words, they all made sense in their own time and place. This point bears repeating, because we often assume that the only rational healing methods for animals are those of the present time. But obviously, knowledge and technologies change quickly. Today, people around the world consider veterinary medicine and many other animal healing methods to be effective and rational. We do not want future generations to judge us negatively for what we do not yet know (we have not yet discovered a cure for cancer, for example). In the same way, we cannot judge people of the past who believed firmly in their chosen theories and methods of healing animals (regardless of whether we now find those methods to be effective).

The first animal healing system is *self-healing*, or instinctive healing on the part of the animal. The most well-known method is the instinct of injured or sick animals to hide and rest. Animals are also observed to eat certain plants or substances to self-medicate (such as self-induced vomiting in domesticated dogs with gastroenteritis). Biologists and evolutionary anthropologists have discovered several examples of these behaviors in wild animals. Mountain gorillas eat clay to absorb and neutralize ingested toxins; Ethiopian baboons eat the leaves of a plant that helps them expel parasitic flatworms. Capuchin

monkeys collect and rub themselves with millipedes, whose bodies contain benzoquinone insecticides that reduce heavy external parasite infestations. Elephants in western Kenya travel to the caves of Mount Elgon and eat the soft, salt-laden clay found there, which helps them to digest toxins in the plants they eat. Despite these activities, animals still get sick, fall prey to parasites, and die; but researchers believe that some instinctive animal behaviors have evolved to address illnesses and injuries. Of course, this is a human interpretation of certain animal behaviors that may or may not be true, and therein lies the mystery (since we cannot communicate directly with the animals). But researchers assert that animals' behaviors are "self-medicating" when the specific medicinal plants (and other things) they use are not normally part of their diet; provide no nutritional benefit; are not used by all animals in the group; and are usually used during certain seasons or life stages (for example, pregnancy). Self-treatment, in other words, is the most likely explanation. "Zoopharmacognosy" is the academic field that links observations of eating behaviors with the theory that animals have evolved ways to heal themselves to survive. The development of this interesting field is beyond the scope of this book, so we turn now to the other healing systems.

These types of healing are conducted by humans, on animals. *Mystical medicine*, *empirical medicine*, and *ethnoveterinary medicine* are the oldest approaches in the human repertoire. Some of these methods continue to be important around the world today in various cultures. *Mystical* healing methods, usually a combination of rituals and petitions to a deity or higher power(s), correspond directly to a culture's major spiritual and religious beliefs about how animals' bodies function, what causes illness in them, and how they are expected to respond to magical procedures or prayers. In the first two chapters of this book, mystical and sacred healing traditions will be an important context for our discussion of animal healing circa 1500–1700. However, such healing methods are still important today, especially in sacred-based cultures and societies around the world. In *empirical* healing systems, practitioners select therapies based on observation, experience, and trying several likely treatments. While empirical systems did not exclude theories of health and disease, they placed emphasis on clinical experience and what we would call trial and error. In the modern era, empiricism has been derided as unscientific; however, contemporary veterinary medicine obviously still includes reliance on experience, observation, and clinical response to treatment.

Likewise, *ethnoveterinary medicine* encompasses the uses of treatments learned or identified by laypeople, the folk medicine that has been woven into today's veterinary treatments. (And as we will see in Chapter 3, natural history and medical botany were key components of the first veterinary schools in France in the 1700s.) Most animal healing conducted in the non-Western

world is still done by laypeople and professionals using traditional methods. *Contemporary veterinary medicine* refers to the version of school-based, Western veterinary medicine that has been practiced professionally since the late 1700s (Chapters 4–7). This system of animal healing has incorporated many components from the other systems, yet like any "new" system it has commonly disavowed them to distinguish itself. With many successes and many continuing challenges, the practice of contemporary veterinary medicine today is enriched by understanding how practitioners of the past have envisioned and taken action to restore health in their

How to Use This Book

We have organized the book around themes: social/cultural and scientific. This book may be read chapter by chapter or *in toto*, either integrated into scientific courses (such as anatomy) or as a textbook for a veterinary history course. The book is built around eight learning objectives. A table of these learning objectives and the chapters that focus on them is found in Appendix B. Appendix C provides suggestions of which chapters to assign within standard veterinary courses, such as anatomy, physiology, pathology, surgery, food hygiene, and ethics/deontology. Appendix A lists early veterinary schools, and the dates founded, for many nations. Veterinary professors can therefore easily insert history into existing courses in the veterinary curriculum. In this concise history of veterinary medicine, we do not attempt to include all important topics in the history of animal healing. Instead, we frame the history of animal healing and veterinary medicine using a global and world history approach, and we include activities at the end of each chapter that encourage readers to explore the veterinary history of their own region and nation. Every chapter considers how animal healing interacted with tensions between the economic, military, and emotional (religious) value, status, and uses of domesticated animals. Who were the animal healers? What was their social status? How were they trained? What skills and knowledge did they have? How did people explain or theorize animal health problems in each place and time period?

In Chapter 1, we highlight traditions of animal healing around the globe, from South American, to Islamic and Ottoman, to Ayurvedic and Chinese. We broadly analyze early veterinary activities, including professionalization, and link them to the more well-known histories of military animal healers and the development of veterinary anatomy since 1500. In Chapter 2, we describe the impact of large-scale animal epidemics and pandemics enabled by the ecological exchanges of animals, parasites, and pathogens. Developments in international trade, colonialism, and conquest frame Chapter 2 and set up the military and economic needs that shaped the professionalization of modern

veterinary medicine in Europe, which we explore in Chapter 3. Some questions of importance in these chapters include the following: Which medical concepts, popular beliefs, and therapies were used in animal health care? How were animal diseases circulating around the world due to exploration, colonialism, war, and trade? What was the impact of these diseases on human health and well-being, and on the projects of colonialism and state formation? In terms of the modern veterinary curriculum, Chapter 2 highlights the development of physiology and new disease causation models; Chapter 3 details the growth of veterinary surgery. Chapter 3 also asks, How did the Western veterinary professionalization process of the eighteenth and nineteenth centuries proceed? How was the circulation of veterinary knowledge organized, particularly with reference to the challenges of animal disease outbreaks that had accompanied war, trade, and colonialism? How did the modern veterinary school develop, and why did this model spread around the world?

The dramatic political as well as scientific developments of the nineteenth and twentieth centuries frame Chapters 4–6: the rise of germ theories, the world wars, problems of food insecurity, and the various manifestations of modernity implied by new regimes of animal production. How did new domains for animal healing arise (such as preventive medicine in intensive animal agriculture and the need for veterinarians specializing in "exotic" zoo animals and pets)? How did veterinary public health grow during this time, especially as circulations of scientific knowledge (and animal diseases) increased in scope? What roles did laboratory research, germ theories, and comparative medicine play? Chapter 7, the final chapter of the book, considers how veterinary medicine has continued to change in the early twenty-first century, with the dramatic worldwide increase in companion animal practice, the availability of new medical and digital technologies, and the politicization of animal welfare and animal rights.

The Epilogue concludes the book by discussing veterinary medicine circa 2021 and the traditional concerns and new realities it faces. These new realities include the need to ensure food animal and herd health in a world increasingly affected by emerging diseases and climate change – while most European and North American veterinarians specialize in individual treatment of companion animals (pets). With technological developments, such as the ability to genetically modify and clone organisms, we have unprecedented levels of control over animals' biology. How are veterinarians navigating these dramatic changes and potential ethical concerns? These questions and many others ensure that the future of veterinary medicine will be as dynamic as its past has been. As mediators between humans and animals, veterinarians and other animal healers have both shaped and been shaped by the social, cultural, and economic roles of animals over time.