INTRODUCTION

Viral Connections

Whenever I went to the Sarai Kale Khan slum, in the heart of Delhi, I never saw Neelam attending the informal lessons given there by the social worker. She was too old to attend school, she would tell me later. Neelam was twelve when we met, and for the past five years she had been working as a plastic collector in the nearby Nizamuddin railway station. Our first chat occurred while she was sorting her collected stuff, next to the one-room house where her family of six lived. Neelam could not remember the incident that left a protruding scar on her thin left calf. It was just one among the many that resulted from her job. What she did remember vividly was what had happened to her cousin Charita, who died in their native village in Maharashtra six weeks after being bitten by a dog. Neelam still could not understand how Charita was suddenly unable to recognize her family or know where she was. She remembered Charita staring at her with empty eyes, looking at her own house as if she had never seen it before. Then, Neelam told me, Charita started throwing things; she was particularly terrified by glasses of water. Neelam's mother, Nidhi, nods in agreement while her daughter speaks. Nidhi's only consolation regarding her niece's death is that at least she did not have to suffer puppies growing in her stomach. This, Nidhi has heard from her neighbors in Delhi, is the unfortunate fate of many dog bite victims.

This book is about how and why Charita, the dog who bit her, and the rabies virus came to be in close enough proximity that a lethal infection was triggered. It is also about monkeys and cattle, for rabies is a multispecies issue in India and, like dogs, these animals have now become part of the Indian urban society and ecosystem, strengthening important ecological, spiritual, symbolic, and economic ties with the history and landscape of Indian cities and towns, particularly Delhi and Jaipur, where I did most of the research for this book. In other words, this study investigates the worlds that people and these three animal species have more or less consciously built for one another and, much to their regret, for the rabies virus as well. Following Alex M. Nading's reasoning about entanglement, in the context of this book it is useful to see life not simply as a vitality to be secured but as "the unfolding, often incidental attachments and affinities, antagonisms and animosities that bring people, nonhuman animals, and materials into each other's worlds" (2012, 574). One of the results of this collective world building is increased mutual vulnerability. This book deals with rabies-driven human torment and death, but it is also about the "silenced non-human dimension of health" (Nading 2014b, 205). As Donna Haraway famously wrote, in a multispecies world, "becoming is always becoming with" (2008, 244). In the case of rabies—a disease that kills across species—suffering is always suffering with.

Rabies is a cruel disease, and not just because its victims think that they will have to bear an agonizing, unnatural pregnancy. It is the deadliest disease on earth, fatal in over 99% of cases. It has no effective cure once its clinical signs appear. Given that it is a neuro-invasive disease that affects the brain, it has devastating effects on the behavior of its victims, making them unrecognizable to their friends and family (whatever their species). No single test is available to diagnose rabies infection before the onset of symptoms. Its unpredictable and sometimes very long incubation period makes the course of the illness potentially more devastating than death itself. Finally, rabies deeply unsettles the relationship between human and nonhuman animals, no matter what side you view it from.

Rabies is technically defined as a zoonosis—that is, a disease that is naturally transmissible to humans from animals. The main characteristic of any zoonosis is that its infectivity completely disregards the boundary lines between species, which are regularly crossed by viruses in their role as transboundary tricksters. At present, it is estimated that 60% of existing human infectious diseases are of animal origin, as are 75% of emerging

human diseases (WHO 2014, 1). In three-fourths of the world's countries where rabies is rife, mammals are at particular risk, although there are many variants of the rabies virus, each maintained in a particular reservoir animal in which the virus typically lives and from which it moves both within and between species to infect. Dogs are the main reservoirs for rabies and, because of their proximity to humans, the most common vectors of the disease to people.

Rabies causes similar physical suffering and death in all the species it affects. Yet given the state of underreporting in many countries, estimating how many animals across the world suffer from rabies at any given time remains particularly difficult. Consequently, the topic of animal *well-being*—which I and others (Rock and Degeling 2016, 70) prefer to the term *welfare*, which is more commonly used in veterinary medicine, as if "a state of *being* or *doing well* in life" (OED, emphasis added) could not apply to animals—is largely ignored. Paradoxically, this is the case even if rabies is, strictly speaking, a disease of animals rather than of humans, who rarely transmit it but are generally dead-end hosts. Dogs, so close to humans yet so overlooked when it comes to rabies, are the species that suffers the most from this situation, to the extent that the Global Alliance for Rabies Control (GARC) considers them "rabies' forgotten victims," not only because they suffer and die from the disease in far greater numbers than people do, but also because people kill them out of fear and loathing. In fact, up to ten million dogs a year, or 27,397 a day, may be culled across the world in attempts to control rabies (GARC n.d.).

Now that rabies is formally recognized as a shared health issue of humans and animals, the Office International des Épizooties (OIE, or World Organization for Animal Health), the World Health Organization (WHO), the UN Food and Agriculture Organization (FAO), and GARC have joined forces to mount a sustained effort to control it under the banner of the One Health Initiative. In December 2015, these agencies gave themselves fifteen years to bring the annual number of human rabies deaths to zero from the current 59,000 (WHO 2017, 77). At present, someone dies from rabies every nine minutes, predominantly in the rural and economically disadvantaged and marginalized areas of Asia and Africa (WHO 2018b, 5). This collaborative initiative marks the first time that the human and animal health sectors have come together to pursue a common strategy to combat this disease. Although the elimination of rabies in humans is the ultimate target of this project (its complete eradication being far beyond

current capacities, given the broad range of rabies vectors), its success will depend heavily on the drastic reduction of the disease in animals. In fact, only a solid commitment to reducing rabies in both humans and animals can hope to make a significant difference in the multispecies fight against rabies. In practical terms, given that more than 95% of all human deaths (and most spillovers—Grover et al. 2018) result from transmission via dog bite, controlling this disease in dogs is the only means of undermining its infectious cycle. As I argue in chapter 3, dog vaccination—not dog culling—is the way to go. However counterintuitive it may seem, decades of scientific research have demonstrated that culling dogs is not only useless but also counterproductive, as vaccinated dogs are the most effective barrier against rabies. This is why we should look at them as "co-participants rather than vessels of disease" (Brown and Kelly 2014, 286): they die of rabies like us, they fight rabies with us.

This approach to rabies is grounded not only on an ethical foundation, as it humanely relieves both humans and animals from the threat of this disease, but also on a concrete, practical one. Rabies causes an annual worldwide direct economic loss of US$8.6 billion (Hampson et al. 2015, 12) and an indirect, aggregate loss of US$120 billion (Anderson and Shwiff 2013, 449). By comparison, the 2014 Ebola epidemic was responsible for 11,316 deaths and US$2.2 billion in economic losses. The largest portion of the economic cost of rabies is due to premature deaths (55%), followed by the direct costs of post-bite vaccination (20%), lost income and loss of labor within households while seeking treatment (15%), and additional costs to communities from livestock losses (6%). Only 1.5% of the US$8.6 billion can be attributed to the cost of dog vaccinations by veterinarians. Every year, about fifteen million people worldwide receive post-exposure prophylaxis (PEP), but even if this prevents hundreds of thousands of rabies deaths annually, this emergency strategy is costly. What is worse, this financial and psychological cost is largely paid by the world's poorest people, thus perpetuating their poverty. In fact, a post-bite treatment course can cost up to US$40 in Africa and US$49 in Asia (Knobel et al. 2005, 365), where the average daily income is only a few dollars. The irony is that just 10% of the current budget for emergency treatment of bite wounds would probably be enough to vaccinate all the unvaccinated dogs in the world, thus virtually eliminating canine rabies worldwide (WHO 2015, 150). By contrast, the US$2.7 billion spent worldwide for PEP each year (or 31% of the aforementioned US$8.6 billion in direct economic costs) is wasted, as

it is administered on an ungrounded precautionary basis, rather than only in cases where there is good reason to suspect genuine infection (Lavan et al. 2017, 1670).

The basis of the new joint policy of OIE, WHO, FAO, and GARC is the One Health framework. The integration of human, animal, and environmental health has a long history, but it remained somehow limited to theory until 2008, when this paradigm was formally structured and launched specifically to tackle the complexity of zoonoses. Rabies has turned out to be the zoonosis that most perfectly fits into the One Health strategy (Rupprecht, Kuzmin, and Meslin 2017, 3). The joint policy agenda maintains not only that human, animal, and environmental health are deeply intertwined but also that the fight against the diseases that affect them requires interdisciplinary and intersectoral cooperation. In other words, major opportunities exist to protect public health if policies are aimed at preventing and controlling pathogens at the human-animal-environment interface instead of dealing with these three sectors as unconnected entities. Understandably, this approach is particularly useful when it comes to zoonoses, as they can easily fall into the "no-man's-land" between public health, environmental management, and veterinary medicine.

Although appropriate tools and proven strategies for controlling rabies and making it 100% preventable already exist on paper, this disease receives marginal attention at the practical level. In fact, rabies is one of the neglected zoonotic diseases that WHO has identified within the class of "neglected tropical diseases" (NTDs). NTDs are a group of communicable pathologies common in tropical and subtropical conditions that affect more than one billion so-called abandoned victims. These diseases have an impact mainly on poor and marginalized populations in low-resource settings—people who live without adequate sanitation and in close contact with infectious vectors and animals, people whose feeble political voices are often unheard. While several NTDs with a somewhat smaller impact receive far greater attention than rabies (Rupprecht, Kuzmin, and Meslin 2017, 3), WHO (2013b, 1) currently lists it as one of the priorities. According to Cathleen A. Hanlon et al. (2001, 2273), rabies is the most important viral zoonosis from a global perspective. The objective of reaching zero human deaths by 2030 would contribute to fulfilling the UN's Sustainable Development Goals, particularly goal 3.3, an end to NTD epidemics.

Neglect when it comes to addressing rabies is largely explained by the fact that in developing countries this disease predominantly affects dogs,

who have trifling economic value compared to livestock and receive minimal attention from the veterinary sector, at least in rural areas. What is not minimal, though, is the psychological trauma that rabies and animal bites cause in individuals, families, and communities, which unfortunately is also ignored. Apart from damaging the human-animal bond, the fear of bites and rabies in rabies-endemic countries may limit people's movement outdoors, with all of the negative consequences that can result. Therefore, as Katie Hampson et al. (2015, 14) point out, this anxiety should be given more attention and precise quantification. Moreover, dog-mediated rabies affects not only people but also their livestock, which are often the economic backbone of developing countries like India. In killing livestock, rabies has a strong impact on food availability (i.e., milk and meat), on nonconsumable products (i.e., leather and manure), and on the power of livestock for transportation and plowing. Darryn L. Knobel et al. (2005, 363) estimate 11,500 livestock losses annually due to rabies in Africa and 21,150 in Asia, at a cost of US$150 and US$500, respectively, per head of cattle.

Although rabies is a global concern, it is particularly linked to India. The term *rabies* comes from the Latin, which is in turn related to the Sanskrit word *rabhas*, which the Monier-Williams dictionary translates as "violence," "impetuosity," "zeal," "ardor," "force," or "energy." Rabies is one of the oldest diseases known to humankind. The first detailed medical account of it appeared in the *Sushruta Samhita*, a Sanskrit text on human medicine composed in northern India in the third century C.E. Centuries later, in 1911, at the Kasauli Pasteur Institute, Sir David Semple developed the sheep-brain vaccine, which was used to fight rabies until modern cell culture vaccines were made available in the early 1980s. Despite this historical connection to rabies, today India still pays the highest toll globally in terms of human deaths, almost 21,000 annually (Garg 2014, 16). It has been calculated that someone in India is bitten by an animal every two seconds, and someone dies of rabies every twenty minutes. Thus WHO currently considers India not only a high-risk country but a widely acknowledged global hotspot for this disease.

Nevertheless, rabies remains neglected in India. Formally speaking, it is not a notifiable disease, meaning that Indian law does not require that occurrences be reported to the national epidemiological tracking system or to international organizations such as OIE or WHO. Consequently, the number of rabies deaths in India has so far emerged only from estimates (Taylor et al. 2017, 133), mainly thanks to the health centers that keep

registers of rabies cases and communicate them to the appropriate authorities in a systematic manner. However, these data inevitably leave out the people who do not seek proper medical advice and who die at home. Furthermore, because of the long incubation period, rabies victims may miss the link between exposure and illness, thus preventing hospitals from registering their history of animal bite. When it comes to medical staff, the paralytic form of rabies is often misdiagnosed (e.g., it is confused with Guillain-Barré syndrome), contributing to the underreporting of the disease. There is also confusion about whether the available data are based on actual rabies deaths or, more generally, on the PEP administered to patients who have been exposed to animal bites. In addition, if the same patient visits different hospitals in search of vaccination, doubts arise as to how many times the case is registered. Finally, the fact that India is challenged by several competing health priorities is another reason for the widespread negligence regarding this disease. Only 4% of the global research on rabies was dedicated to understanding the disease in India between 2001 and 2011 (Abbas and Kakkar 2013a, 560).

Although this book deals with rabies in the challenging Indian context, highlighting the peculiarities of the relationship between this country and rabies, it also provides hints for understanding this disease more generally. And it looks not only at rabies but also at animal bites, which are a widespread public health issue at the global level (Gilchrist et al. 2008, 296). Unlike many other zoonoses, exposure to rabies occurs through direct, individual contact with the infected animal, in most cases through a bite that lacerates skin and tears flesh. If the absence of data on rabies hides the actual number of deaths it causes, it also inevitably fails to account for the many more animal bites that may or may not eventually cause rabies. And even if the incidence of rabies is a major concern in affected communities, animal bites alone may cause physical suffering, debilitating private and public expenditure, and psychological stress, and they are thus worth studying in their own right.

The fieldwork on which this book is based was carried out in the cities of Delhi and Jaipur. Although rabies is most deadly in the rural areas of India, several factors explain my choice of urban settings. First of all, like rural areas, urban slums are vulnerable to this disease because of the convergence of risk factors such as social marginalization, financial constraints, and poor education. A study conducted in some rural and urban slums of Delhi in 2016 reported a higher incidence of dog bites than found in the nationwide

survey conventionally used as a point of reference by researchers on rabies in India (Sharma et al. 2016, 118). Furthermore, given that the urban population (of a combined eighty-seven Indian cities) may reach 255 million by 2030 (NIUA 2011), zoonotic infections, including rabies, will soon threaten a growing number of the urban poor (PHFI and WHO 2008, 8). In addition, when it comes to the proximity of humans and animals, and hence the possibility for pathogen transmission, urban India is often not too different from rural India. In villages and towns, animal farming is generally unorganized, with 70% of the Indian livestock market owned by 67% of small and marginal farmers, and meat and milk production is relevant not just in rural but also in urban India. As Ajay Gandhi and Lotte Hoek observe, "Animals remain an inextricable element of the South Asian city" (2012, 9), despite attempts to cleanse and segregate the urban space, which are described in the following chapters. Finally, the first experiments with rabies-control measures in India began in its major cities, Jaipur being among the forerunners. Because of its role as the capital city and its international exposure, Delhi is another ideal location for this research.

Like data on rabies in dogs, information on rabies in cattle and macaques is predictably very spotty, when it exists at all. Nevertheless, rabies in livestock is attracting growing interest at the global level, mainly because of its economic impact. Similarly, the role of primates in relation to rabies and bites is of urgent importance, given the increased opportunities for humans to interact with these animals in temples, parks, and tourist spots around the world. Moreover, rabies in primates and other wildlife presents the risk of species spillover, which must be closely monitored for its potential epidemiological impact (Singh and Gajadhar 2014, 74). Incidentally, in January 2017, evidence of infection with rabies in bats was found for the first time in India, prompting health authorities to adopt a more holistic view of this zoonosis and to revise national guidelines for rabies management (Anand 2017).

Yet as I learned from Indian wildlife advocates and conservationists (e.g., Vanak, Belsare, and Gompper 2007), this revised approach to rabies in wildlife should put the domestic dog at the heart of the discussion. Not only are dogs the most abundant reservoir of rabies, but especially in rural India (and in many African countries) they live and interact with local wildlife so closely—often even inside protected areas—that they can introduce rabies into these populations quite easily. This results in the decline of wildlife populations, which is particularly dangerous in the case of species

on the verge of extinction, and in more rabid attacks on humans, which not only cause additional human deaths but also influence the attitudes of people toward wildlife (e.g., wolves—Isloor et al. 2014), and consequently toward wildlife policies and conservation (Gompper 2013b). Given the focus of this book on urban India, this issue is marginal to the discussion here. But however India eventually approaches its problem with rabies, it cannot avoid considering the impact of the dog population (and, consequently, dog population management and dog ownership policies) on wildlife. The case of a rabid dog biting an adult tiger in the Panna Tiger Reserve, one of the key sites of India's tiger protection project, speaks for itself (Neha 2013). India needs to pursue a balanced strategy that goes beyond the domestic sphere—and its members, such as our canine "best friends"—that we humans value so much, and take other species into account as well.

In a milestone of medical anthropology, Peter J. Brown, Marcia C. Inhorn, and Daniel J. Smith clearly state that diseases cannot be explained as "things in themselves" (1996, 183). When it comes to one of the most aggressive infectious diseases known to humankind, it is clear that diseased beings, whether human or animal, cannot be considered "bodies in themselves." Even clearer is that these bodies have not become infected for purely biological reasons. In fact, rabies is endemic in India for reasons that are as much social, cultural, economic, political, and religious as they are biological. This book aims to reconstruct the broad and complex web of factors that bring people into contact with animals and create favorable conditions and pathways for the rabies virus to infect, kill, and thrive. As Alex M. Nading stresses, "Bodily biologies are linked in some meaningful way to extrabodily ecologies" (2014a, 5). What I aim to explore here is the extrabodily ecology of rabies.

I want to investigate the context in which rabies lives on the streets of Delhi and Jaipur, for it is crucial that we reconstruct the intricate dynamics of rabies transmission. In fact, like any living organism, the rabies virus evolves not only in response to its own internal circumstances but also in response to the environment into which it is inserted and with which it must cope. "Organisms are constructed in development, not simply 'programmed' to develop by genes. Living things do not evolve to fit into preexisting environments, but coconstruct and coevolve with their environments, in the process changing the structure of ecosystems" (Laland et al. 2015, 162). The environment in which they develop is, of course, composed of much more than mere physical elements grouped together. It is a space made of entwined

human-animal-environment relations, which include the possibilities that people and animals more or less consciously offer to the rabies virus to spread, along with the human attempts to contain it. Within this mesh of relations, the rabies virus is a social being like the other human and animal beings around it, though its agency is clearly ontologically different. This co-construction of relations continuously alters the virus's world, making rabies ecology far less knowable and stable than public health policy tends to understand or acknowledge. In fact, as Natalie Porter concludes in her study of avian influenza, infectious, multispecies, multidimensional diseases must be looked at as "constantly changing" (2012, 118).

The need for the multifactorial, inclusive, and integrative perspective that I propose here has also been advocated by the Public Health Foundation of India. Its "Roadmap for Combating Zoonoses in India" openly declares that the major mistake in recent strategies of rabies management in India has been reliance on an overly mechanistic, linear, simplistic, and disconnected approach at the expense of a much more useful "big picture" approach (PHFI and WHO 2008, 8). In fact, most research on rabies carried out in India (87%) has focused on genetics and biology, giving minimal attention to the other components of the disease (Kakkar et al. 2012, 3). This kind of research struggles for biomedical solutions that cannot solve a complex systemic challenge like rabies on their own. Ironically, given that rabies potentially affects many species, Indian research on rabies has focused primarily on the rabies virus (58%) and humans (34%), largely ignoring dogs (6%) and almost never taking a multiple-animal approach (1%) (Kakkar et al. 2012, 3). In more general terms, original studies in the wide field of public health (including epidemiology, health policy, and systems research) are limited in India (Dandona et al. 2004, 1).

When we do pursue a big-picture approach, rabies can reveal a lot about the society in which it is embedded. In fact, the ecology of rabies is what Richard Levins and Richard Lewontin (1985) describe as "dialectical"—that is, as emerging from a specific historical, economic, and political context. For me, understanding this disease has entailed comprehending India itself. Within my broader interest in the contextual aspects of rabies, I have focused particularly on sociocultural drivers, largely because of my background in anthropology. But this approach is also in line with the latest recommendations of WHO and OIE. At a conference titled "Global Elimination of Dog-Mediated Human Rabies" in December 2015, the first of five key pillars of rabies elimination was identified as sociocultural. "The

socio-cultural context influences rabies perceptions and dog-keeping practices of at-risk populations," the conference report stated. "Understanding the context guides approaches to motivate behavioural change and plan feasible delivery of services" (WHO and OIE 2015, 14). Determining what rabies means to people and how they see the animals they live with is the first step to comprehending this disease and the world around it. Understanding how rabies is perceived also reveals a lot about how it can eventually be managed, at both an individual and a collective level. If we remove rabies from its sociocultural context, this zoonosis can easily be kept at bay: it has a low basic reproduction number (which is used to measure the transmission potential of a disease), and high-quality vaccines exist for both humans and animals. Clearly, something more—something different—is causing rabies to be the public health threat that it is. As Meike Wolf points out (2015, 6), the role of culture must be considered simply because it is an integral part of diseases, bodies, and biologies.

That said, as will become clearer in chapter 6, I do not simplistically place all, or even many, of the dynamics of rabies inside "culture," as if this were a bottomless container. As Charles Briggs and Clara Mantini-Briggs (2016, 232) teach us in their account of a rabies epidemic in Venezuela, health inequalities due to structural factors are often turned into a "cultural pathology" that is all too easy to blame. An often cited example of this tendency is the reliance on local systems of medicine and traditional healers, which biomedicine conveniently prefers to describe as barriers to health and health-related institutional efforts rather than as consequences—not causes—of sick health systems or, more simply, of the common denominator of neglected tropical diseases: poverty. Ironically, for these diseases of poverty—as NTDs are often called—there is still insufficient research on how the underlying context of poverty (i.e., structural inequalities in access to health services, infrastructure, education, and political power) influences the effectiveness and outcome of NTD-control strategies (Bardosh 2014, 2).

Meeting a Quasi–Life Form

Understanding rabies demands a certain familiarity not only with the life forms affected by it but especially with the quasi–life form (following Lowe 2010, 626) that spreads this disease around. Rabies is caused by a plethora

of different lyssaviruses, negative-strand RNA virus species of the genus *Lyssavirus*, family Rhabdoviridae, order Mononegavirales. However, the prototypical rabies virus, the RABV, is the main causative agent of classic rabies in animals and humans. Bullet-shaped, it moves from the entry point in the body along the nerves to the spinal cord and thence the brain, where it eventually causes acute encephalitis. Infection occurs when the virus enters the body through transdermal inoculation (a bite or, if the claws are covered with saliva, a scratch) or direct contact between infected saliva (e.g., through a lick) and mucous membranes (e.g., eyeballs or mouth) or abraded skin. Milk and meat from a rabid animal are unsafe if drunk, eaten, or handled raw, but cooking them at a temperature above 60 degrees Celsius (140 degrees Fahrenheit) will kill the virus. Human-to-human transmission by bite (or kiss, in the case of abraded skin in the recipient) is theoretically possible but has never been confirmed, while there have been unfortunate events of transmission by the transplantation of infected organs.

Immediately after infection, the rabies virus enters an eclipse phase during which it replicates in the muscle cells close to the site of infection without stimulating any immune response. This incubation period in humans is highly variable—from two weeks to, more rarely, some years—depending on the distance from the wound to the central nervous system, the amount of virus inoculated, and the virus strain. Animals like dogs and cats usually show signs of the disease between two and eight weeks, while in cattle it may take up to four months. When the virus reaches the brain, the clinical signs of rabies invariably appear. The infective period for dogs, cats, and ferrets is considered to start ten days before the onset of the first evident clinical signs, constituting an insidious threat to anyone encountering seemingly healthy animals in this period of time. When the virus is eventually shed in the saliva, the infection cycle of rabies is complete and the lyssavirus is ready to move on to another victim, relying on the aggressive behavior and abnormal production of saliva it causes in the current host.

All animals exhibit certain neurological signs as a result of rabies, which may differ slightly from species to species. In the prodromal stage, minor behavioral changes might occur, such as unprovoked aggressiveness in tame animals, daytime activities in nocturnal animals, and no fear of humans in wild animals. Symptoms may also include vomiting, fever, and dilation of the pupils. In the case of furious rabies, the first stage is generally followed by a period of severe restlessness and aggressiveness, marked by repetitive movements, running for no apparent reason, and unprovoked

attacks. Violent convulsions eventually lead to death. In the case of paralytic, or dumb, rabies, animals are unable to swallow due to the paralysis of face and throat muscles, and thus show abnormal vocalizations and the typical sign of foaming saliva around the mouth. However, contrary to common belief, rabid dogs are not hydrophobic (scared of choking on water owing to the virus's inhibition of the operation of throat muscles). Paralysis usually begins in the hind legs and, once extended to the rest of the body, leads to death.

Many of these symptoms also occur in humans. The prodromal phase of human rabies is marked by generic signs such as weakness, fever, headache, loss of appetite, nausea, myalgia (muscle pain), asthenia (reduction of muscle power), anorexia, insomnia, and abnormal sensations of tingling or burning at the wound site. The second and last phase, when the rabies virus starts "suppressing the rational and stimulating the animal" (Wasik and Murphy 2012, 3), is characterized by more specific neurological symptoms, in the case of both furious and dumb rabies. In furious rabies, symptoms include uncontrolled hyperactivity, confusion, hallucinations, combativeness, tachycardia, meningism, disorientation, hypersensitivity to stimuli, hyperesthesia, muscle spasms (when they affect the mouth, they cause excessive salivation), and paralysis of the vocal chords (which causes voice alterations). These phases of extreme excitement are often interspersed with lucid intervals, during which patients may fully understand their appalling predicament. Hydrophobia—the sensation of drowning stimulated by the mere sight of a glass of water—appears in about half of cases. In the case of dumb rabies (about 30% of human cases), the course of the disease is longer, usually less dramatic, and includes lethargy, gradual paralysis of breathing and swallowing muscles, coma, and eventually a fatal cardiorespiratory arrest. It is not by chance that the virus owes its name to the Greek word *lyssa*, which means "frenzy" and "madness."

No single test is available to diagnose rabies in humans before the onset of its symptoms, and unless the rabies-specific signs of hydrophobia or aerophobia (fear of drafts or fresh air) are present, a clinical diagnosis may be difficult to establish (Rupprecht, Kuzmin, and Meslin 2017, 8). Moreover, laboratory diagnosis in live human patients is usually reliable only in the case of positive results. Thus postmortem analysis of brain tissue or skin/hair follicles remains the preferred method of detecting this disease (WHO 2018b, 23–34). When the symptoms of rabies become evident, even the most intensive supportive care is usually futile, and there are no specific drugs or

therapies that can save the patient's life. In 2005, Jeanna Giese became the first person to survive rabies thanks to the Milwaukee protocol. This procedure involves inducing a coma to protect the brain while the body fights off the rabies virus. Since then, only a tiny handful of people with early symptoms of rabies have managed to survive despite neurological deficits, thanks to this procedure (or similar intensive medical care), which, however, is understandably impractical for most rabies-endemic areas. Both humans and animals rarely survive more than ten days from the onset of symptoms.

The only chance of survival after the bite of a rabid animal but before the onset of symptoms is immediate and accurate post-exposure prophylaxis. Thoroughly washing and flushing the wound with soap and running water for fifteen minutes is effective in dramatically reducing the number of viral particles deposited in it. If available, alcohol/ethanol, sodium hypochlorite, and povidone-iodine are also recommended to chemically remove the infected saliva. Covering the wound with dressings or bandages or stitching it shut should be avoided whenever possible. Victims should promptly be taken to a doctor, who should treat the case according to the epidemiology of rabies in the area and as per the national and WHO guidelines. WHO (2013b, 57) identifies three categories of risk based on the type of exposure to an animal suspected or confirmed to be rabid, or an animal unavailable for testing. Category 1 includes touching or feeding animals, licks on intact skin, contact of intact skin with secretions or excretions of a rabid animal or human case. No PEP is needed if a reliable case history is available. Category 2 includes nibbling of uncovered skin and minor scratches or abrasions without bleeding. In this case, the vaccine must be administered immediately in three or four doses according to the latest vaccination regimens recommended by WHO (2018a, 208). Treatment can be stopped if the animal remains healthy throughout the observation period or is proved to be negative for rabies by a reliable laboratory. For dogs, cats, and domestic ferrets, WHO (2018b, 156) recommends observation for ten days, while for other domestic and wild species it suggests a more conservative fourteen-day clinical investigation, or euthanasia if the severity of the situation requires it. Category 3 includes single or multiple transdermal bites or scratches, licks on broken skin, contamination of mucous membrane with saliva, and exposure to bats. In addition to the vaccine treatment (which can be stopped in the case of a nonrabid animal), one dose of rabies immunoglobulin (RIG) must be injected as soon as possible—but

only once in a lifetime and no later than seven days after the first dose of vaccine—in and around the wound site. RIG is a biological product that provides immediate antibodies until the patient's own immune system can respond to the virus. PEP vaccination (via intramuscular or intradermal route) should be given in the deltoid muscle or, in small children, into the upper thigh. PEP is highly successful in preventing the disease if administered within about a week of exposure.

Indian Deaths

In many of the developing countries stricken by rabies, data on human deaths, access to vaccines, and occurrence in animal populations are limited, outdated, probably unreliable, and thus much disputed. In Africa, for example, the actual number of human deaths may be underreported one hundredfold (Scott et al. 2017, 2). In India, by contrast, the NGO the Voice of Stray Dogs maintains on its website that the human death toll of 20,000 per year used by WHO and "imported" by the Association for Prevention and Control of Rabies in India (APCRI) is inflated by a factor of nearly one hundred, if compared with the "authentic rabies deaths figures" provided in July 2012 by the Central Bureau of Health Intelligence (under the Ministry of Health and Family Welfare), according to which Indian hospitals reported an average of 292 rabies deaths per year in the period from 2004 to 2010. At the same time, the National Centre for Disease Control (under the same Ministry of Health and Family Welfare) reports the 20,000 figure on the page of its website devoted to the National Rabies Control Programme. In 2018 the *WHO Expert Consultation on Rabies* report put together estimates from five different sources and gave the number of Indian deaths as ranging from 12,700 to 20,847 (WHO 2018b, 7). In the World Animal Health Information System managed by OIE, the data about rabies provided by India are limited and erratic.

Newspapers and other media follow this rollercoaster of numbers closely, creating further confusion when dealing simultaneously with rabies deaths and animal bites, though of course animal bites do not always transmit rabies. Given this numerical uncertainty in India, and in many other countries, WHO concludes that national data on rabies are more likely to indicate the presence of the disease than to document its full extent. While I do not deny the utility of high-quality surveillance data—primarily to break the circle of

neglect that surrounds rabies and to allow authorities to prioritize diseases in an accurate and sensible way—I fully align myself with WHO's clear and wise claim, and thus choose not to indulge further in an inconclusive debate here over the number of bites and rabies cases. Because rabies is totally preventable through vaccination, every death is one too many. Given the horrendous course of this disease—YouTube is full of heartbreaking videos of people and animals succumbing to rabies—each experience of agony is unacceptable. Leaving aside the actual number of rabies cases, the mere presence of the disease in a multispecies community is enough to damage the human-animal bond that, in turn, is a triggering factor for rabies.

According to WHO data, nearly 35% of all human rabies deaths occur in India. The Public Health Foundation of India's "Roadmap for Combating Zoonoses" suggests that what makes India particularly vulnerable to rabies, and more generally to zoonotic diseases, is its status as a developing country with a huge human population. This puts pressure on local habitats and on the human-animal interface, and the problem is exacerbated by particular cultural beliefs and practices regarding the human-animal relationship (e.g., dog ownership practices). This situation is aggravated by many other serious health challenges that crowd out the threat of rabies and discourage a well-planned, long-term strategy for its prevention and control. The result, the Public Health Foundation of India concludes, is insufficient technical capacity, a lack of research-based policymaking, and irregular surveillance and response. To make matters worse, considering the size of India, few medical institutions have the laboratory facilities necessary to detect rabies. Adagonda Sherikar and V. S. Waskar (2005, 700) highlight such additional obstacles as the consumption of unpasteurized milk, illicit animal slaughter, inappropriate waste disposal, and illegal trade in animals and animal products. The situation is further complicated by the vastness of the country and the decentralized, three-tier system of national, state, and local government (GARC and RIA 2012, preface), and by a weak interdisciplinary disease-management approach on the part of the human, domestic animal, wildlife, and environmental sectors. All of these factors contribute to putting rabies on the list of priority diseases in the "Roadmap for Combating Zoonoses" (Sekar et al. 2011, 4). A study by Arun Kurian et al. (2014, 359) ranks rabies first among the twenty-two zoonoses affecting India. Currently, India spends about two billion rupees (US$28 million) each year on PEP, with a loss of thirty-eight man-hours for every post-bite treatment (Vanak 2017).

The latest survey on rabies in India, carried out in 2017 by the APCRI (2018, 10) and sponsored by WHO, found that slightly more than two-thirds of rabies victims are males, and that 68% of victims live in rural or semi-urban areas. They are often the breadwinners, and their deaths may have severe consequences for the financial situation of their families. In 31% of rabies cases, the victim is under fourteen years of age. In an APCRI study of 2004, dogs were the biting animals in 96% of cases of rabies (17); in the 2018 APCRI study, dogs accounted for 74% of cases (49). The 2018 study found that the second-most-common biting animal is the cat, but Himangshu Dutta (2012, 760) claims that the number of rabies cases caused by monkey bites has been constantly increasing over the years, especially in northern India. At a conference titled "Rabies Post-Exposure Prophylaxis: Recommendations and Practices" in Delhi in March 2013, the municipal health officer N. K. Yadav stated that 5% of all bite cases treated in Delhi by Maharishi Valmiki Infectious Diseases Hospital between 2006 and 2011 were caused by monkeys. A survey of Delhi slum dwellers showed that monkeys are perceived, after dogs, as the second-most dangerous animals when it comes to the risk of catching rabies (Sharma et al. 2016, 117). Concern with primate-mediated rabies in India is increasing also within the international medical community, as monkey bites account for 31% of injuries necessitating PEP in international tourists returning from countries where rabies is endemic (Gautret et al. 2014, 4).

With reference to (dog-mediated) rabies in cattle, official statistics of the Ministry of Agriculture (2016, 159) report ninety-four deaths in 2015–16 for the entire country, but it is likely that these numbers are incomplete. In fact, Stephanie Shwiff, Katie Hampson, and Aaron Anderson (2013, 354) claim that rabies disproportionately affects Asia when it comes to cattle deaths. Cases of cattle bites to humans and consequent cattle-mediated rabies are rare (or unlikely to be reported), but they do occur. To mention just one, in February 2017 a cow attacked about twenty people in a village in Tamil Nadu and, while kept under observation for suspected rabies, she died some days later. After the disease was confirmed, all her victims underwent anti-rabies treatment (Oppili 2017). This event demonstrates that the possibility that rabies may be behind abnormal cattle behavior should always be considered. Concerns about the consumption of infected milk are more frequent. For example, in January 2017 the *Times of India* (2017b) reported that eighty people in Aurangabad district fell ill after consuming the milk of two cows who had allegedly been bitten by rabid dogs. The article mentioned nausea

and vomiting as the only symptoms reported by the patients, who were treated immediately, and did not clarify the final diagnosis, but it stressed the risk posed by milk in relation to rabies. This by-product is particularly risky because of the central role of cow's milk in Hindu rituals, especially because in order to make *prasad* (religious offerings to the deities, including sanctified food occasionally consumed by devotees), it can be used raw.

In his survey of cases of animal rabies in the period 1949 to 1967, B. K. Kathuria (1970, 2) reported high rates of the disease in cattle, sometimes higher than in dogs. Moreover, as B. C. Ramanna, Guddeti S. Reddy, and Villuppanoor A. Srinivasan observe (1991, 285), and as I discuss in chapter 5, while many developed countries recommend the destruction of livestock exposed to the bite of a rabid animal, this policy is difficult to implement in India because of harsh socioeconomic conditions and the religious veneration of cows. Thus it is essential to stress that cattle may catch and transmit rabies, especially given the generally positive and benevolent attitude toward cows in India, which may cause people to overlook this risk. In fact, in a multicentric study presented at the 2013 conference on rabies mentioned above, 39% of respondents believed that the bite of a cow cannot cause rabies; lizards and rabbits, who were on the same list, attracted more (unfounded) suspicion.

Returning to dog-mediated rabies, many deaths in India are due to the fact that 79% of dog bite victims receive no rabies treatment (APCRI 2004, 18). Even among the treated patients who nevertheless eventually died of rabies, the APCRI survey (19) found that 82% had never completed the course of immunization and 99% had received no rabies immunoglobulin (RIG), demonstrating gross negligence on the part of the health-care system. In 2017, the same nationwide survey found that the percentage of category 3 patients who received RIG had increased to 16 (APCRI 2018, 41). Official sources state that the use of RIG is particularly low because of its cost, its unavailability, insufficient awareness among medical staff, and the fear of side effects of equine rabies immunoglobulin among professionals (RIA 2011, 48). In fact, thanks to the higher cost of human rabies immunoglobulin, equine rabies immunoglobulin is allowed as a cheaper alternative in India. Nevertheless, a single monoclonal antibody product against rabies, licensed in the country in 2017, has been demonstrated to be safe and effective in clinical trials (WHO 2018a, 212).

At the same time, alternative remedies such as magic and religious practices and herbal therapies continue to be popular, being sought in 29% and

11% of cases, respectively (APCRI 2004, 19). Other studies, however, report much higher percentages of people relying on traditional healing applications—for example, 57% in Dehradun (Ohri et al. 2016, 848) and 55% in Panchkula (Tiwari et al. 2019, 12). In addition to personal preferences for indigenous medicine and traditional healers, people may also resort to them because, while some government hospitals provide the PEP vaccination at low or no cost, budgets are often insufficient, and this results in dangerous shortages and patients' consequent mistrust. The price of a vaccine dose at the drugstore ranges from 300 to 350 rupees (US$4.20–$5). In 2019 the central government considered banning the export of the 30% of the total fifty million doses produced that India currently sells abroad, because the country is facing an annual internal demand of forty-eight million doses, with the result that there is a 20–80% shortage in almost all states (Dey 2019). Moreover, like other Asian countries, India is also affected by the circulation of counterfeit vaccines produced in China (Patranobis 2018).

As in the human medical system, veterinarians are not always adequately trained to deal with rabies (Rani et al. 2010, 1). Because India is a heavily agricultural nation, competency in animal husbandry is the priority in veterinary education. Since rabies mainly affects dogs and is not among the most common pathologies of livestock, veterinary students are not given much training in the disease. Moreover, in 2015 only 70,767 veterinarians and veterinary paraprofessionals were reported to be working in India (OIE 2018). Ironically, in the same period, Delhi alone had more than 50,000 traditional healers for human patients (*Hindu* 2009).

Despite these obstacles, in the past fifteen years India has tried to move forward in its fight against rabies. In 2009, it passed the Prevention and Control of Infectious and Contagious Diseases in Animals Act. During the Tenth Five-Year Plan (2002–7), a program specifically to control rabies was submitted but not approved. During the next Five-Year Plan (2007–12), strategies to control rabies were developed and tested in five cities (Delhi, Ahmedabad, Bangalore, Pune, and Madurai). Once the disease was acknowledged as a major public health challenge, the National Rabies Control Programme was created by the Ministry of Health and Family Welfare under the Twelfth Five-Year Plan (2012–17) and received almost four billion rupees in funding (US$58 million). While the human health component of this initiative has been implemented throughout the country under the National Centre for Disease Control, the animal health component was initially launched in March 2015 in some districts in Haryana.

This initiative was soon discontinued, however, owing to lack of interministerial agreement on funding. In 2017, the Federation of Indian Animal Protection Organizations (FIAPO) launched the Rabies Free Kerala campaign in collaboration with local governments. In 2018, dog bites (though not, curiously, rabies) were included in the Integrated Disease Surveillance Programme of the Ministry of Health and Family Welfare. In the meantime, thanks to the support received by the government of Goa, the UK-based NGO Mission Rabies began experimenting with oral rabies vaccination to control rabies in this state (Gibson et al. 2019). Nevertheless, India has not yet joined the Rabies Vaccine Bank, launched by OIE in 2012 to facilitate the procurement of high-quality dog vaccines. Similarly, India has not yet begun the One Health Zoonotic Disease Prioritization Process recommended by OIE. Interestingly, of the twenty-five countries that have completed this process, twenty-four have prioritized rabies (Shadomy 2019).

Following Rabies

What I have briefly outlined above is a basic overview of the structural elements that compose rabies. The focus of my field research and of this book is the relational dimension of rabies, which necessarily depends on the affiliations between people and animals. Animals have occupied a marginal place in most social studies of health, disease, and medicine; I attempt here to bring them to the forefront, squarely alongside humans. In pursuit of my interest in human-animal social relations, I openly shadowed rabies, people, and animals on the streets of Delhi and Jaipur to observe the moments of interaction and other points of contact among them and to understand how they relate to one another. While this approach may appear at first glance to be focused on micro-interactions, it actually allowed me to broaden what I initially considered to be the borders of a study of rabies. By following the economic, cultural, religious, political, and ecological associations that form the basis of rabies infection, I was able to explore new pathways and intersections that I had previously been unable to imagine, and I discovered that the roads that lead to rabies in India are more numerous than I had anticipated. While following these roads, the big picture that I was aiming for gradually came into view. Moreover, although my approach to studying rabies has been place-based, it has always remained connected to the broader global context (Tsing 2005). Indian rhesus macaques have

been shipped to American laboratories, Siberian huskies are imported to Delhi as pets, and beef and carabeef (buffalo meat) from India are enjoyed in Southeast Asian kitchens. The implications of these types of exchanges will become clearer in the following chapters.

Apart from the geographical location of my fieldwork, the only limit that I tried to impose on the size of this picture is its cultural and religious context, by focusing on Hinduism. Yet this should not be understood as a simplification. Hinduism is the most widespread religion in India; it is practiced by roughly 950 million people in an astonishingly high number of personal, familiar, and community interpretations. Owing to its complex, dynamic, multifaceted nature, Hinduism is also extremely challenging when it comes to human relationships with nature and other animal species. Religion deeply permeates the daily lives of orthodox Hindus in particular, thus influencing their behavior, habits, and mindset. An example that gave me food for thought: male public urination is very common in Delhi and indeed throughout India. Isolated walls along pavements are the preferred location. Neither the angry looks of passersby nor notices threatening fines seem to discourage men from urinating by the roadside. But what humans cannot accomplish, gods can. Not a single drop of urine can be found on walls where tiles depicting Hindu deities have been installed about one meter from the ground. After all, as the rickshaw driver who taught me the basics of rickshaw driving in Jaipur used to say, "Indians are and will always be God-fearing people." In a lane not far from Connaught Place, in the heart of the Indian capital, I found confirmation of this claim. "Who can be so mad as to pee facing Shiva?" a passerby asked me rhetorically.

These anti-urine tiles were also scattered throughout Jangpura and Lajpat Nagar, the Delhi neighborhoods where I lived. Located in the north end of the South East Delhi district, they are popular areas that have grown exponentially over the past hundred years thanks to the relocation of the inhabitants of the Raisina Village, who were moved to make way for governmental buildings along the Rajpath, and the accommodation of the refugees who arrived in Delhi when India and Pakistan were separated in 1947. The slum where young Neelam lived was about one kilometer from my place, just behind the stinky drain that trickles toward the Yamuna River along the north side of Jangpura. Along the railway tracks that divide Jangpura and Lajpat Nagar, wherever some land is spared from residential (over)building, more or less improvised slums dot the landscape. Despite the noise created by the 11,000 people—the registered ones—with whom I

shared the square kilometer around my flat, one of my most vivid memories of life there is the braying of the donkeys who were kept by the inhabitants of a nearby slum for the transportation of construction material. In Lajpat Nagar, I also lived with the smells of hundreds of dogs, as my flatmates were veterinarians, and their clothes always smelled of sick animals and the operating room.

Taught something new every day about animal medicine and ethology by my flatmates, I blended these lessons with what I knew of public health, Indian religious studies, and, of course, medical anthropology, as I undertook the research for this book. For the multispecies ethnography I carried out in 2012–13, 2015, and 2019, I learned a great deal from Eben Kirksey and Stefan Helmreich (2010) and from the exceptionally stimulating literature to which their work led me. Technically speaking, combining personal stories of human-animal interaction and infection with more general data allowed me to keep a kind of dual, and thus doubly useful, perspective on rabies: in the world of rabies, every infected bite is identical in that it leads to the same end, yet each bite is also different, for it derives from a unique connection between a human and an animal. Until we reach the saturation point, the more stories we collect, the deeper our understanding of rabies becomes, and the better we can comprehend the lives of the people and animals behind statistical figures, which tend to gloss over life's complexity and turn bodies into numbers (Briggs 2016, 157). As Charles Briggs points out, especially in contexts of health and communication inequalities, *each* contribution to knowledge production is key to building a larger "ecology of evidence."

After conducting archival research at the National Medical Library, the Centre des Sciences Humaines, and the Indian Social Institute, I combined qualitative and quantitative research in my fieldwork. The former included minimally structured, open-ended, free-flowing, face-to-face interviews in English and Hindi with a wide and varied range of people: health authorities (among them doctors, veterinarians, primatologists, and public health authorities), dog feeders, monkey trainers, cattle farmers, garbage collectors, cattle shelter directors, Hindu devotees, Hindu priests, staff at cremation sites, animal welfare activists, and pet-shop owners. With respect to participant observation—the primary tool in ethnographic research—I made use of it as soon as I stepped out of my room, focusing my attention on the everyday life, entanglements, and intimacy (Govindrajan 2018) of people and animals. The Ottawa Charter for Health Promotion of 1986 states, "Health is created and lived by people within the settings of

their everyday life; where they learn, work, play and love" (WHO 1986), and I took this statement to heart (though I would add "and animals" after "people"). I combined observation with photographic surveying, employed as an unobtrusive research tool. By "unobtrusive research" I mean, following Webb et al. ([1966] 2000), a method of collecting data that does not involve direct elicitation of research subjects but instead uses unusual sources—in my case, this included garbage and food offerings for street animals. Taking pictures occasionally also yielded precious moments of learning about animal behavior—for example, an interaction one day with a young macaque in Connaught Place. At the time, I knew that avoiding eye contact is good monkey manners, but I had yet to witness the agitation caused by the big, zooming eye of the camera. By stepping forward and baring his canine teeth, this macaque taught me a valuable lesson, both as a person and as an ethnographer, that I would not soon forget.

The quantitative methodology consisted of semi-structured interviews and questionnaires. The interviews comprised multiple conversations with the 145 street and slum children I met. I decided to work consistently with these children, not only because they are common victims of rabies in India but also because their voices are not often listened to by anthropologists (Hirschfeld 2002). I met them either in the slums where they lived or, in the case of the street children, in the shelters where they were temporarily housed. Their average age was twelve, males outnumbered females, they were mainly Hindu, and only half of them had ever attended school. Although I am familiar with Hindi (the language mainly spoken in northern India), I sought the assistance of two people for the interviews because these children, most of them migrants from all over India, might have been uncomfortable with my standard Hindi. The translators were fluent in English, Hindi, and their native languages—Punjabi and Sadri. In most of the slums we visited, we were introduced to the local communities by a woman named Kamna, who had been working for a long time as a teacher of the children who could not attend proper school or needed extra coaching to prepare them for the rigid admission exams to private schools.

In the field of human-animal studies, questionnaires are used extensively to collect data about people's beliefs and attitudes toward animals (Anderson 2007). I used ad hoc questionnaires in English—the lingua franca of the Indian university system—to reach 185 mainly middle-class university students living in Delhi and studying in the universities of the city. I have included them in this research not only because they will soon

be in charge of Indian politics and economy but also because they belong to a booming and influential class that appears to be reshaping India's culture, ethics, and mindset. The mean age of the students I met was twenty-four; males slightly outnumbered females and they were predominantly Hindu (though most did not consider religion important in their lives); 60% of them were not vegetarians. Many of them declared an interest in animal welfare, but only a tiny fraction were actually engaged in animal activism. Most of our conversations and questionnaire compilation took place over a drink or snack in the square outside the Vishwavidyalaya metro station, which serves the University of Delhi, under an advertising billboard reading, "The biggest gathering of youths of the capital."

My research also greatly benefited from my diverse and extensive experience in three veterinary hospitals and shelters for street animals in both cities where I lived. I agree with Donna Haraway that in order to talk about animals responsibly and usefully we must get "dirty and knowledgeable" (2008, 80). As it is impossible to get dirty without using the body in a direct, close, even intimate way, I always inaugurated my experience in the veterinary hospitals and shelters by performing the grimiest tasks: removing guano from the pigeon cages, cleaning up kittens' diarrhea, bathing mangy dogs, and helping during autopsies. Later, I also bottle-fed dying cattle, assisted in treating worm-infested wounds, counted surgically removed ovaries and testicles, and befriended dogs traumatized by abuse or paralyzed by road accidents. These one-on-one interactions with animals were essential to this kind of research (Sanders and Arluke 1993, 378). I got the chance to interact not only with species with which I was already acquainted, such as dogs, cats, cattle, donkeys, and horses, but also with eagles, monkeys, peacocks, camels, egrets, and parrots, all animals who were collected from the streets of Delhi and Jaipur.

To stay informed about human cases of rabies and human-animal conflict, since 2012 I have systematically searched for all news stories on these topics in the leading English newspapers of India, such as the *Times of India*, the *Hindu*, the *Hindustan Times*, the *Indian Express*, the *New Indian Express*, and the *Pioneer*. Newspaper articles, although they cannot necessarily be taken as unbiased, objective accounts, are nevertheless a valuable source of the perspectives and voices in the debate over human-animal issues within a large setting (Podberscek 1994, 232). In fact, as Amy J. Dickman (2010, 462) rightly notes with regard to the complexities of human-animal conflicts, people base their perceptions and attitudes not only on personal experiences but also on wider societal experiences. Moreover, news articles

have allowed me to feel connected with my fieldwork site when I could not physically be there. Even if regional newspapers in vernacular languages have a wider audience, English-language news sources address the urban, educated middle class in which I am interested because of its direct involvement in the hornet's nest of animal-related issues in India.

In my fieldwork, I covered considerable distances within the immense city of Delhi and the overcrowded city of Jaipur. I followed cows on foot for twelve hours at a stretch, registering and analyzing their interactions with people. I rode for hours in the animal hospital ambulances that patrol the streets looking for sick animals and stray dogs to spay, neuter, and vaccinate against rabies. I scoured Old Delhi's labyrinth of narrow lanes looking for dogs to vaccinate with a rabies team from the North Delhi Municipal Corporation. In short, I took to heart the precept of Kirksey and Helmreich (2010, 555) that in order to study animals in their natural environment, multispecies ethnography must be multisited (Marcus 1995). Walking around Delhi was particularly challenging, not only because of the poor conditions of roadsides and the vast size of this city, but also because walking there invariably put me out of place (Douglas 1966, 36), a concept that will reappear throughout this book in relation to the many species I encountered. "In Delhi, only the poor and dogs walk," I was told by the shoemaker who worked on the pavement opposite my flat in Lajpat Nagar, whenever he spotted me coming home on foot. Moreover, except for the areas around schools, markets, and places of worship—all related to easily recognizable female activities—Indian streets are mainly seen as male space. Going out and doing *ghumna-phirna* (loafing around just for pleasure or without a precise aim, as laypeople may perceive ethnographic walking) is a pastime that men generally consider despicable for solitary women like me.

While moving around Delhi and Jaipur looking for contacts between humans, animals, and the rabies virus, it was all too easy to acknowledge that these cities are perfect examples of zoöpolises (Wolch 1998, 119). As a Greek boy who now lives in Vietnam once told me in Delhi, "Compared to where I live, India is another world; it's a world where animals still exist." A zoöpolis is a nonanthropocentric city that is open to nature—or, as Steven Hinchliffe claims, a space where nature does not stop (1999, 138)—in which nonhuman animals are effective members of the multispecies community that accommodates them, and are adapted (or trying to adapt themselves) to the "natural-cultural" (Fuentes 2010) environment in which they live. Following the definition of "hybrid geographies" proposed by Sarah Whatmore, a zoöpolis can be understood as the result of

"the heterogeneous [more than human] entanglements of social life" (2002, 3). As Agustín Fuentes (2009, 14) explains, the spaces of these cities are integrative, shared, and shaped by the synergy of humans and animals, who together build and negotiate their co-produced niche, or co-ecology. Not only is this niche a physical space, but it is multidimensional, created at the intersection of ecological, social, cultural, religious, economic, and political factors. Niches, or "zones of sympatry" (Fuentes and Baynes-Rock 2017, 6), are generally imagined as enclaves within a larger space, as areas of limited geographical expansion. Based on my exploration of Delhi and Jaipur, which I do not claim was exhaustive, these two densely inhabited cities appeared to me as zones of sympatry in their entirety. I struggle to recall a portion of their urban landscape that could be described as a zone of allopatry (i.e., lack of geographical overlap), where no dog, macaque, or cattle was around. These three animal species, together with humans, were ubiquitous co-inhabitants of their cities, ever present co-residents of their overlapping spaces.

As imagined by urban geographers, a zoöpolis demolishes the "ontological exceptionalism of humans" (Houston et al. 2017, 1) by refusing persistent dualistic notions, translated into boundary lines, such as domesticated/wild, familiar/out of place, natural/cultural. Consequently, it takes for granted that "gaps" between these abstract categories are actually the norm in typical (that is, fluid and unstable) landscapes (Nading 2014b, 19). For example, as Melanie Rock and Chris Degeling (2016, 70) observe, in a zoöpolis, free-roaming dogs perfectly exemplify how nonhumans easily bridge the divisions between otherness, liminality, and kinship that people create for their own convenience and think they can impose on their passive co-existing species. Even more fitting and telling is the example provided by the cattle who live in Delhi and Jaipur: they may be owned yet neglected, unowned yet well cared for, worshipped yet exploited, slaughtered yet protected by law.

Another artificial construction is the public/private dichotomy, which for the purpose of this book needs to be clarified briefly. Apart from animal hospitals and shelters, I carried out most of my fieldwork in what legal language would define as public spaces, mainly on the street. Yet it immediately became obvious to me that I was navigating ideas of public and private very different from those I grew up with in northern Italy. I felt embarrassed whenever my eyes involuntarily fell upon scenes of people urinating and defecating not only in public spaces but in public view. I felt equally embarrassed whenever, invited to visit people I had just met, I was

received for a chat, a chai (Indian tea), or even an entire meal sitting on their beds, occasionally with a half-naked, half-asleep relative in the bed next to us. By contrast, entering a kitchen was usually more complicated, and every time I did so, it was evident that I was crossing the threshold of domestic intimacy. With regard to human-animal-rabies relations, it will become clear as this story unfolds how porous the boundaries between public and private spaces are.

Outline of the Book

Although I aim in this book to present a multispecies narrative, its division into single-species chapters, though they are not meant to describe discrete worlds, has been necessary for the sake of clarity. Chapter 1 presents the human component of the relationship with other animals, focusing on the living conditions of street and slum children and the ideology evident in the lifestyle and language of middle-class youth. It also introduces more fully the towns where I carried out my research, and, in the case of Delhi, it describes the discriminating attitude of people who, idealizing globalist, capitalist modernity, insist on a utopian division between species and spaces. Finally, it concisely outlines the basic concepts of Hinduism relevant to the subject of this book, and related issues such as vegetarianism and animal activism. Chapter 2 describes the role of food as the central knot in the network of interspecies connections considered in this study. In fact, it is largely around food that people's and animals' lives intersect in Delhi and Jaipur. This chapter does not look at animals as sources of food for humans but, more intriguingly, at how people voluntarily and involuntarily feed their neighbor animals. I pay particular attention to the plenitude of garbage on Indian streets, the widespread Hindu practice of offering food to street animals, and the unprecedented abundance of cattle carcasses, which contributes to the proliferation of dogs and the consequent problems of bites and rabies. Relevant but often overlooked factors such as open defecation, human/animal scavenging, the presence of unburned human bodies floating in rivers (per Hindu death customs), and the improper disposal of animal carcasses are also discussed, as they are crucial to understanding the complexity of rabies.

Chapter 3 outlines the role of dogs in Hinduism, with special reference to Bheru, a god associated with these animals. It also describes the extremely ambivalent attitude toward dogs in India, focusing on the contrasting lives

of overpampered purebred pet dogs and the despised Indian street dogs whom most people consider responsible for bites and rabies. Moving among dog lovers, animal rights activists, and dog haters, it presents the strategies currently being implemented to control the population of street dogs and rabies. Chapter 4 first presents the main motives behind the arrival of macaques in Indian cities (deforestation, illegal monkey training for entertainment purposes, the use of macaques in Indian and international laboratories, etc.) and the "menace narratives" and episodes of mass hysteria that have resulted. It then addresses the widespread cult of Hanuman, a simian god who indirectly guarantees food, shelter, and legal protection to his flesh-and-blood representatives. The chapter closes with a look at the measures used to manage the continuous, and occasionally "biting," tug of war between humans and primates within this unique context. Chapter 5 deals with Indian cows, animals who have been protagonists of one of the most heated and prolonged debates in the history of anthropology. This discussion has revolved around their supposed sacredness, sometimes attributed to economic factors, sometimes to religious ones. I do not engage with this rigid and somewhat abstract dichotomy, instead looking at the real life of street cows, which is closely connected to complex issues such as urban poverty, environmental deterioration, and growing health risks—for cows, as they choke to death on plastic garbage, and for their coexisting species, as they die of rabies. The chapter explores the reasons why cows end up roaming around and the attempts to remove them from the streets and from the risk of catching and transmitting rabies.

Chapter 6 addresses rabies more directly, through the data I gathered by talking with street and slum children and middle-class university students. It describes how rabies is perceived, what is known about it, how people view rabid dogs, how animal bites are treated, and the main reasons for the vulnerability of rabies' most common victims—male children. The chapter analyzes the unique belief that dog bite causes a terrifying puppy pregnancy in humans and the role of this belief in the fight against rabies. It also provides a comprehensive look at the typical interactions between the four species examined in this study that contribute to the transmission of rabies.