The Role of Animals in Pandemic Narratives: Forewarning Disaster, Causing Outbreaks, Conferring Immunity

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Abstract

In this chapter, we explore the role of animals in pandemic narratives. We start by discussing how animals often serve as harbingers of disaster in literature and culture. We use Raphael's *Il Morbetto* and Shelley's *The Revolt of Islam* as case studies to illustrate how they are often imagined to die before humans as a signal of the impending tragedy. Next, we argue animals may be perceived as aggravating the epidemic by reversing to a wild state – as happens in Teófilo's *A Fome* or Giono's *Le Hussard sur le toit*. We then analyze how they become agents of contagion following the discovery of animal vectors in the late 19th century. This is what happens in Murnau's *Nosferatu*, where rats and the rodent-like Nosferatu are taken to cause the outbreak. Finally, we investigate the representation of animals as agents conferring immunity in *I Am Legend* and *Y: The Last Man*, in which animals grant the main characters with anomalous and unanticipated resistance to disease.

INTRODUCTION

Animals have always had an important place in the cultural imagination of epidemics: dogs are blamed for rabies in Ancient Akkadian literature; diseases and animals placed side by side in Biblical plagues; while many medieval sources imagine serpents and frogs as the root causes of plague outbreaks.

In this article, we study the representation of animals in pandemic fiction. We argue that animals perform a recurrent role as 'expository characters', standing at

the beginning of a chain of events and at the same time, help to clarify and explain it. Without these expository animal characters, the action would not unfold in the same way. By drawing examples from various media, we suggest that animals perform three main recurrent functions, all of which vary in accordance with developments in science and medicine. In all of them, animals are vital to: (1) forewarn disaster is approaching, (2) worsen the outbreaks or cause it directly or (3) confer immunity to other characters.

ANIMALS FOREWARNING DISASTER

Prior to the discovery of animal vectors in the 19th century, animals were rarely considered relevant for the eruption and maintenance of epidemics – apart from the associations of dogs with rabies and snakes with poison. Far from being seen as potential disease-spreaders, non-human animals were commonly depicted as companions in misfortune who suffered from the same ailments as humans. This perception reflected human-animal relationships established before the Industrial Revolution, when humans had a much closer relationship with and relied far more on animals for food, transport and the production of goods, which in turn, ascribed a higher symbolic and spiritual meaning to many animals (Thomas 1983).[1]

In the influential essay, *Why look at animals?* (1980), John Berger notes the fascination that animals exerted on humans before the advent of industrial production. In his view, their special capabilities – strength, speed, dexterity, sensitivity to smells or sound and so forth – induced an admiration and respect which, albeit irretrievably lost today, were previously constant throughout human history.

On these grounds, animals were understood as more perceptive and, therefore, more connected to 'the natural world'. As such, they are frequently depicted in

1 As a field, the Animal Studies engages transdisciplinary approaches drawn from Zoology, History, Law, Literary Studies, Anthropology, Philosophy and others, to study both animal life in itself and the relationship between human and non-human animals. It seeks to offer new light on both broader and specific understandings of animals as living beings and it also aims to critically probe the dominance of anthropocentrism in Western culture (cf. Waldau 2013). Some of the field's key areas of investigation are: animal agency; animal welfare and ethics; the cultural imagination of animals; human-animal relationships; animal rights; among others. The terminology *human* and *non-human animals* is used within the field to emphasize the – often overlooked – fact that human beings are also part of the animal world, and also that non-human animals share similar characteristics with their human counterparts.

folklore, fiction and even some historical chronicles, as able to sense that danger is approaching, sometimes intuitively, even before any signs are available. They may flee before a storm approaches, for example, or behave oddly prior to an earthquake. One such case is found in Pliny the Elder, who asserts that, before earthquakes, "birds don't remain sitting quietly" (Tributsch 2013, 278) – in fact, such anecdotal evidence is recurrent enough to be taken seriously by present scientific research (cf. Wikelski et al. 2020). Not all occurrences are necessarily tied to natural disasters; human action may also be predicted by animals, and it is a common trope in literature and film for animals to notice a threat before it is evident in anyway. In some cases, a paranormal element seems to be implied in this perception, for instance, when dogs bark insistently at a character who will turn out to be a serial-killer, a vampire, a demon, etc. As such, animals often occupy the narratological function of forewarning the immediate future and thus, in the case of natural catastrophes such as epidemics, they become harbingers of disaster.

Homer is a case in point. At the start of the *Iliad* (I, v. 69-72), Apollo sends a pestilence to the Greek camp as punishment for Agamemnon's refusal to return prisoners of war. Albeit the retribution is aimed at humans, the text makes clear that animals are struck first, with the Greeks following suit:

> On mules and dogs the infection first began;
> And last, the vengeful arrows [of pestilence] fix'd in man.
> For nine long nights, through all the dusky air,
> The pyres, thick-flaming, shot a dismal glare. (ibid. 1909, 35)

In a similar take, Thucydides seems to suggest in *The Peloponnesian War* that nature may foretell calamity, since during the conflict, "eclipses of the sun, [were] occurring more frequently than in previous memory; [as well as] major droughts in some parts, followed by famine […]" (2009 [c. 431-400 *BCE*], 13). Later, when describing the Plague of Athens, he notices an odd event: the "notable disappearance of carrion birds, [which were] nowhere to be seen in their usual or any other activity" (ibid., 98). The anomaly is concomitant with the outbreak, which was called before "one of the most destructive causes of widespread death" (ibid., 13). He also remarks that some animals died immediately after feeding on the bodies of the plague victims (ibid.). The assertion is possibly an overstatement designed to create a Homeric intertext. Few pathogens kill several species aimlessly at once; besides, bioarchaeology identifies the Plague of Athens as caused by *Salmonella typhi*, for which animals can be carriers, but it is not ordinarily lethal to them in large numbers (cf. Papagrigorakis et al. 2006).

Regardless of that, Thucydides is likely followed by Boccaccio in *The Decameron*, which was written between 1348-1353. The Italian author claims to have seen pigs die moments after having sniffed the garments of plague victims. The anecdote is possibly apocryphal or exaggerated since *Yersinia pestis* requires a few days of incubation before any symptoms surface. Nonetheless, it serves the narratological purpose of illustrating the seriousness of the menace faced by humans. The expiring animals are a sort of prelude for a greater tragedy in the making.

That is also the role Percy Shelley imputes to animals in the narrative poem *The Revolt of Islam* (1818). It narrates the story of Laon and Cythna as they initiate a rebellion against the tyrant Othman to free the allegorical Golden City. In the poem, animals are the first to be stricken by the disease, and as such, they anticipate the plague and famine that are about to erupt. After Othman's army violently supresses a popular revolt, the bodies of humans and animals are left to rot. The fumes exuding from the corpses unleash a plague that grows by following a clear pattern:

> First Want, then Plague came on the beasts; their food
> Failed, and they drew the breath of its decay.
> […]
> In their green eyes, a strange disease did glow,
> They sank in hideous spasm or pains severe and slow.
> The fish were poisoned in the streams; the birds
> In the green woods perished; the insect race
> Was withered up; the scattered flocks and herds
> Who had survived the wild beasts' hungry chase
> Died moaning, each upon the other's face
> In helpless agony gazing; round the City.
> (Canto Tenth, XIV to XV) (Shelley 1818, 219)

The plague strikes animals in a hierarchical way, moving bottom-up in a scale that implies a human-centred distinction between lower and higher life forms. The "strange disease" hits fish first, then birds, insects, and finally, reaches mammals, mostly cattle and sheep. The hierarchical order in which the animal victims are organized suggests that the next prey will notedly be human beings. This use of animals as announcers of death creates an atmosphere of suspense that prepares the way for the looming catastrophe.

An analogous case is found in the plagues of Egypt as described in the *Book of Exodus*, where animals suffer alongside humans in most cases: they are all

infected by lice (3rd plague); slain by wild beasts (4th); tormented by festering boils (6th); killed by a storm of hail and fire (7th); and starved after a cloud of locusts devastates the land (8th). If that was not enough, the fifth plague consists of a pestilence that decimates only livestock; that is to say, animals die as a means to punish humans indirectly. The shared retributions and the co-suffering reveal a profound connection between the fate of human and non-human animals. And even if many plagues are somehow related to disease, they do not imply any kind of contagion, as animals are not seen as causing or worsening the calamity in any way. Moreover, even when animals are part of the problem, as during the multiplication of frogs (2nd plague), they are considered more of a practical nuisance rather than a health menace – as their common association with toxicity could suggest.

A comparable portrayal is also found in the Renaissance print *Il Morbetto* (c. 1515) (cf. fig. 1), produced by the Italian engraver Marcantonio Raimondi after sketches by Raphael known as *The Plague of Phrygia* (c. 1512-1514) (cf. Boeckl 2000, 48-51 and 91-106). It depicts a city ravaged by pestilence through a combination of public and domestic scenes. A large dark cloud looms on the horizon in an unmistakable allusion to miasmas, the foul odours which were taught to cause epidemics by medical theories of the time. A woman has just died in the foreground, and her suckling infant still tries to drink her milk. A few individuals come to their aid, but all shudder at the view and the stench. A man moves the baby's face away while covering his nose to avoid inhaling the noxious fumes. A related scene is found to the left, where a man holding a torch discovers the bodies of three dead calves – a dead horse is also visible to the right in the background. Nearby, a sickened cow observes the dead calves, in what can be interpreted as a reversed parallel of the dead mother's scene. A fourth calf sniffs its dead companions, thus completing the action from which the baby was precluded. The dialogue and overlap between the scene performed by humans and that performed by the cow and the calves serve as another indication that, in times of pestilence, animals are thought of as victims and co-sufferers, rather than originators or spreaders.

The affinity between human and animal distress is further highlighted by the Latin phrase inscribed in the monument that separates the two scenes: *linquebant dulcis animas aut aegra trahebant corpora.* The sentence is taken from a passage of Virgil's *Aeneid*, and it translates as "People let go of the sweet breath of life or they dragged ailing bodies / painfully" (2007 [29-19 *BCE*], 58). The description is part of a scene referred to as 'the plague of Pergamea'. Aeneas misinterprets an oracle from Apollo and tries to fulfil his mission of founding a great city in Crete, rather than Italy. Due to the mistake, he, his men and their animals and crops are punished by a pestilence. As in the Bible, the problem is ultimately caused by the

human failure to obey the commands of God. Animals do not contribute to the transgression in any way; but nevertheless they must innocently share the fate of humans.

Moreover, the status of the animals as 'collateral damage' reveals that, culturally, there were no fundamental divergences between understandings of human and animal health. In effect, prior to the germ theory of disease and the consequent scientificization of medicine in the late 19th and early 20th, the division between human and veterinary medicine was less pronounced. As Rudolf Virchow – who made numerous contributions to pathology and social medicine but repeatedly dismissed the Germ Theory of Disease – still remarked in 1872: "Between animal and human medicines there are no dividing lines – nor should there be. The object is different, but the experience obtained constitutes the basis of all medicine" (Saunders 2000, 203).

ANIMALS WORSENING AND CAUSING OUTBREAKS

After the turn of the 19th century, Italian scientist Agostino Bassi (1773-1856) would show in his widely circulated essay *Del mal del segno* (1835) how disease in silkworms was both contagious and caused by microorganisms. A decade later, he would expand his ideas in *Del Contagio in Generale* (1844), arguing that animalcules could be responsible for human maladies too. Concomitantly, in 1847, Ignaz Semmelweis (1818-1865) established the statistical correlation between unwashed hands and puerperal fever (cf. Carter 2017, 28-32 and 44-61).

These early propositions were followed by the meteoric rise of the Germ Theory of Disease after the 1860s. This new understanding of disease ushered a revolution whose profound consequences went well beyond science and medicine to influence nearly all areas of life. A series of significant breakthroughs bacteriologists demonstrated how the *animalcules* – which were now increasingly being termed *microbes* – were responsible for illnesses in plants, animals and humans. Louis Pasteur (1822-1895) proved that microorganisms spoiled milk, wine and beer. Gerhard Hansen (1841-1912) discovered that the bacterium *Mycobacterium leprae* caused leprosy in 1873, thus identifying the first human pathogen (Worboys, 531). Little after, Robert Koch (1843-1910) established the link between *Bacillus anthracis* and anthrax in cattle and sheep (cf. Blevins/Bronze 2010). In the early 1880s, Pasteur and Émile Roux would successfully develop vaccines against anthrax and rabies, solving in the process the mystery of how Jenner's vaccination against smallpox worked (cf. Bazin 2011). In the meantime, in 1882

and 1883, Koch would discover the pathogens that caused tuberculosis and cholera, the two major infections of the century (cf. Blevins/Bronze 2010).

These findings offered visibility to the formerly unseen threat posed by the microbial world. As a result, they provided a solid and robust rationale for the urban and social reforms which sanitarians had advocated since the 1840s. Foreseeably, sanitarians quickly updated their reliance on miasmas to adopt the new concept of microbes (cf. Latour 1993). Yet, since microscopic life was described for over two centuries as composed of 'tiny animals', many cultural discourses were naturally built around the animalization and anthropomorphizing of germs (cf. King 2014, Tomes 1999). As such, threatening bacteria were often imagined in newspapers, caricatures and fiction, as minuscule insects, reptiles or chimaeras (Stones et al. 2022, 107-113). If animalcules had been interesting oddities before, they now turned into villains responsible for immensurable death and suffering.

These were not the only cultural perceptions to shift, for research increasingly revealed the role of animals in disseminating germs. Malaria, for example, was linked to mosquitos in the 1890s by Ronald Ross and Giovanni Battista Grassi (Worboys, 514). The exact relationship with mosquitos was established for yellow fever by Carlos Juan Finlay in 1881 and later confirmed by Walter Reed in the early 1900s (ibid.). To make a few other examples: rats were identified as the vectors of plague by Paul-Louis Simond in 1898 (Simond et al. 1998); shortly followed by the connection of African sleeping sickness to the tsetse fly by David Bruce in 1903; or of Chagas' disease to the barber bug by Carlos Chagas in 1908 (ibid., 527-530).

These ties between certain animals and particular diseases were a novelty. Traditionally, humans primarily categorized animal species based on their perceived utility or threat: wild or tame, edible or inedible, useful or useless (cf. Thomas 1983, 47-55). Those creatures which served as transportation, or which provided nourishment and work power were regarded with appreciation and concern – which is not to say that cruelty to animals was not equally rife. Certain species were interpreted as menacing to human life and others to human subsistence for consuming crops and spoiling food. The first groups included wolves, bears and wild boars, while the latter comprised the so-called 'vermin': insects, rats, foxes and certain birds. Creatures appertaining to these groups were often persecuted and exterminated (ibid., 58).

Nonetheless, persecutions were carried out because of the perceived threat to people and their property by direct action, not by means of diseases – with the eventual exception of rabid dogs and 'poisonous creatures'. Every so often, animals could be considered an indirect danger to health due to their power to generate miasmas, either through excrement or by their decomposition after death. This

was the reason why laws regulating butchery and the disposal of offal and animal carcasses in the open air were created (cf. Carr 2008, 451). Yet, the inner workings of contagion were not explicitly tied to animals; they resulted instead from all types of decaying matter, including human and even plant materials. Given that miasmas could originate from any of the abundant and ubiquitous organic sources, there was no systematic effort to inculpate non-human animals for their existence.

These perceptions slowly started to change with the rise of sanitary movements; yet major cultural transformations only took place after the breakthroughs of bacteriology after the 1880s. In that regard, the successive discovery of animal vectors had significant importance. Once that link was established, pre-existing notions of 'vermin' could be updated to include this new biological peril. Such was the case of rats and mice: even though they had been despised and considered symbols of evil for long – and had been, on occasion, indirectly linked to miasmas and the plague (cf. Cole 2010; Biehler 2013, 113) –, it was throughout the 1800s that rats and mice were increasingly equated with disease. At first, they were generally paired to filth and squalor, just to become the quintessential emblem of plague by the turn of the century after their identification as a vector. Then, controlling the rat population became a major strategy used to curb plague outbreaks in Rio de Janeiro (1900), Sidney (1900) or San Francisco (1900-1904), among others.

These transformations were also noticeable in literature too, where the advent of animals as disease-spreaders took hold after the beginning of the 1900s. Rats appear abundantly in Bram Stoker's *Dracula* in a meaningful relationship with the Count. They convey old ideas about 'vermin' and, hence, serve to highlight his parasitic reliance on human blood. After being severely injured, Renfield reveals to Drs. Seward and Van Helsing a vision in which Dracula summons "Rat, rats, rats! Hundreds, thousands, millions of them, and everyone a life; and dogs to eat them, and cats too" (1983 [1897], 279). Then, he conjures up a dark mist in which "there were thousands of rats with their eyes blazing red – like His, only smaller. He held up His hand, and they all stopped" (ibid.). Dracula is akin to these animals and can control them.

Nevertheless, the rats do not invoke ideas of plague here for two reasons. Firstly, *Dracula* was serialized in 1897 and published in book form in the following year. Therefore, it slightly pre-dates Simond's discovery of the role played by rodents in the transmission of plague. Secondly, these rats seen in a vision are offered to Renfield as a reward to be presumably consumed as food.

This is not to say that the narrative disregards medical discourses. The threat of looming biological invasion appears metaphorically throughout the entire novel. Dracula is himself linked to epidemic diseases: his victims become frail

and feverish; he can infect others with vampirism; he is a tall and pale noble, and his mouth is eventually tinged with blood – as in the case of stereotypical tuberculosis patients –; he invades a major urban center to feed preferably on sensible and refined women – in the same way that tuberculosis was imagined as doing (cf. Byrne 2011, 124-149) –; he can summon a cloud of mist before landing in England or invading Nina Harker's room – very much like miasmas –; he comes from a barbaric and loosely defined 'East' – in the same way as *Asiatic* cholera or *Oriental* plague. In this way, the Count is depicted in two complementary ways which do not intersect directly. On the one hand, he is related to rats, which are understood as disgusting parasites and symbols of corruption. On the other, he is seen as an invasive biological force in the guise of the numerous epidemics of the 19th century.

Nevertheless, in our interpretation, these two co-existent views do not interact to create a third relationship that sees rats as vectors of plague or dogs and bats as vectors of rabies. Rats were chosen due to their rich symbolic charge, which is undoubtedly related to decay and filth – and consequently to disease –, yet still it is less direct than our present-day sensibility would suggest. By the same token, dogs or bats are employed in the narrative not so much for their ties with rabies but rather for being an allegory of evil (dogs) and feeding on blood (bats).

Yet, that relationship changes completely in *Nosferatu: A Symphony of Horror*, the cinematic version of the novel directed by Murnau in 1922. In the film, the Count is directly and inextricably linked to the bubonic plague by means of rats. This is obvious from the moment the coffins loaded with accursed earth are dispatched by ship to Germany. When the port authorities inspect one of them, they discover they are all teeming with rats. In the following scenes, the imminent arrival of the Count is announced by his insane follower, at the same instant in which, a professor compares carnivorous plants and microscopic 'polyps' to vampires during the course of a lecture. The superposition of a macroscopic menace (Nosferatu) and also a microscopic one (*Yersinia pestis* delivered by means of rats) is quite evident. A little later, the newspapers are shown announcing that "a plague epidemic has broken out in Transylvania" and its "victims appear to have strange scars on their necks" (Murnau 1922 [00:46:41 min.]), an ambiguous reference to the vampire's bite as much as to the plague's buboes which customarily erupt in the area. In the meantime, a sailor falls sick in the ship and realizes in his delirium Nosferatu's presence. The sailor soon dies and is shortly followed by the rest of the crew, all of whom are explicitly decimated by "the epidemic on board" (ibid. [00:49:15 min.]). The Count and his mischief of rats are inseparable: they leave Transylvania, get out of the coffins on the ship, and disembark in Germany always at the same time. Once the ghost ship is inspected, politicians read about

the plague on its registers and immediately sound the alarm of a "plague threat" (ibid. [01:03:51 min.]).

Interestingly, on hearing the terrible news, many politicians cover their noses to avoid miasmas, thus confusing the current and the discarded mechanisms of contagion. A plague outbreak erupts from this point onwards, with a vast number of citizens perishing and houses being marked with characteristic white crosses. Seemingly, these individuals genuinely die of the plague since the Count pays no attention to the surrounding chaos; he is all too busy preparing an attack against Ellen, the virtuous wife of his real estate agent about whom he obsesses.

In this fashion, Murnau's *Nosferatu* constructs a tripartite relationship in which vampire, rats and plague are indissociably linked. However, this interaction emerges only partially in *Dracula*, where rats appear less extensively and are not considered vectors of plague; instead, they are loosely linked to disease in general by eliciting ideas about filth. These changes reveal the new perspectives about animals as vectors that circulated in the twenty-five years, which separate the publication of the novel (1897) and the making of the film (1922).

Another example of animals acting to worsen a natural disaster is found in the Brazilian naturalist novel *A Fome* (*Hunger*), published by Rodolfo Teófilo in 1890. It describes the deadliest natural catastrophe in Brazilian history: the Great Drought of 1877-1878, which caused a third of the population of the Northeast region to succumb to hunger or to a concomitant outbreak of smallpox; an overall loss of life equated to 5% of the Brazilian population at the time (cf. Mota et al. 2021).

The novel follows a family of formerly rich farmers who migrate to the coast searching for better life conditions. Their future sufferings are foretold before their departure by the sudden death of their cattle due to "epizootics of various nature" and the "microbe of anthrax" (Teófilo 2011 [1890], 22; authors' translation).[2] Moreover, when they start the quest, the migrant family discovers the hinterlands are startlingly silent: "[n]ão se ouvia o trinar de uma ave, o zumbir de um inseto!" (ibid., 30).[3] In both cases, the death or disappearance of animals serve to forewarn disaster.

2 "Epizootias de diversas naturezas se desenvolveram e faziam diariamente centenas de vítimas. O micróbio do carbúnculo, embora fosse enterrado não morria, ressuscitaria nas ervas do campo levado pelas minhocas, quando chovesse" (Teófilo 2011 [1890], 22).

3 "Not the twitter of a bird, not the chirp of an insect could be heard!" (authors' translation).

Along the way, besides suffering from hunger and illness, the migrants are constantly attacked by ravenous animals, who – like the smallpox outbreak on the making – seem to thrive in the desolate conditions. Such is the case of the New World vultures (*urubus*), whose imagery is used to stage the overall human misery and death but also to engender a gothic atmosphere:

> Os urubus, pousados aos milhares nos galhos das árvores num crocitar constante, tornavam a solidão tétrica e pavorosa. De uma gula insaciável, espreitavam as vítimas, que caíam aos centos mortas de fome e de peste, e banqueteavam-se naquele repasto de pelangas. A atmosfera que enchia os campos era deletéria e podre.[4] (ibid., 22)

In the passage, the vultures gather around on the trees waiting for their next prey. They are very numerous and noisy and consequently stand in stark contrast to the barren and silent surroundings. In addition, they act in consort with natural catastrophes, waiting for weakened victims to succumb to hunger or to plague (*peste*) – a word which is carefully chosen to refer to a collection of diseases, rather than to bubonic plague itself. The stench referred to in the last sentence is yet another invocation of miasmas. However, it is also used to reveal the combined burden of disease, hunger and now, animal aggression: if the adjective 'deleterious' could be interpreted as referring mostly to the plague – in Portuguese, it is nearly always used in the expression 'deleterious to health' –, the smell of 'rotten' cadavers is tied to the vultures, who, as the text suggests, devour their victims still alive. The passage thus makes clear that hunger and disease may impair the health, but it is the vultures that come in for the kill at the end.

Proof of that is a later scene in which a woman, too weak to protect herself, is eaten alive by the birds:

> [...] uma mulher tão magra como uma múmia, era devorada ainda viva pelos urubus. Banquete horrível! Como o Prometeu, imóvel e sem ação, sente rasgarem-lhe as entranhas as garras e os bicos acerados das aves malditas! Vivia, ainda, quando

4 "The vultures made the loneliness gloomy and dreadful with their constant caw while perched by the thousands on the tree branches. With insatiable gluttony, they were on the lookout for victims, who fell dead of hunger and plague by the hundreds, and they feasted on that pasture of flesh. The atmosphere that filled the fields was deleterious and rotten" (authors' translation).

> estas, que das alturas devassavam a terra, procurando repasto à fome, vêem-na e descem sobre ela.[5] (ibid., 67)

Bats are also portrayed by Teófilo as parasites working in tandem with disease. Early on in the novel, they are called 'stinking' animals and are compared with rats infested by fleas – which they pass over to one of the characters. Later on, the main character witnesses a grotesque scene in which a frail baby is bled dry by hundreds of bats. He tries to scare them away, but the bats pay no attention to him and, without regard for personal safety, continue to attack the child. In fact, the narrator remarks that they were already so full with blood that they could no longer fly (ibid., 58). Instants before, the character had been attacked by a dog that was in such a frenzy it had to be put down with axe blows. The savagery and temerity of the animals – whose aggression can be only avoided by extermination – is consistent with the symptoms of rabies; besides, dogs and bats are its stereotypical vectors. In this way, certain non-human animals are used in the narrative to add up to a Gothic panorama of disease and decay; their status as contagious vectors is not stated directly, but it is understood tacitly.

Another example of how animals may worsen an epidemic is found in Jean Giono's *Horseman on the Roof* (*Le Hussard sur le toit*, 1995 [1951]). In the novel, we accompany the wanderings of the officer Angelo Pardi through Provence in 1832, at the height of a cholera outbreak. At the very start of the book, Angelo enters a village whose entire population has been exterminated by cholera. That comes across as an enormous exaggeration of historical fact, since despite its seriousness, cholera rarely caused more than 5% of the population to die (cf. Guerios 2021, 100; Hays 2005, 229-331). Given that some persons may carry cholera vibrios with only mild or asymptomatic infections, and also that mathematical models predict them to be at least three times more numerous (cf. King et al. 2008, 878; Sack et al. 2004, 224), even in the worst-case scenario, only a third of the population would fall seriously ill at any given time – let alone die from the infection.

This information was probably accessible to the author, so in our reading, the epidemic's augmented ferocity seems to be intentional. Giono seems to be modelling cholera on the plague, with its pulmonary and septicaemic forms that are indeed deadly in a hundred per cent of cases (cf. Moss 2008). In addition, the

5 "[…] a woman as thin as a mummy was devoured alive by vultures. Horrible feast! As Prometheus, motionless and actionless, she feels the claws and sharp beaks of the cursed birds tearing her entrails! She was still alive when the birds which were ravaging the earth from above, seeking food out of the famine, saw her and descended on to her" (authors' translation).

Provence region is notable for its plague outbreaks, especially the much-publicized Plague of Marseille of 1720-22. The manipulation of the mortality rate results in a gothic atmosphere, and one which is particularly frightful since it is allegedly based on historical facts.

Angelo wanders around against this dramatic background and his interaction with the epidemic is mediated by various animal encounters, which work, in some instances, as harbingers of disaster and in others as disease spreaders. Before realizing that the city was stricken with pestilence, Angelo notes that "the roofs of the houses were covered with birds" (Giono 1995 [1951], 28). He wonders if something is wrong and his suspicion grows when he listens to "a dense chorus of asses braying, horses neighing, and sheep bleating" (ibid., 29). The entire setting seems unnatural to him and the animals sound "as if somebody were cutting their throats" (ibid.).

Next, the presence of disease is revealed theatrically when "his horse suddenly shied as a huge clump of crows flew up to reveal a body lying across the track" (ibid., 29). It was the partially-devoured corpse of a woman. Shocked, Angelo tries to disperse the birds that are not intimidated; they fly off only in the last instant and shortly after, regroup and return to stand against him. The crows "stank like stale syrup" (ibid.), just like the corpse which "smelled appallingly" (ibid., 30). Immediately after the confrontation, Angelo feels the urge to throw up – a typical cholera symptom –, as if he had been metaphorically contaminated by the birds.

However, he manages to control himself and continues to roam around, slowly grasping that all of the inhabitants died from cholera. In the process, he encounters a succession of animals – and is attacked by most of them. A dog "leaped at his stomach and would have bitten him badly had he not instinctively hurled it back" (ibid., 30). As the dog continues to strike, Angelo notices its "strange eyes" and "a muzzle smeared with nameless gobbets" (ibid.), both of which indicate ferociousness and, possibly, rabies. Furthermore, the dog – like the crows – was feeding on the corpse of the cholera victim; that seems to indicate a degree of contagiousness, as if the animals had turned rabid after consuming the contaminated flesh.

The scene is repeated once Angelo enters a house to find a few partially eaten bodies, including a baby. They have all died of cholera: "[the bodies] were blue, their eyes sunk deep in the sockets, and their faces, reduced to skin and bone, thrust out enormous noses, thin as knife blades" (ibid., 32). Angelo then notices the presence of rats that also seem malicious and threatening:

> He found there a fourth body, naked, very thin, quite blue, curled up on the bed amid copious evacuations of milky curds. Some rats that were busy eating the

> shoulders and arms jumped aside when Angelo parted the curtains. He wanted to kill them with the spade, but he would have had to strike the corpse, too; besides, they were watching him with inflamed eyes, they were grinding their teeth, crouching on all fours as if to spring. (Giono 1995 [1951], 33)

A clear link is established between the rats and cholera: they move around amid the victim's evacuations, precisely the mechanism of contagion for the infection. Again, the animal's defiance suggests they are somehow rabid. Moreover, the plague is also invoked by the presence of the rats – cholera is effectively referred to as 'plague' several times along the novel.

Once more, Angelo "was nearly bitten by two of the animals, which flung themselves at his boots" (ibid., 33). He kills one of the rats, but the other, in yet another reference of the miasmas, "raised a stench so horrible that Angelo had to get out of the house as fast as he could" (ibid.). In the following scenes, Angelo continues to meet cats who look like foxes, horses and goats who are maddened by hunger, and pigs that were "voracious beasts" (ibid., 38) and "mad with rage" (ibid., 39), and "had charged the man like a bull" (ibid.).

When combined, these scenes reveal the author's intention of creating the feeling of a 'total outbreak': a perfect storm that combines cholera and numerous animal attackers – crows, dogs, rats, pigs – that, in turn, are symbolically tied to rabies, the plague and filth in general. Interestingly, cholera, which follows the faecal-oral route, cannot be spread by animal vectors. However, the fact is manipulated in the novel precisely to create a gothic atmosphere in which non-human animals turn upon humans.

Such framing of animals as disease vectors seems to respond to the scientific discoveries of the late 19th century, as well as the wish to create human-centered narratives. At a later date, with the reappearance of vector-born diseases in the 21st century, animals will turn into real *epidemic villains* in modern fiction, as in the formulation of Christos Lynteris. As he puts it: "No longer seen as mere reservoirs or spreaders of disease, but as the very ground where new pathogens emerge, non-human animals are today conceived as the incubators of existential risk for humanity" (Lynteris 2019, 1). In this sense, a few selected animals – bats and rodents especially – are listed as an epidemiological danger to society, a pattern which has circulated far and wide during the Covid-19 pandemic.

ANIMALS CONFERRING IMMUNITY

The 20th and 21st centuries have been profoundly impacted by advances in medical science which resulted in an unprecedented rise in life expectancy. The creation and distribution of vaccines have been an important part of this development: vaccines have saved the lives of millions and even achieved the extinction of a human and an animal disease – smallpox (1977) and rinderpest (2011), respectively (cf. Greenwood 2014).

However, vaccines have raised a lot of controversy throughout history, and have always stirred up resistance from different groups in different societies. The reasons for this vary widely, but in 19th century Europe especially, it was commonly related to its animal origins (cf. Bennett 2016). The word 'vaccine' was coined by Edward Jenner in 1796 from the Latin word for cow, *vacca*. The name referred to the cowpox virus which was used to inoculate humans against smallpox. At the time, the vaccination procedure was achieved through a close human-animal link: pus was collected from infected cows and administered to humans via scratches on the skin; then, after a few days, the matter produced by this individual could be used to immunize a second person and the vaccination chain could continue this way.

In the 1880s, rabbits also became part of the picture, after Pasteur and Roux discovered how to attenuate the rabies virus via 'animal filters'. They would contaminate rabbits one after another to obtain a progressively weakened version of the infection (Bazin 2011). In 1885, after Pasteur successfully immunized a nine-year-old boy who had been bitten by a rabid dog, the rabies vaccine became a popular sensation in France (cf. Wasik/Murphy 2013, 137-148). Consequently, rabbits became linked in the popular imagination with vaccine development and Pasteur started to appear in images alongside various animals. In 1887, for instance, he was celebrated in a drawing by Théobald Chartran published in *Vanity Fair* which was part of the series "Men of the Day" (cf. fig. 2). The image is entitled "Hydrophobia" – the historical name for rabies – and in it Pasteur poses with two rabbits in his arms – one of them even looks directly at the viewer. The complete absence of dogs in a drawing that portrays rabies demonstrates the rabbits' new iconic status.

Several other examples are available at the Pasteur Institute's website.[6] In a caricature by Moloch published in *La chronique Parisienne* in 1885, for instance, the scientist is portrayed while ostentatiously cooking two rabbits as if he was a *chef de cuisine*. In another, drawn by F. Graetz and published in *Revue encyclo-*

6 Cf. "Caricatures de Louis Pasteur" in: https://phototheque.pasteur.fr/, 2023-01-23.

pédique ten years later, Pasteur vaccinates himself in his laboratory 'against the Prussian Order of Merit' and is surrounded by both caged and uncaged animals: dogs, rabbits, various types of rats and mice, and even a horse. The association between non-human animals and vaccine development is explicit.

In literary narratives, such a link between animals and development of immunity against one disease also emerges occasionally, especially when the diseases depicted in the story happen to be new. One example is found in the popular novel *I Am Legend* (1995 [1954]) by Richard Matheson. In the narrative, all humans were transformed into vampires after a new and strange disease emerged. The only exception is Robert Neville, who lives by himself in this post-apocalyptic world. At the start of the narrative, Neville has been isolated for a long period of time, and he struggles daily to gather goods and repel vampire attacks, amid an unsettling environment of collapse and loneliness. The story does not provide much detail on to how the pandemic started, but it is clear that vampirism is contagious and that Neville is immune to it for some mysterious reason.

The novel explores two possible relationships between human and non-human animals: companionship and immunity. The first one unfolds when the character comes across a dog that is equally untouched by the disease. The animal is the first living creature to come near Neville and he changes his behaviour entirely after the appearance of the dog. If previously his only concerns were to survive the vampire attacks, now Neville's whole existence centres around his non-human companion. Their relationship is an affectionate one and it offers them both a much-needed psychological relief from constant persecution and a secluded life. As noted by Donna Haraway, dogs can "become therapists, companions, students and inmates in the world of prison cells" (2008, 63).

Besides representing an affectionate solace in the character's lonely life, the dog's immunity also suggests that there might be other survivors after all. However, the hope does not last for long: the dog eventually falls sick and Neville, in despair over the possible loss of his companion, commits himself to finding a cure. Previously, Neville had studied the disease and had actually discovered the pathogen responsible for it: it was a type of bacteria – which he names the *vampiris bacillus* – that was capable of dividing into many spores. These spores were dispersed by the wind during dust storms – yet another conjuring of miasmas – and entered the victims' bodies via "minute skin abrasions" (Matheson 1995 [1954], 88). All of that was achieved "without bats fluttering against state windows, all without the supernatural" (ibid.). After the progress, Neville hits a wall and gives up on the effort. Now, however, he restarts his investigations, but the dog dies before he was able to make any substantial progress.

Over two years later, he meets yet another survivor, this time a woman called Ruth. Neville is suspicious at first and subjects her to a few tests, some of which she fails. Still, he eventually starts to trust her and, unknowing of her real intentions of spying on him, answers to all her queries, including his conjectures about why he is immune:

> "Then why are we immune?" she asked.
> For a long moment he looked at her, withholding any answer. Then, with a shrug, he said, "I don't know about you. As for me, while I was stationed in Panama during the war I was bitten by a vampire bat. And, though I can't prove it, my theory is that the bat had previously encountered a true vampire and acquired the *vampire's* germ. The germ caused the bat to seek human rather than animal blood. But, by the time the germ had passed into my system, it had been weakened in some way by the bat's system. It made me terribly ill, of course, but it didn't kill me, and as a result, my body built up an immunity to it. That's my theory, anyway. I can't find any better reason". (ibid., 144)

Contrasting with the negative representations discussed before, bats are not the vector of contagion here but confer immunity via a sort of 'natural vaccination'. By a fortunate chain of events, the bat became an 'animal filter', attenuated the pathogen very much like Pasteur's rabbits. In *I Am Legend*, bats are not only dismissed from having any role in the spread of vampirism, but in Neville's case even become an agent of immunization. The novel was published in the mid-20th century and at this point in history, numerous advances in immunology were already consolidated. Thus, it is not surprising that the key to the novel is also tied with scientific developments.

A similar connection between human-animal immunity and an epidemiological threat appears in *Y: The Last Man* a series of comics by Brian Vaughan and Pia Guerra (2002-2008). It depicts the aftershock of a pandemic that killed all mammals possessing a Y chromosome, that is to say, every single human and non-human male in the planet. The only exception to the rule is the story's main character, Yorick Brown, and his capuchin monkey, Ampersand. In the series, Yorick is an unremarkable young man in his early twenties, who suddenly finds himself to be extremely valuable for being humankind's only chance of long-term survival. Given his special status, Yorick becomes the focus of a secret governmental mission mobilized by his mother, who is a member of the United States House of Representatives. A geneticist, Dr. Allison Mann, is part of this mission and she hopes to discover what is the source for Yorick's immunity.

In their quest, the team will eventually discover that Ampersand, the protagonist's monkey, used to be a laboratory animal. He had been injected with a special chemical designed by a scientist trying to sabotage Dr. Mann's experiments with cloning. The compound was intended to infect and kill her developing clones. Yet, it does not behave as expected and ends up by protecting Ampersand from the forthcoming plague. In addition, the monkey does not reach his final destination in Dr. Mann's lab, but is mistakenly delivered to Yorick instead. Once they get together, Yorick keeps in close contact with Ampersand by feeding him and cleaning his faeces and urine. Later on, it will be revealed, that in this process the monkey probably infected Yorick – who was asymptomatic – and thus, conferred immunity on him. It was Dr. Mann who first suspects of this chain of events: "Something *inside* of Ampersand *masked* you to the effects of the plague [italics in orig.]" (Vaughan/Guerra 2005, 147). Trying to explain to Yorick how this process could have taken place, she mentions vaccines and highlights again that "something in your pet produced a kind of antibody that sparred him from extinction" (ibid., 149). Similarly to *I am Legend*, the interspecific contact boosted the immune system of the human protagonists, in a reversal of the common depiction of animals as vector which contribute with disease spread. Dr. Mann also emphasizes that in the comic: "I mean, diseases like AIDS probably started with Ampersand's *ancestors*. Isn't it reassuring to think that nature might balance things out by providing his species with a cure to a *different* syndrome? [italics in orig.]" (ibid., 149). In the story, this discovery of the mechanism of immunization is remarkable because it might bring them "closer to discovering what *caused* the plague [italics in orig.]" (ibid.).

CONCLUSION

We argued in this chapter that, throughout history, non-human animals play different roles in pandemic narratives, some of them can be negative, when animals are perceived as worsening or causing disease outbreaks; while others can be positive, when animals forewarn about imminent disasters or confer immunity on humans.

This perspective contrasts sharply with modern views that often consider animals to be reservoirs and disseminators of infection, or, in Christos Lynteris' formulation, "as the very ground where new pathogens emerge" (2019, 1). That was evident recently in 2020, when 17 million minks were killed in Denmark after the authorities concluded that they could act as vectors for the coronavirus and, therefore, posed a threat to public health (cf. BBC News 2020).

We proposed that a fundamental step in this transformation was the discovery that germs cause diseases and that animals may function as vectors that spread pathogens. This realization had profound consequences that far surpassed science boundaries and influenced societies on political, economic, cultural and artistic levels. These discourses would later play a significant role in the rise of totalitarian regimes in the 1930s and they are still present today – although in different form – in contemporary debates about climate change or the Covid-19 pandemic.

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IMAGES

Figure 1: Sketch by Raphael known as The Plague of Phrygia *(c. 1512-1515)*

Source: Raimondi, Marcantonio/Raphael (c. 1512-1515) *The Morbetto*, or *The Plague of Phrygia*, Italy, Chicago, Art Institute Chicago, https://www.artic.edu/artworks/61969/the-morbetto-or-the-plague-of-phrygia, 2022-11-18.

Figure 2: Pasteur with two white rabbits in his arms as one of the "Men of the Day" in Vanity Fair (1887)

Source: Chartran, Théobald (1887) "Hydrophobia", *Vanity Fair*, n°372, 8 jan. 1887, Wellcome Collection, https://wellcomecollection.org/works/tme22wja, 2023-01-27.