



## Did Dracula really transmit the plague? The history of bloodsuckers and their diseases

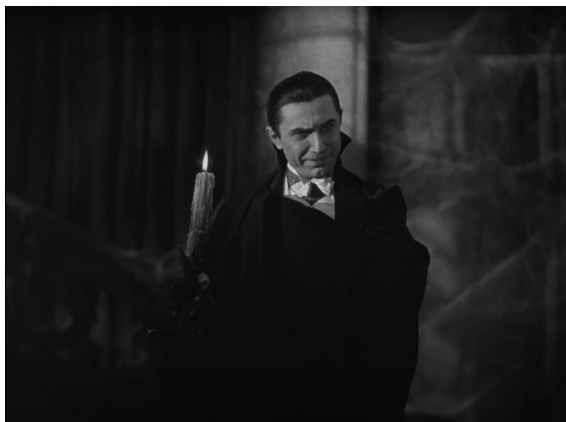
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*"Diseases have spawn one of the most enduring and widespread monster myths in civilisation."*  
(Dowling, 2016)

Vampires are some of the most persistent and best-known creatures in the western world. Different cultures have other names and appearances for similar monsters, e.g., the Chinese jiangshi, the Mexican chorti, or the Caribbean soucouyant.



**Figure 1.** Classic vampire: Bela Lugosi as Dracula in the eponymous 1931 film (Universal Pictures); public domain.

It was mainly diseases, pestering humanity in the past, that are responsible for their creation. Those diseases could appear without warning to cause huge pandemics and then retreat, sometimes for hundreds of years. Before the age of medical science, people were frightened and naturally turned to the supernatural to make sense of it.

Interestingly, vampire legends them-

selves have suggested that the power of the undead can be passed to their victims through their bite, much like a disease. In some modern stories vampirism is actually spread by a virus; some examples are *Underworld* (2003), *I Am Legend* (2007), *Daybreakers* (2009), and, quite obviously, *Vampire Virus* (2020). And there is also the Shadow Plague in the video game *Plague Inc.* (Ndemic Creations, 2012), which is not really spread by vampires but offers an interesting twist to vampirism and plagues.

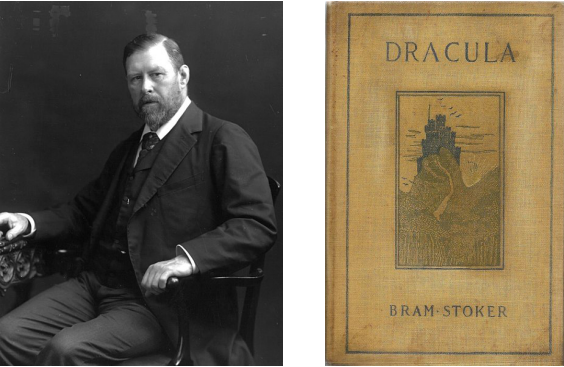
However, I would like to go slightly back in time and give three examples of the best-known classic vampire stories which have implemented diseases into their plot.

### DRACULA AND SLIGO'S CHOLERA OUTBREAK

Bram Stoker's mother, Charlotte Thornley, grew up as the daughter of a policeman, in Old Market Street, Sligo, Ireland, where she witnessed the cholera outbreak of 1832. –Sligo was hit by the disease worse than any other town in Europe: 1,500 people were killed within six weeks. Charlotte's family escaped the epidemic but it is said that she became haunted by what she saw during that time and told her son the stories of those horrors many times.

Bram Stoker, who was born in Dublin in 1847, wrote the novel *Dracula* in 1897. Simply put, it is the story of a Transylvanian vampire who travels to England in search of new blood. The parallels between the

cholera outbreak and his story are quite intriguing (see Table 1 for some examples).



**Figure 2.** Left: Bram Stoker (1847–1912); unidentified photographer, public domain. Right: Cover of the first American edition of *Dracula*, published Doubleday and McClure, 1899; public domain.

As we all know, the origin of the vampire idea lies in the Balkans (I won’t mention Vlad here), where we can still find deeply-rooted evidence for the bloodsucking legend of evil returners.

In Bulgaria for example, a 700-hundred-year-old skeleton was found with its teeth removed and stabbed through the chest with an iron rod, which is, as we all know, the best way to eliminate a vampire (nope, no Impaler in this article).

Strikingly, in Poland during the 17th and 18th centuries, the people of Drawsko came to the same conclusion as Stoker: suspected vampires were buried under very precautionous circumstances. They had their teeth removed, or were found with sickles across their necks and stones under their chins to prevent them rising from the dead and biting the living. But actually, those Polish “vampires” were victims of cholera, which battered Poland during that time.



**Figure 3.** Individual (45–49-year-old female) with a stone placed directly on top of the throat. Source: Gregoricka et al. (2014).

**Table 1.** Some parallels between the stories Charlotte told her young son and the story in his novel.

Charlotte’s Sligo stories	Bram’s <i>Dracula</i>
Members of the catholic clergy recorded only occasional cases.	Crucifix and holy water, symbols of the catholic church, were used to fight the vampires.
People remembered a terrible smell, hanging over Sligo for months, even after the epidemic had ceased.	A rotting smell could be sensed at places associated with Dracula.
Cholera victims have been buried before they were actually dead.	The undead vampires sleep in coffins and crypts.
The first death of a cholera patient was on a spectacularly hot August 11 <sup>th</sup> , accompanied by a thunder storm.	The count’s arrival by ship also happened during a storm and his first victim was found on August 11 <sup>th</sup> .

## NOSFERATU, MASTER OF THE PLAGUE



**Figure 4.** Top: Max Shreck as Count Orlok on the disease-ridden ship, from the 1922 film (Prana Film). Bottom: Klaus Kinski as the Count in the 1979 version (20th Century Fox).

We can also find buried vampires that “arose” from other diseases, such as the plague. It is not surprising that another vampire story, similar to *Dracula*, but not quite the same, incorporated facts of epidemics with a different cause.

Friedrich Wilhelm Murnau (December 28, 1888 – March 11, 1931) could not use the name ‘Dracula’ and other facts of the book due to copyright issues with Stoker’s estate, when he created his silent vampire film *Nosferatu* in 1922 (*Nosferatu – Eine Symphonie des Grauens*, in the original). (The name maybe comes from the Romanian word for vampire and the Greek ‘nosophoros’ [νοσοφορος], meaning “disease-bearing”.) Despite the changes, the story is still very similar to *Dracula*. Count Orlok wants to expand, travels with his coffins to Wismar, Germany, by ship via the Black Sea. He systematically kills the entire crew. When the ghost ship arrives with its cargo in Wismar, Van Helsing (interestingly this character was allowed to occur) discovers a logbook that says the plague was on board. Wismar

is then flooded with rats from the ship – the plague on their tailcoat – and death spreads rapidly throughout the town. Meanwhile, Nosferatu devours lots of blood and is eventually defeated by love.

German film director Werner Herzog is responsible for the 1979 film *Nosferatu the Vampyre* (*Nosferatu: Phantom der Nacht*, in the original), with Klaus Kinski as the Count, as an homage remake of Murnau’s masterpiece of German expressionist cinema.

### **BOX 1. Cruel movie facts.**

Herzog used 11,000 rats for a scene in the remake. Travelling from Hungary to the Netherlands— because that was the only place where he was allowed to release so many rats — the conditions were so poor that the rats ate each other.

Herzog also insisted that the plain white rats be dyed grey. Therefore, the cages containing the rats, were submerged in boiling liquid for several seconds, causing half of them to die. The surviving rats immediately proceeded to lick themselves clean of the dye.

## YELLOW FEVER IN *INTERVIEW WITH THE VAMPIRE*



**Figure 5.** Lestat giving his blood to Louis in *Interview with the Vampire* (Warner Bros, 1994).

New Orleans was nicknamed ‘Necropolis’ between 1817 and 1905 because during that time, approximately 10% of the city’s population would die of yellow fever during the summer months (July–October). An ideal place for the protagonists of Anne



Rice's *Interview with the Vampire*, Louis (Brad Pitt in the movie adaptation), Lestat (Tom Cruise) and Claudia (Kirsten Dunst), to hide and kill. A flood of immigrants arriving at the port every day and people dying like flies gave the vampires a great stage to perform undetected.

The worst year was 1853, with 8,000 deaths. Patients bleeding through their eyes, nose and ears, or vomiting blood before dying, was not an unusual sight for citizens of the Necropolis.

Yellow fever was so strongly entangled with daily life in New Orleans in the 19th century that it shaped social structure. It was all about the question of who had survived the virus and was "acclimated" and who hadn't got it yet, who were ranked as "unacclimated". To get certain jobs, you had to be acclimated; marriages and neighbourhoods were based on the families' yellow fever status; and businesses could raise or fall due to immunity. Since there was actually no physical sign, people had to be inventive in order to prove that they were acclimated (think covid vaccine pass). Some people also actively tried to get infected, especially European immigrants, who had not been around the virus before and were considered bigger risks.

And although yellow fever was dictating daily life in New Orleans, the disease was so poorly understood that myths appeared along the Mississippi. Apart from the vampire stories, another myth was that black people were immune and this was deliberately used to justify slavery. Advocates of slavery argued that God had made black people immune to expand the cotton industry and the national economy, and to save white people from death with the comment "If black people are naturally resistant to yellow fever, black slavery is natural, even humanitarian, because it protects white people from labour in hot, swampy spaces that were prone to yellow fever." Very inconsistently to this argument, acclimated slaves sold for 25 to 50% more than unacclimated slaves.

## INSECTS, ACTING AS VECTORS, CAUSED THE PANDEMICS

### Cholera

Cholera is an infection of the small intestine by some strains of the bacterium *Vibrio cholera*. The transmission happens usually through the faecal-oral route where sanitation is very poor – either by drinking contaminated water or via flies contaminating food after hanging out in cesspits. Of the 120,000 species of flies (Order Diptera) presently known to science, only a few species of the families Calliphoridae (blowflies), Muscidae (houseflies), Fanniidae (lesser house flies), and Sarcophagidae (flesh flies) eat faeces and transmit cholera.



**Figure 6.** Larva and adult female of a housefly, *Musca domestica*; illustration by Amedeo J. E. Terzi (1872–1956), public domain.

There were seven big cholera pandemics in the world (Table 2). The best-known outbreak was the one mentioned earlier in the mid-19th century, especially in London, where the solution was found. It was John Snow (no, not that one; this one knew stuff), an incredible physician, who revolutionised not only the application of anaesthetics but also the sanitation in the city.

**Table 2.** Big cholera outbreaks around the world.

1817–1824	China, India, Indonesia.
1829–1837	Egypt, Germany France,, Hungary, North America, Russia, United Kingdom.
1846–1860	Arabia, Cuba, France, Gran Canaria, Iran, Iraq, Ireland, Japan, Korea, Mexico, North America, Philippines, Russia, South America, Spain, Tunisia, United Kingdom.
1863–1875	Algeria, Austrian Empire, Belgium, Ganges Delta, Germany, Hungary, London, Mecca, Netherlands, Northern Africa, Russia, North America, Zanzibar.
1881–1896	Egypt, Hamburg, Japan, Persia, Spain.
1899–1923	Bulgaria, the Balkans, India, Philippines, Romania, Russia.
1961–1975	Indonesia, South America, USSR, with smaller outbreaks in Istanbul, Japan, Jerusalem, and the South Pacific.

**Figure 7.** Cholera victim exhibiting the bluish pallor characteristic of the disease; illustration by John William Gear (1806–1866), c. 1832, public domain.

Thanks to him, anaesthetics such as ether and chloroform were soon a standard procedure for surgery, although he rather used it in women in labour despite protests from the Church (but supported by Queen Victoria who, after seven children, apparently found the idea of sleeping through the birth rather appealing). Dr Snow did not believe in the miasma theory (the bad air that originated from foul matter), let alone in vampires who might have brought the bad air. Instead, he discovered that the contamination of water by faeces was the cause of cholera. His first action was to have all handles removed from public water pumps, where people literally passed the bacteria from one hand to the next.

## Plague

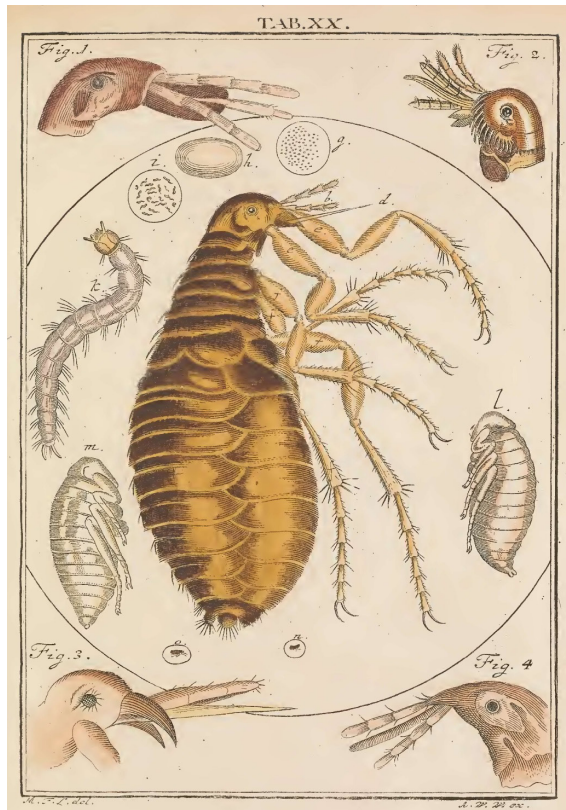
At some stage, people made the connection between the plague and rats (actually the first hint can be found in the Bible). But it was only in 1894 that Alexandre Yersin, a Swiss/French physician and bacteriologist from the Pasteur Institute, discovered the *Yersinia pestis* bacterium. Four years later, the transmission of bacteria from rodents by flea bites was discovered by Jean-Paul Simond. Due to political rivalry around the discovery, however, this was only recognised another five years later, when the Oriental rat flea (*Xenopsylla cheopis*) was found in Sudan and described by Charles Rothschild and Karl Jordan in 1903.

The bacteria cause the production of a biofilm in the infected flea's foregut. So, when sucking blood, the flea cannot swallow but re-injects the host's blood back... together with the bacteria. Due to lack of food in the flea's belly, it bites more viciously, potentially resulting in increased spreading.

There are three forms of plague: Bubonic, Pneumonic, and Septicemic. Bubonic plague is the most common form. It is an infection of the lymphatic system, where bacteria rapidly spread to the lymph nodes and multiply. The pneumonic plague occurs when *Yersinia pestis* infects the lungs and can actually spread as an aerosol – breathing in *Y. pestis* suspended in respiratory



droplets from human to human. Septicemic plague occurs when plague bacteria multiply in the blood. It can be a complication of pneumonic or bubonic plague or it can occur by itself. When it occurs alone, it is caused in the same ways as bubonic plague; however, buboes do not develop. Patients have fever, chills, prostration, abdominal pain, shock, and bleeding into skin and other organs.



**Figure 8.** Illustration depicting the microscopic features of fleas; extracted from Ledermüller (1764).

The first pandemic happened in the Eastern Roman Empire in the 6th century and, along two centuries, caused 25 to 50 million deaths! The much better known one, the Black Death, was the second pandemic of bubonic plague in the Late Middle Ages (1340–1400). It started in Central Asia (Mongolia) in 1330, when Mongols attacked an Italian trading station. The fleeing Italians sailed on ships, unknowingly taking the Black Death back to Europe with them in the shape of the rat fleas. People fleeing from one area to another helped spreading the disease, which killed a third of the European human population.

There was also a third modern pandemic in the late 19th century. In 1894, 80,000 people died in Canton (Guangzhou), China; the plague reached Hong Kong via water-traffic. The most affected district in Hong Kong was Taipingshan, one of the poorest and most crowded areas at the foot of Victoria Peak, where the rich British colonisers resided. The Shropshire Light Infantry, aka the “Whitewash Brigade”, was responsible for cleaning the district using harmful chemicals and lime (hence the name). They also burned household items and entire houses. The Chinese population refused western medicine and rumours were spread that infected (living) people had been burnt, that British soldiers would search the houses to rape women, and that the doctors made medicine out of the plague victims. The conflict between the Chinese community and the British government grew much stronger during that tragic year.

From Hong Kong, the plague spread rapidly to port cities throughout the world via shipping routes. For instance, to Chinatown in San Francisco from 1900 to 1904. The last major outbreak was recorded in Los Angeles in 1924, but the disease is still present in wild rodents.

### Yellow fever

Yellow fever is caused by the yellow fever virus transmitted by the yellow fever mosquito... but wait, there is more.

The origin of the flavivirus lies in Africa, where it most likely developed in primates, but it was taken to the Americas by the slave trade. The first record was 1647 in Barbados, where it caused suffering to indigenous peoples and newcomers alike before spreading through the colonies, like Hispanola. Later the virus spread to Philadelphia, Mississippi, Louisiana and New York.

The virus causes fever, muscle pain, headache, shivers, and nausea in a short acute phase (3 to 4 days) and mostly that’s it. In the critical toxic phase, which often leads to death, cells of the inner organs are at-

tacked, i.e., liver and kidneys, causing jaundice, abdominal pain, vomiting, bleeding from mouth, nose and eyes, blood in vomit and feces, and kidney failure. The blood in the vomit is responsible for the name “blood vomit” or “dark vomit” in many languages and supported vampire hysteria.



**Figure 9.** A patient in the final stages of yellow fever; image extracted from Pariset (1820).

Walter Reed, a US Army physician, is often credited for having fought yellow fever, but there actually were many scientists involved in finding its cause and cure. Reed proved in 1896 that yellow fever was not a result from drinking river water. He was probably not aware that Cuban epidemiologists had already proposed, in 1881, that a mosquito transmitted the disease by biting a human host. Now we know that mosquitoes may also pass on the virus through their eggs.

In 1901, Reed confirmed this hypothesis, which allowed the resumption and completion of work on the Panama Canal (1904–1914). In 1927, researcher Adrian Stokes induced yellow fever in rhesus monkeys from India and identified the virus, but died himself of it during his experiments.

Max Theiler, a South African-American virologist and doctor, survived yellow fever and developed immunity. In 1937 he developed a vaccine against yellow fever and was awarded the Nobel Prize in Physiology or Medicine in 1951.



**Figure 10.** An adult female yellow fever mosquito, *Aedes aegypti*, which can also transmit dengue, zika and chikungunya; illustration by Amedeo J. E. Terzi (1872–1956), public domain.

### OTHER “EVIDENCES” FOR THE LIVING DEATH

It is actually no surprise that people feared the undead, even if they have been buried, because when bodies decompose, they are literally all over the place. Back then, these decomposition processes have been very much misinterpreted.

It has been reported that noises can be heard from graves and that the soil looks disrupted. After reopening the graves, corpses have been found warm, flushed and swollen, which is caused by the action of microorganisms in the body, resulting in discoloration of tissue and body fluids as well as gas production, bloating the belly. The pressure of the gas is forcing the darkened body fluids out of the mouth and nostrils, and the blood can re-liquify. This looks like the deceased has feasted on blood. The pressure of the gas is also responsible for noises, such as winds and shrieks, and even



a change of position after rigor mortis has passed. And as loose soil needs a while to settle, the eruption of the corpse can de-arrange the earth. Many people actually still believe the myth that fingernails and hair still grow after death. This is easily explained as the skin of the deceased shrinks - even the teeth can appear longer. What is more, the pressure in the corpse can result in an erection, having led to the myth that vampires have a great lust.



**Figure 11.** *Le Vampire*, by de R. de Moraine (1864), public domain.

Not all vampires were thought to physically leave their grave, but these stationary fiends were still thought to cause trouble aboveground. The foul decomposition volatiles were proof of a vampire's presence and considered responsible of carrying diseases, which led to the strategy of using smelly stuff like garlic as a protection.

In northern Germany and New England "after-devourers" stayed in the ground, chewing on the burial shrouds that were used to cover the faces of the dead, which

led to the name "shroud eaters".

Now we know that the bacteria in the mouth can decay shrouds. By removing the teeth, stuffing its mouth with soil or a stone, the vampire would lose the ability to chew and thus die of starvation.

With the knowledge of the so-called Thanatology, we cannot only explain the changes in a decaying body, but also understand the mechanisms of insect activity on corpses. This enables us to interpret the succession of insect settlement and use this information for Forensic Entomology, which is the study of insects/arthropods in criminal investigation to estimate the post-mortem index, any change in position of the corpse, as well as the cause of death. Apart from Applied Taxonomy, many studies are necessary in order to calculate larval development timeframes effected by, e.g., temperature or chemicals.

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Dr **Julia Kasper** is the insect curator at the Museum of New Zealand Te Papa Tongarewa and is specialised in Diptera (flies) taxonomy and Medical Entomology. Trained in Berlin in Forensic Entomology, she soon became interested in bloodsucking Diptera and other insects that transmit diseases, as well as the unique and sometimes bizarre dipteran fauna of New Zealand. That, mixed with her interest in historical and cultural aspects of Entomology, led to this article.