Introduction - Culprit: The Oriental Rat Flea

Kingdom: *Animalia*
Phylum: *Arthropoda*
Class: *Insecta*
Family: *Pulicidae*
Order: *Siphonaptera*
Genus: *Xenopsylla*
Species: *cheopis*

Dead littered the streets everywhere. Cattle and livestock roamed the country unsupervised. Brother abandoned brother.

The Black Death was one of the worst natural disasters in history. In 1347 A.D., a great plague swept over Europe and attacked cities causing widespread panic and death. One third of the population of Europe died.

The primary culprits in transmitting this disease were Oriental Rat Fleas carried on the back of black rats.

- Frederick F. Cartwright, DISEASE AND HISTORY, Dorset Press, New York, 1991, p. 42.

The Oriental Rat Flea: xenopsylla cheopis

Fleas are blood-sucking parasites. They can spread dangerous diseases to humans and other animals.

It is possible the first flea was from Africa and traveled by boat on the back of a rat to different places around the world.

The Black Death, also known as the bubonic plague, is one of the deadly diseases that the flea can spread to man and animals.

Body Parts

The rat flea has two eyes, yet it can only see very bright light. On the very tip of its head is a comb. Right behind the eyes are two short antennae. Behind the antennae is the pronotum and behind that lays the protonotal comb.

A flea's mouth has two functions: one for squirting saliva or partly digested blood into the bite, and one for sucking up blood from the host. This process transmits germs that may cause diseases the flea might have.

Fleas smell carbon dioxide from breathing humans and animals. They jump rapidly to the source to feed on the newly found host. A flea is wingless so it can not fly, but it can jump long distances with the help of small powerful legs. A flea can use its legs to jump up to 200 times its own body length. It can also jump about 130 times its own height.

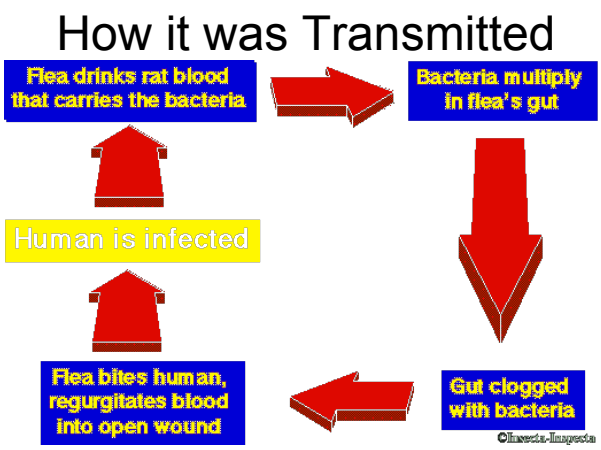
The flea's body is only about one tenth of an inch. A flea's body is constructed to make it easier to jump long distances. The flea's body consists of three regions: head, thorax, and abdomen. The head and the thorax have rows of bristles (called combs) and the abdomen consists of eight visible segments.

Life Cycle

There are four stages in a flea's life. The first stage is the egg stage. Microscopic white eggs fall easily from the female to the ground or from the animal she lays on. If they are laid on an animal, they soon fall off in the dust or in the animal's bedding. When the eggs fall on the ground, they might fall into crevices on the floor where they will be safe until they hatch one to ten days later.

When they finally hatch, the flea is a larva. The larva looks very similar to a worm that is about two millimeters long. It only has a small body and a mouth part. (No arms or legs) At this stage, the flea does not drink blood; instead it eats dead skin cells, flea droppings, and other smaller parasites lying around them in the dust. When the larvae is mature it makes a silken cocoon around itself and pupates. This is when the flea spins a white, silken cocoon for itself. The flea stays in this stage from one week to six months changing in a process called metamorphosis.

When the flea comes out of its cocoon, it begins the final cycle, called the adult stage. A flea can now suck blood from hosts and mate with other fleas. A single female flea can mate once and lay eggs every day with up to fifty eggs per day. Fleas like to live in an environment that is warm, where they can live up to a year.



How was the Black Death transmitted? The three forms of the Black Death were transmitted two ways. The septicemic and bubonic plague were transmitted with direct contact with a flea, while the pneumonic plague was transmitted through airborne droplets of saliva coughed up by bubonic or septicemic infected humans.

The bubonic and septicemic plague were transmitted by the bite of an infected flea. Fleas, humans, and rats served as hosts for the disease. The bacteria (*Yersinia pestis*) multiplied inside the flea blocking the flea's stomach. This caused it to be very hungry. The flea would then start ravenously biting a host. Since the feeding tube to the stomach was blocked, the flea was unable to satisfy its hunger. As a result, it continued to feed in a frenzy. During the feeding process, infected blood carrying the plague bacteria flowed into the human's wound. The plague bacteria now had a new host. Meanwhile, the flea soon starved to death.

The pneumonic plague was transmitted differently than the other two forms. It was transmitted through droplets sprayed from the lungs and mouth of an infected person. In the droplets were the bacteria that caused the plague. The bacteria entered the lungs through the windpipe and started attacking the lungs and throat.

The Black Death

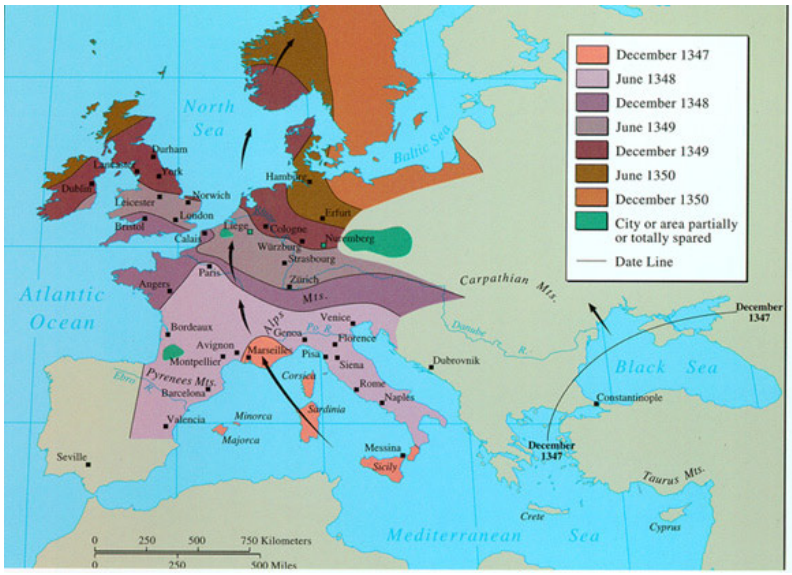
The Black Death came in three forms, the **bubonic**, **pneumonic**, and **septicemic**. All forms were caused by a bacterium called *Yersinia pestis*, and each form of the plague killed people in a vicious way.

The **bubonic plague** was the most commonly seen form of the Black Death. The mortality rate was 30-75%. . The term 'bubonic' refers to the characteristic bubo or enlarged lymphatic gland. The symptoms were enlarged and inflamed lymph nodes around arm pits, the neck and the groin. Victims could get headaches, nausea, aching joints, a fever of 101-105 degrees, vomiting, and a general feeling of illness. The symptoms took from 1-7 days to appear.

The **pneumonic plague** was the second most commonly seen form of the Black Death. The **pneumonic** and the **septicemic plague** were probably seen less then the bubonic plague because the victims often died before they could reach other places (this was caused by the inefficiency of transportation). The mortality rate for the pneumonic plague was 90-95%. The pneumonic plague infected the lungs. Symptoms included slimy sputum tinted with blood. Sputum is saliva mixed with mucus from the respiratory system. As the disease progressed, the sputum became free flowing and bright red. Symptoms took 1-7 days to appear.

The septicemic plague was the most rare form of all. The mortality was close to 100% (even today there is no treatment). Symptoms were a high fever and skin turning deep shades of purple due to DIC (disseminated intravascular coagulation). The picture above demonstrates what DIC can look like. In its most deadly form DIC can cause a victims skin to turn dark purple. The black death got its name from the deep purple, almost black discoloration." Victims usually died the same day symptoms appeared. In some cities, as many as 800 people died every day.

The Path



If the plague had just stayed in one city, the containment might have spared Europe. Unfortunately, the plague spread when people fled to other cities. It is believed the plague came from Asia, and moved west with Mongol armies and traders.

"According to a traditional story, the plague came to Europe from the town of Caffa, a Crimean port on the Black Sea where Italian merchants from Genoa maintained a thriving trade center. The Crimea was inhabited by Tartars, a people of the steppe, a dry, treeless region of central Asia. When the plague struck the area in 1346, tens of thousands of Tartars died. Perhaps superstition caused the Muslim Tartars to blame their misfortune on the Christian Genoese. Or perhaps a Christian and Muslim had become involved in a street brawl in Caffa, and the Tartars wanted revenge. In any case, the Tartars sent an army to attack Caffa, where the Genoese had fortified themselves. As the Tartars laid siege to Caffa, plague struck their army and many died. The Tartars decided to share their suffering with the Genoese. They used huge catapults to lob the infected corpses of plague victims over the walls of Caffa. As the Tartars had intended, the rotting corpses littered the streets, and the plague quickly spread throughout the besieged city. The Genoese decided they must flee; they boarded their galleys and set sail for Italy, carrying rats, fleas, and the Black Death with them." (Corzine, 1997)

The plague traveled on trade routes and caravans. Its path of death was generally from south to north and east to west passing through Italy, France, England, Germany, Denmark, Sweden, Poland, Finland, and eventually reaching Greenland.

Efforts to Stop the Plague

Although the government had medical workers try to prevent the plague, the plague persisted. Most medical workers quit and journeyed away because they feared getting the plague themselves.

"When the government acts to prevent or control a calamity, but the calamity persists, people turn to cures. Many believed that the disease was transmitted upon the air, probably because the smell from the dead and dying was so awful. So, the living turned to scents to ward off the deadly vapors. People burned all manner of incense: juniper, laurel, pine, beech, lemon leaves, rosemary, camphor and sulfur. Others had handkerchiefs dipped in aromatic oils, to cover their faces when going out. Another remedy was the cure of sound. Towns rang church bells to drive the plague away, for the ringing of town bells was done in crises of all kinds. Other towns fired cannons, which was new and made a comfortingly loud ding. There were no ends to talismans, charms, and spells that could be purchased from the local wise woman or apothecary. Many people knew of someone's friend or cousin who had drank elderberry every day, or who had worn a jade necklace, and who had survived the dreaded disease." (Knox, pg. 10)

There were methods that did work. "Cities were hardest hit and tried to take measures to control an epidemic no one understood. In Milan, to take one of the most successful examples, city officials immediately walled up houses found to have the plague, isolating the healthy in them along with the sick. Venice took sophisticated and stringent quarantine and health measures, including isolating all incoming ships on a separate island. But people died anyway, though fewer in Milan and Venice than in cities that took no such measures. Pope Clement VI, living at Avignon, sat between two large fires to breath pure air. The plague bacillus actually is destroyed by heat, so this was one of the few truly effective measures taken." (Knox pg. 9)

http://history.idbsu.edu/westciv/plague
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Changes in Europe

How did the Black Death affect European civilization? It affected Europe's population and also its economy. Changes in the size of civilization led to changes in trade, the church, music and art, and many other things.

The Black Death killed off a huge number of Europe's population. Fleas infected with the Bubonic Plague would jump from rats to travelers, killing millions and infesting the continent with world-shaking fear. Normal people were tormented by the threat of death, causing them to change their views on leisure, work, and art. Even children suffered.

Economy

The economy of Europe was hit hard. The biggest problem was that valuable skills disappeared when large numbers of the working class died. Therefore, those who had skills became even more valuable than the rich people. The society structure began to change giving poor laborers more say. The peasants and craftsmen demanded higher wages. The poor people saw so much death they wanted to enjoy life. Serfs began to leave their land and instead of planting crops. Crops were neglected and animals were abandoned and left to starve. Several domesticated animals began to roam the forest. Farming communities became rare. People began breaking the law because there was no one to enforce it. People called "Bechini" committed terrible crimes. The horror of the Black Death had taken on a new victim, the economy.

Children

Partially due to the lack of children's skills to provide for themselves, the children suffered. Not only were the children affected physically, but also mentally. Exposure to public craziness, and (obviously) abundant death was premature. The death of family members left the children facing death and pain at an early age. Parents even abandoned their children, leaving them to the streets instead of risking getting the plague from their children. Children were especially unlucky if they were female. Baby girls would be left to die because parents preferred male children that could carry on the family name.

Effect over Time

It took four hundred years before Europe's population equaled the pre-Black Death figures. Since there were fewer workers, workers became more valuable and gained more rights. Small towns and cities grew while large estates and manors began to collapse as farm laborers gained the right to move. The middle class began to grow. The very social, economic, and political structure of Europe was forever altered. One tiny insect, a flea, toppled feudalism and changed the course of history in Europe.