

Host-Pathogen Interaction (Immunology)
Prof. Himanshu Kumar
Laboratory of Immunology and Infectious Disease Biology
Department of Biological Sciences
Indian Institute of Science Education and Research (IISER) - Bhopals

Lecture: 2
History of Immunology - 2

Hi, so in previous session we have looked at the history or some part of history of immunology and we have learned about how this smallpox one of deadliest disease in ancient time was uh initiated not initiated means it was taking place from last thousand years. So, it was there and then how the progress against this deadly disease were taken place there was a concept of variolation.

You have understood that at that time there is a no science knowledge but still people tried to defend this disease by this method variolation which was taken place in various part of the world you can understand it was it was started in Ottoman Empire then it moved to China, India and this ~~variolation~~ ~~relation~~ process was uh taken place many people had benefited some people died due to variolation also.

Because the method was not standardized and then there was a the remarkable work of I will say the Immunology or as well as vaccine biology started and the work of Edward Jenner ah resulted to the eradication of this deadly disease. And then we have also learned the concept of attenuation by Louis Pasteur's work and we have also learned that there are several vaccines were created and this vaccine by this why these vaccines are not only limited to the viruses.

They also have created for bacterial diseases like bacillus ~~anthracis and thoraxes~~ and then we looked at the Robert Koch work and this his work was a very much remarkable and he has given a very nice Koch postulate and Robert Koch work also resulted to the discovery of ~~my~~ mycobacterium tuberculosis and there is a one very important test which was or still we do the tuberculin test. And today we will continue in this session we will continue that how this pandemic plague and quarantine concept came.

So, I will show you a very nice video which is little longer video and this will give a lot of information about ancient disease and how they are they are defending themselves from these disease. And please note that there was a no scientific background at that time or a very little knowledge over there. So, on that basis how people used to protect themselves let us have this video.

(Video Starts: 03:42)

Hello and welcome to ancient history encyclopedia my name is Kelly and today we are going to look at some of the plagues and pandemics throughout the ancient and Medieval World the word plague referring to a lethal epidemic was coined by The Physician Galen who lived through the antonym plague of 165 to 190 CE. And when we are referring to a plague we mean a contagious bacterial disease.

The word pandemic comes from the Greek word pandemos which can be broken down to pan meaning all and demos meaning people and refers to a plague which is prevalent over an entire country or the world. The cause of the plague was unknown until 1894 CE when the bacterium *Yersinia Pestis* was identified and it is now understood as being the cause of most plagues but not all of them. The bacterium was carried on by the fleas on rodents which was passed to humans through bites.

The plague has the ability to kill due to the toxic nature of *Yersinia Pestis* which compromises the immune system also whilst multiplying in the body prior to this knowledge the plague was believed to have been caused by supernatural powers as a punishment from the gods or god or as a result of a population sin. There are three types of plagues and although some outbreaks in history may have been smallpox or typhus we still refer to them as plague.

The three types of plagues are bubonic which is caused by the bite of a carrier flea it causes the lymph nodes to swell and swollen lymph nodes are called bubos hence the name. The second type of plague is septicemic which is either caused by an infected flea or contact with an infected animal which enters the bloodstream and multiplies. The third plague is pneumonic which is caused by an infected animal and spread through person-to-person coughing.

The plague attacks the lung and multiplies rapidly which can cause the lungs to eventually shut down the first play we are going to look at is the plague of Athens between 429 and 426 BCE. The plague arrived through the port of Piraeus in 430 BCE and killed between 75000 and 100000 people at this time Athens was fighting Sparta in the second Peloponnesian War and the general and Statesman Pericles ordered the population of Athens to retreat behind its walls.

Due to the close quarters of its population and nowhere to quarantine those infected the disease spread very quickly. The symptoms included fever, sneezing, sore throat extremely bad breath violent coughing chest pains insomnia and convulsions. Even those healthy when contracted the plague often succumbed within the first 10 days of getting the first symptom the fever persisted so, fiercely that people could not tolerate clothing and were in constant need of water they could not hold down.

Thucydides described a complete breakdown of Law and abandonment of religious practices. Those who survive the disease became immune and helped those still afflicted. The plague killed many people in power including Pericles which greatly affected the outcome of the war. Athens was significantly weakened and with so, many people dead they eventually lost the war to Sparta. The antonym plague first appeared in the Roman army during the siege of the city of Jerusalem in 165 to 166 CE.

The plague ended up devastating the Roman Empire which was being co-ruled by Marcus Aurelius and Lucius Verus. The plague killed 5 million people by its end in 190 CE. Modern Scholars believe the plague started in China and travelled down the Silk Road and its symptoms were very similar to those of the plague of Athens. The plague eventually took both Lucius Verus in 169 CE and Aurelius in 180 CE.

Who blamed the Christians for the plague believing their reluctance to follow the state religion angered the gods. More people actually converted to Christianity during this time as the Christians became the primary caregivers and attended to the afflicted without regard to their own personal safety. The antonym plague greatly affected the dynamics of the Roman Empire. The economy came close to failing as the farmers could not Harvest their crops many of The Artisans were no longer alive to make crafts.

And the general population was greatly diminished. The plague of Cyprianum raged from 250 to 266 CE and was named after the cleric who documented it Saint Cyprian. The plague took 5000 people a day and modern Scholars now believe it might have been the Bubonic plague cholera typhus or potentially smallpox. The plague struck the Roman Empire during a week period the crisis of the third century when there was no strong central leadership.

The Roman army was weakened further as was the economy as many of the farmers succumbed leaving crops to rot in the fields. The plague of Justinian is the first plague to have been documented as caused by the bacterium *Yersinia Pestis* ending with a death toll of 50 million it started in 542 CE and continued for 200 years. Those affected often died within a week of contracting it and it is known to have been a combination of all three types of plague.

The plague travelled along the Silk Road but it is also believed to have been spread via the supply trains of Justinian the first's army which carried infected rats to Constantinople. Due to their lack of knowledge of plagues they relied heavily on prayers and protective amulets. However the most effective measure was quarantining the sick to slow the spread of the disease. The Empire survived the outbreak however was greatly diminished having lost 25 percent of its population.

The Roman plague of 590 CE was a continuation of the Justinian plague centralized in Rome with no official death toll. Just like the Justinian plague it was a combination of all three types of plague with the bubonic strand being most prevalent. Pope Gregory the Great declared it a punishment from God and felt the only way to stop the disease was with penitential processions throughout the city begging for mercy.

Now these processions helped with the spread of the disease with people often collapsing whilst participating. Once the plague ended however these processions were credited with placating god's wrath. The near East plagues were present in the region from 562 CE and were believed to have been a continuation of the Justinian plague. In just three days alone the plague claimed the lives of 200000 people in the city of Basra.

The best known outbreak was the plague of Sheroe between 627 and 628 CE which claimed the life of the Sasanian Monarch Kavad II whose birth name was Sheroe. Sheroe had his

brothers Step Brothers and half-brothers all murdered. So, they could not challenge him for the throne and then he died of the plague a few months later. His seven-year-old son Ardachy III was the only person left to succeed him Guided by a regent.

And when they were both overthrown the instability of the Sasanian Empire worsened until its eventual collapse. The Black Death is the best known plague in history caused by the bacterium *Yersinia Pestis* ~~Yesenia Pestis~~ it raged from 1347 to 1352 CE and killed around 30 million people. It was a Bubonic plague with the other two types present and those affected often died within three days of contracting it.

The plague was thought to have come from Asia and arriving in Europe from Sicily via the Genos trading ships. The plague attacked Britain, France and Spain within two years and through trade it got to Ireland. By 1350 CE the plague had spread to Germany, Scandinavia and into Russia. Once again the plague was attributed to God's Wrath the devil and sinfulness of humanity. The Pieter Bruegel on modern day Dubrovnik started the effective measure of requiring all ships that came to port to quarantine for 30 days.

No one could get on or off the ship. This effective measure was adopted by other cities and the isolation period was increased to 40 days or quarantino which is the route for the English word quarantine. Those who have found breaking isolation were fined and placed in further quarantine. The system was not foolproof though and the disease continued to spread with the wealthy buying their way out and those who simply ignored the policy.

The effects of the plague on medieval European Society were enormous due to the amount of deaths the feudal system could not be maintained and those who could still work demanded more money. Women's rights improved however because so, many land-owning husbands and Sons had perished and women were allowed to retain control of the properties and businesses. It is at this point in history when European population shifted their focus from heaven and God to humanity and life on earth a shift which would one day give rise to the Renaissance.

The Colombian Exchange refers to the transference of culture people and Technology between Europe and the so-called new world following Christopher Columbus's expedition of 1492 CE. The repercussions of finding the Americas was the death of 80 to 90 percent of the

indigenous population due to their lack of immunity to European diseases such as typhus, measles, smallpox, yellow fever and potentially syphilis.

The epidemics brought by the Europeans spread through cities towns and villages in 1520 CE and again in 1545 to 1548 CE. The epidemics killed most of the population and contributed to the fall of the Inca and Aztec Empires. Colonization by the Europeans was made much easier due to the heavily reduced populations of certain tribes and regions. As you can see the human race has faced many plagues in history.

And as we are all aware can destabilize and reduce populations even in the modern day. In 1918 CE the influenza outbreak or Spanish flu killed between 50 and 100 million people worldwide. During that epidemic the most effective means of slowing the spread was through self-isolation and social distance. During this covid-19 outbreak the best thing we can do is stay healthy stay inside and practice social distancing to slow the spread.

(Video Ends: 14:27)

So, I hope you have enjoyed this ~~uh~~ very very nice video ~~I~~ which talks about quite ancient to current scenario. And this video also discussed about the one of very severe plague which is caused by Yersinia Pestis this is a bacteria. And with this I will stop here and in next session we will discuss about ~~uh~~ what are the components of immunity and basically people try to find out what is the mechanism or what is the basis of immunity. So, in next session we will discuss all those things, thank you.