

Origins of the Plague

Scientists reveal the cause of the most devastating pandemics in human history

The Lancet Infectious Disease

An international team of scientists has discovered that two of the world's most devastating plagues—the Plague of Justinian and the Black Death, each responsible for killing as many as half the people in Europe—were caused by distinct strains of the same pathogen, one that faded out on its own, the other leading to worldwide spread and re-emergence in the late 1800s.

These findings suggest a new strain of plague could emerge again in humans in the future.

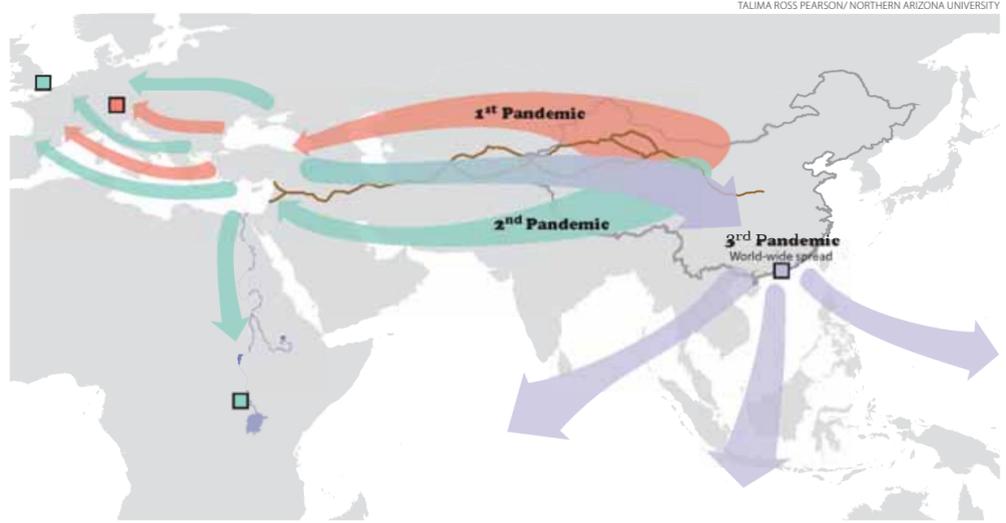
“The research is both fascinating and perplexing, it generates new questions which need to be explored, for example why did this pandemic, which killed somewhere between 50 and 100 million people die out?” said Hendrik Poinar, associate professor and director of the

McMaster Ancient DNA Centre and an investigator with the Michael G. DeGroot Institute for Infectious Disease Research.

The findings are dramatic because little has been known about the origins or cause of the Justinian Plague, which helped bring an end to the Roman Empire, and its relationship to the Black Death, some 800 years later.

Scientists hope this could lead to a better understanding of the dynamics of modern infectious disease, including a form of the plague that still kills thousands every year.

The Plague of Justinian struck in the sixth century and is estimated to have killed between 30 and 50 million people—virtually half the world's population as it spread across Asia, North Africa, Arabia and Europe. The Black Death would strike some 800 years later with similar force, killing 50 million Europeans between just 1347 and 1351 alone.



A graphic showing the spread of the 1st Pandemic (the Plague of Justinian); the 2nd Pandemic (the Black Death); and the 3rd Pandemic that spread from Hong Kong. Scientists now believe all three pandemics were caused by strains of the same pathogen.

Study of Teeth

Using sophisticated methods, researchers from many universities including McMaster University, Northern Arizona University and the University of Sydney, isolated minuscule DNA fragments from the 1500-year-old teeth of two victims of the Justinian Plague, buried in Bavaria, Germany. These are the oldest pathogen genomes obtained to date.

Using these short fragments, they reconstructed the genome of the oldest *Yersinia pestis*, the bacterium responsible for the plague, and compared it to a database of genomes of more than a hundred contemporary strains.

The results are currently published in the online edition of *The Lancet Infectious Disease*. They show the strain responsible for the Justinian outbreak was an evolutionary ‘dead-end’ and distinct from strains involved later in the Black Death and other plague pandemics that would follow.

The third pandemic, which spread from Hong Kong across the globe is likely a descendant of the Black Death strain and

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thus much more successful than the one responsible for the Justinian Plague.

“We know the bacterium *Y. pestis* has jumped from rodents into humans throughout history and rodent reservoirs of plague still exist today in many parts of the world.

If the Justinian Plague could erupt in the human population, cause a massive pandemic, and then die out, it suggest it could happen again. Fortunately we now have antibiotics that could be used to effectively treat plague, which lessens the chances of another large scale human pandemic” said Dave

Wagner, an associate professor in the Center for Microbial Genetics and Genomics at Northern Arizona University.

The samples used in the latest research were taken from two victims of the Justinian Plague, buried in a gravesite in a small cemetery in the German town of Aschheim. Scientists believe the victims died in the latter stages of the epidemic when it had reached southern Bavaria, likely sometime between 541 and 543.

The skeletal remains yielded important clues and raised more questions.

Origin of Plague Strain

Researchers now believe the Justinian *Y. pestis* strain originated in Asia, not in Africa as originally thought. But they could not establish a ‘molecular clock’ so its evolutionary time-scale remains elusive. This suggests that earlier epidemics, such as the Plague of Athens (430 BC) and the Antonine Plague (165-180 AD), could also be separate, independent emergences of related *Y. pestis* strains into humans.

“The tick of the plague bac-

teria molecular clock is highly erratic. Determining why is an important goal for future research” said Edward Holmes, an NHMRC Australia Fellow at the University of Sydney.

Our response to modern infectious diseases is a direct outcome of lessons learned from ancestral pandemics, say the researchers.

“This study raises intriguing questions about why a pathogen that was both so successful and so deadly died out. One testable possibility is that human populations evolved to become less susceptible,” said Holmes.

“Another possibility is that changes in the climate became less suitable for the plague bacterium to survive in the wild,” said Wagner.

The research was funded in part by the Social Sciences and Humanities Research Council of Canada, Canada Research Chairs Program, U.S. Department of Homeland Security, U.S. National Institutes of Health and the Australian National Health and Medical Research Council.

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Acupuncture for Children

Acu-child continued from B3

There are three easy acupressure massage techniques that any parent can easily learn. The first is to locate the point and simply hold down on it, as if the finger were an acupuncture needle.

The second is to locate the point and then massage it in small circles, either clockwise or counter-clockwise. The third is to locate the point and then stroke the area back and forth. This generally works best for points on the arms and legs.

Remember that with acupressure, a general area is being massaged and that pinpoint precision is not as important as it would be with an acupuncture needle.

Tools

Acupressure can be done with either finger pressure or with a metal tool. Most pediatric acupuncturists will stimulate the acupressure points using a metal “shonishin” device. The reason for the use of a metal tool is that it conducts the Qi or energy of the body more efficiently than finger pressure alone. This is why acupuncture needles are made of metal.

For a do-it-yourself acupressure tool, a coin, ring, or other smooth metal object can be used. Some babies and children don't like to be massaged with a metal tool, though, so for them standard finger pressure will also be effective. Just double the amount of time that is spent on each point.



Parents can easily learn acupressure massage techniques that can help their child through common health issues such as coughs, constipation, and sleep problems.

Ultimately, the most important thing is that the acupressure points are being massaged, so however it can be done is just fine.

Getting Your Child to Cooperate

As soon as a baby is old enough to turn over and crawl, administering an acupressure treatment can become quite a challenge.

While a parent will want them to be still for a few minutes, all they will want to do is be on the move. To get the acupressure done will require some savvy parenting, but just as with diaper changes and necessary medications, a way can be found to do it.

It is usually best to put babies in a highchair or car seat so that they are somewhat restrained during their treatment. Another idea is to go into the bathroom and close the door.

To engage an older child in the actual massage, stickers can

be put on the points, or points can be written on and then washed (massaged) off.

'Less Is More'

Children respond quickly to acupressure, and this positive response can sometimes cause parents to get carried away and over-treat their kids. It is best to treat chronic conditions once a day and acute conditions twice a day. Chinese Medicine is designed to ignite the body's own healing energy, so overkill is not necessary.

With kids, the adage is “less is more.” Start simply with acupressure sessions with children. Pick one condition and treat that for a week. Use two or three points and then add more as needed. Sometimes when one condition is cleared, then other co-existing problems will also disappear. So go slowly and see what happens.

There is nothing esoteric or

complicated about practicing acupressure on children. Anyone can do it with some simple instruction, and then it is literally in their hands for whenever it is needed.

It is an effective, inexpensive, and natural remedy with a tradition that spans several thousand years, so you can have confidence in its ability to help with the most basic pediatric complaints. Adding acupressure to your parenting bag of tricks is a great idea—you have nothing to lose, and your child will have so much to gain.

Jennifer Taveras, L.Ac., has an acupuncturist practice at Triangle Wellness in New York City and is also the creator of the Holistic Baby Acupressure System, which educates parents internationally on pediatric acupressure protocols. Her instructional book and DVD are available at HolisticBabyAcupressureSystem.com.