

After the European invasion in 1519, an outbreak named “cocoliztli” killed nearly 15 million Aztecs from 1545 to 1550. This was considered the death strike that demolished the Aztec empire, nevertheless, the exact cause or causes of the epidemic has remained a mystery.

Recently, a study published in the journal Nature Ecology and Evolution suggests the outbreak could have been caused by *Salmonella enterica*—subset Paratyphi C, as its DNA was found in individuals buried at a cemetery especially for victims of cocoliztli.

Please discuss freely using all aspects of view points:

One common belief is that cocoliztli was brought to Mexico by the Europeans, and made worse by drought in the years just prior to the outbreak. (30%)

1. Why would have cocoliztli impacted the Aztec people more than the Europeans?
2. What would have “drought prior to the epidemic year” be associated with the outbreak?

The authors analyzed 24 individuals from the cocoliztli cemetery and 5 from a nearby cemetery used before the epidemic. DNAs were extracted from their tooth pulp-chambers and analyzed by metagenomic approach with MALT, a new algorithm which works by placing all sequenced DNA fragments at the taxonomic position of best fit by comparing every read to every possible position in every genome included in all complete bacterial genomes available through NCBI RefSeq. (70%)

3. What is the reason to analyze 5 samples from a “nearby” cemetery used before the epidemic? How would the authors screen out environmental background signals that may have just made it in to their data?
4. What are the pros and cons of choosing DNA extracted from the tooth pulp-chamber of the samples?
5. Only 10 out of 24 cocoliztli victims were found positive with *Salmonella enterica* DNA. Do you think this ratio is convincing enough to relate the pathogen as the cause of the 1550 outbreak?
6. The authors only analyzed against the completed bacterial genome database from NCBI, please comment.
7. What further evidences do you think are needed to support the principal role of *salmonella enterica* infection in the 1550 epidemic?

Bonus question. (最高給至 10%，但總分仍不超過 100%)

8. Please let us know what comes to your mind after answering these questions. Thank you.

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