Commentary: John Lea’s Cholera with Reference to Geological Theory, April 1850

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In 1850, John Lea (1782–1862) published his Cholera, with Reference to the Geological Theory in Cincinnati, Ohio. Unlike other interpretations of cholera produced around this time, John Lea’s interpretation focused on rocks and soil instead of animalcules, fungi or poisons. Lea relied upon a 50-year-old theory stating calcareous rocks were the cause for diseases due to their alkalinity. It was Lea’s experiences with the 1830 epidemic in Tennessee that led him to develop this theory when a severe Asiatic cholera epidemic struck his town, preceded and followed by its milder form cholera morbus. Earlier versions of this geological theory were posed for such diseases as ‘black-vomit’ in 1800 for which an opposite relationship was developed, yellow fever between 1800 and 1840 and cholera after the first pandemic. John Lea’s ability to differentiate Asiatic cholera from cholera morbus was not overly successful, for he was...
not a physician. He was a notary public with a wife and several children.6 He moved to Cincinnati, Ohio, around 1840,7 and during his spare time was a gardener and horticulturalist8 who kept a weather journal9–12 and applied meteorological skills to improving the products of his garden and fruit-bearing trees. It was the observations Lea made about local topography and water behaviour that brought him to his conclusions about the geological theory. When we read his pamphlet we can tell Lea’s conclusions were very subjective and speculative. For example, he blamed the cases suffered by newly arrived immigrants on their inability to adapt to the new climate. For Bostonians and New Yorkers, he blamed it on the ‘sub-acid’ or alkaline oranges found in their diet which served as an ‘exciting cause’, turning cholera morbus into its more malignant form. Reading the world news, he blamed the epidemics in Egypt on the low rainfall which forced citizens to rely upon cholera-ridden Nile River water. For those residing next to the Little Miami River in Ohio, the highly alkaline calcium-rich fossil beds were to blame.

To prevent ‘the virus of cholera’, Lea noted accurately the role water quality plays in disease prevention. He favoured the capture of rainwater with barrels and cisterns, a very common practice locally. But he also noted the value of ‘river water’ supplied by iron pipes and steam power to town and city settings, ‘soft water’ provided to some towns by aqueducts and mineral-free water flowing through sandstone and alluvial river beds. He also noted that certain diets made you healthier, drinking tea prevented Asiatic cholera like it did in China, and when rainwater wasn’t accessible, wine, spirits and beer were healthy substitutes.13 Throughout all of these discussions, geology was used to explain why cholera occurred and how it could be prevented, claiming ‘arenaceous’ or sandy soil and alluvium were the safest soils to reside on.

In April 1850, Lea’s pamphlet was published just a few weeks before the annual meeting of the American Medical Association [AMA] in Cincinnati.14 During this meeting, the Committee for Practical Medicine and Epidemics displayed a map depicting the first cases of cholera in the Philadelphia area (Figure 1). Their map contrasted with that of Lea, and provided no reasons for the disease whereas Lea’s map clearly depicted cases and deaths in relation to houses and the type of water that was used.

In August and September of 1850, portions of Lea’s work were reprinted in the Eclectic Medical Journal15,16 produced by an alternative medical profession popular to the region.17 This was months before the public would hear about the AMA’s accomplishments and coverage of this disease published in it Transactions.11 Lea’s article again appeared in February 1851 in the Western Lancet.18 Two months later, Dr Theodore Bell published an article summarizing the success of doctors with this epidemic.19 At the end of his article he referred to Lea as a member of ‘the Wernérien or aqueous school’, a personal comment comparing him to a late 18th-century geologist, hydrologist and speculative miner.20 A few months later, news of William Farr’s work on the elevation theory for cholera was published, with most of his findings contradicting Lea’s claims.21,22 As the credibility of Lea’s work rapidly diminished, Cincinnatian physician Thomas Carroll composed a summary of the local epidemic for the Western Lancet in 1854, in which he stated only the following about Lea’s geological theory: ‘[n]either sandy deserts nor mountain heights could stop its progress’.

In 1855, John Snow’s second edition of On the Mode of Communication of Cholera was published.24 In this book, Snow stated the following about Lea’s theory:

Mr John Lea, of Cincinnati, has advanced what he calls a geological theory of cholera. He supposed that the cholera-poison, which he believes to exist in the air about the sick, requires the existence of calcareous or magnesium salts in the drinking water to give it effect. This view is not consistent with what we know of cholera, but there are certain circumstances related by Mr Lea which deserve attention. The connection which Mr Lea has observed between cholera and the water is highly interesting, although it probably admits of a very different explanation from the one he has given.

The accomplishments of John Snow and William Farr ultimately led to the popularization of the ‘zymotic theory’ for diseases like cholera during the late 1850s. This philosophy was embraced by nearly all physicians during the decades to come.25–28 In 1884, the vibrio identified by Filippo Pacini (1812–83)29 was ultimately proven to be the cause for Asiatic cholera.

![Figure 1](http://ije.oxfordjournals.org/DownloadedFrom/mai/75/991-992.pdf)
by Robert Koch (1843–1910).30,31 Four years later, the relationship between the vibrio and alkalinity was documented by Japanese microbiologist Kitasato Shibasaburō32 but by then Lea’s Geological Theory was long forgotten. To date, *Vibrio cholerae* is the only known human pathogen that can thrive in an environment with a pH above 8.033–35 demonstrating the value of Lea’s discovery. In recent years, the changing relationships between microorganisms and our environment make the study of the geology of disease an important spatial global health care issue.36–40

References


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