

Thème 3A – Le maintien de l'intégrité de l'organisme

3-A – Immunité

John Snow and cholera.

Today, scientists consider Snow to be the pioneer of public health research in a field known as epidemiology. Much of the current epidemiological research done at the U.S. Centers for Disease Control, which still uses theories such as Snow's to track the sources and causes of many diseases.

Using the documents, you will explain the main steps of the scientific method used by Snow in the case of the cholera outbreak in London.

**Document 1: Hypothesis about the origin of the cholera outbreaks.**

The prevailing opinion was that cholera was spread either by miasmas or by person-to-person contact. Snow began examining the victims and found that their initial symptoms were always related to the gastrointestinal tract. Snow reasoned that, if cholera was spread by bad air, it should cause pulmonary symptoms, but since the symptoms were gastrointestinal, perhaps it was transmitted by water or food consumption.

In August 1849 Snow published a paper entitled "On the Mode of Communication of Cholera" in which he presented his theory that the disease was acquired by ingestion of contaminated water, but his theory did not get much traction with the medical establishment. The epidemic ended in 1849, but Snow continued to collect data on the pattern of disease and began finding evidence that linked cholera to specific sources of water.

**Document 2: London's water supply and cholera's toll.**

London's water supply system consisted of shallow public wells where people could pump their own water to carry home, and about a dozen water utilities that drew water from the Thames to supply a jumble<sup>1</sup> of water lines to more upscale houses.

An increasing numbers of businesses and homes had water piped from the Thames River by private companies:

Water company	Houses served	Cholera deaths	Death rate per 10,000 houses
Southwark & Vauxhall	40,046	1,262	315
Lambeth	28,017	98	37
The rest of London	256,423	1,422	59

**Document 3: the 'Ghost map'.**

Snow subsequently published a map of the epidemic to support his theory. A detail from this map is shown below. The complete map shows the locations of the 13 public wells in the area, and the 578 cholera deaths mapped by home address, marked as black bars stacked perpendicular to the streets.



Pleas, turn over →

<sup>1</sup> Jumble = enchevêtrement

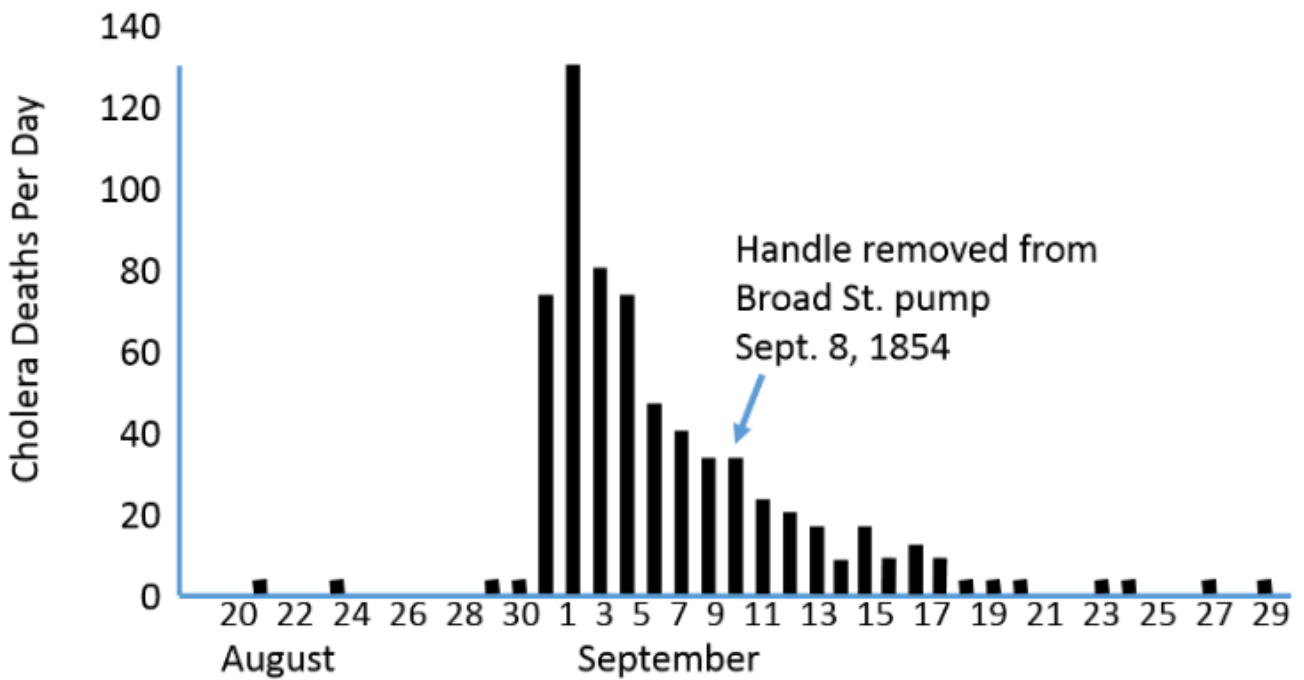
Document 4: Pictures and graph



Source: The Broad Street Pump, Safe & Sound, Penguin, 1971 in English MP. Victorian Values -- The Life and Times of Dr. Edwin Lankester, 1990.



Water pump from Broad Street with handle removed.



Source: <http://www.ph.ucla.edu/>

## Teacher's corner :

You've got the opportunity to test if the student is aware about the scientific method.

### Document 1:

1. The problem : where does the cholera outbreak come from ?  
Answer was: from the air with rotten corpses and waste → miasma, pollution of the air.  
Objection: if it was spread by something in the air, so the symptoms should be pulmonary but they were gastrointestinal.  
Be aware that at that time, germs hadn't yet been discovered.  
Hypothesis: the cause is in the polluted water.

### Document 2:

2. According to this theory, the number of death must be related to the source of water.  
Apparently, all of the water sources weren't affected.  
Maybe people came to different pumps. (see on document 4)

### Document 3:

3. John Snow analysis of cholera death: first map of epidemiology.  
Each black bar is a deceased person and all the bars stacked perpendicular to the streets.  
We can see that there is a wide toll in Broad Street near its pump.

### Document 4:

4. What is a pump? It is made with a handle and if you want water to come, you need to up and down lift the handle.  
Dr Snow had to test his hypothesis. He needed to forbid the access at the pump, but having a kind of law is not enough. Posting policemen is probably doubtful; they can be 24/7.  
The solution imagined by John Snow with the authorities was simply to remove the handle. How simple! How elegant!  
As you can see now in Broad Street.  
Immediately, we can see on the curve that the number of deaths plummeted.

### Other possible questions:

- Some anomalies: Some anomalies are worth noting. Although the large workhouse just north of Broad Street housed over 500 paupers, it suffered very few cholera deaths because it had its own well (not shown on the map). Likewise, The workers at the brewery one block east of the Broad Street pump could drink all the beer they wanted; the fermentation killed the cholera bacteria, and none of the brewery workers contracted cholera.
- The cartoon can be an extension. Describe it...

