

John Snow

John Snow worked out how to control cholera, a major infectious disease, decades before scientists learned that bacteria cause diseases. He used logic and gathered evidence to work out how it was spread. Today we would call this epidemiology.

In the nineteenth century most ordinary people got their water supply from wells or public water pumps. This image from 1866 shows Death supplying infected water



In Snow's time scientists knew very little about causes of diseases and had limited equipment.

- Find out why we do not have an effective vaccine against cholera.
- Find out about the problem of cholera in refugee camps today.

Box 1 What causes cholera?

Cholera is caused by a bacterium, *Vibrio cholerae*, which infects the intestine. It spreads in food or water contaminated with faeces. Infected people develop violent diarrhoea. They soon lose most of the fluid and salts in their bodies (up to 25% of body weight within 24 hours). This loss of salts upsets the pH balance of the blood and passage of nerve impulses. Both dehydration and loss of salts can be fatal. About half the people with untreated cholera die.

John Snow was born in 1813. His father was a farmer and he was apprenticed at the age of 14 to a surgeon in Newcastle-on-Tyne. He became a surgeon in coal mines — a job which did not carry the high status it does now and chiefly involved sawing off damaged limbs and sewing wounds. Snow first learned about cholera when he worked as an assistant in an epidemic of Asiatic cholera in London in 1831.

From surgeon to physician

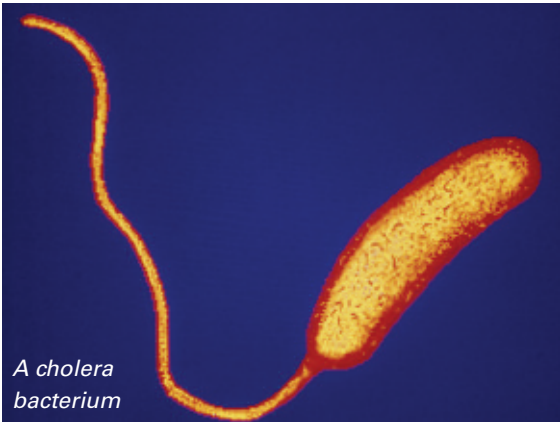
In 1836 Snow began to increase his skills. He studied at the Hunterian School of Medicine in London, observed doctors at the Westminster Hospital, and eventually was admitted to the Royal College of Surgeons of England. He was also licensed as an apothecary, which meant he could make his own medicines; it also allowed him to develop his interest in anaesthetics.

He gradually became more highly qualified and eminent, until in 1850 he was admitted to the Royal College of Physicians. A physician was thought to be a far more knowledgeable and respectable profession than a surgeon. He was also elected president of what would become the Medical Society of London.

Ideas about cholera

Long before the outbreak for which he is most famous Snow had explained in a scientific paper his ideas about how cholera was spread. He put forward the hypothesis that the 'Cholera Poison' reproduced in the human body and was spread to others by contaminated food or water. This was very different from the prevailing idea that diseases were spread in contaminated air by 'vapours' or 'miasmas', and few people were interested in his hypothesis.

Snow had no way of proving his theory, and could only support it with circumstantial evidence. He treated many cholera patients but did not catch the disease despite breathing in the supposedly contaminated 'vapours'. He observed that the illness always affected the digestive system first. This suggested to him that the infectious agent entered by mouth. Evidence from another cholera outbreak persuaded him that it was connected to water supplied by a particular water company — a charge the company rejected.



Morecam Animal Health Ltd/SPL

Box 2 Useful website

Log on to <http://www.ph.ucla.edu/epi/snow.html> to find out much more about John Snow, including portraits and the site of the pump as it is today.

Cholera outbreak, 1854

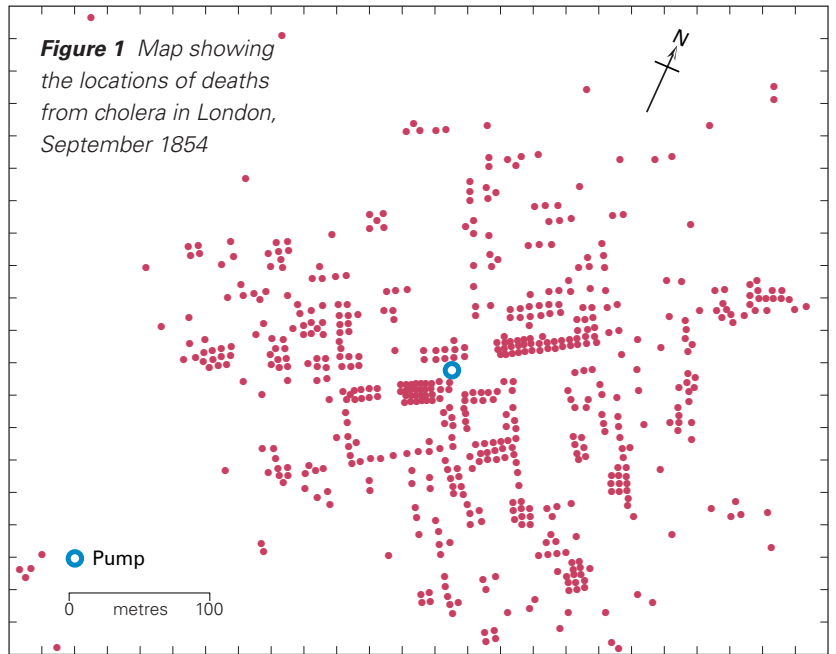
At the end of August 1854 there was a major cholera outbreak in Soho, central London. It spread rapidly – 600 people died within days in an area less than a quarter of a mile square. Snow investigated, starting from his conviction that the only way the disease could spread so rapidly was through contaminated water.

He decided that the most likely source was a public water pump at the junction of Broad Street and Cambridge Street. He examined it on the fourth day of the outbreak, but the water had very little obvious contamination. Snow was disappointed not to find the evidence he expected to support his theory, but rather than giving up he looked for other evidence.

He found out where the cholera victims had lived from the Register of Deaths, then visited the area to locate each death. It was obvious that most of the victims lived near the pump (Figure 1). Even the more distant deaths had used water from the Broad Street pump. In contrast, local people who did not use the pump were not ill – for example, the inhabitants of the local workhouse who had their own well, and the local brewery workers who drank beer brewed with water from the brewery well.

Snow met the parish authorities and told them what he had found. The next day the handle was removed so that the pump could not be used. The number of cholera cases started to go down straight away.

The well under the pump was about 9 m deep and there was a sewer about 7 m down, close to the well. People said the water smelt ‘offensive’ at the time of the outbreak. Snow thought that sewage carrying cholera had got into the well from the sewer, or possibly from nearby cesspits. Once the outbreak started diarrhoea from cholera victims entered the sewer and cesspits and leaked into the well. This caused more infections that increased the sewage load that leaked into the well and so on.



The aftermath

Snow’s carefully gathered data had little impact. More people accepted his theory when the link between water from the pump and the more distant victims was clarified but the health authorities still rejected it. After investigating a further outbreak Snow published a second edition of his paper on the spread of cholera with more detailed and convincing evidence. His ideas were finally accepted.

Snow went on to concentrate on using chloroform and ether in anaesthesia. He trialled ether on dental patients, improved the way it was administered and became expert in its use. Snow died on 16 June 1858, and was buried in Brompton cemetery.

Jane Taylor teaches biology and is an editor of CATALYST.

The workhouse was a place where destitute people of the parish were sent to live.

Queen Victoria used Snow’s services as an anaesthetist when she gave birth to two of her children.

Answers to wordsquare, page 15

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