JOHN SNOW AND THE BROAD STREET PUMP
ON THE TRAIL OF AN EPIDEMIC

By Kathleen Tuthill, Illustrated by Rupert Van Wyk

British doctor John Snow couldn't convince other doctors and scientists that cholera, a deadly disease, was spread when people drank contaminated water until a mother washed her baby's diaper in a town well in 1854 and touched off an epidemic that killed 616 people.

Dr. Snow, an obstetrician with an interest in many aspects of medical science, had long believed that water contaminated by sewage was the cause of cholera. Cholera is an intestinal disease than can cause death within hours after the first symptoms of vomiting or diarrhea. Snow published an article in 1849 outlining his theory, but doctors and scientists thought he was on the wrong track and stuck with the popular belief of the time that cholera was caused by breathing vapors or a "miasma in the atmosphere".

The first cases of cholera in England were reported in1831, about the time Dr. Snow as finishing up his medical studies at the age of eighteen. Between 1831 and 1854, tens of thousands of people in England died of cholera. Although Dr. Snow was deeply involved in experiments using a new technique, known as anesthesia, to deliver babies, he was also fascinated with researching his theory on how cholera spread.

In the middle 1800s, people didn't have running water or modern toilets in their homes. They used town wells and communal pumps to get the water they used for drinking, cooking and washing. Septic systems were primitive and most homes and businesses dumped untreated sewage and animal waste directly into the Thames River or into open pits called "cesspools". Water companies often bottled water from the Thames and delivered it to pubs, breweries and other businesses.

Dr. Snow believed sewage dumped into the river or into cesspools near town wells could contaminate the water supply, leading to a rapid spread of disease.

In August of 1854 Soho, a suburb of London, was hit hard by a terrible outbreak of cholera. Dr. Snows himself lived near Soho, and immediately went to work to prove his theory that contaminated water was the cause of the outbreak.

“Within 250 yards of the spot where Cambridge Street joins Broad Street there were upwards of 500 fatal attacks of cholera in 10 days,” Dr. Snow wrote “As soon as I became acquainted with the situation and extent of this irruption (sic) of cholera, I suspected some contamination of the water of the much-frequented street-pump in Broad Street.”

Dr. Snow worked around the clock to track down information from hospital and public records on when the outbreak began and whether the victims drank water from the Broad Street pump. Snow suspected that those who lived or worked near the pump were the most likely to use the pump and thus, contract cholera. His pioneering medical research paid off. By using a geographical grid to chart deaths from the outbreak and investigating each case to determine access to the pump water, Snow developed what he considered positive proof the pump was the source of the epidemic.

Besides those who lived near the pump, Snow tracked hundreds of cases of cholera to nearby schools, restaurants, businesses and pubs.

According to Snow’s records, the keeper of one coffee shop in the neighborhood who served glasses of water from the Broad Street pump along with meals said she knew of nine of her customers who had contracted cholera.

A popular bubbly drink of the time was called “sherbet”, which was a spoonful of powder that fizzed when mixed with water. In the Broad Street area of Soho, that water usually came from the Broad Street pump and was, Snow believed, the source for many cases.

Snow also investigated groups of people who did not get cholera and tracked down whether they drank pump water. That information was important because it helped Snow rule out other possible sources of the epidemic besides pump water.

He found several important examples. A workhouse, or prison, near Soho had 535 inmates but almost no cases of cholera. Snow discovered the workhouse had its own well and bought water from the Grand Junction Water Works.

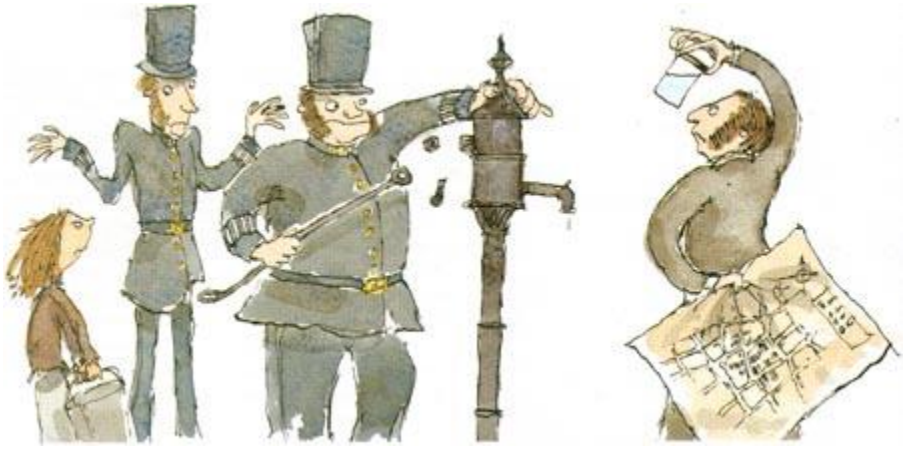
The men who worked in a brewery on Broad Street which made malt liquor also escaped getting cholera. The proprietor of the brewery, Mr. Huggins, told Snow that the men drank the liquor they made or water from the brewery’s own well and not water from the Broad Street pump. None of the men contracted cholera. A factory near the pump, at 37 Broad

Street, wasn't so lucky. The factory kept two tubs of water from the pump on hand for employees to drink and 16 of the workers died from cholera.

The cases of two women, a niece and her aunt, who died of cholera puzzled Snow. The aunt lived some distance from Soho, as did her niece, and Snow could make no connection to the pump. The mystery was cleared up when he talked to the woman's son. He told Snow that his mother had lived in the Broad Street area at one time and liked the taste of the water from the pump so much that she had bottles of it brought to her regularly. Water drawn from the pump on 31 August, the day of the outbreak, was delivered to her. As was her custom, she and her visiting niece took a glass of the pump water for refreshment, and according to Snow's records, both died of cholera the following day.

Snow was able to prove that the cholera was not a problem in Soho except among people who were in the habit of drinking water from the Broad Street pump. He also studied samples of water from the pump and found white flecks floating in it, which he believed were the source of contamination.

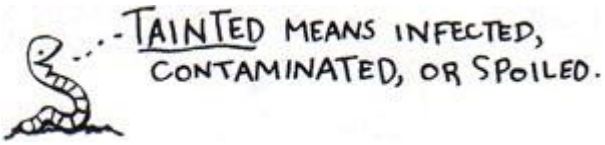
On 7 September 1854, Snow took his research to the town officials and convinced them to take the handle off the pump, making it impossible to draw water. The officials were reluctant to believe him, but took the handle off as a trial only to find the outbreak of cholera almost immediately trickled to a stop. Little by little, people who had left their homes and businesses in the Broad Street area out of fear of getting cholera began to return.



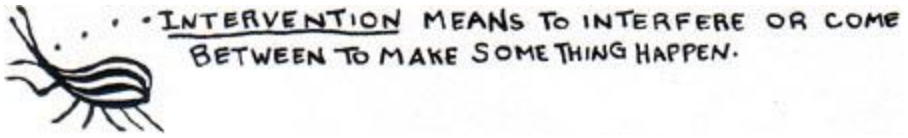
Despite the success of Snow's theory in stemming the cholera epidemic in Soho, public officials still thought his hypothesis was nonsense. They refused to do anything to clean up the cesspools and sewers. The Board of Health issued a report that said, "we see no reason to adopt this belief" and shrugged off Snow's evidence as mere "suggestions."

For months afterward Snow continued to track every case of cholera from the 1854 Soho outbreak and traced almost all of them back to the pump, including a cabinetmaker who was passing through the area and children who lived closer to other pumps but walked by the Broad Street pump on their way to school. What he couldn't prove was where the contamination came from in the first place.

Officials contended there was no way sewage from town pipes leaked into the pump and Snow himself said he couldn't figure out whether the sewage came from open sewers, drains underneath houses or businesses, public pipes or cesspools.



The mystery might never have been solved except that a minister, Reverend Henry Whitehead, took on the task of proving Snow wrong. The minister contended that the outbreak was caused not by tainted water, but by God's divine intervention. He did not find any such proof and in fact, his published report confirms Snow's findings. Best of all, it gave Snow the probable solution to the cause of the pump's contamination.



Reverend Whitehead interviewed a woman, who lived at 40 Broad Street, whose child who had contracted cholera from some other source. The child's mother washed the baby's diapers in water which she then dumped into a leaky cesspool just three feet from the Broad Street pump, touching off what Snow called "the most terrible outbreak of cholera which ever occurred in this kingdom."

A year later a magazine called *The Builder* published Reverend Whitehead's findings along with a challenge to Soho officials to close the cesspool and repair the sewers and drains because "in spite of the late numerous deaths, we have all the materials for a fresh epidemic." It took many years before public officials made those improvements.

In 1883 a German physician, Robert Koch, took the search for the cause of cholera a step further when he isolated the bacterium *Vibrio cholerae*, the "poison" Snow contended caused cholera. Dr. Koch determined that cholera is not contagious from person to person, but is spread only through unsanitary water or food supply sources, a major victory for Snow's theory. The cholera epidemics in Europe and the United States in the 19th century ended after cities finally improved water supply sanitation.

The World Health Organization estimates 78 percent of the people in Third World countries are still without clean water supplies today, and up to 85 percent of those people don't live in areas with adequate sewage treatment, making cholera outbreaks an ongoing concern in some parts of the world.

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 Snows' to track the sources and causes of many diseases.

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