JOHN SNOW

John Snow, epidemiologist, pharmacologist, anesthesiologist, surgeon, and physician, made significant contributions to the field of public health and medicine. He is best known for his work on cholera, a disease that plagued London in the mid-19th century. Snow's work was instrumental in understanding the spread of cholera and in developing effective means of controlling its spread.

Snow was born in York on January 13, 1813, the son of a farmer. In private school, it is reported that he was eager to learn and was especially fond of mathematics. At the age of 14, he became a pupil of William Hardcastle, surgeon at Newcastle-on-Tyne, and studied at the Newcastle Infirmary. Before he had completed his training as a surgeon's apprentice, he became a vegetarian and a prohibitionist. Having accepted this way of life, he remained a vigilant crusader in the following years. His first experience with cholera was in the 1851 epidemic in Newcastle. It began or was first noted during the Polish-Russian War, and moved westward across Europe, over to Britain, and eventually spread to a number of countries throughout the world. More than 20,000 persons died in Britain during the epidemic.

Snow was not a particularly social fellow, rather, he preferred books, laboratory experiments, and bodily exercise. Reserved, clever, and considered by some to be a little peculiar, he was not too proud to ask for a translation in the library when the original was unknown. Furthermore, he was a faithful member of the Westminster Medical Society, a body which gave particular encouragement to young members of the profession who were eager to present a scientific essay or engage in a debate. In 1833, at the age of 25, Snow qualified for membership in the Royal College of Surgeons of England. His formal education was completed in 1844, at the age of 31, and he passed the M.D. examination at the University of London.

Epidemiology and anesthetics shared Snow's attention while he was building a practice in London. His contributions to epidemiology were as extensive as those in anesthetics, but were judged by several to be more significant. Cholera epidemics provided the same data for the observations in field epidemiology, which are fundamental and were made some time before the investigations of Pasteur and Koch in microbiology. The concept of the spread of cholera remains valid, although microorganisms were not identified until decades later. Snow reasoned that, since the initial symptoms of cholera usually indicated primary infection at the alimentary tract, the pathogenic agent gained entrance into the body via the stomach.

There is sufficient evidence also, I believe, in the following pages, to prove the mode of communication of cholera here explained.

The paper in which minute quantities of the enteric and excretory depositions of cholera patients must be swallowed are sufficiently numerous, to account for the spread of the disease and on examination it is found to spread more where the facilities for this mode of communication are greatest.

Finlandi experience was obtained in an outbreak of cholera which occurred near the intersection of Cambridge and Broad streets, Goldsmith Square, London, in 1854. In a period of 10 days, more than 500 fatal cases were reported. The number would have been considerably greater had not e large percentage of the population fled the city. Snow's epidemiologic studies concentrated on the contamination of the water from the street pump.

I suspected water contamination of the water of the much frequented street pump in Broad Street. . . . I requested permission, therefore, to take a list at the Central Register Office, of the deaths from cholera, registered during the week ending . . . which was kindly granted. Eighty-nine deaths from cholera were registered, during the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump. The result of the inquiry then was, that there had been as particular outbreak in increase of deaths, in this part of London, except among the persons who were in the habit of drinking the water of the street-managed pump well. I had an interview with the Guard of Guardians of St. James's Parish, on the evening of Thursday, 7th September, and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day.

Before pursuing the epizootic investigations in the spread of cholera, Snow did not ignore the opportunity in the newly discovered anesthetic agents in the 1840s. One of his first communications before the medical society described a device for treatment of asphyxia and the resuscitation of the asphyxiated. The instrument was based on the principle of a pulmonoscope, which had been invented by a Mr. Read of Regent Circum. Snow assumed that the stimulus for the first inspiration in the newborn was similar to that for others; that is to say, it was from inadequate oxygen pressure. Also, he speculated that the pulsive action of the heart was partially related to the capillaries, since the action of the heart was not sufficient to propel the blood throughout the circuit.

While Snow was waiting for his practices to expand, the discovery of ether for anesthesia was announced to the world. With a background and interest in respiration and asphyxia, it seems natural for his manifest curiosity to have led him into experimental studies on the pharmacology of anaes-
thetic agents and the use of ether in the practice of anesthesia. A few of the experimental studies dealt with ether. Chloroform, on the other hand, benefited most from his investigations. The design of an improved inhaler, supplemented by experimental studies on anesthesia, placed Snow in the advanced anesthesia coteries in London.

The uncertain reputation of ether, plus the desire of the English to be somewhat different from the Americans, has been held responsible for the preference of Syne and Simpson, especially, for chloroform. However, neither physician was endowed with the capacity or displayed any compelling desire to investigate chloroform in the laboratory. Snow filled the void. The physical, and pharmacological properties of a number of volatile agents were studied. The boiling point, the percentage of mixture of the experimental substance with air, and the quantity required by inhalation for insensibility were included in the physical studies. The pharmacological aspects included the minimal lethal dose in animals and mode of death, whether by cardiac or respiratory failure. However, extensive precautions were taken to prevent unnecessary suffering in animals; they were not used thoughtlessly in experiments. The effect of the agents on man concluded the investigation. Snow was invariably the experimental subject in this phase.

Snow administered chloroform to the young and the old. By 1857, this agent had been given to 190 infants under one year of age; two were only 8 and 10 days old. At the other extreme, chloroform was administered to several patients over 75 years of age and one as old as 90 years. The precipitation of a fit of epilepsy with chloroform was observed in the susceptible. Neither menstruation nor pregnancy was judged to be a contraindication if there was need for anesthesia. No ill-effects were observed in patients with pulmonary tuberculosis.

Skillful administration of anesthesia permitted the surgeon to operate on patients with heart disease. Even with anesthesia, however, surgery was for the unfit. Readmission of chloroform was recommended, "if the operation lasted more than a minute or two." Also,

when the surgeon is entering in the neighbourhood of im- portant parts, it is desirable to prevent any signs of sensibility, and to keep repeating for chloroform as to keep up, the coma, without, however, causing embarrassment of the breathing, or wide dilatation of the pupil. In the greater number of operations, however, it is better to wait till there is some sign of sensibility, such as a slight cry or tendency to flush, before the inhalation is resumed; and then a few puffs of well diluted vapour make the patient quiet again.

The records of 50 fatal cases of inhalation ther-

apy, including postmortem examinations when performed, were reviewed critically. The deaths in sev-

eral of the cases upon review were judged to be

unrelated to the anesthetic agent, in others to an overdose of the agent, with cardiac arrest. In Case 44, mouth-to-mouth respiration was practiced.

Mr. Buxton commenced practicing artificial breathing by the application of his own mouth to that of the patient. In this way, feeble respiration was to be all very convenient, and the process was kept up about without interruption for from five to eight minutes. During the first three or four minutes after the alarm began, the patient continued at go make the stimulating efforts of voluntary inspiration, and the case was not thought, by these looking on, to be by any means hopeless. At length, however, these finally ceased, and from that time it was apparent that the vein was dead.

The extent of Snow's anesthetic practice was remarkable. Although the incidence data for each of the surgical procedures were not recorded, he reported that:

I have notes of 40 cases of amputation of the thigh to which I have administered chloroform, . . . . I have notes of 31 cases in which I have administered chloroform during amputation of the leg. I have memorised of 100 cases of cancer in which I have given chloroform; I have notes of 141 operations for hare-lip, for which I have given chloroform. . . . I have, however, administered chloroform fifty-three times during the extraction of teeth.

Snow's policy in reviewing medical books is similar to the current policy of the book review section of this periodical. Snow was reluctant to compose a harsh review. In his judgment, if the book was good, it was deserving of praise; if the book was bad, why be troubled to review it. With so many books received in this editorial office and the opportunity to review only a small percentage of the total, the precedent established by Snow has been followed in recent years. If space is not available in this journal to comment on good books, then such space is not available to discuss the sad features of bad books.

With neither studying an epidemic of cholera or extending the information on anesthesia, Snow re-

ained an excellent practitioner of medicine. Com-
pletely devoted to his patients, he was willing to inaugurate a seat when the patient was unable to pay. His life was rather selfish in that he never married and his hours were not troubled by the responsi-

bilities of a home or family. One obvious conclu-

sion is that his abstinent life did not lead to un-

usual longevity. He died in 1859 at the age of 42, having suffered from hematemesis several times in the years preceding his death. The terminal event was preceded by left hemiparesis.


3. Snow, J.: On Chloroform and Other Anesthetics, B. W. Richard-