The Lancaster County Cholera Epidemic of 1854 and the Challenge to the Miasma Theory of Disease

By John B. Osbourne

EARLY ON THE MORNING OF SUNDAY, September 10, 1854, the fellows of the College of Physicians of Philadelphia received an urgent appeal for medical aid from the hastily assembled Sanitary Committee of Columbia, Pennsylvania, seventy-five miles to the west, on the eastern bank of the Susquehanna River. Cholera had broken out in the town, and by Saturday, September 9, it had killed thirty people, including one of the town's six physicians. The desperate townspeople turned naturally to the College of Physicians. Founded in 1777 by a group of prominent medical men in Philadelphia to advance the medical profession and to promote public health, the college had become the most prestigious medical society in the country. Henry Hartshorne, MD, a fellow of the college and noted Quaker humanitarian, responded immediately, leaving for Columbia that day. T. Heber Jackson, MD, of Philadelphia, arrived the same day. The next day, Monday, September 11, the college held a special meeting and resolved that a delegation of five fellows be sent to Columbia, including the eminent physicians Wilson Jewell and Rene La Roche. They arrived in Columbia on September 12, joining other volunteer physicians in aiding the sick and instituting measures intended to curb the further spread of the disease.1 Believing they knew the etiology of cholera, they came to Columbia to discover its source, not its cause.

The committee that went to Columbia was made up of outspoken advocates of the miasma theory and were convinced that cholera was spread by foul air emanating from filth. The committee's observations in

Columbia confirmed their beliefs, and the fellows focused their efforts on finding the source of filth they believed to be responsible for the miasma. When they discovered rotting carcasses of animals in the river, they deduced that these were the sources of the corruption responsible for the epidemic. Having prescribed sanitary measures for the city, the majority of the fellows returned to Philadelphia the next day convinced that "the prevailing affection presented no peculiar features."2

Dr. Jackson remained in Columbia gathering data on the disease, and he reassessed the validity of the miasma theory subscribed to by the fellows. Little is known about T. Heber Jackson. His name does not appear on the rolls of the College of Physicians of Philadelphia or in either contemporary or modern medical biographical dictionaries. Like Jackson, John Atlee, a physician and associate fellow of the College of Physicians, found that his observations of a less severe cholera outbreak in nearby Lancaster could not be explained by the conventional miasma theory. The professional debate that ensued between Jackson and Atlee and the leadership of the College of Physicians can be pieced together from articles in medical journals, essays, and the records of the meetings of the College of Physicians. Their efforts were part of a larger challenge to then current medical orthodoxy and helped to pave the way for the rejection of the miasma theory of disease and the acceptance of the germ theory in America.

Cholera, which was endemic to India, escaped the subcontinent in 1817, striking Moscow in September 1830. It then spread westward across Europe, reaching England in 1831 and North America in 1832. The pandemic would return to Europe and America in 1849, 1854, and 1866, each time filling the population with terror and revulsion; the mystery surrounding the cause of the disease only exacerbated the situation. Its effects were both rapid and devastating, and death was agonizing to

those who succumbed to the disease. The victims were attacked by diarrhea and vomiting, followed by intense thirst, cramps in the trunk and legs, shortness of breath, and a radical shrinking of the flesh as the body became dehydrated. The afflicted person's bodily fluids were excreted as "rice water." He or she collapsed and turned blue, with death following quickly for the more fortunate ones. As many as 50 percent of those who contracted cholera died.

The etiology of cholera, not proven with certainty until the 1880s, was a bacterium, vibro cholerae, transmitted through the ingestion of human feces, primarily through drinking polluted water.With no certain knowledge as to the cause of cholera, speculation about its etiology divided European and American physicians into two camps: those who believed it to be spread by contagion and those who thought it was caused by miasmic vapors emanating from filth and rotting organic matter. Each of these theories had roots in antiquity. From the time of the ancient Jews, it had been recognized that certain diseases were transmitted either through direct contact between humans or through objects or animals that had been in physical contact with a victim. By the sixteenth century, plague, smallpox, measles, tuberculosis, rabies, and syphilis were recognized as diseases spread by contagion.3 The advocates of the contagion theory for cholera justified their position on the grounds that cholera followed trade routes and often broke out first among those newly arrived in cities. Believing as they did that contagious diseases were always spread by individual contact with a victim or things with which a victim had come into direct contact, the contagionists were unable to explain why outbreaks of cholera could occur over long distances and attack whole districts at once. They were unaware of either the existence of the cholera bacterium or that the ingestion of water containing this bacterium was the primary means by which large numbers of people some distance from

the original victim could be infected. Thus their narrow definition of a contagious disease as one that spread through individual human contact and their lack of understanding of the etiology of cholera left the contagionists with no evidence to substantiate their theory.

The rival miasma theory also had ancient roots. Both Hippocrates and Galen believed that many epidemic diseases were caused by atmospheric and climatic conditions. By the eighteenth century, this belief had been refined into the theory that epidemic diseases were caused by environmental conditions, such as noxious gasses emanating from human wastes, unhygienic living conditions, rotting animal and vegetable matter, and swamps. As these conditions could be ameliorated by human intervention, advocates of the miasma theory began to subscribe to sanitarianism, or the theory that providing humanity with hygienic living conditions could eliminate disease. They also came to believe that differences among epidemic diseases were due to variations in local conditions. Unable to account for the fact that miasmas sickened some people and not others living in the same atmospheric conditions, the supporters of the miasma theory posited that certain individuals had a predisposition to catching epidemic diseases due to physical infirmity, diet, corrupted morals, and emotional excitement.4

In his seminal essay on the rise of anticontagionism, the eminent pioneer medical historian Erwin H. Ackerknecht demonstrated that, with insufficient medical knowledge to make a scientific judgment on the question, the medical community often took sides in the contagion-miasma dispute based on social, economic, and political considerations. The advocates of the contagion theory believed the best way to control the disease was through the traditional practice of state-run quarantine. As autocratic bureaucracies in Russia and Prussia used the theory to justify quarantines, liberal physicians, in an age of laissez-faire liberalism, viewed it as a tool

of repressive governments and an enemy of trade and commerce.5 With the arrival of cholera in the West, the contagion theory quickly fell into disfavor in Great Britain and the United States. Also aiding in the demise of the contagion theory was the failure of quarantine to contain cholera. Thus, because of the lack of conclusive evidence about the etiology of cholera, the miasma theory, with its accompanying stress on sanitary reform, triumphed in medical circles for political and hygienic reasons. The miasma theory "reached its highest peak of elaboration, acceptance, and scientific respectability on the eve of the cholera epidemics of 1854."6 American physicians refused to admit that the epidemic was a new disease imported by European immigrants. Even before cholera's first arrival in the Americas in 1832, the College of Physicians of Philadelphia had concluded that the disease was merely a more virulent form of a diarrhea-producing disease known since ancient times and named cholera by Hippocrates.7 Members of the college who went to Montreal in 1832 to study the first outbreak of cholera in the New World returned convinced that the disease they had witnessed was neither imported nor spread by contagion, a conviction they continued to hold in 1854.8

The anticontagionist beliefs of the fellows of the College of Physicians of Philadelphia were strongly influenced by their commitment to sanitarianism, a doctrine that stressed that cities must be cleansed and the conditions of the lower classes improved if the spread of epidemic diseases was to be controlled. They subscribed to the doctrines of Edwin Chadwick, the English leader of this movement, who claimed that "all smell is disease."9 He had been the driving force behind the creation of the British Central Board of Health in 1848 to police the sanitation of Britain's cities. Believing that the deadly cholera miasma was generated in filth, sanitarians such as the fellows of the College of Physicians of Philadelphia were certain that cleaning up cities would end the pestilence.

This conviction was confirmed for them as early as 1832, during the first American cholera epidemic, when the city of Philadelphia's cholera death rate was one-quarter that of New York's and one-twelfth that of Montreal's. The medical community attributed this success in part to the fact that the city used clean water from the Fairmount Reservoir to wash the filth from the streets.10 Ironically, while the fellows of the College of Physicians searched for sources of airborne miasmas to explain the cholera epidemic, it was Philadelphia's unique supply of clean drinking water from the Fairmount Reservoir that spared the city, as Philadelphia's drinking water was not polluted by human feces, which spread the bacterium cholera.

Cholera outbreaks in Lancaster County, Pennsylvania, and Broad Street, London, in late August and early September 1854 provided case studies for physicians attempting to discover the true etiology of the disease. Dr. John Snow in London and Drs. T. Heber Jackson and John Atlee in Lancaster County, Pennsylvania, would use data gathered during these outbreaks to question the widely held medical belief that cholera was generated in filth and spread through the air by miasma. Theorizing that cholera was spread by some form of contagion, these physicians challenged the prevalent sanitarian, anticontagionist theories of the time.

They also questioned the generally accepted doctrine of predisposing causes, which posited that ethnicity, class, and one's physical, hygienic, and moral condition dictated the likelihood of one's catching the disease. Snow's research, which enabled him to prove that cholera was spread primarily through contaminated drinking water, made him justifiably famous in medical circles. In recent years, Snow has been the subject of numerous scholarly studies and popular biographies.11 The March 2003 issue of the journal Hospital Doctor selected him as the most important doctor of all time. However, as Charles Rosenberg, the author of the classic

account of cholera in the United States, has pointed out, Snow was not alone in challenging medical opinion on the etiology of cholera. His was one of dozens of theories on the cause of cholera being put forward in the early 1850s.Yet, he was set apart from the rest by the exhaustive and comprehensive nature of the research data upon which he based his theory of the etiology of the disease.12

Dr. Jackson's and Dr. Atlee's theories on the cholera epidemics in provincial Lancaster County in 1854 were neither as comprehensive as Snow's, nor based upon detailed data like that which Snow assembled. However, like Snow, who disputed the anticontagionist theories of the British General Board of Health and the professional leadership of the three medical corporations of London, Jackson and Atlee raised doubts about the validity of the miasma theory.13 They also challenged the opinions of members of the prestigious College of Physicians of Philadelphia who had come to Columbia to study the epidemic.

Both the London, England, and Lancaster, Pennsylvania, cholera epidemics claimed huge numbers of victims. As many as 697 people died in the densely populated London district of Soho.14 Dr. Snow was able to trace the source of the Soho epidemic to a pump on Broad Street and thence to a sewer that leaked the original victim's excrement into the well. His findings provided the evidence needed to confirm his 1849–54 studies connecting outbreaks of cholera with local water supplies. Although Snow was not immediately successful in persuading England's medical elite of the validity of his theory, within a decade his work became the new medical orthodoxy. Like Snow in London, T. Heber Jackson and John L. Atlee discovered that the miasma theories for cholera espoused by their colleagues failed to explain the progression of the disease that they observed in Lancaster County. All three drew upon innovative medical technology such as microscopy, statistics, and epidemiological mapping

to gather the evidence needed to make their cases.

Columbia had been untouched by cholera until September 1854. The town is located on the eastern bank of the Susquehanna River and, in 1854, was one of the great transportation and industrial centers of Pennsylvania. It was the terminus of two canals and three railroads. A canal on the west bank at Wrightsville linked Columbia to the Chesapeake Bay. A canal starting at Columbia on the east bank went as far north as the mouth of the Juniata River north of Harrisburg. A dam below the town provided the water to feed the Chesapeake canal and created a basin in which barges could be loaded and unloaded. Columbia was connected to Philadelphia, Lancaster, Harrisburg, and Port Deposit, Maryland, by rail and became a major transfer point for coal brought down the river. Each spring, log rafts from forests in the central part of the state were floated down the river to sawmills in the town. Iron ore, discovered near Columbia, led to the establishment of foundries and a rolling mill to serve the railroads. Silk mills also provided a major source of employment in the town.Trade and commerce generated by this activity transformed the main street of Columbia into a commercial center that some said rivaled the shopping districts of Philadelphia. The Columbia Bank, with five hundred thousand dollars in capitalization, was the largest bank in the county. Founded by Quakers, the town became a haven for runaway slaves. A mile-long bridge that connected the town with the western bank of the Susquehanna provided a convenient crossing point for runaway slaves coming north as well as for immigrants going west. By 1850, almost 20 percent of the population of Columbia was African American. Numerous German and Irish immigrants also lived in the town, drawn there by employment in the railroads, canals, coal yards, and warehouses.15

In August 1854, the inhabitants of a house in Columbia fell victim to

what was diagnosed as cholera, and the house in which they lived was ordered destroyed by the town authorities. No further cholera cases were recorded until September 6, 1854, when two German immigrants, sick with cholera, were left at the railroad terminus in Columbia while their party continued west. The men died the next day. Four Columbians who had tried to aid them came down with cholera and died shortly thereafter. 16 By September 9, cholera had spread to almost every section of the town, and 30 people had died, many of whom had visited the stricken immigrants. Physicians had no doubt that the disease that they were witnessing was cholera. The virulence of the epidemic that struck Columbia caused Jackson to observe that two-thirds of the victims died within five hours of showing symptoms of the disease.17 Although only 127 victims died in Columbia—out of a population of five thousand—Dr. Wilson Jewell of the College of Physicians of Philadelphia and president of the Philadelphia Board of Health estimated that if a similar outbreak had occurred in Philadelphia, it would have killed 75 people an hour.18 Columbia's rail link to Philadelphia was a conduit for medical assistance as well as cholera. Drs. Hartshorne, La Roche, and Jewell, who traveled to Columbia from Philadelphia by rail, were all outspoken sanitarians and anticontagionists. They were committed to creating new public health standards that would address city sanitation, water supply, and waste disposal and thus improve the dismal state of public hygiene in American cities. All three fellows were convinced that filth was the primary threat to the health of both Columbia and Philadelphia.

An 1848 report on the public health of Philadelphia written for the American Medical Association described the sanitary conditions in that city as being atrocious; streets were never cleaned, sewers were clogged, and water supplies were contaminated. The report criticized the Board of Health for inactivity and lack of control over those responsible for cleaning

the streets. Even though Philadelphia responded to the criticism of the AMA report by attempting to cleanse itself, these efforts did not meet the College of Physicians' standards.19 At a June 26, 1849, meeting of the college, Dr. Charles D. Meigs, who would be appointed chairman of the committee that went to Columbia, decried the lack of support politicians gave the medical community. He commented, "Were our municipal and state governments aware of their duty and responsibility as guardians of the people, they would take measures to reach the reason and conscience of every citizen" on the importance of civic hygiene in the control of cholera.20

Meigs and the fellows of the college who traveled to Columbia would have concurred with Dr. Hartshorne "that mortality from cholera is almost invariably commensurate with the filth and destitution of the inhabitants and their abodes."21 For Hartshorne, the filth that was endemic in mid-nineteenth-century cities provided an incubator for diseases and was most prevalent among the poor. He gave credence to the idea that microscopic life might be responsible for causing cholera, although he avoided speculating on how the cholera "germs" came to be in the offending filth. Hartshorne observed that "cholera is generated only in the presence of a certain unknown contingent, whose capriciousness of migration, partial subjection to temperature, and other habitudes, suggest the probability of the animalcular hypothesis."22 Hartshorne was more interested in practical solutions for defeating cholera than in hypo thetical explanations of its nature. He concluded that:

Whatever the theory, the lesson from all the facts is one . . . of hygiene and prevention. Cities should be built and regulated to prevent epidemics, as they should be to afford security from conflagrations. The laws of public benevolence, like those of private morality, are an essential part of the economy of the world. As personal vice brings misery, by violation of the

physical laws, so the aggregate vice of communities, and the neglect of the higher classes to do their best for those around them, meet with retribution, in those scourges, which under the forms of plague, cholera, typhus, and yellow fever, desolate populations almost in proportion to the errors of their local life.23

Hartshorne strongly objected to the practice of personal quarantine against cholera, arguing that it was noncontagious and that the only protection against the disease was “local, municipal and domestic sanitation.” 24 He believed communities, led by the upper orders of society, should work together to promote the health of their citizens. It was a responsibility that civic leaders neglected to fulfill.

Rene La Roche was a member of the Philadelphia Board of Health, and his anticontagionism theory dominated the board’s thinking in the 1850s.25 His book on the history, pathology, and etiology of yellow fever was considered to be the definitive study of the disease when it was published in 1855. He was more skeptical than Hartshorne of the idea that cholera might be caused by microscopic “germs.” In an address given before the College of Physicians on April 5, 1854, he commented that while he was willing to admit the possibility that diseases might be caused by “microscopic beings produced out of pre-existing germs under peculiar and favorable circumstances of locality and atmosphere,” he found the idea to “smack more of poetry than sound theory.”26 Like Hartshorne, he contended that the source of cholera was local in origin.27 Believing filth and local meteorological and geographic conditions to be responsible for the creation of the disease, he was therefore an ardent advocate of sanitary reform.

Wilson Jewell was president of the Philadelphia Board of Health and a prime mover in the creation of the national Quarantine and Sanitary Commission that met annually between 1857 and 1860.28 His writings

demonstrate the validity of Ackerknecht's observation that the debate over contagion was never just a theoretical one, but was always tied to the question of quarantines and the bureaucracies that enforced them.29

Jewell observed that:

The doctrine . . . of specific contagion, or the spread of epidemic diseases by contagion, which was universally received when quarantines were first instituted, has, within the present century, undergone almost an entire revolution. . . . A judicious modification of the present unsound, ill-advised and ancient code of quarantine law is therefore not only called for, but absolutely necessary.30

Arriving in Columbia with preconceived ideas as to the causes of cholera, and determined to collect evidence to support their sanitarian and public-health reform agenda, the fellows from the College of Physicians of Philadelphia quickly became convinced that they had discovered the source of the deadly disease in the filth from the river. They disputed newspaper reports that attributed the epidemic to waterborne pollution. A telegraphic newspaper dispatch from Columbia on September 13 reported that "the river is very low, and at the point where the water is drawn up into the basin of the water works, two slaughter houses empty their garbage. There being no current to carry the filth off, the water became strongly impregnated with the poisonous matter, and was freely drunk by our unsuspecting inhabitants." It was further reported that "while those who used water from that source [the town reservoir, whose water came from the polluted river] have perished by dozens, those who used spring water have not been affected."31

Convinced of the validity of the miasma theory, the doctors from the College of Physicians rejected the idea that the epidemic was spread through the town's water supply. Dr. Jewell challenged the idea that only those who drank from the reservoir became ill. He was emphatic that the

“exciting cause of this epidemic is in the atmosphere, and not the water, as the victims have been indiscriminately from among those who used the water from the reservoir, and those who drink nothing but spring water.”32

Hartshorne gave a somewhat different description of the condition in which he found the river and the town reservoir, but he still emphasized that the epidemic was due to airborne miasma:

an exceeding drought had reduced the channel of the river to an unusually low ebb, and that, in its bed, a short space above the town, a number of carcases [sic] of sheep and other animals, thrown from the railroad trains, etc., were putrefying rankly in the sun. A reservoir which supplied many of the people with drinking water was filled from the river not far from that spot, and the wind blew from it directly over the town. If we are correctly informed, the first subsidence of the disease attended a change of the wind.

In his 1855 essay on cholera, Hartshorne described and rejected Snow’s theory, put forward in an 1853 article, that cholera was transmitted from victim to victim through the water supply, writing, “water cannot be shewn to consist in its serving as a vehicle for a poison, a contagion, generating specially in the bodies of those who have suffered from the disease. We have seen that this cannot be, since there is no such contagion generally speaking, if it even can exist.”While denying that the vomit and diarrhea of victims propagated cholera, he argued that if left at a specific temperature for several days, these discharges would give off miasma. He believed they “undergo a process of fermentation; they are then capable of exciting cholera in healthy individuals.”33

Not surprisingly, the Philadelphia physicians, with their strong commitment to sanitarianism, “on their arrival . . . had met the resident physicians, and . . . sanitary measures were agreed upon and published. Means

were also adopted for obtaining supplies for the place." This latter action addressed a major problem because, convinced that cholera was conta gious, the "country people round the devastated town refuse[d] to hold any intercourse with the citizens, and much suffering from the want of wholesome food ha[d] been the result." According to Jackson, a "notable improvement in the health of the town" followed the supplying of the population with food.34

The doctors' recommendations were standard treatment for the time. They prescribed that victims be given large doses of opium combined with an astringent, with opium enemata to be administered in severe cases. Beef teas and broths rehydrated the victims, while preparations of mercury and bleeding were used as a last resort. The fellows from the College of Physicians found little that was unique in the Columbia epidemic, concluding that "the prevailing affection presented no peculiar features." Having no further interest in the epidemic, several of the physicians, including Jewell, returned to Philadelphia on Wednesday, September 13.35

However, believing that the intensity of the Columbia epidemic provided optimum conditions for studying cholera's causes,T. Heber Jackson remained in Columbia. He envisioned Columbia as a laboratory and a relatively contained environment that would enable him to study the "conditions under which cholera prevails." He hoped "to discover its cause, and the laws by which it is governed" and noted that "it is no easy matter to follow distinctly the progress of an epidemic when it prevails extensively in a large and populous city; but in a small town, its origin and progress can be more readily traced."36 Historian Charles Rosenberg has observed that during the 1849–54 epidemics, as in 1832, the general public viewed cholera as "a disease of poverty and sin":

By 1849 the connection between cholera and vice had become almost a

verbal reflex. The relationship between vice and poverty was a mental reflex even more firmly established. . . . Cholera was an exercise of God's will. The religious of every sect, in 1849, as in 1832, accepted cholera as a chastisement appropriate to a nation sunk in materialism and sin.37

Ebenezer Erskine, Columbia's Presbyterian minister, was most fervent in his advocacy that cholera was sent by God to punish sinners. Erskine was not an unknown, uneducated preacher. He had earned his bachelor's degree from Jefferson (now Washington and Jefferson) College in Pennsylvania and graduated from the Presbyterian Seminary at Princeton.38 In his October 1854 sermons, Erskine compared the Columbia cholera epidemic to the plague. He cited 2 Samuel 24:15, in which "the Lord sent a pestilence upon Israel" to "punish the people for their transgressions." Erskine had no doubt that one must "acknowledge such a pestilence to be a message from God . . . to chastise communities for their impiety and wickedness." He saw drunkenness, gambling, licentiousness, an absence of brotherly love and charity among the business classes, impiety and irreligion, a spirit of lawlessness among the young, profanation of the Sabbath and of God's name, and a "cold formal, worldly spirit . . . among the professed people of God" as having influenced God to inflict the people with cholera.39

Erskine, like both the public and the medical establishment of the time, believed that cholera most readily struck the poor and certain ethnic groups. He singled out the poor and immigrants for special condemnation, focusing especially on Irish Roman Catholics whom, he claimed, lived in the thrall of "a besotted and rapacious priesthood who teach their unhappy and deluded followers" false doctrines. Erskine belittled the physicians' attempts to discover the cause of cholera, saying that "the most eminent in medical science were compelled to acknowledge that the law of its progress was veiled in mystery." Employing an odd use of the new

science of statistics for one who was dismissive of scientific enquiry, Erskine pointed out that only six pious individuals had died during the epidemic, in contrast to the hundred sinners who professed no religion. He observed that what was a severe judgment upon the ungodly "might be only a fatherly chastisement to the people of God."40

The popular press mirrored Erskine's judgments. The editor of the Wrightsville newspaper also saw God's hand in the epidemic, commenting that "truly the lord has visited in sore judgment; may we learn right eousness, and humble ourselves under his mighty hand." The Lancaster Inland Weekly echoed this assessment, noting that "it is a visitation from Deity . . . to teach us all, as we jog along, a valuable lesson."41

In contrast, Jackson drew upon his observations in Columbia to challenge this widely accepted belief that poverty, ethnicity, and filth bred cholera. He reported his findings on the disease the next year in the American Journal of Medical Science. Neither Jackson nor the other Philadelphia physicians gave credence to the popular theory that cholera was a punishment from God. However, "the closely related doctrine of predisposing causes, which claimed that physical and psychological conditions made certain individuals susceptible to the disease, was unquestioned by the medical profession."42 The fellows of the College of Physicians of Philadelphia and the vast majority of their medical colleagues believed that cholera was predominantly a disease of the poor and the profligate, a consequence of ethnic background, immorality, poor health, or living in a filthy environment. Filth, endemic in nineteenthcentury cities, was seen as providing the catalyst for the growth of the cholera poison—perhaps by zymotic action. The wind was thought to carry the resulting miasma to the victims. Because the disease was believed to be airborne, many thought it began in the lungs. The fact that it would strike some while passing over others was explained by the theory

that certain people had a constitutional predisposition to catching the disease.

Neither the College of Physicians' assumptions that the poor, intemperate, and certain ethnic groups were predisposed to catching cholera, nor popular leaders' beliefs that it was God's revenge, were ultimately born out by the events in Columbia. The Harrisburg Morning Herald announced with alarm that "some of the most prominent citizens, including two physicians, are reported being among the victims. The epidemic is confined to no locality or class of citizen but prevails in all parts of the town, and strikes down the high and low, the rich and poor, the healthy and feeble." The Lancaster Examiner and Herald was even more explicit in its astonishment, commenting that cholera had attacked "not only the vicious and imprudent but those who have been remarkable for the consistency and regularity of their lives."43 There was general agreement that Columbia's ethnic minorities were the ones who suffered most from the epidemic. However, while the press believed that the large poor black population was most affected by the disease, Jackson found that it was the poor German laborers who fell ill most frequently.44 The fact that the Columbia epidemic spared neither the prosperous nor the virtuous, but struck rich and poor, virtuous and profligate, and various ethnic groups alike, led Jackson to question to validity of the theory of predisposing causes.

Jackson believed that poor people's inability to escape the town made it appear that "the working class was much more obnoxious to the disease than they really were." Jackson reported that during the first night the epidemic broke out "all portions of the town, all classes of people were compelled impartially to contribute victims to the merciless pestilence." A panic "seized upon the citizens, and many of those whose means enabled them to leave, fled from the devoted town." By Monday, he noted, "more

than half the population . . . had left, and numerous persons left daily, until the week was far advanced. . . . [H]ad all the citizens remained, no distinction of class would have availed as a protection, but all would have suffered alike, in proportion to their numbers." Like Snow, Jackson rejected the idea that degeneration and lack of cleanliness among the poor made them uniquely susceptible to cholera.45

Jackson and Snow used maps to demonstrate the validity of their theories. Jackson referred his readers to "the accompanying plan of the town," on which he had marked the sites of the early victims' dwellings. He argued that it "will clearly appear" that the epidemic struck the homes of the prosperous and poor alike.46 Similarly, Snow used a map of the Broad Street neighborhood to demonstrate that it was those who depended upon the deadly pump for their water who caught cholera, regardless of class or other factors. Snow also used maps to illustrate the connection between sources of household water supply and the percentage of cholera deaths in the areas supplied by two London water companies.47

Jackson expanded his enquiry into the cause of the disease and evaluated Jewell and La Roche's miasma theory against his own data. He found that his Philadelphia colleagues had failed to explain the phenomenon he had observed. Jackson argued that:

Before it is determined that emanations from the river, wafted into the town by this southeast wind, were productive of the cholera it will be worth while to remember that during a long series of years Columbia had been exposed to precisely the same influences, the same combination of circumstances and yet remained happily free from cholera. It is not denied that the condition of the river air . . . might have afforded a suitable nidus for the disease. . . . [I]f the river and its shores are to be accused of having generated the cholera poison, why and how did the people of Wrightsville, on the opposite bank from Columbia, escape? especially when, as on

Sunday, the strong northerly wind was blowing. And yet escape they did, without a single case.48

Jackson was of two minds about the possibility that cholera in Columbia was propagated by contagion. He questioned the popular belief that the epidemic had been spread by the two German immigrants just because they, and those who had communicated directly with them, were the first victims. He pointed out that between midnight of the evening the immigrants died and dawn, there were thirty reported cases of cholera. Subscribing to the contemporary belief that contagion depended on person-to-person contact, Jackson observed that "contagious diseases do not seize upon great numbers at once, but progress from case to case." Therefore, it did not appear that the disease was simply contagious. On the other hand, an individual who visited Columbia during the epidemic fell sick and died of the disease only when he reached home, seventeen miles away. The friend who attended him and the individual who buried him also contracted cholera and died. Jackson believed that the only way these two people could have contracted cholera was from the man who had visited Columbia. Thus, it was very probable that cholera was, in this case, contagious. Faced with contradictory evidence, Jackson refused to ascribe the epidemic to any single cause and ultimately left the question of contagion open.49While Jackson raised serious doubts about the validity of the miasma theory and its corollary doctrine of predisposing causes, he did not believe that he had the evidence necessary to advocate a contagionist theory of cholera's etiology.

Unlike T. Heber Jackson, John Atlee was a well-known and prominent physician. He received his MD from the University of Pennsylvania in 1820 and from 1850 to 1852 studied medicine in Paris and Berlin, where, in all likelihood, he developed his skills as a microscopist.50 Atlee's entire medical career was spent in Lancaster, where he earned the accolades of

his colleagues for his skills as a surgeon. He was an associate member of the College of Physicians of Philadelphia and a founder of the Lancaster County Medical Society (1844) and the Pennsylvania Medical Society (1848), serving a term as president of each of those organizations. Atlee also was a founding member of the American Medical Association (1847), where he held both the office of vice president (1865) and president (1882). His assessments of the cholera outbreak in Lancaster, while differing from Jackson's evaluation of the Columbia epidemic, were equally critical of the miasma theory to which the fellows of the College of Physicians subscribed.

The city of Lancaster, where Atlee had his practice, was a little over ten miles east of Columbia and was also visited by cholera late in the summer of 1854. The city of Lancaster was the county seat, and with an estimated population of fourteen thousand, it was almost three times the size of Columbia. The city was undergoing a period of rapid growth, which was reflected in the major civic, commercial, and academic construction projects; a new courthouse, market house, jail, opera house, and city reservoir were built in the early 1850s. In addition, the newly merged Franklin and Marshall College was constructing a campus on College Hill. Situated in or near the city were a thriving rifle works, textile mills, and the Lancaster Locomotive Engine and Machine Manufacturing Company as well as other foundries and over one hundred licensed retail establishments.51

Lancaster was set in what contemporaries considered to be a healthy location on high ground a mile north of the Conestoga River, a tributary of the Susquehanna, where it was presumably relatively free from the river's miasmic mists. Despite its location, though, Lancaster, like all other cities of the era, was extremely unhygienic. The editor of the Lancaster Inland Daily subscribed to the filth theory of disease and chastised

the city's fathers for not ordering the city's cleaning:

The streets are, some of them, very filthy. Stagnant waters, impure matter and filthy gutters are to be found in many of our streets. This is wrong. The streets should be kept clean and in good order, and if the private premises of our citizens be also kept clean and pure, and people are prudent, there need be little fear of the cholera.52

In the summer of 1854, Atlee was in charge of both the Lancaster County hospital and the almshouse. His actions, intended to minimize the potential for a cholera outbreak in those facilities, suggest that he gave some credence to the filth theory of disease. Having heard of the prevalence of cholera in Philadelphia, Atlee ordered that both institutions be thoroughly cleaned and whitewashed, that the sewers be cleansed, and that decomposed animal and vegetable materials be removed. The outhouses were purified with lime to remove the noxious odors that were believed to carry the disease.53

On August 2, Patrick Tute, the first cholera victim in Lancaster, arrived at the railroad station from Philadelphia, collapsed, and was placed in the county hospital without the medical authorities' knowledge. On August 4, John Carr, the second Lancaster cholera victim, was brought to the hospital from Columbia after suffering from diarrhea. In his Report to the Sanitary Committee of Lancaster County, Atlee implied that Tute and Carr introduced the disease to the hospital. Although there were three hundred inmates in the hospital and the adjacent almshouse when cholera broke out in August 1854, Atlee believed his actions had kept the disease in check. Only twenty-six people died of cholera, most of whom, according to Atlee, were aged and insane. Altee's observation suggests that he still gave some credence to the theory of predisposing causes. He also had not yet completely rejected the theory that miasma could spread the epidemic. Atlee noted that "it was remarked that

during the prevalence of warm southerly winds blowing directly from the river, there were more cases of the disease." But Atlee then proceeded to speculate on the etiology of the disease and identified "a few cases that which in my opinion bear very decidedly upon this point."54 These cases demonstrated that he subscribed to the theory that cholera could be spread by contagion.

In early August, a Lancaster city resident and her sister went to Cleveland to help a daughter who had caught cholera. The daughter died immediately after their arrival. She had been nursing a doctor who had contracted cholera while helping victims of the disease and who boarded in her house with his family. The doctor, his wife, and their child all died of cholera, as did the daughter's younger sister and hired girl. After settling the daughter's affairs, the women returned to Lancaster with the victim's five-month-old child and a bundle of the deceased woman's clothes. Shortly after her arrival in Lancaster, the child died of a cholera-like disease. Within two weeks, four more members of the family died. All had had contact with the child. Further supporting his suspicions about the contagious nature of cholera was the fact that one of the dead family members had worn a dress that had belonged to her diseased sister. Another of the victims had contracted the disease after washing the clothing that was brought from Cleveland. Atlee was convinced that the disease was brought to Lancaster on the victim's clothing and was spread by contagion to the other family members. According to Atlee, "No case of cholera existed in or near the city at this time, except at the hospital; nor were there, at any time any cases in . . . the northwest portion of it." He did not believe that the cholera could have come from any other source, as the house in which the family lived was in "a high and healthy quarter of this city, but thinly built up, and having in its immediate vicinity no stagnant water, nor source of miasma."55

While discounting the idea that cholera was self-generating in filth, Atlee did acknowledge the possibility that heat, moisture, putrefying animal and vegetable matter, and improper cleanliness and diet could encourage the spread of the disease.56 However, though he felt that filth probably propagated cholera, Atlee thought that the disease itself was imported and did not develop spontaneously in the locality. His study of the cholera epidemics in Columbia and at the Lancaster County hospital and almshouse led him to reassess his belief in the miasma theory and caused him to hypothesize that the disease was spread through contagion by immigrants passing through Lancaster on their way west. He posited that these same immigrants carried cholera with them to Columbia, infecting the inhabitants of the house that was burned down some weeks before the epidemic struck. From this evidence Dr. Atlee concluded:

From a careful and unprejudiced survey of the above facts and circumstances, it appears to me that but one conclusion can be arrived at—one until now, opposed to my own opinion as to the etiology of cholera, viz: That a specific poison emanating from the bodies of the sick, was eliminated, which produced a similar disease in those who were exposed to it. Call it contagion, infection, or by any other name we please, it has the same characteristic properties as the poison of smallpox, of measles, and of scarlatina—that of reproducing in those susceptible of its influence the same specific disease.57

Atlee cited eminent British physicians who had great experience in the treatment of the disease to justify further his conviction that cholera was spread by contagion. He commented critically that “we have been deceived upon this subject since its first appearance in India in 1817.” One of these physicians,Dr. Copland of Edinburgh, had pointed out that medical officers in India had sent “a mass of testimony which to his mind was conclusive upon the contagiousness of cholera; yet those whose duty

it was to make up the general reports for publication, whether from preconceived opinion, or from a different view of the testimony, strongly opposed this idea, and attributed the diseases exclusively to atmospheric influences."58

Atlee's medical studies in France in the early 1850s, where the theory of epidemic contagionism was regaining support in medical circles, undoubtedly helped to persuade him of the contagious nature of cholera.59 Like Jackson, Atlee's primary concern was to develop a rational, scientific explanation for the means by which cholera was spread through populations. They both advocated putting aside traditional medical theories in favor of what would come to be regarded as an epidemiological approach to the disease. As Atlee explained:

Let us endeavor, casting aside all preconceived opinion, to arrive at the truth. The sooner it is known, the sooner shall we be enabled to contend against this fell destroyer. It is only by the careful collection of facts in the history of any epidemic, and the logical deduction from them, that correct principles can be formed, and successful practice established.60

Unlike the doctors from the College of Physicians, whose preconceived ideas about the causes of the disease and generalized beliefs about filth resulted in hasty judgments about the source of the Columbia epidemic, Atlee investigated the spread of the disease scientifically. He described his research as an attempt to discover the etiology of the disease and suggested that it was zymotic in nature. Atlee drew upon the new medical methods to which he must have been exposed, either in Europe, or perhaps from Professor Samuel Jackson, MD (no relation to Dr. T. Heber Jackson), who was professor of the institutes of medicine at the University of Pennsylvania. Professor Jackson had been sent to Montreal in the spring of 1832 and was put in charge of cholera hospitals in Philadelphia during the 1832 epidemic. At an emergency meeting of the

college to address the cholera crisis of 1849, Professor Jackson had called for the lesions of the intestinal mucous membrane to be examined microscopically, "systematically and thoroughly, without prejudice and unbiassed by the authority of names or systems."61 Atlee also called for an unbiased scientific investigation of the cause of cholera, observing that "the means of investigation are rapidly multiplying. Chemical analysis and microscopic investigation are continually exposing the errors of earlier observers, and unfolding new views of the phenomena of healthy and diseased action."62

While Jackson and Snow were using statistics and maps to present their data, another methodology, microscopy, developed in Paris and Berlin, was being used by Dr. Atlee in Lancaster to challenge the validity of the miasma theory. Unlike most of his colleagues, Atlee either owned or had access to a powerful microscope. By examining discharges from the bowels and stomachs of different cholera victims, he discovered extremely minute foreign bodies, which he suspected might be causing the disease. Atlee did not speculate on whether these microscopic objects were living organisms or merely chemical compounds. He sent a drawing of the particles to Professor Jackson at the University of Pennsylvania.63

Atlee was not the first physician to observe microscopic particles that he presumed were associated with cholera. Dr. William Budd described the microscopic particles he discovered in the excreta of cholera victims in 1849. Filippo Pacini published a report in Florence in 1854 in which he described the cholera bacterium he found in the excreta and intestinal contents with such accuracy that it still bears the name he gave to it. Snow had read about Pacini's discovery in December 1854 and, according to historian Richard J. Evans, "at least four other scientists working along similar lines in the 1850s also have a claim to be regarded as the discoverers of the bacillus, though in every case their claim is a good deal less

strong."64

Dr. Atlee appears not to have continued his microscopic research, perhaps because like so many American doctors, the daily challenges and demands of his medical practice consumed his time.65 Atlee and the other researchers lacked the scientific methodology for furthering their investigations. Neither Louis Pasteur's seminal discovery that a disease organism can be cultured outside the body nor Robert Koch's perfection of the pure-culture techniques for doing so had been developed. It would be two decades before Koch created the analytical techniques needed to isolate, examine, and propagate the cholera bacillus. He applied these medical research methods to identify the cause of cholera definitively in 1883.

There is no written record of direct attacks from the medical establishment upon Atlee and Jackson after the publication of their articles challenging the orthodox view of cholera's etiology. However, from the comments of Hartshorne, Jewell, and others, there is little doubt that many of the fellows of the College of Physicians strongly disagreed with Atlee's and Jackson's conclusions. Atlee specifically referred to being challenged by Philadelphia doctors because of an article he wrote proving that cholera was contagious. In his "Reminiscences," he recounted, "when in a medical convention in Baltimore some of the Philadelphia physicians took exception to an article that I had published to this effect in a med ical review, I easily controverted them with an account of our experience in 1832, and demonstrated that with a proper quarantine in Philadelphia, Lancaster would have been protected from the spread of the disease hither."66

In 1854, the editor of the York, Pennsylvania, People's Advocate put little faith in the powers of medical science to discover the cause of cholera, "for the cure of the disease physicians have much or—if we should judge from their want of success at Columbia—everything to learn." Considering how many years had passed since cholera first

appeared in America, “we almost despair of its ever being brought . . . within the power of medicine.”67 Despite this pessimistic assessment, the dispute over the etiology of cholera raised by Jackson and Atlee and the question of contagion, quarantine, and public health that was so forcefully argued by the doctors from the College of Physicians of Philadelphia would be settled within the next two decades. The miasma theory would fall into disrepute after the Civil War, invalidated by a new contagion theory based on John Snow’s research and the growing acceptance of the germ theory.What, to the editor of the York newspaper, appeared to be the hopeless impotence of the medical profession should be seen instead as an example of how scientific disputation and the application of the latest medical theory and methodology permitted researchers to find the cause of, and a possible prevention for, cholera.

As Ackerknecht has pointed out, in an era that saw the triumph of anticontagion, the efforts of a handful of physicians to challenge the miasma theory of etiology and their attempts to use scientific enquiry to develop a valid contagion theory helped pave the way for the acceptance of the work of Snow and others.68 Within a decade of the Broad Street epidemic, Snow’s views would become accepted orthodoxy. Although the work of Drs.T. Heber Jackson and John Atlee are little known, their challenges to the miasma theory of cholera demonstrated a growing skepticism of that paradigm, which led to its eventual rejection by the medical community.

Millersville University

JOHN B. OSBORNE

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