

# ABRAHAM LINCOLN'S BLUE PILLS

*did our 16th president suffer from mercury poisoning?*

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**ABSTRACT** It is well known that Abraham Lincoln took a medicine called “blue mass” or “blue pill,” commonly prescribed in the 19th century. What is now hardly known is that the main ingredient of blue mass was finely dispersed elemental mercury. As his friends understood, mercury was often prescribed for melancholy or “hypochondriasis,” a condition Lincoln famously endured. Mercury in the form of the blue pill is a potential neurotoxin, which we have demonstrated by recreating and testing the recipe. We present the testimony of many of Lincoln’s contemporaries to suggest that Lincoln suffered the neurobehavioural consequences of mercury intoxication but, perhaps crucial to history, *before* the main years of his presidency; he was astute enough to recognize the effects and stop the medication soon after his inauguration.

## ABRAHAM LINCOLN’S CLINICAL HISTORY BEFORE 1861

Consider a man in his fifties who has habitually ingested medicinal mercury; whose family and friends say that he demonstrates bizarre behavior and outbursts

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of rage, insomnia and forgetfulness, whose hands are seen to tremble under stress, and who, after ceasing to take mercury because it made him “cross,” behaves like a saint under the greatest personal and professional duress. A clinician would most certainly suspect mercury poisoning. Such a man was Abraham Lincoln.

Lincoln’s personality, at least from the late 1830s, was one of rapidly shifting moods (Wilson 1997). Orville H. Browning, a close friend from the Springfield years and an astute observer, put it most succinctly: “He was sometimes jolly and genial, and again at other times absorbed and abstracted.” These alternations, said Browning, were only part of Lincoln’s “constitutional melancholy,” but he emphasized that “both moods quickly passed away” (Burlingame 1996, p. 2). By the 1850s, however, both the character and intensity of reported behaviors seemed to change. Lincoln’s usual ebullience now alternated with an unshakable withdrawal from his surroundings and company, a behavior his contemporaries called “gloom,” and observers described sudden outbursts of irrational or intemperate behavior.

A young lawyer, Jonathan Birch, first met Lincoln in Bloomington in the late 1850s. His memoir describes Lincoln with near-photographic precision: “His eyes would sparkle with fun, and when he had reached the point in his narrative which invariably evoked the laughter of the crowd, nobody’s enjoyment was greater than his.” The account then reveals the sudden turning of mood of which Lincoln was so often capable. “An hour later,” Birch recorded:

he might be seen in the same place or in some law office near by, but alas, how different! His chair, no longer in the center of the room, would be leaning back against the wall; his feet drawn up and resting on the front rounds so that his knees and chin were about on a level; his hat tipped slightly forward, as if to shield his face; his eyes no longer sparkling with fun and merriment, but sad and downcast, and his hands clasped around his knees. There, drawn up within himself as it were, he would sit, the very picture of dejection and gloom.

“Thus absorbed,” commented Birch, “have I seen him sit for hours at a time, defying the interruption of even his closest friends. No one ever thought of breaking the spell by speech; for, by his moody silence and abstraction, he had thrown about him a barrier so dense and impenetrable that no one dared to break through” (Weik 1911).

Lincoln’s sister-in-law Mrs. Frances Wallace, interviewed by Lincoln’s law partner and biographer William H. Herndon, commented (in Herndon’s paraphrase) both on the fixity and abruptness of mood change: “He was a sad man—an abstracted man . . . Lincoln would lean back—his head against the top of a rocking Chair—sit abstracted that way for moments—20–30 minutes—and all at once burst out in a joke—though his thoughts were not on a joke” (Wilson and Davis 1998, p. 486) Lincoln’s colleague on the law circuit, Henry Clay Whitney, once watched Lincoln “sitting alone in the corner of the bar, most remote from any one, wrapped in abstraction and gloom” (Whitney 1892, pp. 146–47).

According to Whitney, Lincoln's face grew ever sadder, even grief-stricken, and gave the appearance of despairing melancholy. Lincoln remained in what Whitney called "his cave of gloom" until he suddenly seemed to be "awakened from sleep." Whitney also clearly distinguished these dramatic changes in behavior from any ordinary turn of mien: "In his melancholy moods, the exuberant fountains of his pleasantry and mimicry were completely sealed and frozen up, but when the black fit passed by, he could range from grave to gay, from lively to severe, with the greatest facility" (p. 135).

Witnesses testified to bizarre behavior and outbursts of rage. Whitney, who first met Lincoln in 1854, sometimes shared a room with him as they toured from one county courthouse to another. He described the following incident: "One morning, I was awakened early—before daylight—by my companion sitting up in bed, his figure dimly visible by the ghostly firelight, and talking the wildest and most incoherent nonsense all to himself." Whitney said this was no unique event: "A stranger to Lincoln would have supposed he had suddenly gone insane. Of course I knew Lincoln and his idiosyncrasies, and felt no alarm, so I listened and laughed." Whitney said he left the babbling Lincoln alone, for such behavior was not unusual, although Whitney conceded that "this time to which I refer was a radical manifestation of it" (Whitney 1892, p. 68). We may date this episode approximately, as Whitney said it took place in Danville, with Judge David Davis also along. Davis and Lincoln are known to have been in Danville together on 8 May 1857 and 9 May 1859 (Baringer 1960, 2:194, 250). Herndon recalled similar behavior by Lincoln. "In one of his abstract moods he would to the observer's surprise without warning burst out in a loud laugh or quickly spring up and run downstairs as if his house were on fire, saying nothing" (Hertz 1938, p. 263). Lincoln biographer Albert J. Beveridge interpreted Herndon's testimony to indicate that "time and again Herndon had experiences of the same nature" (Beveridge 1928, 1:522).

Biographer Michael Burlingame has fully documented a number of times Lincoln became memorably enraged in the years before 1861 (Burlingame 1994, ch. 7). Whitney was particularly struck by how readily Lincoln could become so angered that his face turned "lurid with majestic and terrifying wrath" (Burlingame 1994, p. 148). In a graphic description, Herndon himself observed Lincoln in 1859 becoming "so angry that he looked like Lucifer in an uncontrollable rage" (Burlingame 1994, p. 155). A singular episode was recounted by Ward H. Lamon (Lincoln's political operative, body guard and law circuit partner) in a posthumous memoir compiled by his daughter from his notes. In an 1858 debate with Stephen Douglas, Lincoln denied an accusation made earlier by Douglas that he, as congressman, had voted against support for American troops in the Mexican War. As Lincoln responded to the charge, Lamon recalled, "He gradually became more and more excited; his voice thrilled and his whole frame shook." Lincoln then reached over to Orlando B. Ficklin, who had served with Lincoln in Congress,

took Ficklin by the coat-collar, back of his neck, and in no gentle manner lifted him from his seat as if he had been a kitten, and said, "Fellow-citizens, here is Ficklin, who was at that time in Congress with me, and he knows it is a lie." He shook Ficklin until his teeth chattered. Fearing that he would shake Ficklin's head off, I grasped Mr. Lincoln's hand and broke his grip. (Lamon 1895, pp. 23–24)<sup>1</sup>

Insomnia, memory loss and subtle neurological signs are also common to mercury poisoning. Insomnia was observed by at least one observer in the 1850s, a young lawyer Lawrence Weldon, who wrote that the future president "would frequently lapse into reverie and remain lost in thought long after the rest of us had retired for the night, and more than once I remember waking up early in the morning to find him sitting before the fire, his mind apparently concentrated on some subject, and with the saddest expression I have ever seen in a human being's eyes" (Beveridge 1928, 1:523). Whitney was particularly struck by an episode of forgetfulness to recount it nearly 50 years later:

When he was running for the Presidency in 1860, I attended the great mass-meeting at Springfield, and going directly to his house, found him in the front yard watching the procession, which was then already passing, shook hands with him, and spoke briefly. An hour later I returned and introduced a friend. After speaking to the newcomer, he seized me by the hand, and gazing at me peculiarly, said, "Whitney, I've not hold of your hand before." I corrected him, and he gazed at me with a dazed look, and said hesitatingly: "No! I've not seen you before to-day." (Whitney 1908)

(Lincoln in the front yard would have been standing behind his fence, as a contemporary photo shows, and therefore unlikely to have had a distracting crowd about him.)

Chronic mercury poisoning may also cause various kinds of nerve damage, both those visible to the clinician and those only detected by nerve and muscle function tests (Levine et al. 1982; Miller et al. 1975). A neurologist would first examine the way a person walks. Normally, one uses "position sense" to place one's feet in walking, heel-toe, heel-toe; a person with nerve damage from diabetes, alcoholism, or heavy metal poisoning can't quite tell where the feet are and walks with an exaggerated gait. Herndon has left some observations of Lincoln's gait tantalizing in their specificity: "When [Lincoln] moved and walked along . . . he put his whole foot down flat at once, not rising from the toe, and hence he had no spring to his walk. . . . He never wore his shoe out at the heel and the toe more, as most men do, than at the middle of the sole" (Hertz 1938, pp. 413, 470).

<sup>1</sup>Lamon located the episode during the third debate, at Jonesboro, but transcripts indicate the event occurred at the fourth debate three days later in Charleston. See <[http://www.debateinfo.com/hall\\_of\\_fame/lincoln-douglas](http://www.debateinfo.com/hall_of_fame/lincoln-douglas)>. Ficklin served in Congress from that District.

Another a classic manifestation of mercury poisoning, tremor, was surely absent in 1865 when Lincoln chopped wood in a display for wounded veterans and then held the axe out at arm's length by the tip of the handle (Lattimer 1981). But more subtle neurological changes, such as diminished motor speed and lessened dexterity, can be found immediately after mercury poisoning and may last years after the exposure (Albers et al. 1988). Such deficiencies could affect the control of a steady flow from an ink-dipped steel nib, especially when the writer is under stress. (Gerstner and Huff 1977, p. 506). Herndon noticed something about an 10 October 1860 note to him from Lincoln, written during the heat of the election campaign: "The handwriting was a little tremulous, showing that L was excited—nervous." Only Herndon's transcription of the note exists, along with his comment (Library of Congress). The campaign for president had been a time of great stress for Lincoln; a contemporary account reported that, "He was care worn & more haggard & stooped than I ever saw him" (Wallace 1944, p. 36). In another instance, on 16 February 1863, a keen observer witnessed Lincoln's hand trembling while writing a letter. Benjamin Brown French, Commissioner of Public Buildings, wrote in his diary: "[The President] certainly is growing feeble. He wrote a note while I was present, and his hand trembled as I never saw it before, and he looked worn and haggard" (Cole and McDonough 1989, pp. 416–17). (The letter in question, from Lincoln to Attorney General Edward Bates, is located in the National Archives, College Park, MD, RG204 Record 460. Our own analysis of the handwriting suggests shakiness but no evidence of an intention tremor.) Lincoln himself might have been aware of a tendency to tremor, for as he was about to sign the Emancipation Proclamation he worried that, with his arm "stiff and numb" from shaking hands at the New Year's Day reception, "this signature is one that will be closely examined, and if they find my hand trembled, they will say he had some compunctions." The observers were relieved to see his hand firm (Seward 1916, p. 227).

#### **THE BLUE PILL: PRESCRIPTION FOR "HYPOCHONDRIASIS"**

Mercury was known to be poisonous as early as 2,000 years ago, but its main use as therapy began in the 16th century for treatment of syphilis (Goldwater 1972). By the 18th to mid-19th centuries, the popularity of mercury as a treatment for nearly every ill rose as medical practice degenerated. Thus one Dr. Thomas Dover (1660–1743), of Dover's Powders fame, prescribed blue mass for everything from "apoplexy to worms," for begetting children to curing tuberculosis (Goldwater 1972, pp. 240–41). Calomel as a cathartic was also used to treat and prevent cholera, combined with bloodletting thought to "render the system more susceptible to the action of the grand remedy, Mercury" (Rosenberg 1962, p. 66). One disease in particular became a target for mercury-dispensing practitioners: the mental distress syndrome known as hypochondriasis.

*Hypochondriasis* labeled a great sweep of mental and intestinal distress. “Beside Feare and Sorrow, *sharpe belchings, fulsome crudities, heat in the bowels, winde and rumbling in the guts, vehement gripings . . . colde joynts, indigestion,*” is how Oxford scholar Robert Burton (1577–1640) described the condition in his compendium on mental illness, *The Anatomy of Melancholy*. Burton cited the prevailing wisdom that an obstructed liver was one of the principal origins of hypochondriasis, “the shop of humours, & especially causeth Melancholy.” Burton explained that when ill spirits and humors troubled the soul, or “precedent diseases . . . distempered” a body, it became “clogged with an abundance of gross humours,” which then had to be purged by laxatives and emetics. Otherwise, “the Braine is still distempered . . . by vapors which arise from the other parts, and fume up into the head, altering the animal faculties” (Burton 1989).

Whether it originated in the liver or in the brain, hypochondriasis was unquestionably seen as an ailment with true physical manifestations. A famed American physician, Benjamin Rush, wrote in his widely used textbook, *Medical Inquiries and Observations upon the Diseases of the Mind*: “It is true, [hypochondriasis] is seated in the mind; but it is as much the effect of corporeal causes as a pleurisy or a bilious fever.” Rush recommended mercury as a stimulant to purge “morbid excitement” from the brain, as well as to remove “visceral obstructions” (Rush 1835, pp. 74–80, 105).

Another popular textbook of medicine was William Buchan’s *Domestic Medicine*, published in 22 editions between 1769 and 1828. From the third edition of 1774 on, Buchan described hypochondriasis as a disease attacking men of melancholy temperament and “brought on by long and serious attention to abstruse subjects, grief, the suppression of customary evacuations, excess of venery . . . [and] obstructions in some of the viscera, as the liver, spleen &c.” Buchan’s recommended cure was to promote secretions with purgatives, with mercury first mentioned in the 1779 sixth edition (Buchan 1779, p. 732).

The diagnosis of hypochondriasis became a fashionable catch-all in the 1800s for a variety of baffling illnesses, many blamed on the liver. In an era of less-than-ideal hygiene there was surely a lot of hepatitis, and Britons returning from Asia and the West Indies also brought back bizarre liver and intestinal diseases. “Hepatic disease, although belonging more properly to a warmer climate, forms a large proportion in the class even of English maladies,” stated one authority on hypochondriasis (Reid 1817, p. 112). The use of mercury to relieve hypochondriasis was based on the belief that mercury acted as an “alterative,” by “subvert[ing] diseased actions by substituting its own instead,” and as a stimulative with “increased activity imparted to all the secretory functions, particularly those of the salivary glands and the liver . . . a general excitement of the organic actions” (Wood and Bache 1843, p. 379; 1834, p. 350). Physicians could see patients salivating profusely, but how did they know it stimulated the liver? What they noticed was the usual brown color of stool turning green, and they assumed that bile flow was being stimulated and obstructions relieved. Such observations

convinced many medical authorities that mercury was a drug of choice, and they would not be dissuaded even when a contemporary, British physician George Scott, proved in 1859 that calomel did not increase biliary secretion in dogs (Warner 1986, pp. 224–26). What actually was happening was that the antibacterial effect of mercury was inhibiting normal intestinal bacteria from converting green bile pigments to brown bile pigments—nothing more (Goodman and Gilman 1955, pp. 1055–56). Nevertheless, when in 1863 U.S. Surgeon General William A. Hammond removed calomel from the Union Army's pharmacopeia, calls for his cashiering came from all corners of the medical establishment (Brieger 1967).

There were cautionary voices all along, and they proved correct. The eminent British physician and physiologist Thomas John Graham, writing in the 1820s, counseled that “the immoderate use of mercury” was itself a *cause* of hypochondriasis: “Calomel and emetics, when frequently repeated and long continued, cannot fail to aggravate and confirm the evil they were intended to cure” (Graham 1826). James Hamilton warned that mercurial medicines could themselves produce “shocking depression of spirits, and other nervous agitations” (Hamilton 1821, p. 14). The eminent Irish surgeon, Abraham Colles, described the consequence of prolonged use of mercury (as he deemed necessary for syphilis), a condition he called “mercurial erethismus,” which produced “a great depression of strength, a sense of anxiety about the precordia . . . frequent sighing” (Colles 1837, pp. 71–72).

#### LINCOLN TAKES THE BLUE PILL FOR MELANCHOLY/HYPOCHONDRIASIS

An essay on Lincoln by Gore Vidal (1993), in which he quoted Herndon—“Mr. Lincoln had an evacuation, a passage, about once a week, ate blue mass” (Hertz 1938, p. 199)—first alerted the authors of this article to the possibility of mercury poisoning. Vidal accepted at face value that blue mass was merely some medication for chronic constipation; other historians, including David Donald in his recent biography of Lincoln, have followed suit (Donald 1996, p. 164). Only recently has any historian identified elemental mercury as the active ingredient, and then only in a passing footnote (Wilson and Davis 1998, p. 466). In not realizing the identity of blue mass and the reason for its use, scholars have missed an opportunity to explore why Lincoln began taking mercury in the first place, and the potential connection between blue mass and Lincoln's behavior, given mercury's action as a neurotoxin. This historical oversight is all the more startling since Lincoln's contemporaries knew exactly why he took mercury as a medicine.

When Herndon said Lincoln “*ate* blue mass” (emphasis ours) he surely understood why. Lincoln suffered from melancholy (“black bile,” in humoral terms). As Herndon described it: “[T]he most significant and noteworthy thing about him was his look of abstraction and melancholy. It was as painful as it was

inescapable. I have often watched him in one of these moods . . . the most striking picture of dejection I had ever seen” (Weik 1922, p. 105). Lincoln’s melancholy “was a matter of frequent discussion among his friends” (Herndon and Weik 1890, p. 588n). John Todd Stuart, Mary Lincoln’s cousin and her husband’s one-time law partner and sometime political adversary, gave the melancholy a physiological origin in Herndon’s paraphrase of the interview held two months after the assassination: “Lincoln is a gloomy man—a sad man. Lincoln is—was a kind of vegetable—that the pores of his flesh acted as an appropriate organ for such Evacuations” (Wilson and Davis 1998, p. 63). Whitney likewise related his discussion about the cause of Lincoln’s melancholy: “Stuart told me his liver did not secrete bile—that he had no natural evacuation of bowels &c. That was also a cause” (Wilson and Davis 1998, p. 617). Ward Lamon, who knew Lincoln since 1852, acknowledged that “it would be very difficult to cite all the causes of Mr. Lincoln’s melancholy disposition,” but he emphasized that “blue pills were the medicinal remedy which he affected most” (Lamon 1872, p. 475). In his interview with Herndon, Lamon associated Lincoln’s hypochondriasis to the mercurial therapy: “[W]hen hed had no passages he alwys had a sick head ache—Took Blue pills—blue Mass” (p. 466). “Sick headache” was synonymous with “bilious headache,” that is, associated with the liver, and to be treated with the blue pill (Family Doctor 1889, p. 361).

Stuart took credit for recommending blue pills to Lincoln just before the 1861 inauguration, saying “he did take it before he went to Washington & for five months while he was President” (Wilson and Davis 1998, pp. 631–32). But since Lincoln was away from his law practice for much of the time between 1858 to 1860 as he campaigned for high office, it is certain that Herndon and Lamon had noticed Lincoln taking the pills well before 1861. Another interpretation of the conflicting testimony is that the turmoil of the 1860 campaign prompted Stuart’s advice, and that Lincoln *restarted* a familiar medicine. In any case, Lincoln himself may have recognized the ill effects of mercury, as he told Stuart they made him cross (Wilson and Davis 1998, pp. 631–32).

In explaining Lincoln’s moods and use of blue mass, his friends were adequately describing Burton’s hypochondriasis and its accepted treatment. Lincoln himself knew about hypochondriasis and feared it. As early as 1837, when a young woman whom he had been diffidently courting was about to leave town, he wrote that the prospect of losing her “gives me the hypo whenever I think of it” (Basler 1953, 1:79). But hypochondriasis actually did hit him, and hard, on New Year’s Day 1841—which he remembered as “that fatal first of Jany” (1:282)—when his engagement to Mary Todd was broken off. He was so distraught for several weeks thereafter that his friends feared he might even commit suicide. (Douglas L. Wilson [1997] presents evidence that the breakup and subsequent distress began a month earlier.) On 20 January 1841, Lincoln wrote urgently to John Stuart, now a U.S. Congressman: “I have, within the last few days, been making a most discreditable exhibition of myself in the way of

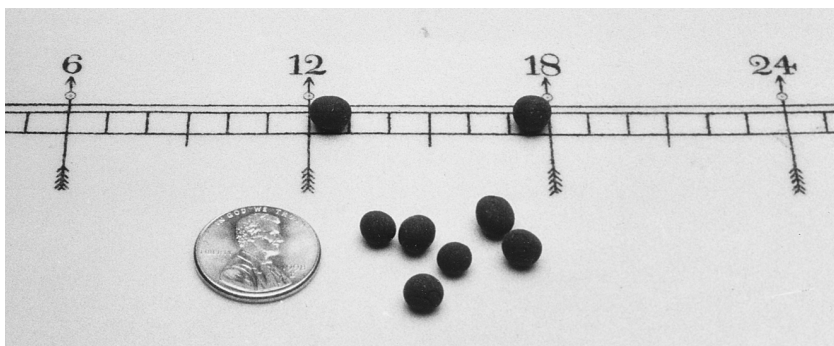


hypochondriasm [sic].” Fearing his physician and friend, Anson Henry, was preparing to leave Springfield for better prospects, Lincoln implored Stuart to use his influence to have Dr. Henry appointed the postmaster in Springfield. The doctor, Lincoln admitted, “is necessary to my existence” (Basler 1953, 1:228). Given Benjamin Rush’s influence over medical practice at the time, it seems reasonable to suppose that the physician would have used blue pills to treat his patient. Recovery, however, was only gradual: a full year later, 3 February 1842, Lincoln wrote to his friend Joshua Speed: “I have been quite clear of hypo since you left [3 January 1842]—even better than I was along in the fall” (1:268). (Lincoln had rested for a month on Speed’s mother’s farm in August and September 1841.)

Besides hypochondriasis, there was perhaps another worry bedeviling Lincoln. At about this time, according to Herndon’s recollection five decades later, Lincoln wrote to the famous physician Daniel Drake, then teaching at the Louisville Medical Institute, concerning the syphilis that, said Herndon, “hung to him and, not wishing to trust our physicians, he wrote a note to Doctor Drake.” The disease had supposedly been contracted in 1835 or 1836, Herndon reported, when Lincoln “went to Beardstown and during a devilish passion had connection with a girl and caught the disease” (Hertz 1938, p. 259). We cannot know if Lincoln actually contracted syphilis, although the disease was not uncommon. However, while it would be exceedingly rare for secondary syphilis to recur four to five years after the initial venereal chancre (Gjestland 1955), fear of venereal disease was typical of persons with hypochondriasis in those days, according to Dr. Rush (1835, p. 5). Daniel Drake was also widely consulted by those with hypochondriasis, and for this disorder he would offer the usual prescription of blue mass or calomel (Drake 1870).

### RECREATING THE BLUE PILL

Physicians of the past who used mercury as a laxative to treat “bilious” and melancholic” diseases believed that blue mass was milder than calomel because it caused less intestinal griping. (Wood and Bache 1858, p. 1184). What they didn’t know was that elemental mercury, especially in its vapor phase, binds more quickly to the nervous system than the salt form (Feldman 1999), and would thus be more rapidly neurotoxic. It is true that elemental mercury as the familiar silver puddle is poorly absorbed by the intestine; but physicians and pharmacologists of the past pounded blue mass to such fine division as to eliminate any vestige of the silver drops, a process they called “extinction” (Wood and Bache 1858, p. 1188), thus markedly increasing the surface area of the metal so that more metal vapor would gas off (Berlin 1979, p. 510). As the authors of *The National Dispensatory* wrote, “All agree that the efficacy of the [blue mass] preparation is proportionate . . . to the degree in which the metallic globules disappear”; they considered the treatment had been “efficacious” if a patient salivated



**FIGURE 1**

Blue mass pills each containing approximately 65 milligrams of elemental mercury per pill. The pills were made to an 1879 recipe (unchanged over several decades) by Professor Cheryl Zimmerman and graduate student Kamran Askari of the College of Pharmacy, University of Minnesota, Minneapolis. Pictured here is a close-up of a 19th-century pill tile (approximately 12 by 18 inches) on which the compound was prepared as a strip, then rolled into pills. The ruler at the top is in centimeters.

PHOTO CREDIT: RALPH E. FERNANDEZ.

and had sore gums, sure signs that mercury had been absorbed (Stille and Maisch 1879, pp. 1074–75).

The “blue pill” is actually a round, gray pellet the size of a peppercorn. We didn’t know this until we asked our colleagues at the University of Minnesota, Professor Cheryl Zimmerman and graduate student Kamran Askari, to reproduce it from an invariant 19th-century formula (Stille and Maisch 1879). It was simple enough to assemble most of the ingredients, which include mercury, liquorice root, rose-water, honey and sugar, and confection of dead rose petals. (In seeking the last item, they set the local florist to wondering if some strange cult happenings were at hand.) Our colleagues deferred to tradition and compounded the ingredients with an old-fashioned mortar and pestle, rolling the pills to their desired size on a 19th-century pill tile (Fig. 1); but to accord with 20th-century care and safety regulations, our colleagues insisted on surgical gowns, gloves, masks, and caps, and they worked under a negative pressure hood.

Their caution was well advised. To examine these pills as if they had been in the stomach, Dr. Wade A. Scheil of the 3M company, St. Paul, crushed two pills in sealed bottles with 250 cc of slightly acidic solution at body temperature. Mercury vapor in the air space of the bottles was detected semi-quantitatively by a Jerome 411 Gold Film Mercury Vapor Analyzer (Arizona Instrument Corporation), which is sensitive to as little as 3  $\mu\text{g}$  per cubic meter. The vapor from the pills registered off the top of the scale, at over 1.99 mg per cubic meter. The U.S. National Institute for Occupational Safety and Health (NIOSH) limits air exposure to 1/40 that level in any eight hours (Agocs 1992, p. 17). The same solutions were then passed through ultra-fine membrane filters with pores the size of molecules that can be absorbed directly through the intestine into the

bloodstream. Dr. Scheil found that 750  $\mu\text{g}$  of mercury per liter of solution had come through the filter. The U.S. Environmental Protection Agency advises that one liter of water should contain no more than two micrograms of mercury and indicates that only up to 21  $\mu\text{g}$  of any form of mercury per day may be ingested by an adult without harm to health (Agocs 1992, p. 18). The usual dose of blue mass was one pill two to three times a day, for a total of 130 to 185 mg of mercury—nearly 9,000 times the allowable amount if all were absorbed. Someone who “ate” these little pills would have seriously risked poisoning, absorbing both vapor and solid element.

### MERCURY AND ITS EFFECTS ON HUMANS

Despite the medicinal use of mercury for the past half millennium, it is only in the last few decades that the biology of mercury poisoning has become completely understood. Humans may be exposed to mercury in three chemical forms. *Elemental mercury*, whose vapor finds easy entry into the body through the lungs and skin, is the form mainly responsible for mercury poisoning in industrial accidents. *Inorganic mercury*, bound into salts with ions such as iodide, nitrate, or chloride; mercurous chloride, known as calomel or “sweet sublimate,” was once the most commonly prescribed form of mercurial medicine. *Organic mercury* bound to carbon compounds caused the horrific Minamata disease, when industrial discharge of mercury into the Japanese bay was converted to methyl mercury by microorganisms and passed up the food chain to be absorbed by humans with their daily ration of fish (Feldman 1999).

Regardless in what form or route it enters the body, mercury is eventually metabolized to mercuric chloride—“corrosive sublimate”—which preferentially binds to the central nervous system and kidneys; thus mercury’s toxicity is mainly revealed by neurobehavioral disorders or renal failure. Because mercury is excreted from the body only slowly, over months to years, one can suffer chronic poisoning by taking mercury in small, regular amounts that build up body stores faster than excreted.

Once mercury is absorbed, the signs and symptoms of poisoning are reliably predictable. In two reports Josef Warkany and Donald Hubbard (1951, 1953) described a total of 68 infants and children in Ohio being slowly poisoned by calomel (then commonly used as a teething powder, laxative, and treatment for worms), or by mercurial ointments smeared on diaper rash. Four decades later, 53 adult men working in a chlorine factory in Tennessee were suddenly exposed to mercury vapor leaking from catalytic cells (Bluhm et al. 1992). Despite the vastly different conditions of exposure, the two groups suffered remarkably similar effects. About two-thirds of the patients in both groups became irritable, anxious, and hostile to the point of sudden rages and even violence; the adults also admitted to depression and forgetfulness. About 25 percent in each group had tremors or muscle twitching, and about one-fifth suffered insomnia. The children were

more likely to lose weight, and they had that reddish blistering on the palms and soles peculiar to children poisoned by mercury, known as acrodynia, or “pink disease.” The classic signs of salivation and inflamed gums were seen in just 21 percent of the children and only 9 percent of the adults. No patient had all the signs.

Emotional lability and hypersensitivity, collectively known as *erethism*, are typical and early signs of mercury poisoning; the word connotes reddening and flushing of the face. A description of erethism in a modern scientific paper on mercury poisoning brings Lincoln’s condition vividly to mind:

Mercurialism also manifests itself in an alteration of the emotional state. With an insidious onset, the mood generally swings toward the depressive side. Exposed persons . . . withdraw more and more from social contacts; they become increasingly irritable and sensitive, reacting strongly to relatively innocent remarks uttered by family and friends. (Gerstner and Huff 1977, pp. 506–7)

(Lest the reader wonder if Mary Todd Lincoln’s notorious tantrums were also a result of blue mass, they were not: in December 1869 she took the medicine, apparently for the first time, and had an immediate, severe reaction [Turner and Turner 1972, pp. 537–38].)

It may be difficult for Lincoln historians to accept the possibility of mercury poisoning in their man, who by the 1850s already showed the remarkable qualities of character he would take to his presidency. But if, after his initial experience with hypochondriasis, Lincoln continued taking blue pills as self-treatment for a persistent constipation–melancholia complex, then the signs and symptoms his contemporaries described could readily have been due to a low level of poisoning known as “micromercurialism,” not incompatible with his persona (Feldman 1982).

### LINCOLN STOPS TAKING THE BLUE PILL

As the behavioral effects of mercury intoxication may be reversible, our clinical suspicion may be strengthened if we examine reports of Lincoln’s behavior after he stopped taking blue mass. If Stuart’s testimony is correct—that Lincoln stopped taking blue pills about five months after his March 1861 inauguration because they “made him cross”—this decision becomes one of the key reference points in the story.

Soon after his inauguration Lincoln was visited by a delegation from California seeking patronage. In the course of conversation, one member maligned a close friend of the President. At that moment, according to one observer, “The anger of Mr. Lincoln was kindled instantly, and blazed forth with such vehemence that everybody quailed before it. His wrath was simply terrible” (Julian 1886, pp. 50–51). But while such an outburst had been typical of Lincoln in the previous years, the rages soon seemed to lessen and, indeed, vanish. Michael Burlingame comments on the White House years:

The remarkable thing about Lincoln's temper is not how often it erupted, but how seldom it did, considering how frequently he encountered the insolence of epaulets, the abuse of friends and opponents alike, and the egomaniacal selfishness of editors, senators, representatives, governors, cabinet members, generals, and flocks of others who pestered him unmercifully about their own petty concerns. (Burlingame 1994, p. 208)

What episodes of anger are documented seem to have been appropriate to the situation, and restrained. For example, in July 1861, a Union army doctor criticized Lincoln's garb to his face, saying he resembled a Virginia wood-chopper. A witness recalled: "This unexpected allusion to his appearance was a little too much for the President. A little red spot of hectic red burned for a moment on his cheeks," but nonetheless he replied pleasantly and generously (Burlingame 1994, pp. 206–7). When in the summer of 1863, just before the fall of Vicksburg, Senator Wade of Ohio abusively castigated Lincoln for not firing General Grant, Lincoln turned him away with a deft verbal parry (Lamon 1895, pp. 182–83). Lincoln's secretary John Nicolay said that day in and out for four years he was able "to witness his [the President's] bearing under most trying conditions and circumstances, and during the whole time never saw him manifest any extraordinary excitement . . . or indulge in any violence of speech or action beyond that of impressive emphasis" (Burlingame 1994, p. 147). Another of Lincoln's young secretaries, William O. Stoddard, opined that "To say that [Lincoln] now and then gave way to short-lived fits of petulance is but to admit that he was human" (Stoddard 1885, p. 382), but he records in his entire biography only one unremarkable "fit of petulance": when a Union officer told Lincoln in February 1862 that no advance was possible because the pontoon trains weren't ready, "Lincoln retorted, 'Why in hell and damnation ain't they ready?' [and then] resumed the work before him, but wrote at about double his ordinary speed" (p. 285). Later that fall, an unanswered raid by "Jeb" Stuart into Maryland and Pennsylvania vexed Lincoln who, according to Nicolay, "well-nigh lost his temper over it," but restrained himself (Wilson and Davis 1998, p. 388). Attorney General Bates found a moment of temper in September 1863 remarkable enough to record in his diary: "The Prest. was greatly moved—more angry than I ever saw him" (Beale 1933, p. 306). Josiah Holland, one of Lincoln's earliest biographers, did note that Lincoln became more "peevish" and "querulous" as the war dragged on. But Holland's adjectives described an anecdote about a persistent lady who wanted Union hospitals for the wounded established in the north. While Lincoln was clearly irritated by the challenge to his avowed policy—he feared more deserters the closer to home—he encouraged the supplicant to return, and in the end conceded the point most graciously. Holland was comparing Lincoln's occasional sharp retort to what Holland regarded as his perfect equanimity in debates with Douglas (but see Lamon's eye-witness recollection above), and against the demi-god status Holland predicted Lincoln, like Washington before him, would acquire (Holland 1866, pp. 443–56).

Nothing in these mild episodes is comparable to the towering rages described by other observers in the 1850s, or their accounts of strange behavior. Even the deep melancholy and unassailable “cave of gloom” seemed to disappear: Nicolay’s daughter Helen, working from her father’s extensive notes, related that, “Gradually under the strain of responsibility and care, [Lincoln’s] demeanor changed. He was just as cordial, just as kindly; but his infectious laughter was less often heard; and from brooding on serious and weighty things he acquired an air of detachment. ‘Lincoln’s prevailing mood in later years was one of meditation,’ my father wrote” (Nicolay 1912, p. 191). Clearly different from what Whitney and others reported in the 1850s, but similar to O.H. Browning’s description, which we take to be from the 1840s, a French diplomat recorded facile changes from laughter to sadness and back to a “generous and open disposition . . . In one evening I happened to count over twenty of these alterations and contrasts” (Pineton 1893). However, an obvious weakness in comparing pre- and post-White House observations is that we have, to our knowledge, only Ward Lamon reporting from both perspectives.

### CONCLUSION

Another difficulty with our hypothesis of mercury intoxication is not knowing precisely when Lincoln took blue pills, in what quantities, or even where he procured them. Ledgers and day books from the Corneau & Diller Drug Store in Springfield spanning the years 1849 to 1861 show that 245 medicinal and sundry purchases were made by the Lincolns, including eight purchases of brandy (Hickey 1984). Of this total, only five were unspecified pills and four were calomel. No specific mention is made of blue mass or blue pills, even though mercury in this form was dispensed to other patrons. It is conceivable that one of the proprietors, Roland Diller, Lincoln’s close friend and political ally who lived but a block away (Obituary 1906), was providing blue mass “off the books,” since opprobrium would have been attached to the diagnosis of hypochondriasis in a person who aimed for high public office. Another private source could have been Mary Lincoln’s brother-in-law and physician, William S. Wallace, who had been a co-owner of the same drugstore from 1839 to 1849. Of course, Lincoln may have obtained blue mass from druggists in other towns while on the law circuit. Records show that he obtained a medication from a pharmacy in Ashland on the Beardstown-Springfield road sometime in the early 1850s (Hack 1996) that may have contained mercury: H.O. Brownback, great-grandson of the physician and founder of Brownback Drug Company, still has a prescription written for Abraham Lincoln but believes patient confidentiality rules against its publication. In a letter to one of us (NH) dated 21 August 1996, Dr. Brownback wrote:

The fact that Lincoln chose to seek medical and pharmaceutical care outside of his immediate community certainly acts to heighten our sense of responsibility in the matter. While I sincerely regret that I am unable to further assist in your

research, I do advise that the various mercuric compounds were common ingredients in many mid-Nineteenth Century prescriptions.

The strongest evidence that Lincoln found his own sources for medicine comes from a letter dated 3 April 1861, from Samuel H. Melvin, a physician and owner of the largest medical and pharmaceutical supply business in Springfield (Melvin 1863):

Hon A. Lincoln Washington City DC

Dear Sir

I only arrived at home this morn—having been detained in Ohio longer than I expected. I now hasten to send you the Pills as requested. I send you 5 boxes made by Mr Canedy and one box of my own manufacture.

“Mr. Canedy” is identified as Peleg Coffin Canedy, a Springfield pharmacist and “friends with Abraham Lincoln” (Novak 2001).

Could a retrospective diagnosis of mercurialism be made from a sample of Lincoln’s hair? A single dose of mercury clears from the blood within a few days, moving on to other parts of the body. Mercury in the hair thus reflects the blood level at the time the hair root is forming. The mercury is chemically bound to and moves up with the growing shaft. As hair grows at about one centimeter a month, approximately five inches per year, mercury in the top centimeter of a moderately long hair reflects mercury ingested a year before; more recent intake would be seen in hair closer to the scalp (Gerstner and Huff 1977, pp. 503–5). The specimen at the Museum of Health and Medicine in Washington, D.C., is said to come from Lincoln’s autopsy, and thus unlikely to be revealing if Lincoln gave up blue mass in 1861; any mercury in this sample would reflect intake in 1865 because Lincoln had a near crew-cut two months before his death (Hamilton and Ostendorf 1963, p. 196).

If blue pills prompted Abraham Lincoln’s remarkable behavior in the decade before he went to the White House, then his insightful decision to stop taking them may have been crucial to the outcome of the Civil War. Imagine a President Lincoln impaired by the bewildering effect of mercury poisoning while trying to cope with political intrigue, military reversals, the incompetence of his generals, and his own personal tragedies. His calm steadiness was at least as necessary in preserving the Union, it may be argued, as battlefield decisions, military appointments, or political strategies that history records as important for the success of the Federal cause.

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