Bloodletting

Four thousand years of bad medicine

On the night of December 13, 1799, George Washington was growing sicker by the hour. He had been in good health and was out riding earlier in the day. That evening Washington sat reading with his aide Tobias Lear and Mrs. Washington until about 9:00. Lear noted that "[h]e was very chearful, and when he met with anything interesting or entertaining, he read it aloud as well as his hoarseness would permit him." Turning down offers of medicines for his cold, he went to bed, but was up at 2:30 feeling very sick. By the morning he called for an aide named George Rawlins to come and bleed him, and had Lear send for Dr. James Craik. Washington felt Rawlins was too timid in cutting open his arm and encouraged him, "More, more!" His neck was bathed in ammonium carbonate—smelling salts. Lear also sent for a second doctor, from farther away. When Craik arrived, he treated Washington's throat with cantharidin, a powerful blistering agent made of the crushed bodies of blister beetles. This treatment had been known in Chinese medicine for over 2,000 years. It was adopted by the Egyptians, Greeks, and Romans, and ultimately came to be used in the Americas. It blistered his already desperately sore throat, in the hope that it would reduce the excess in bodily "humors" that Craik felt were making him sick. The doctor also bled Washington again, taking more blood this time, and then administered a "glister"—a medicated enema. Although it produced the expected result, it did not reverse Washington's decline.

Dr. Elisha Dick arrived around 3, and after consulting with Craik, bled Washington again. Dr. Gustavus Richard Brown arrived shortly after that and had Washington drink a mixture called calomel, made of the powered mineral mercury chloride. This was an ancient drug from the Middle East, described by the Persian physician and alchemist Rhazes (Abū Bakr al-Rāzī, ca. 864–925 CE). It was toxic and played havoc with the lining of the patient's esophagus and intestines, but in nineteenth-century Europe and America it was seen as a panacea and used on gout, tuberculosis, syphilis, influenza, and all forms of cancer. The long-term effects of mercury on his central nervous system would have been horrendous, but in Washington's case it merely acted as another laxative, exacerbating the dehydration he was suffering from the bleeding and other treatments.

By this point they had removed eighty ounces (2.4 liters) of President Washington's blood, about half an average man's total blood volume. Typically, losing fifty ounces would cause one to lose consciousness, and Washington had also been subjected to other bodily insults and damage from the chemicals and laxatives. He asked Lear to bring

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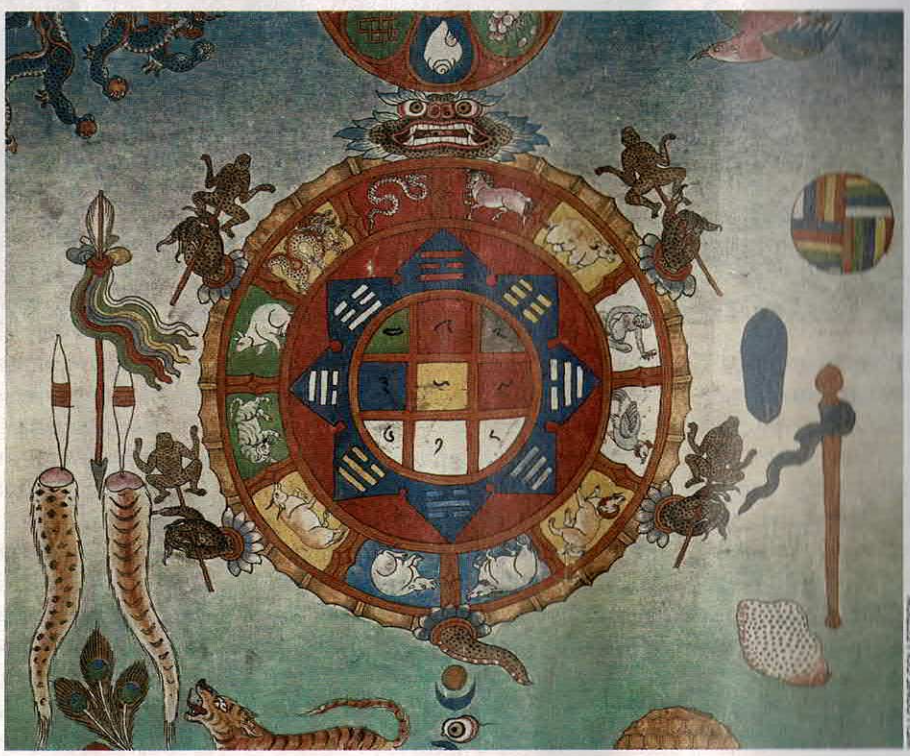
Reproduction from the Latin codex n. 1382 of an illustration of surgery (bloodletting) by M. Rolando da Parma (c. 1264) Carbonelli.



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Tibetan chart indicates good and bad bloodletting days and when to guard against demons.

Mrs. Washington and to retrieve his current will, which he gave to her. Later, he said to the doctors, "I feel myself going, I thank you for your attentions; but I pray you to take no more trouble about me, let me go off quietly; I cannot last long." He died shortly thereafter. He was sixty-seven years old.

Why were Washington's doctors so convinced that bloodletting would cure him? The prevailing theory of disease in the late 1700s was that he became ill because of contact with infectious *miasmas*, which he encountered being out in the wet and cold. These miasmas created a life-threatening imbalance in Washington's bodily *humors*, which the doctors tried to bring back into balance by removing blood from his body.

The ideas of both miasmas and humors date back to Greek medicine. Hippocrates (ca. 460–ca. 375 BCE) was among a group of scholars elaborating this theory between about 450 and 300 BCE. "Humors" is a translation of the Greek term χυμός (chymos), which is the word used for fruit juice, tree sap, or the fluids in the tissues of plants. Hippocrates identified four key humors: blood, yellow bile, black bile, and phlegm. In his treatise, *On the Nature of Man*, Hippocrates wrote:

> These are the things that make up [the body's] constitution and cause its pains and health. Health is primarily that state in which these [humors] are in the correct proportion to each other, both in strength and quantity, and are well mixed. Pain occurs when one of the substances presents either a deficiency or an excess, or is separated in the body and not mixed with others.

The book *On the Nature of Man* is part of the Hippocratic Corpus, a group of about sixty medical texts produced by several authors. Because of their emphasis on case studies and their careful notes, it formed the basis of most of Roman, European, and Islamic medicine through George Washington's time.

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1853 painting by Junius Brutus Stearns (1810–1885) of George Washington on his death bed attended by family and friends.

The problem with early theories of disease such as Hippocrates's, however, was that no effective treatments existed for the conditions described. For example, a great plague hit Athens in 429–425 BCE. It was probably typhoid fever, a disease caused by salmonella bacteria, usually ingested through contaminated drinking water. It killed about a third of Athens's population and played a role in Athens's decline in the Greek world. The historian Thucydides (ca. 460–ca. 404 BCE) described those times: "the physicians at first were not of any service, ignorant as they were of the proper way to treat it, and they died themselves the most thickly, as they visited the sick most often; nor did any human art succeed any better. Supplications in the temples, divinations, and so forth were found equally futile, till the overwhelming nature of the disaster at last put a stop to them altogether." Victims had high fevers, broke out in pustules, had violent diarrhea, and after a few days died in huge numbers. Archaeologists have discovered mass graves from this period, with some victims' bodies preserving traces of the typhoid fever's DNA. There are some reports of physicians calling for bonfires, hoping that they would disperse the miasmas or unclean air they saw as the plague's cause.

In the centuries after Hippocrates (and allied authors), several Greek scholars took issue with some of the ideas in the Hippocratic Corpus, mostly based on dissections showing the complete extent of the system of blood circulation in the body. The humoral theory was openly questioned. However, during the Roman Empire, the Greek physician Galen (Galanus, 129–216 CE) turned back

such progress, codifying much of the Hippocratic work in a series of very influential treatises. He was a prolific writer and was the personal physician to several emperors. In Galen's work, arterial blood flowed from the heart outward and never returned. The darker blood in veins flowed out from the liver, and also never returned. Stagnant blood from either source, or an imbalance between the two humors, could cause disease. Letting some blood out, through phlebotomy, allowed it to be refreshed with new blood. Galen wrote hundreds of documents totaling over three million words, and his work became the basis of European medicine after the collapse of the Roman Empire. Galen's work was also central to Persian and Arabic physicians' study of medicine during Islam's Golden Age from the eighth to thirteenth centuries CE.

KATERYNA KON/SHUTTERSTOCK

Salmonella bacteria similar to those that cause typhoid fever

Galen's view of the system of humors, arteries, and veins was not seriously challenged until the 1500s, when a Flemish physician and anatomist, Andries van Wesel (1514–1564) began to conduct detailed dissections of human cadavers. He rendered his name in Latin as Andreas Vesalius. Vesalius, like many Renaissance scholars, wanted to base his conclusions on careful observation, rather than relying on the word of the classical scholars. In fact, he chafed at many of the clear mistakes handed down from the Greeks and Romans. "Aristotle and many others say men have more teeth than women; it is no harder for anyone to test this than it is for me to say it is false, since no one is prevented from counting teeth." As an anatomist, he identified many problems with Galen's work, and wrote in his most important work, *On the Fabric of the Human Body,* "I am well aware how upset the students . . . become nowadays, when they discover in the course of a single dissection that Galen has departed on two hundred or more occasions from the true description of the harmony, function, and action of the human parts. . . ." As with Ptolemy (ca. 100–ca. 170 CE)'s view of the solar system (*see "How the Sun was Misplaced for 1700 Years," November 2022*) it was considered a near-heresy to contradict an ancient master such as Galen. Vesalius and later scholars, especially English physician William Harvey (1578–1657), proved that the body's system of arteries and veins were connected.

It was not preposterous that early anatomists believed the systems of arteries and veins were separate. Bright red, oxygenated blood flowed in arteries out from the heart under high pressure, going through smaller and smaller vessels until they seemed to disappear in microcapillaries, visible only through a microscope. Veins had darker, oxygen-depleted blood, flowing under lower pressure (also outward, in Galen's view, from the liver to the extremities). When cut, arteries spurt; veins ooze. But Vesalius, Harvey, and other scholars showed the two systems to be interconnected, and that a steady volume of blood was pumped throughout the body by the heart. Even when this truth was established, however, the overall practice of bloodletting to restore imbalances in bodily humors was continued well into the nineteenth century. What finally stopped it were repeated observations that patients who received the treatment almost always did worse than those who did not.

In the early 1800s, the practice of bloodletting in the West was especially popular. In the 1830s, an important British medical encyclopedia recommended bloodletting as a treatment for over 100 diseases, including acne, cancer, cholera, diabetes, gout, herpes, indigestion, insanity, leprosy, plague, pneumonia, scurvy, smallpox, and tuberculosis. There were also moral overtones involved in bloodletting in Europe, because of the belief that hot blood carried strong biological urges and passions. In Gustave Flaubert (1821–1880)'s *Madame Bovary* (published 1856), a character announces, "If I were the government, I'd have all priests bled once a month. That's

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A colored etching from the 1800s by Charles Williams. English poet and essayist, Bonnell Thornton (1725–1768), pleads, "Nature is the best physician and she works with very few medicines, the assistance she wants I shall give and save my fees and my life.

right . . . once a month! A nice big phlebotomy for the sake of public order and morality."

By the mid-1800s, a new theory of disease was gathering followers. It was a "germ theory" of disease, which holds that sickness is caused by microorganisms that have found their way into the body. These include bacteria, viruses, microparasites, prions, fungi, and other bearers of disease. It is actually an old theory: Greek and Roman physicians had speculated on the existence of microscopic "seeds," or *semina*, of infection. In the Indian Vedic literature from the same classical period, there is also discussion of tiny particles called *krimi* that were thought to be related to disease. On the face of it, germ theory was not that easy to accept, especially before there were microscopes to see these infinitesimal creatures. How could something as tiny as a single cell affect a whole human body, especially once it became clear that we were surrounded by microscopic lifeforms all the time? Nevertheless, it has proven an effective way to explain many diseases, especially since scientists such as Louis Pasteur (1822–1895) showed direct linkages between germs and disease. Germ theory doesn't explain everything: so far it contributes little to our understanding of diseases such as cancer, autoimmune disorders, ALS, muscular dystrophy, kidney and liver diseases, diabetes, and genetic conditions. But the effectiveness of a round of antibiotics for a bacterial infection is a powerful argument for the theory's general value. And patients today are inclined to ask for antibiotics for diseases that won't be helped by them, just as Washington demanded to be bled.

President Washington probably would have survived if he had simply been left to recover. It is arguable that what killed him was having *too many* doctors, each of whom went to their #1 treatment—bloodletting—for such a celebrated patient. At the time he died, the germ theory of disease was just beginning to gain adherents. It may not have offered any help in Washington's case, but it might have made his doctors heed Hippocrates' advice from 430 BCE in the first volume of his text *On Epidemics*: "As to diseases, the physician should make a habit of two things—to help, or at least to do no harm."

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