

THE FORGOTTEN PLAGUE

A MURDEROUS DISEASE WAS RAVAGING THE SOUTH. THEN ONE BRAVE AND DETERMINED DOCTOR DISCOVERED THE CURE—AND NOBODY BELIEVED HIM.

BY DANIEL AKST

Oblivion is a virtue in a disease. Cancer, AIDS, diabetes, and even tuberculosis are too much with us, but hardly anyone knows what pellagra is because the disfiguring deadly illness is virtually nonexistent in America today.

For the first third of this century, pellagra was a scourge across the American South, killing thousands and afflicting hundreds of thousands more. Its cause was unknown, and there was no treatment, let alone cure. Victims were shunned like lepers, and by 1914 the sickness was a national scandal.

The conquest of pellagra was a triumph of epidemiology over an affliction perhaps as ancient as the Bible, but it was also a triumph of one remarkable man, a medical Sherlock Holmes who fought ignorance, politics, and injustice as well as the disease. Even when the mystery of this preventable killer was solved, pellagra raged for another generation. It was as if the disease mocked science as crucial but insufficient. Pellagra is no longer a national health threat, and that is exactly why the experience of its conqueror is worth retelling.

Pellagra was known as the disease of the three D's: dermatitis, diarrhea, and dementia. Victims suffered scaling, leprous skin, intestinal distress, lethargy, and depression. The trademark symptom was a butterfly rash—an ugly symmetrical blotch that spread across the victim's face—marking him or her for all to see. Advanced stages involved hallucinations and even madness.

The name comes from the Latin for "rough skin," and the term first appeared in a 1771 treatise by Francesco Frapolti, a Milanese who heard it from peasants. The illness may far predate its discovery. (Job may have suffered from it rather than the syphilis or leprosy that some theorists suggest.) Pellagra was a serious problem in southern Europe in the eighteenth and nineteenth centuries, when Goethe commented on the sickly brown complexion of Italian women who subsisted on corn and buckwheat.

The disease was little noticed in America until March 1902, when an impoverished Georgia farmer, driven by 15 years of suffering, consulted an Atlanta doctor named H. F. Harris. Every year the young man came down with a bizarre spring fever. In early February he would develop strange symptoms, and by May or June his weight would fall below 100 pounds and he'd be stricken with blisters. By the summer's end he had always recovered. The doctor told him to move to a cooler climate and avoid rotten corn.

Dr. Harris recognized the oddity as pellagra, and he reported the case to the state medical association. Within a decade it was an epidemic across the South and was probably the region's greatest threat to mental health. Soon there was evidence that it had been around a long time. In 1916 Dr. W. J. Kerr, former chief surgeon at the notorious Confederate prison camp at Andersonville, Georgia, said it was probably pellagra and not typhoid that had killed hundreds of Union prisoners in 1864. In the Southern epidemic children were the most likely to die, along with adults already stricken with illnesses like tuberculosis. Death could arrive in six months.

One known constant was pellagra's long association with corn. Polenta eaters in Italy and cornpone consumers in Alabama were equally beset. Even so, early-twentieth-century doctors did not significantly explore the possibility of a dietary cause for the disease, or for such other ailments as beriberi that we now know result from nutrient deficiencies. Vitamin research was in its infancy, and science still focused on microbes as the cause of common diseases.

By the early twentieth century tuberculosis, cholera, diphtheria, typhus, tetanus, syphilis, and plague were known to be bacterial. Amoebas and bacteria caused dysentery. Malaria and yellow fever were transmitted by mosquito, which indicated an infectious element. Doctors fell into two broad camps concerning pellagra: Corn, moldy or otherwise, was blamed by some who became known as Zeists, named for the botanical name of maize. The anti-Zeists, a diverse lot, blamed various other substances and infectious media.

Like all mysteries, this one was seen through the prism of personal prejudice. Corn was America's biggest crop, and corn growers were appalled that their product might be considered unwholesome. Many people instead blamed the enormous number of Italian immigrants as carriers. Others, reflecting a growing interest in eugenics, took pellagra to be hereditary. Some Southerners, sensitive about their region's reputation for hookworm and backwardness, denied there was any problem at all.

But there was indeed. The disease hit hardest in the poorest, most remote places and was grossly underreported as it moved across the South, but by 1915 reliable estimates put the number of cases at between 75,000 and 165,000 out of an estimated 32.5 million people, with a mortality rate of perhaps 5 percent. Those numbers would continue to rise in the years ahead despite every effort to keep them down, for pellagra was not associated only with corn.

It was also tied to poverty, although few understood this yet. The disease ravaged mental institutions and orphanages. In 1914, 190 people died at the vast Georgia state sanitarium in Milledgeville, where pellagra passed tuberculosis as the number one killer.

Ignorance made matters worse. Tennessee moved to isolate all victims, wrongly declared pellagra a transmissible disease, and required physicians to report it. Many hospitals turned sufferers away, and in one case student nurses went on strike when told to treat pellagra patients. A whole body of lore grew up around the disease as patent medicines flourished and doctors tried more than 200 remedies, from arsenic to electroshock. One myth held that Jews were immune.

The federal government began working to quell the disease and the growing hysteria in 1909. Claude H. Lavinder, a capable U.S. Public Health Service officer, led the effort, but unfortunately he couldn't get anywhere. In 1912 two Northern philanthropists, Col. Robert M. Thompson of New York and J. H. McFadden of Philadelphia, created the Thompson-McFadden Commission and donated fifteen thousand dollars for a study that concluded diet was irrelevant; pellagra was reported to be spread from person to person with a strong inverse correlation to sewage systems, and the report speculated that the disease might be an intestinal infection spread by contaminated food.

By 1914 there was a clamor for action, and Surgeon General Rupert Blue, a native of South Carolina, believed he knew just the man for the job. Joseph Goldberger had been born in 1874 to a Jewish family in the Carpathian village of Girald. Seven years later his family emigrated from what was then the Austro-Hungarian Empire. Yiddish was his native tongue, and his parents never did learn English. The Goldbergers lived above their grocery store on Manhattan's Lower East Side, and all seven children helped out. Joe made deliveries, but his ineptitude as a grocer was almost a family joke, and so he was allowed to indulge his love of reading. He seemed to take after a great-grandfather who was an eminent local Hebrew scholar.

By the time he was 18, Joe had finished his second year of engineering studies at the City College of New York, where he stood fifth in a class of six hundred. He switched to medicine at Bellevue Hospital Medical College after attending a lecture with a friend. Bellevue students were exposed to clinical material hard to duplicate elsewhere. The hospital treated about twenty thousand patients a year, including poor immigrants, alcoholics, and prostitutes presenting a vast array of symptoms and diseases.

Goldberger set upon the place with the energy—indeed the monomania—that would later become his trademark. He was a stern-looking six-footer with reddish brown hair, wire-rimmed spectacles, and a stubborn thrust to his jaw. Though stoop-shouldered and reserved, he was a man of great humor and warmth in private. When he was not in classes or in a lab, he ransacked the school library, devouring thousands of case histories. He graduated second in his class—by tenths of a point—in 1895 and was first on the internship exams.

Bored in private practice, he applied to the U.S. Navy Medical Corps when the Spanish-American War broke out in 1898, but he was shut out. The Navy was the most aristocratic of our armed services, and naval surgeons were the most status-conscious of military men. His biographer, Dr. Robert Parsons, himself a naval surgeon,

implies with some disgust that anti-Semitism left no room for a Goldberger: "Racially and euphonically, it was not a name consonant with the social distinctions of the Navy of that day."

This was a break for history. After the Navy rejected him, Goldberger answered an ad for the U.S. Marine Hospital Service, which accepted recruits by examination. Characteristically he finished first.

He couldn't have found a better home. In 1902 this agency became the U.S. Public Health Service and Marine Hospital, and although it retained a military flavor—the top man was the Surgeon General, and everyone had a rank and a weird opéra bouffe uniform for formal occasions—its main task was fighting disease. Contrary to usual perceptions about government bureaucracy, the PHS was a model of efficiency, and its history verges on the glorious. It hired smart, dedicated young physicians who routinely risked death in the line of underpaid duty. PHS alumni went on to positions of prominence at the nation's top hospitals and medical schools.

By the time he was sent South to fight pellagra, Goldberger was an established medical sleuth of brilliance and tenacity. An expert on mosquitoes and intestinal worms, he was already responsible for a number of major public health advances. His work on the communicability of measles cut the quarantine period by half, and he proved that Brill's disease, a fever found in New York City, was none other than typhus.

Goldberger was famously methodical. Investigating a typhoid outbreak in Washington, D.C., he practically barricaded himself into the Library of Congress, where he read about the disease in several languages, using translators for the languages he didn't know. He was so reluctant to leave at closing time that the library eventually gave him a cot and an alarm clock. He slept only a few hours a night for days on end until he had read every word. Then he personally surveyed the entire Potomac basin in an attempt to chart every outfall and privy in the region.

He was also imaginative and fast. In Philadelphia he solved the mystery of Schamberg's disease in 48 hours by plunging his arm into some suspicious-looking straw mattresses, contracting the debilitating rash, and then triumphantly isolating the mite responsible. He discovered that the holy water fonts at churches and convents in Mexico were rich breeding grounds for the mosquitoes that spread yellow fever. In village after village Goldberger would kneel, cross himself, and, when no one was looking, toss in a bichloride tablet.

He never stopped conducting research. When he caught yellow fever in 1902, he knew delirium would come, and he insisted that his ravings be recorded. "Waldo, Greene, McAdam, Groenvelt, Branham," the notes reported. Goldberger was muttering the names of earlier public health officers who had died of yellow fever. In 1907 he got an agonizing case of dengue, and some two years later he nearly died of typhus. "I feel as proud of these notches as if I had received the Cross of the Legion of Honor," he wrote.

Surgeon General Blue had picked the right man, although the timing was awkward. Throughout Goldberger's career, towns, schools, and social clubs excluded Jews, and even the Jewish-owned *New York Times* accepted Christian-only help-wanted ads. Goldberger was not an observant Jew, although his letters show that he thought about God, and he wasn't preoccupied with anti-Semitism. Still, because his fiancée was a Christian New Orleans debutante, he reminded her that he was "one of a race despised and respected—curious paradox!—by many if not all of your people." She married him anyway—after her influential father checked his background as far as Girald and as high as the Surgeon General.

Goldberger went South in the spring of 1914, just as the annual pellagra crop was beginning to bear its fruit. Traveling light, he crisscrossed the region, stopping in Alabama, Georgia, Kentucky, Florida, South Carolina, Mississippi, and Virginia, and what he saw astonished him.

Goldberger had a healthy appetite, and he was horrified to discover that millions subsisted on "the three M's"—meal, molasses, and meat. The meal was from corn, and the meat was fatback or salt pork. This was the diet of the poor in the rural communities and mill villages of the semifeudal South, and it differed sharply from the diet of poor Northerners, who rarely got pellagra. Affluent Southerners didn't eat this way either. Nor did they get sick.

The three M's went back to frontier days, but the labor-intensive Southern system of agriculture, dependent as it was on tenant farming and a strict cotton monoculture, enforced it. Cotton was planted right up to the doors of many rural shacks, leaving no room—and no time—for gardens. Fresh meat and produce weren't widely available, and as Goldberger discovered to his rue, the poor often preferred a Model T to a cow when they did get some money. Cornmeal, molasses, and fatback were cheap, fast, and filling. They didn't spoil easily. And

they were especially pleasing to landowners and mill operators, who often provided food for their tenants and workers.

The problem was most in evidence at Southern orphanages and insane asylums, where Goldberger (who had read *Oliver Twist*) walked into a Dickensian nightmare. At Milledgeville, for example, the total per diem operating budget in 1910 amounted to 34.5 cents per patient, including salaries, meals, and supplies. A 3,000-acre farm attached to the facility was used mainly to grow cotton and corn. Breakfast was grits, beef hash, biscuits, and coffee. Lunch was a two-inch square of boiled beef, with vegetables cooked like "hog slop." Dinner consisted of bread and syrup. One inmate complained he didn't get enough to feed a "good hungry mockingbird."

There were 365 cases of pellagra at Milledgeville in 1914. Yet not one staff member was afflicted. So how could pellagra be infectious? Goldberger was assured that the staffers were in close contact with patients all day and ate the same food from the same kitchen, but he discovered that this wasn't exactly true. The staff fed itself first, taking the best foods and even milk, which patients rarely received. The staff also supplemented its meals with food purchased elsewhere.

Doctors didn't catch pellagra either—not even Dr. Edward Francis, a PHS colleague of Goldberger who had contracted so many diseases in his career it seemed he might well sprout a cast if placed in a roomful of people with broken bones.

In a matter of weeks Goldberger had the answer. Many investigators before him had thought pellagra was caused by something people ate. Goldberger knew instinctively it was from something they didn't eat. A few scientists before him had speculated along these lines, including Dr. Giovanni Battista Marzari, as early as 1810, and another, Dr. F. M. Sandwith, as late as 1912. But Goldberger would prove it.

"The writer desires to invite attention to certain observations recorded in the literature of pellagra the significance of which appears entirely to have escaped attention," he wrote in the June 26, 1914, issue of *Public Health Reports*, urging fresh milk, meat, and eggs to combat the disease.

He was appalled by the poverty and the misery of the South in those days, but unfortunately he missed the political implications of his own scientific insight. What he was really saying was that across the South there was famine. The problem was not infection or moldy corn. It was poverty. Pellagra was a symptom as much as a disease. He would spend the next 15 years trying to make Southerners listen.

First he set about proving his hypothesis. At Milledgeville he isolated two wards of 40 victims each, left their unsanitary conditions unchanged, and cured them all in a year with a healthier diet. In other wards pellagrins, as those who suffer from the ailment are called, continued to die on the three M's.

In Jackson, Mississippi, Goldberger found an orphanage that served grits, gravy, biscuits, and syrup for breakfast; a roll for lunch; and boiled vegetables and vegetable soup, corn bread, and molasses for dinner. Aghast, he ordered the children stuffed like French geese with milk, eggs, meat, beans, and oatmeal, all at federal expense. They cheered when he visited. In the summer of 1914 this crowded, dirty institution and another one a short distance away had 204 cases of pellagra. By the spring of 1915 they were still crowded and dirty, but the formerly listless children were bursting with energy. "They are all well," Goldberger exulted in a letter home.

He did this again and again, with help from a team of PHS doctors. Yet his findings weren't accepted. He was attacked at medical conferences, in the press, and even from the pulpit. One of the Jackson orphanages didn't even change its annual Thanksgiving appeal for "molasses, corn, flour, sugar, grits, cured meats, all kinds of canned goods." At some institutions where he had wiped out pellagra, the three M's were reinstated, and the disease returned.

Goldberger's impatience didn't help. The October 1915 triennial meeting of the Association for the Study of Pellagra was startled by front-page news from Washington, B.C. The Public Health Service had declared that pellagra resulted from a poor diet and the deteriorating status of Southern workers following the industrial depression of 1907. Dr. James A. Hayne of South Carolina, Goldberger's chief adversary in the years to come, not only scoffed at his findings but complained that "when you tell [a] health officer that the way to stop this thing is to make the whole people of the state change their mode of living, you put a proposition up to him that is almost impossible."

Ten days later the Southern medical establishment was thrown into an uproar when Goldberger's amazing prison experiment was unveiled. Early in 1915 he persuaded Mississippi's governor, Earl Brewer, to offer pardons to

any twelve convicts willing to participate in a secret study at Rankin Prison Farm, near Jackson. Rankin was free of pellagra. Six murderers and other felons volunteered, and they were moved into relatively luxurious and scrupulously clean quarters to prevent "infection." A good cook was provided, and the men's diet was gradually changed until they had their fill of biscuits, mush, coffee, syrup, grits, and so forth. The inmates couldn't believe their good fortune.

Goldberger's experiment would today be considered unethical, but it was a dramatic success. He induced pellagra by diet alone in a group of healthy white men—those least prone to the disease—to prove his theory. He calculated that if he could bring on pellagra, he could cure it.

The Rankin experiment had a six-month deadline, and although the subjects were wrecks in its final weeks, the skin lesions considered crucial for a diagnosis still hadn't appeared. Goldberger and his disciple Dr. George Wheeler couldn't believe it. Then, on September 12, 1915, dermatitis was discovered. Six cases of pellagra were confirmed. Goldberger wrote to his wife: "We have really and truly produced pellagra in great big vigorous men by just feeding them properly, or rather, 'improperly.' This is way beyond anything I had anticipated."

In a dramatic ceremony Governor Brewer delivered the pardons as promised, and he asked the men to stay on so that they could be fed and cared for properly. Some wept, but they "all went off like a lot of scared rabbits," Goldberger reported. Said one: "I have been through a thousand hells."

One week later, at a meeting of the Southern Medical Association, in Dallas, Goldberger was pilloried in absentia—not for his ethics but for his results. Speaker after speaker trotted out the old standbys: corn bread, Italians, amoebae, cane sugar, and infection. The personal attacks on Goldberger—whose report noted that the Rankin inmates' diet had been the same as the average poor Southerner's—were vitriolic.

Goldberger kept a furious silence, privately calling his critics "blind, selfish, jealous, prejudiced asses." He could take solace that, historically, his experience was typical. In 1753 James Lind reported that two oranges and a lemon a day would cure scurvy (vitamin C deficiency), but the British Navy waited 43 years to adopt his findings. Similarly, Christiaan Eijkman and Gerrit Grijn showed in the 1890s that whole-grain rice prevented beriberi (vitamin B₁ deficiency), but those findings took 10 years to be accepted.

Goldberger continued to crusade. At a state hospital in Columbia, South Carolina, he mixed samples of a pellagrin's scales and intestinal discharge with flour into a kind of tablet, and he ate it. Days before, he had injected himself with blood and lesion materials from a pellagrin. When nothing happened, Goldberger launched a series of "filth parties." In the spring of 1916 he and fifteen associates tried to contract pellagra by eating or injecting the blood, feces, urine, skin scales, and nasal secretions of pellagra sufferers. When Goldberger's wife, Mary, was injected with a pellagrin's blood, a nurse became hysterical.

"We had our final 'filth party'... this noon," he wrote. "If anyone ever got pellagra that way, we three should certainly have it good and hard! We just feasted on filth." No one was infected, and the results were reported worldwide. Still, doubts persisted. In the fall of 1916 the Thompson-McFadden Commission stated flatly that pellagra was an infectious disease caused by poor sanitation.

Goldberger set about gathering epidemiological data to augment his experimental results. In a comprehensive five-year study that combined sociology, medicine, economics, and statistics, he and Edgar Sydenstricker, a PHS economist, surveyed nearly 24 cotton-mill villages in South Carolina. They documented every aspect of family diet and living conditions, and they discovered that pellagra was more widespread—but perhaps less lethal—than previously suspected. Most cases were among children, who rarely got medical attention.

No wonder. Sydenstricker and Goldberger were dismayed by the squalor. The economist noted that, since 1904, wages for the workers had risen 25 percent but food prices were up 60 percent. The study showed a perfect inverse correlation between income and pellagra: People with sewers didn't get the disease; they lived in better neighborhoods because they had more money.

Goldberger didn't reveal these findings immediately, fearing they might arouse intense protest and torpedo his study. Instead he led a massive public education campaign in cooperation with several states, and this seemed to help. So did World War I. Mill wages rose rapidly from 1916 to 1920, while food prices rose more slowly. At last pellagra grew scarce.

Cotton and tobacco prices collapsed in 1920, and the boll weevil appeared everywhere. A new outbreak of

pellagra was inevitable. In July 1921 Goldberger issued a public warning. His words made page one of *The New York Times* and other newspapers. As he predicted, pellagra exploded throughout the South. President Harding personally took an interest.

The Southern response was one of denial. A newspaper editor said Southern bounty made gout a bigger threat than pellagra. States indignantly rejected offers of free condensed milk and meat from the Borden Milk Company and the Institute of American Meat Packers. The South would bear its troubles in a "manly and courageous way," huffed the Memphis *Commercial Appeal*. "Don't the dern fools know that for four long years the confederate soldiers had mighty little else to eat except swine bosom, corn pone and molasses," demanded the Birmingham, Alabama, *News*, "and there never was a case of pellagra heard of in the army?" (The idea of perfect health among the Confederate forces is of course fantastical.)

Goldberger kept up the fight on several fronts, including, crucially, the laboratory. A few vitamins had been discovered by the early 1920s, and work was also in progress with amino acids. Goldberger recognized that the South was too poor to feed itself properly, so he and his staff set out to identify the missing pellagra nutrients and supply them cheaply. He and his men tested nearly every common food for its usefulness against pellagra, and four years later they announced that brewer's yeast was a cure. Southerners, including Hayne, ridiculed the idea. Then, in 1927, the Mississippi River overwhelmed its banks and left 112 counties in twelve states under water, and pellagra raged anew. At Goldberger's urging, the American Red Cross distributed nearly six tons of brewer's yeast, with cures resulting in a few weeks. The daily treatment cost three cents.

Goldberger died of kidney cancer in 1929, at the age of 54. To his widow's despair, rumors spread that he had died of pellagra. Hayne attacked him at the next Southern Medical Association meeting, where an Egyptian specialist blamed pellagra on a bean toxin and a Virginia doctor suspected a virus. A Tulane professor insisted it was an iron deficiency.

The newspapers were kinder and lionized Goldberger at least as far as Peru, although some American papers carried subheadlines like "Jew Discovered Cause of Pellagra" and "The Wandering Jew who Whipped Pellagra."

Pellagra persisted in the South until World War II, but by 1928 it was beginning a steady slide into oblivion. Public education helped enormously, and for the next twenty years yeast was distributed throughout the South. Even Hayne came around. In 1931 he gave out several tons of the stuff in South Carolina.

Pellagra finally fell victim to a variety of forces. Science was among them, but so were politics and economics. The prolonged slump in cotton prices during the 1930s forced farmers to diversify and grow more food. Rural electrification encouraged the spread of refrigeration. New Deal programs distributed stoves and pressure cookers, which promoted gardening and home canning.

In 1937 Dr. Conrad A. Elvehjem, at the University of Wisconsin, identified nicotinic acid, a B complex vitamin, as the deficiency that caused pellagra. Starting in World War II, commercially produced white bread was enriched with "niacin"—made up as a more palatable name than nicotinic acid (which derives from the fact that the vitamin can be obtained by oxidizing nicotine). In 1945 Wisconsin researchers found that corn significantly increases the body's niacin requirement, while milk reduces it. Later research showed that the amino acid tryptophan, which is found in milk and turkey, fights the deficiency because the body makes niacin from the acid.

Pellagra was eliminated, but not before 30 years of terrible suffering after the answer was known. Science, it seems, was not enough. "I'm only a bum doctor," Goldberger told the writer Paul de Kruif, "and what can I do about the economic conditions of the South?"

Not much. In *The Butterfly Caste*, a concise and readable history of pellagra, the author Elizabeth W. Etheridge puts it this way: "As a public relations man, Goldberger was a failure. ... As a social reformer ... he was hardly a success. ... As a medical detective, however, he was a genius."

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