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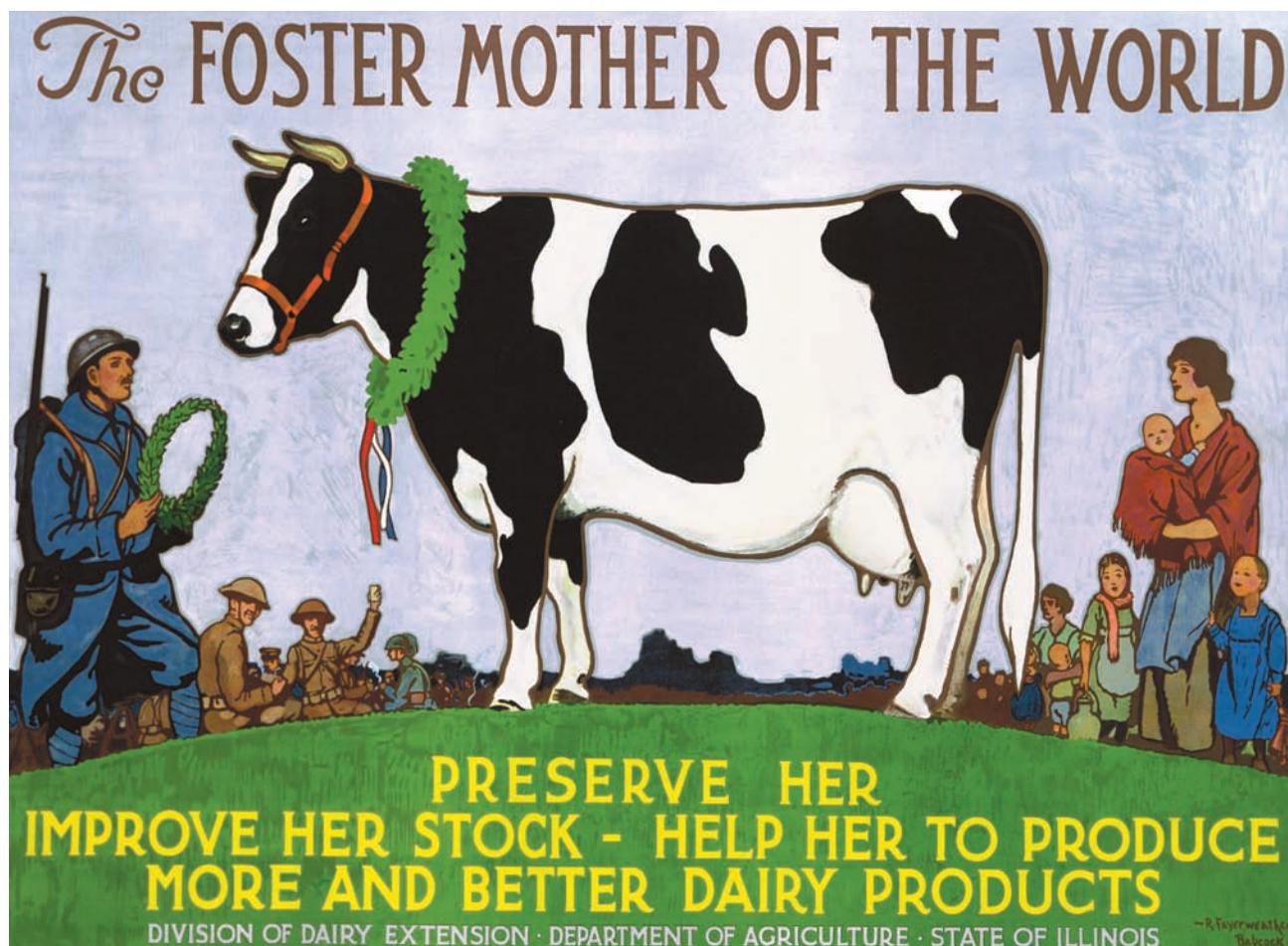


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# “In Bacteria Land”

## The Battle over Raw Milk

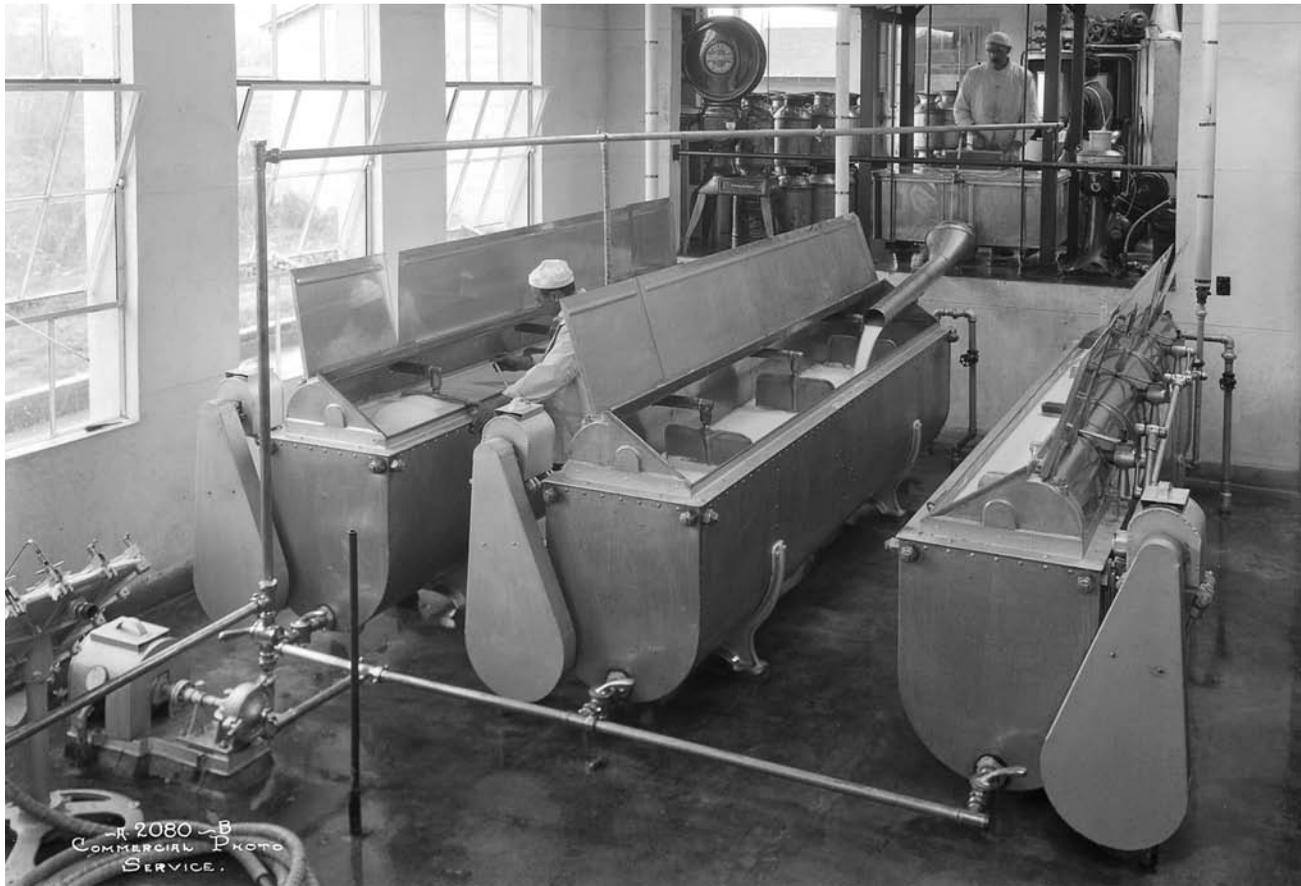


THE FIRST MILK PASTEURIZATION controversies began more than a century ago, after the new medical discipline of pediatrics decreed that fresh, unsoured cows' milk was a vital necessity for all children—vital enough to acquire an emotionally charged popular image as not just a replacement for mother's milk but its twin or surrogate, equally linked with maternal nurture.

At the time, the mid-nineteenth-century scandal of “swill milk”—the wretched stuff produced by huge urban milking-and-feeding operations that kept herds of perpetually sick cows chained in filthy sheds, eating brewery or distillery

Above: This poster by Richard Fayerweather Babcock was commissioned to accompany a 1919 promotional film produced by the Dairy Division of the Illinois State Department of Agriculture and titled *The Foster Mother of the World*.

wastes—was still fresh in both consumers' and health authorities' memories. Reformers' denunciations and lurid media exposés had partly conquered this evil by the mid-1880s.<sup>1</sup> But contaminated milk was still a serious public-health issue when French and German researchers began actually observing bacterial growth processes under the microscope and seeking ways to eliminate



pathogens. The first reports about successful “purification” treatments of milk in Europe reached the United States in the 1880s.

Pasteur himself never attempted to “pasteurize” milk. But it was an ideal object for the chief conceptual breakthroughs resulting from his and Robert Koch’s pioneering experiments—for instance, the discovery of the “thermal death point” or “thermal death time” of microbes, meaning whatever combination of time and temperature would inactivate a particular species. Mere heat treatment, however, was insufficient without simultaneously addressing other factors. Because pathogens could be transmitted through air, water, or even a moment’s direct physical contact, milk, as a phenomenally rich medium, required the strictest possible handling at all stages from milking barn to family table.

### The First Pasteurization Wars

European and American experimenters eagerly sought to “purify” milk through different time/temperature combinations and methods of sterilizing, filling, and sealing individual milk bottles. Then, in 1893, two white knights burst onto the American public-health scene: the New York City philanthropist Nathan Straus and the Newark, New Jersey, pediatrician Henry L. Coit. Impassioned idealists

*Above: The pasteurizing room at the new Tacoma Dairy in November 1926. The man in the background is in the receiving room, where the milk arrives from local dairies. The milk then pours into the large metal pasteurizing machines in the foreground.*

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both, they campaigned for directly opposed agendas that still fuel the passions of antagonists.

Straus had no medical or scientific training. But he did have the support of the pediatric pioneer Abraham Jacobi and the example of the New York physician Henry Koplik, who in 1889 had founded an experimental public “depot” that provided heat-treated milk to ailing children. Straus and Jacobi together organized an ambitious system of depots funded and administered by Straus.<sup>2</sup> These small, on-site pasteurization, refrigeration, and bottling facilities sold chilled, pasteurized milk in sealed bottles for a nominal fee. Purchasers were instructed to keep the milk cold until the moment of use and to see that it touched nothing unsanitary in the home.

Coit, equally eager to apply the tools of modern science to milk-borne disease, had arrived at another approach. Straus’s unceasing mantra was “Raw Milk Kills.” Coit’s belief might be paraphrased as “Dirty Milk Kills,” with dirtiness to be confirmed by actual bacterial counts. His plan called for physicians trained in dairy microbiology

and sanitation to supervise individual farm dairies through all steps of milk production and bottling.<sup>3</sup> The medical supervisors were organized into chapters under a national Association of American Medical Milk Commissions, whose job it was to ensure that only uncontaminated raw milk could be officially labeled “Certified Milk.” Participating operations were required to adopt exacting sanitary measures for cows, milking barns, milkers (who then worked by hand), and equipment. The milk, filled on-site into rapidly sealed sterile bottles, was promptly refrigerated. Cows were periodically tested for milk-borne diseases including tuberculosis, typhoid, scarlet fever, and diphtheria; supervising physicians inspected all farms and facilities and tested the milk to ensure rigorous bacteriological purity.

For more than a decade popular opinion leaned toward certification. Many American mothers and pediatricians shared what S. Josephine Baker, of the New York Bureau of Child Hygiene, called “an unhappy prejudice against ‘cooked’ milk.”<sup>4</sup> They considered the new technology both a violation of a near-sacred substance and a wanton gambling with infants’ lives. Pro-certifiers denounced the pasteurized product as, in one physician’s words, “at best an apology for dirty milk”<sup>5</sup>—a boon to greedy farmers who expected an unnatural application of technology to camouflage their dirty habits. The eventual turnaround owed less to the infallibility of pasteurization than to the enormous expense of the certification process, which also left alarming room for error or corner-cutting at several different stages. The certification movement, which resisted the economies of scale being adopted by modern dairymen, proved a short-lived phenomenon. Even as late as 1900 certified milk remained about twice as expensive as pasteurized. It soon priced itself out of realistic range for most people, and the Medical Milk Commissions were in decline before Coit’s death in 1917. Only an obscure handful remained in 1950; by then “Raw Milk Kills” was the only approach admitted by mainstream medical opinion.

## The Forgotten Common Ground

Child mortality in American cities began a remarkable decline during the pasteurization controversy.<sup>6</sup> Though historians have cited such potential reasons as generally rising incomes or better overall nutrition, no one doubts that improved food hygiene played a major role, with milk hygiene being the linchpin of the effort. Neither pasteurized nor certified milk deserves sole credit; the most striking new element in the situation was *clean* milk.

The historical amnesia surrounding today’s raw-milk donnybrooks obscures how many ideas the warring proponents shared without acknowledging it. All knew that under the wrong bacteriological conditions milk could kill, and that the right conditions began with strictest cleanliness in everything that touched milk from the moment it was drawn—the air in barns and bottling rooms, the milker’s hands, the cow’s udder and teats, pails or other collection vessels, and the water used to wash all of the above. All understood that milk bottles should be sealed the instant they were filled; that freshly drawn milk should be rapidly chilled to at least 45°F and kept at that temperature until the time of use; and that mothers should be told to practice vigilant precautions at home. In other words, all debaters of heat treatment versus certification agreed on *the basic principles of milk hygiene*.

Though many on both sides of the debate liked hurling insults at each other better than sharing credit, at least some pro-pasteurizers sought fair-minded argument. In *The Common Sense of the Milk Question* (1908) the popular socialist writer John Spargo—who once had dubbed pasteurization “a grave mistake”—implored both parties to reason together without “unnecessary vehemence.” He saw raw-milk proponents as “radical idealists” bent on securing “a practically germless milk supply which is absolutely safe and clean.” By contrast, advocates of “purified” (i.e., pasteurized) milk held “the conservative view that in this far from ideal world pure milk is impossible as a general rule... And, because they believe this, they urge that, while aiming at absolute purity, it is necessary in the meantime to purify the milk.”<sup>7</sup> Though sympathetic to the “idealism” of raw-milk advocates, Spargo had concluded that “Pasteurization is a makeshift, but I do not despise the makeshift on that account.”<sup>8</sup> Like others who might have liked milk to be ideally clean all the time, he had gradually decided that compromise was not a bad thing in an imperfect world.

Equally nuanced arguments came from Milton J. Rosenau, a tireless pasteurization advocate who nonetheless welcomed well-handled certified raw milk. “It is self-evident that pasteurization is an expedient and not an ideal,” he remarked in *The Milk Question* (1912). “We would all like to do away with the necessity for armies and navies, but present conditions demand their maintenance. The same is true of the harmful bacteria in milk.”<sup>9</sup>

## Big Milk Drives out Raw Milk—Almost

A new mentality took hold in the 1920s, when demand for fresh milk skyrocketed after a stream of new nutritional

discoveries revealed that cows' milk, already known to be a rich source of calcium, phosphorus, and protein, also contained several important vitamins. The implications seemed obvious to medical authorities. Declaring in 1921 that "no other food is so vital to the welfare and health of the human race as milk," the public-health spokesman Charles E. North cited his colleague Graham Lusk's fiat, "No family of five should buy meat until they have bought at least three quarts of milk."<sup>10</sup>

The American dairy industry ratcheted up to a higher gear. The priorities of farmers and commercial dairies underwent seismic shifts in response to the lucrative options suddenly offered by the burgeoning fluid-milk market (as opposed to, say, butter or cheese manufacturers). Supplying that market, however, soon became a punishingly capital-intensive proposition. Small independent farms disappeared by the thousands after World War I, and surviving farmers began entering into arrangements with commercial dairies or regional dairy cooperatives that kept updating strict sanitary requirements in step with new technological advances. Farms without access to electric utilities were at an increasing disadvantage as refinements like refrigerated bulk-milk tanks and milking machines became necessities. The level of capital investment needed to start and maintain a dairy farm grew ever steeper.<sup>11</sup>

Raw milk for retail sale was irrelevant to this new commercial dairying landscape. Even so, early efforts to enforce pasteurization by law met many roadblocks. The reason was a widening gap of perceived interests between centers of consumption (growing cities and towns, where potential disease victims were concentrated) and production (the shrinking countryside, where farmers felt threatened by the heavy hand of regulation). Venturing on untested legal ground, large cities led the way in mandating pasteurization of milk for human consumption. Chicago made an early attempt in 1908 and enacted a more comprehensive ordinance in 1916; New York City meanwhile passed its first ordinance in 1910, with several modifications over the next few years.<sup>12</sup> A hodgepodge of pasteurization ordinances, stricter or looser, gradually reached smaller municipalities before World War II.

For a time, political dogfights kept health authorities from taking the cause to the state level, though in 1924 the U.S. Public Health Service had circulated a draft of an instrument (the forerunner to today's federal Pasteurized Milk Ordinance) meant to serve as a model for state pasteurization laws. The climate changed with still greater expansion of dairying after the war. The first statewide pasteurization requirement went into effect in Michigan

in 1948; other states soon followed suit.<sup>13</sup> Within about a decade all states in the Union had their own legal curbs (with a jumble of different provisions) on retail sales of raw milk.

Though few American consumers ever saw raw milk, the cause was not altogether defunct. Certified-milk diehards had managed to keep the Medical Milk Commissions alive in a handful of states. Other raw-milk advocates preached to anyone who would listen, inspired—as Charles North had been—by thoughts of vitamins. The big vitamin breakthroughs that began after 1912 had helped to convince an already-extant club of raw-food fans that cooking transformed "living" or "life-giving" foods into "dead" substances doomed to putrefy into dangerous poisons in the body. Seizing on the discovery that cooking destroys or inactivates some vitamins while appealing to the charged image of cows' milk as mother's milk surrogate, these advocates rose to levels of zealotry surpassing all other raw-food beliefs. But throughout most of the twentieth century the number of raw-milk proponents were small and their voices fairly muted.

### Meanwhile, in Bacteria Land...

While the raw-milk cause lay partly dormant, American dairy farming and milk processing continued expanding on a scale that in the end would sadly justify Spargo's remark of more than a century ago: "In bacteria land, as in most other places, the wicked flourish and the good die too easily."<sup>14</sup>

No aspect of contemporary dairying would be remotely recognizable to survivors of the first pasteurization wars. The industry today rests on extreme economies of scale that begin with the cow. In 1950 there were roughly twenty-four million American dairy cows giving an annual average of about 5,300 pounds of milk each. In 2000 the corresponding figures were about 9.2 million cows and more than eighteen thousand pounds.<sup>15</sup> A crucial factor has been new feeding strategies that increase milk production by supplementing forage (originally grass, today more often hay or silage) with admixtures of corn, soybeans, and/or other high-energy foods that place some strain on ruminant metabolisms. The size of operations has increased exponentially. In 1950 eighty or one hundred cows might have constituted a large dairy herd; today, some factory farms in the Rocky Mountain and Pacific Coast states have twelve or fifteen thousand.

The search for cost efficiency has also affected pasteurization methods. Early pioneers tried different approaches to the thermal death point before generally adopting a method that involved pumping a batch of milk into a vat and maintaining it at 145°F for thirty minutes. Within a few decades, however, many dairies had switched to systems

that typically heated milk to 161°F for fifteen *seconds* and could handle enormous volumes of milk at once. Most milk in retail stores today has been pasteurized in vast, complex continuous-feed systems, by either this “high-temperature-short-time” (HTST) method or the still-cheaper ultra-pasteurization method (280°F for two seconds).<sup>16</sup>

No pasteurization method will permanently eliminate all pathogens. Milk is as good a growth medium for bacteria after heat treatment as before. But every change in the industry in the last fifty years has altered the bacteriological playing field in unforeseen ways, inevitably offering new opportunities for the wicked to flourish in bacteria land. The greater the volume of milk in pasteurization facilities, the wider the effect of anything that happens to go wrong. An early example occurred in 1927, when a basic hygiene error at a Montreal dairy plant led to an outbreak of some five thousand typhoid cases, with 533 deaths.<sup>17</sup>

Typhoid is no longer a major killer in First World countries—nor are tuberculosis, scarlet fever, and diphtheria, the other principal milk-borne diseases of a century ago. Neither is brucellosis, which was recognized a little later. A whole new microbiological cast of characters now dominates the scene. Most are exceptionally hardy under conditions—inside both pipelines and cows—that would kill or inhibit other bacteria. One reason for their unexpected emergence in milk is the aforementioned trend toward high-energy rations. Such diets dispose dairy cows to a condition called ruminal acidosis, in which the pH of the first stomach chamber (rumen) is significantly lowered. As a result, some acid-tolerant bacteria can flourish in bovine digestive tracts that wouldn’t survive a more alkaline environment. Among them are the O157:H7 strain of *Escherichia coli* and some particularly virulent *Salmonella* types. *Listeria monocytogenes*, another frequent guest at the party, is notoriously hard to kill and increasingly turns up in silage fed to dairy cows, especially since cost-efficient techniques of bundling silage in larger bales came in a few decades ago.<sup>18</sup>

Rigorous pasteurization kills these hardy “new” pathogens—but we must reckon with the huge, intricate systems of pipe feeds, valves, and shunts in today’s pasteurizing-processing-packaging plants. A single valve mistakenly left open for even seconds can allow raw milk to mix with pasteurized. Contamination can also occur if the inner walls and pipes of tank trucks have not been fully sterilized after contact with some infected substance. This is why what *look* like correctly pasteurized milk products have on occasion caused massive outbreaks of disease.

The two best-known instances were salmonellosis outbreaks. The first, which occurred in Illinois in 1985,

produced sixteen thousand documented cases and is thought to have sickened about two hundred thousand people. In 1994 another episode traced to a Minnesota ice cream plant produced an estimated two hundred forty thousand illnesses and two thousand confirmed cases.<sup>19</sup> Luckily, neither mishap killed anyone—unlike the small 2007 listeriosis outbreak in Massachusetts that caused four fatalities.<sup>20</sup>

The backdrop to these events has been a growing popular distrust of public-health regulation itself. In 1910 local, state, and national health authorities were seen by most citizens as benevolent and enlightened guardians. Now, however, their credibility is in tatters across a surprisingly broad spectrum of the population. A contributing factor may have been the 1960s and 1970s counterculture wars, which popularized alternative medical approaches while nourishing the belief—equally prevalent in right- and left-wing circles—that government, industry, and mainstream medicine formed an axis of evil, or at least criminal incompetence. A stream of reports on food-borne illness has strengthened such views. *Salmonella* contamination of eggs in the late 1980s was an early instance. By 2000 accounts of *E. coli* O157:H7 outbreaks traced to interstate hamburger shipments had become grimly familiar. Recent reports involving various pathogens in nationally distributed shipments of lettuce, spinach, jalapeño peppers, and other raw vegetables have opened up still greater vistas of fear. In the unprecedented crisis of faith now facing public-health authorities, milk is a particular flashpoint for furious accusations and counteraccusations.

Official attitudes toward raw milk hardened during the colossal twentieth-century growth of American dairying. The product became more flavorless and anonymous as more drastic processing (including homogenization, which destroys the cream layer of milk) became standard. Consumers and health authorities alike forgot that one farm’s milk might ever have tasted better or worse than another’s—universal knowledge when herds were comparatively small and elite dairies boasted of using the milk of “Golden Guernsey” or “All-Jersey” cows. Meanwhile, the training of milk-safety inspectors came to focus on commercial facilities, where sanitary compliance could be measured by fairly standardized formulas. By contrast, milk was produced under more diverse conditions a century ago, and regulators were used to figuring in variables that had now dropped from memory.

The experts were thus unprepared when in the 1970s the aging cadre of raw-milk fans expanded to take in younger advocates of “natural foods” and back-to-the-soil agendas. Some of these *Whole Earth Catalog* types would

later be the parents of Whole Foods patrons used to straddling mainstream and alternative health philosophies. By about 2000 raw-milk warriors had acquired a revitalized sense of mission. They command frequent media attention today, largely through the efforts of the Weston A. Price Foundation, founded in 1999.

The eponymous Price (1870–1948) was an American dentist turned medical anthropologist. Convinced that endemic tooth decay in the industrialized West pointed to widespread physical changes induced by alarming modern forms of malnutrition and ignored by twentieth-century medicine, he traveled to many corners of the globe for corroborating evidence. Raw milk—though unmentioned in his 1939 work *Nutrition and Physical Degeneration*—is the Price Foundation’s core cause. Partly through the Internet, the foundation has tremendously shaken up public debate of the question. Today nearly all readily searchable information and misinformation on raw milk can be traced to the Price Foundation on the one side or federal and state government spokespersons on the other.

### Intolerant Ideologies in Collision

The pro-raws have usefully reminded students of regulatory history that thoughtful public-health authorities did not always ridicule “clean raw milk” as a contradiction in terms or seek to cut off rational debate. Price Foundation allies have also publicized the oft-neglected truth that not all mainstream farms and dairies maintain impeccable sanitation at every stage from milking through packaging. They have fiercely protested the treatment of dairy cows on many farms—a punishing regimen that leaves the animals vulnerable to ruminal acidosis along with resulting liver and hoof problems, and that has helped lower life expectancy to three or four years after first lactation at the age of about two. (Eighteen-year-old cows were not uncommon in the 1940s.) And their attempts to repeal or reform existing pasteurization laws in many states have turned the spotlight on a surreal patchwork of regulations that may allow raw milk to be sold only as pet food in one state, only when dyed gray in another, and only when it comes from goats in a third.

Unfortunately, reasonable pro-raw arguments tend to get whizzed with others in the polemical blender. Some proponents do not realize that different pasteurization methods (e.g., old-fashioned batch pasteurization, which does not as broadly alter the bacterial flora and enzymes of milk as the HTST method) exist, or that pasteurized milk can be unhomogenized. Many seriously believe that only raw milk is *real* milk, and that pasteurization (envisioned as one

uniform enemy) converts it into something “dead,” “toxic,” or at least robbed of vital nutrients. Advocates usually identify the missing substances as vitamin C, thiamine, lactase and other enzymes, “good” bacteria, and immune-system boosters, and claim that these make raw milk a preventive or cure for many ailments. Some cite just a few ills, others anything from lactose intolerance, asthma, autism, and cancer to major infectious diseases.

It is true that chemists and biologists have neither fathomed all the complexities of any animal’s milk nor learned everything about the digestive and immunological systems of the nurslings meant to receive it. That pasteurization may cause yet-unmeasured changes in the fragile, intricate substance is highly likely. To date no one has conclusively refuted all claims that it destroys some desirable effect of raw milk. But aside from known losses of vitamin C and thiamine (easily obtainable from better dietary sources), none of the usual claims for raw milk has been verified through systematic testing, and some are based on obvious misconceptions. The lactose-intolerance argument, for instance, has been bolstered by the fact that both laypeople and many doctors often chalk up any milk-related digestive trouble to lactose intolerance without conducting specific diagnostic tests. Lactose cannot be the culprit in all such cases, because raw milk contains as much lactose as pasteurized. Nor, as believers sometimes claim, does raw milk have enough lactase to break down lactose. Lactase does not occur in milk; it is secreted in the small intestine of all baby mammals.

Misconceptions about bacteria also abound. By one popular doctrine, raw milk is naturally filled with lactic-acid bacteria (the useful tribe responsible for the souring of yogurt, cultured buttermilk, and their relatives) that, in the words of the self-appointed medical “myth-buster” William Campbell Douglass II, can “destroy any harmful pathogens that may be present.”<sup>21</sup> The kernel of truth in this whopper is that lactic-acid bacteria present in the air easily invade freshly drawn raw milk and often—not always—inhibit many—not all—pathogens by getting there first and commandeering the food supply. But this happens only if the milk sits at room temperature long enough for the lactic-acid bacteria to multiply to the point of changing fresh, fluid milk into a sour, thickened clabber—a lowered pH that Douglass and his fellow partisans certainly do not have in mind when they sing the praises of fresh raw milk. And it is simply untrue that the “good” microflora of raw milk, soured or unsoured, infallibly wipe out virulent strains of *Salmonella*, *Listeria*, *E. coli*, and the more easily killed but still dangerous *Campylobacter*.



Faced with evidence that raw milk may be implicated in specific outbreaks of these menaces, some loyalists dismiss the whole germ theory of infectious disease. Some more rationally argue that medical science still has not fully comprehended immunity to contagion and that regular exposure to a range of bacteria benign and otherwise may have real preventive benefits, especially for children. Still others sensibly point out that not all “evidence” holds up under systematic scrutiny, that “may be implicated” is not synonymous with “has been proved to be at fault,” and that only case-by-case examination can establish the facts.<sup>22</sup>

Some members of this last group would like to engage federal and state officials in constructive debate about

*Above: Suzanne, a dairy cow from Eastleigh Farm in Framingham, Massachusetts, grazes near the Statehouse on Boston Common, May 10, 2010. The cow's visit was part of a rally by raw-milk proponents as the state agriculture department held a public hearing about non-farm sales of raw milk.*

PHOTOGRAPH BY STEVEN SENNE/AP PHOTO

precise standards in milk-safety laws. The compliment, however, is seldom returned by officialdom—including the Food and Drug Administration (FDA) and different branches of the United States Department of Agriculture, as well as the Centers for Disease Control, the National Institutes of Health, every state health department, and essentially every public-health education program. These

agencies' tenacious efforts to debunk the myth that raw milk is somehow disease-proof are laudable and their overall public-health arguments generally convincing. Their good sense is another matter. Like their opponents, they furiously assert a monopoly on truth.

In 1910 some pasteurization pioneers would have met the question, "Under what circumstances is it safe to drink raw milk?" with measured answers about ideals and expedients. Today the only answer admitted by the FDA Dairy Safety Division and state or local counterparts is "Never! Under *no* circumstances." These authorities rightly warn that anyone can get sick from drinking raw milk contaminated with pathogens. They do not acknowledge that such episodes chiefly affect handfuls of people who live on farms or buy milk directly or at a short remove from farmers—not thousands of consumers dependent on the mainstream food supply. The watchdogs seldom mention massive outbreaks caused by pasteurization slipups or recontamination of correctly pasteurized milk.

## The New PR and Bacteriological Battlegrounds

The first really new contribution to the battle in more than a century has arrived in the last decade or so: advocates have learned to frame the pasteurization issue around civil rights and freedom of choice. Many now use raids on offending farms to denounce "Gestapo tactics," draw comparisons with the black liberation movement, promote conspiracy theories in cyberspace and elsewhere, and exhort people to take their health into their own hands. The language in which Representative Ron Paul has repeatedly introduced a bill to ease the Pasteurized Milk Ordinance's restrictions on interstate shipments of raw milk amply illustrates the new approach: "Many of these people have done their own research and come to the conclusion that unpasteurized milk is healthier than pasteurized milk...I urge my colleagues to join me in promoting consumers' rights, the original intent of the Constitution, and federalism by cosponsoring my legislation to allow the interstate shipment of unpasteurized milk and milk products for human consumption."<sup>23</sup>

Kindred strategies to help raw-milk advocates challenge state prohibitions or restrictions (e.g., the New York State requirement limiting retail sales of raw milk to the farm where it was produced) have come from the Farm-to-Consumer Legal Defense Fund, a legal arm of the Price Foundation. One popular tactic involves shares in corporations ("cow shares" or "farm shares") that in effect free raw-milk transactions from regulations governing retail purchase at the place and time the article changes hands.<sup>24</sup>

In weighing this aspect of the battle, we must keep in sight the emergence of pathogens that were unknown during the Coit-Straus wars—a development that hugely complicates the already-complex business of judging the safety of raw milk. To look at the problems involved is to gain a great deal of sympathy for both conscientious regulators and conscientious raw-milk supporters. The crux of the matter is that doing actual counts of all the bacteria in raw milk is logistically impossible. Even counts of all possible milk-borne pathogens from typhoid bacilli to *E. coli* O157:H7 would exhaust the resources of either state health departments or accredited private laboratories. What tests, then, should be performed, by whom, and at whose expense? The forbidding logistics and cost of complete supervision make it obvious why many health watchdogs would like to eliminate the whole issue by simply outlawing all raw-milk sales. The corresponding difficulties for farmers are equally daunting.

The fastest, most cost-efficient testing approach is to gauge the overall level of bacterial activity by a general marker. Wherever raw-milk regulation is under debate, the simplest suggestion invariably is for farmers to collect milk samples, send them to state-accredited laboratories for tests including one for the preferred marker, and assume the cost themselves. The standard marker organisms are coliform bacteria, a group of different kinds that live in the intestines of people and other warm-blooded animals. Not necessarily harmful in their own right, they broadly indicate how far the activity of other, more dangerous bacteria has progressed. The coliform maximum most often recommended is 10 per milliliter, which is also a usual maximum for pasteurized milk. Though applying the same standard to pasteurized and raw milk may sound like obvious fairness, in this case the obvious is misleading. Very clean milk freshly drawn from healthy cows is comparatively sterile. But it is intrinsically a richer microbiological medium than milk straight out of today's HTST pasteurization systems. Even clean, well-maintained raw-milk operations commonly find a 10-coliform-per-milliliter limit nearly impossible to comply with. A frequently proposed alternative, requiring producing farmers to draw up and implement HACCP (Hazard Analysis and Critical Control Points) plans similar to those now used in some other sectors of the food industry, usually draws furious attacks from observers convinced that it will put the foxes in charge of the henhouses.

The climate in which some earlier observers could set aside "unnecessary vehemence" and view competing agendas with sympathy and fair-mindedness—weighing

the ideal of pure, unpasteurized milk against the pragmatic makeshift of pasteurization—is almost beyond imagining today. Twenty-first-century partisans seem unaware how irresponsible it is to debate so complex a question with more eagerness to discredit opponents than to make common cause against a common enemy: food-borne disease itself, which in the last several decades has mustered new fighting forces and done frightening end runs around measures designed to control it.

Making raw milk accessible to all who consider themselves constitutionally entitled to do their own research and come to their own conclusions is a recipe for chaos. Imposing blanket prohibitions on the sale of raw milk is a recipe for driving it underground while encouraging angrier, more paranoid attacks on the entire foundation of public-health authority. Everyone would benefit from less fanaticism on both sides.

Advocates who understand that raw milk is not a cure-all, a surefire repellent to pathogens, or miraculously removed from today's evolving bacteriological landscape might well try to reason with (or dissociate themselves from) noisy hardliners, while health authorities able to see beyond one-size-fits-all regulatory approaches might well acknowledge the good sense of bringing small raw-milk producers under responsible supervision in an atmosphere of civility, instead of driving them to flirt with a semi-outlaw fringe. And both sides might well recall the real lesson of the first pasteurization wars: What ultimately curbed the loss of life through contaminated milk was not pasteurization or certification per se, but new tools of science that provided hygienic insights equally applicable to two otherwise divergent agendas. Does no rational common ground exist today? 🍷

#### NOTES

1. For useful surveys of the swill scandals, see Ralph Selitzer, *The Dairy Industry in America* (New York: Dairy Field/Books for Industry, 1976), 34–39, 123–129; and Bee Wilson, *Swindled: The Dark History of Food Fraud from Poisoned Candy to Counterfeit Coffee* (Princeton, NJ: Princeton University Press, 2008), 154–163.

2. Richard Meckel, *Save the Babies: American Public Health Reform and the Prevention of Infant Mortality, 1850–1929* (Baltimore: Johns Hopkins University Press, 1990), 78–79, 85; Selitzer, *Dairy Industry in America*, 133–135; Lina Guthertz Straus, *Disease in Milk: The Remedy Pasteurization: The Life Work of Nathan Straus* (New York: Arno Press, 1977 [rpt. of 2d ed., New York: Dutton, 1917]), 189–191.

3. Milton J. Rosenau, *The Milk Question* (Boston: Houghton Mifflin, 1912), 141–160. The standard account of Coit's career is Manfred J. Waserman, "Henry L. Coit and the Certified Milk Movement in the Development of Modern Pediatrics," *Bulletin of the History of Medicine* 46 (1972): 359–390.
4. S. Josephine Baker, *Fighting for Life* (New York: Macmillan, 1939), 250.
5. Elias Bartley, quoted in Meckel, *Save the Babies*, 263 n. 61.
6. The best historical survey is Meckel, *Save the Babies*.
7. John Spargo, *The Common Sense of the Milk Question* (New York: Macmillan, 1908) viii, 241, 242, 244.
8. *Ibid.*, ix.
9. Rosenau, *Milk Question*, 189.
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20. "Outbreak of Listeria Monocytogenes Infections Associated with Pasteurized Milk from a Local Dairy—Massachusetts 2007," at <http://jama.ama-assn.org/cgi/content/full/301/8/820>.
21. William Campbell Douglass II, "The Raw Truth about Real Milk," at <http://docs.google.com/viewer?a=v&q=cache:29m3jntU00j:form.douglasreport.com/reports/raw-milk.pdf+%22Raw+Truth+about+Real+Milk>.
22. David E. Gumpert usefully summarizes a number of pro-raw arguments in *The Raw Milk Revolution: Behind America's Emerging Battle over Food Rights* (White River Junction, VT: Chelsea Green, 2009).
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