Antibiotics and Agricultural Change: Purifying Milk and Protecting Health in the Postwar Era

KENDRA SMITH-HOWARD

New ways of understanding milk purity accompanied the introduction of veterinary antibiotics to the dairy farm. Antibiotics—once viewed as substances that could rid milk of bacterial hazards—became understood as food adulterants when residues of the drugs were detected in milk. Although consumers’ concerns about food purity became critical in the postwar era, only in the late 1950s and early 1960s did public health officials and consumers take interest in the potential human health effects of antibiotic residues. Veterinarians and milk processors, not consumers, led the effort to curb indiscriminate use of antibiotics in the 1940s and 1950s. Paying close attention to the context in which farmers chose to use antibiotics and monitored drug residues, this article seeks to explain why farm people adopted veterinary drugs and how they adapted to new regulatory structures and shifting ideas about milk purity.

Agricultural historians have elegantly explained the economic and social consequences of the technological reorganization of agriculture after World War II. Less often examined is how postwar changes in agriculture forced Americans—producers and consumers alike—to redefine what constituted pure food and revise their role in upholding it. No food was more central to these profound changes in defining purity than milk. Prone to spoilage and easily adulterated, milk was consumed by populations most vulnerable to contamination: children, the elderly, and the sick. Thus, milk had long been at the forefront of reforms to improve

KENDRA SMITH-HOWARD is assistant professor of history at University at Albany–SUNY. She is presently revising a manuscript that examines how new standards of purity and ideas about modernity shaped dairy farm practice and consumers’ vision of milk from 1900 to the present.

© the Agricultural History Society, 2010
DOI: 10.3098/ah.2010.84.3.327
food quality. Milk purity remained important in the postwar era, but what constituted “pure” milk became more contested and complicated than ever before.¹

The introduction of antibiotics to dairy farming in the immediate postwar era generated new debates about food purity. These notions of purity, not mere economic self-interest, played an important role in coloring farmers’ use of veterinary drugs and their reactions to antibiotic regulations. Farmers conceived of pure milk as that which had low bacterial counts; they turned to antibiotics to treat cases of mastitis, an infectious disease of the udder that expelled bacteria into milk and thwarted milk purity. Initially, the adoption of antibiotics in dairying was the concern of milk producers. But in the late 1950s, food regulators and consumers started to define milk purity by its freedom from technological adulterants and to understand antibiotic residues as a potential public health threat. By the early 1960s, then, farm families and consumers alike sought a wholesome product but differed in identifying which elements defined pure and impure milk. Consumers, largely focused on the purity of milk itself and less on the cows that produced it, were troubled by the potential health effects of antibiotic residues tainting the product. Farm families emphasized the importance of milk from cows free of disease. While the Food and Drug Administration (FDA) guidelines required both that milk come from healthy animals and be free of adulterants like antibiotics, the agency’s regulatory actions emphasized the technological risks to nature—pesticides and antibiotics—and left the task of keeping cows free of disease to veterinarians, dairy scientists, and farm families.

For food regulators, antibiotic residues constituted merely the newest adulterant contaminating the milk supply. During the late nineteenth and early twentieth centuries, federal and state governments, driven by episodes like the 1898 embalmed beef scandal and Upton Sinclair’s The Jungle, enacted regulations that established what constituted pure and impure foods. The most important of these regulations, the 1906 Pure Food and Drug Act, sought to prevent manufacturers from diluting or blending their product with low-cost fillers or from including addictive substances in foods without indicating their presence. In the case of milk, regulations targeted the use of formaldehyde as a preservative. They also condemned the more common practice of watering milk, adding substances to make watery milk appear less translucent, and selling it at
full price. In this sense, post–World War II regulators’ efforts against antibiotics and pesticide residues mirrored earlier efforts to eliminate an adulterating additive from otherwise “pure” milk.²

But the attributes of safe and sanitary milk extended beyond the definition established by the 1906 Food and Drug Act. In milk, bacterial purity was as important for food safety as freedom from adulteration. Bacteria posed just as great a threat to human health as additives. Watered-down milk, while cheating consumers, was usually harmless to health. Milk free of adulterants, however, could imperil drinkers with septic sore throat, scarlet fever, diarrhea, and other communicable diseases. To prevent such risks, agricultural and public health reformers at the turn of the century required bacterial counts of milk, inspected dairy barns, and began to pasteurize milk. They also sought to eradicate veterinary diseases that introduced bacteria into milk, such as bovine tuberculosis and mastitis. In the postwar era, antibiotic treatment became a primary way to stifle the latter disease. The new attention to antibiotic residues made the very substance credited as a legitimate agent of purification—the drugs to treat mastitis—an adulterant itself. This would have important implications for the ways in which farm families understood and reacted to antibiotic regulation.³

While the shift from viewing antibiotics as a purifying substance to seeing them as poisons set the drugs apart from other adulterants in the eyes of producers, from consumers’ perspective, antibiotics fit within a larger postwar pattern. As World War II fostered the development of nuclear technologies and spawned growth in the pharmaceutical and chemical industries, it also gave rise to disquieting unease about the place of modern technology in human life. Technologies once glorified as modern marvels became anxiety inducing. By 1947 the awe with which Americans greeted nuclear weapons blended with deep fears about radiation sickness and cancer, and these worries lingered in the 1950s as nuclear testing continued. The ubiquity of synthetic chemicals stirred misgivings about a poisoned world.⁴

Food became central in the postwar environmental critique, for tracing impurities in the food supply provided a way for consumer activists to crystallize their concerns. When consumer and anti-nuclear activists sought to call attention to the risks of nuclear testing, they utilized the slogan “Pure milk, not poison” to galvanize a broader audience.
Rachel Carson, similarly, bolstered her case for an end to the indiscriminate use of insecticides in *Silent Spring* by publicizing the chemicals’ ubiquitous presence on the dinner table. Thus, historians grant consumer activists a central place in the history of twentieth-century reform and have portrayed them as the leading voices in expressing concerns about food purity.  

Farm producers rarely appear in such narratives, but when they do, they are usually characterized as more interested in protecting animals’ economic value than ensuring human health. But efforts to tackle veterinary diseases like mastitis were not solely measures to increase farm profits; they also carried important public health implications. Insofar as cows afflicted with mastitis secreted bacteria, they contaminated the milk of consumers. Rather than view animal and human health as oppositional, many farm producers and veterinarians understood the well-being of animals to be intimately linked to food safety. Furthermore, veterinarians and farm producers took the problems of antibiotic residues seriously in the immediate postwar period; indeed, actors within the dairy industry led the movement to keep antibiotics out of milk during the late 1940s and 1950s. Although this situation changed as producers felt increasingly pressured to produce more milk at lower cost (resorting to antibiotics to do so) in the 1960s and 1970s, in this earlier period producers and veterinarians advocated more discriminating use of antibiotics in dairy herds.

Farmers’ renewed desire to rid milk of one kind of impurities—mastitis bacteria—set the stage for the introduction of a different sort of impurities—antibiotic residues—into milk, and thereby initiated new debates over what constituted “pure” milk. World War II shaped the adoption of veterinary antibiotics. The war stimulated the production of penicillin and other antibiotic preparations. It also indirectly created conditions that made dairy farmers more likely to embrace new drugs. To overcome unprecedented labor shortages during the war years, farmers swiftly adopted milking machines. This trend continued after the war. Between 1945 and 1950 the number of farms reporting a milking machine increased 74 percent. While mastitis afflicted dairy cows before the widespread adoption of milking machines, the technology facilitated the disease’s spread. Improperly sanitized milking machine parts could transfer infectious bacteria from cow to cow, while imprecisely calibrated
machines bruised cows’ udders and increased the risk of infection with mastitis. At the very moment when pharmaceutical companies made their drugs available, dairy farmers were struggling more than ever before with the disease of mastitis in their herds.7

Farmers’ frustration with mastitis enhanced their interest in antibiotic remedies because, as the disease pained cows’ udders, it bruised the farm balance sheet. Milk from cattle with clinical mastitis could not be sold, because the bacteria such cows secreted might cause septic sore throat or food poisoning to those who drank it. Cows with subclinical mastitis produced less milk—as much as 22 percent less—according to a Hoard’s Dairyman study. Farm profits decreased as milk volume dwindled. Virginia Hollerith, the part-owner of a dairy farm in Virginia, understood the economic liability the disease posed. She advised the farm’s manager in early 1945, “The farm is costing too much…. Mastitis and slow breeding are the main loss of milk production so do all you can to control these.”8

Farmers linked milking machines to the increase in mastitis. Frustrated by the unrelenting mastitis cases affecting three cows of her herd, Vermont farmer Gertrude Mallary deemed the new milking machine responsible for the outbreak. She told its vendor, “It is obvious that something about the machines, or our operation of them, is causing the trouble, because the two or three problem cows, those which were not educable to the machines, do not have these things, nor do the eight or ten which are milked by hand at the other barn.” Although mastitis tarnished optimism about milking machines, farmers remained invested in the new technology that quickened the pace of twice-daily milking tasks. Used according to expert recommendations, though, milking machines did not so much save labor as reallocate it to tasks of disease prevention, such as examining cows’ udders for signs of irritation, separating infected cows from uninfected ones, sanitizing machine cups with chlorine, scrubbing cattle stalls with lye or lime, and supplying cows with fresh bedding.9

Pharmaceutical companies capitalized on dairy farmers’ frustration with mastitis and the time-consuming tasks of disease prevention in their promotional campaigns. Drug manufacturers focused their pitch to dairy farmers on therapeutic uses of the drugs and especially on the drugs’ ability to eliminate mastitis. By the 1950s nearly every issue of Hoard’s Dairyman, the nation’s leading dairy journal, carried full or half-page
advertisements in which Squibb, Wyeth, and American Cyanamid promised to restore the health of cows and thereby milk markets with slogans like, “When Mastitis Goes . . . Saleable Milk Flows.” Farmers also found antibiotics on the shelves at feed dealers where they purchased seeds and fertilizers. By mid-decade, farmers were as likely to buy veterinary drugs in a small-town pharmacy as Epsom salts or an ice cream sundae.10

It is not surprising that veterinary antibiotics appealed to dairy farmers. The drugs promised to return ailing cows to health and to restore the volume of saleable milk, without requiring the intensive labor of non-pharmaceutical mastitis control. Farmers first turned to penicillin to treat mastitis in the late 1940s. By the 1950s farmers also used preparations with streptomycin, chlortetraline, oxytetracycline, neomycin, polymyxin, subtilin, supromycetin, and chloramphenicol. By 1959 agricultural officials estimated that half of the two hundred four tons of antibiotics used for veterinary treatment were directed toward healing mastitis in dairy cattle.11

As dairy farmers began using antibiotics, it became clear that the drugs did more than transform the bacterial composition of cows’ udders. The drugs persisted in bodies of cows and lingered in the milk supply. As antibiotics passed from cows’ udders into milk, they converted in law and practice from veterinary remedies into food adulterants. To prevent contamination of food with the unintentional residues, federal health officials required dairy farmers to withhold milk from treated animals for seventy-two hours before sale by 1951. Then, after surveys of the milk supply in the mid-1950s indicated continued presence of antibiotic residues, FDA agents coordinated a campaign to ensure compliance with withholding laws in 1959 and 1960. That year, the FDA also banned any dosages or drugs that persisted in milk more than ninety-six hours, expanding previous FDA regulations to include intravenous and intra-muscular applications. By 1959 and 1960, when the FDA initiated its stepped-up action on antibiotic residues, consumer concerns about food additives were on the upswing. The 1958 Delaney Amendment to the Food and Drug Act, which established a zero tolerance for all carcinogens in food, ignited consumers’ interest, and the 1960 publication of William Longgood’s Poisons in Your Food furthered their concerns. But, in 1951, when FDA regulators first acted to establish withholding times for antibiotics on dairy animals, consumer groups had less influence.
Members within the dairy industry brought problems with antibiotics and drug-contaminated milk to the fore.\textsuperscript{12}

In the late 1940s and early 1950s, veterinarians and food processors were the first to caution farmers against overreliance on antibiotics in dairy herds. While they focused primarily on the impact of the drugs on farm and factory production, not on the residues’ health effects on consumers, they were no less concerned about milk purity than consumer advocates and food regulators who later became interested in the problem. Veterinarians worried that indiscriminate use of antibiotics might make it more difficult to overcome bacterial threats to milk purity. Food processors needed milk to be free of antibiotic residues to make cultured dairy foods like cheese or yogurt. What did milk purity entail? How should it be measured? Who should uphold it? Veterinarians and food processors were the first to revisit these questions in the wake of antibiotic adoption.

Long before antibiotic preparations lined the shelves of drug stores and feed dealers, veterinarians established themselves as guardians of milk’s safety. As intermediaries between urban public health officials and farm producers, they explained to farm families the need for sanitary reforms and certified barnyard cleanliness to city milk inspectors. In the postwar era, many veterinarians incorporated antibiotics into their efforts to purify milk by eliminating disease bacteria. But as they did so, veterinarians feared that the widespread availability of the drugs would minimize farmers’ attention to the risks posed by unsanitary practices and diminish farmers’ reliance on veterinarians. Thus, veterinarians insisted on the continued need for non-pharmaceutical preventative measures to combat disease and defended their unique role in ensuring milk’s safety.\textsuperscript{13}

Veterinarians believed that antibiotics could play an important role in purifying milk, but most thought that the authority to administer these drugs should be reserved for professionals. Because their expertise equipped them to identify the bacterial causes of mastitis, veterinarians argued that they could treat the disease more effectively than others. As veterinarians Oscar Schalm and Ralph Little explained in 1947, “Chemotherapy of the udder . . . as conducted by a veterinarian will produce much better results than if undertaken by the dairyman in a haphazard manner without this professional service. The cost of an eradication
program as conducted by a veterinarian . . . may seem expensive to the dairyman. Nevertheless, the actual increase in production of the successfully treated animals through ensuing lactations will more than offset the small original expenditure.” Veterinarians made their case in textbooks and in advertisements printed in dairy journals. One advertisement urged farmers “Don’t trifle with mastitis. Experimenting, gambling on ‘easy cures,’ may cost you enormous milk losses. Get the help of your Veterinarian and go after this disease with all the skill that modern science can give you.” The ability to select appropriate remedies was needed to eradicate the troubling disease.  

While veterinarians reasoned that they should administer drugs exclusively, they emphasized that farmers’ work of regular sanitary practice was also important in curbing disease. Antibiotics would be ineffective against mastitis, even when properly prescribed and applied, without careful measures to guard against re-infection—such as separating infected cows from non-infected ones and sanitizing the udder during milking. Only veterinarians could diagnose the specific bacteriological cause of a case of mastitis and select the most appropriate medicine, but farmers could protect milk quality by upholding high standards of sanitation on the farm. Though their responsibilities differed, both farmers and veterinarians played key roles in protecting milk’s purity by curbing mastitis.  

Few farmers were content to stick to the circumscribed role in mastitis control that veterinarians suggested. Paying a veterinarian for bacteriological analysis seemed costly and time consuming; in tight times, consultation fees added to farm costs and any delay in treatment lengthened the amount of time that milk from an afflicted cow was kept from sale. Many dairy farm managers thus preferred to purchase and administer antibiotics themselves. Farm record books from the late 1940s and 1950s reveal this pattern. New York farmer William Gifford purchased his first tube of penicillin in February of 1946, but not from the veterinarian that he consulted for other cattle ailments. In 1949 Illinois dairy farmer Dale Beall bought penstix, a penicillin treatment for mastitis, from Tyson’s Drug Store. Advertisements for veterinary antibiotics promoted the do-it-yourself approach. A 1952 Wyeth advertisement for its tribiotic ointment, for instance, utilized farmers’ testimonials to underscore the drug’s effectiveness. Although the text included the line, “Consult your veterinarian as you would your physician,” none of the featured testimonials came from
veterinarians or mentioned any role that they played in guiding farmers’ use of the drugs. One farmer even shared that “I’m certainly telling all of the dairymen around here about this wonderful new way to control mastitis.” This displacement of expertise for word-of-mouth recommendation was precisely what veterinarians feared. However, farmers’ independence over mastitis control did not always signal a broader challenge to veterinary authority. For instance, in the very week that Dale Beall bought penicillin, he hired a veterinarian to vaccinate animals. Farmers continued to rely on veterinarians for many procedures, but considered mastitis treatment a routine task that did not require their skill.  

Any trend toward farmer-administered care frustrated veterinarians and not just because of their professional losses. The more antibiotics were used, the more complex mastitis cases became. Drugs applied with an unsanitized tube or to an uncleansed udder carried more disease bacteria into cows’ bodies than the drugs had the power to cure. When more complicated infection ensued, veterinarians were called to address troublesome mastitis cases that posed grave risks to animal health and milk purity. Furthermore, frequent exposure to antibiotics encouraged bacterial resistance, making it ever-more difficult for farmers to overcome infection and produce clean milk. Dealing with these pesky mastitis cases emboldened veterinarians to pressure regulators to limit lay access to antibiotics and to require veterinary prescriptions. Of course, veterinarians’ worries about antibiotics were also about the eroding power of their profession. But by highlighting the drugs’ inability to eradicate mastitis and publicizing the risks of their misuse, veterinarians offered some of the earliest critiques of the new technology.  

The use of antibiotics in dairying also presented challenges for milk processors. Small quantities of drugs secreted in milk after treatment stilled the growth of starter cultures used to make cheese and cultured dairy foods. It took twice as long for cottage cheese curds to develop in milk from cows treated with aureomycin, and cheddar cheese made from antibiotic-laden milk developed off-flavors. In 1953 an advisor to Wisconsin cheesemakers reported that “Last winter the Swiss cheese factories in the Monroe area made the poorest quality of cheese as a whole that has been made in the last twenty years. . . . I know that the antibiotics and some of the synthetic washing powders have caused a lot of the trouble.”
Milk processors had long been concerned about purity. Like veterinarians, milk plant managers sought to eliminate milk’s bacterial impurities; they tested milk to ensure it was free of disease and rejected milk with too high a bacterial count. By the 1950s they urged patrons to adopt bulk refrigerated coolers that chilled milk quickly, sped delivery, and thereby reduced the risk of spoilage. Ironically, some of the reforms dairy plant managers encouraged to reduce milk’s bacteria counts intensified problems with antibiotic contamination. As farm families adopted bulk refrigerated coolers, for instance, milk was pooled in the stainless steel tank of a refrigerated milk truck before arriving at the factory. Prior to the use of bulk milk tank trucks, milk arrived at the dairy plant in forty-pound cans, each clearly linked to a specific farm by its label. But after the adoption of bulk handling, a truck might carry the milk from as many as twenty farms, and milk mingled en route to the cheese plant. When milk haulers loaded milk onto the truck, they performed a bacterial count to ensure the quality of each farm’s product and prevent one farm’s milk from tainting the entire load. But well into the 1950s, neither the haulers nor the cheesemakers who received the milk had a reliable, rapid test to detect the presence of antibiotics. Lacking this diagnostic, antibiotic-contaminated milk from just one or two cows on a single farm could render an entire batch of milk unfit for processing.19

To address new risks of contamination, cheesemakers adopted a new standard of purity, one that required milk to be free of bacteria and from residues of technologies used to curb bacteria. They recognized the utility of antibiotics for treating mastitis (and thereby reducing bacterial counts) but also wanted to keep milk free of drug residues. They asked farmers to withhold milk from sale for the seventy-two hours or six milkings following antibiotic treatment. A seventy-two-hour delay, they believed, would prevent tainted milk from reaching the market and prevent residues from slowing lactic acid production necessary to make cheese. In August 1951 the FDA endorsed this position, requiring antibiotic manufacturers to advise users that milk from an antibiotic-treated quarter of the udder was not to be sold for seventy-two hours after treatment. This regulation, the FDA’s first on antibiotics in milk, referred specifically to the impact of antibiotic drugs on cheese starters. It thereby reflected the way that production-driven concerns initiated revisions to the idea of milk purity.20
Dairy plant managers skirted a difficult line in waging educational campaigns about drug-withholding laws. As cheesemakers reclassified what constituted pure milk, they worried that any publicity about antibiotic-tainted milk might encourage consumers to rethink whether milk was safe to drink or cheese fit to eat. They wanted to alert farmers of the detrimental effects of sending milk to market too soon after treatment, but they also wanted to maintain consumers’ confidence in the safety of their product. Thus, at a 1951 meeting where Wisconsin’s cheesemakers passed a resolution urging seventy-two-hour withholding, the association president directly asked reporters to minimize the significance of the resolution in the local press, saying, “I hope you will refrain from playing up these resolutions in the paper. The consuming public might think there is something wrong with the milk. We don’t want this impression.” By the mid-1950s cheesemakers’ simultaneous efforts to convince farmers of the problematic nature of antibiotic-laden milk and yet reassure consumers of milk’s safety would become increasingly difficult to sustain.

Before 1951, discussion of the problems and possibilities associated with using antibiotics to treat mastitis remained largely within the dairy industry. But in the mid-1950s, the conversation shifted. No longer did debates center on antibiotics’ effects on cows’ health or on cheese cultures; rather, the impact of antibiotic-laden milk on human health became the primary focus. Two factors precipitated the change. First, surveys in the early 1950s revealed that antibiotic residues were reaching milk drinkers despite withholding laws. Second, new evidence on the potential health risks associated with penicillin-tainted milk in 1957 deepened food regulators’ concerns.

The FDA played a central role in shifting the terms of milk purity to focus more squarely on adulterants. In most regions of the United States, FDA officials were the first food regulators to address antibiotic contamination of milk. Very few state or local milk officials regularly tested milk for antibiotic residues until late in 1959 or early 1960. Before that, city health departments that checked milk for the substances—like those of Des Moines, Iowa, and Rochester, New York—were exceptions. In 1957, when Wisconsin state milk control officials fined a dairy producer who sold antibiotic-laden milk, the arrest was enough of an aberration from national norms to merit special mention at a meeting of milk inspectors in New York State. Wisconsin’s active concern for control over antibiotic residues
probably stemmed from the influence of the state’s cheese industry. Milk-processing plants, like cheese factories, were more likely to analyze milk for antibiotics than local or state milk inspectors until the late 1950s.\textsuperscript{22}

Although the FDA played a key role in changing the definition of milk purity, its efforts were largely advisory until the late 1950s. State and local officials maintained the responsibility for enforcing milk control laws. The FDA’s involvement and its studies of milk carrying antibiotic residues were important nonetheless. In 1954, 1955, and 1956 the FDA conducted surveys of fluid milk that found 3.2, 11.6, and 5.9 percent of samples, respectively, contained traces of penicillin and other drugs. Local surveys in New York and Massachusetts reflected a similar degree of contamination. These studies provided solid evidence that farmers were not complying with the recommendations to withhold milk for seventy-two hours after antibiotic treatment.\textsuperscript{23}

Prompted by these results, the FDA reevaluated the potential public health implications of antibiotic-laden milk. In 1956 a panel of pediatricians and allergists advised the FDA that, while small quantities of penicillin in milk posed no danger to the vast majority of consumers, the residues could trigger allergic reactions among those with heightened sensitivity to the drug. Those already sensitized could suffer dermatitis, hives, or even anaphylactic shock. Concerns about penicillin allergies were not entirely new, but food regulators had minimized them in the early 1950s. For instance, in February 1950, when a dairy scientist at the University of Florida inquired about the public health significance of antibiotic-contaminated milk, physicians in the FDA’s Division of Pharmacology advised that, “If the contaminated milk is sufficiently diluted with uncontaminated milk we would not be concerned with human consumption.” But, by 1957, FDA regulators viewed penicillin-laden milk as a potential public health hazard. In 1957 new FDA policies addressed the continued presence of antibiotics, especially of penicillin, in the milk supply. One regulation required antibiotic manufacturers to print warning labels directly on the container of the drug, not just in the literature accompanying the medicine, making it more likely that the seventy-two-hour rule would be read by those who used antibiotics. The agency also established a maximum dosage for penicillin at one hundred thousand Oxford units. Previous to this ruling, some preparations contained as many as 1,500,000 units of penicillin per dose.\textsuperscript{24}
Many citizens learned of the potential for veterinary drugs to contaminate milk for the first time in the mid-1950s, in tandem with the FDA’s growing involvement. Newspapers printed the results of the FDA surveys. Magazines geared to readers concerned about food additives, such as J.I. Rodale’s *Prevention*, spotlighted the risks of antibiotic-laced foods. In July 1955 and February 1956, *Prevention* focused entire issues on milk in which the presence of penicillin received frequent mention. *Prevention*’s readers were admittedly a select group, but in 1953 even mainstream journals like *Ladies’ Home Journal* and *Newsweek* published articles under the headlines “Dangerous Drugs?” and “Lifesaving Drugs Can Harm You.” Only some of the articles about the risks of antibiotics referred specifically to their uses by dairy farmers, but they tempered optimism about antibiotics and prompted readers to be cautious about the so-called “wonder drugs.”

Federal action drove state and local health departments to test milk for antibiotics. Before 1957 FDA officials’ actions had been largely to research the extent of adulteration and issue stricter labeling laws. But, faced with continued evidence of antibiotic contamination and newly convinced of the public health threat such milk posed, the FDA announced a new initiative to eliminate antibiotic and pesticide residues in 1959. In the two-part program FDA officials would sample interstate milk shipments to test for antibiotics and encourage testing by state and local milk control agents. As federal officials tested milk and trained local and state regulators to utilize quicker methods for residue testing, the new vision of milk purity—as focused on technological adulterants as biological threats—reordered mastitis treatment on the nation’s dairy farms.

Economic changes in the dairy industry and shifting cultural ideals made the FDA’s regulatory action against antibiotic contamination in 1959 and 1960 possible. First, the FDA’s ability to restrict the sale of antibiotic-adulterated milk rested in the development of an intrastate market for fluid milk. By 1959 states that produced a milk surplus sent their products across state lines. Milk from Minnesota supplied states as distant as Kansas, Kentucky, Louisiana, Missouri, Nebraska, and Texas. Wisconsin sent as much as 85 percent of its milk and dairy products out of the state. The FDA crackdown on antibiotic residues in milk focused on five districts where fluid milk regularly crossed state lines: Chicago, Cincinnati, Baltimore, Kansas City, and Minneapolis. The same processes
of bulk-handling, long-distance shipping, and concentration in the milk market that made it more difficult to track the source of milk contamination simultaneously enabled the FDA to intensify its regulatory efforts. Second, the FDA’s regulatory action against antibiotic-laden milk relied on a shifting vision of milk purity that defined technological adulteration as akin to bacterial contamination. Cheesemakers’ concerns about the effects of drug residues on bacterial cultures in the early 1950s first alerted regulators to the problematic side effects of the use of veterinary antibiotics. As new evidence surfaced about the risks of penicillin, regulators reconceived their perspective on antibiotics, from potential purifiers to potential threats to milk safety. In campaigning against antibiotic residues in 1959 and 1960, milk inspectors asked dairy processors, veterinarians, and farm families to revise their thinking, too.²⁷

As FDA regulators readied for the agency’s enforcement activities, they reached out to state and local milk inspectors and milk processors to publicize their intended efforts to keep milk free of antibiotic residues. Industry officials willingly cooperated with the FDA action. Dairy plants—from Boston’s Hood Dairy to the Carnation Company, Kraft Cheese to the Michigan Milk Producer’s Association—sent firmer warnings cautioning patrons of the potential seizure of contaminated milk by FDA inspectors and intensified their own testing activities. Although milk processors had initially focused on the ways in which the drugs slowed cheesemaking practices, they readily incorporated evidence of the health hazards of antibiotics to convince farm families of the necessity of delivering clean milk to market. One editorial, published in the December 9, 1959 issue of Dairy Records advised patrons, “If anyone is inclined to brush off the F & D regulations on the use of antibiotics treating mastitis as just another silly rule of a bogeyman to harass the milk producer, he is sadly misinformed. The medical profession is in agreement that some people are so allergic to penicillin and other antibiotics that even minute quantities may bring serious consequences.” Food processors’ vision of purity and their justification for it mirrored those of FDA regulators.²⁸

Both dairy processors and food regulators blamed the continued presence of antibiotics in the nation’s milk on dairy farmers’ stubborn disregard for the seventy-two-hour milk withholding recommendations. Carelessness surely played a role in continued milk contamination with veterinary
antibiotics, but records of regulators suggest that the decision of dairy farmers to either disregard or embrace the withholding regulations derived from farmers’ own perceptions of milk purity and their conception of their role in upholding it. Past experiences and contemporary challenges—most importantly, the history of eradicating milk of bacterial contaminants and experiences dealing with other technological threats to milk purity—shaped the ways that farmers understood antibiotic contamination.

Farmers’ experiences dealing with bacterial contaminants filtered their understanding of antibiotic residues. Many of the farmers who erred in sending milk to market too soon after antibiotic treatment associated visible healing of cows’ udders with the return of milk to a suitable condition for sale. These farmers defined pure milk by the absence of disease bacteria, not the absence of drug residues. A dairy farmer in Kansas told the local FDA inspector that “the veterinarian had told him he could use the milk as soon as the condition for which he was treating the cow cleaned up.” Some farmers also thought that antibiotic residues, like bacteria of milk-borne diseases, were eliminated by pasteurization. Such farmers thus had to reorder their farming practice to conform to the vision of purity established by dairy companies and milk regulators.

While some farmers adjusted slowly to new ideas of milk purity, by the late 1950s and early 1960s many others were very familiar with a vision that emphasized freedom from technological adulterants. By that time, antibiotic residues were merely one of the many potential contaminants of milk; dairy farmers also struggled to respond to concerns about pesticides and particles of radioactive fallout in their product. The FDA’s proclamation of stricter testing for antibiotic residues came in the immediate wake of its action against cranberries tainted by the herbicide amonitriazole. Dairy companies used the cranberry incident to warn patrons of the risks of sending milk with antibiotic residues to market. In Pennsylvania, one dairy company headlined its farm producer pamphlet on antibiotics—“After Cranberries, Milk?” At the 1960 annual meeting of a Wisconsin dairy cooperative, the president remarked, “I know all dairymen will agree that every precaution must be taken to prevent a public loss of confidence in dairy products such as occurred in the cranberry fiasco.”

Farmers, experienced with eliminating pesticides or strontium-90 from milk were receptive to the antibiotic crackdown, partly because it
was easier. As Wesley Sawyer, president of the California Holstein-Friesian Association and Stanislaus County Farm Bureau explained:

Dairymen with whom I have talked from all parts of California as well as from several other western states, readily agree that they should be responsible for any residues appearing in milk which it is within their control to prevent. With reference to antibiotics, a tolerance at or approaching zero, although perhaps in some instances this might prove to be costly, comes under a phase of dairy management within the control of the dairyman.

Sawyer embraced tighter restrictions on antibiotic adulteration because he believed that farmers could keep veterinary drugs out of milk. His position on pesticide residues, however, differed, as he worried that farmers were being held liable for impurities caused by remote sources out of their control—such as drifting herbicides, feed purchased from distant dealers, or in the case of radioactive fallout—the military policies of foreign governments. Farmers like Sawyer were thus willing to accept new standards that redefined the lines between pure and impure milk, but only insofar as such standards for milk purity could be easily controlled through farm practice. 31

Despite the willingness of farmers like Sawyer to accept tighter standards on antibiotic residues in the late 1950s and early 1960s, historians have paid more attention to how agriculturalists resisted new federal policies on food additives than why they might have cooperated with them. The emphasis is not misplaced; in the wake of growing concern about food additives, many farm organizations and agricultural lobbyists stolidly defended their use of pesticides and growth hormones and worked to undermine the credibility of those who opposed their use. Some farmers reacted in the same way to restrictions on antibiotics. But the tone of suspicion and contentiousness that characterized debates over DDT and diethylstilbestrol (DES) did not dominate the late 1950s and 1960 discussion over keeping antibiotic residues out of milk. 32

Farmers’ measured acceptance towards the FDA’s policy on antibiotic use stemmed from multiple sources, rooted in the historic context of the 1960 campaign. First, cheesemakers and veterinarians—who had regular contact with farm families—framed the issue of antibiotic adulteration and cautioned farmers about their indiscriminate use. The production-related concerns also made it more difficult to dismiss the hazards associated
with antibiotic residues as a scare invented by FDA agents. Second, as dairy farmers contended with a growing consumer movement that questioned the purity of milk, concurring with withholding laws on antibiotics appeared to be a relatively easy way to restore confidence in their product. Finally, the calculus of risks and rewards through which dairy farmers evaluated postwar agricultural technologies offered mixed conclusions about the use of antibiotics. Farmers bristled at restrictions on DDT and DES largely because they believed benefits from the technologies far outweighed the potential health threats the substances posed. But, by the late 1950s and early 1960s, farmers were becoming disappointed with the ability of antibiotics to eradicate mastitis, especially cases caused by the recalcitrant Staphylococcus aureus. One researcher pessimistically concluded in 1960 that, despite the widespread use of antibiotic treatments, “mastitis . . . is probably as far from satisfactory control and elimination, as it ever has been in the history of modern dairying.” If farmers defended their use of DDT and DES because they thought the products did more good than harm, some within the dairy industry viewed antibiotics as a technology that offered continued risks, but only limited rewards. 33

The language with which dairy farmers and veterinarians expressed their disillusionment with antibiotics is especially revealing, for it helps demonstrate that the distrust of pharmaceutical companies was not consumers’ alone. Veterinarians and milk sanitarians who reported on continued problems with milk purity blamed the drug companies who waged relentless advertising campaigns, not just farmers who failed to abide by withholding laws. Urging more attention to dairy management than to antibiotic treatment of mastitis, one dairying expert noted, “farmers buy a lot of ‘treatment’ by brain washing drug concerns.” All the Nebraska veterinarians who responded to a 1960 survey on mastitis and antibiotics residues stated that dairymen had been “the victims of advertisers” in turning so wholeheartedly to antibiotic treatments. As agriculturalists adopted new postwar technologies into farm practice, then, some also incorporated the rhetoric of books like Vance Packard’s Hidden Persuaders. Whereas the more commonly told histories about pesticide residues or DES in the nation’s food supply differentiate the demands of food consumers from those of agricultural producers, a focus on antibiotic residues reveals even some within the dairy industry greeted new agricultural technologies with a dose of skepticism, concern, and even criticism of corporate power. 34
Despite the misgivings expressed about antibiotic treatment in the early 1960s, the use on dairy farms only increased. The changing economic and political landscape of the late 1960s and 1970s created the conditions for a greater commitment to veterinary antibiotics and a more acrimonious tone to discussions of food regulations. By the 1970s consumers’ focus on food additives sharpened. While consumers had previously expressed concerns about food purity, in the 1960s, environmentalism became a mainstream movement, and consumers a potent political force. Americans who learned from *Silent Spring* the ecological principles like those of bioaccumulation became more sensitive to the potential for technological contaminants to move through the food chain. Once contamination caused by strontium-90 and pesticide residues had been stifled through the 1963 Test Ban Treaty and a ban on DDT, consumer activists scrutinized substances they viewed as remaining threats to the food supply—including antibiotic residues.  

As consumers assumed an increasing role in defining food purity, veterinarians’ position on antibiotics shifted. In the 1960s and 1970s they continued to find that widespread use of veterinary antibiotics was accompanied by increased incidence of bacterial resistance. In the 1950s problems with increased bacterial resistance inspired veterinarians to emphasize non-pharmaceutical preventative measures and to urge farmers to treat only acute mastitis cases. But, by the 1970s, some veterinarians advocated reducing incidence of chronic mastitis by infusing antibiotics into all quarters of all cows during the dry period. Such an approach seemed more cost-effective than selective treatment for it did not require diagnostic sampling to determine which cows should be treated. While the new approach to mastitis had little impact on the presence of antibiotic residues in milk (since it was carried out when cows were not lactating), it did transform veterinarians’ position toward antibiotics. Once constituting a voice of caution, many veterinarians now advocated routine, widespread use of veterinary drugs. Thus, consumer-driven concerns—about milk purity and potential threats to public health posed by antibiotic-resistant bacteria—came to dominate the critique of veterinary antibiotics.  

Veterinarians’ shifting recommendations took place in a radically altered dairy industry. By the 1960s far fewer dairy farms produced the nation’s milk than in 1945; those dairy farm families that remained in the
business did so by increasing herd size and boosting the milk production of each cow. In such a system, dairying experts experienced even greater difficulties in convincing farm operators to take the extra time needed for preventative measures against mastitis, for in larger herds, farmers focused on overall herd production, not the clinical condition of individual cows. The bleak economic picture for remaining dairies made mastitis all the more troublesome. During the 1960s dairy farm profits failed to keep pace with increasing operating costs, and cows weakened by mastitis that produced less milk worsened problems with farm income. For some farmers, the economic pressures must have made it even more tempting to cheat on antibiotic withholding times and send milk to market before the full seventy-two hours after antibiotic treatment had passed. Seen together, then, the growing power of the consumer movement, shifting veterinary recommendations, and worsening economic conditions heightened what was at stake for farmers deciding how to utilize antibiotics on the farm and drove more contentious conversations about antibiotic residues than had characterized the late 1940s and 1950s.  

In the postwar United States, Americans redefined what constituted pure milk. Antibiotics—once seen as substances that could rid milk of bacterial hazards—became understood as food adulterants. A new standard of purity, one classifying pure milk as that which lacked bacterial hazards and synthetic residues emerged. New rules were more than a mere consequence of introducing antibiotics into farm practice; the process of determining who had the power to define food purity reflected broader social and economic trends—such as the growing power of consumers and the reorganization of the agricultural economy.  

Investigating how farm producers and veterinarians reacted to antibiotics in this early period enriches the existing literature on postwar agriculture and food safety in two ways. First, it offers a richer picture of the context in which farm families evaluated agricultural technologies in the years immediately following World War II. Decisions about whether and how to use veterinary antibiotics were tied to a wide variety of other factors—the effects of milking machines on cows’ udders, advice from milk processors, and desires to restore consumer confidence in milk. Examining the multiplicity of factors that shaped farmers’ adoption and use of antibiotics illustrates the terrific tensions facing farm producers in the postwar era, tensions more often obscured than fully explained in
histories that trace the development of regulations against residues of agricultural technologies in foods. Second, while contemporary rhetoric and historical analysis often pits all food consumers against all food producers, such investigation demonstrates that producers held diverse positions about the appropriate uses of agricultural technologies. Even as congressional representatives and USDA bureaucrats defended farmers’ use of pesticides and agricultural organizations complained about regulations on DES, some farmers willingly complied with regulations on antibiotics. When veterinarians voiced frustration with antibiotics, some utilized language commonly associated with consumer activists to do so.

Once troubling because of the production-related challenges they posed, food regulators came to act on antibiotic residues because of their potential to threaten consumers’ health. Economic changes that diminished the number of dairy farms, concentrated food processing, and sent milk across state lines empowered the FDA to intervene to ensure food safety. Tracing the history of efforts to keep milk free of antibiotic residues thus explains the circumstances of adoption and use of this new technology, but also offers perspective on the changing relationship between farm producers and food consumers in the postwar era.

NOTES


2010 Antibiotics and Agricultural Change


8. For 22 percent figure, see, Anon., “Herd Health: Mastitis,” Hoard’s Dairyman, Feb. 25, 1945, 135; C. S. Bryan, “Prevention and Control of Mastitis,” Hoard’s Dairyman, Mar. 10,


27. Shelbey Gray to Chiefs of Districts, Sept. 28, 1959; C. W. Burch to John Harvey, Oct. 28, 1959, Box 2650, FDA General Subject Files.

28. Ray Clark to George Clarke, Feb. 16, 1960, Box 2818; Kraft Foods pamphlet, Box 2821; Clyde Russell, Group Discussion Held at Michigan State University, Dec. 22, 1959; Nevis Cook, Boston District FDA Report, Dec. 11, 1959; Nevis Cook to FDA Administration, Dec. 11, 1959, Box 2650; A. M. Meekman to County Agricultural Agents, Dec. 28, 1959, Box 2818, FDA General Subject Files.
29. Cliff Shane to Kansas City District, Jan. 7, 1959, Box 2650; Jerome Trichter to George Larrick, Mar. 16, 1960, Box 2821, FDA General Subject Files.


31. Wesley Sawyer to Oren Harris, Mar. 22, 1960; K. M. Autrey to George P. Larrick, May 31, 1960, Box 2821, FDA General Subject Files.


38. Douglas, Purity and Danger, 44–45.