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The Safety of Raw versus Pasteurized Milk

It is very difficult to get a man to understand something when his salary depends on not understanding it.

Upton Sinclair

Drinking raw milk is like playing Russian roulette with your health.

John F. Sheehan, Director
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Several issues are central to the raw milk controversy in America today. Some are scientific and some essentially legal. Even the scientific issues are shrouded in legalities and politics, but we'll approach them in a straightforward and practical manner. One issue is the question of safety: How safe is raw milk? We'll answer that question by considering the historical records of both raw and pasteurized milk as agents associated with disease, and by looking at scientific evidence delineating the numerous components in raw milk that kill pathogens and strengthen the immune system.

Another scientific issue involves the health benefits of raw milk

compared to pasteurized—a subject that has been explored in many of the preceding pages. We'll look at this issue again in Chapters 16-18 as we explore why and how green pastures and contented cows produce nature's most nearly perfect food for children and adults.

Legal issues surrounding the raw milk controversy are complex and many of their ramifications are beyond the scope of this book. But we'll consider a number of practical questions. Is the alleged evidence about the dangers of raw milk so strong that the government should prohibit its being sold or even given away, as indeed has occurred in some states and countries? Even more fundamental, does our constitutional government have the right to make laws outlawing a food that has sustained much of humanity throughout recorded history? In the face of restrictive and unfair laws, what legal structures exist that may allow dairy farmers to legally make raw milk products available to consumers for reasonable compensation? How are producers and consumers of raw milk working together to change existing laws that prevent farmers from selling raw milk and its products on the open market?

The answers to these questions are shaping the way a determined minority of Americans has built a grassroots movement to make a ready supply of raw milk and raw milk products available for themselves, their families and anyone else who desires it. These committed individuals—farmers, consumers, activists, alternative medical practitioners and their patients, journalists, local, state and federal government representatives and others in public life—and the legal issues they are confronting are the subject of Chapter 19. For now, we consider a more straightforward matter: the safety of raw versus pasteurized milk.

The position of the public health and conventional medical communities on raw milk is unequivocal: they are dead-set against it. In 1986, an FDA ruling banned the interstate shipment of raw milk, butter and cream across state lines. For many years, officials in every state have pushed for laws banning all sales of raw milk, with strong support from the Centers for Disease Control (CDC) and the FDA. Within the last thirty years, legislation has banned retail sales of raw milk in most states and restricted sales to the farm where the milk is produced in many others. But no state has passed legislation against the purchase,

possession or consumption of raw milk. This fact alone argues that the incentive to ban raw milk sales is based on economic rather than public health concerns. FDA assertions that raw milk is “inherently dangerous and should not be consumed”¹ serve as a smoke screen for legislation that helps centralize the dairy industry and eliminate competition from small independent farmers.

Health officials frequently draw attention to studies claiming that raw milk has caused illness—most often issuing press releases against raw milk during outbreaks caused by other foods. However as we shall see, most of these published reports exhibit extreme bias on the part of investigators and contain numerous flaws. In fact, many studies claiming this “inherently dangerous” food as a cause of disease actually exonerate raw milk as a culprit.

RAW MILK IS INHERENTLY SAFE

While government officials have painted raw milk as a dangerous soup of pathogenic bacteria, a great deal of obscure, peer reviewed research has revealed a very different picture. After all, raw milk is the first food of every mammal on the planet. The calf that is born in the muck and manure immediately gets up and begins to suck on its mother’s unsanitary teat; likewise, the puppy crawls across filthy bedding to find its mother’s unwashed nipple. If raw milk is an inherently dangerous food, how is it that the family of mammals has survived?

Mammals including humans have survived because raw milk contains multiple, redundant systems of bioactive components that can reduce or eliminate populations of pathogenic bacteria while also strengthening the immune system of the suckling infant.

Early researchers recognized factors responsible for the germicidal property of raw milk, as described in the 1935 textbook *Fundamentals of Dairy Science*.² In 1938, researchers found that raw milk would not support the growth of a wide range of pathogens, noting that heated milk supports the growth of harmful bacteria by inactivating “inhibins.”³

Today we have detailed knowledge about these “inhibins.” The two major components, which form the backbone of this amazing system, are the enzymes lactoperoxidase and lactoferrin. The lactoperoxidase

enzyme uses small amounts of free radicals to seek out and destroy bad bacteria.⁴ It is found in all mammalian secretions including tears and saliva.⁵ Levels tend to be higher in animal milk—goat milk contains ten times more lactoperoxidase than human milk.⁶ So effective is lactoperoxidase at killing pathogens that officials in other countries are exploring the possibilities of using lactoperoxidase for ensuring the safety of other foods, and even as an alternative to pasteurization.⁷

Peroxidase enzymes such as lactoperoxidase are common in the living tissues of plants and animals and play an important role in innate immunity to infection. They are harmless to animal and plant tissue but strongly inhibit the bacterial membrane enzymes that are critical to bacterial survival. These enzymes initiate the production of powerful oxidizing agents (peroxides), which are based on sulphur groups.

Lactoperoxidase was discovered in milk one hundred years ago when cheesemakers observed that at certain times of the year starter bacteria added to milk would not work. This took place during the blooming of certain grasses high in sulphur compounds, which are readily oxidized to thiocyanates by lactoperoxidase. The thiocyanates formed are so strongly antimicrobial, they inhibit not only the pathogenic and spoilage bacteria but also the lactic acid bacteria used by the cheesemakers.⁸

The second major antimicrobial enzyme in milk is lactoferrin, which works by stealing iron away from pathogens and carrying it through the gut wall into the blood stream. Thus, this enzyme does a double duty, killing off a wide range iron-loving pathogens while helping the infant to absorb all the iron contained in the milk. In addition, lactoferrin stimulates the immune system.⁹

According to a recent review in the *Journal of Experimental Therapeutics and Oncology*, lactoferrin exhibits fungistatic, bacteriostatic, bactericidal and antiviral properties and inhibits the growth of parasites. It is effective against *E. coli*, *S. typhimurium*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Vibrio cholerae*, *Haemophilus influenzae*, *S. aureus*, *Klebsiella pneumoniae*, *Candida albicans*, *Candida crusei*, *Tinea pedis*, *Toxoplasma gondii*, *Plasmodium falciparum*, *Herpes simplex*, hepatitis C virus, human papillomavirus and various other pathogens.

It is not effective against beneficial bacteria such as bifidobacteria and lactobacillus species.¹⁰

One of the main iron-loving pathogens is the tuberculosis bacillus. In a study involving mice bred to be susceptible to tuberculosis, treatment with lactoferrin significantly reduced the burden of TB organisms.¹¹ Another iron-loving microorganism is *Candida albicans*, a yeast ubiquitously present in the digestive tract, which can cause serious health problems when conditions favor its overgrowth. Mice injected with *Candida albicans* had increased survival time when treated with lactoferrin.¹¹ Other research indicates that lactoferrin can be used to cut visceral fat levels by as much as forty percent, and that the compound has many other health benefits.¹² You can even purchase lactoferrin as a supplement—or benefit from its actions simply by drinking raw milk.

In 2004, the FDA approved lactoferrin for use as an antimicrobial spray to combat virulent *E. coli O157:H7* contamination in the meat industry! The FDA press release praised the product as an innovative way to protect the nation from food-borne illness. “Innovative technology is a critical building block in preserving the strong foundation of the U.S. food supply,” said Dr. Lester Crawford, Deputy Commissioner of the Food and Drug Administration. “We must continue to encourage scientific research and new technology to maintain this nation’s safe food supply.”¹³

Since the dawn of mammalian history, nature has provided this “innovative technology” to nursing infants to protect their vulnerable and sensitive digestive systems from the insults of invading pathogens. Perhaps this is one reason why responsibly handled raw milk rarely leads to genuine cases of food-borne illness.

Physicians from earlier times often referred to milk as white blood, a designation that modern science proves to be correct. A key player in raw milk’s anti-microbial and immune support system is white blood cells, or leukocytes, exactly the same as those found in blood. Leukocytes form the basis of milk’s safety net, consuming foreign bacteria, yeasts and molds. They also produce hydrogen peroxide to activate the lactoperoxidase system and anaerobic carbon dioxide, which blocks aerobic microorganisms.¹⁴ Raw milk contains B-lymphocytes, a type of white

blood cell that aids the immune system by producing specific antibodies; macrophages, which engulf foreign proteins and bacteria; neutrophils, which kill infected cells and stimulate the immune system; T-lymphocytes, which multiply when bad bacteria are present and produce immune-strengthening compounds; and immunoglobulins (IgM, IgA, IgG₁ and IgG₂), or antibodies, which transfer immunity from the animal producing the milk to the animal or person consuming the milk, especially in colostrum.¹⁵

Many other components in raw milk play the dual roles of fighting pathogens and supporting the immune system. These include polysaccharides, which encourage the growth of good bacteria in the gut and protect the gut wall; oligosaccharides, which protect other components in raw milk from destruction by enzymes and stomach acids while preventing bacteria from attaching to the gut lining; medium-chain fatty acids, which disrupt the cell walls of pathogens while strengthening the immune system; lysozymes and other enzymes that disrupt bacterial cell walls; hormones and growth factors, which stimulate maturation of gut cells and prevent “leaky gut;” fibronectin, which increases the antimicrobial activity of macrophages and helps repair damaged tissues; B₁₂-binding protein, which inhibits bacterial growth in the colon by reducing levels of vitamin B₁₂, while also helping the infant absorb all the B₁₂ in the milk; glucomacropeptide, which inhibits bacterial and viral adhesion, suppresses gastric secretion and promotes the growth of beneficial bacteria; bifidus factor, which promotes the growth of *Lactobacillus bifidus*, one of the helpful bacteria families that crowd out dangerous microorganisms; and the lactobacilli themselves, which proliferate in raw milk over time and crowd out bad bacteria.¹⁶

All these factors work together to inactivate pathogens “individually, additively and synergistically,” as one researcher put it.¹⁷ These protective factors “can target multiple early steps in pathogen replication and target each step with more than one antimicrobial compound.” At the same time, these compounds work to strengthen the immune system and the gut wall.

Of course, this marvelous synergistic system can be overwhelmed if milk is produced in filthy conditions, but when the cows are healthy

and the production methods clean, they ensure a product that is inherently safe.

Pasteurization largely wipes out these numerous protective factors, inactivating the various leukocytes, antibodies, enzymes and binding proteins, while reducing the activity of medium-chain fatty acids, lysozymes, oligosaccharides, hormones and growth factors, and beneficial bacteria. Ultrapasteurization—most milk is ultrapasteurized these days—inactivates lysozyme, and all but the medium chain fatty acids are inactivated in infant formula.¹⁸

Lactoperoxidase loses biological activity at 178 degrees Fahrenheit. It therefore survives pasteurization (about 160 degrees Fahrenheit) but not the ultra-high heat treatment (UHT) of 230 degrees Fahrenheit used in the production of today's long-life milks. However, even at regular pasteurization temperatures, lactoperoxidase will be greatly reduced in potency because pasteurization partially destroys the hydrogen peroxide present in the milk and also destroys the two systems that generate hydrogen peroxide, namely leukocytes and lactic acid bacteria.¹⁹

In a publication denouncing the consumption of raw milk, the FDA cites one study claiming that pasteurization does not inactivate lactoferrin.²⁰ But the authors of this study used not milk but purified lactoferrin, with its iron component removed. Although lactoferrin is more heat-stable when the iron is removed, accomplishing this removal of iron requires incubating purified lactoferrin with citric acid at 41 degrees Fahrenheit for twenty-four hours and running it through a gel filtration system. Such a "lactoferrin product" bears very little resemblance to the lactoferrin in raw milk.

In 1977, researchers showed that the original lower-temperature, longer-time pasteurization of human milk at 145 degrees Fahrenheit for thirty minutes destroys sixty-five percent of the lactoferrin.²¹ They did not evaluate the antibacterial efficacy of the remaining thirty-five percent, which may have been damaged or completely destroyed. Heating human milk to 185 degrees Fahrenheit for fifteen minutes caused ninety-six percent destruction of its lactoferrin. Again, we do not know whether the remaining four percent retained its antibacterial potency. (Remember, ultrapasteurization takes milk to even higher temperatures.)

Thus, pasteurization largely inactivates raw milk's built-in safety system. Proof of raw milk's anti-microbial properties comes from what are known as "challenge tests," where pathogens are added to raw milk and then monitored over time. For example, when the pathogen *Campylobacter* is added to raw milk, the levels decrease—in chilled milk from thirteen thousand per milliliter to less than ten per milliliter in nine days. At room temperature, the decline is even more rapid.²² In one study, researchers credited the action of lactoperoxidase in killing added fungal and bacterial agents, but decline in pathogen numbers is most likely due to the whole complex of antimicrobial factors.²³ Recently in California, Organic Pastures Dairy Company subjected their raw milk and colostrum to challenge tests monitored by an independent laboratory. Pathogen counts declined over time and in some cases were undetectable within a week. The laboratory concluded, "Raw colostrum and raw milk do not appear to support the growth of salmonella, *E. coli* O157:H7 or *Listeria monocytogenes*."²⁴

Milk's anti-microbial properties can be very frustrating to researchers. In 1985, a team of scientists tried to blame raw milk for an outbreak of *Campylobacter jejuni* in a village where virtually everyone drank raw milk from a single farm. They found the organism in rubbish heaps and watering holes, but not in the milk or milk filters. Frustrated with this result, they cultured samples right on the farm instead of carrying them in sterile containers to a sterile working space in the laboratory as is usually done, and the milk and milk filters proved contaminated. They claimed the reason they had to culture the milk on the farm was because the *C. jejuni* was unable to tolerate the "natural antibacterial effect of fresh milk" for the several hours it took to transport the milk to the lab, but they offered no explanation of how the milk could have made anyone sick if all the *C. jejuni* within it died within hours of milking. When they tried quantifying two of the positive samples after some unspecified time, the milk turned up negative. When they tried subtyping two other samples soon after collection, they failed because the bacteria could not survive long enough for them to finish the procedure.²⁵

Pasteurized milk will not pass these challenge tests. Should pathogens contaminate pasteurized milk, very little of the protective system

remains to keep them in check. And since pasteurized milk comes from large factories with wide distribution networks, contaminated pasteurized milk often results in hundreds if not thousands of illnesses and even a few deaths, as we shall see.

RAW VERSUS PASTEURIZED BREAST MILK

Much of the research that has revealed the amazing anti-microbial and immune supportive properties of raw milk has been carried out on human milk. However, these discoveries apply to the milk of all mammals; in fact, as we have seen, protective components such as lactoperoxidase are often higher in the milk of animals.

Human milk requires the same antimicrobial system as animal milk because human milk is not pathogen-free. The notion that human infants suckled a sterile product, as scientists for many years believed, has given way to the realization that human milk contains many pathogens. For example, scientists in Finland detected several strains of *Staphylococcus aureus*, “known as a causative agent of maternal breast infections and neonatal infections” in human breast milk samples.²⁶ Scientists in Canada report that breast milk “is a body fluid capable of transmitting blood-borne pathogens when ingested.”²⁷

In fact, in a screening program for expressed breast milk in China, testing revealed “the alarming fact that our study group had the highest rate of contamination ever reported.”²⁸ Pathogenic bacteria in the milk included enterococci and *Staphylococcus aureus*. The research team speculated that the high rate of contamination “could be due to the Chinese tradition of avoiding bathing for one month after childbirth.” Apparently, mother’s milk picks up numerous pathogens from the skin; and one theory holds that immune signals for pathogens are also transferred to breast milk via ducts that connect with the digestive tract.²⁹

The protective factors in milk inhibit not only existing pathogens but also “anticipate new mutations and new pathogens . . .”³⁰ The immunological factor IgA, for example “appears to reflect long-term maternal immunologic memory.”³¹ This explains the Chinese wisdom—shocking to investigators—of not bathing for a month after giving birth. When the infant suckles milk containing pathogens, the immunological factors in

that same milk can program the infant for protection against a myriad of pathogens, and can protect him for life! These studies can only inspire awe and wonder at the exquisite processes that support biological life.

Other studies on human milk show that heating reduces the ability of milk to protect against infections. In 1984, researchers in India carried out a randomized controlled trial involving two hundred twenty-six high-risk newborns, given combinations of formula and raw and pasteurized human milk. The highest rate of infection occurred in the group given pasteurized human milk plus formula (thirty-three percent). Those given raw human milk plus formula had a sixteen percent rate of infection and those given pasteurized human milk alone had just over a fourteen percent rate of infection. The lowest rate of infection was about ten percent in the group given raw human milk only.³²

Scientists in Africa looked at ways of storing human milk. No growth of pathogens was observed in raw human milk stored four hours at high temperature (eighty-six to one hundred degrees Fahrenheit), eight hours at room temperature (fifty nine to eighty-one degrees Fahrenheit) and twenty-four hours at refrigerator temperature (thirty-nine to fifty degrees Fahrenheit).³³ They concluded that “although freezing temperature (thirty-two to thirty-nine degrees Fahrenheit) seemed safest for breast milk storage, short-term storage in a freezer was not recommended due to the likely hazards of the thawing process.” Another study found that raw human milk was safe for human consumption for up to seventy-two hours refrigerated.³⁴ Longer-term storage by freezing did not cause safety problems.

Unfortunately, human milk donated to breast milk banks is routinely pasteurized before freezing, thereby destroying the many protective mechanisms that human milk can confer on premature babies. And accidents do happen. A recent outbreak of *Pseudomonas aeruginosa* in a neonatal intensive care unit caused by a contaminated milk bank pasteurizer resulted in thirty-one cases of infection and four deaths.³⁵

Pasteurization not only compromises the safety of breast milk, it also compromises its nutritional value. For example, researchers in 1986 published a randomized controlled study to assess the effect of pasteurization of breast milk on the growth of very-low-birth-weight infants.

Infants bottle fed untreated milk from their own mothers grew more rapidly than those fed pasteurized pooled preterm milk.³⁶ Another study carried out in the same year also found reasons for concern about the effect of heat sterilizing breast milk. Researchers compared the results of feeding pooled pasteurized breast milk with their own untreated mother's milk to very-low-birth-weight babies. Those receiving unpasteurized human milk had significantly more rapid weight gain. Researchers attributed the lower weight gain in babies fed pasteurized human milk to the destruction of lipase, an enzyme needed to utilize milk fat.³⁷

From a study published in 1977 we learn: "Human milk was subjected to heat treatments of graded severity and examined for its content of immunoglobulins, lactoferrin, lysozyme, vitamin B₁₂- and folate-binder proteins, and lactoperoxidase. Holder pasteurization [146 degrees F for 30 minutes] reduced the IgA titer by 20 percent, and destroyed the small content of IgM and most of the lactoferrin. Lysozyme was stable to this treatment, but with an increase in temperature there was progressive destruction, to near 100 percent at 212 degrees F. The same was broadly true of the capacity of milk to bind folic acid and protect it against bacterial uptake; with vitamin B₁₂ the binder was more labile at 167 degrees F than at 212 degrees F. The [heat-treated] milk contained no detectable lactoperoxidase."³⁸

Government officials widely support giving raw milk to infants—as long as that raw milk is human breast milk. According to a document posted at the Centers for Disease Control website, "Mother's milk is the safest food for young infants. Breastfeeding prevents salmonellosis and many other health problems." Yet the same website contains the following warning against salmonella: "Cook poultry, ground beef, and eggs thoroughly before eating. Do not eat or drink foods containing raw eggs, or raw unpasteurized milk."³⁹ For mothers who are unable to breastfeed for whatever reason, or who simply choose not to do so, the logical alternative is homemade formula based on raw milk from another mammal, but official government policy adamantly opposes giving raw milk from animals to infants, recommending manufactured formula instead, a product that is highly synthetic and which has its own safety issues. Between 1982 and 1994 alone, there were twenty-two significant recalls of

infant formula in the United States due to health and safety problems.⁴⁰ (For more on infant formula based on raw milk, see Chapter 16.)

Thus, while research on human milk has revealed numerous protective components in raw milk, the bureaucrats in our government agencies are mired in forty-year-old science. Next time one of these unenlightened souls tells you that the milk you give your children has to be pasteurized for their protection, ask them whether the pathogen-loaded breast milk mothers give their infants needs to be pasteurized as well.

THE DANGERS OF PASTEURIZED MILK

Public health officials claim that pasteurization is “the only way to ensure that milk is safe to drink.” Indeed, milk in general—both pasteurized and raw—is a particularly safe food. For example, in 1997, milk and milk products accounted for only two-tenths of one percent of all reported cases of food-borne illness.⁴¹ Barring post-pasteurization contamination, residual amounts of protective factors that remain after pasteurization are probably adequate to combat most heat-resistant pathogens found in commercial milk.

Nevertheless, pasteurized milk sometimes causes illness, and when it does, the outbreak usually involves many individuals. A 1976 outbreak of *Yersina enterocolitica* from pasteurized chocolate milk sickened thirty-six children, sixteen of whom required appendectomies.⁴² In 1982, the same organism sickened seventeen thousand pasteurized milk consumers in several states. The tainted milk was traced to a pasteurizing plant in Memphis, Tennessee.⁴³ A 1983 outbreak of *Listeria monocytogenes* sickened forty-nine people in Massachusetts and caused fourteen deaths.⁴⁴ Almost two hundred thousand individuals may have been sickened from the outbreak of *Salmonella typhimurium* that took place in the Midwest in 1984-85,⁴⁵ discussed in Chapter 12.

During the 1990s, the most serious incidents included an outbreak causing over two thousand *Salmonella enteritidis* illnesses from pasteurized ice cream in Minnesota, South Dakota and Wisconsin⁴⁶ and an outbreak of *Yersina enterocolitica* in pasteurized milk that sickened ten children, three of whom were hospitalized.⁴⁷

And there have been recent outbreaks as well. In 2000, *Salmonella*

typhimurim from pasteurized milk sickened almost one hundred individuals in Pennsylvania and New Jersey.⁴⁸ *Campylobacter jejuni* from pasteurized milk sickened two hundred inmates in a Colorado prison in 2005⁴⁹ and almost sixteen hundred inmates in a California prison in 2006.⁵⁰ In 2007, three people in Massachusetts died from *Listeria monocytogenes* in pasteurized milk.⁵¹ Yet no one from the FDA or other government agencies describes pasteurized milk as “inherently dangerous” or calls for its removal from the marketplace.

THE DANGERS OF OTHER FOODS

According to a Center for Science in the Public Interest (CSPI) report, between 1990 and 2004 the following outbreaks occurred:

31,496 illnesses, 639 outbreaks from produce
16,280 illnesses, 541 outbreaks from poultry
13,220 illnesses, 467 outbreaks from beef
11,027 illnesses, 341 outbreaks from eggs
9,969 illnesses, 984 outbreaks from seafood

The largest percentage of outbreaks came from seafood (thirty-three percent of the total) while the largest percentage of illnesses came from produce (thirty-eight percent of the total). While dairy foods (both pasteurized and raw) contribute to less than one percent of all reported food-borne illnesses, the risk from other foods is large.⁵²

According to Robert Tauxe, CDC Chief of the Food-borne and Diarrheal Diseases Branch, food-borne pathogens such as campylobacter, *E. coli O157:H7*, *Yersina enterocolitica*, cryptosporidium and listeria, have emerged only within the past twenty-five years. In contrast, the five pathogens that plagued the early decades of the 1900s, when pasteurization was implemented, those causing brucellosis, botulism, typhoid fever, trichinosis and cholera, combined account for only one one-hundredth percent of food-borne illnesses today. Most of those are associated with foreign travel.⁵³

Tauxe reports that thirteen recently emerged pathogens are responsible for a majority of the seventy-six million cases of food-borne illness,

three hundred thousand hospitalizations, and five thousand deaths annually, and he estimates that one in four Americans experiences a food-borne illness every year. The following are some major pathogens and their reported cases per annum:

Campylobacter	1,963,000
Salmonella	1,342,000
<i>E. Coli O157:H7</i>	92,000
<i>Yersina enterocolitica</i>	87,000
Listeria	2,000

The majority of food-borne illness is caused by Norwalk-like viruses (noroviruses), which account for over nine million cases per year. These viruses are resistant to both freezing and high temperatures. CDC currently does not conduct active surveillance to monitor outbreaks of gastroenteritis caused by noroviruses.

Many factors common to modern life explain the emergence of these new pathogens—overuse and misuse of antibiotics, crowded feedlots, low-quality and low-cost animal feed, globalization of the food supply, and reduced human immunity due to poor nutrition.

The CSPI statistics may be an underestimation. Eggs contaminated with salmonella—we looked at how nearly all eggs are produced in Chapter 11—are said by some authorities to sicken three hundred thousand and kill hundreds of Americans each year.⁵⁴ A nationwide study published by the USDA in 1996 found that over seven percent of ground beef samples taken at processing plants were contaminated with salmonella and almost twelve percent were contaminated with listeria.⁵⁵ In contrast with the situation in this country, Sweden began a program over forty years ago to eliminate salmonella from its livestock, and only about one-tenth of one percent of Swedish cattle harbor salmonella today. Salmonella has also been almost completely eliminated from Swedish eggs.⁵⁶

It's not just salmonella and listeria that taint American meat and processed foods. Thirty percent of ground beef samples taken at processing plants were contaminated with the pathogen *Staphylococcus*

aureus and over half with *Clostridium perfringens*. “All of these pathogens can make people sick,” wrote Eric Schlosser in *Fast Food Nation*. “Food poisoning caused by *Listeria* generally requires hospitalization and proves fatal in about one out of every five cases. In the USDA study, 78.6 percent of the ground beef contained microbes that are spread primarily by fecal material. The medical literature on the causes of food poisoning is full of euphemisms and dry scientific terms: coliform levels, aerobic plate counts, sorbitol, MacConkey agar and so on. Behind them lies a simple explanation for why eating a hamburger can now make you seriously ill: There is shit in the meat.”⁵⁷

And it’s also in white meat. Over seventy percent of chicken samples tested in Washington, DC grocery stores in 1999-2000 came back positive for campylobacter; almost fifteen percent of turkey samples contained the pathogen. By contrast, the same survey found that less than two percent of pork samples tested positive for the organism and only one-half percent of beef samples.⁵⁸

Organisms that cause illness are ubiquitous—and tenacious. *E. coli* and *Salmonella enteritidis* can survive on coins for a week or more, and *Salmonella enteritidis* can survive on glass or Teflon for up to seventeen days.⁵⁹

Milk substitutes also harbor pathogens. A 1998 survey found five types of microorganisms in four brands of stored soy milk samples. During storage at forty-one degrees Fahrenheit, microbial counts increased sharply after two to three weeks.⁶⁰ Dry, powdered foods are not safe either. A 1978 survey found salmonella in many “health food” products including soy flour, soy protein powder and soy milk powder.⁶¹

The same thing that contaminates our meat and eggs—manure from confinement animal operations—is also a major source of contamination in fruits and vegetables. Documented outbreaks of human infections associated with consumption of raw fruits, vegetables and unpasteurized fruit juices have increased dramatically in recent years. According to the Centers for Disease Control and Prevention, in the U.S. the number of reported produce-related outbreaks per year doubled between the period 1973-1987 and 1988-1992. These include salmonellosis linked to tomatoes, seed sprouts, cantaloupe, apple juice, and or-

ange juice; *Escherichia coli* O157:H7 infection associated with lettuce, sprouts and apple juice; enterotoxigenic *E. coli* linked to carrots; shigellosis linked to lettuce, scallions and parsley; cholera linked to strawberries; parasitic diseases linked to raspberries, basil and apple cider; hepatitis A virus linked to lettuce, raspberries and frozen strawberries; and Norwalk or Norwalk-like virus linked to melon, salad and celery.⁶² In 1997, fruits, vegetables and salad contributed to thirty-six outbreaks compared to only nine for chicken, three for eggs and two for milk.⁶³

In the fall of 2006, a particularly virulent outbreak of *E. coli* O157:H7 traced to spinach grown in California's Salinas Valley sickened over two hundred individuals and caused three deaths.⁶⁴ This was followed by a lettuce outbreak that made seventy-one people ill.⁶⁵ In both outbreaks, many people ended up in the hospital, most with bloody diarrhea, but in a few cases, the bacteria released toxins into the bloodstream that caused the kidneys and other organs to shut down.

Investigators noted that potential environmental risk factors for *E. coli* contamination at or near the fields included the presence of wild pigs, the proximity of irrigation wells used to grow produce for ready-to-eat packaging and surface waterways exposed to feces from cattle and wildlife.⁶⁶ In other words, infected manure from animals and wildlife was the likely cause of the outbreak. And the most likely source of infected manure—which is used as fertilizer and also ends up in well water and irrigation water—is confinement animal operations, including confinement dairy operations.

The Centers for Disease Control cites increased consumption of fruits and vegetables, which Americans are urged to eat as “part of a healthy diet,” as a factor in the huge increase in food-borne illness from plant foods. There are no requirements for pasteurizing these foods we're supposed to eat more of; in fact, consumers are encouraged to eat them raw. FDA advises consumers that all produce should be thoroughly washed before it is eaten, but in the latest outbreaks, washing the produce would not have prevented illness. That's because these bacteria can grow inside the leaves of lettuce, spinach and other vegetables and fruit, where surface treatments cannot reach. In addition, microbes can organize themselves into tightly knit communities called biofilms, which

coat fruits and vegetables and protect the bacteria from water and antimicrobial solutions.⁶⁷

The raw milk movement provides a real solution to the problem of food-borne illness—because raw milk consumers make sure their milk comes from small, pasture-based farms and healthy animals unlikely to harbor pathogens and unlikely to contribute to water pollution; and because raw milk builds immunity to disease-causing organisms that are simply a natural part of the world in which we live.

REPORTS OF ILLNESS FROM RAW MILK: A HISTORY OF BIAS

So if raw milk is inherently safe, why do we so often hear that raw milk causes illness? What about all the reports in the scientific literature linking outbreaks of disease to raw milk? The answer lies in the attitude of bias against raw milk held by most scientists and government officials. So ingrained is this prejudice that researchers may not even be aware of their lack of impartiality. Yet a careful reading of the published literature reveals a long history of unfounded assumptions, inappropriate sampling techniques and tortured conclusions used to build a case against raw milk. Often a single biased report that finds an association of raw milk with illness—and an association is not the same as a proven cause—serves as justification for shutting down a raw milk dairy or passing more restrictive laws. In fact, the pattern of raw milk “incident” leading to restriction of access to raw milk happens so frequently that some raw milk activists have raised the spectre of deliberate sabotage.

For many years, the state of Georgia was a raw milk state, due in large part to the persistence of Mathis Dairy in Dekalb, one of the last certified raw milk dairies in the country. Numerous attempts to pass legislation against raw milk in the state had failed, thanks to the popularity of the dairy and its iconic mascot, Rosebud the cow. But a 1983 outbreak of campylobacter in Atlanta gave authorities the ammunition they needed. Raw milk was banned in Georgia as a result of the incident. The report on the outbreak, published in the *American Journal of Epidemiology*, noted that “extensive testing failed to find campylobacter or any other pathogens in any milk products from the dairy. All safety measures had been followed faithfully.” Yet the authors concluded, “The

only means available to ensure the public's health would be proper pasteurization before consumption."⁶⁸ Ironically, this study was published shortly before the massive 1984-85 outbreak traced to a pasteurizing plant in Melrose Park, Illinois, in which almost two hundred thousand midwesterners were sickened by salmonella from *pasteurized* milk.

Raw milk sales are not allowed in the state of Wisconsin. But in June of 2000, the owners of Clearview Acres in Sawyer County started a cow share program to meet the burgeoning demand for raw milk. The program had approval from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), which suggested a format used by another state-authorized cow-share program in Wisconsin. However, Clearview owners were not satisfied with the two-page contract that DATCP suggested, finding that it did not contain enough provision for testing and safety. The revised contract allowed for greater safety protocols, and the program was soon supplying milk to three hundred individuals.

During a twelve-week period beginning November 10, 2001, an outbreak of *Campylobacter jejuni* caused diarrhea, abdominal cramps and fever in hundreds of people in northwestern Wisconsin. Officials blamed the outbreak on the consumption of raw milk from Clearview Acres, an accusation formalized in a DATCP report issued June 28, 2002 and posted on the CDC website.⁶⁹ According to a report, seventy out of seventy-five persons confirmed with the illness drank unpasteurized milk from the dairy.

The owners of the dairy did their own research by contacting emergency rooms in the area. According to their estimates, the campylobacter infection afflicted as many as eight hundred individuals—most of whom did not drink raw milk—throughout northwest Wisconsin. Reports of illness continued for eight weeks after provision of raw milk to cow-share holders had ceased.

Only twenty-four of three hundred eighty-five cow-share owners became ill—eight confirmed cases and sixteen probable family members of the eight confirmed. Most of these had consumed hamburger at a local restaurant. No illness occurred in the remaining three hundred sixty-one individuals consuming raw milk from Clearview Acres dairy.⁷⁰

The discrepancy in government figures and those of Clearview Acres was due to interview tactics by local officials. Afflicted individuals who showed up at the nearest local hospital were questioned as to whether or not they drank raw milk. Medical personnel tested only those who answered yes. All others were given an antibiotic and sent home without further investigation—and thus not included in the official count of those who got sick. Reports of illness in other hospitals were ignored.

Clearview Acres was a Grade A dairy with an excellent history of cleanliness. In fact, in October 2001, Clearview Acres received the second highest rating of all farms receiving federal inspection. The rating was ninety-nine out of a possible one hundred. The dairy regularly tested its milk for the presence of pathogens. All tests, including those for campylobacter, had been negative. During the outbreak, DATCP tested Clearview Acres milk for campylobacter in state laboratories and claimed the results were positive. Clearview Acres' own tests were negative.

Documents released in the court case involving Clearview Acres indicate that the state instituted an undercover operation shortly after the cow-share program began, with the express purpose of shutting down the operation. When state tests of Clearview Acres milk consistently came up negative, the state attempted to take away the farm's Grade A permit, but was stymied for lack of jurisdiction. Finally, DATCP blamed Clearview Acres milk on the local campylobacter outbreak and issued a cease-and-desist order.

The bias in sampling techniques, underreporting of widespread illness, suspicious results of the state's campylobacter test and the documented clear intent on the part of officials to shut down the cow-share operation would prevent any honest investigator from concluding that the raw milk from Clearview Acres had caused the outbreak. Yet this report still remains on the CDC website, and officials often cite the Wisconsin outbreak as an argument against the consumption of raw milk.

Ohio has prohibited the sale of raw milk since 1997 with a grandfather clause allowing any farmer licensed to sell raw milk before 1965 to continue. The last farm to hold a raw milk permit, Young's Dairy in Yellow Springs, voluntarily gave it up in January of 2003 after an outbreak

of salmonella that sickened forty-seven people, sixteen of whom worked on the farm. The strain originated elsewhere in the state and officials could not positively attribute the problem to Young's.⁷¹ Nevertheless, the state put considerable pressure on the dairy—threatening to take away their Grade A license and close down the pasteurized portion of their business—which then closed down the raw milk portion of their operation.

The outbreak and subsequent decision by the dairy came just one week after the Ohio Farm Bureau Federation voted to support an effort aimed at permitting more people to sell raw milk. The majority of the more than four hundred delegates to the group's annual meetings, all active or retired farmers from across the state, stated that farmers who wanted to sell raw milk should be able to obtain a license to do so. Then came the incident at Young's Dairy. Coincidence? We think not.

LISTERIA AND RAW MILK: BUILDING A CASE IN PENNSYLVANIA

Listeria monocytogenes is a dangerous pathogen that can cause fever, muscle aches and gastrointestinal symptoms such as nausea and diarrhea. But although raw milk has been blamed for many types of illness, it has not historically been associated with *Listeria monocytogenes* (*L. mono.*). In response to a freedom of information request by the Weston A. Price Foundation, submitted in early 2007, the Centers for Disease Control provided data on raw milk outbreaks for the period 1973-2005. The report listed no cases of food-borne illness from fluid raw milk caused by listeria during the thirteen-year period.⁷² (There were a number of cases that linked Mexican-style raw milk cheese with listeria—more on this later.)

Suddenly, however, raw milk and listeria were in the news. On April 7, 2007, the Pennsylvania Department of Agriculture (PDA) issued a press release stating that raw milk from the farm of Clark and Elaine Duncan had tested positive for *L. mono.* The milk inspector had taken the sample on March 31 and obtained the results on April 4. Up to that point, PDA policy allowed raw milk sales to continue unless a second milk sample also came back positive, but the new head of dairy safety, Bill Chirdon, immediately suspended milk sales after the single negative

test. The Duncans sent a sample to a private lab the week following their suspension and that came back positive as well. However, there were no reported illnesses from the dairy's customers.

On April 4, the same day the Duncans' test results came back positive, PDA told Arnold and Esther Diller of Piney Ridge Farm in northwestern Pennsylvania that they were suspending their raw milk sales because their milk had tested positive for listeria. Arnold Diller subsequently sent a sample to an independent lab, which came back negative. As a condition for resuming sales on their farm, their inspector gave them a list of tasks to accomplish for reinspection. After repeatedly failing to clean a piece of milking equipment to the satisfaction of the inspector, the Dillers turned in their license to PDA.

The Dillers had obtained their permit not long before, in 2006, in response to increasing consumer demand, and thus became one of the few permitted raw milk dairies in western Pennsylvania—most Pennsylvania dairies holding permits are in the eastern part of the state. Some of the Dillers' customers picked up the milk at a local health food store. Shortly before the state's positive listeria tests, a Pennsylvania food and safety inspector witnessed the raw milk in a walk-in cooler and voiced disapproval, even though no law prohibits the practice. One of their customers was a state representative who had earlier told PDA officials how happy he was to be able to get raw milk from the Dillers. In what seemed like an attempt to discourage the lawmaker from remaining a customer, the night before PDA issued the press release about the positive test results, the agency faxed a copy of it to the representative.

Not long after their sales were suspended, the Dillers were told by a state employee from Harrisburg that if they voluntarily gave up their raw milk license, their problems with the state would clear up. Instead, the Dillers re-applied, and in response to considerable pressure from the local chapter leader of the Weston A. Price Foundation, who insisted on a meeting with Bill Chirdon, their permit was reinstated—after considerable foot dragging—in August of 2008.

The most suspicious example of biased PDA policy involved the Beulah Land Jersey Farm, owned by Dennis and Joanne Wenger. The Wengers sold milk for pasteurization to Dairylea and also had a raw

milk permit. On April 8, both U.S. Dairy (a state-approved independent lab) and the PDA took samples from the bulk tank. The next day, the milk hauler for Dairylea picked up milk. On April 11, PDA informed the Wengers that their test was “presumptive positive” for listeria and requested they discontinue selling raw milk. Additionally, the PDA test results showed a somatic cell count (SCC) of over one million. On April 14, the PDA called to say that the test had confirmed “positive” for listeria and that they would have to discontinue raw milk sales. By this time the Wengers had received the results from both U.S. Dairy and Dairylea showing SCC under two hundred thousand. The Wengers faxed copies of these test results to PDA.

On April 15, 16 and 17, MicroBac (another state-approved independent lab) came to the farm to take samples from the bulk tank for listeria testing. On April 16, Dennis Wenger called two state senators to inform them about the large discrepancy in somatic cell counts between PDA’s test results and those of U.S. Dairy and Dairylea. Later that day, Mr. Wenger received a call from Bill Chirdon, who insisted that the PDA laboratories “never made a mistake.”

After some discussion, Chirdon offered to retest the Beulah Land Jersey Farm milk. The next day, on April 17, the state came to take samples. The SCC test results for this sample were considerably lower than the first PDA test but still much higher than those obtained by the other two labs.

On Saturday, April 19, the Wengers received the test results from the first sample taken by MicroBac—negative for listeria. On the following Monday, the state lab made a highly unusual call to MicroBac to find out the results of the Wengers’ samples. MicroBac refused to release the information without the Wengers’ consent. The state then called the Wengers to inform them that their sample was negative. This was followed by a call from MicroBac saying that the second and third samples had also tested negative. PDA reinstated the Wengers’ raw milk permit on April 22.

It is important to stress the fact that not one of these dairies’ customers got sick from listeria, in spite of the PDA’s positive test results. Yet press releases linking raw milk with listeria remain on government

websites and now abound on the internet. The sudden advent of findings raises the strong suspicion that the PDA wanted to build a case linking raw milk with *L. mono.* where none existed before. As a result of these incidents, many farmers have turned in their permits or have not renewed them, and are claiming their constitutional right to sell milk directly to consumers without a license. As Dennis Wenger stated, “I never questioned the state inspection system before, but now I don’t trust them at all.”

Health officials have withheld another important fact: microbiologists currently believe that only a few of the hundreds of types of *L. mono.* are actually pathogenic.⁷³ Thus, when initial tests for *L. mono.* come back positive, those charged with testing protocols for raw milk should stipulate further tests to determine the specific strain. Unfortunately, such testing is expensive and never definitive. Read on.

THE SOFT SCIENCE OF MICROBIOLOGICAL TESTING

Most people have a high regard for science, and they assume that the results of laboratory tests are precise—that they are the Truth with a capital T. However, in reality, microbiological testing is more art than science, and fraught with pitfalls. Every step of testing procedures provides the possibility for error: samples can be contaminated, mishandled or even mislabeled and analytical results can be misleading and misinterpreted. Most important, testing requires personal skill and judgment that can significantly impact the ultimate results.

Microbiological testing must accomplish three things: determine whether a bacterium is present; then determine the specific type of bacterium from thousands of others with similar characteristics; and if present determine how many there are. In other words, find, distinguish and count.⁷⁴

The typical laboratory technique for finding bacteria begins with sample collection—which must be performed carefully to avoid contamination and prevent the numerous ways in which the sample’s content may be changed. The sample is then inoculated into an enrichment liquid to encourage growth of certain bacteria and suppress others. To isolate individual bacteria colonies, the enrichment liquid is streaked

across a petri dish containing nutrients solidified in agar. Standardized careful streaking—usually done by hand—helps create individual bacteria colonies containing thousands of bacteria and make them visible. This traditional means of “isolation” is based on the idea that if spread thin enough, each separate colony will grow from a single bacterium. If there were different types of bacteria in the sample, so the thinking goes, each would separate out and develop into individual colonies that could be further tested for identification.

Counting often involves making careful serial dilutions so that one tube contains low enough numbers to make counting possible, and then performing several tests on each. One traditional counting technique relies on tables to determine the “most probable number.” For example, if the table gives a count of ninety-three colony-forming units per milliliter, the statistical analysis acknowledges that the actual number in this example could be as low as eighteen or as high as four hundred twenty.

Variability in results is constantly present. For example, samples taken from the same bulk tank will vary according to how the sample was collected, whether the milk was thoroughly stirred, whether the samples were kept in the inspector’s pocket, how long before the sample was tested and whether they were tested in the same or different laboratories. When counting is performed using highly advanced automated machines, additional errors can be committed by the lab technician, or result from machine dysfunction or incorrect calibration of the equipment.

To determine the type of bacteria present once they have isolated a colony, technicians use various tests to detect the production of a metabolite, gas or enzyme, a change in pH or hemolysis (the breaking open of red blood cells). For example, coliform colonies produce gas and turn blue when a special compound is added to a manufacturer’s specially formulated petri dish.

There are literally hundreds of test kits available to determine the kind of microorganism present, all intensely marketed by the manufacturers. If funding or patience is limited, wrong kit choices on the first few attempts may result in a failure to identify the specific type of bacteria. And as every step of the testing procedure must be defined and followed

exactly, and requires the personal skill, judgment and honesty of the technician, opportunities for error are numerous. Simple clerical error in recording test results is one of the most common sources of incorrect results.

And then there is the problem of deliberate bias. As explained by Dr. Ted Beals, a pathologist with many years of laboratory experience, when investigators have preconceived ideas about what they are looking for, they have ways of finding it. They can

- ♦ Stop pursuing a question as soon as they get the answer they want;
- ♦ Keep trying until they get the answer they want;
- ♦ Fail to admit to possible misinterpretation if they get the answer they want;
- ♦ Say nothing if they don't get the answer they want.

During the period of alleged *L. mono.* contamination described earlier, officials from the Pennsylvania Department of Agriculture spoke with pride about their newly equipped state laboratory, which uses a rapid testing system, the VIDAS 30, developed by the food industry, to get quick preliminary results. But even this system requires overnight incubation of samples and specialized growth conditions, and often further “gold standard” testing fails to confirm the results obtained by the rapid testing system. In addition, the equipment was developed by the industry to err on the side of false positives. This is appropriate for internal quality testing by the food company. For industry, some false positive results for pathogens are acceptable using the rapid testing system. The food company can then play it safe by withholding food from distribution until further confirmation, or nonconfirmation, is obtained. However, false positive preliminary results used by regulators, to force the shut down of a dairy operation before confirmation, is scientifically inappropriate and can be devastating to small family dairies.

There is also the question of whether such rapid testing techniques are even appropriate for use on a living food like raw milk, which naturally contains bacteria that can confuse a machine programmed to de-

tect a short list of characteristics that might be present in organisms that do not cause disease. And standard operating procedures are extremely specific for each test, each sample type and each type of equipment. Rapid testing equipment was not developed for fresh raw milk intended for direct consumption. It has been standardized for raw milk intended for pasteurization or pasteurized milk, so it is neither fair policy nor good science to use the same testing protocol for the two products.

If preliminary test results are positive, such as for listeria, the laboratory then uses a culturing technique intended to suppress the growth of anything in the culture other than bacteria like listeria. This is a fair test if the milk is pasteurized, because pasteurized milk is a dead food with no good bacteria to out-compete pathogens. Australian microbiologist Ron Hull, PhD, has carried out tests showing that in raw milk, the threat of listeria goes away with time because good bacteria gradually increase and eventually render listeria harmless.⁷⁵

Furthermore, only a few strains of *Listeria monocytogenes* are associated with disease outbreaks.⁷⁶ Once *L. mono.* has been detected, additional (and often expensive) tests are needed to determine whether the bacteria are of the virulent type that causes illness in humans. And even if a laboratory finds a small number of pathogenic organisms—some new techniques are so sensitive they can find a single bacterium in very large samples—this does not mean that the consumption of a glass of raw milk testing positive will necessarily cause disease. With most organisms, it takes thousands or even millions of virulent organisms to make someone sick.

Comparing raw milk to pasteurized milk is like comparing a fresh product with a cooked product. For this reason, a zero tolerance approach is appropriate for pasteurized milk but not for raw milk, because raw milk contains good bacteria present to overwhelm any pathogens present. What's needed are studies to quantify how high the infectious dose in raw milk would have to be before it could cause illness in humans consuming the product.

USDA publishes an infectious dose for most food-borne pathogens even though they acknowledge that it is unlikely to be the same in all foods or in different people.⁷⁷ But the agency has never conducted

studies to determine what the infectious dose for pathogens would be in fresh raw milk intended for human consumption.

The current zero tolerance standard for listeria in raw milk is not appropriate because, as the experience in Pennsylvania has shown, large numbers of people consuming raw milk reported as testing positive for listeria are not getting sick. The policy causes economic hardship for raw milk producers and supply interruptions for consumers. The fact that the Pennsylvania Department of Agriculture did not until recently suspend a raw milk permit when the first test was positive shows a fundamental acceptance of this concept—that the tolerance levels for listeria and other pathogens in raw milk is not zero.

According to Dr. Beals, microbiological testing should be used on the farm, where a farmer can use routine periodic testing to monitor the health of his herd, the handling of milk and the cleanliness of the containers and equipment. The appropriate use of laboratory testing for pathogens occurs *after* an illness is reported. Then testing samples from the sick person can be used to track the specific virulent bacteria to determine whether food was the source of the infection. Sophisticated fingerprint characteristics can be essential to pinpoint the exact source and allow for corrective actions to minimize risk to other people without unnecessarily harming the precarious cash flow of small farmers.

SURVEY TECHNIQUES: MORE BIAS

When investigators put together a report on an outbreak of food-borne illness intended for publication in a scientific journal, they depend not only on laboratory test results, but also on data about the individuals who got sick. And this data can be chosen and manipulated in such a way as to give the conclusion the investigators are seeking. Dr. Beal's postulates listed above apply equally well to sampling methods as they do to testing protocols—ask questions that elicit the answer you want, stop asking questions when you get the answer you want, deny any possibility of misinterpretation when you get the answer you want, and say nothing about data that conflict with the answer you want. . . then proclaim the answer you wanted to the public via scientific articles and alarmist press releases.

If health officials can possibly link an incidence of disease with raw milk, they will. The outbreak in northern Wisconsin, described earlier, provides a typical example. Hospital personnel were able to create a statistical association between illness and raw milk by excluding those who were sick but did not drink raw milk. Food questionnaires used to determine the source of illness always contain a question about raw milk consumption. Often it is the first question.

At a Pennsylvania Senate hearing on raw milk held in September, 2007, one attendee related the following story. After consuming underdone chicken in a local restaurant, her daughter became violently ill and was taken to the hospital. The diagnosis was listeriosis. Several weeks later she received a call from the health department. Their first question: “Did your daughter drink raw milk?” The woman assured the health department that her daughter did not drink raw milk and told them she suspected the underdone chicken her daughter had eaten. But the questioner was distinctly uninterested in the chicken. After repeating the question several more times, “Are you sure your daughter did not consume raw milk?” the official terminated the conversation. This occurred during the period, described earlier, when the Pennsylvania Department of Agriculture (PDA) was claiming that milk from several raw milk dairies was contaminated with *Listeria monocytogenes*.

Here’s another disturbing report from a Pennsylvania activist, which occurred during the same period: “Recently I had occasion to speak with a dairy farmer who had been in the news and was the subject of harassment by the Pennsylvania Department of Agriculture. I learned that a family member had been harassed by telephone when her baby came down with salmonella poisoning. The rest of the family had eaten chicken from a fast food restaurant and drank raw milk from this particular farm, yet only the baby became ill. The baby had not consumed either food but was on formula—not breast milk, not raw cow’s milk, not store-bought cow’s milk. Yet the daily harassment by phone from the Pennsylvania health department had brought the mother to near collapse as she tried to care for her several healthy young children and the ill baby. The health department tried to trick, cajole and bully her into saying that the baby could have or might have had some raw milk from

this farm. Upon a call from the farmer asking them to contact the farm's lawyer instead of harassing the family, PDA harassment subsided. However, other farm clients were also harassed. One patient said he had not been to get milk because of an illness so he had not even had any raw milk in the house when he became ill with salmonella."⁷⁸

In the Ohio incident that led to the closing of Young's Dairy, the infection was known to have begun elsewhere in the state; and the dairy was also a petting zoo. Visitors to farms and petting zoos, especially children, often get sick if they do not have any natural immunity to a farm environment. If they happen to drink raw milk at the same time, the milk is blamed, not the farm.

A major source of food-borne illness is runoff water from confinement farms. Yet investigators rarely test the water when searching for a culprit. In fact, in most cases of food-borne illness where raw milk is a suspect, investigators rarely have a sample of raw milk to test. The wheels of bureaucracy move slowly and by the time an investigation has begun, the necessary sample has been consumed or poured down the drain.

Then there is the problem of selective reporting. Cases of food-borne illness that occur within a reasonable time after the consumption of raw milk are likely to be reported at a much higher rate than other cases of food-borne illness because of the aggressive campaign that the FDA, CDC, and various state agencies have waged to monitor raw milk closely and "educate" the public about its dangers. This alone could cause a statistical association to appear, one that proves nothing except the existence of reporting bias.

A document published by the Weston A. Price Foundation provides the following hypothetical scenario. "A large outbreak of salmonella affects ten thousand people. Most of them have minor symptoms ranging from queasiness to diarrhea. Ten of them call their doctors and ask whether they should worry about it. The doctors ask them if they have recently drunk raw milk, eaten raw meat or poultry, visited a petting zoo or played with a turtle—the usual suspects. Most of them have not, so the doctor says not to worry about it and to call back in a week if it persists or in a few days if it gets worse. But when one patient responds that

he has drunk raw milk, the doctor is alarmed. She takes a stool sample and alerts the health authorities so they can monitor the populace for an outbreak. The authorities run a news campaign suggesting a possible association between salmonella and raw milk from a local farm, and reiterate the warning that ‘drinking raw milk is playing Russian roulette with your health’ and that salmonella infections can produce permanent disabilities such as ‘reactive arthritis’ if they go untreated. Out of the ten thousand people suffering from queasiness or transient diarrhea, about one hundred have drunk raw milk; thirty of them panic and call their physician or the health authorities. The nine thousand nine hundred who did not drink raw milk take comfort in the fact that they only eat safe foods such as cooked chicken and rinsed spinach and therefore only report their illness at the usual rate of one-tenth of one percent. Presto: a statistical association is born.”⁷⁹

And, as any statistician can tell you, correlation does not prove causation. According to author Gary Taubes, “What we derive from epidemiologic studies are associations and hypotheses. . . You cannot prove any hypothesis true. All you can do is refute the hypotheses and see which ones you have left.”⁸⁰

Or, as the saying goes, “Epidemiology is like a bikini. What is revealed is interesting. What is concealed is crucial.”

MEXICAN-STYLE RAW MILK CHEESE: AN EASY TARGET

Several serious outbreaks of disease have involved Mexican-style raw milk cheese—so-called “suitcase cheese” or *queso fresco*—which is a particularly easy target for investigative bias. Consider an epidemic of listeriosis in Los Angeles County, which involved one hundred forty-two reported cases between January 1 through August 15, 1985. Ninety-three cases occurred in pregnant women or their offspring. There were forty-eight deaths: twenty fetuses, ten neonates and eighteen nonpregnant adults. Most of the victims were Hispanic.

In a 1988 report on the epidemic, entitled “Epidemic listeriosis associated with Mexican-style cheese,” lead author M. J. Linnan and his team wrote, “An investigation of the cheese plant suggested that the cheese was commonly contaminated with unpasteurized milk.”⁸¹ But

there was never any evidence that the contamination of this cheese—which was sold as a pasteurized product—was related to contaminated raw milk!⁸²

The initial investigation found that, compared to uninfected controls, infected patients were over five times more likely to have eaten Mexican-style cheese, over four times more likely to have engaged in sexual intercourse in the preceding month (remember, many of those who became sick were pregnant, therefore were likely to be married or have partners), and just over four times as likely to have consumed a root vegetable called jicama (remember, most of the victims were Hispanic).

A secondary investigation found that the association with cheese was due specifically to the use of a cheese produced by Jalisco Mexican Products. The investigators did not pursue the associations with sexual intercourse or jicama any further.

Investigators found the matching strain of listeria in multiple unopened packages of the cheese on June 12, 1985 and initiated a recall of the product the following day. Despite the recall, the outbreak continued producing new cases at full force through the end of July.

The team then tested the cheese for alkaline phosphatase (ALP) activity. Complete destruction of the enzyme ALP is considered the standard test for successful pasteurization. They found excessive ALP activity in nine out of eighty samples of cheese. But investigation of the factory showed that the pasteurizer was working properly.

The authors provided no data showing a relationship between ALP levels and contamination with live listeria, and of twenty-seven dairy farms that supplied raw milk to the cheese plant, they found no cases of listeriosis in any of the herds. Furthermore, all raw milk samples tested negative for the organism. Yet the researchers concluded that the outbreak was caused by cheese “commonly contaminated with unpasteurized milk.”

The presence of ALP in some of the cheese samples allowed the authors of the Linnan report to blame raw milk for the outbreak. But three years later, researchers showed that Mexican-style soft cheeses contain both heat-stable and heat-labile forms of microbial ALP.⁸³ Moreover,

some cheese bacteria produce ALP that cannot be differentiated from ALP indigenous to milk. In 2007, the industry introduced a new detection method to correct this problem.⁸⁴ Thus, this test when performed in 1985 was not a valid means for demonstrating inadequate pasteurization in this type of cheese. The milk or cheese was clearly contaminated at the cheese manufacturing plant, either before pasteurization, after pasteurization, or both.

Jalisco sued Alta Dena Dairy, one of its suppliers, for a portion of the estimated one hundred million dollars in damage claims filed by victims of the listeriosis epidemic. In 1989, however, a jury absolved Alta Dena of all responsibility for the epidemic, citing complete lack of evidence that its raw milk was contaminated.

According to the Linnan report, this outbreak of listeria was the third one traced to a specific food product. The first occurred in 1981 and was traced to coleslaw. The second, in which forty-nine patients became ill and fourteen died—occurred in 1983 and was traced to pasteurized milk. Health officials often warn pregnant women not to consume raw milk or Mexican-style cheese—but never about the dangers of consuming coleslaw and pasteurized milk.

Mexican-style cheese was the whipping boy for a large outbreak of listeriosis that occurred in North Carolina between October, 2000 and January, 2001. Several years later, in 2005, a team led by P. D. MacDonald published a report on the epidemic.⁸⁵ The results of their case-control study may have been biased from the beginning as “During the study, rumors spread that the suspected vehicle of infection was homemade Mexican-style cheese.” The patients were questioned several months after the event, and “rumors” may have helped them selectively remember consuming *queso fresco*.

Nevertheless, investigators found that case patients were almost five times as likely as controls to have eaten hot dogs. According to a 2003 risk assessment jointly published by the FDA, USDA and CDC, non-reheated hot dogs are over three hundred eighty times as likely as fresh, soft cheese to cause listeriosis.⁸⁶ No hot dogs were tested for the presence of listeria, even though during the period of the outbreak, a massive recall of listeria-infected hotdogs—nine hundred thousand

pounds of them—took place in ten southeastern states.⁸⁷ Barbequed chicken was also recalled at the time—but the company producing the product refused to comply with the recall.⁸⁸

Instead, the MacDonald team pointed the finger at the raw milk used to produce soft cheese. The title of their report: “Outbreak of listeriosis among Mexican immigrants as a result of consumption of illicitly produced Mexican-style cheese.”

In the body of the report, we read, “For Hispanic women, we recommend targeted education and dietary counseling about the hazards of eating fresh cheese, undercooked hot dogs, deli meats and other ready-to-eat meat products implicated as vehicles for listeriosis during pregnancy.” But only “illicitly produced Mexican-style cheese” got star billing in the title.

Of the several sources of raw milk used for the cheese, listeria was present in the bulk tank raw milk of one manufacturing-grade dairy, and it matched isolates recovered from ten female case patients, from cheese bought from a door-to-door vendor and from unlabeled cheese from two Hispanic markets. MacDonald and his team fail to mention whether they obtained matching isolates from the listeriosis-infected hotdogs.

Unlike the Jalisco case in California, where listeria was found in unopened packages of factory-made cheese, some of the samples tested in North Carolina were already opened and came from the refrigerators of individuals who had become ill. The finding of listeria in the cheese does not, therefore, mean that the cheese caused an illness. It is equally likely that the sick person contaminated the cheese. And because the *queso fresco* in this case was an artisan product, likely vectors of disease include cutting boards, kitchen counters and food preparation utensils in small kitchens where the standards of sanitation may not be ideal. But since the outbreak occurred in a Hispanic community where everyone consumed Hispanic food, including Mexican-style raw cheese, it was easy for the researchers to create a statistical association of raw milk cheese with the outbreak.

**THE PUBLISHED LITERATURE ON RAW MILK OUTBREAKS:
BUILDING THE CASE AGAINST RAW MILK**

The National Conference on Interstate Milk Shipments is a non-profit organization that represents the interests of the dairy industry. The group meets every other year to discuss topics of concern to conventional milk processors. At the group's May, 2005 meeting, Cindy Leonard, MS, of the FDA's Division of Dairy and Egg Safety presented a PowerPoint presentation prepared by John F. Sheehan, head of the division. The presentation aimed at defusing the arguments of raw milk proponents, namely that raw milk is inherently safe and more nutritious than pasteurized milk. Mr. Sheehan's take-home message: raw milk provides no nutritional advantage over pasteurized, and the only way to make raw milk safe is to pasteurize it.⁸⁹

Sheehan refers to fifteen studies linking illness with raw milk or Mexican-style raw cheese. Of the fifteen papers referenced, eighty percent linked raw milk to illness without a positive milk sample, and two-thirds found no valid statistical association with raw milk. The FDA presentation misrepresented the findings of almost half the reports. In a third, the authors discovered alternative likely sources of infection but did not pursue them and in thirteen percent of the studies, investigators found no evidence that anyone had even consumed a raw milk product. In one study, the outbreak did not even exist!⁹⁰

More to the point, not one of the fifteen studies demonstrated that pasteurization would have prevented the outbreak. (We'll examine the claim that raw milk has no health benefits in Chapter 16.)

Another review of cases alledging illness caused by unpasteurized milk and cheese comes from the Centers for Disease Control.⁹¹ For the period 1998 to 2005, the agency lists thirty-nine outbreaks associated with raw dairy products resulting in eight hundred thirty-one illnesses, sixty-six hospitalizations and one death. Of these, more than half are newspaper reports and health department press releases, not articles published in the scientific literature. In eighty-two percent of cases, there was no valid milk sample and in seventy-eight percent, officials could not provide a valid statistical association with raw milk. In ninety-seven percent of the cases, no evidence is provided to indicate that

pasteurization would have prevented the outbreak. Two of the incidents were traced to pasteurized milk and one to pasteurization failure. Three of the reports cited were either unpublished or not verifiable. Most importantly, the death reported in the summary appears nowhere in the table.⁹² More sloppy government work accepted as gospel in the court of public opinion.

Bill Marler is a high-profile attorney who specializes in food-borne illness litigation. His law firm won the highly publicized Jack-in-the-Box and Odwalla juice cases, in which dozens of people in Washington State became ill and several died from *E. Coli O157:H7*. In 2008, Marler focused his attention on raw milk, posting a blog⁹³ and publishing two position papers full of FDA-inspired language against raw milk and raw milk products.⁹⁴

Interestingly, up to that point, Marler had lost the one raw milk case he had taken, which involved a 2001 outbreak of *E. coli O157:H7* that sickened at least two hundred people at Prospect Elementary School in rural Robeson County, North Carolina. An epidemiological report blamed the outbreak on homemade butter made from raw cream served to students as a classroom demonstration. The judge ruled that the school had governmental immunity and could not be sued.⁹⁵

One of Marler's position papers contains a list of one hundred two references from scientific journals purporting to implicate raw milk in disease. It is obvious that the list was compiled by an intern or law student who simply did a search for "raw," "milk" and "outbreak" without actually reading the studies. Only seventy-three out of the total report on actual illnesses; eight report on the presence of pathogens in the milk of bulk holding tanks (hence milk destined for pasteurization) and twenty-one are reviews, editorials or letters to the editors of scientific journals. In fact, a number of the citations are reports of outbreaks traced to pasteurized milk, reviews focusing on the dangers of pasteurized milk, or letters to the editor supporting the right of consumers to purchase raw milk.

Of the studies implicating raw milk in food-borne illness, a full ninety-six percent had either no valid positive milk sample or no valid statistical association. Several of the studies served as a platform to hurl

insults at raw milk advocates or discuss methods for hurting the commercial interests of farmers. One study author complained that because raw milk advocates “have lost their case in the scientific and medical communities,” they have turned to the legal and political arena to take advantage of the “current climate of heightened concern for personal liberties and freedom of choice, and frequent rejection of science.”⁹⁶

SALMONELLA IN RAW MILK AND OTHER FOODS: THE DOUBLE STANDARD

Infection with salmonella species accounts for a substantial portion of food-borne illness in this country, with an estimated million and one half cases and five hundred deaths annually.⁹⁷ An infective dose of salmonella requires at least one million organisms. Ground beef is a common and persistent source; USDA regulations allow for up to ten percent of the samples taken at a given plant to contain salmonella, but these limits are often exceeded. High levels of salmonella in ground beef indicate high levels of fecal contamination.

Meanwhile, known sources of salmonella are routinely fed to cattle. Quoting again from *Fast Food Nation* by Eric Schlosser: “A study published a few years ago in *Preventive Medicine* notes that in Arkansas alone, about 3 million pounds of chicken manure were fed to cattle in 1994. According to Dr. Neal D. Barnard, who heads the Physicians Committee for Responsible Medicine, chicken manure may contain dangerous bacteria such as salmonella and campylobacter, parasites such as tapeworms and *Giardia lamblia*, antibiotic residues, arsenic and heavy metals.”⁹⁸

An example of the difficulty USDA officials have in enforcing regulations against the meatpacking industry is provided by the 1999 case of a ground beef plant in Dallas, owned by Supreme Beef Processors, which failed a series of USDA tests for salmonella. Up to forty-seven percent of the company’s ground beef contained salmonella—nearly five times higher than what USDA regulations allow. Yet the USDA continued to purchase large quantities of meat from Supreme Beef for use in schools. Indeed, Supreme Beef Processors was one of the nation’s largest suppliers to the school lunch program, annually providing nearly half of its

ground beef to schools. On November 30, 1999, the USDA finally removed inspectors from the company's plant, shutting it down.

The next day, Supreme Beef sued the USDA in federal court, claiming that salmonella was a natural organism, not an adulterant, and contending that the USDA should not have removed inspectors from the plant. Federal Judge A. Joe Fish ordered inspectors back into the plant, pending resolution of the lawsuit. The plant shutdown lasted less than one day. Six months later the judge issued a decision, ruling that the presence of high levels of salmonella in the plant's ground beef was not proof that conditions there were "unsanitary."

"Fish endorsed one of Supreme Beef's central arguments: a ground beef processor should not be held responsible for the bacterial levels of meat that could easily have been tainted with salmonella at a slaughterhouse. The ruling cast doubt on the USDA's ability to withdraw inspectors from a plant [and thus shut the plant down] where tests revealed excessive levels of fecal contamination. Although Supreme Beef portrayed itself as an innocent victim of forces beyond its control, much of the beef used at the plant had come from its own slaughterhouse in Ladonia, Texas. That slaughterhouse had repeatedly failed USDA tests for salmonella."⁹⁹

In contrast, consider the story of raw milk and salmonella in California. The California State Health Department and several county health departments, most notably those of Los Angeles and San Diego counties, conspired for some thirty years to harass Alta Dena Dairy and nearly every other raw milk dairy in the state, and to put them out of business. The Steuve brothers—Ed, Harold and Elmer—founded Alta Dena in Monrovia in 1945 with sixty-one milk cows and two bulls. Dr. Pottenger was a regular customer. In 1950 the family purchased a much larger operation in Chino. The dairy became certified for raw milk production in 1953 and grew rapidly. By the 1980s, the dairy milked over eight thousand cows daily and owned eighteen thousand animals. With eight hundred employees, Alta Dena was the largest producer-distributor in the nation, selling over twenty thousand gallons of certified raw milk daily. Alta Dena products, including raw milk and raw butter, buttermilk, ice cream, kefir and yogurt, were sold in health food stores in

every state. For over forty years, Alta Dena proved that safe and healthy raw dairy products could be produced and distributed on a large scale with literally no proven cases of illness caused by their products. This fact did not deter the various county health officials and the California State Health Department from their campaign to destroy Alta Dena. Eventually, the Department's chosen weapon would be salmonella, a weapon they used only after failing with the alleged threat of a number of other diseases to generate fear of raw milk in the public and a costly ongoing legal morass for Alta Dena.

The first assault occurred in 1965, when a San Diego County health officer named Askew summarily issued an order banning all raw milk in the county, claiming to have found *Staphylococcus aureus* in Alta Dena milk. While these bacteria can be involved in everything from skin infections to pneumonia, they are ubiquitous in the environment and are carried by about half of the human population. Many pasteurized dairy products contain low levels of *S. aureus*, with residues of higher levels present before pasteurization.¹⁰⁰ *S. aureus* poisoning is usually traced to processed foods such as ham and cream-filled pastries. Although *S. aureus* can cause mastitis in cows and staphylococcal poisoning has on occasion been attributed to a wide variety of dairy products in the past, the only four major outbreaks reported in the United States since 1970 have involved dairy products, namely processed butter products and pasteurized two percent chocolate milk.¹⁰¹

Illness caused by *S. aureus* is brief and intense, with nausea, vomiting, diarrhea and cramps. Acute symptoms last only a few hours, with the patient fully recovered within a day or two.¹⁰² No one had become ill when Alta Dena milk was banned in San Diego County. "The health officer stated publicly that he was going to do away with raw milk in the state of California," writes Dr. William Campbell Douglass in *The Milk Book*, "if it was the last thing he ever did."¹⁰³

According to Douglass, health officer Askew was asked at a hearing of the County Board of Supervisors whether to his knowledge anyone had ever become sick from drinking certified raw milk in San Diego County. He answered, "No, but it could happen." The Board urged him to lift the ban, yet he refused to do so. The country's largest producer-

distributor dairy could not sell its raw milk in San Diego County, and the ban remained in effect for three years. Finally, after a three-year battle, the Fourth District Court of Appeals ruled that the health officer had exceeded his authority. Meanwhile, in 1967, the California Medical Society passed a resolution calling for the pasteurization of all milk in California. Three other counties summarily banned raw milk, but vociferous public opposition succeeded in removal of the bans.

It was in January of 1969 that the Los Angeles County Health Department attacked Alta Dena. The *Los Angeles Times* announced, with banner headlines based on information supplied by the Health Department, that Alta Dena raw milk was banned with the presumption of contamination by the organisms that cause Q fever. This obscure viral-like disease is caused by the parasite *Coxiella burnetii*, which is carried in ticks and sometimes in the ruminant animals that ticks infect.

The parasite causes no symptoms in the animals; most cases of Q fever occur in farmers and meat factory employees who work in close contact with animals, and the disease appears to be transmitted by inhalation of the parasite. The symptoms are fever, pain and intense headache, and most patients recover fully with two to four weeks of antibiotic treatment.¹⁰⁴

C. burnetii has been found in milk from cows carrying the parasite, and regular consumers of raw milk sometimes have antibodies to the parasite without showing any evidence of disease. This implies that exposure stimulates the immune system to develop resistance. Two reports in the medical literature have linked raw milk consumption with a few dozen cases of Q fever (one article was published in 1968, a few months before the Los Angeles County leveled charges), but the association remains totally unproven. In fact, Elliott Ryser states that “in one study in which contaminated raw milk was ingested by human volunteers illness did not occur.” Other studies showed that the parasite survived the temperatures normally used for pasteurization for most of the twentieth century.¹⁰⁵ On balance, it appears unlikely that Q fever has ever been transmitted by the consumption of raw milk.

No one in Los Angeles County had reported any symptoms of Q fever. Alta Dena defied the LA County Health Board ban, continuing to

sell raw milk in the county, and was taken to court. Meanwhile the dairy labeled its raw milk as “pet food, not for human consumption.” Harold Steuve, president of the dairy and the mayor of Monrovia at the time, was arrested for contempt of court. Only when Alta Dena’s expert witnesses testified that Q fever was caused by inhalation of the parasite and not by consumption of raw milk did prosecutors drop the charges.

A 1966 Los Angeles County Health Department report on Q fever proves the health department’s bias. The report describes seven cases, six of which lived “in or around dairies.” None of the seven drank raw milk. Contact with animals and subsequent airborne spread, the report admitted, was the vector for infection, but claimed that “the most practical solution now available” was the universal pasteurization of all milk.

The California State Health Department led the next attack, in 1974, with a statewide ban of Alta Dena’s raw milk, citing the threat of brucellosis. All Alta Dena cows had of course been vaccinated against the disease and were routinely tested as an extra precaution. The ban forced the dairy to go to court once again and to retest the entire herd. No brucellosis was found, and Alta Dena resumed sales of raw milk. But, once again, the Steuves lost thousands of dollars in legal and testing expenses, and an untold amount of sales due to adverse publicity.

Having failed to show that Alta Dena raw milk had ever caused any of the classic milk-borne illnesses, the state zeroed in on salmonella. In the mid 1970s the state made numerous statements claiming that salmonella-contaminated raw milk was produced by Alta Dena and other California raw milk dairies. In 1978, the Steuve brothers led California raw milk producers in seeking a California state Senate bill requiring the State Health Department to oversee raw dairy foods in a manner similar to that of other food products. On June 4th, a week before the Senate bill was to come up for debate, a state laboratory claimed to have found salmonella in Alta Dena milk. The State Health Department delayed five days before releasing the information, while the public bought and consumed the milk—milk the state would subsequently declare a public health hazard. Then on June 9th, two days before the Senate debate was to begin, the Department notified the press of the alleged contamination, claiming that an epidemic of salmonella poisoning was imminent.

The only epidemic was an outbreak of inflammatory news reports. From San Rafael to Sacramento, from Ventura to Vallejo, raw milk producers stood accused: “Raw Milk Warning,” “Some Raw Milk Found to be Contaminated,” “Contaminated Raw Milk Ordered Off Shelves.” Radio announcements warned the public not to drink raw milk from Alta Dena dairy. No one got sick, but in the hysteria the Senate bill failed.

A few days later, after reviewing relevant documents, the *Los Angeles Herald Examiner* accused California State Health Department officials of falsifying bacterial reports in order to defeat the Senate bill. Two independent laboratories—one that did testing for the Los Angeles County Medical Milk Commission and the other that did considerable testing for the state—returned negative results for salmonella. The Health Department laboratory had either falsified its results, or the testing methods had been so sloppy that the milk samples were contaminated during the testing procedures. The *Herald Examiner* article hinted at a conspiracy to eliminate raw dairy products among members of the State Health Department.

Other State Health Department tactics bolstered the conspiracy charge. In several instances, products for which there was no evidence of contamination at all—falsified, inaccurate, or otherwise—were destroyed. Officials forced a food store manager to pour ninety gallons of certified raw milk down a toilet. Health officers punched holes in Alta Dena raw cheese, and poured Chlorox over it. The Department leaked a “staff report” to *New Age*, a widely read California magazine, which published excerpts in August 1978. “Evidence points to a continuing health hazard to the public consuming Alta Dena’s raw certified milk,” reported *New Age*, and quoted a medical epidemiologist who claimed that Alta Dena raw milk was killing cancer patients.

The epidemiologist and two of his colleagues, both of whom worked with the California State Health Department, published a report in the *British Medical Journal* stating that twenty-two patients, mostly with leukemias and lymphomas, had died between 1971 and 1975, sometime after “exposure” to Alta Dena raw milk.¹⁰⁶ Publication in a foreign journal made the authors relatively immune to lawsuits. Since then, the article has been widely quoted as scientific fact in American journals.

The governor's office in California received over seventeen thousand letters, telegrams and phone calls in defense of Alta Dena within two months of the *Herald Examiner* report. The furor died down, but the number of letters alone grew to over fifty thousand. The State Health Department was undeterred, repeating unconfirmed allegations of salmonella contamination later in 1978 and again in 1979. Both times, newspapers generated the usual scare headlines: "Poisoned Milk Recalled," "State Issues Warning About Alta Dena Milk," and "Tainted Milk Ordered Off Market Shelves." Again the allegations were false, no one got sick and Alta Dena carried on. But one by one, other raw milk producers in the state went out of business.

In 1983, Nevada state inspectors seized Alta Dena raw milk from a health food store and claimed it contained salmonella. The milk was twenty-one days old, past its expiration date. Four different labs, including the California State Health Department lab and one county lab, subsequently analyzed the milk and found no salmonella. The FDA spent three days investigating the Alta Dena Dairy and found nothing of importance. The California State Health Department nevertheless issued warnings to the people of California not to drink Alta Dena raw milk, or even give it to their pets.

Also in 1983, the report describing five serious salmonella cases at the Veterans Administration Medical Center in San Diego was published.¹⁰⁷ Three of the five patients were regular consumers of Alta Dena raw milk, and one of them, a patient with advanced cancer who had been receiving extensive chemotherapy, died with an acute salmonella infection.

Ignoring all the evidence on the benefits of raw milk and the desire of many people to consume it, the Department used the *possibility* of occasional salmonella contamination as an excuse to wage a vendetta against Alta Dena and California's other raw milk producers.

In 1984, an article in *Vogue* headlined "A Raw Milk Warning: A New and Dangerous Health Fad" featured statistics published in the newsletter of an organization called California Council Against Health Frauds. The report claimed that raw milk drinkers were at increased risk of salmonella infection, "which can result in high fevers and bloody di-

arrhea.” These symptoms are extremely rare for most salmonella infections. People who drink raw milk are one hundred eighteen times more at risk, said the article. This exaggeration was obtained by manipulating figures originally published in 1944.

In 19, Consumers Union of the United States joined with California’s conventional dairy producers to file suit against Alta Dena Dairy for advertising, allegedly falsely, that raw milk was healthful and pasteurized was not. The State Health Department concurrently claimed that raw milk products were a public health hazard and prohibited Alta Dena from distributing and selling its raw milk pending settlement of the Consumers Union suit. In 1992, the court ruled that Alta Dena’s health claims were illegal and ordered all raw milk sold in California to carry a government warning. The Steuves then sold Alta Dena Dairy, but continued to produce and distribute raw dairy products under the Steuve’s Natural label.

In 1997, John Leedom, MD, one of the six members of the Los Angeles County Medical Milk Commission, publicly stated that not only licensed grade A raw milk but also certified raw milk should be banned in Los Angeles County. Alta Dena produced licensed grade A raw milk that was also certified by the Commission; California’s other licensed grade A raw milk producers were not certified. Three other commissioners sided with Leedom. According to James Privitera, MD, one of the two commissioners who favored keeping raw milk available, the majority implemented regulations so restrictive and prejudicial that it became impossible for raw milk producers to stay in business. Alta Dena’s new owners at that point stopped selling raw milk, and Steuve’s Natural raw milk has not been available since May, 1999. We’ll pick up the story of what’s happened with raw milk in California later in this chapter.

DEATHS ATTRIBUTED TO RAW MILK: MORE BAD SCIENCE

Illness attributed to raw milk tends to be mild and of short duration; occasionally, however, a report links raw milk with death. One of the most widely cited involves the cancer patient at the Veterans Administration, mentioned above, who consumed Alta Dena milk. Her death was attributed to a virulent form of the bacterium, *Salmonella dublin*

(*S. dublin*). As with most infections, people with suppressed immune systems (such as AIDS patients or people taking corticosteroids or chemotherapy) have the greatest risk from organisms like salmonella.

The report, published in the *Western Journal of Medicine* in May, 1983 was entitled “Invasive *Salmonella dublin* Infections Associated with Drinking Raw Milk.”¹⁰⁸ The author conducted a year-long study in 1980 and 1981 at the Veterans Administration Medical Center (VAMC) in San Diego. During that year, fourteen cases of salmonella infection had been diagnosed at the hospital; five of them were *S. dublin* infections. The ages of these five individuals ranged from fifty-six to ninety-seven, and all but one had a serious preexisting chronic disease or were taking immunosuppressive corticosteroid or chemotherapy drugs. Three of the five had drunk raw milk from Alta Dena dairy within the previous two weeks.

The eighty-five-year-old woman had chronic leukemia, diagnosed in 1979. To quote from the article, “In September 1981 she was treated for the first time with cyclophosphamide [a highly toxic chemotherapy agent which impairs natural immunity to infection] and prednisone three times a day. A week later diarrhea, fever and chills developed and she had a syncopal episode [temporary loss of consciousness due to a fall in blood pressure]. . . blood, urine, and stool cultures all grew *S. dublin* . . . she died on the 17th hospital day. . . This woman’s immune status was compromised by both the leukemia and the therapy. She presented in shock with an overwhelming *Salmonella* bacteremia [bacteria in the blood].” Three of the other four patients with *S. dublin* infections were sick enough to require antibiotic therapy and admission to the hospital; one was hospitalized for several weeks.

This story presents another example of the gulf between biased science and the facts of the case. The doctors offered no proof that the raw milk the woman drank carried salmonella. And whatever the source of infection, were it not for the immunosuppressive drugs, none of the individuals would have become infected with salmonella. How long had the eighty-five-year-old woman been drinking raw milk with impunity before her first week of chemotherapy, at the end of which she became deathly ill? The article does not address this question. About the many

benefits of raw milk, the author says only, "I will not comment on the validity of the nutritional claims that are made for raw milk."

Another case occurred in 1975 and involved an infant who was switched from breast-feeding to raw goat milk at two months. The child began to have loose green stools with some streaking of blood and a purplish discoloration of the gums. After receiving a DPT immunization at five months, the child began to vomit three or four times a day and was admitted to the hospital one week later. On the eleventh day after admission, he received a blood transfusion using blood that had evidence of a *Toxoplasmosis gondii* infection, and this evidence was found in the child a few days later. The infant was severely deficient in folic acid, which is present at only one-fifth the level in goat milk as it is in cow milk or human milk.

The report on his death carried the title, "Toxoplasmosis in an infant fed unpasteurized goat milk."¹⁰⁹ None of the milk samples tested positive for *T. gondii*, but the authors blamed the infant's symptoms on *T. gondii* supposedly acquired from drinking raw milk anyway, and offered no discussion of how his severe folic acid deficiency may have contributed to his symptoms.

Other deaths attributed to raw milk are found in reports on infection allegedly due to Mexican-style raw milk cheese. As discussed earlier in this chapter, raw Mexican-style cheese is an easy target. In the California outbreak, raw milk was exonerated by a jury; in the North Carolina outbreak, investigators ignored other more likely vectors of disease, based their conclusions on tests of opened samples, and engaged in interview techniques designed to achieve the foregone conclusion that raw milk was to blame.

TYPHOID FEVER, SCARLET FEVER AND DIPHTHERIA: BAD SCIENCE FROM THE PAST

While illness attributed to raw milk in modern times involves acute gastrointestinal episodes that are usually short-lived and do not require medical treatment, fifty or one hundred years ago, raw milk was routinely blamed for a host of diseases often depicted as deadly. These diseases included typhoid fever, scarlet fever, diphtheria, tuberculosis and

undulant fever. Although these diseases occur only rarely today—many have not been linked to milk at all since the 1950s—they are often trotted out in official publications, media stories and hearings on legislation affecting the sale of raw milk. Public health officials imply that should raw milk become more widely available, the old diseases would be back with us, threatening many people with disease.

An example is found in Elliot Ryser’s chapter “Public Health Concerns” in *Applied Dairy Microbiology*:¹¹⁰ “Outbreaks of milk-borne illness date from the inception of the dairy industry. Bacterial infections including diphtheria, scarlet fever, tuberculosis and typhoid fever predominated before World War II and were almost invariably linked to consumption of raw milk. . . .” No reference is given for this incorrect information. Nor is there mention of the fact that pasteurized milk caused the worst milk-borne outbreak of typhoid fever ever; in 1927 in Montreal, almost five thousand people were stricken and four hundred fifty-three died during a four-month period in an epidemic that was traced to negligence at a local pasteurizing plant.¹¹¹

Ryser continues: “. . . early surveillance efforts soon led to passage of the first Model Milk Ordinance, which stressed nationwide pasteurization and the eventual reduction in the incidence of milk-borne enteric diseases with no milk-borne cases of diphtheria, scarlet fever, tuberculosis, or typhoid fever reported in more than 40 years. . . . Banning the interstate shipment of all raw milk products, both certified and noncertified, in 1986 helped reduce the number of raw milk-related outbreaks. Sporadic illnesses continue to be reported, however, particularly among farm families who routinely consume milk from their own dairy herds.” Again no references are given, this time for the statement about farm families. Taken together, these passages are not only misleading but also very confusing. Let’s examine them and see why.

First we have the sentence “Bacterial infections including diphtheria, scarlet fever, tuberculosis and typhoid fever predominated before World War II and were almost invariably linked to consumption of raw milk.” Dr. Ryser appears to have told us that raw milk caused most cases of these illnesses. That assertion would be blatantly untrue—but that is not quite what he is telling us. For if we check back to the sentence be-

fore (“Outbreaks of milk-borne illness date from the inception of the dairy industry”), we see that he may be referring only to cases of the diseases that were milk-borne.

But as indicated above, Ryser does not reference the “almost invariably” statement. How much milk-borne disease was actually attributed to raw milk in the years leading up to and during World War II? In her series of articles “Why Milk Pasteurization?” published in the *Rural New Yorker*, Jean Bullitt Darlington provided some revealing statistics published by the Ontario Department of Health and the U.S. Public Health Service. For the years 1934 through 1941, the total number of cases of typhoid fever reported for the province of Ontario, from all causes, was just under two thousand, with two hundred forty five deaths. The total number of cases reported as milk-borne was sixteen, with two deaths.¹¹² The records do not tell us how many of these few cases were associated with raw milk and how many with pasteurized. But it is clear that Ryser’s association of typhoid fever with raw milk is highly misleading. In fact, less than one percent of the total cases of typhoid in the eight-year period were reported as milk-borne, and less than one percent of the deaths were from cases that were reported as milk-borne.

Figures for the United States demonstrate that Ryser’s contention that milk-borne diseases “. . . were almost invariably linked to consumption of raw milk” not only has no basis in fact, but presents a picture that is the opposite of the facts. The U.S. Public Health Service reported that in twenty-two years, 1922-1944 inclusive, reports linked a total of almost thirty-eight thousand cases of all kinds of diseases to all varieties of milk and milk products, pasteurized and raw, with an average of seventeen hundred twenty-six cases per year. For 1944 in particular, there were one thousand four hundred forty-nine milk-related cases, of which only four hundred thirty were attributed to raw milk. There were twenty deaths—only one of which was attributed to the consumption of raw milk.^{113, 114}

As noted above, Ryser reports, “. . . the eventual reduction in the incidence of milk-borne enteric diseases with no milk-borne cases of diphtheria, scarlet fever, tuberculosis, or typhoid fever reported in more than 40 years. . . . Banning the interstate shipment of all raw milk prod-

ucts, both certified and noncertified, in 1986 helped reduce the number of raw milk-related outbreaks.” Here it appears that banning raw milk had the effect of reducing the incidence of diphtheria, scarlet fever, tuberculosis and typhoid fever. But since Ryser has just told us that there have been no milk-borne cases during the last forty years, he is actually claiming a reduction in the “number of milk-related outbreaks” of “enteric diseases” (typically mild gastrointestinal illness). His next sentence is, “Sporadic illnesses continue to be reported, however, particularly among farm families who routinely consume milk from their own dairy herds.” The implication once again is that these sporadic illnesses include diphtheria, scarlet fever, tuberculosis and typhoid fever when in fact they are “enteric diseases,” a few days of diarrhea. Ryser provides no reference to document this assertion. It is impossible to say with certainty whether this writing is deliberately misleading or simply inept.

In this and earlier chapters, we’ve examined gross exaggerations by public health authorities on the extent of problems caused by raw milk—a constant theme through the medical literature of the past one hundred years. In Chapter 5, I described part of a 1929 address by William Dodge Frost, PhD and Doctor of Public Health, in which he analyzed the question of how many of the cases of typhoid, scarlet fever and diphtheria in the United States in the years 1906 through 1925 could be attributed to the consumption of milk. Here I quote some of the actual figures that formed the basis of Dr. Frost’s conclusions:

“The table shows that the proportion of milk-borne typhoid to the total amount of typhoid varies from 0.17 to 0.94 of 1 percent and that the average for the 20-year period is about one-half of 1 percent (0.53 percent).

“In the case of scarlet fever, the yearly percentages range from 0.05 to 0.37 of 1 percent with an average of 0.106 percent.

“The percentages for diphtheria range from 0.0 to 0.18 of 1 percent, with an average of 0.028 percent.

“The milk-borne are 0.221 of 1 percent of the total [for all three diseases] or practically 1 case milk-borne to 450 cases acquired some other way.”¹¹⁵

This evidence about typhoid fever, scarlet fever and diphtheria

should be considered along with that of Mrs. Darlington. Consider too the fact that there have been no milk-borne cases of these diseases reported during the past forty years, despite the continued legal availability of raw milk in some thirty-five states, and the fact that millions of farm families during the last forty years have continued to drink raw milk. Is it not abundantly clear that any allusion to potential problems with these diseases today, as a warning against raw milk becoming more widely available, is a complete and utter smokescreen?

Once again quoting Mrs. Darlington, whose 1947 articles remain as relevant today as ever: “If evidence for the case for [compulsory] pasteurization is so difficult to find that it must needs be distorted and in some cases even invented—which is clear from the most recent publicity on the subject—an honest mind cannot fail to grasp that the case for [compulsory] pasteurization is a very weak case indeed.”¹¹⁶

RAW MILK AND *E. COLI O157:H7*

Small social gatherings used to be the source of most cases of food poisoning. Such outbreaks still do occur, but new kinds of outbreaks are more typical now, outbreaks caused by changes in the way food is produced. According to Dr. Robert V. Tauxe, head of the Food-borne and Diarrheal Diseases Branch at the CDC, America’s centralized, industrialized system of food processing has created outbreaks that have the potential to sicken millions of people.¹¹⁷

Food-borne illness from milk products usually involves gastrointestinal illness precipitated by the bacteria salmonella and campylobacter. Incidents involving these two organisms have accounted for most dairy-related illnesses reported since the early 1980s. Recently, the new virulent form of *E. coli* (*E. coli O157:H7*) has caused dairy-related outbreaks of illness, which have received considerable attention because of the particularly severe or fatal complications sometimes produced by the organisms. (Most forms of *E. coli* do not cause illness, and in fact play a beneficial role in the digestive tract, and even with *E. coli O157:H7*, only a few of its strains are pathogenic.) In *Applied Dairy Microbiology*, Ryser reports, “at least 60 cases of raw milk-associated illness” due to *E. coli O157:H7*. In the same paragraph, he documents more than

500 hamburger-related cases of *E. coli* O157:H7 illness that caused the deaths of four children in 1993—the now famous Jack-in-the-Box case that occurred in Washington state. At least fifteen additional outbreaks linked to the consumption of undercooked ground beef occurred in the 1980s. In Canada, sixteen hundred cases were reported in 1992, and fourteen hundred were reported in the United States in 1994.¹¹⁸

Ryser also documents a number of *E. coli* O157:H7 outbreaks that involved pasteurized milk, citing faulty pasteurization or post-pasteurization contamination. As usual, Ryser cites these outbreaks as additional reason for compulsory pasteurization. Writing of one outbreak involving eighteen severe cases in Montana in 1994, however, he actually provides us with fair warning that one should avoid all pasteurized dairy products (though this was certainly not his intent): “This outbreak does raise serious new public health concerns regarding the possible presence of toxic strains of *E. coli* in factory environments and their entry into finished products as post-processing contaminants.”¹¹⁹ It appears that what’s in the milk is the same thing Eric Schlosser told us is in the meat.

One outbreak attributed to raw milk and often cited in the scientific literature took place in 2001 on Vancouver Island in British Columbia. The report, entitled “*Escherichia coli* O157 Outbreak Associated with the Ingestion of Unpasteurized Goat’s Milk in British Columbia,” describes five cases of *E. coli* O157:H7.¹²⁰

The first case occurred in a one-year-old child who had consumed raw goat’s milk and also had visited a petting zoo—a common source of illness. The authors did not describe any follow-up of the petting zoo lead. Two children of the same family became ill soon after, but the authors did not report whether they had drunk raw milk. Three months earlier, the family had joined a cooperative that supplied them with the milk, of which eighteen other families were members, none of whom reported illness. Two children of another family who visited the cooperative farm became ill, but the authors did not report whether they had purchased or consumed any raw milk.

Two out of seven bottles of milk purchased by the first family were tested for the organism, one of which was found “presumptively” positive after “enrichment” with a testing substance; the other sample tested

negative. The authors did not report whether the infected bottle had already been opened, nor did they report testing any milk obtained from the farm itself. They did not discuss the possibility that the infected persons had contaminated the milk after becoming ill, nor did they report testing any other foods from the family's house or the water on the farm. The investigation provides an excellent example of the methodology described above: look until you find the answer you want; stop looking when you find the answer you want.

While health officials build a case against *E. coli* in raw milk, the fact remains that other foods, such as undercooked meat, are the most likely candidates to cause the type of epidemics that Dr. Tauxe of the CDC is most concerned about—those that sicken millions of people.

The organism was first identified in 1982. This pathogen has become widely dispersed in the food supply with the rise of huge feedlots, slaughterhouses and hamburger grinders. Meat production in America is ever more centralized: most of the beef consumed in the United States is now slaughtered in thirteen large packing houses. Eric Schlosser, author of *Fast Food Nation*, provides the following description: “The meat-packing system that arose to supply the nation's fast food chains—an industry molded to serve their needs, to provide massive amounts of uniform ground beef so that all of McDonald's hamburgers would taste the same—has proved to be an extremely efficient system for spreading disease. The large meatpacking companies have managed to avoid the sort of liability routinely imposed on the manufacturers of most consumer products. Today the government can demand the nationwide recall of defective sneakers, but it cannot order a meatpacking company to remove contaminated, potentially lethal ground beef from fast food kitchens and supermarket shelves.”¹²¹

Another danger from confinement farms is runoff water, which carries *E. coli:O157:H7* onto crops and into households. This is a particularly serious problem in Washington, a state in which a disproportionate number of cases has occurred. Between 1990-1999, twenty-three such outbreaks were reported in Washington state, afflicting at least two hundred eighty-eight individuals, from sources as diverse as fish, lettuce and lasagna, as well as from ground beef.¹²² The worst outbreak occurred

in October 1996, when seventy individuals became sickened from contaminated apple juice—the famous Odwalla juice case. This highly publicized outbreak led to federal regulations requiring the pasteurization of all fruit juice sold in retail outlets.¹²³

In late November of 2005, an outbreak of illness attributed to virulent *E. coli* O157:H7 afflicted eight Washington state individuals who had consumed raw milk, sparking a flurry of news reports, vaulting the subject of raw milk into the national media—and also raising the spectre of deliberate sabotage.

The milk came from Dee Creek Farm, a small family farm near the town of Woodland in Cowlitz County, in southwestern Washington State. The owners, Anita and Michael Puckett, operated a cow share program, one of several in the state. State officials knew about the Pucketts' operation—the Pucketts described their operation earlier that year, in July, to Claudia Coles, head of the Department of Agriculture's safety program, at a conference on small farm operations. Coles listened and asked leading questions but did not express disapproval. A later report quoted her as saying, "We can't do anything about it unless there is a health problem."

The Pucketts were new to dairying. They did not have fancy facilities but were careful to follow good sanitary practices as recommended by several other dairymen in the area. The cows grazed on pasture but came into a barn for milking. The Pucketts washed the teats with iodine and milked with a milking machine into a closed stainless steel bucket which they carefully washed before milking. They then transported the buckets into their kitchen where they transferred the milk into gallon-sized glass jars owned by the shareholders. It was the shareholders' duty to provide clean jars, but the Pucketts then washed the jars again in the dishwasher, just to be safe. The filled jars went immediately into the freezer for ninety minutes and then into the refrigerator.

The various shareholder families had organized themselves into groups for milk pick-up. Each day of the week, one family picked up milk at the farm for a dozen or so other shareholders. When the pickup person arrived at the farm, the Pucketts placed the glass jars into a large cooler with blue ice. Each group of families had a pickup location, such

as a front porch, where the cooler was left unattended. Families for each group had a window of three to nine p.m. to come by and retrieve their milk from the cooler. The Pucketts had explained the pickup system to agents from the Department of Health and the Department of Agriculture on one of their visits to the farm; the officials offered no feedback, neither positive nor negative.

Michael Puckett often picked up the empty cooler early the following morning, on the way home from his night job. About two weeks before the incident, he was somewhat unnerved by the presence of a car parked across the street of the pickup house. A driver sat behind the steering wheel. Puckett stalled to see how long the car would remain. Twenty minutes passed, at which time a police car arrived and the waiting car moved off.¹²⁴

The first Dee Creek shareholder to become sick was a child from a family that picked up milk on Monday from the milking of November 26 or 27, at the pickup house where Michael had noticed the parked car. Soon other children fell ill and several were hospitalized. Health officials quickly confirmed the culprit as a strain of virulent *E. coli* O157:H7.

The newspapers reported seventeen or eighteen confirmed cases of food-borne illness from virulent *E. coli* in Dee Creek Farm shareholders—the first of many exaggerations to appear in the media. According to the Washington Department of Health, there were only seven; according to a farm spokesperson, there were actually eight confirmed cases, six people (from four families) from the Monday pickup group of thirteen families and two from the Tuesday pickup group of six families. In all, five were hospitalized, from three families, all from the Monday pickup group. One was released after treatment with IV for dehydration, one was released after three days and one after five days, but two of the children, from two different families, remained hospitalized in serious condition for around a month. One member of the Puckett family tested positive but did not get sick, and three other individuals among the shareholder families had symptoms but did not test positive. In fact, of the other eleven “cases,” at least eight of them specifically tested negative. One important point: Dee Creek Farm stopped distribution and advised their shareholders to cease consumption of their milk days before

the Department of Health even acknowledged that they knew about the issue and contacted the farm.

The Washington State Department of Agriculture (WSDA) visited the farm three times during the week of December 12 to conduct a thorough investigation, taking samples of milk and swabs from all five cows on the farm. At that point, the Pucketts had put away the equipment they used for their share holders and were milking only for their pigs. This they explained to the inspectors, noting how they did things differently when they milked for human consumption. Mrs. Puckett had to remind the inspectors to hose down and sterilize their boots before they entered the milking barn—the farm was very muddy at the time, as were all farms in the region, because of a record-breaking rainy season. WSDA included embarrassing photographs of mud-splattered cows and equipment in their report on the investigation.

Predictably, the media coverage of the incident leaned heavily on health department reports, described as “a showcase of sensationalism and unprofessional journalism.” However, TV interviews did include many consumers who expressed passionate support of raw milk. In one, a shareholder poured a glass of Dee Creek Farm’s milk that she still had in her refrigerator for her family to drink. The newspapers reported that the law offices of William D. Marler had contacted two of the three afflicted families.

On December 21, the Clark County Health Department issued a report stating that the Washington State Department of Agriculture had confirmed *E. coli* O157:H7 in Dee Creek Farm milk—Clark County was the scene of an outbreak of *E. coli* O157:H7 at a county fair earlier in the year. Claudia Coles left two telephone messages, one to the Pucketts and one to their daughter, apologizing for the Clark County report and stating that at that point, they had found no specific pathogens in the milk.

It was at a press conference on January 16 that Washington State officials announced a positive finding of *E. coli* O157:H7 in two samples of milk and five environmental samples from Dee Creek farm, of a strain that matched those cultured from the stool of the sick children. The report stated that “Raw milk bought and distributed from Dee Creek Farm was consumed by all affected people prior to their becoming ill,” and that

“Dee Creek Farm illegally sold raw milk.” The state report concluded: “The WSDA FSP investigation along with the epidemiological work by the County Health Departments demonstrates that the illegal raw milk provided by Dee Creek Farms was the source of the *E. coli* O157:H7 that sickened at least 18 people in Washington and Oregon.”¹¹⁷

While state officials expressed confidence that the outbreak was caused by raw milk, they ignored many important facts. First, and most important, was the fact that independent labs testing Dee Creek’s milk, following the same testing protocol used by the state, found no *E. coli* O157:H7, not even in the same samples the state claimed tested positive.

Another fact: there was at least one concurrent outbreak of infection from *E. coli* O157:H7, affecting several family members, in the area. One boy ended up in the same hospital as the Dee Creek kids, in critical condition, and was still there after a month, possibly with long-term brain, nerve and kidney damage. Several of his family members were also confirmed with *E. coli* O157:H7.

Neither the state nor the media thought it relevant to report these illnesses. We can only guess whether there were other unreported cases of *E. coli* O157:H7 at the same time. (All three raw-milk drinking children have since recovered.)

One more fact: just two months before the Dee Creek incident, in September 2005, *E. coli* O157:H7 was found in water samples in a north Spokane water district, prompting a health alert.

Then there are the tactics of the Washington State Department of Agriculture—reminiscent of those used against Alta Dena in the 1970s and 1980s. The state kept its final report secret until the day before the introduction of new raw milk legislation banning cow shares and announced “proof positive” at a press conference. Dee Creek Farm and others involved learned of the final report and the press release from the media, not the state.

To make their case for the new legislation, officials claimed that Dee Creek had barred entry to the farm. In fact, the Pucketts had never barred entry to the farm, only requested that inspections take place when they did not have other obligations (such as meeting with their attorney

or visiting the doctor), to which officials agreed. (When confronted with these lies, Michael Tokos of WSDA apologized and agreed that the Pucketts did not ever bar entry.) The whole affair smacks of well-planned orchestration, perfectly timed to influence anti-cow-share legislation.

Another particularly virulent outbreak of *E. coli* O157:H7 illness, one we discussed earlier, occurred in California during a ten-week period, beginning in August, 2006. Over half the two hundred four victims were hospitalized; thirty-one cases involved a type of kidney failure called hemolytic uremic syndrome (HUS), and there were three deaths. HUS, by the way, usually occurs when the patient afflicted by virulent *E. coli* is given antibiotics, which can lead to a build up of Shiga toxin that can cause kidney failure.¹²⁵

Using PFGE analysis, investigators finally matched the particular strain of *E. coli* O157:H7—out of over thirty-five hundred known unique *E. coli* O157:H7 strains—to fresh salad spinach grown in the Salinas valley and also to cattle feces from a cattle ranch uphill of the spinach fields.¹²⁶ Several companies voluntarily recalled their spinach as the industry scrambled to find ways to prevent future outbreaks—spinach growers alone suffered two hundred million dollars in lost sales in 2006 and more in earlier outbreaks.

But the problem is complex. If, as most investigators suspect, runoff water from confinement farms is a source of the organism, it will be a continuing source of infection—which apparently cannot be washed off, as *E. coli* can reside within the tissue of the leaves as well as on the surface. Clorox rinses and cold storage have proven equally ineffective in preventing illness.¹²⁷

Virulent *E. coli* almost certainly originates with the confinement of livestock, so it is ironic that a lot of the media attention during the outbreak focused on a raw milk dairy farmer from Fresno who grazes his dairy cows on grass. Mark McAfee, the outspoken president and founder of Organic Pastures Dairy, even developed a mobile milking parlor so his cows could always be on pasture. His raw milk products, including butter, cream, yoghurt, kefir and cheese, sell in health food stores throughout California, where retail sales of raw milk and raw milk products are legal. It was raw milk products from Organic Pastures Dairy that

replaced those from Steuve's after California health officials forced the closure of the Steuve brothers' raw milk business.

McAfee instituted a private testing program when he went into business in 1999, frequently subjecting the milk products, the farm environment, the cows and their manure to laboratory analysis. At the time of the outbreak, he had performed over thirteen hundred tests, not once finding a human pathogen.

Then came reports that several children had been hospitalized from *E. coli* O157:H7, all of whom had consumed raw milk. According to the FDA, five were ill and four hospitalized. In reality, only two were hospitalized, both of whom had been given antibiotics in spite of express instructions on their armbands forbidding antibiotics. McAfee visited both children in the hospital. The mother of one child denied the illness had anything to do with raw milk and the other child had consumed spinach two days before the illness.

"Just to be safe," the California Department of Food and Agriculture (CDFA) quarantined all Organic Pastures raw milk products. A state team dressed up in protective gear showed up at the farm and tested and retested the cows, the milk and the manure on the farm. They found pathogens only in two heifers, which were not being milked. McAfee had purchased the heifers from a confinement dairy—he says the pathogen finding taught him a lesson, and he will never bring outside cows into his herd again. In any event, the strain from the heifers did not match the strain that had sickened the children. The state lifted the quarantine two weeks later and eventually paid a partial compensation to Organic Pastures for loss of sales.

But the link between California raw milk and *E. coli* O157:H7 died a slow death. An FDA anti-raw milk PowerPoint presentation posted on the Internet several months later contained several slides linking a "California raw milk dairy" to four HUS hospitalizations from *E. coli* O157:H7. The slides were removed after an angry letter from McAfee threatened the agency with a lawsuit.¹²⁸ In a June, 2008 court case involving raw milk, attorneys for the Maryland Department of Health and Mental Hygiene cited "children in California drinking raw milk, getting sick from *E. coli* and almost dying," in arguments opposing cow-shares agreements.

And when attorney Bill Marler convinced two of the victims to sue the dairy, more reports about the case appeared in the newspapers. Marler placed an inflammatory video, full of distortions, about the sick children on YouTube.com, but removed it after receiving a letter from McAfee enumerating its errors. Still, all the free publicity at the time of the outbreak led to a twelve percent increase in sales for Organic Pastures.

THE SAFETY OF RAW VERSUS PASTEURIZED MILK

We now come to the sixty-four thousand dollar question. What is the risk of illness on a per-serving basis for raw milk compared to pasteurized milk and also to other foods? The obvious bias in published reports makes this a difficult question to answer, but we can try.

From a joint USDA/FDA/CDC paper on *Listeria monocytogenes*, published in September, 2003, the authors estimated that there are five hundred fifteen times more illnesses from *L. mono.* per year due to deli meats and twenty-nine times more illnesses from *L. mono.* per year due to pasteurized milk compared to raw milk.¹²⁹ On a per-serving basis, the authors estimated that deli meats are ten times more likely to cause illness than raw milk—yet we hear no warnings from the FDA that “Deli meats are inherently dangerous and should not be consumed.”

The CDC attributes nineteen thousand five hundred thirty-one illnesses to the consumption of pasteurized milk and milk products from 1980-2005, just over ten times the number of illnesses attributed to raw milk during the same period. The CDC estimates that 3.5 percent of American households drink raw milk on a regular basis. Using this estimate, there are over twice as many illnesses attributed to raw milk compared to pasteurized milk on a per-serving basis. Adjusting for bias in the numbers attributed to raw milk, however, pasteurized milk may be over five times more dangerous than raw milk on a per-serving basis.¹³⁰ One statistician concluded from the CDC numbers that you’d have to drink over three million glasses of raw milk before you might expect to get an illness of any kind due to the milk.¹³¹

Here’s another way to crunch the numbers. There are about sixty government-reported illnesses from raw milk per year—a number that is probably greatly exaggerated—and about one-half million raw milk

drinkers in the U.S.—a number that is conservative. But using these figures, the rate of illness from raw milk can be calculated at about one one-hundredth of one percent per year—the actual percentage is probably much lower. The rate of illness from other foods is about twenty-five percent—seventy-six million cases per year in a population of about three hundred million. Thus even using inflated government statistics on illness from raw milk, you are over twenty-five hundred times more likely to contract illness from other foods than from raw milk.

JUST HOW DANGEROUS ARE PATHOGENS, ANYWAY?

A recurring theme in this book has been the importance of each individual's immunity in resisting the potentially harmful effects of pathogenic bacteria. This topic emerged in a January 5th, 2000 *Los Angeles Times* article titled "The Great Egg Panic: New proposals rekindle the debate over eggs' safety. But some scientists say the fears are overblown."¹³²

"New government proposals designed to check salmonella poisoning could force routine pasteurization or irradiation of the American egg supply," the article reads. Officials argue that because three hundred thousand Americans are sickened and hundreds die each year from salmonella in eggs, eggs should be irradiated. "Today's egg, the new wisdom dictates, is too frequently contaminated with a bacterium called *Salmonella enteritidis* to be eaten as eggs always have been: sunny side up, in mayonnaise, cracked raw over hot pasta and grated with Parmesan cheese or simply soft-boiled and spooned worshipfully from a cup." Other officials disagree, including Peter Barton Hutt, former chief counsel for the FDA. He calls the statistical modeling that produces the food poisoning statistics "the closest thing I can think of in this modern age to a Ouija board." Now a lecturer on food safety at Harvard University, Hutt says, "The statistics are all over the place because none of them are any good. They are all wild guesses."¹³³

So while it is clear that many commercially produced eggs contain salmonella, it's not at all clear how many, or how many problems this may lead to, or why some people are afflicted while most are not.

According to John R. Roth, a professor of biology at the University

of Utah, who has been studying salmonella for forty years, “. . . probably it [salmonella] exists in very many organisms at a low level where it’s not a pathogen but living as part of the gut flora.” The idea of banishing it, he says, is absurd. “Salmonella is distributed pretty widely, and if you’re willing to look closely enough, you’d probably find it almost everywhere. Sometimes it makes a mistake and gets across the gut wall and into an organism. Then it has all these mechanisms for surviving known as virulence.”¹³⁴

In the vast majority of cases, that virulence manifests as an irritation in the gut wall where the immune system fights off the bacteria, and symptoms range from loose stools to flu-like illness. In rare cases, the infection reaches the bloodstream, and occasionally these cases may be fatal. Salmonella-induced fatalities almost always involve individuals who are immunosuppressed from previous drug therapy. According to the Centers for Disease Control in Atlanta, between 1985 and 1998 there were seventy-nine verified deaths from this cause, about five per year—one-tenth the number of people killed in the U.S. each year by lightning.¹³⁵

Roth’s assertion that salmonella is literally everywhere is important, for it confirms two things. First, there is no point in sanitizing the food supply, because contamination with salmonella and other organisms can just as easily occur after pasteurization, irradiation or whatever other process is used to sanitize. Second, the individuals who become ill as a result of exposure do so because their immune systems are functioning abnormally.

Actually, regular exposure to organisms such as salmonella can build resistance and immunity. In effect, we can make ourselves stronger and healthier by eating raw foods that may contain organisms considered “pathogenic.” That is why regular raw milk drinkers are much less likely to become ill during outbreaks of illness attributed to raw milk than first-time raw milk drinkers. According to a 1985 report, “Persons, regardless of age, who are routinely exposed to *Campylobacter jejuni* by vehicles such as raw milk may develop some protective immunity. [This is] supported by several serological studies . . .”¹³⁶

During one campylobacter outbreak “. . . none of the chronic raw

milk drinkers became ill after ingesting large amounts of the same milk that caused a high attack rate among those persons who were acutely exposed . . . Presumably this phenomenon is due to previous exposure to *Campylobacter* with subsequent development of immunity . . . this investigation confirms the presence of these antibodies [to *Campylobacter*] in persons chronically exposed to raw milk and for the first time, to our knowledge, shows an association between high antibody levels and immunity to infection under field conditions.”¹³⁷

Quite simply, these studies confirm the fact that raw milk drinkers develop powerful immunity and resistance to pathogenic organisms. The same journals that provide this information have continued to demand a complete ban on raw milk, including a ban on farmers giving the product away to neighbors and friends. Yet in this age of widespread threat from virulent microorganisms, raw milk proves to be the one food that can provide immunity to the pathogens in the other foods we consume.

GRASS-FED, FULL-FAT RAW MILK IS SAFEST

Back in 1936, Edwin Jordan, author of *A Textbook of General Bacteriology*, pointed out that “The character of pasture was early observed to affect the kind and abundance of the species [of bacteria] found in milk; the lack of pasture in more recent years has been demonstrated to have a profound effect.”¹³⁸ Numerous studies have confirmed the fact that current feeding methods utilizing large quantities of grains have had a profound influence on the kind and abundance of bacteria found in milk, much to the detriment of the health of the animals and the quality of the milk.

Of particular relevance is the development of acid-resistant strains of bacteria in modern cattle. According to a 1998 *Science* magazine article, cattle fed mostly grain have a lower (more acidic) intestinal pH and are more likely to harbor pathogenic bacteria than cattle fed mostly grass and hay. The abnormally low pH in which the bacteria develop makes these bacteria acid-resistant. “The ability of bacteria to act as food-borne pathogens depends on their capacity to survive the low pH of the [human] gastric stomach and to colonize the intestinal tract of

humans,” the authors write. “Cattle that were fed grain had one million-fold more acid-resistant *E. coli* than cattle fed hay.”¹³⁹

These acid-resistant pathogenic bacteria from heavily grain-fed, overly acidic cattle have an increased ability to survive the acid environment of the human stomach and subsequently colonize the intestinal tract and cause disease. This is a major reason why raw milk (or meat) from grass-fed cows is so much safer than milk from animals kept largely or entirely in confinement and fed mostly grains.

The butterfat in milk is another factor that protects us from illness. In addition to containing antimicrobial short- and medium-chain fatty acids, butterfat is a carrier for important vitamins that strengthen the immune system. Another substance, called glycosphingolipids, protects against gastrointestinal infections, especially in the very young and the elderly. In a study involving pasteurized milk, children who drank skimmed milk had diarrhea at rates three to five times greater than children who drink whole milk.¹⁴⁰

Milk was designed by nature to be a perfect food—but in order for milk to be a perfect food, and a completely safe food, it should be produced and consumed as nature intended. . . from cows on pasture, with all the butterfat, and unpasteurized. Natural, rich and raw!