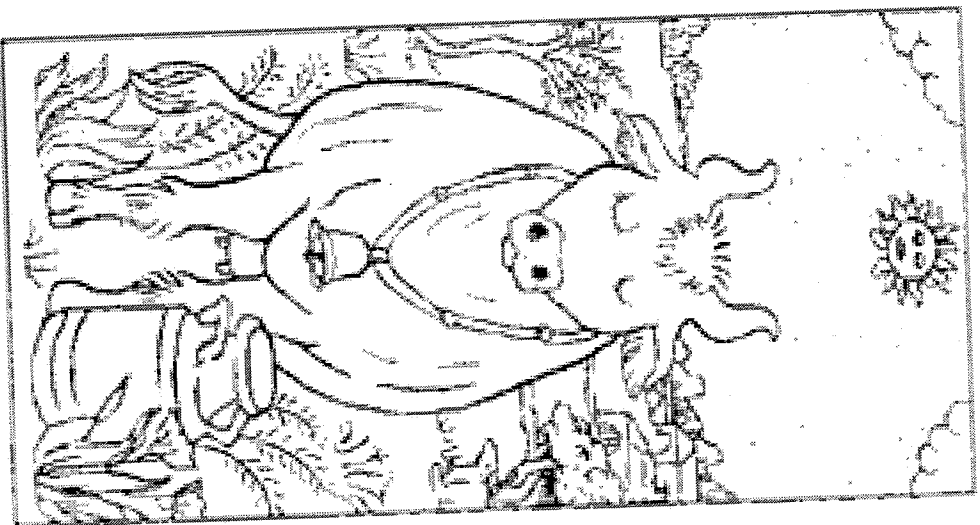


# A Campaign for *Real Milk*

**FULL-FAT  
PASTURE-FED  
UNPROCESSED**



By the Weston A. Price Foundation

A Campaign for Real Milk Is a Project of  
The Weston A. Price Foundation  
[westonaprice.org](http://westonaprice.org)

This document is posted at [realmilk.com](http://realmilk.com).  
Updated August 1, 2008

# Presentation Topics

1. Is Raw Milk Safe?
2. Is Raw Milk More Nutritious?
3. Is Milk from Pastured Cows More Nutritious?
4. Is Raw Milk Better for Farmers?

## ACKNOWLEDGEMENTS

With thanks to the following for help in preparing this presentation:

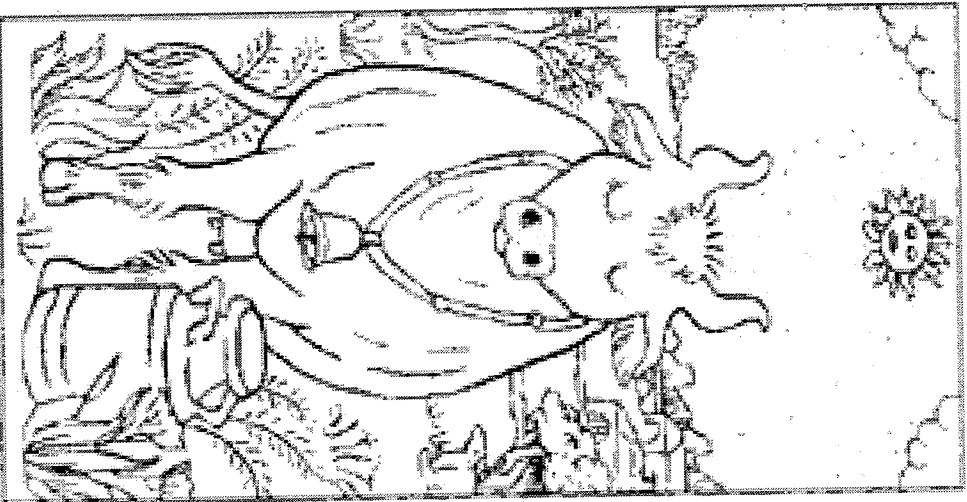
Lee Dexter, President, White Egret Farms

Ron Hull, PhD

Jill Nienhiser

Chris Masterjohn

# Part 1: Is Raw Milk Safe?



“Drinking raw milk or eating raw milk products is like playing Russian roulette with your health.”<sup>1</sup>

—John F. Sheehan, Director,  
US Food and Drug Administration,  
Division of Dairy and Egg Safety

FDA Consumer, Sept/Oct 2004.

## Raw Milk Is Uniquely Safe



Consider the calf, born in the muck, which then suckles on its mother's manure-covered teat. How can that calf survive?

Because raw milk contains multiple, natural redundant systems of bioactive components that can reduce or eliminate populations of pathogenic bacteria.

## Built-In Protective Systems in Raw Milk:

### Lactoperoxidase

- Uses small amounts of  $\text{H}_2\text{O}_2$  and free radicals to seek out and destroy bad bacteria<sup>1</sup>
- Found in all mammalian secretions—breast milk, tears, saliva, etc.<sup>1,2</sup>
- Levels are **10 times higher** in goat milk than in breast milk<sup>3</sup>
- Other countries are looking into using lactoperoxidase instead of pasteurization to ensure safety of commercial milk as well as for preserving other foods<sup>1,2,4,5</sup>

1. *Indian J Exp Biology*, 1998;36: 808-810.
2. *British J Nutrition*, 2000;84(Suppl. 1.): S19-S25.
3. *J Dairy Sci*, 1991;74:783-787.
4. *Life Sciences*, 2000;66(25):2433-2439.
5. *Trends in Food Science & Technology* 16 (2005) 137-154

## Built-In Protective Systems in Raw Milk: Lactoferrin

- Plentiful in raw milk; effectiveness greatly reduced by pasteurization<sup>1</sup>
- Steals iron away from pathogens and carries it through the gut wall into the blood stream; stimulates the immune system<sup>1</sup>
- Kills wide range of pathogens; does not kill beneficial bacteria.<sup>2</sup>
- In a study involving mice bred to be susceptible to tuberculosis, treatment with lactoferrin significantly reduced the burden of tuberculosis organisms.<sup>3</sup>
- Mice injected with *Candida albicans*, another iron-loving organism, had increased survival time when treated with lactoferrin.<sup>4</sup>
- Believed to cut visceral fat levels by as much as 40%.<sup>5</sup> Many other health benefits—is sold as a supplement!
- FDA approved for use in anti-microbial spray to combat *E. coli* O157:H7 contamination in meat industry!<sup>6</sup>

1. *British J Nutrition*, 2000;84(Suppl. 1):S11-S17.  
2. Zimecki and Kruzel. *J Exp Ther Oncol*. 2007;6(2):89-106  
3. *J Experimental Med*, 2002 DEC 02;196(11):1507-1513.  
4. *Infection and Immunity*, 2001 JUN;69(6):3883-3890.  
5. *MSN-Mainichi Daily News*, 2007 APR 11.  
6. *FDA News*, August 22, 2004

## Built-In Protective Systems in Raw Milk: Other Bioactive Components I – Components of Blood

- **Leukocytes**—Eat all foreign bacteria, yeast and molds (phagocytosis). Destroyed at 56C and by pumping milk. Produce  $H_2O_2$  to activate the lacto-peroxidase system. Produce anaerobic  $CO_2$  that blocks all aerobic microbes. Basis of immunity.
- **B-lymphocytes** – Kill foreign bacteria; call in other parts of the immune system<sup>1,3</sup>
- **Macrophages** – Engulf foreign proteins and bacteria<sup>4</sup>
- **Neutrophils** – Kill infected cells; mobilize other parts of the immune system<sup>1</sup>
- **T-lymphocytes** – Multiply if bad bacteria are present; produce immune-strengthening compounds<sup>1</sup>
- **Immunoglobulins (IgM, IgA, IgG1, IgG2)**--Transfer of immunity from cow to calf/person in milk and especially colostrum<sup>2,3</sup>
- **Antibodies**—Bind to foreign microbes and prevent them from migrating outside the gut; initiate immune response.

<sup>1.</sup> *Scientific American*, December 1995.  
<sup>2,3,4</sup> *British J of Nutrition*, 2000;84(Suppl. 1):S3-S10, S75-S80, S81-S89.

## **Built-In Protective Systems in Raw Milk:**

### **Other Bioactive Components II – Fats and Carbohydrates**

- **Polysaccharides**—Encourage the growth of good bacteria in the gut; protect the gut wall
- **Oligosaccharides** – Protect other components from being destroyed by stomach acids and enzymes; bind to bacteria and prevent them from attaching to the gut lining; other functions just being discovered.<sup>1,2</sup>
- **Medium-Chain Fatty Acids**—Disrupt cell walls of bad bacteria; levels so high in goat milk that the test for the presence of antibiotics had to be changed.

1. *British J Nutrition*, 2000:84(Suppl. 1):S3-S10.

2. *Scientific American*, December 1995.



## **Built-In Protective Systems in Raw Milk:**

### **Other Bioactive Components III**

- **Enzymes, e.g. Complement & Lysozyme**—Disrupt bacterial cell walls. Complement destroyed at 56C; Lysozyme at 90C.<sup>1,2</sup>
- **Hormones & Growth Factors** – Stimulate maturation of gut cells; prevent “leaky” gut.<sup>2</sup>
- **Mucins** – Adhere to bacteria and viruses, preventing those organisms from attaching to the mucosa and causing disease.<sup>1,2</sup>
- **Fibronectin** – Increases anti-microbial activity of macrophages and helps to repair damaged tissues.<sup>1</sup>
- **Glycomacropeptide** – Inhibits bacterial/viral adhesion, suppresses gastric secretion, and promotes bifido-bacterial growth<sup>3</sup>

1. *British J Nutrition*, 2000:84(Suppl. 1):S3-S10.

2. *Scientific American*, December 1995.

3. *British J Nutrition*, 2000:84(Suppl. 1):S3-S10, S39-S46

## Built-In Protective Systems in Raw Milk: Other Bioactive Components IV

- **B<sub>12</sub> Binding Protein** – Reduces Vitamin B<sub>12</sub> in the colon, which harmful bacteria need for growth<sup>1</sup>
- **Bifidus Factor** – Promotes growth of *Lactobacillus bifidus*, a helpful bacteria in baby's gut, which helps crowd out dangerous germs<sup>1,2</sup>
- **Beneficial Bacteria** – *Lactobacilli* and *bifidus* bacteria, crowd out bad bacteria, product lactic acid that kills bad bacteria.

1. *Scientific American*, December 1995.  
2., 3. *British J Nutrition*, 2000:84(Suppl. 1):S3-S10, S39-S46.

## Destruction of Built-In Safety Systems by Pasteurization

<b>Component</b>	<b>Breast Milk</b>	<b>Raw Milk</b>	<b>Pasteurized Milk</b>	<b>UHT Milk</b>	<b>Infant Formula</b>
<b>B-lymphocytes</b>	active	active	inactivated	inactivated	inactivated
<b>Macrophages</b>	active	active	inactivated	inactivated	inactivated
<b>Neutrophils</b>	active	active	inactivated	inactivated	inactivated
<b>Lymphocytes</b>	active	active	inactivated	inactivated	inactivated
<b>IgA/IgG Antibodies</b>	active	active	inactivated	inactivated	inactivated
<b>B<sub>12</sub> Binding Protein</b>	active	active	inactivated	inactivated	inactivated
<b>Bifidus Factor</b>	active	active	inactivated	inactivated	inactivated
<b>Medium-Chain Fatty Acids</b>	active	active	reduced	reduced	reduced
<b>Fibronectin</b>	active	active	inactivated	inactivated	inactivated
<b>Gamma-Interferon</b>	active	active	inactivated	inactivated	inactivated
<b>Lactoferrin</b>	active	active	reduced	inactivated	inactivated
<b>Lactoperoxidase</b>	active	active	reduced	inactivated	inactivated
<b>Lysozyme</b>	active	active	reduced	Inactivated	inactivated
<b>Mucin A/Oligosaccharides</b>	active	active	reduced	reduced	inactivated
<b>Hormones &amp; Growth Factors</b>	active	active	reduced	reduced	Inactivated

1. *Scientific American*, December 1995.
2. *The Lancet*, 17 NOV 1984;2(8412):1111-1113.

## **Destruction of Built-In Safety Systems by Pasteurization II**

- Milk's anti-microbial properties have been detailed only recently, but the destruction of protective properties was recognized as early as 1938 in studies showing that raw milk did not support the growth of a wide range of pathogens.
- Researchers noted that heating milk supports the growth of harmful bacteria by inactivating "inhibins" (factors that inhibit bacterial growth).

*The Drug and Cosmetic Industry, 1938:43:1.*

## **Coliforms – not the same as pathogens**

- Rod-shaped bacteria found everywhere in the environment, including the gut, the feces, soil, water and plants.
- Four main groups: *E.coli*, *Kiebsiella*, *Enterobacter*, *Citrobacter*.
- Key characteristic: ferment lactose into lactic-acid.
- "... Research results have shown that total coliforms may not be an appropriate bacterial indicator of fecal pollution."
- "... Significant concentrations of coliforms in distribution systems do not represent a health risk to water consumers."
- "With few exceptions, coliforms themselves are not considered to be a health risk. . ."
- "It is widely accepted that the total coliform group of bacteria is diverse and they can be considered normal inhabitants of many soil and water environments that have not been impacted by fecal pollution."

## Coliforms in raw milk inhibit pathogen growth<sup>14</sup>

- Enterococci (considered “virulent” and/or “antibiotic resistant” in hospitals) inhibit pathogens such as listeria in raw feta cheese. [eurekalert.org](http://eurekalert.org), April, 2008.

- Lactobacillus and staphylococcus produce bacteriocins against *L. Monocytogenes* and are sold as commercial starters to control listeria. Hull. *Australian Journal of Dairy Technology* Aug 2007;62(2):100-102

- Staphylococci, Streptococci, Lactobacillis and *Ent. faecalis* in raw human milk inhibit pathogenic *Staph aureus*. Heikkila and Saris. *J Appl Microbiology* 2003,95, 471-478

# New Medical Paradigm- Coliforms Essential

## • OLD PARADIGM:

Healthy human body is sterile and microbes attack it, making us sick.

## • NEW PARADIGM:

Healthy human body lives in symbiotic relationship with microorganisms.

## • Arguments for pasteurization are based on a discredited medical paradigm.

A6 Monday, June 5, 2006

## Legion of Little Helpers in the Gut Keeps Us Alive

By Hana Weiss  
Washington Post Staff Writer

So you think you are the self-reliant type. A rugged individualist. Well, give it up. You'll be nothing without the trillions of microbes inhabiting your large intestine, performing critical physiological functions that your highly refined human cells wouldn't have a clue how to do.

That's one of the humbling truths emerging from the most thorough census yet of the bacterial tenants harbored inside our bodies. The new view, made possible by cutting-edge DNA sequencing techniques, is that the so-called human genome — all the genes in our cells — is but a fraction of what it takes to make a human.

In fact, it's time to stop thinking of yourself as a single living thing at all, say the scientists behind the new work. Better to see yourself as a "super-organism," they say, a hybrid creature consisting of about 10 percent human cells and 90 percent bacterial cells.

The numbers might strike fear into people, but the overall concept is one we have to understand and adjust to, said Steven Gill, a microbial geneticist who helped lead the study at the Institute for Genome Research in Rockville.

A better understanding of the bacteria

containing microbes inside our bodies has

not only implications in the not-so-distant future, Gill and others predicted,

doctors will test for subtle changes in the

numbers and kinds of microbes in people's

guts as early indicators of disease. Doctors

may prescribe live bacterial supplements to

bring certain physiological measures back

into normal range, and drug companies will

be working on drugs to fight off or amplify

the action of helpful bacteria.

"These microbes are master physiologi-

cal chemists," said Jeffrey J. Gordon of

Washington University in St. Louis, author

of a new book, "Understanding Our Bio-

synthetic Capabilities and Following the

Pathways by which they operate could be

the starting point for a 21st-century phar-

macy.

Scientists have long recognized that the

number of human cells in the body is

described by the 100 trillion or so bacteria

living in and on it. It's a daunting reality ob-

scured by the fact that human cells are

much bigger than bacterial cells, but all

their numbers, bacteria account for only

about three percent of the average person's

weight. Just how important those three percent

are, however, has been difficult to appreciate until now. Most bacteria are too finicky to grow in laboratory dishes. As a result, little was known about who those majority shareholders really are and when, exactly, they show up.

The new study, described in last week's issue of the journal *Science*, took a novel approach. Rather than struggling to grow the body's myriad microbes and testing their ability to perform various biochemical reactions — the methods scientists traditionally use to classify bacteria — the team used tiny molecular probes resembling DNA. Yet instead of being injected into the cells, the probes of bacterial DNA, from unknowns of the microbial outpost of two volunteers.

By comparing the DNA sequences of those snippets with those of previously studied bacteria, the team was able to sort many of the invisible bugs into known families. Hundreds of others, it became clear, belonged to small families unknown to scientists.

But the team members went further. By comparing the genetic puzzle pieces with similar sequences stored in databases, they were able to determine what biological functions many of these microbes are performing in the gut. And, as it turns out, no small number of those functions are critical to human gut health.

Some of the microbes have the genetic machinery to make essential vitamins that are not found in the diet and that human cells can barely manufacture, including several B vitamins. Others make enzymes that can break the chemical bonds in plant fibers, or polysaccharides, where a plant's nutritional energy is stored.

They have even recorded in our own genes the ability to break down the complex molecules that these microbial genomes have a whole arsenal of gene products to degrade.

Some bacteria in the gut break down the waxes and other chemicals made by plants that could cause cancer if other microbes didn't break them down. Others have the genetic capacity to synthesize hydrogen gas from the gut — a by-product of digestion that can kill helpful bacteria — and convert it into methane. That makes the microbes a more biological friendly place, while contributing in sometimes embarrassing amounts to Earth's accumulation of greenhouse gases. And in one especially fascinating example, bacteria in the gut produce a chemical called an enzyme that facilitates the produc-

tion of butyryl coenzyme A, a fatty acid that is a favorite food of the cells that line the colon. "We provide them a good place to live," said Jeffrey Gordon, a professor at Washington University said of the bacterial cells, "and they are feeding the lining of our gut."

The new work does not purport to be a complete survey of all microbes in the human gut. And it did not even take a stab at the body's other pockets of microbial diversity — primarily the nose and mouth, the vagina, and the skin. But it does have the potential to reveal at last the metabolic details of our many microbes, said Claire M. Fraser-Liggett, president and director of the Institute for Genome Research.

With the technology improving and getting cheaper, she said, it won't be long before it's easy to monitor a person's microbial changes from day to day — or compare which bugs are good and which are bad, which have different diets or health histories.

"One question we need to tackle is: Is there such a thing as a core microbiome, a set of organisms or bacterial genes you find in most or all individuals?" Fraser-Liggett said. "It may be that microbes are very stable and diet doesn't play a huge role. Or it may be that it's a lot more dynamic."

With that kind of information in hand, doctors could think about prescribing particular "probiotic" foods or supplements to change a patient's microbiome in beneficial ways, or adjusting a patient's diet to make a better fit with the bugs that the patient is harboring.

To improve our microbial life would be to improve an important contributor to our health and our biology, Gordon said. Edward Delano, a professor at the Massachusetts Institute of Technology who has used similar techniques to study marine microbial diversity, said he was not completely comfortable with the idea that people are superorganisms and that the environment is just a backdrop.

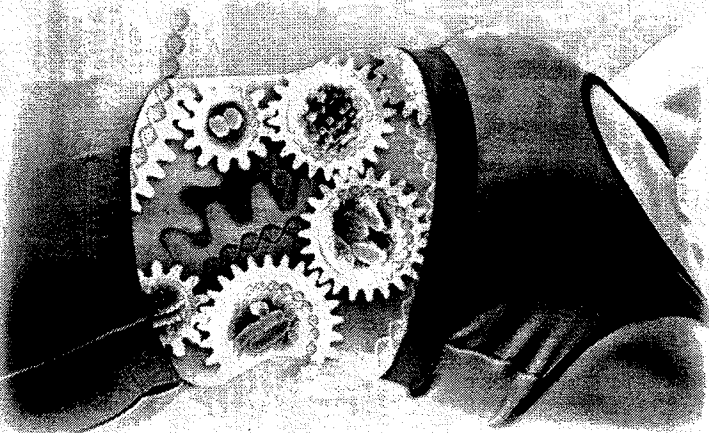
But he said he appreciated the focus on the positive side of bacteria. "We typically think of microbes as being associated with human disease. Delano said. But they are always with us and are associated most of the time with human health."

Researcher

Mag. Smith contributed to this report.

## SCIENCE

THE WASHINGTON POST



### Gut Bacteria: Our Essential Assistants

Five ways that intestinal microbes keep us alive, by doing what we can't.

- Vitamin synthesis, including several B vitamins.
- Breakdown of complex plant sugars to extract energy.
- Fermentation of dietary fiber.
- Conversion of hydrogen gas to methane.
- Breakdown of plant toxins that cause cancer and other diseases.

## Medical Uses of Coliform Bacteria

- Reseeding of colon with fecal bacteria to combat diarrhea from overgrowth of *Clostridium difficile* after antibiotic treatment.
- *Lactobacillis* to combat rotaviruses that cause diarrhea and intestinal inflammation in children.
- *Streptococcus* nasal spray to combat pathogens that cause otitis media (ear infections).
- *Lactobacillis* to prevent *Staph. aureus* from colonizing wound sites.
- A harmless strain of *E. Coli* injected into the bladder to successfully combat urinary tract infections.



# Food-Borne Illnesses Associated with Milk

## A Comparison with Other Foods, 1997

Food	No. of Outbreaks	%	No. of Cases	%
Milk	2	0.4	23	0.2
Eggs	3	0.6	91	0.8
Chicken	9	1.8	256	2.1
Fruits/Vegetables	15	3.0	719	6.0
Salads	21	4.2	1104	9.2

**Milk, both pasteurized and raw,  
has low rate of causing food-borne illness**

*MMWR* Mar 2, 2000:49(SS01):1-51

# Food-Borne Illnesses 1990 - 2004

FOOD	NO. OF OUTBREAKS	%	NO. OF CASES	%
Produce	639	22%	31,496	38%
Poultry	541	18%	16,280	20%
Beef	467	16%	13,220	16%
Eggs	341	11%	11,027	13%
Seafood	984	33%	9,969	12%

*Center for Science in the Public Interest*

## ***Campylobacter***—Most Common Cause of Food-Borne Illness

While raw milk often gets the blame for food-borne illnesses, *Campylobacter* is the most common cause and is best known for contaminating meats.

### **Meats sampled for *Campylobacter* from 59 Washington, DC grocery stores during 1999-2000.**

	No. of Samples	% Positive
Chicken	184	70.7%
Turkey	172	14.5%
Pork	181	1.7%
Beef	182	0.5%

*Applied and Environmental Microbiology*, 2001:67(12):5431-5436

# ***Listeria monocytogenes* – Deadly food pathogen**

- Raw milk is often blamed for causing infection with *Listeria Monocytogenes*, a deadly food pathogen that can cause severe illness and fetal death, premature birth or neonatal illness and death.
- In a 2003 USDA/FDA report: Compared to raw milk  
515 times more illnesses from *L-mono* due to deli meats  
29 times more illness from *L-mono* due to pasteurized milk
- On a PER-SERVING BASIS, deli meats were TEN times more likely to cause illness
- FDA: “Raw milk is inherently dangerous and should not be consumed.”
- Where are the FDA’s charges that deli meats are “inherently dangerous and should not be consumed? Where is the FDA’s exhortation to “everyone charged with protecting the public health” to “prevent the sale of deli meats to consumers”?

*Interpretive Summary – Listeria Monocytogenes Risk Assessment,*

Center for Food Safety and Applied Nutrition,  
FDA, USDHHS, USDA, Sept. 2003, page 17

# ***Listeria monocytogenes* – Not a Problem in Raw Milk**

- In a response to a Freedom of Information request, the Centers for Disease Control provided data on raw milk outbreaks 1993-2005—a 13-year period.
- In this report, CDC listed NO cases of foodborne illness from raw milk caused by *Listeria* during the period.
- Recently the Pennsylvania Department of Agriculture (PDA) has suspended sales of several dairies and issued inflammatory press releases, claiming *listeria monocytogenes* in the milk.
- Independent tests have shown NO *Listeria* in the milk and in all cases sales were resumed. There were no illnesses.
- Is the PDA trying to falsely build a case that *Listeria* is a problem in raw milk?

## Pathogens Can Multiply in Pasteurized Milk and Other Foods but Not in Raw Milk

- *Campylobacter* in chilled raw milk (4°C):  
Day 0 = 13,000,000/ml  
Day 9 = less than 10/ml<sup>1</sup>
- *Campylobacter* in body temperature raw milk (37°C):  
Bovine strains decreased by 100 cells/ml in 48 hrs.  
Poultry strains decreased by 10,000 cells/ml in 48 hrs.<sup>2</sup>
- Note that the protective components work more quickly to reduce levels of pathogens in warm milk than in chilled milk.

1. *Applied and Environmental Microbiology*, 1982;44(5):1154-58  
2. *Mikrobiyoloji Bul*, 1987;21(3):200-5

## Raw Milk Destroys Pathogens Through Challenge Tests

- Lactoperoxidase in raw milk kills added fungal and bacterial agents<sup>1, 2</sup>
- Raw goat milk kills *Campylobacter jejuni* in a challenge test<sup>3</sup>

1. *Life Sciences*, 2000;66(25):2433-9.
2. *Indian J Experimental Biology*, 1998;36:808-10.
3. *J. Food Protection*, 63: 916-920.
4. *Milchwissenschaft* 55: 249-252.

## Recent Challenge Test

- BSK Food & Dairy Laboratories (2002) inoculated raw colostrum and raw milk samples from Organic Pastures Dairy (Fresno, California) with three pathogens.
- 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*.”

McAfee, M. Unpublished data.



## The Money that Pays for Our Food Is a Source of Pathogens

- *E. Coli* has been shown to survive on coins for 7-11 days at room temperature.
- *Salmonella enteritidis* can survive 1-9 days on pennies, nickels, dimes and quarters.
- *Salmonella enteritidis* can also survive on glass and Teflon for up to 17 days.

## Soy Products Contain Pathogens

- 1998 survey looked at 4 brands of soy milk; five types of microorganisms found in stored soy milk samples. During storage at 5°C, microbial counts increased sharply after 2-3 weeks.<sup>1</sup>
- 1978 survey found *Salmonella* in many “health food” products, including soy flour, soy protein powder and soy milk powder. “The occurrence of this pathogen in three types of soybean products should warrant further investigation of soybean derivatives as potentially significant sources of *Salmonella*.”<sup>2</sup>

1. *J Food Protection*, 1998; 61(9):1161-1164.  
2. *Applied & Environmental Microbiology*, Mar 1979; 37(3):559-566.

# Breast Milk Contains Pathogens

- **MISCONCEPTION:** Until recently, the medical profession claimed that breast milk was sterile.
- **PATHOGENS:** We now know that breast milk contains pathogens, often at very high levels.
- **IMMUNITY FOR LIFE:** The bioactive components in milk program the baby to have immunity for life to any pathogens he comes in contact with.
- **PASTEURIZE BREAST MILK?** Should mothers be required to pasteurize their own milk before giving it to their babies?
- **DISCRIMINATION:** Laws prevent mothers from obtaining raw milk to feed their babies should their own supply be inadequate.

1. *J Appl Microbiol.* 2003;95(3):471-8.
2. *Neonatal Netw.* 2000 Oct;19(7)21-5.
3. *J Hosp Infec.* 2004 Oct;58(2):146-50.
4. *Curr Med Chem.* 1999 Feb;6(2):117-27.
5. *Scientific American*, December 1995.
6. *Lancet.* 1984 Nov 17;2(8412):1111-1113.
7. *Cent Afr J Med.* 2000 Sep;46(9):247-51.
8. *Eur J Pediatr.* 2000 Nov;159(11):793-7.
9. *J Dairy Sci* 1991;74:783-787.

**Pasteurization Reduces Protective Effects of Breast Milk**

1984 study involving high-risk premature infants

Type of Milk	Rate of infection
Pasteurized human milk + formula	33.0%
Raw human milk + formula	16.0%
Pasteurized human milk	14.3%
Raw human milk	10.5%

*Lancet.* 1984 Nov 17;2(8412):1111-1113

## Pasteurizing Breast Milk Puts Infants at Risk!<sup>29</sup>

A recent outbreak of *Pseudomonas aeruginosa* in a neonatal intensive care unit caused by a contaminated milk bank pasteurizer resulted in 31 cases of infection and 4 deaths.

*Arch Dis Child Fetal Neonatal Ed*, 2003 Sep;88(5):F434-5.

## Some Outbreaks Due to Pasteurized Milk

- 1976—1 outbreak *Y. enterocolitica* in **36** children, 16 of whom had appendectomies, due to pasteurized chocolate milk<sup>1</sup>
- 1982—Over **17,000** cases *Y. enterocolitica* in several states from milk produced in Memphis, TN<sup>2</sup>
- 1983—1 outbreak, **49** cases, **14 deaths** from *L. monocytogenes* in MA<sup>2</sup>
- 1984-85—3 outbreaks of antimicrobial-resistant *S. typhimurium*, at plant in Melrose Park IL. The third wave had **16,284** confirmed cases; surveys indicated as many as 197,581 persons may have been affected<sup>2</sup>
- 1985—**1,500+** cases, *Salmonella* culture confirmed, in Northern IL<sup>2</sup>
- 1993-94—1 outbreak, **2014** cases/**142** confirmed *S. enteritidis* due to pasteurized ice cream in MN, SD, WI<sup>6</sup>
- 1995—Outbreak of *Yersinia enterocolitica* in **10 children**, 3 hospitalized due to post-pasteurization contamination<sup>7</sup>
- 2000—1 outbreak, **98** cases/**38** confirmed *S. typhimurium* in PA and NJ<sup>7</sup>
- 2005—1 outbreak, **200** cases *C. jejuni* in CO prison<sup>9</sup>
- 2006—1 outbreak, **1592** cases/**52** confirmed *C. jejuni* infections in CA<sup>10</sup>
- 2007—1 outbreak, **3 deaths** from *L. monocytogenes* in MA.<sup>11</sup>

## **Milk Safety in California**

Since 1999:

- Over 40 million servings of Organic Pastures raw milk, not one confirmed illness; in over 1,300 tests, no human pathogens ever found in the milk, or even in the manure of the animals being milked.
- Several pasteurized milk products recalled and one publicized outbreak of illness due to pasteurized milk during the same period, an outbreak of campylobacter that sickened 1,300 inmates in 11 state prisons.

## Bias in Reporting Safety of Raw Milk I

- 1983 OUTBREAK of *Campylobacter* infection in Atlanta, GA blamed on raw milk.
- EXTENSIVE TESTING failed to find *Campylobacter* or any other pathogens in any milk products from the dairy. All safety measures had been followed faithfully.
- AUTHORS' CONCLUSION: "The only means available to ensure the public's health would be proper pasteurization before consumption."<sup>1</sup>
- RAW MILK BANNED in Georgia as a result of this incident.

*Am J Epidemiol.* 1983 Apr;117(4):475-83.



## Bias in Reporting Safety of Raw Milk II

- **OUTBREAK:** November 2001 outbreak of *Campylobacter* in Wisconsin blamed on raw milk from a cow-share program in Sawyer County. The farm has an outstanding safety record.
- **OFFICIAL REPORT:** 75 persons ill.<sup>1</sup>
- **INDEPENDENT REPORT:** Over 800 ill during 12 weeks following Nov 10, 2001.
- **HAMBURGER LIKELY CAUSE:** Only 24 of 385 cow-share owners became ill. Most had consumed hamburger at a local restaurant. No illness in remaining 361 cow-share owners.
- **BIAS:** Local hospitals tested only those who said they had consumed raw milk; others sent home without investigation, so mostly raw milk drinkers included in report.
- **LAB TESTS CLEAN:** Independent lab tests found no *Campylobacter* in the milk.<sup>2</sup>

1. *MMWR* 2002 JUN 28;51(25):548  
2. [http://www.realmilk.com/pr\\_071402.html](http://www.realmilk.com/pr_071402.html)

## Bias in Reporting Safety of Raw Milk III

- CDC REPORT: In 2002, an outbreak of *Salmonella Typhimurium* implicated raw milk purchased at a dairy producing certified milk in Ohio.<sup>1</sup>
- SOURCE NOT DETERMINED: According to the CDC: “The source for contamination was not determined; however, the findings suggest that contamination of milk might have occurred during the milking, bottling or capping process.”
- MANY POSSIBLE SOURCES: There were many possible of vectors of illness on the dairy besides raw milk.
- COINCIDENCE? The outbreak came just a week after the Ohio Farm Bureau Federation voted in favor of raw milk.
- NO MORE RAW MILK SALES: The dairy, which had been in business for decades without incident, caved in to health department pressure.

1. *MMWR* 2002 JUN 28;51(25):548

2. [http://www.realmilk.com/pr\\_071402.html](http://www.realmilk.com/pr_071402.html)

## Bias in Reporting Safety of Raw Milk IV

- VANCOUVER ISLAND, five children from different families were diagnosed with an infection of *E.coli* O157:h7 after drinking raw goat's milk<sup>1</sup>
- BIAS: The report provides an excellent example of bias. The title, "*Escherichia Coli* O157 Outbreak Associated with the Ingestion of Unpasteurized Goat's Milk in British Columbia, 2001" does not reflect the possible sources of infection presented in the report.
- SAMPLES: One milk sample found "presumptively" positive after "enrichment" with a testing substance; no *E.coli* found in samples before "enrichment"; no *E.coli* found in second sample.
- OTHER SOURCES: First child infected had also visited a petting farm (a common source of infection); all children lived on a cooperative farm (where contact with animals was a possible source of infection.) *E. coli* O157:H7 in water a huge problem in the nearby state of Washington due to run-off from industrial farms. *E. coli* infection usually comes from hamburger meat.

## Bias in Reporting Safety of Raw Milk V

- North Carolina, 10/2000 – 1/2001, Outbreak of Listeriosis Associated with Homemade Mexican-Style Raw Cheese *MMWR* July 06, 2001 50(26):560-2; MacDonald and others. *Clin Infect Dis.* 2005;40(5):677-82
- Results probably biased as “During the study, rumors spread that the suspected vehicle of infection was homemade Mexican-style cheese.”
- Case patients were almost five times as likely as controls to have eaten hot dogs. The outbreak occurred during a massive recall of *Listeria*-infected hotdogs (900,000 pounds of hotdogs) in 10 southeastern states.
- Raeford Farms barbecued chickens were also recalled at time of outbreak—the company refused to comply with the recall!
- *Listeria* was present in the bulk tank raw milk of a manufacturing-grade dairy equipped only to produced process dairy products; bulk tank raw milk from dairies equipped to sell milk as a beverage did not contain the organism.
- Revised milking procedures focusing on thorough cleaning of teats and equipment got rid of *Listeria* contamination at the manufacturing-grade dairy.
- **NO PASTEURIZATION WAS NECESSARY** to prevent contamination with *Listeria*.
- Raw milk was the made a well-publicized whipping boy for widespread contamination problems in other foods.

## Bias in Reporting Safety of Raw Milk VI

- Virulent *E. coli* O157:H7 sickens up to 20,000 per year in US and kills several hundred.
- Recent outbreak in California traced to contaminated spinach.
- California officials blamed illness in 4 children during spinach outbreak on raw milk from Organic Pastures Dairy. Ordered quarantine of all OP raw milk products.
- After extensive testing, no *E. coli* O157:H7 found in OP raw dairy products. Quarantine lifted. OP Dairy paid compensation.
- FDA blames illnesses on OP raw milk in slides 56-59 of anti-raw milk powerpoint.
- FDA removes slides after letter from OP president Mark McAfee, who points out errors and reminds FDA officials that they are breaking food liability laws.
- Officials still refer to this incident as though OP were to blame.

# Slide Removed

- FDA removed these and other erroneous slides after protest by Organic Pastures Dairy
- Only two children hospitalized; they were given antibiotics, which is contra-indicated for *E. coli* O157:H7.
- The raw milk was exonerated and the California Department of Farms and Agriculture made a payment to compensate the dairy for lost business.

## Recent Outbreaks - California

- California Outbreak
- Onset 9/6, 9/13/06
- 4 Patients
- 4 Hospitalized
- 4 Hemolytic Uremic Syndrome (HUS)
- HUS can cause kidney failure and death
- *E. Coli* O157:H7

## Recent Outbreaks - California

- 4 children ill;
- An 8-year-old San Diego County girl, a Riverside County boy, 7, and a 10-year-old girl in San Bernardino County got sick after drinking contaminated milk.
- Case B (8 year old boy, SDC key id 07-015191) was confirmed as being associated with consuming the recalled brand of organic raw milk. He consumed the milk on 9/8 at the home of a friend, and his (Case B) onset was 9/13.

# Techniques for Blaming Raw Milk

- When testing raw milk, use cultures to promote pathogen multiplication and highly sensitive milk testing techniques that find pathogens in extremely small numbers, levels that would not cause illness. (Any substance you test will show pathogens if the test is sensitive enough.)
- Use new rapid testing techniques developed for the food industry that err on the side of finding false positives.
- When there is an outbreak, use food questionnaires that leave out likely vectors of disease but ALWAYS include raw milk.
- When there is an outbreak, test raw milk products first, and test them in the home setting rather than from the shelf. If a person is infected and has handled a raw milk product, the product will test positive for the organism. Omit testing other foods or raw milk products on the shelf (not handled by the consumer) but report a positive lab result for the raw milk product.
- Omit subjects who got sick but did not drink raw milk.
- Ignore equally likely or more likely sources of infection, such as visit to a farm or petting zoo, tap water or other foods.
- Assume that statistical association constitutes proof. It is easy to create a statistical association with raw milk using the above techniques.
- Issue inflammatory press releases accusing raw milk, which are not retracted when the dairy is exonerated.

## Double Standard for Pasteurized Milk

- Feb 24, 2006, Wal-Mart in Vidalia Georgia pulls pasteurized milk from shelves due to foul odor.

Foodconsumer.org 28 Feb 06

- At least one child seriously sick, not reported in news release. Private communication.
- Voluntary recall announced Feb 27, three days later – no sense of urgency.
- Wal-Mart applauded by Commissioner Tommy Irvin.
- No government recalls; no warnings to the public to avoid drinking pasteurized milk.



# Risky Behaviors? More Double Standards

- FDA calls drinking raw milk “risky behavior.”
- 1999 FDA Survey, 19,356 adults, 8 states. *Am J Prev Med* April 16(3):312-221
  - 50% consumed uncooked eggs
  - 20% consumed pink hamburgers
  - 8% consumed raw oysters
  - 1% consumed raw milk
- 2008 Study of 4548 young college students. *J Am Dietetic Assoc* 108:549-552
  - 53% consumed raw cookie dough
  - 33% consumed eggs with runny yolks
  - 29% consumed raw sprouts
  - 11% consumed raw oysters, clams or mussels
  - 7% consumed rare hamburger
  - Did not report raw milk consumption
- None of the common “risky behaviors” has prominence on FDA’s website for food safety, but raw milk does.
- No pasteurization requirement for common “risky behavior” foods.

# FDA Powerpoint Warning Against Raw Milk

Posted at [www.cfsan.fda.gov/~ear/milksafe](http://www.cfsan.fda.gov/~ear/milksafe), John F. Sheehan, Director, Division of Plant and Dairy Food Safety, contends that pasteurization is the only way to ensure the safety of milk. Of the 15 studies referenced:

No Valid Positive Milk Sample	12/15	80%
No Valid Statistical Association with Raw Milk	10/15	67%
Findings Misrepresented by FDA	7/15	47%
Alternatives Discovered, Not Pursued	5/15	33%
No Evidence Anyone Consumed Raw Milk Products	2/15	13%
Outbreak Did Not Even Exist	1/15	13%
<b>Did Not Show that Pasteurization Would Have Prevented Outbreak</b>	<b>15/15</b>	<b>100%</b>

# Safety of Raw Milk Versus Pasteurized Milk I

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- 1980-2005, CDC attributes 19,531 illnesses to consumption of pasteurized milk and milk products.
- This is 10.7 times the number of illnesses attributed to raw milk during the same period.
- Raw milk sales represent about 1% of nation's milk sales.
- Adjusting for bias, pasteurized milk is 1.1 and 15.3 times more dangerous than raw milk on a per-serving basis.
- Since 100% of reports cited by FDA fail to show evidence that pasteurization would have prevented the outbreak, **the risk of illness attributable to lack of pasteurization may approach zero.**

## **Safety of Raw Milk Versus Pasteurized Milk II**

- 60 government-reported illnesses from raw milk per year. This number is probably greatly exaggerated.
- About 500,000 raw milk drinkers in the US.
- Rate of illness from raw milk can be calculated at .012%. The actual percentage is probably much lower.
- 76,000,000 cases of food-borne illness from all sources in the US per year.
- Population about 300,000,000
- Rate of illness from all foods is 25%
- Thus, even using inflated government statistics on illness from raw milk, you are over 2000 times more likely to contract illness from other foods than from raw milk. PLUS, drinking raw milk protects you against illness from other foods!

## Raw Milk Production Today

Compared to 30-50 years ago, dairy farmers today can take advantage of many advancements that contribute to a safe product:

- Managed rotational grazing, ensures healthy cows
- Understanding of and effective testing for all zoonoses (diseases that cross-infect from animals to humans)
- Understanding of how water-borne pathogens get into bulk milk and control measures. Effective cleaning systems.
- Refrigerated bulk tanks
- Refrigerated transportation
- Easier and inexpensive milk testing techniques

# Heat-Resistant Pathogens in Pasteurized Milk<sup>46</sup>

- Johne's bacteria (paratuberculosis bacteria)—suspected of causing Crohn's disease, now routinely found in pasteurized milk (19% of samples tested).<sup>1</sup>
- *B. Cereus* spores, Botulism spores and Protozoan parasites survive pasteurization.<sup>2</sup>
- *Listeria monocytogenes* and *E. coli* O157:H7 survive HTST pasteurization; various *Bacillus* and *Clostridium* species may also survive pasteurization.<sup>3</sup>
- Dormancy of heat-treated *E. Coli* can cause typical laboratory culture techniques to underestimate presence of *E. coli* in pasteurized milk 100-fold.<sup>4</sup>

1. *Appl & Environ Microbiol* 2002 May;68(5):2428-35

2. Elliott Ryser. Public Health Concerns. In: Marth E, Stelle J, eds. *Applied Dairy Microbiology*, New York, Marcel Dekker, 2001.

3. Binderova and Rysanek. *Veterinari Medicina*. 1999;44(10):301-308.

4. Gunasekera and others. *Appl Environ Microbiol*. 2002;68(4):1988-1993 (and references therein).