

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

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

Five-Fold Protective System in Raw Milk

1. Destroys pathogens in the milk.
2. Stimulates the Immune system.
3. Builds healthy gut wall.
4. Prevents absorption of pathogens and toxins in the gut.
5. Ensures assimilation of all the nutrients.

Built in Protective Systems in raw milk (Lactoperoxidase)

- Uses small amounts of H₂O₂ and free radicals to seek out and destroy bad bacteria¹
- Found in all mammalian secretions—breast milk, tears, saliva, etc.^{1,2}
- Levels are 10 times higher in goat milk than in breast milk³
- Other countries are looking into using lactoperoxidase instead of pasteurization to ensure safety of commercial milk as well as for preserving other foods^{1,2,4,5}

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 pasteurization¹
- Steals iron away from pathogens and carries it through the gut wall into the blood stream; has anti-inflammatory properties; stimulates the immune system¹
- Kills wide range of pathogens including viruses; does not kill beneficial bacteria.²
- In a study involving mice bred to be susceptible to tuberculosis, treatment with lactoferrin significantly reduced the burden of tuberculosis organisms.³

- Mice injected with *Candida albicans*, another iron-loving organism, had increased survival time when treated with lactoferrin.⁴
- Believed to cut visceral fat levels by as much as 40%.⁵ 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!⁶

1. *British J Nutrition*, 2000;84(Suppl. 1):S11-S17; *JACN* 2001 20(5):389S-395S.

2. Zimecki and Kruzel. *J Exp Ther Oncol*. 2007;6(2):89-106; *International Dairy Journal* 2006 16:1252-1261

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 (components of blood)

- **Leukocytes**—Eat all foreign bacteria, yeast and molds (phagocytosis). Destroyed at 56C and by pumping milk. Produce H₂O₂ to activate the lacto-peroxidase system. Produce anaerobic CO₂ that blocks all aerobic microbes. Basis of immunity.
- **B-lymphocytes** – Kill foreign bacteria; call in other parts of the immune system^{1,2}
- **Macrophages** – Engulf foreign proteins and bacteria²
- **Neutrophils** – Kill infected cells; mobilize other parts of the immune system¹
- **T-lymphocytes** – Multiply if bad bacteria are present; produce immune-strengthening compounds¹
- **Immunoglobulins (IgM, IgA, IgG1, IgG2)**--Transfer of immunity from cow to calf/person in milk and especially colostrum; provides “passive immunization”²
- **Antibodies**—Bind to foreign microbes and prevent them from migrating outside the gut; initiate immune response.

Built in Protective Systems in Raw Milk (other bio-active components)

- **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.^{1,2}
- **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; may reduce intestinal injury and protect the liver.³

- **Phospholipids and Spingolipids**—bind to intestinal cells, prevent absorption of pathogens and toxins.³ Spingolipids are important components in cell membranes, protect cells against toxins, support digestion and protect against cancer.
- **Enzymes, e.g. Complement & Lysozyme**—Disrupt bacterial cell walls. Complement destroyed at 56C; Lysozyme at 90C.^{1,2}
- **Hormones & Growth Factors** – Stimulate maturation of gut cells; prevent “leaky” gut.²
- **Mucins** – Adhere to bacteria and viruses, preventing those organisms from attaching to the mucosa and causing disease.^{1,2}
- **Fibronectin** – Increases anti-microbial activity of macrophages and helps to repair damaged tissues.¹
- **Glycomacropeptide** – Inhibits bacterial/viral adhesion, suppresses gastric secretion, and promotes bifido-bacterial growth; supports immune system. ³
- **Beneficial Bacteria** – *Lactobacilli* and *bifidus* bacteria, crowd out bad bacteria, product lactic acid that kills bad bacteria.
- **Bifidus Factor** – Promotes growth of *Lactobacillus bifidus*, a helpful bacteria in baby’s gut, which helps crowd out dangerous germs^{1,2}
- **B₁₂ Binding Protein** – Reduces Vitamin B₁₂ in the colon, which harmful bacteria need for growth¹
- **Lactoglobulins:** Carry vitamins A and D and possibly other nutrients.³

Destruction of built in safety- system by pasteurization

- 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).

Component	Breast Milk	Raw Milk	Pasteurized Milk	UHT Milk	Infant Formula
B-lymphocytes	active	active	inactivated	inactivated	inactivated
Macrophages	active	active	inactivated	inactivated	inactivated
Neutrophils	active	active	inactivated	inactivated	inactivated
Lymphocytes	active	active	inactivated	inactivated	inactivated
IgA/IgG Antibodies	active	active	inactivated	inactivated	inactivated
B₁₂ Binding Protein	active	active	inactivated	inactivated	inactivated
Bifidus Factor	active	active	inactivated	inactivated	inactivated
Medium-Chain Fatty Acids	active	active	reduced	reduced	reduced
Fibronectin	active	active	inactivated	inactivated	inactivated
Gamma-Interferon	active	active	inactivated	inactivated	inactivated
Lactoferrin	active	active	reduced	inactivated	inactivated
Lactoperoxidase	active	active	reduced	inactivated	inactivated
Lysozyme	active	active	reduced	Inactivated	inactivated
Mucin A/Oligosaccharides	active	active	reduced	reduced	inactivated
Hormones & Growth Factors	active	active	reduced	reduced	Inactivated

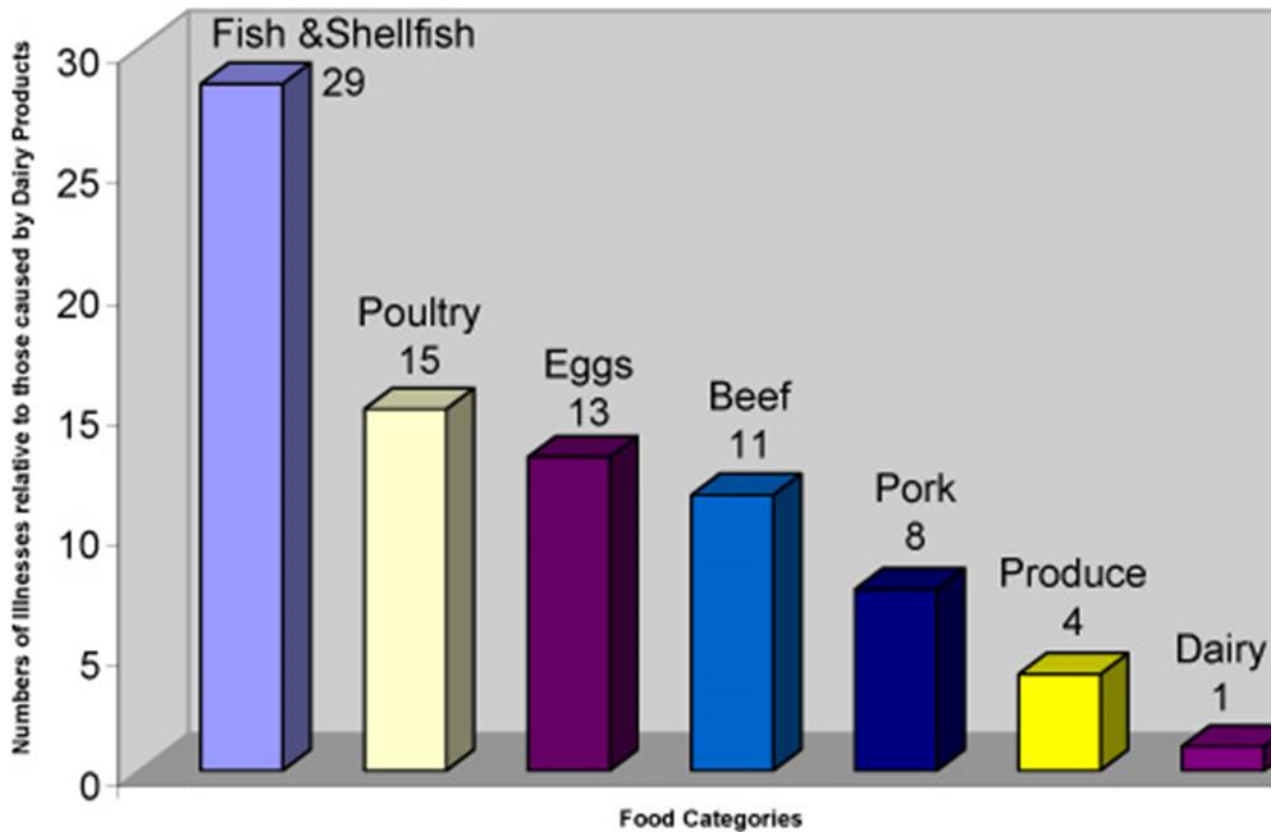
Food-borne Illnesses Associate with Milk: A Comparison with Other Foods, 1997

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 1996-2000

Relative Number of Foodborne Illnesses Linked to Outbreaks Caused by Various Food Categories, Adjusted for Consumption 1999-2006



*Using the yearly average illnesses linked to Dairy outbreaks as the baseline