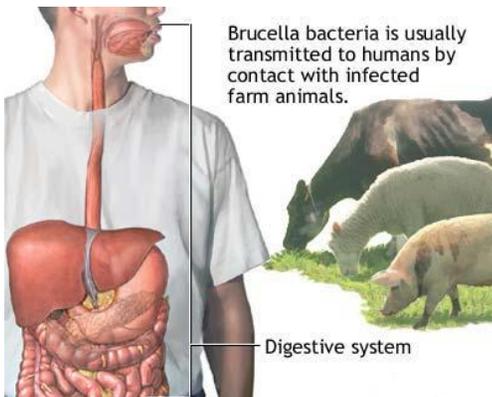


The Raw Milk debate – a new threat to a century of public health achievement

Dr. John P. Sanders DVM, DACVPM
July 12, 2009



Disclaimer

- This presentation does NOT represent any official position being advocated by the United States Government.
- This presentation is a uniquely created for this meeting

Acknowledgements

- Information presented in this presentation came from a variety of sources including FDA, and CDC website and Marler Blog as published by MarlerClark

At the turn of the 20th Century

- There was increase in people moving into urban center
 - With that public health saw
 - Increases infant mortality
 - Related to unregulated drugs
 - Poor sanitation
 - Issues with the milk supply

Unregulated Drugs

- Until 1906, there was no FDA so people marketed a number of products to treat various ailments such as Consumption, nervous disorders, allergies, etc
- There was no mandated Good Manufacturing standards or inspection of production facilities



Snake oil claims of the 1800's



- Cures
 - Arthritis
 - Inflammation
 - Neurologic conditions

Sanitation

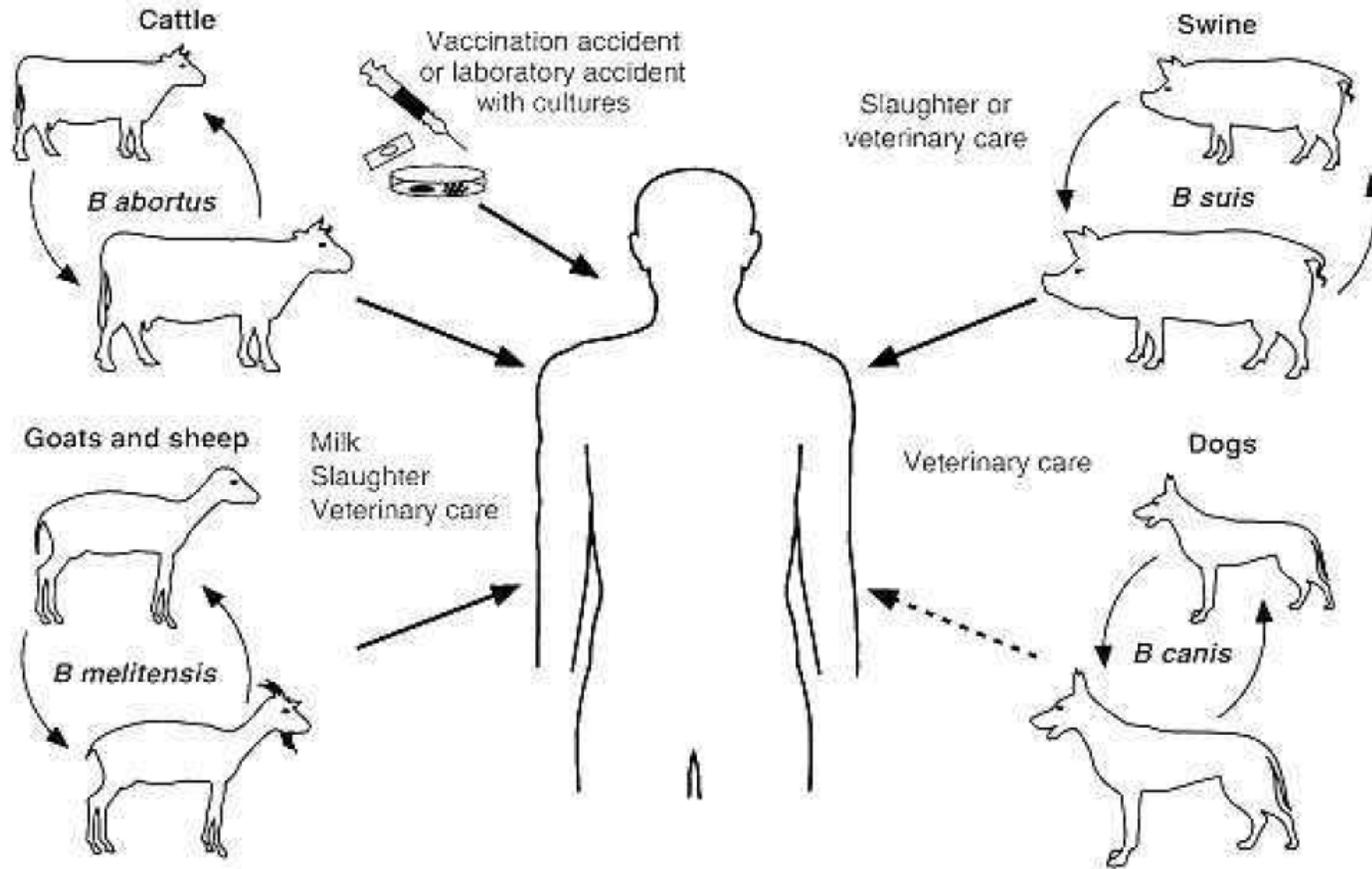
- John Snow -1854
 - Cholera outbreak
- Chlorination of the water supplies
- Sewage removal and treatment



Why at the turn of the 19th Century was Pasteurization of milk promoted by Public Health

- To Control diseases like Consumption (tuberculosis), undulant fever (Brucellosis), Q Fever (*Coxiella burnetii*), and Scarlet Fever (*Streptococcus pyogenes*)
- Reduce infant mortality
- Reduce the incidence of diarrhea disease

undulant fever (Brucellosis) transmission routes



What was the result of the Public health advancements

- In the early 20th Century, mortality in the United States declined dramatically. Mortality rates fell by 40% from 1900 to 1940, an average decline of about 1% per year. Life expectancy at birth rose from 47 to 63. Together with the late 19th Century, no other documented period in American history witnessed such rapidly falling mortality rates.

Success of Public Health

INFANT DEATH RATES - June 9, 1909

SAVING INFANTS' LIVES.

**Value of Milk Pasteurization Shown in
Official British Report.**

Special Cable to THE NEW YORK TIMES.

LONDON, June 5.—Convincing testimony as to the value of milk pasteurization, as advocated by Nathan Straus, is contained in a Blue Book issued yesterday.

The death rate for children under 5 has been reduced from 67.8 per 1,000 in 1857 to 40.9 per 1,000 in 1907. This decline is attributed to the administrative measures and the greater attention given to the supply of milk. In ten towns depots have been opened for the supply of pasteurized milk for in-

Success of Public Health

NY Times - May 23, 1909

Surprising Decrease in Deaths.

The result was astonishing. When Dr. Priestley began the distribution the infant mortality in the whole borough was 134 per 1,000. In the Marsh Ward and Bishop's Ward, the parts which were served by the depot, it was 187 and 272 per 1,000, respectively. During the first six months the death rate among the infants fed on milk from the depot was only 58, and Dr. Priestley points out that the depot-fed infants were selected from the worst lives in the district. Their parents brought them to the depot only when everything else had failed, and in many cases they were practically moribund when brought in.



Milk wagon in front of the W.B. Hage Creamery in 1895. Dr. Gochenauer instructed local dairymen on keeping their milk safe for human consumption. Commercial pasteurizing machines did not become available until 1895. The first compulsory pasteurization law was in Chicago in 1908.

Regulatory History

In 1924, the US Public Health Service developed the Standard Milk Ordinance to assist states with voluntary pasteurization programs. The Grade A Pasteurized Milk Ordinance (PMO), is administered by US Department of Health and Human Services (HHS), Uniform Public Health, and Food and Drug Administration (FDA) and defines practices relating to milk barn and processing plant design, milking practices, sanitation and pasteurization of Grade A milk standards.



Milk Heating History

- Pasteurization made it possible to store and distribute milk
- Illnesses transmitted by raw milk were virtually eliminated with commercial implementation of pasteurization, in combination with improved management practices on dairy farms.
- In 1938, milk products were the source of 25% of all food and waterborne illnesses that were traced to sources of 25% of all food and waterborne illnesses that were traced to sources, but not they account for far less than 1% of all food and waterborne illnesses.



U.S. Law U.S.
Code of
Federal
Regulations
Title 21
Section
1240.61

UPDATED US PASTEURIZATION REQUIREMENTS

FDA promulgation of 21 CFR 1240.61 was prompted by a court case, Public Citizen v. Heckler, 653 F. Supp. 1229 (D.D.C. 1986).

In promulgating this regulation, FDA made a number of findings relative to raw milk, including the following: "Raw milk, no matter how carefully produced, may be unsafe" (52 F. 29514, Aug. 10, 1987).

Why in 21st Century is Pasteurization of milk still being promoted by Public Health

- Four 19th century diseases have been reduced or eliminated from the US Dairy Herds and milk supply, four new pathogens have replaced them (Campylobacter, E. coli O157:H7, Listeria, and Salmonella sp.)
- Outside the United States, the original four still exist, there have been two document outbreaks of M. Bovis in people have consumed unpasteurized produced south of the United States where TB is still present in these herds
- All these organism have been cultured from raw milk samples taken from the bulk milk tanks from around this country and outside the US as well.

Outbreaks

- The CDC reports that from 1998 to 2004 there were 39 outbreaks in which unpasteurized milk or cheese made from unpasteurized milk were implicated.
- These outbreaks occurred in 22 states and two of them were multi-state outbreaks. An estimated 831 illnesses, 66 hospitalizations and 1 death were associated with these outbreaks.
- Not all outbreaks are recognized.
- Even when they are, not all are reported to CDC.
- Virtually impossible to capture all of the incidents of individual illness which might occur

Alleged benefits of drinking raw milk

1. Raw milk kills pathogens
2. Pasteurization inactivates enzymes that kill pathogens, including lactoferrin, xanthine oxidase, lactoperoxidase, lysozyme and nisin
3. Pasteurized milk causes lactose intolerance
4. Pasteurized milk causes allergic reactions
5. Pasteurized milk is the number one allergic food in this country
6. Pasteurized milk..... has been associated with ...arthritis
7. The pasteurization process turns casein into a very dangerous molecule that can further precipitate the brain injury (referring to autism)."
8. Pasteurization makes insoluble the major part of the calcium contained in raw milk. This frequently leads to rickets, bad teeth or nervous troubles
9. Pasteurization destroys 20 % of the iodine present in milk, causes constipation and generally takes from milk it's most vital qualities
10. Pasteurization destroys Vitamins A, D, E and F, sometimes by as much as 60.... And other water-soluble vitamins by as much as 38 -80%.

Myth No. 1

“Raw milk kills pathogens”

No, it doesn't.

- Allusion to the fact that milk does contain certain indigenous enzymes to which antimicrobial properties have been ascribed and to the fact that certain strains of bacteria which might be present in any given milk might be able to produce anti-bacterial compounds known as bacteriocins.

Myth No. 2

“Pasteurization inactivates enzymes that kill pathogens, including lactoferrin, xanthine oxidase, lactoperoxidase, lysozyme and nisin.”

No, it doesn't.

- Xanthine oxidase (XO) does not kill pathogens and is not destroyed by pasteurization.
- XO is thought to play a role in human nutrition and health and is a major component of the milk fat globule membrane (MFGM).
- XO has survived a laboratory heating of milk to 75C x 15s, which exceeds minimum HTST conditions.
- Griffiths J. Food Prot. 49 696-705 (1986).

More on XO

- Another myth : “Homogenization alters XO by making it smaller (somehow). The XO can then access the bloodstream to interact with arterial walls, triggering the deposition of cholesterol and causing atherosclerosis.”
- In 1971, Oster postulated that individuals who drink homogenized milk are prone to atherosclerosis because XO causes a depletion of plasmalogen in cell membranes.
- Additional research and epidemiological studies, including one by the American Heart Association, led to the conclusion twenty years ago that XO was not associated with atherosclerosis.
- Homogenization is simply a process whereby a relatively uniform globule size is mechanically imparted to the fat phase in milk.

- Lactoperoxidase is an integral part of the lactoperoxidase system (lactoperoxidase/thiocyanate/hydrogen peroxide).
- System does have antimicrobial effects.
- In those developing countries where it is difficult to cool milk, the system is utilized by the addition of added thiocyanate and hydrogen peroxide.
- Lactoperoxidase is a very heat stable enzyme. It is not destroyed by minimum pasteurization conditions.
- It is, however, very sensitive to heat at 80C regardless of holding time.



- Lysozyme, in conjunction with lactoferrin, does have a bactericidal effect.
- Lysozyme is not completely destroyed by pasteurization
- In excess of 70% of bovine milk lysozyme will survive normal HTST conditions (Griffiths, 1986).

- Nisin is not an enzyme, but a type of bacteriocin.
- Bacteriocins are proteinaceous toxins produced by bacteria.
- Nisin belongs to a class of bacteriocins known as lantibiotics.
- Nisin binds to a cell membrane precursor lipid component and disrupts cell membrane formation.
- Raw milk will contain inappreciable levels of nisin.

Myth No.3

“Pasteurized milk causes lactose intolerance.”

No, it doesn't.

- Lactose intolerance is an inborn error of metabolism.
- All milks, raw or pasteurized, will contain lactose.
- Pasteurization does not change the concentration of lactose.
- A person who is lactose intolerant has a reduced ability to synthesize beta-galactosidase (lactase)
- Might be expected to experience the symptoms of lactose intolerance when consuming either a raw or pasteurized milk.

Myth No. 4

“Pasteurized milk causes allergic reactions.”

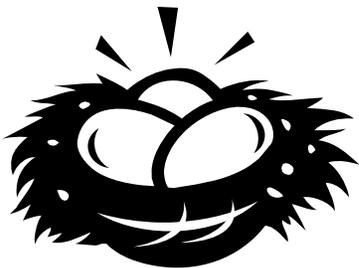
- The milk proteins which cause allergic reactions (including lactoferrin) in dairy-sensitive people are present in both raw milk and pasteurized milk.



Myth No.5

“ Pasteurized milk is the number one allergic food in this country.”

- Peanuts are the leading cause of severe allergic reactions, followed by nuts, shellfish, fish and eggs.



Myth No. 6

“Pasteurized milk..... has been associated with ...arthritis.”

- FDA was unable to locate any literature in support of this proposition.
- We did find one reference associating ingestion of **RAW** milk with a case of septic arthritis of the hip joint.
- See Campbell et al. J. Clin. Pathology 1993 (Nov) 46 (11) 1057-1058
- Reactive arthritis can occur after Salmonella infections

Myth No. 7

“ The pasteurization process turns casein into a very dangerous molecule that can further precipitate the brain injury (referring to autism).”

- FDA or a Review of Peer-Reviewed literature
- was unable to find any support for this statement.
- The statement is very non-specific.
- Do not know which casein species nor do we know the name of the “dangerous molecule”.
- Caseins are largely unaffected by pasteurization.
- Farrell and Douglas (1983) showed that there was little difference in the soluble casein found in raw milk (78.8%) and pasteurized milk (74.8%) (Kiel. Milchwirtsch. Forschungsber. 35;345-356).

Myth no. 8

“ Pasteurization makes insoluble the major part of the calcium contained in raw milk. This frequently leads to rickets, bad teeth or nervous troubles.”



- FDA was unable to locate literature associating pasteurization of milk with either rickets, bad teeth or nervous troubles.
- When human milk was pasteurized, there were no obvious differences in the absorption of nitrogen or the absorption and retention of calcium, phosphorous and sodium when compared to either raw milk or even a boiled milk and all three types were fed to very low birth weight preterm infants.
- Williamson et al. Arch. Dis. Child 1978 Jul (53) 7:555-563

- Literature indicates essentially no differences in calcium levels for both raw and pasteurized cow and goat's milk.
Lopez et al. JDS 68:1878-1886
- Generally understood that calcium is present in milk at about 1200mg/l.
- Only 34% of the calcium in milk is soluble; 66% of it is present in colloidal form – bound either to phosphate or citrate.
- Perhaps author is referring to a shift in the equilibrium between soluble and colloidal phases which will occur with temperature changes
- Often, temperature-induced changes in the equilibrium are reversible.
- The majority of calcium in milk is already in the colloidal as opposed to soluble phase.

Myth No. 9

“ Pasteurization destroys 20 % of the iodine present in milk, causes constipation and generally takes from milk it’s most vital qualities.”

- Pasteurization does not “take from milk it’s most vital qualities”. Far from it. Minimum pasteurization conditions provide safety to milk without appreciably altering it’s nutritional value.
- Iodine: Literature indicates that neither cream removal nor pasteurization nor spray-drying of milk affected the concentration of either natural or iodophor-derived iodine.
- Even when milk was boiled, only 0.02% of iodine was lost.
- Wheeler et al. JDS 1983 Feb 66(2) 187-195.

- With regard to the constipation claim, it appears that statement may be based on research which appeared in the NEJM between 1998 and 1999.
- That research dealt with cow's milk and chronic constipation in children.
- The claimant simply extrapolated that research to the population at large, which is, of course, inappropriate.
- The literature that we have seen does not indicate a belief that pasteurization of milk is considered to be causative of constipation, rather a sensitivity to cow's milk protein is believed to be the problem

Myth No. 10

“ Pasteurization destroys Vitamins A, D, E and F, sometimes by as much as 60.... And other water-soluble vitamins by as much as 38 -80%. ”

- We think that the claimant here must mean to say Vitamin K and not F.
- Pasteurization of milk does not cause appreciable loss of Vitamin A or any other fat-soluble vitamin.
- See Heat-Induced Changes in Milk, 2nd ed. P.F. Fox, ed. (1995) IDF
- With respect to the other water-solubles in milk, suffice it to say that milk is a good source of thiamine, folate, B-12 and riboflavin and that pasteurization will result in anywhere from zero to 10 percent reduction for each of them.

Other Claims of Raw Milk

- Probiotics or beneficial bacteria
- Higher nutritive value
- Contains undefined substance to protect against arthritis
- Promotes proper development of teeth and reduces incidence of caries
- Enhances fertility

Conclusion

- Many negatives are being assigned to the pasteurization of milk. Little, if any of it, is substantiable by the literature currently available.
- We hope that this information will have been helpful to you and we would encourage you to feel free to use the information provided here today as may be necessary.

Thought for the Day



‘It is very difficult to get a person to understand something when his/her salary depends on not understanding it.’

Upton Sinclair from *The Jungle*

