

Weighing the Risks/Benefits of Un-Pasteurized Raw Milk

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Abstract— With the increasing popularity of raw un-pasteurized Milk on the rise in the U.S., the general public is usually getting two sides of the story from whole food practitioners to full government studies. This paper is a collection of unbiased studies refuting and/or defending the health benefits of drinking raw milk over heated pasteurized milk. These claims range from nutritional loss from the pasteurization process to addressing unsubstantiated claims that raw milk can heal lactose intolerance, childhood asthma/allergies, as well as gut microflora in the human digestive system. The discussion of safety is also addressed as drinking raw milk holds an increase risk of pathogenic infection, hospitalization, as well as possible death. Although there are a number of studies on the subject, the acute scale of research and the small size of the sample groups/evaluation times doesn't offer any definitive conclusions but only suggestions. The final conclusion on health risk from the data collected has shown an overblown exaggeration of the danger while the comparisons of raw versus pasteurized milk seem to completely dispell the supposed bold claims of healing and nutritional loss.

Index Terms— Pasteurization, Pathogens, Outbreaks, Vat, MicroFlora, Asthma, Allergies.

1 INTRODUCTION

The debate on the benefits of consuming raw milk has grown in popularity over the years [1]. This growth has brought alarm and concern from not only the Food and Drug Administration but also the Centers for Disease Control and Prevention due to the increased risk of pathogenic diseases minus the pasteurization process of milk. This unbiased review weighs the true human health risk in relation to common everyday risk of pathogenic illnesses [1]. The comparison results of raw milk versus pasteurized milk are taken into consideration on numerous studies to draw conclusions on nutritional differences as well as dispelling or proving the claims of raw milk's healing benefits for childhood asthma, lactose intolerance, and improved human gut health.

2 EVALUATION OF THE ACTUAL HEALTH RISKS

The heated debate of health and safety has been a common battle ground between government legislators and raw milk dairy farmers/re-sellers [1]. Regulations on the sales of un-pasteurized milk in the U.S. range in restrictions, some states only allowing location farms to sell, while other states allow retail sales at local grocery stores. Currently Louisiana, Wisconsin, Kentucky, New York, Rhode Island, and Hawaii have completely banned raw milk for human consumption.

Although there has been numerous outbreaks in the last twenty years, the total annual illnesses for the U.S. currently stands at 781 with 22 total hospitalization in related to raw dairy [2]. It's important to consider that it includes all raw animal milks, cheeses, and butters. The fat solidity of a particular form of dairy does play a great factor in the increase or decrease of bacterial/pathogenic load. Between 2013 and 2018 (5 years) there has been a total of only 2 confirmed deaths from raw dairy in the United States [3]. Singling out raw milk my itself, those annual illnesses come to only 112 and only 5 hospitalizations. Those numbers might sound alarming but one has to take into account that 3.4% of American's drink raw milk. That's approximately 11 million people [4]. The odds of dying from a pathogenic sickness as a result of the ingestion of raw milk is 4.5 million to 1.

Some might conclude avoiding the risk completely by not drinking raw milk is a valid solution. However, when one considers the common pathogenic bacterial infections most common to raw milk, the risk exists for individuals with or without the consumption of raw milk. The top four raw milk bacterial infections are as follows in order of most common: Campylobacter SPP (79%), E. Coli (17%), Salmonella Enterica (3%), and Coxiella Burnetii (1%). See Fig.1 Raw milk related to these four-bacterium combined make up only .007% of the cases and only .04% of the hospitalizations (those including bacterial infections from other sources besides raw milk). See Fig.3 Salmonella is a much more common risk even to those that do not drink raw milk and can be transmitted simply by the touching/eating

uncooked poultry. Campylobacter SPP, the most common bacterial pathogen contracted from the human consumption of raw milk, has shown to have more common outbreaks with the combined threats of poultry, beef, and other unidentified foods. See Fig.2. These are common risks the average public takes part in on a regular daily basis regarding food consumption, most not aware of the risk themselves.

From this analysis on odds and occurrence comparison it is noticeably clear the risk is very acute considering the odds of infection and the common bacterial threats that exist equally for consumers and non-consumers of raw milk. It is also important to note that most cases and hospitalizations are usually correlated with underdeveloped or compromised immune systems (i.e. developing infants and the elderly). Furthermore, today common raw dairy farms practice intense scrutiny and evaluation regarding animal health and sanitation which has led to such sparse numbers in incidences.

3 VITAMIN AND MINERAL LOSS FROM PASTEURIZATION

One of the most crucial factors to consider in choosing raw milk over pasteurized milk is the loss of vitamin and mineral content. One study has concluded that the difference is shockingly minimal [5]. Vitamins, minerals, and even proteins have been scientifically proven resilient to the heating process and have survived (for the most part) the pasteurization process. The only significant decrease of vitamins (over 10% loss) has been B12 (Cyanocobalamin), B2 (Riboflavin), B9 (Folate), Vitamin C, and Vitamin E. Surprisingly the pasteurization process showed a significant (10% or more gain) of the Vitamin A. One might argue that this degrades the nutritional value but the fact of only a loss of 10% is so insignificant when weighing the human daily requirement value from one serving of milk (8 ounces) its simply not debatable. A simple increase of less of an ounce more of pasteurized milk would make up for the loss from the heating process.

4 CHILDHOOD ASTHMA/ALLERGIES

Cow's milk allergy (CMA) is an abnormal immunological response because of a particular sensitization to a protein in a food. Young infants are more susceptible to CMA due to their milder digestive systems (higher stomach pH, weaker pepsin/enzyme activity, higher stomach pH), which exposes them to more allergic reactions from "intact" proteins or large peptide sequences [7]. Surprisingly, children with CMA have shows that the intake of pasteurized milk is not correlated with any increased risk of respiratory allergies and/or dermatitis. Epidemiological studies have shown that being raised in a farming environment could be associated with a decreased risk of allergy and asthma [8], a possible influence that has been theorized as being involved in this result is the early digestion of raw milk.

5 LACTOSE INTOLERANCE IMPACT

There are many forms of milks that contain the sugar lactose, when consumed, the lactase enzyme (β -galactosidase) hydrolyses it into glucose and galactose, which soon after is absorbed into the body. With age most people develop the inability to digest lactose, resulting in a condition identified as lactose intolerance, resulting in bloating, diarrhea, and gas. There are those that claim raw milk alleviates lactose intolerance. A recent study found that raw milk failed to reduce lactose malabsorption related with pasteurized milk among adults positive for lactose malabsorption [10]. Since there is no β -galactosidase enzyme contained in un-pasteurized milk, there is no apparent reason raw milk could assist with the condition. Yogurts, that inhibit elevated levels of bacteria and have abundant β -galactosidase enzyme, have been shown to be much more tolerated by those with lactose intolerance.

A more definite study was done by comparing the reaction of 16 adults with lactose intolerance while having them ingest three types of milk (raw, soy, and pasteurized) over a three phase periods (8 days per phase) [10]. Lactose intolerance malabsorption was measured by hydrogen (H₂) breath testing (to see if there were improvements in the illness during absorption period). See 4-6.

The final conclusions were that raw milk failed to reduce lactose intolerance symptoms (H₂ levels) when compared with the control groups (pasteurized and soy) among adults whom where positive for lactose malabsorption, refuting the widespread anecdotal claims that drinking raw milk decreases the symptoms of lactose intolerance.

6 BENEFICIAL MICROFLORA

Wholistic practitioners and media outlets have claimed that raw milk is healthier as it retains a greater amount of “good bacteria”. In copious amounts (millions of colony units per millilitres) these probiotics and antimicrobial systems can be beneficial for human health. The most common beneficial bacteria for human consumption have been Bifidobacteria or Lactobacillus acidophilus. These two bacteria are not found in extremely high numbers (only low levels) in raw milk. It is highly desirable and beneficial that commercial probiotics are sourced from humans (not animals like cows) as their levels of colony units is much higher [11].

It is important to note that raw milk does have potential antimicrobial systems including lactoperoxidase, lactoferrin, bacteriocins, xanthine oxidase, and oligosaccharides. Although these systems have a 70% retainment rate after pasteurization, collectively they are still unable to stop pathogen growth in the un-pasteurized milk [12].

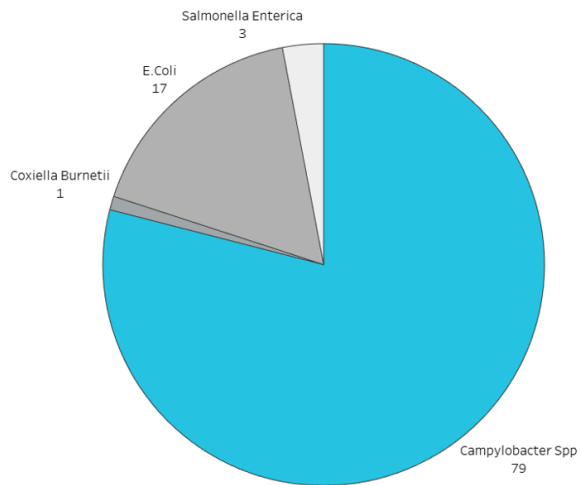


Fig. 1. U.S. Raw Milk Related Illness Outbreaks Percentage Cases (2013-2018)

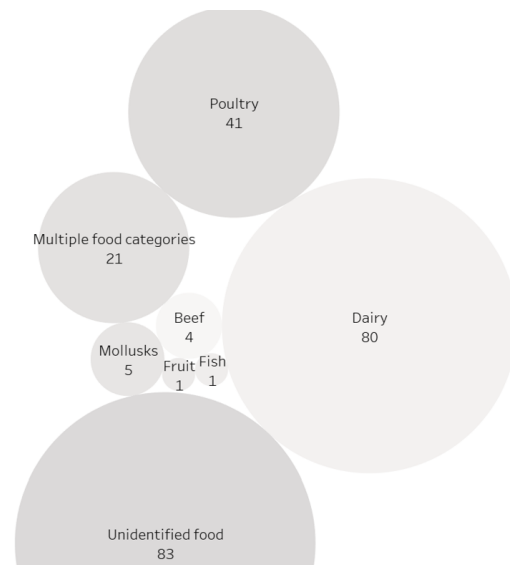


Fig. 2. U.S. Campylobacter SPP Outbreaks (2010-2017)

U.S. Annual Food Illnesses for Bacterial Infections

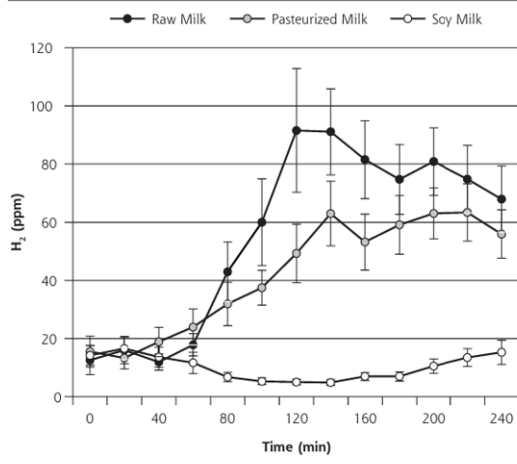
Bacterial Infection	U.S. Annual Cases
Campylobacter SPP	1,500,000
Coxiella Burnetii	178
E. Coli	95,000
Salmonella Enterica	1,350,000

U.S. Annual Raw Milk Cases/Hospitalizations

Bacterial Infection	U.S. Annual Cases traced to Raw Milk
Campylobacter SPP	154
Coxiella Burnetii	19
E. Coli	33
Salmonella Enterica	2

Fig. 3. Annual U.S. Raw Milk Related Illness Cases

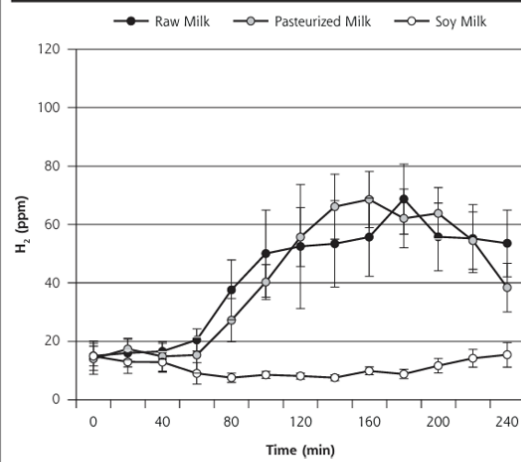
Figure 3a. Breath H₂ results for day 1 of each 8-day crossover phase (n = 16) (mean ± SEM).



H₂ = hydrogen; SEM = standard error of the mean.
 Note: End-alveolar air samples collected before and at 12 consecutive 20-minute intervals after ingestion of 473 mL (16 oz) of milk.

Fig. 4. Breath H₂ results for day 1 of each 8-day crossover.

Figure 3b. Breath H₂ results for day 8 of each 8-day crossover phase (n = 14) (mean ± SEM).



H₂ = hydrogen; SEM = standard error of the mean.
 Note: End-alveolar air samples collected before and at 12 consecutive 20-minute intervals after ingestion of 473 mL (16 oz) of milk. All data for 2 participants who did not undergo the day-8 hydrogen breath test during one of the milk phases were omitted from this analysis.

Fig. 5. Breath H₂ results for day 8 of each 8-day crossover

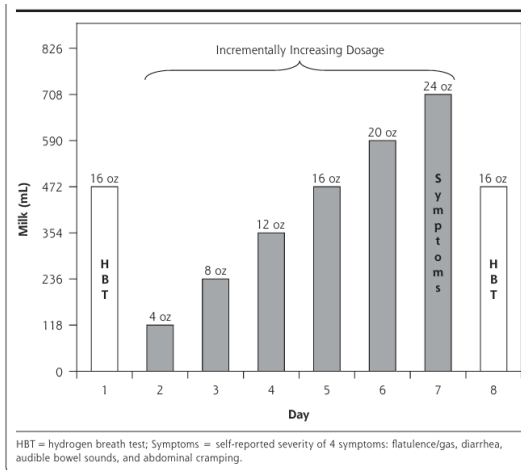


Fig. 6. Milk dosage protocol and outcome measure for each

8-day milk phase: full amount of milk was consumed in 1 sitting

For each day.

7 CONCLUSION AND FUTURE WORK

Regarding health risk raw milk is relatively safe to drink in consideration of today's scrupulous safety and health practices performed by raw dairy farms around the U.S. Conversely, health benefits studies have shown the retaining/minimum loss of vitamins and minerals after pasteurization despite allegations of heated denaturing from wholistic practitioners. Raw milk does not show to be a cure-all for lactose intolerance, childhood asthma/allergies, or a higher level of beneficial microflora for gut health.

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