## Fresh Dairy: Why Mess With Udder Perfection?

Milk may be the single most historically important food to human health. Not just any milk, mind you, but raw milk from healthy, free-to-roam, grass-fed cows. The difference between the milk you buy in the store, and the milk your great-great-grandparents enjoyed is, unfortunately, enormous. If we lived in a country where raw milk from healthy, pastured cows were still a legal product and available as readily as, say, soda or a handgun, we'd all be taller and healthier, and I'd see fewer elderly patients with hunched backs and broken hips. If you're lucky enough to live in a state where raw milk is available in stores and you don't buy it, you are passing up a huge opportunity to improve your health immediately. If you have kids, raw milk will not only help them grow, but will also boost their immune systems so they get sick less often. And, since the cream in raw milk is an important source of brain-building fats, whole milk and other raw dairy products will also help them to learn.

It's a common misperception that milk drinking is a relatively new practice, one limited to Europeans. The reality is that our cultural—and now, our epigenetic—dependence on milk most likely originated somewhere in Africa. It is highly likely that milk consumption gave those who practiced animal husbandry such an advantage that it rapidly spread across the continent and then into Europe and Asia. With such widespread use, it's likely that to allow for optimal expression, many of our genes now require it. In those countries where people's stature most benefitted from the consumption of raw milk, when raw milk is replaced with a processed alternative, their bones take the hardest hit. It's a case of the bigger they are the harder they fall. In places like Norway, Sweden, and Denmark, people now suffer from particularly high rates of osteoporosis and degenerative arthritis.

Our genes have been infused with real dairy products for tens of thousands of years. Recent geologic and climatologic research reveals that, from 100,000 to 10,000 years ago, the Sahara was a lush paradise of grassland. During that window of abundance, the human population exploded. To deal with the consequential depletion of wild resources, people began experiments in "proto-farming," a term coined by biologist and historian Colin Tudge to describe humanity's slow-motion leap from living in harmony with the land as hunter-gatherers to adopting the now-familiar program of altering the ecology to suit our interests. Author Thom Hartmann explains in his book The Last Hours of Ancient Sunlight:

*Something important happened around 40,000 years ago: humans figured out a way to change the patterns of nature so we could get more sunlight/food than other species did. The human food supply was determined by how many deer or rabbits the local forest could support […]. But in areas where the soil was too poor for farming or forest, supporting only scrub brush and grasses, humans discovered that ruminants (grazing animals like goats, sheep, and cows) could eat those plants that we couldn't, and could therefore convert the daily sunlight captured by the scrub and wild plants on that "useless" land into animal flesh, which we could eat.*

Or drink, as the case may be.

For millennia, much of the world's population has depended largely on milk for nutritional sustenance. However, the medical world has been ignorant of milk's nearly ubiquitous use,

confused by the issue of lactose intolerance. Because Europeans have lower rates of lactose intolerance, most Western physicians presume that only European populations have historically practiced dairying. But this confusion arises in part because most Western physicians don't know very much about fermentation.

## Lactose Intolerance

Lactose is the major type of sugar in milk. Nearly everyone can digest it while we're babies and dependent on our mother's milk, but many people lose the lactase enzyme in the lining of the intestine, growing lactose intolerant as they get older. Fermentation breaks down lactose, so you don't need that enzyme as long as you only eat fermented dairy products, such as yoghurt and cheese. The reason people living in warmer climates tend to be lactose intolerant more often than Europeans stems from the fact that fermentation progresses rapidly in warmer climates. Once fermented, the potentially irritating lactose sugars are gone. A child living in a warmer climate would, after weaning, have such infrequent need for the lactase enzyme that the epigenetic librarian would simply switch the gene off. In cooler European climates, fresh milk stays fresh for hours or days, and was presumably consumed that way often enough to keep the lactase enzyme epigenetically activated throughout a person's life. If you have true lactose intolerance, as opposed to a protein allergy, you should be able to tolerate yoghurt, cheese, and cream (dairy fat contains little to no lactose—and minimal protein).

## Why Most Milk is Pasteurized Today

Most of us also have heard that milk needs to be pasteurized to be safe. But we haven't heard the whole story. For perhaps thousands of years, people who gave their animals the basic, humane care they deserved survived and thrived drinking completely fresh, raw milk. The need for pasteurization was a reality when in-city dairies housed diseased cows whose hindquarters ran with rivulets of manure. Tainting milk's reputation even further, around the same time, dairymen were often infected with diphtheria, spreading the deadly bacteria through the medium of warm, protein-rich milk. But no epidemics have ever been traced to raw milk consumption when the cows were healthy and the humans milking them were disease free. If the animal is sickly—as they invariably are when raise in crowded, nightmarish conditions—its milk should probably not be consumed at all. When that's your only choice, then yes, it ought to be cooked first to reduce the risk of potentially lethal infections including undulant fever, hemolytic uremia, sepsis, and more. But it's not your only choice.
If you erase any ethical entanglement, impulse of social responsibility, nagging moral prohibition, and investment in human health, you could call milk pasteurization a good thing. In terms of volume of product output per production unit, pasteurization plays a crucial role in converting small family farms into perfectly efficient milk producers for the national brands: cheaper feed (silage and grain instead of fresh grass and hay), more cows per square foot, more "milk" per cow. That explains why big agribusiness roots for pasteurization. But how did the rest of us get convinced?

Our fear of fresh milk can be traced to the energetic campaigning of a man named Charles North who patented the first batch-processing pasteurization machine in 1907. A skilled orator and savvy businessman, he visited small towns throughout the country creating publicity and interest in his machines by claiming to have come directly from another small town, just like theirs, where people were dying from drinking unpasteurized milk. Of course, his claims were total fiction and doctors were staunchly opposed to pasteurization. The facts were on their side. Unfortunately, North had something better—fear. And he milked that fear right into a small fortune. The pasteurization industry mushroomed from nonexistence to a major political presence. Today, at the University of Pennsylvania where medical professors once protested that pasteurization "should never be had recourse to," medical students are given lessons on the many health benefits of pasteurization.

Whenever I have a patient who was raised on a farm, who looks tough and boasts how rarely he gets sick, I ask him if he drank raw milk as a child. Nine times out of ten, he says yes. Every family dairyman I've talked to keeps raw milk around for their own families and happily testifies to its health benefits. Unlike meat or fruit or really any other food, milk is unique in that its one and only purpose is to nourish something else. Not only is it loaded with nutrients, it is engineered with an intricate micro-architecture that is key to enhancing digestive function while preventing the nourishing compounds from reacting with one another. Processing fundamentally alters this micro-architecture and diminishes nutritive value significantly. How much of a difference does this make? Enough that, based on their health and bone structure, I can guess with a high degree of accuracy which of my patients had access to raw milk as a child and which did not.

Since 1948, when states began passing mandatory pasteurization laws, raw milk fans have waged a bitter battle against government intervention. During hearings in which laws requiring pasteurization have been challenged, pasteurization proponents deny any nutritional difference between pasteurized, homogenized milk and raw. But as dairy scientists point out, heat denatures proteins, and homogenization explodes the fat droplets in milk. This is significant. Even to the naked eye, there's a difference: Unlike cooked milk, the fresh product has a layer of cream floating at the top. But to fully understand how these two products differ, we need to bring out the microscope.

## The Difference Between Fresh and Processed

If we put a drop of fresh milk on a slide, we see thousands of lipid droplets of varying size streaming under the cover slip and maybe a living lactobacilli or two wiggling from edge to edge. These come from the cow's udders which, when well cared for, are colonized with beneficial bacteria, as is human skin. We want good bacteria in our milk. These probiotics protect both the milk and the milk consumer from pathogens. Good bacteria accomplish this by using the same bacterial communication techniques we read about in the section on fermentation.

Using the powerful electron microscope, we can magnify milk 10,000,000 times. Now we can see casein micelles, which are amazingly complex. Imagine a mound of spaghetti and meatballs formed into a big round ball. The strands of spaghetti are made of protein (casein), and the

meatballs are made of the most digestible form of calcium phosphate, called colloidal calcium phosphate, which holds the spaghetti strands together in a clump with its tiny magnetic charge. This clumping prevents sugar from reacting with and destroying milk's essential amino acids.

Each tiny globe of fat in the milk is enclosed inside a phospholipid membrane very similar to the membrane surrounding every cell in your body. The mammary gland cell that produced the fat droplet donated some of its membrane when the droplet exited the cell. This coating performs several tasks, starting in the milk duct where it prevents fat droplets from coalescing and clogging up mom's mammary passageways. The milk fat globule's lipid bilayer is studded with a variety of specialized proteins, just like the living cells in your body. Some proteins protect the globule from bacterial infection while others are tagged with short chains of sugars that may function as a signal to the intestinal cell that the contents are to be accepted without immune inspection, streamlining digestion. Still others may act as intestinal cell growth factors, encouraging and directing intestinal cells' growth and function. As long as the coating surrounds the milk fat globule, the fat is easily digested, the gallbladder doesn't have to squeeze out any bile for the fat to be absorbed, the fatty acids inside the blob are isolated from the calcium in the casein micelles, and everything goes smoothly. But if calcium and fats come into contact with one another, as we'll see in a moment, milk loses much of its capacity to deliver nutrients into your body.

Let's go back to the light microscope to take a look at pasteurized, homogenized milk and identify what distinguishes it from raw. One striking difference will be the homogeneity of fat globule sizes and the absence of living bacteria. But the real damage is hiding behind all this homogeneity and is only revealed under the electron microscope. Now we see that these fat blobs lack the sophisticated bilayer wrapping and are instead caked with minerals and tangled remnants of casein micelles. Why does it look like this? The heat of pasteurization forces the sugar to react with amino acids, denaturing the proteins and knocking the fragile colloidal calcium phosphate out of the spaghetti-and-meatballs matrix, while the denatured spaghetti strands tangle into a tight, hard knot. Homogenization squeezes the milk through tiny holes under intense pressure, destroying the architecture of the fat globules. Once the two processing steps have destroyed the natural architecture of milk, valuable nutrients react with each other with health-damaging consequences.

Processing can render milk highly irritating to the intestinal tract, and such a wide variety of chemical changes may occur that processed milk can lead to diarrhea or constipation. During processing, the nice, soft meatball of colloidal calcium phosphate fuses with the fatty acids to form a kind of milkfat soap. This reaction, called saponification, irritates many people's GI tracts and makes the calcium and phosphate much less bioavailable and more difficult to absorb.188 How difficult? Food conglomerates have a lot of influence on the direction of research funding. And the dairy industry is big business. Little wonder that no studies have been funded to compare the nutritional value of raw, whole cow's milk to pasteurized, head-to-head. But studies have been done on skim milk and human breast milk comparing fresh versus pasteurized, and the difference is dramatic: Processed milks contained anywhere from one half to one sixth the bioavailable minerals of the fresh products. When fresh, the milk fat globule carries signal molecules on the surface, which help your body recognize milk as a helpful substance as opposed to, say, an invasive bacteria. Processing demolishes those handy signals and so, instead of getting a free pass into the intestinal cell, the curiously distorted signals slow

the process of digestion down so much that it can lead to constipation. Heat destroys amino acids, especially the fragile essential amino acids, and so pasteurized milk contains less protein than fresh. But the damaged amino acids don't just disappear; they have been glycated, oxidized and transformed into stuff like N-carboxymethyl-lysine, malonaldehyde, and 4-hydroxynonanal—potential allergens and pro-inflammatory irritants.

And there's more. Many of the active enzymes in fresh milk designed to help streamline the digestive process have also been destroyed. Other enzymes, such as xanthine oxidase, which ordinarily protect the milk (but cause damage inside our arteries), can play stowaway within the artificially formed fat blobs and be absorbed. Normally, our digestive system would chop up this enzyme and digest it. But hidden inside fat, it can be ingested whole, and may retain some of its original activity. Once in the body, xanthine oxidase can generate free radicals and lead to atherosclerosis and asthma. One more thing that makes raw milk special is the surface molecules on milk fat globule membranes, called gangliosides. Gangliosides inhibit harmful bacteria in the intestine. Once digested, they've been shown to stimulate neural development. Homogenization strips these benefits away.

What does all this scientific data mean to you? It means that the processed milk you buy in the store is not milk. Not really. If you can't find a good source of fresh, unprocessed milk, what can you do? Get the next best thing: yoghurt made from organic, whole milk. The fermentation process rejuvenates damaged proteins and makes minerals more bioavailable. A breakfast of yoghurt, fresh fruit slices, and nuts is nutritionally far superior to cold cereal and processed milk. But if you aren't ready to give up milk for breakfast, then get organic whole milk (not low fat), preferably from cows raised on pasture—not grain! Non-organic dairy may seem cheaper, but in reality you get far less nutrition for the dollar than you do with organic because at least organically raised cows produce milk. The stuff that comes out of malnourished cows living in cement milk-factories hardly qualifies as such. Whatever you do, avoid soymilk. The primary difference between Yoo-hoo, a junk food beverage snack sold in your local 7-11, and the soymilk sold in the health food stores is that Yoo-hoo is flavored with chocolate.