The Paleo Diet Update

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Welcome to the latest edition of *The Paleo Diet Update*.

Articles on paleo nutrition, as well as answers to selected reader questions are published in my newsletter. Answers to selected reader questions are also posted on my blog, and answers to commonly asked questions are posted on the FAQ page of my web site. Special reports and more lengthy papers are sold from my web site store. You may also purchase back issues of my newsletters.

The content on the Paleo Diet web site and Paleo Diet blog is searchable. I encourage you to search my web site and blog, or browse my FAQ page to see if the information you're seeking has been documented. As always, you have my sincere thanks for your continued readership and for purchasing my writings on diet and paleo nutrition.

Loren Cordain, Ph.D., Professor


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In This Issue

The Adverse Effects of Milk - by Loren Cordain & Pedro Bastos

Editor's note: Dr. Cordain was contacted over the summer by journalist Ben Hewitt, who was writing an article for *Men's Journal.* Mr. Hewitt inquired about the adverse effects of milk consumption, which prompted the following responses from Dr. Cordain and Pedro Bastos.

Hello Dr. Cordain,

I am working on an article for Men's Journal about the negative impact of dairy products on some people. Basically, can you explain why milk is problematic? My understanding is that, similar to gluten, milk is potentially inflammatory, which is why it's such a common allergen. Can you expand on this?

If someone is drinking milk now, and not feeling any negative effects, does that mean he doesn't have an issue with milk?

What sort of changes have you observed in people who've given up dairy?

Also, are all dairy products problematic, or is milk a particularly bad one?

What do you recommend in place of milk to fill that nutritional gap?

Thanks so much for your help.

Thanks,
Ben

Hi Ben,

I really am not a world expert when it comes to health problems associated with milk, but I will copy Pedro Bastos, a colleague who is, and who has written a few pieces on this that may help to answer your questions:

Milk has numerous properties that may adversely affect health.

- Paradoxically, milk has a low glycemic response, but has an insulin response similar to eating a chocolate chip cookie or candy. In a recent study of young boys, they became insulin resistance after 7 days on a high milk diet compared to 7 days of a high meat diet.

- In humans, milk drinking elevates a hormone called IGF-1 which increases growth in children, resulting in an increased adult stature, but it also increases the risk for breast, colon and most particularly prostate cancer. How milk drinking increases IGF-1 is not completely known, but two mechanisms have been proposed: 1) bovine milk contains IGF-1 which crosses the human gut barrier, and 2) IGF-1 concentrations in human blood vary with insulin -- because milk increases the insulin response so dramatically, then this response in turn may increase IGF-1.

- In numerous epidemiological studies, milk drinking has been associated with an increased risk for numerous autoimmune diseases including multiple sclerosis, rheumatoid arthritis and type 1 diabetes. Young children are particularly at risk for type 1 diabetes if bovine milk exposure occurs before the age of 1 year. In animal models of multiple sclerosis, a particular protein found in milk (butyrophilin) when injected into rats causes the animal equivalent of MS.

- In a series of epidemiological studies from the Harvard School of Public Health, milk drinking has shown to dramatically increase the risk for acne. Once again the mechanism has not been completely worked out but may once again involve milks highly insulinotropic effect and/or various hormones found in milk that bypass the gut barrier and enter circulation.

- In many epidemiological studies, milk drinking increases the risk for atherosclerosis and fatal myocardial infarctions independent of its saturated fat content. Again the mechanisms are unclear, but it likely involves chronic low level inflammation, or perhaps endocrine substances found in bovine milk that adversely interact with mechanisms known to underlie cardiovascular disease.

- Milk contains a hormone called betacellulin which binds a human gut receptor called the epidermal growth factor receptor (EGF-R). In many human cancers, there is massive over expression of this receptor which may be linked to chronic consumption of betacellulin in bovine milk.

- There are many more health problems associated with milk drinking, but these are the ones that come immediately to mind. I'm sure Pedro can add many more.

Are all dairy products problematic, or is milk a particularly bad one?

I believe that all dairy products are problematic. Cheeses do not cause the high insulin response as does milk, yogurt and other fermented dairy products, but is one of the most acidic of all foods. Paradoxically, despite its high calcium content, its net acidic load promotes calcium loss from the bones. Betacellulin is also found in cheese, but many of the other hormones found in milk do not survive the cheese making process.

If someone is drinking milk now, and not feeling any negative effects, does that mean he doesn't have an issue with milk?

We cannot feel whether or not we are insulin resistant or if bovine hormones are entering our bloodstream, or if our arteries are becoming clogged with the atherosclerotic process, but we can notice improvements in acne and symptoms of allergy (wheezing, sneezing, rashes etc.), or autoimmune disease.

What sort of changes have you observed in people who've given up dairy?

I am not a clinician, and generally the anecdotal responses I am privy to involve people not just giving up dairy only, but rather adopting a Paleo diet in which all dairy is eliminated, along with all grains, processed foods, salt, legumes and potatoes. If you go to my website and look at the success stories section, you can read about these people.

What do you recommend in place of milk to fill that nutritional gap?

I don't view it as a nutritional gap, but rather a liability which causes our health to suffer in the long run. We have run nutritional comparisons of the following food groups (meats, seafood's, fresh fruits, fresh vegetables, whole grains, nuts & seeds, milk) and published our results in the highest impact nutritional journal in the world, the *American Journal of Clinical Nutrition.* We found that for these 7 food groups, milk ranked third from last for the 14 most commonly lacking nutrients in the US diet. Hence, the commonly held notion that milk is a highly nutritious food is simply untrue.

Except for calcium, milk is a lightweight for many of the vitamins and minerals needed for

optimal human health. Healthy bones result from positive calcium balance. Calcium balance is like a bank account and results from how much calcium we put into our bodies minus how much we lose. The Dairy Council focuses their ads upon the input side of the calcium equation -- more, more, more. However, the calcium that we ultimately lose in our urine is just as important. If we lose more calcium in our urine than we take in, we will never be in calcium balance, no matter how much milk we drink.

The most important factor determining urinary calcium loss is acid base balance. A net acid yielding diet promotes calcium loss in the urine, whereas a net base yielding diet prevents urinary calcium loss. Foods which are base yielding are fruits and vegetables. Studies have shown that by consuming about 25-30 % of our daily energy as fruits and veggies, we can maintain calcium balance at low calcium intakes without milk consumption. Humans have existed on this planet for 2.5 million years, and only in the past 10,000 have we ever consumed milk or dairy products. Like all other mammals on the planet, we did quite well without milk (once we were weaned) for the rest of our adult lives. Have you ever thought about how an elephant can grow such large, health and strong bones without drinking the milk of another species?

I hope this helps.

Loren Cordain, Ph.D., Professor

Hi Ben,

There is a large body of evidence that up until 9,000 years ago in the Middle East[1] and 7,000 years ago in Northern Europe[2], no human being on the planet consumed non human milk or dairy products. So on an evolutionary time scale, non-human milk is a relatively newcomer into human diet. By using the evolutionary template, and knowing that that milk is species specific, we would expect this new habit to have unintended consequences, which go way beyond lactose intolerance (which is actually very common), since only a minor percentage of the world's population continues to produce lactase into adulthood[3].

Indeed there are several lines of evidence raising concerns with milk and dairy intake, such as:

1) Milk and fermented milk (yoghurt, for instance), despite having a low glycemic index and load, elicit a very high insulin response and this has been shown repeatedly in intervention studies [4-9].

As you may be aware, constantly increasing insulinemia may downregulate the insulin receptor, and hence lead to insulin resistance[10-12], which in turn is the primary metabolic defect underlying The Metabolic Syndrome[13], and may be a driving force in obesity[14, 15]. It should also be mentioned that a chronic state of Hyperinsulinemia may set a hormonal cascade that ultimately results in cancer, acne and juvenile myopia, among other diseases[13].

Indeed, a high bovine milk diet has been shown to cause insulin resistance in boys[9]. Moreover, dairy intake is strongly associated with a higher incidence of Acne[16-18] and moderately associated with Prostate Cancer[19-23].

2) Cow's milk appears to be involved in certain autoimmune diseases (AD):

- Various epidemiological studies have associated it with Type 1 Diabetes[24-31], especially when the initial exposure begins in the first months of life.

- Epidemiological studies have repeatedly shown a strong correlation between Multiple Sclerosis and cow's milk consumption[32-36].

- There is molecular mimicry between Bovine Serum Albumin and Human Collagen Type 1, which has implications for Rheumatoid Arthritis[37]. Indeed, case studies have shown that elimination of milk and dairy products from the diets of patients with RA improved symptoms, and the disease was markedly exacerbated on re-challenge[37].

- Bovine milk is also implicated (or appears to have adverse effects) in other auto-immune diseases, such as Crohn's disease[38], Sjögren's syndrome[39], IgA nephropathy[40-42], Behçet's disease[43], and even Celiac disease[40].

3) Hormones in Milk:

In addition to proteins, fats, lactose, vitamins and minerals, milk contains various growth-stimulating steroid and peptide hormone and also catalysts, transporters and stabilizers that ensure their maximum bioactivity[45].

Here's a short list of some hormones present in cow's milk that could be problematic for humans:

Insulin

Cow's Milk, as well as human milk (and presumably milk from all mammals) contains insulin[46-49], and we know that bovine insulin - BI (which differs from human insulin by three amino acids[50]) survives pasteurization, because immunity to this hormone is common in children who consume cow's milk or who have been exposed to infant formulas containing cow's milk[51-54].

This not only confirms that BI is present in commercial pasteurized milk, but also in infant formulas and perhaps other dairy products (although direct evidence is lacking). Moreover, these studies provide evidence that BI survives the human digestive processes and crosses the gut barrier intact, although this could be related to the fact that infants have higher intestinal permeability than older children and adults[50]. Nevertheless, various factors may cause the so called "leaky gut" in virtually everyone, so we shouldn't dismiss bovine insulin altogether.

IGF-1

Cow's milk contains active IGF-1[55], but this has been largely dismissed as relevant, since pasteurization (time and temperature are crucial factors) and fermentation appears to reduce its content[56, 57]. Yet cow's milk consumption, compared to various foods, is associated with a higher plasma IGF-1 concentrations in humans (both children[58-61] and adults[62-66]), which could be due to calcium in milk (which has been shown to increase IGF-1 in boys and girls[67]), the effect of milk upon insulinemia (the high elevation of plasma insulin caused by milk drinking [4-9] could lead to a higher plasma IGF-1[13]) or indeed residual IGF-1 in casein[68] (the major protein in milk).

Betacellulin

Betacellulin (BTC) belongs to the Epidermal Growth Factor family of hormones[69], and is found not only in cow's milk[70] and whey[70], but also in cheese[70]. Therefore, it survives pasteurization and processing. Although no direct evidence yet exists, bovine milk does contain peptidase inhibitors which prevent human gut enzymes from degrading EGF[5] (and most likely BTC), and a low ph such as that found in the gut, it does not impair or prevent BTC from binding its receptor[71]. Finally, there is a luminally expressed EGF receptor in the gut, through which BTC

may enter circulation[69].

Steroid Hormones

The major sources of animal-derived estrogens in the human diet are believed to be milk and dairy products, which presumably account for 70–80% of the total estrogens consumed[72, 73]. Furthermore, it has been pointed out that most milk for human consumption is obtained from cows in the latter half of pregnancy when estrogen metabolites levels are greatly elevated[72-74].

Confirming this, US researchers have measured estrogen metabolites in various milks and shown that buttermilk contains the highest total amount of estrogen metabolites, followed by skim milk, 2% milk and whole milk[72]. Therefore, estrogen metabolites appear to survive pasteurization, and estrone sulphate, which comprises 45% of the conjugated estrogens in Premarin and Prempro (the most frequently prescribed hormone replacement therapy for menopausal women[73]) has high oral bioactivity[73], and is the most prevalent form of estrogen in cow's milk[72, 73].

There are also other steroid hormones in commercial pasteurized cow's milk, such as progesterone, 5α-androstanedione and 5α-pregnanedione, which are dihydrotestosterone (DHT) precursors[75].

As expected from the evidence presented, dairy intake is strongly associated with a higher incidence of acne[16-18], moderately associated with prostate cancer[19-23], and mildly associated with ovarian cancer[76, 77].

Dairy consumption was also associated with an increased incidence of testicular[78, 79], kidney[80], and head and neck cancer[81], but very few studies have been conducted to draw more significant conclusions.

Although epidemiological evidence can't show a clear cause and effect, and clearly much more studies need to be conducted, the current evidence strongly suggests that cow's milk may be implicated in a variety of autoimmune diseases, certain cancers, as well as acne.

4) Milk has a very high calcium/magnesium ratio and may contribute to some micronutrient imbalances.

5) There is evidence of higher fracture incidence rates in countries with higher milk and calcium intake[82], some long term prospective studies have failed to show a benefit from drinking milk or taking calcium supplements[83-85], and a recent meta-analysis, which analyzed seven prospective cohort studies (170,991 women), five prospective cohort studies (68,606 men), five clinical trials, (5,666 women, and 1,074 men), and four clinical trials with separate results for hip fracture (6,504 subjects), concluded that calcium intake doesn't decrease the risk for fractures[86].

Calcium intake is only part of the story; we need to consider GI absorption and renal excretion. In these regards, vegetables from the brassica family have a clear advantage over milk[87].
I know this may sound overly alarming, and possibly exaggerated, but given what I know about milk, I have a hard time recommending it - even though it has some positive effects, such as being a cheap source of high quality protein and various micronutrients.

For those who are fortunate and have access to good (real) food, supplements such as Vitamin D, (which by the way, may be needed in much higher doses than the ones provided by three or four servings of dairy a day), and adopt a diet that has a low glycemic load, is moderate in fructose, is net base yielding and provides sufficient protein, soluble fiber, essential fatty acids, especially EPA, DHA, GLA and AA (with a w6/w3 ratio < 4/1) and all the micronutrients, I

believe milk is not necessary.

I hope this helps.

Best regards,

Pedro Carrera Bastos

Nutrition Researcher, Lisbon, Portugal

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