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Milk Nutrition and Perceptions

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Milk Nutrition and Perceptions

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Author Note:

The topic of milk has become very relevant in today's popular culture. Many wonder if they should be consuming cow's milk or a non-dairy substitute. This research paper goes in depth looking at both sides of the spectrum, from cow's milk to non-dairy substitutes.

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Abstract:

In today's society many people are making the move to become vegan and/or dairy free. According to the US National Library of Medicine, approximately 65% of the human population has a reduced ability to digest lactose. The rise in veganism and an increasing awareness of lactose intolerance have combined to create a non-dairy movement. This paper will address reasons people choose to cut milk out of their diet or not, and will investigate the effects and benefits of milk.

Many articles show milk to be very beneficial to the diet. The American Journal of Clinical Nutrition believes that many vitamins, minerals, and acids found in milk are best absorbed through drinking animal milk. Many people cut milk out of their diet for different reasons. This paper will research what other scholars have found in terms of the sociological and health aspects of milk consumption. It will also share the results of research conducted through social media to find out the consumers perception of milk.

This research investigates why consumers choose not to drink milk, and the understanding about what is in milk. Although supplementation is possible, it must be done with an understanding of nutritional requirements.

Introduction

Cow's milk has a long history dating back to northern mythology. According to a Norse myth, cow named Audhumla was creating from melting ice. Audhumla had horns, and milk was "running like a river through her teats." It was then explained that this milk was meant as food for the Ymer, the first creature to have ever existed (Haug, Hostmark, Harstad 2007).

In recent years milk has become a very controversial topic within the United States because more people are becoming vegans, and more studies have been done discussing health benefits of milk and the nutrients in milk. According to the US National Library of Medicine, approximately 65% of the human population has a reduced ability to digest lactose. (Genetic Home Reference, May 2017) The rise in veganism and an increasing awareness of lactose intolerance have combined to create an increased interest in non-dairy products. This thesis will address reasons people choose to include or exclude animal milk in the diet and will investigate the health reasons for this choice. There are many academic peer-reviewed articles discussing milk products. There has also been an increase in articles in consumer magazines discussing milk's benefits, milk's harmful components, and milk substitutes for those who are unable or unwilling to drink milk products. This research is necessary because while everyone has their own opinion on milk, consumers need more research to support their opinions. This review will discuss why researchers believe humans should be drinking milk, why milk could be harmful, and what are some of the best and worst milk substitutes.

Part 1: Positive Benefits of Dairy Milk

Milk has had a long history in the United States, the first milking cow came to what is now called the United States was in 1525. Other than nutrition, milk had other health benefit. For example, it was noticed in the 1800's that the maids who milked the cows were immune to

the smallpox, which led to the invention of a smallpox vaccine. The 1940's is when milk programs began in schools and when the federal government started to advertise milk. Since then there have been many campaigns and programs created to ensure citizens, especially school children, have easy access to milk. Today, cow's milk is very popular and a convenient way for humans to get nutrition.

Cow's milk is made up of components intended to nourish the baby calf which means that milk is full of nutrients including lipids, proteins, amino acids, vitamins and minerals. It also contains immunoglobulins, hormones, growth factors, peptides, polyamines, enzymes and other bioactive peptides which help the calf grow. All of these nutrients are emulsified throughout the milk as a colloidal dispersion. The composition of the nutrients in milk can vary with the stage of lactation, age, breed, nutrition, energy balance and health status of the udders (Haug, Hostmark, Harstad 2007).

There are many sources that discuss the health benefits of cow's milk, from government to academic research. *The Dietary Guidelines 2015-2020 for Healthy US Style Eating Pattern* state that for a normal 2000 calorie diet a person should consume three cups of milk daily (Dietary Guidelines 2015-2020, 2015). In *Family Economics and Nutrition Review*, it states that milk can make a large contribution to the diet. Milk can be a great source of high quality protein as well as a good source of vitamins and minerals. Some of these vitamins and minerals which will be discussed later include vitamins A, D, B12, riboflavin, calcium, phosphorus, magnesium, potassium, and zinc, to name a few (Lee, Gerier 2002).

The 2007-2010 National Health and Nutrition Examination Survey (NHANES) looked at the Dietary Guidelines for dairy consumption and compared it to estimated actual consumption. This study was surprising because it shows that most Americans consume a lot less than

recommended. For example, 70% of females ages 14-18 consumed below the recommended amount of dairy. Almost none of those females met recommended amounts and only about 5% exceeded the recommendation. In both male and female categories, Americans consumed the most dairy from the ages of 1-3 years old with about 20% of those kids meeting recommendations with an additional 40% exceeding recommendations (United States Department of Agriculture, 2015).

Another study published in BMC Public Health wanted to investigate the relationship between milk and mortality, heart disease, and stroke. It was a meta-analysis and systematic review of observational cohort studies. The study looked at milk without comparing fat content and excluded any studies done on animals, children, and people who were sick. This study analyzed five cohorts in the United States, two in Asia, 11 in Europe, and one in Australia. The age range of participants was 34 to 74 years old. The study concluded that there was no evidence for association between milk consumption and mortality, heart disease, and stroke. However the authors state that a bias is possible within the research because of lack of published data about mortality and stroke related to increased milk consumption (Mullie, Pizot, Autier, 2016).

Most government websites that discuss nutrition talk about the health benefits of milk. One in particular is choosemyplate.gov; this website has a whole section discussing dairy products. According to ChooseMyPlate, four of the most important nutrients in milk are calcium, vitamin D, potassium, and protein. ChooseMyPlate emphasizes the bone health benefits one can receive from milk through calcium and vitamin D. It also states that milk does not naturally contain vitamin D; however, processed cow's milk found in the grocery store are fortified with Vitamin D and can be very useful in the diet. Milk can help reduce the risk of

osteoporosis, especially when consumed during childhood while bones are still growing. Dairy products are a great source of potassium which can help regulate blood pressure. Other benefits of drinking milk include reducing the risk for cardiovascular disease, type 2 diabetes, and lower blood pressure in adults (United States Department of Agriculture, 2017).

Nutrients Found In Cow's Milk

A big benefit of drinking cow's milk is its protein content. Proteins found in milk have a high bioavailability, which means that the body can easily digest them. Milk also contains all of the essential amino acids, making it a source of complete proteins. The proteins found in milk have many functions; these functions range from antimicrobial, killing or stopping growth of unwanted microorganisms, to aiding in absorption of nutrients. Making up about 80% of milk's protein is casein; casein carries calcium and phosphate throughout the body and aids in digestion. Whey is another protein found in milk; the benefits have been known for centuries, a fact suggested by an ancient proverb in Italy stating "If you want to live a healthy and active life, drink whey." All proteins eaten from animal to plant based proteins are digested and absorbed at different rates: whey and casein are both easily digested by the body and are complete protein sources. (Haug, Hostmark, Harstad 2007).

For Americans, milk consumption typically provides more than half the calcium in the typical diet (Haug, Hostmark, Harstad 2007). Calcium is an essential nutrient in the human body because it helps the heart, muscles, and nerves function properly, along with helping blood clot. Calcium also plays a crucial role in bone density and dental health. The National Osteoporosis Foundation and the National Institutes of Health's Osteoporosis and Related Bone Diseases National Resource Center state that many studies have found inadequate consumption of calcium is associated with a low bone mass and high fracture rates. National nutrition surveys have

commonly shown that most people are not getting enough calcium that they need to grow and maintain healthy bones. In the United States, an estimated calcium intake from both food and dietary supplements are surveyed by NHANES. From the years 2003–2006 a mean intake from boys and girls age 9-13, girls age 14–18 years, women aged 51–70 years, and both men and women older than 70 years had an inadequacy in excess of 50% of the calcium requirement. 43% of the adult US population, including 70% of older women, take dietary supplements for calcium. In the same study, a mean was taken for the amount of calcium consumed in food, which was 918 to 1,296 mg/day; those who take supplements typically add an addition 330 mg/day of calcium to the diet. People need the most calcium between the age of 9-18 years of age, then calcium needs increase over the age of 70 (National Institute of Health, 2015).

As mentioned above, there are many different essential minerals found in dairy. Selenium is found naturally in dairy products often varying in amounts; in the US there is typically 8 micrograms per cup of dairy, with 55 micrograms per day recommended for adults. Selenium intake can directly affect selenium levels in the body and play a vital role in the human immune system. Another relevant mineral is iodine, which plays an important role in the thyroid hormone. One cup of milk accounts for 37%, or 56 micrograms, of a recommended daily value of 150 micrograms of iodine for a non-pregnant adult, while pregnant and lactating adults need 220-290 micrograms of iodine per day. Another mineral, magnesium, is found in many foods and milk is one of them, containing about 25 mg per cup of milk. Young adult men need about 400 mg per day and young adult women need 310 mg per day, about seven percent of the daily value in one cup of milk. Magnesium is a part of 300 enzyme systems that help regulate protein synthesis, muscle and nerve function, blood glucose control, and blood pressure. Zinc is an essential part of certain enzymes and has several functions, including DNA repair, cell growth

and replication, gene expression, protein and lipid metabolism, and immune function. Milk is a good source of zinc including 1mg in 1 cup of milk; the daily recommendation for zinc is 11mg for adult males and 8mg for adult females per day with increased needs during pregnancy and lactation. If consumers drink the recommended 3 cups of milk per day, it will provide 3mg, or 26-38%, of the consumers' daily needs for zinc. Zinc is also digested more effectively when consumed from milk than consumed from vegetables.

There are many vital vitamins found in milk. Vitamin A is contained in milk through the form of retinoids, containing 70 micrograms per cup naturally; however, cow's milk is often fortified with vitamin A, increasing to contain 149 micrograms per cup of the daily recommendation of 700-900 micrograms per day, 10% of the daily value. Vitamin A is important because it contributes to vision, proper growth and immunity, as well as maintaining healthy bones and skin. Folate is found naturally in milk providing 12 micrograms per cup, only 3% of the daily value; however, including cow's milk in the diet can improve the bioavailability of folate, which means the body will easily and more efficiently absorb folate. Milk is a good source of riboflavin also known as vitamin B2, as one cup of milk contains 0.5 mg, and the daily recommendation intake for riboflavin is 1.1-1.3mg, increasing during pregnancy and lactation. Riboflavin aids in cellular function, growth and development, and the metabolism of fats, drugs, and steroids. Vitamin B12 is found in milk with about 1.2 micrograms per cup, with the daily recommendation being 2.4 micrograms for adults, which is almost 50% of daily needs. B12 is essential to the diet and is only found in animal food products. Vitamin B12 aids in digestion and a deficiency can cause anemia. (Haug, Hostmark, Harstad 2007; National Institutes of Health, 2018) These are the majority of the vitamins and minerals found in milk. The amount of vitamins and minerals found in milk can vary depending on whether or not the milk is

pasteurized, the type of cow producing the milk, the food the cow is eating, and the timing of when the cow gives birth.

Pasteurized vs. Unpasteurized Animal Milk

There has been much debate over pasteurized vs. unpasteurized milks. Some think that it is unsafe to drink any milk that has not been pasteurized, while others believe that pasteurization kills much of the nutrition in milk. (Klotter, 2005) In 1895 commercial pasteurization machines were introduced in the United States. This came after a period where milk-borne illnesses became a major problem. In the year 1884 Dr. Henry Thatcher saw a child's filthy rag doll fall into the open bucket of a milkman delivering milk. This led Thatcher to create the first glass milk jar. By 1889 the milk jar became an industry standard until the 1950's when paper cartons began to appear. (ProCon, 2013) In 2008, the National Environmental Health Association indicated its strong support pasteurization before sale to the consumer. The FDA requires pasteurization for all milk and milk products in its final stage of processing before human consumption. The FDA also strongly supports consumer education about the dangers of consuming unpasteurized milk (Journal of Environmental Health, 2008). Despite the FDA's warnings, some still promote the nutritional benefits of unpasteurized milk. Ron Schmid, a doctor in naturopathic medicine, wrote a book called *Traditional Foods Are Your Best Medicine and The Untold Story of Milk*. In his book he discusses how raw unpasteurized milks have been a great nutrient and enzyme-rich food to treat disease for a long time. In the 1930s, John Crewe a doctor and founder of Mayo Clinic wrote the book *Raw Milk Cures Many Diseases*. In the 1930's to 40's Francis Pottenger conducted a famous experiment called the Pottenger Cat Study. Pottenger found in this study that "heat-treating milk interferes with calcium metabolism," which affects bone development and resistance to disease (Klotter, 2005).

More recently there has been a more detailed study investigating pasteurized vs. unpasteurized animal milk. This research looked at the bioavailability and the actual nutritional content of milk before and after pasteurization. The Ministry for Primary Industry of New Zealand put together a review that explains this topic. The first nutrient looked at is protein; a human study conducted in 2008 observed “the same metabolic utilisation of milk protein for both raw and pasteurised milk.” (Ministry for Primary Industries, 2013), When looking at the protein content after pasteurization, there is a slight decrease (1-4%) in amino acid content. This change is mainly due to the functional properties such as solubility and emulsifying properties found in milk. A systematic review looked at 40 studies that included the investigation of vitamins A, B1, B2, B6, B12, C, E, and folate. Similar to the FDA findings there was no significant decrease in B1 and B6 after milk pasteurization; however, concentrations of B2, folate, and vitamin C did decrease after pasteurization. However, it is important to note that vitamin C and folate are found in low concentrations in milk, so the significant decrease does not impact one's diet. For example, milk has 0.01mg more of vitamin C in unpasteurized milk. Due to significant variability for vitamin A, E, and B12 the effect of pasteurization could not be determined; however, in some studies vitamin A content actually increased. As discussed above, iodine, calcium and phosphorus are good mineral sources found in milk. Claeys et al. evaluated many studies and came to the conclusion that pasteurization has no significant effect on the amount or bioavailability of calcium. Many other studies demonstrated that there was no impact of pasteurisation on milk mineral content and mineral bioavailability. (Ministry for Primary Industries, 2013)

Goat's Milk

Some consumers buy goat's milk which is very similar to cow's milk. As goats milk also comes from an animal, the nutritional benefits are similar, though not exactly the same. Goats are smaller and require a smaller pasture, which could be argued as a benefit due to environmental reasons. However, giving them a small pasture with minimal grass can lead to a lack of nutrition, limiting milk quality and production. The biggest difference in the fat content of goat's milk is that it has a different distribution amount of fatty acid chains compared to cow's milk. The higher amount of capric, caprylic and caproic acids chains alter the smell and taste associated with goat's milk (Bruhn, 2017).

Animal Milk Fat

Nutritionist often discuss whether milk fat is good for humans. More than half of milk's fatty acids are saturated. Certain fatty acids in milk have been shown to improve health and even lower risk for disease. For example, butyric acid is well known for its gene function and may play a role in cancer prevention; caprylic acid may help delay tumor growth; lauric acid has been shown to have possible antiviral and antibacterial functions. There have been many studies conducted that have shown good results from drinking low fat-dairy when it comes to serum cholesterol. Additionally, milk fat consumption has been shown to have less of an effect on raising serum cholesterol than might be expected from fat (Haug, Hostmark, Harstad 2007). A population based cohort study, published by the *International Journal of Cardiology* including 33,625 participants, used a food frequency questionnaire and the national registry to obtain information. The study was done in the Netherlands, a population that consumes a lot of dairy. The study investigated dairy intake along with dairy subgroups such as high-fat, low-fat, and fermented dairy products in relation to coronary heart disease and stroke. After a 13-year follow

up, the researchers found a stronger correlation from dairy consumption and stroke than from coronary heart disease. This study found that total dairy consumption was not associated with a risk of coronary heart disease or stroke. In participants without hypertension, total dairy consumption was associated with a reduced risk of coronary heart disease. Furthermore, fermented dairy was associated with a lower risk of stroke. There was no significant correlation between high-fat and low-fat dairy and coronary heart disease and stroke (Dalmeijer, Struijk, Schouw, 2013).

Unsaturated fatty acids make up less than half of the fat found in milk. There is one main type of unsaturated fatty acid found in milk called oleic acid, which accounts for about 25% of the unsaturated fatty acids found in milk. Most people around the world get most of their supply of oleic acid through milk and milk products. Oleic acid is a monounsaturated fatty acid which has been shown to lower plasma cholesterol, LDL-cholesterol, and triacylglycerol concentrations. There have been several studies that indicate oleic acid protects against the development of cancer, but the data is not fully developed. Another type of unsaturated fatty acid found in milk is polyunsaturated fatty acids (PUFA); the main PUFA found in milk are omega-6 and omega-3 fatty acids. In the human diet, a person should eat a ratio low in omega-6 to omega-3; the ratio in the human diet should be 1:1 or 2:1 omega-6:omega-3. In the western diet omega-6 sources are readily more available than omega-3 sources, leading most of the population to consume a lot more omega-6s throughout the day. Depending on what the cow is being fed, the amount of omega-6 and -3 fatty acids are typically 2:1, making milk one of the perfect sources for omega-6 and -3 fatty acids that one can find in the diet (Haug, Hostmark, Harstad 2007).

Making up only one percent of milk fat are two very powerful lipids called phospholipids and glycosphingolipids. These fats have many functions within the body, include aiding in cell-to-cell interactions, immune recognition, and signaling for certain hormones and growth factors. Within these fatty acids there is a compound called gangliosides. Gangliosides are found mostly in nerve tissue and are very important for neonatal brain development, receptor functions, allergies, and for protecting against bacterial toxins (Haug, Hostmark, Harstad 2007).

Positive Benefits of Non-Dairy Milk

There are many reasons why people don't drink cow's milk despite the nutritional benefits. Veganism was started in 1944 by Donald Watson, and now has taken off to become a very successful movement. Celebrities like Beyoncé, Jay Z, and Ellen Degeneres have all tried out this diet. The diet forbids the consumption of animal milk (Rami and Trupti, 2014). Another reason many are choosing not to drink animal milk is the large amount of people who are finding themselves lactose intolerant. About 65% of the US human population has some variation of lactose intolerance. People of West African, Arab, Jewish, Greek, and Italian descent have a lactose intolerance rate of nearly 90%. (Genetics Home Reference, 2010) Lactose intolerance is when there is a lack of the enzyme lactase that typically would break down the sugar found in milk, lactose. The inability to break down lactose can cause lots of discomfort including bloating, stomach pain, excessive gas, and diarrhea. (Funk & Wagnalls New World Encyclopedia 2016) Veganism and lactose intolerance affect the food industry greatly because it has created a large market for non-dairy milks.

Coconut Milk

Discussed in this paper will be three types of non-dairy milk including coconut, soy and almond. Coconut milk has become more and more popular in the past decade, and increasingly

restaurants and cafes now use coconut milk as a non-dairy replacement. Grocery stores and large companies have also started making many varieties of coconut milk. With an average of 70 calories per cup, compared to whole cow's milk which has up to 150 calories per cup, coconut milk has become very popular. Like other non-dairy milk alternatives, coconut milk has almost double the amount of calcium found in cow's milk. Coconut milk has 45% of daily calcium needs, whereas cow's milk has about 30%. However, one must keep in mind that a lot of the calcium found in coconut milk has been added into the product and is not found naturally, whereas calcium is natural in cow's milk. In one cup of non-fortified coconut milk, there are 38 mg of calcium which is about 4% of daily calcium needs. (United States Department of Agriculture) Despite the lack of naturally occurring calcium, coconuts themselves have lots of nutrients that are found naturally including vitamin C, E, B1, B3, B5, B6, iron, and phosphorus. These vitamins and minerals found in the coconuts are also found in coconut milk. Coconut milk is high in fats, but more research is now coming out stating it is not the amount of fat one might eat, it is the quality of fat that is eaten. This is where coconut milk is unique: coconuts are higher in medium chain triglycerides, MCT, whereas most fat sources contain almost 100% long chain triglycerides. MCTs are unique because they are transported directly from a person's intestinal tract to the liver, which metabolizes the fat and typically turns it directly into energy. This is opposed to long chain fats, which are absorbed through the lymphatic system then broken down with bile, transported to the bloodstream, then brought to the cells for energy. This allows more time for fat to be deposited in the body and stored. Coconut oil contains about half the amount of MCT's than does pure 100% MCT oil. A researcher at Columbia University named Marie-Pierre St-Onge did a study involving pure MCT oil. In this study, thirty-one obese men and women ate 1,500-1,800 calories a day with 12% of calories coming from either MCT oil or

olive oil. Over the four month study those who used MCT oil lost about four additional pounds than those using olive oil. St-Onge says that the bottom line is "the effect of MCT oil on weight loss is modest." Since coconut oil has only about half the MCT's than pure MCT oil, could there be a lesser effect on weight loss with coconut oil as compared to the pure MTC oil? Research has not been done to prove this theory yet. (Schardt, 2012)

Soy Milk

Soy milk is one of the closest non-dairy milks to match the protein levels of normal cow's milk. There are about 6-8 grams of protein in one cup of soy milk compared to 8g of protein found in cow's milk. The reason that there is a range in protein for soy milk has to do with the different companies that make the milk. The *Environmental Nutrition* magazine has compared different types of non-dairy milks and the different companies that make them. For example Silk® Soy Milk has 8 grams of protein, whereas Trader Joe's® Organic Soy Milk has 7 grams of protein, and the carbohydrate count is also slightly different between the two brands. The *Environmental Nutrition* magazine recommends soy milk more than any other non-dairy milk because of its high protein and low saturated fat content. (McIndoo, 2015) There have been many studies done on the soybean and its many health benefits. The *International Journal of Nutrition, Pharmacology, Neurological Diseases* discusses studies showing how soy has been beneficial. Soy has a low amount of saturated fat, with dietary fiber and phytochemicals such as isoflavone. Isoflavone makes the soybean unique from other legumes, and has been shown to prevent and treat chronic disease. Soy also has high quality protein, which means the protein is easily digested by the body, aiding in muscle building by providing necessary amino acids. Prevention against cardiovascular disease is a more commonly known benefit of soy due to its higher levels of soluble dietary fiber. Soy milk does not have as much fiber as the soybean, but

it still has about 1g per cup of soy milk compared to 0g per cup of cow's milk. High fiber levels help to decrease blood cholesterol levels. Soy milk also has a blood thinning effect due to the isoflavan, which can help those with atherosclerosis. Genistein and isoflavone have been found to reduce the risk of breast and prostate cancer and aid in bone health. Soy contains phytoestrogens that act like synthetic estrogen and can help alleviate some of the symptoms of menopause. (Asif, Acharya 2013). Other benefits of phytoestrogen include reducing the risk for osteoporosis and heart disease, and improving cardiovascular health. (Patisaul, Jefferson 2010)

Almond Milk

Almond milk was created in the 1990's and has no cholesterol or saturated fat, and is lactose free. It is made by soaking almonds in water, then grinding them up together in a machine meant for making vegetable beverages. In the end the "nut water" takes about 30 minutes to prepare and has a ratio of 8:100, almonds to water (Bernat, Maite, Chiralt, Martinez 2015). Almond milk is very useful for people that are lactose intolerant but is not appropriate for those with nut allergies. In a chart made by *Environmental Magazine*, almond milk comes in as one of the lowest calorie milks on the market, ranging from 30-60 kcals per cup. The protein found in almond milk ranks as one of the lowest out of all the milks. The calcium level depends heavily on the brand making the milk because a large amount of calcium is fortified or added into the almond milk. (McIndoo, 2015) Many Americans receive lots of protein from their diet through other foods, and if this is the case, then almond milk can be a healthier alternative to higher calorie milks, because it is low calorie, 60 calories per cup, and low protein with only one gram of protein per cup. (Mangels, 2014) Kristin Kirkpatrick, a registered dietitian from the Cleveland Clinic, says that consuming almond milk can be a great way to lose weight because it has 50% fewer calories than cow's milk (Oaklander, 2015). Comparing Silk™ almond milk to

1% cow's milk, there are a few vitamins and minerals to take into consideration. Almond milk provides iron, vitamin E, and magnesium whereas traditional cow's milk has minimal amounts of these vitamins and minerals. Vitamin E, is found most readily in almond milk, providing about 20% of the daily value in one cup. Also found in almond milk are antioxidants that play a role in anti-inflammatory functions, decreased platelet aggregation or change for blood clots, and immune system enhancement. (National Institute of Health, 2018) Almond milk provides 4% of the daily value of riboflavin. Riboflavin is a B-complex vitamin (B2), which means it cannot be stored in the body so it is important that the vitamin is consumed every day. Riboflavin can aid in digestion by converting carbohydrates into energy. Almond milk only contains 2% of the daily value for iron; however, cow's milk has no iron. Iron is very important to prevent anemia, which means the body is low in red blood cells which impairs oxygen levels.

Conclusion

All different milk varieties have their own unique benefits. Cow's milk is rich in many vitamins and minerals, while containing beneficial unsaturated fatty acids along with saturated fatty acids like caprylic acid that may help delay tumor growth. Coconut milk has fewer calories than cow's milk and also contains a wide range of fat compositions, like medium chain triglycerides. Soy milk is most well known for its great protein source which is easily digestible, along with its long list of health benefits from the soybean, like reducing blood cholesterol because of the soluble fiber. Almond milk is a great non-dairy milk substitute for those wanting to lose weight with its 50% reduction in calories compared to cow's milk. Different people may find some benefits more important than others and base their milk choice of on them.

Part 2: Negatives Aspects of Milk

There are many reasons people choose to drink milk; however, there are many reasons as to why many people stay away for milk. Milk is a very complex food item with a lot of different components, which sometimes the human body does not tolerate. The main ingredient in milk that the body may not tolerate is its sugar, lactose. The lactose is broken down in the small intestine and turned into glucose and galactose; these molecules are then used for energy in the body. A special enzyme, lactase, must be present in order for the break down the milk sugar, lactose. Lactase is abundant in infancy when milk in the main source of nutrients. In most mammals however, lactase is no longer present after infancy, but lots of humans can sustain a high level of lactase throughout the lifetime. Those who lack lactase in the small intestine must limit or stop dairy consumption completely. Distribution of lactase throughout the human body can vary greatly; however, it is mainly found in the epithelial cells of the small intestine (Swallow, 2003).

If those who are lactose intolerant consume lactose, there could be painful and damaging consequences. If the lactose is not broken down in the small intestine it will make its way into the large intestine, and bacteria in the large intestine will feed off the sugar, lactose. This can cause painful gas and diarrhea. While the lactose travels through the small intestine and is not broken down, the lactose sugar can damage the lining of the intestine which can decrease production of lactase even more (Funk & Wagnalls, 2017).

Humans can also be allergic to the protein found in milk. A milk allergy is the most common allergy found in children. It is caused by an abnormal response of the body's immune system to milk. Symptoms for a milk allergy and intolerance can be somewhat similar; however, a milk allergy can affect the whole body. For example, one can develop hives, trouble breathing,

cramps, and itchy skin from a milk allergy, whereas these symptoms would not be present with a milk intolerance. (Mayo Clinic, 2014) A study published in 2013 looked at data from 38,480 parents discussing their children's allergies: 19.9% of those in the study had a milk allergy. Asian and Black children were half as likely as white children to develop a milk allergy. Children ages 6-10 were most likely to develop a dairy allergy. The study concluded that a milk allergy is 20% of the US food allergies and it is one of the most commonly diagnosed food allergies. (Warren, Jhaveri, Warriar, 2013)

A separate study similar to the one discussed above published in the *American Journal for Clinical Nutrition* was conducted in Northern Sweden with 103,256 adult participants. The study investigated the association between all-cause mortality and reported nonfermented and fermented (yogurt, kefir) milk consumption. The study followed up with a mean of 13.7 years, and within that time there were 7121 deaths. Those who consumed nonfermented milk more than 2.5 times per day had a 32% increased chance of all-cause mortality, or death caused by a certain disease, compared to those who consumed milk less than one time per week. For everyone participating in the study, the amount and type of milk was associated with the individuals' lifestyle. As for the fermented milk, it was negatively associated with all-cause mortality. (Tognon et al., 2017)

Animal Milk Fat

More than half of the amount of fat in milk is saturated, which has given milk a bad reputation since the 1960's when much of the population was trying to stay away from saturated fats. These saturated fatty acids include lauric, myristic and palmitic, all of which can raise HDL (high-density lipoprotein) and LDL (low-density lipoprotein) in the body, which can lead to increased total blood cholesterol levels. High intakes of saturated fat and cholesterol have been

associated with a higher risk of becoming obese and developing heart disease. (Haug, Hostmark, Harstad 2007).

High milk fat can be found in whole milk and cheeses. The USDA also warns consumers to stay away from milk fat due to its high saturated fat and cholesterol levels. Choosing foods from the dairy group that are high in saturated fat and cholesterol may raise LDL cholesterol levels. Too much LDL cholesterol in the blood can lead to coronary heart disease. To keep saturated fat at a normal level, watching portion sizes are necessary. The USDA warns that a diet high in fat is also high in calories and can easily lead to excess calorie consumption and weight gain (United States Department of Agriculture, 2017).

Negative Aspects of Non-Dairy Milk

Coconut Milk

Coconut milk has become a new favorite in the non-dairy milk aisle of the grocery store. According to the chart found in the Environmental Nutrition magazine, coconut milk has the highest fat content among the non-dairy milks. For example Silk™ Coconut milk has 5 grams of fat and Silk™ Almond milk has 2.5 grams of fat in 8 ounces of milk (McIndoo, 2015). Similar to what is stated above, saturated fats tend to raise bad cholesterol levels (LDL), which will eventually increase the risk of heart disease. In order for these levels to remain low, one must cut back on saturated fat consumption. (United States Department of Agriculture, 2017).

Many know coconut milk for its medium chain triglycerides, which can be easily digested and lead to health benefits; however, the fat most readily found in coconut oil is called lauric acid, which 70-75% digest like long chain fatty acids as opposed to the medium chain triglycerides caprylic and capric acids which are more easily digested. Caprylic and capric acids

make up roughly 13% of coconut fat whereas lauric acid makes up 44% of fatty acids found in coconut fat. This means a total of 87% of fat found in coconut milk is saturated. (IDFA, 2016)

A study was done by Oxford Academic to review literature on the effects of coconut consumption and cardiovascular risk factors. Twenty one studies were looked at including eight clinical studies and thirteen observable studies. The study concluded that coconut oil generally raises total LDL, bad cholesterol, to a larger extent than unsaturated plant based fats, but to a lesser extent than butter. (Eyres et al, 2016)

Protein is another benefit of drinking cow's milk and one of the main reasons dietitians recommend cow's milk. Coconut milk has a very low level of protein if any protein at all. Silk™, SoDelicious™, and Trader Joe's™ brand coconut milk have zero grams of protein; this is compared to eight grams in cow's milk and one gram of protein in Silk™ Almond milk. This means that coconut milk has the least amount of protein within the non-dairy milks. (McIndoo, 2015) Protein can also help build bone and muscle and repair them after exercise. Inadequate protein intake can lead to decreased calcium absorption which can cause frail and weak bones. If one chooses a milk low in protein they must make sure that they consume a sufficient amount of protein through other sources throughout the day to meet their needs. (Women's Health Advisor, 2015)

Calcium levels are also low in coconut milks. Calcium is key according to the *Women's Health Advisory Journal*. There have been hundreds of studies to show that a diet plentiful in calcium can lead to bone health benefits. Calcium is even more necessary in women's health because women are three times more likely than men to develop fragile bones, seen in osteoporosis and osteopenia, which leads to a higher risk of broken or fractured bones. To prevent these issues consumers must be sure to purchase food and drinks with an adequate

amount of calcium (Women's Health Advisor, 2015). Silk™ Coconut milk has 10% daily value of calcium compared to cow's milk, which has 30.5% daily value, and Silk™ Almond milk, which has 45% daily value of calcium per eight ounces of milk (McIndoo, 2015).

Soy Milk

Soy milk is known to many health professionals as having a close profile to cow's milk because of its higher protein levels opposed to other non-dairy milks that can have very low protein levels. The chart found in the Environmental Nutrition magazine published in 2015 shows that soy milk has a range of 6-8 grams of protein per cup, which is relatively high for a non-dairy milk. However, the consumer must look at the label to ensure the brand of soy milk has high protein levels, whereas cow's milk has a consistent 8 grams of protein per cup.

Soy-containing food products have many bioactive products including saponins, protease inhibitors, phytic acid, and isoflavones. Isoflavones are compounds known as phytoestrogens; these compounds have estrogen-like structures. Soy isoflavones have been linked to many different health effects although whether or not these benefits are valuable is highly debated. Soy isoflavones are typically described as a weak estrogen; however, the weakness depends on many factors including tissue concentration, cell type, hormone receptor type, and stage of differentiation. Another factor includes estrogen receptor activities and can also affect steroid metabolism. Genistein is another component that is contained in soy and other plant based proteins. These compounds are capable of causing reproductive and developmental effects. Although it is unknown how much genistein is actually absorbed into the body, it is thought to be a small amount (Barrett, 2006). It still unknown whether or not phytoestrogens increase or reduce the risk in developing breast cancer. Throughout the past two decades, research has been incongruous. Throughout gestation and infancy, manipulation of estrogen can have adverse

health effects such as malformations in the ovary, uterus, mammary gland and prostate, early puberty, reduced fertility, disrupted brain organization, and reproductive tract cancers. We can see these effects in public health records. For example, one hypothesis is that the median ages at which females experience first breast development and sexual precocity have steadily advanced as more soy products are added to more foods. (Patisaul, Jefferson 2010)

In soy-based infant formulas, isoflavones can contain steroid hormones and may affect the formation of hormone-responsive tissues and activation effects in the central nervous system. Infants can digest isoflavones much easier than adults who have a much more developed gut (Barrett, 2006). At the current moment there is no definite evidence that phytoestrogens have toxic effects in human infants who are fed a diet of soy formula. However, there have been questions raised about studies done on animals and on embryos of infants who are fed solely soy based formulas. An infant consuming soy based formula on a regular basis consumes phytoestrogens with about 4-11 mg/kg of body weight. An adult consuming a diet traditionally high in soy-based products, like Japanese cuisine, typically consume phytoestrogens with about 1 mg/kg of body weight. Although no overt harm has been proven feeding infants soy formulas, this does not apply to premature babies as soy formulas may not adequately promote growth of the premature infant. Long term safety data is very limited, and one thing that most soy researchers can agree on is that much more research is needed in order to have a clear understanding of soy health effects. (Barrett, 2006; Canadian Paediatric Society, 2009) It is important to remember that moderation is key when consuming soy products. For a typical consumer, it is not necessary to be very concerned about soy consumption. However, it is important to make sure the consumer is educated about the negative and positive effects of soy, and realizes that soy does not relieve all ills. Women who are pregnant, nursing, or attempting to

become pregnant should use soy foods with caution and realize that soy formula may not be the best option for their babies. (Patisaul and Jefferson, 2010)

Almond Milk

Almond milk has become very popular in today's society because it is non-dairy, and almonds are very nutrient-dense with lots of good fats and proteins. Many consumers may think that all of the health benefits of the whole almond contribute to the health benefits of the almond milk. This is somewhat true, but the milk version is very watered down. For example, about every 7 almonds contain one gram of fiber, whereas almond milk contains zero grams of fiber in 8 ounces. The process of making almond milk involves straining the pulp from the nut milk; therefore the majority of the fiber is removed from the final product. Almond milk also has very minimal protein; according to the *Environmental Nutrition* magazine almond milk has one gram of protein for 8 ounces of milk, whereas 10 almonds have roughly 2.5 grams of protein. Many of almonds' healthy monounsaturated fats are also diluted in water. (McIndoo, 2015)

Many different variables are either naturally or artificially a part of milk. This makes it more difficult to choose the milk that will benefit consumers the most. Consumers looking for taste could choose a milk different than the consumer that is looking for health benefits.

Whatever the reason might be for consumers to choose the milk, it is important that the health risks and supplementation needed for each kind of milk are known.

Part 3: Animal Milk Public Perceptions

In the following section I examine how milk has been marketed throughout the century and the major organizations supporting or negating dairy milk; I then turn to my own study in order to show how the public perceives animal milk.

Milk has become a significant discussion topic on the internet through blogs, campaigns, news, and many other sources. When “milk” is typed into the Google search bar, pages after pages of information appear. Some Google sources come up with health benefits and milk campaigns, while others like Vegan Society explain the horror of the dairy industry.

On Google alone there are roughly 4.5 billion searches each day on any given topic. In 2014, about 213 million people were searching the internet and this number is expected to grow to 236 million by 2019. Searching anything online has become easier than ever due to smartphones: when a consumer is in the grocery store deciding which milk to purchase, all that is needed is a quick search on a smartphone in the milk aisle. If a company wants the consumer to click on its website and the company has money, it can pay to advertise the website and the link will be moved directly to the top. If the consumer searches something and they pick an article that is not an ad, it is considered an “organic” site visit. These organic site visits have decreased 7% over the past year, even though in years prior the organic sites had an 11% increase in clicks. This is likely due to an increase in paid results pushing the organic results down toward the foot of the page. By next year, the amount of money spent on digital ads is expected to bypass the amount spent on television. Speed in a search engine is also critical as even a second delay will result in a 7% loss of consumers waiting until the new web page loads. Also important is that after three seconds of loading a webpage, 40% of users will leave that page. While many consumers are in a rush and are in the milk aisle deciding which type of milk they should purchase, they will do a quick search on their smartphone and click on the first thing that comes up, depending on what milk company is advertising at the time of the search could determine the customer's purchase. (Eliason, 2016)

Websites Catered Toward Drinking Animal Milk

When a consumer is looking for reasons to drink milk, there are many websites that cater to that. This section will discuss some of those easily accessible websites that are easy to navigate and often visited by consumers looking for advice on milk. One is the National Dairy Council, a non-profit organization run by the dairy farmers, which claims to use “science based education” about nutrition and health benefits that dairy food provides. The website's home page is a large glass of milk, and when scrolling down there are pictures of healthy individuals smiling while drinking milk, along with recipes and other health facts. Because this website was created by the dairy farmers, it most likely has a bias toward cow’s milk. For example, one study found on the website discusses dairy fat versus vegetable fat; the study replaced dairy fat with an equivalent amount of calories from polyunsaturated fat or vegetable fat to see if it affected risk for cardiovascular disease, coronary heart disease, and stroke. The results found that substituting vegetable fat was more beneficial; however, the website also states that the study did not look at composition of dairy fat in different dairy foods and recognizes previous research in cheese, butter, and yogurt stating that more research must be completed. The website is easy to navigate and find information the consumer might be looking for. (Brasseur, 2018)

The National Dairy Council’s main selling point for milk is its health benefits. There are some recipes that make the consumer believe that milk is a delicious and fun food item. However, most of the Dairy Council's website provides research, tips, and articles about the health and nutrition milk can provide to the consumer. (Brasseur et al, 2018)

In 1993 one of the largest and most well known milk campaigns began. The state of California decided that for every gallon of milk sold, three cents would go toward promoting consumption of milk. This allowed for 23 million dollars per year of marketing of milk. This

led to the creation of the California Milk Processor Board, CMPB, consisting of 13 processors that represent the milk industry. The CMPB is the creator and controller of the famous “Got Milk?” campaign; the national dairy boards now have access to use the “Got Milk?” logo and campaign for their own marketing efforts. A variety of manufacturers are also able to use this campaign to create merchandise. (Ng, Ray, Yang, & Yan, 2009)

Gotmilk.com takes a much different approach to milk than does the National Dairy Council. This website is very user friendly and targets a large range of audiences. For example, to attract children there are many child-friendly recipes; the campaign also partners with Girl Scout Cookies to emphasize the deliciousness of the cookie and milk pairing. For the adult age group, the website shares many savory dishes that would not typically appeal to children, like a “chipotle cereal with marcona almonds and sea salt.” However, throughout the website there are many links and article, and very little mention of the health benefits milk has to offer. The GotMilk? campaign is focused more on the flavor and taste benefits milk has to offer. With countless savory and sweet recipes, social media posts, and amazing pictures, this website allows for a delicious perception of milk (Got Milk, 2015).

Milklife.com is another easily accessible website that discusses milk and its benefits. The website is funded and maintained by MilkPEP. MilkPEP is run by nine individuals, all of whom have a marketing background. Some are in charge of media while others collaborate with organizations within the dairy industry to help them build a brand to be successful. Notice, however, that there are no medical professionals working with MilkPEP to provide reliable data for the website. Milk Life’s motto is to “milk every minute out of life,” and the website states multiple times, “we’re here to help you milk life!” There are a few main sections to the website they include fueling team USA, which discusses milk and athletes; another section “Protein

Power Up” discusses the reasons protein is so important in the diet and why the consumers should choose milk protein, for its wide variety of amino acids. Unique to this website is a section to donate milk to the hungry children in America, why consumers should give milk to children, the statistics by state of those in need of milk, and how to donate. Another section includes milk nutrition which explains nine simple, fun nutrition facts about milk along with other helpful hints. The last section, which is also seen throughout the whole website, is for recipes utilizing milk. The Milk Life website is a very visually appealing site that has lots of recipes and is heavily focused on the nutrition aspect of milk. With many social media outlets, colorful pictures, and recipes this site could be easily influential to the typical American consumer curious about milk. (MilkPEP, 2017)

Websites Catered Against Drinking Animal Milk

As discussed earlier veganism has become a large influential movement. In the later part of the 1900’s, celebrities started practicing to veganism, and today even more influential people are becoming vegan. If “veganism” is typed into Google, over 400,000,000 results relating to “veganism” appear. Some are focused on the health benefits the vegan diet has to offer, while other sites explain the terrible ways in which the food industry treats the animals used to produce animal products. One definition of veganism found on vegansociety.com is as follows:

“a philosophy and way of living which seeks to exclude—as far as is possible and practicable—all forms of exploitation of, and cruelty to, animals for food, clothing or any other purpose; and by extension, promotes the development and use of animal-free alternatives for the benefit of humans, animals and the environment. In dietary terms it denotes the practice of dispensing with all products derived wholly or partly from animals.” (Vegansociety, 2018)

This definition is from 1988. The next few paragraphs will compare some of the top vegan websites to see where Americans are getting easily accessible information and reasons as to becoming a vegan.

The first website is vegan.com; this website is user-friendly and mostly for people who have already decided to become vegan. There is a wide variety of information in this website from finding the best vegan restaurants, cooking vegan, to buying vegan groceries and even shoes. The recipes range anywhere from cauliflower buffalo wings to jack-o-lantern stuffed peppers. Even though the website is mainly geared toward younger adults, it is also aimed at parents to utilize the delicious recipes and seek out restaurant recommendations with their kids. One aspect of this website that would be very useful is its many guides: the living guide discusses being vegan in college, at weddings, first time vegan, and more. The food guides explain how to replace the different foods that vegans give up and explains the power foods vegans should be eating; an activism guide discusses how to get involved; there is also the local city guide that highlights five major cities around the US and discusses restaurants in the area; the last section explains how to get proper nutrition and supplements that need to be taken. This website overall makes becoming a vegan look very easy and rewarding. If a consumer was thinking about becoming vegan, this website could be very influential because of how fun and easy it makes veganism look. (Mocana Productions, 2017)

The Vegan Society was created in 1979, and its mission is to promote the vegan lifestyle to benefit people, animals, and the environment. The Vegan Society hopes to get more people to try veganism along with making the vegan lifestyle easy to follow. The website includes a long list of reasons one should become vegan; these include helping protect the exploitation of animals; health benefits that go along with a plant-based diet; providing research articles to prove

the website's claims; helping protect the environment by reducing the carbon footprint, claiming that this is the most effective way humans can lower the carbon footprint; and being a much more sustainable way to feed a family. (VeganSociety, 2018)

The Vegan Society website also has a section about the dairy industry and why drinking milk as a vegetarian is not recommended. The website discusses this by reminding consumers that the egg and dairy industries are not good to their animals. According to vegansociety.com, for a cow to keep producing milk, the cow must keep getting pregnant, many times artificially. After giving birth, the website states, the calf and the mother are separated almost immediately, leaving lots of stress on the mother and the calf. It is stated that a dairy cow lives about seven to eight years before they are slaughtered; however, if the cow is allowed to live free without any exploitation or slaughtering they can live up to 25 years or more. The article ends by stating that farming only exists to make a profit, not to make sure the cattle are being taken care of correctly. (VeganSociety, 2018)

According to Discover Dairy, an Australian website for students and teachers to learn and become educated about the dairy industry, if a cow is continuously milked and fed enough food, the cow will not have to become pregnant as often. Typically the cow becomes pregnant when it is 2 years old; after the first calf is born, the cow can become pregnant again after 100 days. Many farmers will continue to milk the cow until it is seven months pregnant, then allow the cow to focus its energy and food toward the new calf. (Dairy Australia, 2016)

Some of the claims made on the website are not accurate according to the Farming Ensuring National Management (FARM), the national milk producers federation. Milk providers join the federation, which has strict guidelines for animal treatment. In 2016, 98% of the United States milk supply came from farms that participated in the FARM animal care

program. To be a part of the program the farm needs to have a valid veterinary-client patient relationship, training documentation for all employees with animal care responsibilities, and ceased routine tail docking. Other protocols that FARM supports include proper sanitation and waste management to keep the animals dry and comfortable, monitoring change in body condition during gestation and lactation, protection from the heat and cold, minimal airborne particles to prevent odor and dust, a warm dry area for cows to lie down in a comfortable posture, separate pens for all newborn calves, along with multiple other regulations. (National Milk Producers Federation, 2013)

Brand Name Websites

The plethora of name brands of non-dairy milks on the market leads to lots of different and easily accessible websites promoting these non-dairy milks as well as reasons consumers should drink them. Lots of these name brand websites are easy to navigate and are very visually appealing to the customer. There is the “So-Delicious™” website, which is very well put together with all products So-Delicious™ sells. There is also a countless number of recipes utilizing their products, along with nutrition advice about their different types of non-dairy milk (SoDelicious, 2017). “Silk™” is another brand of non-dairy milk that sells coconut, almond, cashew, and soy milk, along with creamers and yogurts. There are many nutrition facts on the website, including why non-dairy milk is better than cow’s milk; their reasons are less calories, less cholesterol, more calcium, less fat, soy milk can help your health, and the perfect way to get your chocolate fixing. Another section on the “Silk” website is where myths regarding non-dairy milk are debunked. For example, they claim that “soy does not support growth and development of children” is responded to with the claim that nutrition communities and government agencies

agree that soy is beneficial to men, women, and children's health because soy is a complete protein along with an excellent source of vitamin D (Silk.com, 2018).

From looking at all of these websites, the takeaway is that there is a wide range of opinions on the internet. This wide range might confuse consumers and make them question if what they are doing is right.

Advertisement Influences

Consumers don't even have to be looking for research for it to appear on the computer screen. With social media becoming more popular, there are many advertisements. Facebook is a very unique ad platform because companies can advertise only to the target market. It works this way because Facebook users fill out lots of information about themselves, sometimes without even noticing. When registering, the user will fill out their name, gender, and age; this is the obvious information that the user knows he is profiled under. However, they are profiled under much more such as when the user “likes” a page or “follows” a group, which makes it easy for one audience to pinpoint a group and makes Facebook advertising very convenient to attract the right target market (Skantze, 2017).

Primary Research

As discussed above, there are lots of easily accessible articles online that have tried to persuade consumers one way or another toward or against the consumption of milk. I wanted to complete my own research and see what the population actually perceives about milk. I set up a SurveyMonkey to complete my research. The survey was shared on my social media site, and with others through email. Within a month's time, the survey accumulated 102 responses. I started the survey by asking for the respondent's age and education status. This is because milk perceptions have changed a lot throughout the years, and someone in their twenties may have a

much different perception than someone much older. Education status could affect the way someone perceives information when looking at websites or articles. The next question asked whether or not the surveyee had an intolerance or allergy to milk; this will help make clear why some surveyees do not drink animal milk. The next question asked “what milk does the surveyor actually drink?” I gave a list of nine different options including cow’s milk, goat's milk or other animal milks, nut milk, oat milk, pea milk, soy milk, coconut milk, and rice milk. For the second part of this question I asked for a reason why they chose that milk. The last question asked “if and where the surveyee had heard any negative comments about milk” either they have never heard anything negative or they had on social media, an internet search, a blog, news articles, word of mouth, or other. The data that follows is raw data, and has not been statistically analyzed.

The majority of those who took the survey were ages 19-25 years old--50% to be exact, 30% were 40-65 years old, 13% were 26-30 years old, 5% were over 65, and only 2% were 18 and under.

Education levels of those who completed the survey correlate to the age groups. No one has less than a highschool degree, 8% have a high school degree; the largest group, 33% have some college education, with 17% receiving an associate degree. The second largest group, 23%, have bachelor's degrees only, and lastly 19% have more than a bachelor's degree, and no one has a PhD. Overall this sample set is well-educated.

The next question asked was about dairy allergy and intolerance. The response was overwhelming: 87% said they have no intolerance or allergy and 13% said they had an intolerance. The concept to note here is that majority of participants are able to drink animal milk without any negative health effects. Out of those 87% who are able to drink animal milk,

72% choose animal milk as their choice of drink (3% choose an animal milk other than cow's milk). The majority of those 29% who chose a milk alternative chose nut milks as their drink of choice. The next most popular milk alternative was coconut milk at 16% and soy milk at 15%. Milk alternatives that only consisted of 6% of the survey include oat, pea, and rice milk. The last 11% stated they do not drink any type of milk at all.

At the next point in the survey, I asked for reasons as to why the participants choose that particular milk in a short answer question. Out of the 102 responses received only 49% participants filled out the short answer question. One of the biggest themes was that about 16% of the responses received have to do with the fact that the consumer grew up drinking that kind of milk and have never wanted to change. This indicated that eating patterns during childhood likely stay with the person so it is possible that these consumers grew up during a time when there was only cow's milk advertisements. Another common theme is simply that the consumer likes the taste of the milk, which received about 12% of the responses. Some mentioned their intolerances to animal milk, while others discussed nutritional benefits of their chosen milk.

The last question asked was whether or not the survey participant had ever heard any negative comments about drinking milk. With a wide market and variety of milk choices, I was expecting most everyone to have heard negative comments about some type of milk. My hypothesis was mostly correct. Only 31% of responses never heard any negatives about milk; Though this number is slightly higher than expected, the majority of participants have heard some kind of negatives about milk, whether it be from a blog, social media, news, Google search, or word of mouth. The largest source of negative information comes from word of mouth, with 38%. The next biggest way to share negative information about milk is social media with 30% then internet searches with 24% news articles with 18%, and blogs with only 5%,

leaving 7% of consumers hearing negative information about milk from other sources. To prove that word of mouth is a very powerful influencer research done by Andrew Baker of the College at San Diego State University, and Naveen Donthu and V. Kumar at Georgia State University in Atlanta, shows that even though online advertising is very popular, consumers' buying behavior is more likely to be influenced by word-of-mouth conversations between consumers sharing strong social ties than by any other form of communication (BizEd, 2016).

Graphs for this primary research can be found in the appendix.

Government Influence

Many consumers will say that the reason schools and government officials make milk sound so healthy is because of all the lobbyists dairy council farmers. I wanted to look into this; on the US Department of Agriculture (USDA) website, it discusses how they come up with the Dietary Guidelines for Americans, which includes milk and dairy. Every five years the USDA and Health and Human Services (HHS) come together to write a report containing nutritional and dietary information and guidelines for the general public. Public Law 101-445 requires these guidelines to come from “current and scientific medical knowledge”. (Executive Summary, 2015) The 2015 edition was built off of the 2010 edition with the “*Scientific Report of the 2015 Dietary Guidelines Advisory Committee* and consideration of Federal agency and public comments.” (Executive Summary, 2015) Many healthcare professionals refer to this source when working with clients and patients.

An article written for Time magazine touches on new research that finds whole milk, not reduced fat milk, will help lower rates of weight gain and metabolic disease. Another observation that the magazine made pertained to the new dietary guidelines that stated, that most people consume much less milk than is recommended for a healthy diet. Dr. Walter Willett,

chair of nutrition at Harvard School of Public Health, says there is no evidence to support such a large milk consumption. Willett believes that the dairy industry played a role in these claims (Heid, 2016). According to Opensecrets.org, a website that follows money trends in the US and its effects on public policy, \$4,517,856 was spent in 2017 for lobbying the dairy industry. (Center for Responsive Politics, 2017)

Dairy policies within the United States are run both by state and national programs. The three federal programs are called Milk Income Loss Contract (MILC) program, Dairy Product Price Support Program (DPPSP), and the Federal Milk Marketing Orders (FMMO). The FMMO is very old and today is outdated, and the International Dairy Food Association (IDFA) is working to improve and make the FMMO a newer and better program. The IDFA represents dairy manufacturing and marketing industries and their suppliers with nearly 525 companies within a \$125-billion a year industry. Over 85% of the milk, cultured products, cheese, ice cream and frozen desserts produced and marketed in the United States are regulated by the IDFA. Their mission is to promote success of their members by influencing federal, state and international government policies with a strong focus on dairy policy, serving as a source of information for the dairy industry to protect and further improve the dairy image. The IDFA also educates the dairy industry stakeholders to exchange views and discuss issues facing the industry today, as the main goal of this group is to protect the dairy industry and to make sure profits are reached through marketing and advocacy (IDFA, 2016).

Conclusion

In conclusion, we now understand that milk has lots of different nutritional components, and milk advertising has lots of influences that affect what kind of milk we choose to drink. Many studies completed by the government and private agencies have studied the health and

nutrition-related effects of cow's milk. Most of these sources shed a positive light on cow's milk, stating that its nutrients are essential for human consumption. Cow's milk is the main source of calcium in the American diet, and calcium is essential for heart, muscle, and nerve functioning, as well as blood clotting. However, there is some research that discusses the negative aspects of milk. A main reason consumers do not drink milk is because they are lactose intolerant. With more than half of the fat coming from milk being saturated fats, this is another significant criticism of cow's milk, and even the USDA advises to stay away from milk fat. However, within recent years there have been many studies that found nutritional benefits of milk fat with its many beneficial fatty acids.

Non-animal milks have become a very popular food trend today, between the growing vegan movement and high demand from large non-dairy milk industries. Many vegan and non-dairy milk companies have done research and published articles as to why consumers should choose that specific type of milk. Some of these reasons include low calorie, low fat, and high calcium levels, making non-dairy milks seem very attractive nutritionally. Those who are against non-dairy milks argue that there is a lack of nutrition found in these milks, meaning low protein and a minimal amount of vitamins and minerals that are naturally occurring. For some, non-dairy milk is necessary due to allergies or intolerances; however for others, non-dairy milk is a health or flavor choice.

My personal research, which was done through [surveymonkey.com](https://www.surveymonkey.com), showed that even though there is an industry for non-dairy milks, the majority of consumers still drink cow's milk even though about 70% of those who took the survey have heard negative information about milk. Regardless, consumers are inundated with information about milk, both dairy and non-dairy. When a consumer goes to the grocery store and look at the overwhelming aisle of

different types of milk, they must be informed and educated as to what would most benefit their health.

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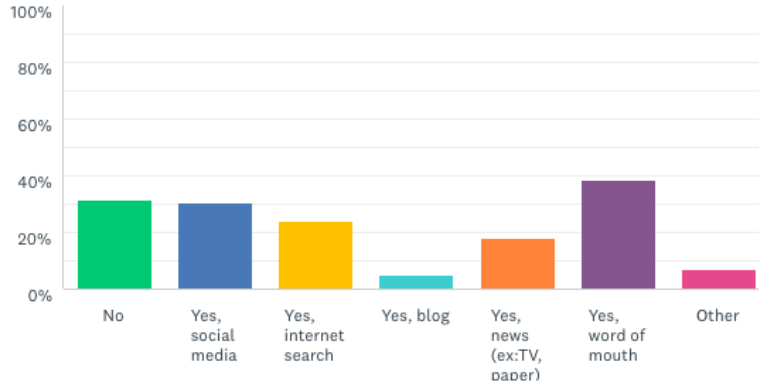
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Appendix:

Have you heard of any negatives about milk?

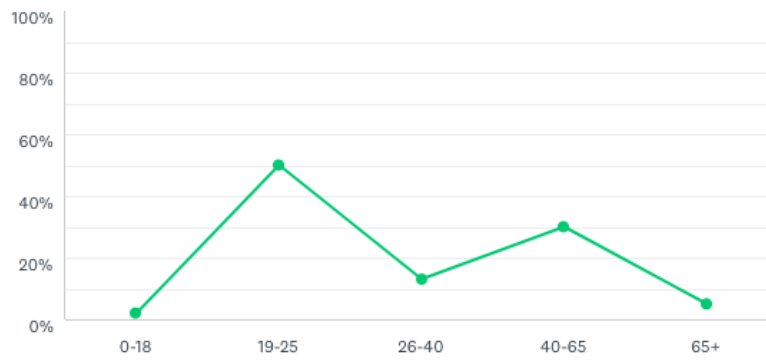
Answered: 99 Skipped: 1



ANSWER CHOICES	RESPONSES	
▼ No	31.31%	31
▼ Yes, social media	30.30%	30
▼ Yes, internet search	24.24%	24
▼ Yes, blog	5.05%	5
▼ Yes, news (ex:TV, paper)	18.18%	18
▼ Yes, word of mouth	38.38%	38
▼ Other	7.07%	7
Total Respondents: 99		

Age

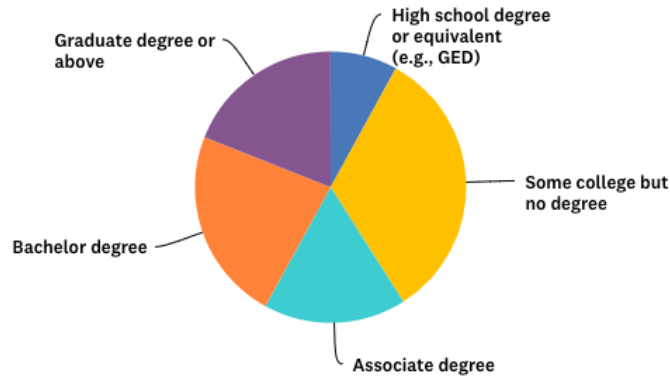
Answered: 100 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ 0-18	2.00% 2
▼ 19-25	50.00% 50
▼ 26-40	13.00% 13
▼ 40-65	30.00% 30
▼ 65+	5.00% 5
TOTAL	100

What is the highest level of school you have completed or the highest degree you have received?

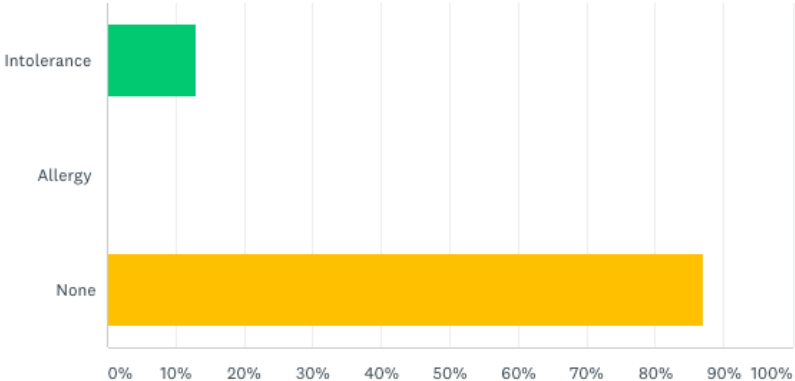
Answered: 100 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ Less than high school degree	0.00% 0
▼ High school degree or equivalent (e.g., GED)	8.00% 8
▼ Some college but no degree	33.00% 33
▼ Associate degree	17.00% 17
▼ Bachelor degree	23.00% 23
▼ Graduate degree or above	19.00% 19
▼ PhD	0.00% 0
TOTAL	100

Do you have an allergy or intolerance to milk?

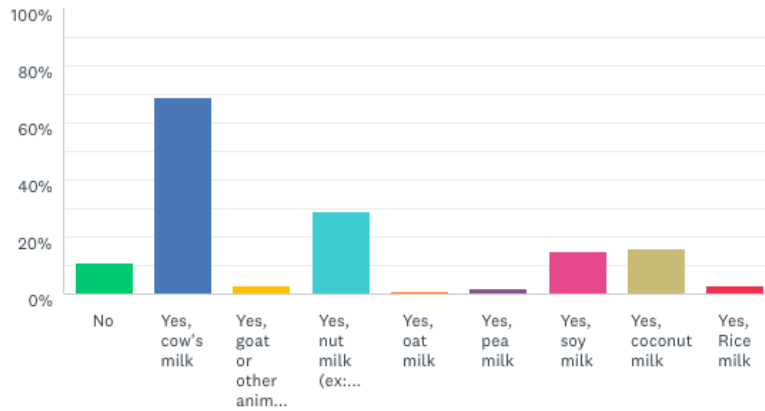
Answered: 100 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ Intolerance	13.00% 13
▼ Allergy	0.00% 0
▼ None	87.00% 87
TOTAL	100

Do you drink milk? If yes, which kind? select all that apply.

Answered: 100 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ No (1)	11.00% 11
▼ Yes, cow's milk (2)	69.00% 69
▼ Yes, goat or other animal milks (3)	3.00% 3
▼ Yes, nut milk (ex: almond, cashew) (4)	29.00% 29
▼ Yes, oat milk (5)	1.00% 1
▼ Yes, pea milk (6)	2.00% 2
▼ Yes, soy milk (7)	15.00% 15
▼ Yes, coconut milk (8)	16.00% 16
▼ Yes, Rice milk (9)	3.00% 3
Total Respondents: 100	

Comments (10)