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Our January 2023 Newsletter for Healthy Living

Time for a Gut Check

Hippocrates once said that "all disease begins in the gut", and the more we learn, the more accurate that statement proves to be. As noted in a 2018 paper: *"While often-quoted figures suggest that the microbes that live in and on the human body outnumber human cells by 10:1, a more recent estimate suggests that we are essentially one part human to one part microbe in terms of cell number. These commensal microorganisms have a vital role in human health. They break down otherwise indigestible dietary fibers and other components of food, produce vitamins, promote the development and maturation of the immune system, and prevent pathogenic bacterial species from colonizing the gut."*

According to evidence cited in this paper, of the 1,000 or so gut bacteria we know of, any given individual will have around 160 different species of bacteria colonizing their gut. This individual combination is known as your gut microbiome, and can have a tremendous influence on health and well-being. The diversity of your gut microbiome begins to be established when you are an infant, and is affected by genetics, whether you are breast- or bottle-fed, and your immediate environment. Later in life your microbiome is significantly affected by your food choices. Diets high in sugar and processed foods may reduce the diversity and your overall health, while diets high in whole foods high in fiber tend to have a beneficial impact.



For example, a number of studies have found obese individuals tend to have a less diverse gut microbiome, in addition to having greater numbers of certain harmful bacteria and fewer beneficial ones. Studies have shown obesity is associated with as much as a 40% decrease in diversity, and that improving that diversity through probiotic supplementation can help resolve metabolic defects, resulting in fat loss. Improving

your microbiome can be as simple as increasing your intake of fermented foods or taking a quality probiotic supplement. Previous research has demonstrated that probiotics — beneficial bacteria found in fermented and cultured foods such as yogurt — have a measurable effect on your metabolism. One such study, published in 2008, found the bacterial strains *Lactobacillus paracasei* and *Lactobacillus rhamnosus* affected a number of different metabolic pathways, including the metabolism of hepatic lipids, amino-acids, methylamines and short-chain fatty acids (SCFAs). As reported by Science Daily: *"Adding 'friendly' bacteria changed the makeup of the bugs in the gut, not only because this increased the number of such bacteria, but also because the 'friendly' bacteria worked with other bacteria in the gut, amplifying their effects."*

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While some claim taking probiotic supplements or eating fermented foods won't have a significant impact on your microbiome, this particular study

found otherwise. As noted by corresponding author Jeremy Nicholson with the department of biomolecular medicine at Imperial College: *"Some argue that probiotics can't change your gut microflora — whilst there are at least a billion bacteria in a pot of yoghurt, there are a hundred trillion in the gut, so you're just whistling in the wind. Our study shows that probiotics can have an effect and they interact with the local ecology, and talk to other bacteria. We're still trying to understand what the changes they bring about mean, in terms of overall health, but we have established that introducing 'friendly' bacteria can change the dynamics of the whole population of microbes in the gut."*

Three main phyla or groups of gut microbes make up the human microbiome and serve diverse structural, protective and metabolic functions: **Bacteroidetes** — *Porphyromonas*, *Prevotella* and *Bacteroides*; **Firmicutes** — *Ruminococcus*, *Clostridium*, *Lactobacillus* and *Eubacteria*; **Actinobacteria** — *Bifidobacteria* (the most prevalent type). As explained in the 2019 Nutrients review, in your gut, these bacteria protect your health by "displacing harmful bacteria, competing with pathogens for nutrients and producing antimicrobial factors." Structural functions provided by them include "developing the immune system, inducing immunoglobulin A (IgA), and reinforcing the mucosal

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K2 For Your Bones

Vitamin K is a fat-soluble vitamin essential for the functioning of several proteins involved in physiological processes. Naturally occurring forms are vitamin K1 (referred to as phylloquinone) and vitamin K2 (called menaquinones). Vitamin K1, which is derived from green plants, is best known for the role it plays in blood clotting, while vitamin K2, derived primarily

poorly absorbed, virtually all of the K2 in fermented foods is readily available to your body. Vitamin K2 can be further broken down into MK-4 and MK-7.

MK-4 (menaquinone-4) is a short-chain form of vitamin K2 found in animal-based foods such as meats dairy and eggs. MK-4 also has a very short biological half-life — about 2.5 hours — making it a poor candidate as a dietary

K2 activates osteocalcin, a protein hormone made by your bone that is dependent on K2 for activation. One of the primary roles osteocalcin plays is in binding calcium and transporting it to the bone. Osteocalcin is a small non-collagenous protein measured in the serum and synovial fluid samples of people with osteoarthritis, and researchers believe serum levels of osteocalcin may be useful as a screening tool to assess osteoporosis risk.

Scientific evidence suggests both vitamin K1 and K2 have anti-inflammatory activity, in part by inhibiting nuclear factor kappa-B. For example, in one meta-analysis, researchers found evidence vitamin K has a protective role in chronic aging conditions, inflammation and cardiovascular disease. Another study confirmed the role the vitamin K2 MK-7 form specifically has in the modulation of inflammatory biomarkers. The researchers evaluated natural vitamin K2 for its potential to inhibit gene expression and production of pro-inflammatory markers in vitro, finding the MK-7 form inhibited gene expression in a dose-dependent manner.

Other research has demonstrated a reduction in C-reactive protein, a common biomarker used to evaluate inflammation in patients with rheumatoid arthritis. C-reactive protein is a risk marker for a wide range of diseases and the researchers concluded higher intake of vitamin K2 may lower overall risk.

If you decide to take a statin or use a vitamin D3 supplement, it is highly recommended you include a vitamin K2 supplement in the MK-7 form. Professor Cees Vermeer, one of the world's top vitamin K2 researchers, recommends between 45 micrograms (mcg) and 185 mcg daily for adults. Remember that since vitamin K2 is fat-soluble, it's best to take it with a small amount of fat to improve absorption.

Consuming foods rich in vitamin K2 is your best bet. MK-4 is found in animal foods such as free-range, organic eggs (particularly the yolk), dark chicken meat and goose liver. MK-7 is found in fermented foods such as fermented soy, and in soft and hard cheeses such as Brie and Gouda.

“Only 10 percent of the vitamin K, which is found in green leafy vegetables, is absorbed in your body....”

from fermented foods and animal products such as eggs, meat and liver, is important to hormone production and utilization, as well as bone and heart health.

Vitamin K2 does not get the attention it deserves, and it's highly likely you're not getting enough in your diet. Although fat-soluble, the body stores very little and it's rapidly depleted without regular dietary intake. Vitamin K2 is needed to activate the protein osteocalcin, which is found in your bones. Without vitamin K2, this and other vitamin K2-dependent proteins remain inactivated, and cannot perform their biological functions.

According to Leon Schurgers, a world-renowned researcher in vitamin K2, the difference between vitamins K1 and K2 was clearly established in The Rotterdam Study, published in 2004, of which Schurgers was a co-author. While

the study focused on the difference between how K1 and K2 affect the heart (K1 has no effect at

all), the researchers also looked at what types of foods supply each of the vitamins. In an interview, he said: *“I measured a variety of food items for vitamin K content ... Vitamin K1 is highly available in green, leafy vegetables — spinach, kale, broccoli and cabbage. However, the absorption of vitamin K1 from food is extremely low. Only 10 percent of the vitamin K which is found in green leafy vegetables, is absorbed in your body ... And there's no variable or modification of the consumption that will significantly increase the absorption ...”*

Vitamin K2, on the other hand, was only present in fermented foods. It's actually produced by specific bacteria during the fermentation process. Certain bacteria in your gut naturally produce vitamin K2 in your body as well. Interestingly, while the K1 in vegetables is

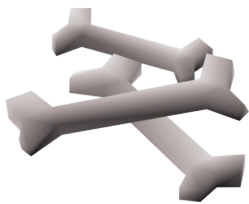
supplement. However, natural MK-4 from food is important for good health, as MK-4 plays a role in gene expression, turning some genes off and others on, and is therefore important for cancer prevention.

MK-7 (menaquinone-7) is a longer-chain form found in fermented foods. There's a variety of these long-chain forms, but the most common one is MK-7. This is the one you'll want to look for in supplements, as this form is extracted from real food, specifically fermented soy. The MK-7, which forms in the fermentation process, has two major advantages. It stays in your body longer and has a longer half-life, which means you can take it just once a day in very convenient dosing.

Research has shown MK-7 helps prevent inflammation by inhibiting proinflammatory markers that can cause autoimmune diseases like rheumatoid arthritis. While vitamin K1 has been found to “moderately reduce” the risk of bone fractures, MK-7 is more effective than vitamin K1 at reaching your bone. In your bones, vitamin K2 is used to produce osteocalcin, improving metabolic and hormonal health and exercise performance. Vitamin K2 also functions as an important cofactor for calcium and vitamin D.

While calcium is important for strengthening bones and overall skeletal health, it only works when it gets to the right place. Vitamin K2 prevents calcium from being deposited along the walls of the blood vessels and directs it into the bone. Vitamin K2 and vitamin D (along with calcium and magnesium) have a synergistic relationship when it comes to your bone and heart health. To maximize your benefits of oral vitamin D supplementation, it's important to maintain optimal levels of vitamin K2. Studies indicate supplementing with both vitamins D3 and K2 offers greater cardiovascular health benefits than consuming either vitamin alone.

As mentioned earlier, vitamin



Reference: Oregon Sate University, Vitamin K. *Journal of Biological Chemistry*, December 14, 2007. *Nutrition Journal*, November 12, 2012. *Integrative Medicine (Encinitas)* February 2015. *Journal of Nutrition* November 1, 2004; 134(11):3100-05 (The Rotterdam Study). *Journal of Agriculture and Food Chemistry*, 2006. *Journal of Hepatology*, July 2007. *Nutraceutical Business Review*, February 23, 2016. *European Journal of Pharmacology*, August 15, 2015. *Osteoporosis International*, March 2013. *Integrative Medicine*, 2015; 14(1). *International Journal of Endocrinology*, 2017; 2017:7454376. *Science Direct*, Osteocalcin. *Journal of Clinical and Diagnostic Research*, 2017; 9(8). *Anti-inflammatory Actions of Vitamin K* March 22, 2017; DOI:10.5771/63891. *Current Nutrition Reports*, 2016; 5(2). *Journal of Medicinal Food*, 2016; 19(7). *Modern Rheumatology*, 2012; 23(5). *Nutraceuticals World*, June 11, 2013.

A Trusty Tonic

Traditionally, apple cider vinegar is made through a long, slow fermentation process that renders it rich in bioactive components like acetic acid, gallic acid, catechin, epicatechin, caffeic acid and more, giving it potent antioxidant, antimicrobial and many other ben-

into sugar, thus slowing the conversion of complex carbohydrate into sugar, preventing a spike by giving you more time to pull sugar out of your blood. There are studies supporting the use of vinegar as a diabetic treatment as well. One study found vinegar treatment im-

“Apple cider vinegar is an excellent natural antimicrobial tonic to... provide immune support.”

eficial properties. "Mother" of vinegar, a cobweb-like amino acid-based substance found in unprocessed, unfiltered vinegar, indicates your vinegar is of the best quality. Most manufacturers pasteurize and filter their vinegar to prevent the mother from forming, but the "murky" kind is actually best, especially if you're planning to consume it.

With its wide variety of health benefits, a jug of raw, unfiltered apple cider vinegar is easily one of the most economical and versatile remedies around, worthy of a place in your home at all times. Some of the health benefits associated with apple cider vinegar consumption include:

Blood sugar control — Vinegar is said to be antiglycemic and has a beneficial effect on your blood sugar, likely due to its acetic acid content, which prevents the complete digestion of complex carbohydrates. Another theory is that vinegar helps inactivate digestive enzymes that break down carbohydrates



proved insulin sensitivity in 19% of individuals with type 2 diabetes and 34% of those with prediabetes.

Heart health — Polyphenols such as chlorogenic acid help inhibit oxidation of LDL cholesterol, while acetic acid helps lower blood pressure. Vinegar has also been shown to lower triglyceride levels and VLDL (very low density lipoprotein) cholesterol in animals.

Weight management — Vinegar may aid weight loss by increasing satiety, another effect attributed to acetic acid. For instance, when volunteers consumed a small amount of vinegar along with a high-carb meal (a bagel and juice) they consumed less food for the remainder of the day. The reduction equated to about 200 to 275 calories a day — an amount that would result in a monthly weight loss of up to 1.5 pounds.

Detox and immune support — Studies have shown apple cider vinegar can be beneficial for liver detoxification and helps cleanse your lymphatic system, which can contribute to improved immune system response. According to *The Truth About Cancer*: "Cider vinegar was ... determined to be a strong antimicrobial agent ... One of the most fatal

bacterium, Mycobacterium tuberculosis, is resistant to disinfectants but is found to be killed by acetic acid. Especially in patients who are immunosuppressed, apple cider vinegar is an excellent natural antimicrobial tonic to rid of harmful bacteria and provide immune support."

Digestive ailments — Acid reflux typically results from a lack of stomach acid. You can easily improve the acid content of your stomach by taking 1 tablespoon

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of raw unfiltered apple cider vinegar in a large glass of water daily. The pectin in apple cider vinegar may also help to soothe intestinal spasms. For everyday gut health, a mixture of 2 teaspoons of apple cider vinegar with 1 teaspoon of raw honey in 1 cup of warm water can help.

Reference: *Diabetes Care*, 2004 Jan; 27(1):281-2. *Journal of Food Science* May 8, 2014. *Bioscience, Biotechnology and Biochemistry*, 65(12):2690-94. *Journal of Agriculture and Food Chemistry*, 2011 June 22; 59(12):1939-42. *The Truth About Cancer* Nov 27, 2017.

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barrier," while metabolic functions "benefit the host by synthesizing vitamin K, folate and biotin" and play a role in the absorption of minerals such as magnesium, calcium and iron. Importantly, gut bacteria also help break down the foods you eat and ferment digestive-resistant starches, turning them into beneficial SCFAs, which help modulate your immune response and inflammation. As explained in the 2019 Nutrients review: "Degradation of dietary polysaccharides and fiber by *Bacteroides* and *Firmicutes* in the gut results in the production of SCFAs, such as propionate, acetate, and butyrate. Propionate is an important energy source for the host via de novo synthesis of lipids and glucose in the liver. Acetate is used in peripheral tissues as a substrate for cholesterol synthesis while butyrate repre-

sents a rich energy source for the epithelial cells that line the colon."

The 2019 Nutrients review also details the mechanisms by which supplementation with probiotics can improve your health and weight. Key areas of influence include: enhancing the integrity of your intestinal epithelial barrier; enhancing the adhesion of bacteria to your intestinal mucosa, thereby facilitating colonization; producing antimicrobial and other health promoting substances; inhibiting pathogenic microbes by competitive exclusion, and modulating your immune system. While individual strains of bacteria have been linked to specific health effects such as reductions in trunk fat or lowered inflammation, several studies have demonstrated that multi-strain probiotics may be more beneficial than single-strain ones, as they

tend to create synergistic effects.

While probiotic supplements are widely available, few can compete with traditionally fermented foods, in terms of the diversity and sheer number of probiotics. Fermented foods are also your least expensive alternative, as you can easily make them at home. Using a starter culture will speed the process and ensure you'll end up with a consistent, high-quality product. Remember, your diet is one of the easiest, fastest and most effective ways to improve and optimize your microbiome, so the good news is you have a great degree of control over your health destiny.

Reference: *Nutrients* 2019 Feb; 11(2):258. "Multi-Strain Probiotics". *Brain* March 2018; 141(3):e20. *PLOS Biology* August 2016; 14(8):e100253. *Cell Host and Microbe* December 2016; 21(1):84-96. *Nature* 2013 Aug 29; 500(7464):585-8. *Science Daily* January 16, 2008. *Nutrients* 2019 Feb; 11(2):258.2 "Gut Microbiota Composition and Function". *Nutrients* 2019 Feb; 11(2):258.3 "Gut Microbiota and Obesity". *Nutrients* 2019 Feb; 11(2):258.5



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