

Barrie Tan, PhD: Using Tocotrienols to Address Lifestyle and Metabolic Disease

Interview by Dick Benson

Abstract

Vitamin E has two subgroups, tocopherols and tocotrienols. In this interview, Dr Tan describes current sources and compositions of tocotrienols. The discussion also explores the anti-inflammatory properties observed with tocotrienol application in cardiovascular and metabolic disease, cancer, radiation exposure, and bone ailments; the nutrient's potential in management of nonalcoholic fatty liver disease; and

addresses recent studies highlighting tocotrienol's role as the 21st century vitamin E. Tocotrienols from plant sources were first developed and brought to the market by Dr Tan, inventor of numerous processes for tocotrienol extraction from plants. These discoveries include tocotrienols from palm (1992), then rice (1998), and finally annatto (2002).

Barrie Tan, PhD, is founder and chief scientist at American River Nutrition. He has made notable contributions in the field of vitamin E tocopherols and tocotrienols, particularly in the area of plant-based tocotrienols. He spent 10 years as professor of chemistry and food science/nutrition at University of Massachusetts Amherst.

Integrative Medicine: A Clinician's Journal (IMCJ): Can you discuss the potential for vitamin E tocotrienols to affect nonalcoholic fatty liver disease?

Dr Tan: When people have fatty liver, it is very hard to lower their liver enzymes, because the liver is so stressed. The organ is very intolerant to fat. The presence of a little bit more than 5% fat is called simple fatty liver. If a lot more than 5% of fat is present, then the condition progresses to something called NASH, nonalcoholic steatohepatitis. When this occurs, the patient becomes the subject for a liver transplant. If you go down that road it's very bad.

I did not know that the liver is so intolerant. To give you a concept of how intolerant that is, consider cirrhosis of the liver. This condition is usually due to insults by continuous alcohol consumption. However, in 1984 The Mayo Clinic had a patient who came in to have his liver examined. A liver biopsy was done and it looked like the liver was cirrhotic. The attending physician asked the patient, "Are you a chronic alcohol consumer?" The patient replied, "No, I never drink alcohol." That was the first time fatty liver was ever reported outside the context of alcohol consumption, and hence the name to this day is nonalcoholic fatty liver disease, NAFLD. It's a very awkward name to describe dysfunction of the liver that appears to be related to alcohol, but is not.

Now, if you put that in perspective today, for every person who has cirrhosis because of alcohol consumption, we have probably 20 to 40 people who have NAFLD. That means this is going to be a 21st century epidemic—unless we change our diets, that is. I cannot imagine there are enough liver transplants available for people with progressive NASH.

Tocotrienols may be a compelling therapeutic approach to NAFLD. In a recent 12-week double-blind, placebo-controlled study of 71 NAFLD patients, researchers administered a dosage of 600 mg/day—300 mg twice daily—tocotrienols from annatto, which led to decreased biochemical levels and metabolic factors associated with fatty liver. Not only did patients lose an average of 10 pounds, but their fatty liver index score also decreased by 11%, indicating reduction of fat within the liver.

IMCJ: How do tocotrienols affect cardiovascular disease and metabolic syndrome?

Dr Tan: As we age, our lipid levels increase. High triglyceride levels, in particular, have been linked with metabolic syndrome. Tocotrienol was first discovered to lower the synthesis of cholesterol. Although the cholesterol drop with tocotrienol is not as dramatic as with statin drugs—approximately 15 to 20% versus 30 to 40%—supplementation of the vitamin does not cause the side effects commonly experienced with statins.

While designing a clinical trial in collaboration with the University of Missouri, I asked a professor from Harvard Medical School about cholesterol and heart attacks, and he said, "Half the people who have heart attacks have high cholesterol. The other half of the people who have heart attacks have normal cholesterol, but

inflammation is high.” With this in mind, I asked the study team to measure inflammation, as I was interested to see if tocotrienol could impact the half of the patients who experienced a heart attack without elevated cholesterol levels. When the study was complete, we found not only a cholesterol reduction of 15% to 20%, but inflammatory markers, including C-reactive protein, dropped by 40%.

Triglyceride levels—relevant in their connection to metabolic syndrome—also dropped by approximately 15% after only 4 weeks of supplementation. The importance of triglyceride lowering is much more well-known in the context of omega-3 fatty acids. People take omega-3s not to lower cholesterol, as cholesterol does not drop if you take omega-3; rather, there may be a risk of increasing cholesterol. Instead, people take omega-3 to lower triglycerides. The reason we care about triglycerides, as I mentioned earlier, is because it is one of the five hallmark criteria for metabolic syndrome. Other criteria include elevated blood pressure, low HDL, fasting glucose over 100, and increased waist circumference. Cholesterol is not on this list.

So if you take omega-3, your triglycerides need to drop. If your triglycerides drop, you are controlling your metabolic syndrome, and you’re controlling the dysfunction of metabolites in your body. And triglyceride is one of these metabolites.

Twenty years ago, we did not call this phenomenon metabolic syndrome. It was called syndrome X, if you remember. The person who changed syndrome X into metabolic syndrome is Gerald Reaven, MD, a Stanford University professor.

He was studying people who have diabetes, and found a cluster of risk factors including abnormal triglycerides, cholesterol, and sugar, among others. He couldn’t figure out what was causing these related elements, so he called it syndrome X. What he found was that the first component of syndrome X to surface was high triglycerides, not sugar. When people have high sugar and they become diabetic, it is already too late.

Even today, the American Diabetes Association states “The one singular marker of diabetes is high sugar.” I don’t have problem with that, but I’d like to figure out long before I’m diabetic how to fix my problem. Dr Reaven provided the answer.

I met him one time, just prior to his retirement, probably 15 years ago. I said, “You’re always busy, and people need your time. Just give me one or two sentences to take home from your findings. I hope that you’ll get the Nobel Prize.” So far he’s not been nominated. He told me “Hypertriglyceridemia always precedes hyperglycemia. Therefore, high triglyceride comes first, before you experience high sugar.” He said, “By the time your sugars are not working properly, your triglycerides have been dysfunctional for a long time. Therefore, when the body’s metabolites are out of order, look at triglycerides. If triglycerides are elevated and you don’t address the

problem, sugar will eventually become impaired as well. If you can lower the triglycerides, sugar will stay in check with time.”

Once people have high sugar and become diabetic, it is questionable if a type 2 diabetic can become nondiabetic. I know there’s a lot of debate out there, but I know this, whether you’re diabetic or not, when you have metabolic syndrome, controlling your triglycerides is a good place to start. And tocotrienols lower triglycerides as well as fish oil. I recommend people to take fish oil and tocotrienols to address hypertriglyceridemia.

As you can see, I am very passionate about this topic. Even though I have been a scientist for over 30 years, I continue to do this research, and am beginning to see well-designed studies bearing fruit for our personal well-being. I am very proud that many health care professional brands wanted to partner with us on this tocotrienol journey, and hope our combined efforts will strengthen the education surrounding this vitamin, so that health professionals and their patients can reap the benefits.