

The Gut and the Brain

A plain-language Q&A with Dr. Mark Kahn on how gut health may affect CCM



Doctors are learning that people with CCM may be able to help manage their disease — not just with medicine, but with everyday choices. One area of new research looks at the gut. Scientists now think that bacteria living in your gut may affect whether CCM lesions form and grow.

About Dr. Mark Kahn

Dr. Kahn is a professor of medicine at the University of Pennsylvania. His lab studies blood vessels and the diseases that affect them, including cavernous malformation (CCM).

Q&A: How Your Gut May Affect CCM

Q: Your team found a link between gut bacteria and CCM. What did you discover?

A: We started with mice that were bred to develop CCM lesions. We found something surprising: mice with the CCM gene change did not develop lesions if they had no harmful bacteria in their gut. This happened when the mice were raised in a very clean (germ-free) environment or given antibiotics that cleared out their gut bacteria. This told us that the gene change by itself is not enough to cause a lesion — bacteria need to leak out of the gut and cause inflammation, too. That inflammation appears to be a second, necessary step.

Q: How does this connect to real patients, not just mice?

A: We already had early clues from human data: a receptor called TLR4, which senses this type of bacteria, plays a role in how severe CCM disease becomes. That pointed us toward two new studies. The first compares the gut bacteria of people who have CCM symptoms to people who don't have CCM, to see if there's a real difference. The second looks at how bacteria would travel from the gut to the brain, since your body already has a strong barrier that normally keeps gut bacteria out of your bloodstream.

Q: What are emulsifiers, and why do they matter for the gut?

A: Emulsifiers are additives used in many packaged foods to blend ingredients like oil and water, and to help foods last longer on the shelf. Past research suggested that emulsifiers can wear down the mucus layer that protects your gut lining. We tested this in CCM mice by feeding them an amount of emulsifiers comparable to what a person eats on a diet high in processed foods for several months. We found that this broke down the mucus layer in the gut, and CCM disease got worse in those mice as a result.

Q: Why is your research so focused on the CCM3 gene?

A: We already knew that people with a CCM3 gene change tend to have a more serious disease course than people with CCM1 or CCM2. CCM3 patients often develop bleeding lesions and stroke in childhood, while CCM1 and CCM2 patients tend to develop symptoms later, in mid-life. It turns out CCM3 is active in the cells that produce mucus in the gut lining. When we removed CCM3 from those gut cells, the gut lining lost its barrier function — even when only one of the two gene copies was affected, which is the situation familial patients actually have. Removing CCM1 or CCM2 from those same gut cells caused no change at all. So CCM3 appears to affect disease in two separate places: the blood vessel cells of the brain (like CCM1 and CCM2 do), and separately, the gut lining. That second effect may help explain why CCM3 disease tends to be more severe.

Q: Should patients try to avoid emulsifiers?

A: It's still early, so I can't give firm clinical advice. But emulsifiers are found mostly in heavily processed foods, which aren't especially good for anyone's health to begin with. If you're eating a lot of processed food, it's reasonable to start looking at how much you're getting and try to cut back. We can't yet say exactly how much this will help any one person, since diet is just one of several factors involved. But for now, reducing emulsifiers in your diet is a safe step you can take.

Bottom Line

Gut bacteria and gut health appear to play a real role in CCM disease, especially for people with a CCM3 gene change. Reducing emulsifiers and processed foods in your diet is a simple, safe step you can take while research continues.

Health Tips for CCM

Vitamin D: Low Vitamin D levels have been linked to a more aggressive course of CCM. Ask your doctor to check your level.

Diet: Try to limit emulsifiers and other processed-food additives. This may help protect the gut mucus lining.

Sleep: Poor oxygen levels during sleep (caused by sleep apnea) may increase inflammation. Researchers are studying whether this is linked to more lesions in the familial form of CCM.

Alliance to Cure Cavernous Malformation

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Patient Registry: Share your data to drive research and new treatments.

Community: Weekly virtual support groups and online forums. You are not alone.



Common Emulsifiers to Watch For

Emulsifiers are additives that help blend ingredients like oil and water and extend a food's shelf life. By law, they must be listed on a food's ingredient label. Below are common emulsifiers and where they're often hidden in packaged foods.

Emulsifier	Where It's Commonly Found
Acacia (gum Arabic)	Cake decorations, candies, frozen desserts, food dressings and flavorings, jellies, soft drink syrups
Acetic acid esters (ACETEM)	Cakes, shortenings, toppings
Ammonium phosphatide	Used as a replacement for lecithin; mostly found in chocolate
Baker's yeast glycan	Cheese- and sour cream-flavored snack dips, cheese spread, frozen dessert, salad dressings, sour cream
Brominated vegetable oil (BVO)	Mountain Dew and similar citrus sodas
Carboxymethylcellulose (cellulose gum)	Beer, cake icing, candy, cheese, ice cream, jellies, pie filling, salad dressing
Carrageenan	Chocolate milk, deli meats, ice cream, infant formula, nut and soy milks, popsicles, frozen meals, protein shakes, yogurt
Diacetyl tartaric acid esters (DATEM)	Biscuits, breads and bread products
Dextrin	Candy, powdered mixes
Guar gum	Baked goods, breakfast cereals, cheese, dairy products, gravies, jams and jellies, sauces, soups, syrups
Lactic acid esters (LACTEM)	Cake gel, cake shortening, ice cream, imitation creams
Lecithin (soy and egg)	Naturally in egg yolks and soybeans; also baked goods, chocolate, ice cream, margarine, mayonnaise
Magnesium stearate	Gum, herbs, spices, supplement tablets, capsules and powders
Mono- and diglycerides	Baked goods, cake mixes, candy, coffee creamer, frozen desserts, ice cream, margarine, peanut butter, processed meats
Phosphates	Breakfast cereals, cheese, cured meat, dehydrated potatoes, fast food, ready-to-eat meals, soda
Polyglycerol esters (PGE)	Bakery products, cakes, margarine, whipped toppings
Polysorbate 60/65/80 (P80)	Baked goods, chewing gum, cottage cheese, ice cream, puddings, powdered drinks, vitamin supplements
Propylene glycol esters of fatty acids (PGMS)	Cake mixes, candy, creamers, dressings, frosting, frozen meals, snacks
Sodium stearoyl-lactylate (SSL)	Cheese substitutes, fillings, icings, pancake/waffle mixes, puddings, sauces
Sorbitan monostearate	Cake fillings and icing, dessert mixes, frozen desserts, ice cream, milk/cream substitutes
Sucrose acetate isobutyrate	Citrus beverages, energy and sport drinks, malt beverage coolers, wine coolers
Sucrose fatty acid ester	Baking mixes, chewing gum, fruit coatings, frosting, frozen dairy desserts
Xanthan gum	Beverages, gluten-free breads, ice creams, non-dairy milks, salad dressings

Tip: You can look up any ingredient using the FDA's food additive resource at:

<https://www.hfpappexternal.fda.gov/scripts/fdcc/index.cfm?set=FoodSubstances>