Waters Center for Biological Medicine

Spring 2026
Volume 12, Issue 1

# WatersBioMed *News*

## Bile, Bowels, Bariatrics, Bitters & Blood Sugar

*Normalizing bile acid regulation by consuming a nutrient-rich, high fiber diet which creates a healthy microbial population in the colon results in a healthy bile profile, improved glucose and fat metabolism, reduced inflammation, satiety after meals and lowers cardiovascular risks.*

Hippocrates is said to have stated: "All disease begins in the gut" four centuries before Christ. Another Greek, Galen, recognized that "yellow bile" emanated from the liver, was passed to the gallbladder and from there entered the duodenum, the first part of the small intestine. He reasoned this out in the second century after Christ.

Bile was known and used as a treatment for disease 3,500 years ago in Babylon. The Chinese recommended the use of animal bile for patients with jaundice, especially that of bears, as early as 300 B.C.

So what is bile, and what is its function? The modern name "bile" comes from the Latin word *bilis* which denotes a greenish-yellow, bitter-tasting fluid originating from the liver. Chemically, bile consists of 95% water, bile salts (about 1%) and the remainder includes cholesterol, phospholipids, fatty acids and salts. It also contains the breakdown products of our dead and recycled red blood cells (heme) biliverdin, which makes our feces brown and our urine yellow.

What is really fascinating to me is that bile acids are exclusively made from cholesterol in the liver and are purposed to make fats – including fatty acids, fat-soluble vitamins such as A, D, E and K as well as cholesterol itself -- more digestible and

CHIROPRACTIC SOCIETY OF WISCONSIN
VAX CON
HINDSIGHT IS 2020
April 24-25, 2026 | Chula Vista Resort, Wisconsin Dells

***Dr. Waters is speaking at VaxCon 2.0***
***April 25, 2026***
***Topic: Aluminum***

Dr. Waters graduated from the University of Illinois Medical School in June 1976

50 Years

Here's to 50 years of learning, caring and thinking outside of the box!

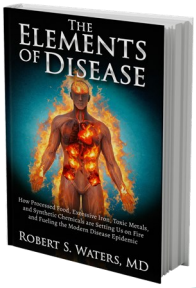
We are grateful he shares his knowledge with us and still enjoys being at the clinic helping his patients!

Congratulations!

Dr. Waters' Book Update: COMING THIS SPRING!

*The Elements of Disease*

*How Processed Food, Excessive Iron, Toxic Metals and Synthetic Chemicals are Setting Us on Fire and Fueling the Modern Disease Epidemic*

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absorbable. Without bile, the fatty material we ingest would exit the body in the stool and never enter our bloodstream.

Despite representing less than 1% of the bile contents, the bile acids are of immense importance to our health. Two primary bile species are the result: cholic acid and chenodeoxycholic acid. Because of their functions as detergents, they are very caustic and thus can damage the epithelial lining of the bile ducts through which they pass and also their storage compartment, the gallbladder. Nature has mitigated the potential dangers of these acids by "conjugating" them with the amino acids glycine and taurine. This makes them less toxic and more soluble in the watery solution of both bile and the intestinal tract.

Bile originates exclusively in the liver from cholesterol. Yes, cholesterol, the villainized molecule that gives all of our cell membranes their structure; the evil molecule whose brain content represents 25% of our entire body's supply and is the template on which all of our steroid hormones – cortisone, estrogen, testosterone, etc., and vitamin D – are built.

So after cholesterol is synthesized in the liver (from sugar and other carbohydrate sources), it is converted into bile salts, released from the liver cells and shunted down the system of bile ducts, accumulating in the gallbladder (where it is also further concentrated) and waits for the person wherein it resides to eat. When the stomach begins to feel tension as it fills after meals, special cells in its wall release a peptide known as CCK (cholecystokinin) – "the one that initiates kinesis (movement) of the sac (cysto) that contains chole" (another term for bile). When the CCK arrives through the bloodstream to the gallbladder it results in contractions of that organ's musculature and the discharge of its contents into the duodenum to begin its work. As it consumes a lot of energy to operate 17 enzymatic steps to synthesize bile salts, after accomplishing their mission, 95% of them are reabsorbed in the terminal region of the small bowel (ileum) and sent back to the liver for reuse. About 5% continues into the colon and exits the body in the stool. This secretory reabsorption is known as the "enterohepatic circulation" of bile. It is also the system through which drugs and other toxicants are removed from the body. So a healthy liver and GI tract are vital to our health.

Missions of bile acids are not limited to their detergent function. In fact, while they traverse the small bowel and colon, the primary bile acids undergo extensive modification by the bacterial members of our microbiome. These microbes break off the amino acids, perform various modifications to the primary bile acid molecules.

At this point there are a few important concepts that will help us to understand the vast implications of bile biology.

First, bile originates exclusively in the liver from cholesterol. Yes, cholesterol, the villainized molecule that gives all of our cell membranes their structure; the evil molecule whose brain content represents 25% of our entire body's supply and is the template on which all of our steroid hormones – cortisone, estrogen, testosterone, *etc.,* and vitamin D – are built. In addition, the synthesis of bile acids is the only pathway the body has available to get rid of excess cholesterol. In case it has not yet hit you – bile salts and acids are in fact steroid hormones. The term itself comes from the word choleSTERol. More on this later.

Second, studies in germ-free animals have shown that without a microbiome, biochemistry is drastically altered and the animals possess numerous defects. Beyond their work as emulsifiers, bile acids are modified by the enzymes present in specific bacterial members of the human microbiome. These metabolites play a major role in our health.

Even more importantly, an equally extensive body of scientific evidence provides proof that the contents of our microbiome are directly related to what we put into our system – we are what we eat and whom we support as members of this Virtual Or-

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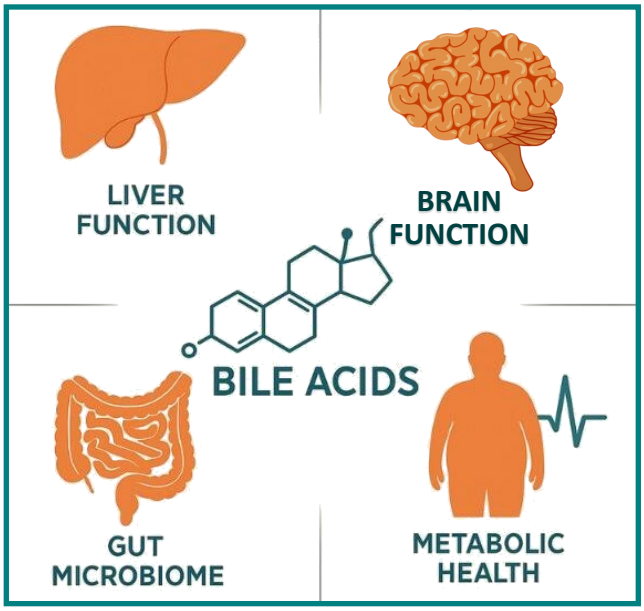
# Bile—continued




gan. This area is discussed in more detail in Chapters 2 and 3 of my forthcoming book: *"The Elements of Disease*."

Let us return to the main message of this Newsletter: The effect of bile acid steroids on our physiology and health. Above I stated that bile acids are transformed into a myriad of secondary and tertiary substances. We also learned that 95% of them are recycled back to the liver for reuse. In the past 25 years, receptors have been identified in the ileum and other areas of the GI tract that have binding sites (much like the steroid estradiol, *e.g.*, has on many DNA response elements) that, when occupied create protein signals which are sent to the liver to regulate bile acid synthesis, fatty acid and cholesterol synthesis, glucose regulation and receptors beyond the liver, with implications in the cause and potential treatment of neurodegenerative, autoimmune and neoplastic diseases.

The two principal receptors that bind bile acids are the FXR (farnesoid X) and the TGR5 (Takeda G protein-coupled receptor 5), as well as the vitamin D receptor. These and other receptors are switched on by bile acids. It gets very complicated, but I just want to give you an idea of how intricately the gastrointestinal tract, including the liver, are wired together to regulate all of our body systems. When bile acids plug into FXR it sets off a chain of molecular events that causes a molecule known as FGF-19 (fibroblast growth factor-19) to be made, released into the blood and travel to the liver where it turns off the rate-controlling enzyme that converts cholesterol to bile acids. This feedback control prevents excess bile acid production which could damage the bile ducts, gallbladder and intestines. Beyond that, activation of FXR also reduces triglyceride synthesis and promotes the burning of fatty acids and, in addition, improves insulin resistance and thus lowers blood sugar (by the way, other molecules that may be familiar to you, such as berberine and ivermectin also activate FXRs with its down-stream health-promoting effects). FXR receptors are present in the brain, pancreas, intestines and many other tissues and along with the above desirable effects reduce inflammation. Here again, my book *"The Elements of Disease"* integrates the effects of diet, the microbiome, free radical production, inflammation and its consequences in the causation of degenerative diseases.

The other major bile acid receptor, TGR5, when activated, triggers the release of GLP-1 (glucagon-like peptide-1) from the "L-cells" of the ileum. This peptide suppresses appetite, slows gastric emptying, increases insulin release and improves blood sugar regulation and thus reduces the risk of cardiovascular disease. Incidentally, "magic weight loss" drugs are mimics of our own GLP-1 and are heavily promoted on television and can cost up to $1,000 per month. They may have serious negative effects that are only now beginning to be observed.

There are three other areas we want to present related to bile. The first is yet another system regulated by bile derivatives: the balance of water across various cell membranes. Earlier I explained that bile consists of 95% water. Well, the control of the passage of this basis of life between its ingestion and its passage through all of the membranes of our various organs, and its elimination *via* our bowels and kidneys are regulated through a group of 13 enzymes known as aquaporins (literally: the pores (porins) through which water (aqua) passes). It is easy to understand that members of this family are critical to fluid balance by their actions on the kidneys, but equally understandable when trying to unwind their functions on the consistency and health of our bile. Yes, if bile is too concentrated the cholesterol in it can

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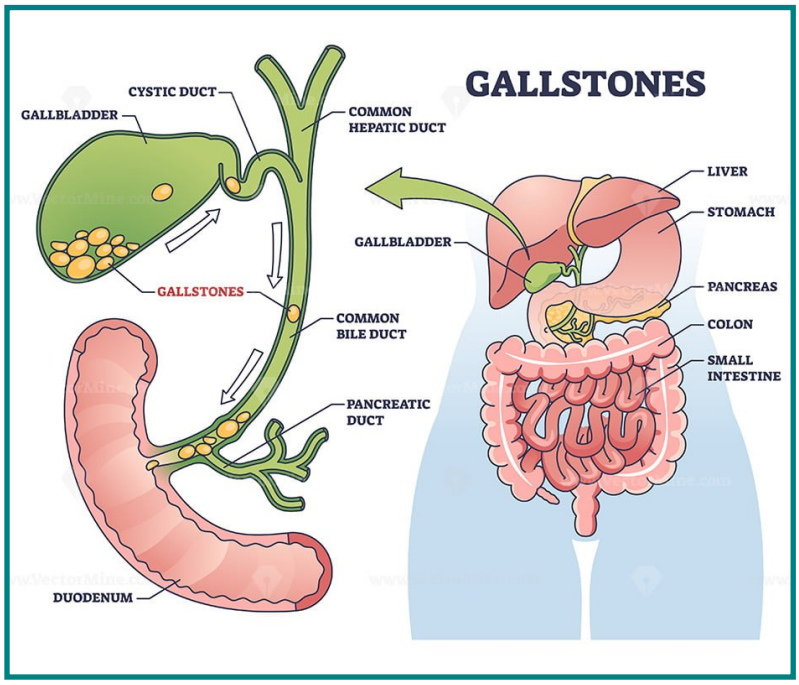
# Bile—continued

form crystals or "gallstones." The control of water passage between the blood and various cellular compartments is so vital that the gallbladder actually has its own specific aquaporins – they are tuned to modulate our fluid balance from messages in the microcosm. In fact, the epithelium of the gallbladder has been shown to experience degenerations very similar to those found in our arterial system. The bile ducts and the cystic duct through which bile flows from the gallbladder into the duodenum have been shown to experience a hardening identical to that seen in blood vessels of patients with diabetes and metabolic syndrome. Lack of proper contractility of bile ducts in the gallbladder can obviously upset the balance of bile flow and its blending with our food, to accomplish, not just emulsification, but timely distribution of the various bile species that regulate diverse processes throughout our body.




Of course, the condition of the gallbladder is predicated on signals from the intestinal microbiome. So it was no surprise that members of our Virtual Organ, the microbiome, contain members such as *Lactobacillus* and others and especially *Limosilactobacillus reuteri* about which we have learned much from the cardiologist, William Davis, MD in reference to the gut-cardiovascular relationship in his books, *"Wheat Belly"* and *"Super Gut."* This latter bacterium sends messages through the FXR receptor to alter bile composition and dampen gallstone production. In fact, one of the tertiary bile acids, tauroursochenodeoxycholic acid (TUDCA) – has been proven to dissolve gallstones and improve liver function in patients with metabolic syndrome when administered at a dose of 400-2,000 mg per day over 6 months. Studies have shown that supplementation of both *L. reuteri* and TUDCA is superior to the use of statin drugs.

Tellingly, several scientific articles have indicated that the use of TUDCA to dissolve gallstones, since at least the 1970s, has dramatically declined as a result of the invention of "endoscopic gallbladder surgery" that avoided the use of open abdominal surgery with all of its risks and complications. It is amazing to me that scientists who did this work on the use of microorganisms and TUDCA did not vociferously object to doing any type of surgery barring, of course, acute gallstone obstructions and infection as a safe and inexpensive alternative to the treatment of gallstones and other liver disorders. After all, there are good reasons we were given a gallbladder.

The second area that can help us both understand and treat metabolic disease in general and liver diseases/gallstones in particular, is the use of natural products that have been applied for thousands of years – bitter compounds. These are the bases of the "aperitifs" that are used in Europe as "digestives." They are produced by the extraction of sometimes dozens of bitter herbal compounds in alcohol. Swedish bitters are one example. Angostura bitters is the one commonly used in our country. These compounds bind FXR receptors and cause the release of GLP-1 and other Incretin hormones (a group of metabolic hormones released after eating which reduce blood sugar and reduce food intake), and there are at least 40 of these released by various intestinal cells to regulate processes in the brain and other organs. When administered they have been shown to reduce energy intake, achieve weight loss, as well as improve metabolic parameters in human beings. Remember – bile is bitter!



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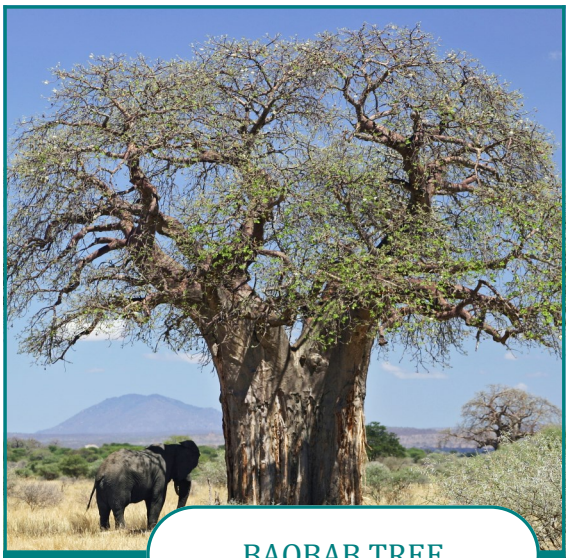
# Bile—continued

In fact, there are scientific studies documenting the effectiveness of TUDCA as a neuroprotective agent in retinal disease, neurological processes and as an agent promoting bone health beyond its effects ameliorating liver disease, at least in cell cultures and animal studies. Its affects are mediated *via* the microbiome. By the way, plant polyphenols such as berberine, curcumin, resveratrol, *et al* also bind bile receptors and interact with our microbiome residents.



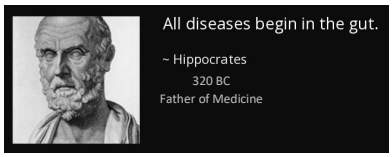
BAOBAB TREE

Prehistoric giants known as the "Tree of Life" due to their extraordinary ability to provide food, water, and shelter in harsh, arid landscapes.

To balance the microbiome I also recommend the supplement, BioGaia, which is a preparation of *Limosilactobacillus reuteri* made in Sweden. To improve the odds of normalizing both bile and gastrointestinal microbiome we often use a preparation known as Baobab that contains various fibers including those from the Baobab Tree of Africa which has unique fiber that have proven their own medicinal value in balancing the microbiome and its production of SCFA's (short chain fatty acids) and processes of bile acids. These are also signaling agents that regulate both the intestinal cells themselves and also have effects on cells through the entire being.

So, normalizing bile acid regulation by consuming a nutrient-rich, high fiber diet which creates a healthy microbial population in the colon results in a healthy bile profile, improved glucose and fat metabolism, reduced inflammation, satiety after meals and lowers cardiovascular risks. And all of this without the use of statin drugs! Oh, by the way, statins have now been shown to both increase blood sugar and reduce the release of GLP-1!

I am beginning to understand that the Greeks were profoundly wise. All disease DOES begin in the GI tract or gut and this includes the liver and bile synthesis along with bile acid steroids regulating the entire system. The bacteria compromising our microbiome and the various bile acids resultant from their activities represent yet another steroid endocrine network. If we could change our diet, and thus our microbiome, we would not need statins and many other drugs, and not only avoid their expense and toxic effects, but we would enjoy even better health.




In summary, adding TUDCA as a bile acid steroid signal, BioGaia to build a healthy microbiome and Baobab to feed your microbiome partners can be a central motif to rebuild and maintain your health.

## Featured Supplements—TUDCA, BioGaia & Baobab Fiber

TUDCA (Tauroursodeoxycholic Acid) is a bile salt that occurs naturally in the body. However, natural levels of TUDCA decline due to aging and impaired liver and bile function.

For best results, take two capsules daily.

Baobab Fiber Plus is a next-generation fiber supplement strategically designed for gentle digestion and optimal tolerance. This innovative formula aids in promoting digestive regularity, alleviating occasional digestive distress and serving as a prebiotic to enhance microbial diversity and beneficial flora.

Mix 1 scoop (16.7 g) with 6-8 ounces of water or your preferred beverage, once daily or as recommended by your health care professional. Use with liquids below 140°F for best results.

BioGaia Gastrus is an advanced probiotic supplement. Each serving contains two patented probiotic strains and a minimum of 200 million cfu of our L. reuteri Gastrus blend per serving.

Use 1-2 capsules per day or as directed by your health care professional.

These statements have not been evaluated by the FDA. These products are not intended to diagnose, treat, cure or prevent any disease.

This a staple meal for Sarah's family. So quick, easy and tasty! Substitute any veggies that you like. Here she used broccoli, cauliflower and carrots...and they were frozen! She also used riced, frozen cauliflower. Easy!

*Wheat Belly Cookbook*

by William Davis, MD

# Chicken Pot Pie With Cauliflower Topping

- 2 lb (1 med head) cauliflower florets
- 1/2 cup shredded cheddar cheese
- 4 tbls butter, divided
- 1/4 tsp salt, divided
- 2 chopped carrots
- 2 cups broccoli florets, cut into small pieces
- 10 ounces sliced mushrooms
- 12 ounces diced chicken
- 1/2 cup sour cream
- 1/4 tsp black pepper

1. Preheat the oven to 375. Place the cauliflower in a steamer basket in a pot of boiling water over medium heat. Cover and cook for 15 minutes, or until very tender.
2. Place in a large bowl with cheese, 2 tablespoons of the butter, 1/4 teaspoon of salt. Mash until smooth and set aside
3. Meanwhile in a large oven proof skillet over medium-high heat, heat 1 tablespoon of the butter. Cook the carrots, broccoli, and mushrooms, stirring frequently, or five minutes, until tender crisp. Remove to a plate and set aside.
4. Return the skillet to the heat. Add the remaining 1 tablespoon butter. Cook chicken, stirring for five minutes, or until no longer pink. Stir in the sour cream, pepper, remaining half teaspoon salt, and reserved vegetables.
5. Cover with the mashed cauliflower and sprinkle the top with paprika. Bake for 35 minutes, until heated, and viola – a nice helping of chicken pot pie.

***Dr. Waters wrote a book!*** **See page 1 for details**

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