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What Basic Blood Tests Can Reveal About Health

Analysis by Dr. Joseph Mercola ✔ Fact Checked | October 15, 2023

STORY AT-A-GLANCE

- While most health practitioners rely on reference ranges provided by the laboratory, there's an evidence-based set of optimal reference ranges, which can more readily predict underlying pathology
- Low bilirubin is clearly associated with an increase in all-cause mortality, as it is a lipophilic antioxidant and a marker of lipid peroxidation. Gamma-glutamyl transferase (GGT), another powerful predictor of mortality, should not be above 20 U/L
- Men and women have different reference ranges for aspartate aminotransferase (AST) and alanine aminotransferase (ALT) ratios (liver enzymes that assess liver function), and the ideal range for optimal health is around 20 U/L, not 40 to 50 U/L as indicated by lab ranges
- Blood viscosity affects a number of different conditions, including nonalcoholic fatty liver disease, gallstones, bone density and more, and can be calculated using two markers: total protein and hematocrit
- One of the most valuable mortality scores is the Intermountain risk score, created based on the basic blood chemistry markers of tens of thousands of patients in a hospital setting. Based on these basic blood markers, you get a 30-day, one-year and five-year mortality risk score

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Dr. Bryan Walsh is a naturopathic physician extensively trained in molecular biological pathways and an associate professor at the University of Western States. In this

interview, we discuss some of the amazing pieces of information you can harvest from a basic blood panel that many conventional physicians either don't know or don't share with you.

Even many functional medicine practitioners, unfortunately, are unaware of this information. One of the problems is that many doctors are unclear about what all the different markers even are.

> *"I'll never forget; the first marker I decided to delve into was albumin,"* Walsh says. *"I'm looking at a lab and thought, 'What really is albumin? I mean, what is the physiological story of albumin? Where is it made? Under what conditions is it made?' …*
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> *I realized that once I knew the whole physiological backstory of albumin … I didn't need a book to look up why it was high or low. When you know the reasons it's made, where it's made and why and how it's stored and how long it lasts (its half-life) … you can, by yourself, think through why albumin might be high or low.*
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> *This was well over a decade ago and I haven't stopped. I then realized I need to learn the physiology of every single one of these markers as best as I possibly can. The more I knew [about these markers], the more [the lab test] started to make sense.*
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> *But in so doing, I also found a lot of issues. One, the ideal of optimal or functional reference ranges [are] sort of arbitrary, but it turns out there are a lot of published literature that suggest there's a better reference range for almost every single marker that you could find on the standard blood chemistry."*

As just one example, conventionally, there's no functional low-end range for bilirubin. However, as Walsh mined the available literature, he discovered, to his great surprise, that this is not true.

"Low bilirubin is very clearly associated with an increase in all-cause mortality," he says. *"The question is, 'Why?' Then you learn total bilirubin is a lipophilic antioxidant. It's a marker of lipid peroxidation …*

When you look at the literature, you can look at what level might indicate excess liquid peroxidation is taking place. The question is how many practitioners know that information? I didn't. I had to teach myself this information. How many practitioners, either conventional or otherwise, are not using bilirubin for the marker that it should be?"

The Cellular Theory of Health

In the interview, Walsh explains what he has dubbed "the cellular theory of health." In summary, the levels of structural organization as taught in basic physiology reveals what we're made up of on a physical level. On the microscopic level, we're made up of atoms, chemicals or elements, things found in the periodic table, such as carbon, oxygen, nitrogen, phosphorus, calcium, magnesium, molybdenum and so on.

"If you take two or more atoms, chemicals, elements and put them together, then you get a molecule … Glucose is a molecule. Amino acid is a molecule. Triacylglycerol is a molecule.

When you take molecules and put them together, then you can get a macromolecule. If you take a bunch of glucose together, you get glycogen. You put a bunch of amino acids together and you get a protein … Three fatty acids and a glycerol [gives you] triacylglycerol.

If you take these macromolecules and put those together, then you make organelles — all the parts of a cell [such as] the mitochondria, the endoplasmic reticulum, the ribosomes and the nucleus. Then if you take those and you wrap them in a phospholipid membrane, then you get a cell."

The cell is the first part of an organism that is fully capable of life. When you put cells together, you get tissues, of which there are four different types: connective, neural,

muscular and epithelial.[1] When you add these four tissues together, you get an organ. (Most organs have all four, at least to some degree.)

Organs with similar functions form an organ system. Examples include the digestive system, respiratory system and the integumentary system. Once you add all the systems together, you finally have a complete organism — in this case, the human body.

> *"Now, here's the whole point,"* Walsh says. *"When somebody has a sign or a symptom of any kind, then you [need to] go backwards in the levels of organization. Let's say they have premenstrual syndrome (PMS) or there are issues with infertility. It's not the whole organism [that is dysfunctional]. It's an organ system.*
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> *It would probably go towards the endocrine system, right? But an organ system is really made up of a bunch of organs. In a woman who has PMS, it's probably not her thymus. It's probably not directly her adrenals or pancreas. It's probably her ovaries.*
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> *According to levels of organization, an organ is really four different types of tissues. So then, if this woman who's suffering with PMS, what's dysfunctional? Is it the epithelial cells? Probably. Because those are the hormone-making cells of the ovaries.*
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> *It's not the connective tissue. It's not the muscular tissue of the ovaries. It's not the neural tissue probably. But epithelial tissue is really just a bunch of cells. So, then, where is the dysfunction in this woman coming from in the first place? It's the cells.*
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> *To put it another way, healthy cells make healthy tissues. Healthy tissues make healthy organs. Healthy organs make healthy organ systems. Healthy organ systems make a healthy organism. I've created this model. One could argue about healthy organelles, like the mitochondria and the endoplasmic reticulum, but if you have healthy cells, then you're going to have a healthy organism …*

Cells need three things. One, they need to be able to make energy … To make energy, they need oxygen for the electron transport chain. They need the right substrate — glucose and fatty acids. They have to have healthy organelles. They have to have the right micronutrients in order to be able to run all these biochemical processes inside the cell.

If one of those things is dysfunctional, you have a dysfunctional cell, then you have dysfunctional tissues, dysfunctional organs, organ systems and organism. The second thing is they need to be protected from things that could otherwise damage them …

Infections can cause cellular dysfunction … An antibody can cause cellular dysfunction … reactive oxygen species (ROS) … or toxins … You can have all the nutrients, all the substrates … but if you have toxin exposure, ROS, immune system dysregulation or infections, then you'll cause cell dysfunction.

[Third] it has to be the right environment. The pH of the cell has to be good. The hydration status has to be good … cell communication [must be good] … The last bit is that your genetics [and] epigenetics can influence all of these things. That's the foundation … [and] you can evaluate most of those components using a blood chemistry."

Ideal Blood Chemistry Reference Ranges Exist

Over the years, Walsh has collected over 100 papers detailing optimal reference ranges for most of the major markers found on a blood chemistry panel, including ancillary ones such as A1C.

What's important to understand is that while most practitioners rely on reference ranges provided by the laboratory, there's an evidence-based set of optimal reference ranges, which can more readily predict underlying pathology.

Fasting glucose, for example, should be between 82 and 88 milligrams per deciliter (mg/dL), Walsh says, based on the available literature, while nonfasting glucose should

ideally be between 82 and 130 mg/dL.

Another example is the aspartate aminotransferase (AST) and alanine aminotransferase (ALT) ratio — liver enzymes that assess liver function.[2] The laboratory range for that typically tops out at 40 units per liter (U/L) for AST and 56 for ALT.

Meanwhile, the medical literature "very clearly show that, a) men and women should have a different AST and ALT reference range, and b), [the ideal range] is not much above 20 U/L," Walsh says.

GGT and Iron

Gamma-glutamyl transferase (GGT), which is a powerful predictor of mortality, also should not be above 20 U/L. “How many doctors are looking at GGT and saying it’s OK when, in fact, according to the literature, it’s absolutely not,” Walsh says. GGT is a liver enzyme involved in glutathione metabolism and the transport of amino acids and peptides.

Not only will the GGT test tell you if you have liver damage, it can also be used as a screening marker for excess free iron and is a great indicator of your sudden cardiac death risk.

In recent years, scientists have discovered GGT is highly interactive with iron. Excessive iron will tend to raise GGT, and when both your serum ferritin and GGT are high, you are at significantly increased risk of chronic health problems, because then you have a combination of free iron, which is highly toxic, and iron storage to keep that toxicity going.

> *"There's a paper done in 2012 that showed the red blood cell (erythrocyte) membrane is a target for GGT. GGT … modifies the erythrocyte membrane. Then some of these elements, like iron and copper, for example, can become more liberated … Because of that, a cysteinylglycine is liberated from glutathione via GGT.*

> *That, in the presence of iron or copper, initiates the Fenton reaction. That's when you get massive oxidative stress. One thing I haven't been able to fully figure out is that if iron and copper are more normal, is GGT less of an issue? I still think it's a marker of xenobiotic exposure and of … oxidative stress due to glutathione deficiency,*" Walsh says.

GGT is an inexpensive test that should be included in every lab. As for serum ferritin, Walsh suggests a low-end of 50 nanograms per milliliter (ng/mL), and a high-end of 115 ng/mL for women and as high as 150 ng/mL for men, although he admits an argument could be made that ferritin should be below 100 ng/mL in both sexes.

I have beta thalassemia and as a result am at high risk for hemochromatosis (iron overload), as my red blood cells are recycled too frequently. From my review of the literature, I believe a more ideal reference range to lower your all-cause mortality risk is between 30 and 40 ng/mL for men and nonmenstruating women.

Walsh also suggests looking at copper and total iron binding capacity (TIBC). One of the roles of copper is to turn iron into the form that's transportable and useable in synthesis. Without copper, your body is unable to use the iron it has. As a result, if copper is low and your body cannot use iron, TIBC will go up.

Copper deficiency anemia has the exact same markers as iron deficiency anemia, with the exception of neutrophils, which tend to be low when there's copper deficiency. A tipoff that you're looking at copper deficiency anemia and not iron deficiency anemia is if it's not being corrected by iron supplementation.

Blood Viscosity Markers

Blood viscosity is another area where blood testing can reveal valuable health information. Blood viscosity affects a number of different conditions, including nonalcoholic fatty liver disease, gallstones, bone density and osteoporosis, diabetes, cardiovascular disease, endothelial dysfunction and much more. Unfortunately, virtually no one is measuring blood viscosity, but it can be done. Walsh explains:

"When you think about what contributes to viscosity, which by the way goes back to basic blood — what is in blood? The most abundant thing in blood, after water, is protein — albumin, globulin and fibrinogen. I was thinking, 'Protein has to contribute to this, and protein's in the blood chemistry.'

Lo and behold, there's a validated calculation that looks at both low shear rate and high shear rate viscosity, that's been validated numerous times; that has been compared to actual whole blood viscosity. The two markers needed are just total protein and hematocrit. That's it … It's so easy to calculate, and it's been validated. Every physician should be running this on every patient …"

Fatty Liver Index

Typically, the term dyslipidemia refers to high cholesterol, high LDL, low HDL and abnormal triglycerides. But research suggests elevated HDL qualifies as dyslipidemia as well, as elevated HDL is not normal either. Walsh cites a paper in which the inclusion criteria was fatty liver diagnosed by ultrasound.

The average AST/ALT ratio in all these patients with fatty liver was in the 20s. Typically, doctors use liver enzymes to diagnose fatty liver. However, you can also use a fatty liver index, which is comprised of GGT, triglycerides, waist circumference and body mass index (BMI).

"It's fairly specific. It's pretty accurate as an indication of fatty liver," Walsh says. *"Here, all you need is a waist circumference … BMI … triglycerides and GGT level. [With that] you can, with some confidence, predict whether they have fatty liver or not. Or, at least from a clinical decision-making perspective, decide if that's something that you want to pursue."*

Intermountain Health Risk Score

Another test most physicians have not heard of, including myself, is the Intermountain health risk score. "This was something I stumbled across because I love blood

chemistry," Walsh says.

> *"It's the best, most valuable, most accurate, most inexpensive test we could possibly be running. I get really frustrated as a functional medicine or naturopathic practitioner, that we're jumping on all these really expensive non-scientifically validated functional medicine tests when there's so much information that could be drawn from [the Intermountain risk score]."*

The Intermountain risk score is a mortality risk score created based on the basic blood chemistry markers of tens of thousands of patients in a hospital setting, including complete blood count (CBC), sodium, potassium bicarbonate, mean platelet volume and other basics. Based on these markers, you end up with a 30-day, a one-year and a five-year mortality risk.

> *"That five-year mortality risk score is so valuable,"* Walsh says. *"You might have somebody who's relatively healthy, self-prescribing a bunch of supplements, maybe exercising a little bit, trying to eat as healthy as they can. But physiologically, something's abnormal.*
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> *They go to their doctor and everything looks pretty good. Let's say their glucose is good. If they were to enter in all these markers and it came out with a slightly high score, that's an indication that not everything is going well …*
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> *Again, if the antithesis of optimal health is death, you can see where you are on this score. If your score doesn't come up great, you can take it to someone who will actually take a look at what you're doing and make some recommendations to try and improve some of these things.*
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> *That's just another example of there's more data inside of a blood chemistry test than the blood chemistry test is actually even reporting on. Things like osmolality. Things like viscosity. Things like the fatty liver index. Things like the Intermountain risk score."*

You can find more information about this score by visiting their site.[3] Simply enter your variables and it will calculate your score for you.

More Information

To learn more, see Walsh's website, DrWalsh.com. If you're a clinician, I highly recommend attending one of his lectures in which you'll learn far more about Walsh's unified cellular theory of health, blood chemistry analysis and evidence-based reference ranges.

His tour covers 12 U.S. cities between March and October 2019, and including Baltimore, Charlotte, Jacksonville, Dallas, Phoenix, Orange County, San Francisco, Portland, Broomfield, Minneapolis, St. Louis and Boston.

It's definitely something that can radically improve your ability to understand and make successful interclinical interventions to improve the health of your patients. I will be attending his Jacksonville, Florida, event April 13 and 14.

In addition to two days of live presentations, you also get five hours of pre-event videos to review, so that you're up to speed on the basics and can really delve deeper during the live portion, and a digital copy of all the slides, references and bibliography presented.

Sources and References

- [1] Life Cycle Human Biology
- [2] Medicinenet.com Liver Blood Tests
- [3] Intermountain Risk Scores