



COMMON SENSE LABS

BLOOD LABS DEMYSTIFIED.

Ken Berry, MD & Kim Howerton

Disclaimer

Welcome to Common Sense Labs: The Book!

Before we dive in, we want to get crystal clear on some details and agreements.

We (Dr. Ken Berry and Kim Howerton) have written this book as a guide that is designed to give you general educational information. It has NOT been designed to provide any specific medical advice or diagnoses. Information provided in this book is not intended to replace the care of a trusted medical practitioner.

We can not and do not attempt to diagnose, treat or cure medical conditions through this book or any discussions of this book.

Our intention is to give examples and education that can be used as information that you discuss with your doctor - but should never REPLACE the advice of your doctor.

Additionally, please be aware that reference ranges shift over time, so there might be discrepancies between what they were at book publication and when you read it.

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Sincerely,
Ken D. Berry, MD and Kim Howerton

TABLE OF CONTENTS

- 1 FOREWORD
- 3 THE SCOPE OF THIS BOOK
- 4 HOW DO BLOOD LABS WORK?
- 5 THE PROBLEM WITH REFERENCE RANGES
- 7 HISTORICAL RANGES
- 8 CONFOUNDERS
- 10 HOW TO PREP FOR LABS
- 13 ANNUAL LABS
- 23 LIPID PANEL
- 25 INDIVIDUAL RECOMMENDED TESTS
- 32 WHAT IF I HAVE SYMPTOMS
- 36 THYROID PANEL
- 43 SEX HORMONES
- 46 DIAGNOSES OF EXCLUSION
- 48 SPECIAL SECTION: SELF MONITORING
- 56 DOCTOR DISAGREEMENTS & ICD CODES
- 58 QUICK REFERENCE LABS

FOREWORD

Tell me if you've heard this one before...

A patient goes to a doctor who sends them to the phlebotomy lab. A few weeks later, they get a call from a nurse who says, "Your cholesterol is high, so we sent a prescription to the pharmacy." No further explanation is given. When you ask for clarification, they tell you the doctor can discuss it with you at your next visit... in 6 months.

Or what about this one?

The receptionist sends an email that says, "Everything on your labs looks fine. The doctor says to try harder to eat right and exercise." But the patient is exhausted no matter how much they sleep, their hair is falling out and they can't seem to get their weight to budge even though they are exercising and eating the way the doctor said to.

Or what about this one?

A patient tells their doctor they are worried about their diabetes risk and asks for a more comprehensive blood evaluation, but the doctor won't order any more tests because, "Your fasting glucose is fine!"

Many of us grew up watching our grandparents (or parents) suffer because they were unwilling or simply unable to question the opinion of their doctor. For years, there was no easy option to become our own health advocate. Our options were limited as most resources were out of reach.

Times have changed. In this modern age, information can be found no farther than the tips of your fingers upon your keyboards. Unfortunately, many blessings bring their own challenges, the Internet is great at information delivery, but this is only part of the process. We all know someone who put their symptoms of runny nose and headache into Dr. Google and determined they have...

CANCER! No- wait... that can't be right, can it?

And here's the rub – information is not enough. Understanding requires context and structure, not just memorizing bits of information.

This is why it is so critical to have the counsel of a well-informed medical provider – a partner in health – to really understand the nuance in interpreting our health information.

If anyone is thinking we are arguing for a world without doctors, think again. Half the writing team on this book is an MD. We love our doctors.

What we are arguing for is creating empowered and educated patients working in partnership with their informed and up-to-date doctor.

Dr. B:

For years, I was an ignorant doctor. I mean it, **Ignorant**. I was sure I knew what I knew, and sure those who disagreed with me were idiots. I went to medical school - I studied these things. Surely what I had been taught was right. Right? "Your cholesterol is high - you need a statin, because high cholesterol will kill you - DUH."

"Your TSH is fine. Your thyroid is fine. Maybe you're tired because you need to lose some weight. DUH."

As we come to expect more from ourselves as active participants in our health journey, we seek to be in partnership with a doctor who will meet us in the spirit of inquiry and experimentation.

Unfortunately, we are aware that not all doctors currently practicing are willing to hold up their end of this – it should be your doctor’s role to be your health advocate, not your health roadblock.f

There are myriad reasons why patients experience less than optimal care especially around ordering the right labs. It’s rarely because the doctor doesn’t care. For the most part, people become doctors because they want to help people. Unfortunately, sometimes doctors fall short due to one or more of the following reasons:

- Doctors are often inadequately or inappropriately trained – “I don’t know how to interpret that xyz lab so I won’t order it”
- Many doctors are not up to date on recent developments in lab interpretation since they graduated from Med School many years prior
- Inappropriately motivated: given motivation by insurance companies to treat in specific ways through billing guidelines
- Distracted and/or overworked
- Practicing by algorithm
- Health Insurance hand slapping – repeatedly being censured by insurance companies for ordering “unnecessary” tests

We firmly believe in a future of empowered health partnerships, ones in which both lived experience and medical knowledge come together to create optimal health.

Fortunately, the number of plugged-in, forward-thinking doctors is growing. A good doctor will eventually see the light if they are truly committed to improving patients health.

If your doctor isn’t supporting you in the way you need, it might be time to evaluate if your doctor just needs education – or if it’s time to find a new one that will support you the way you need.

But over the years, as my own health declined, and my weight increased, and as I continued to follow and give the “standard” advice that I’d been taught, I realized that something was very wrong.

I became a doctor to help people BE HEALTHIER, and yet following my own advice, I was getting sicker and fatter and just plain old before my time.

I realized I’d become that jaded asshole doctor because I was frustrated. My advice wasn’t working, and since my doctor colleagues assured me my advice was sound - so the problem must be my patients’ compliance, not my clearly solid advice. But the nigging feeling that this was all wrong wouldn’t leave me.

So, I hit my old textbooks, looking for answers. The basis of my medical education was founded on solid biochemistry and physiology - the science. There is a real and true underpinning of science in medical interpretations that are crucial to optimize our health.

What is required, however, is not to simply trust averages, generalities, and ranges without fully investigating the core principles of those tests.

Because lot of what I was saying was, frankly, ridiculous. And I have spent every day of my life since then making up for that by making sure folks know how to actually improve their health.

THE SCOPE OF THIS BOOK

We wrote this book for the general public, as we want regular folks to feel informed and comfortable with their body and medical topics. So many of us have had the experience of hearing our doctor tell us about lab results, but having no footing on what they are seeing in the numbers. Or maybe we get the full report in writing, but then have no idea what the test is actually testing and what the results mean!

We wanted to solve that by providing descriptions of common blood tests and what they test for, as well as explaining the results. With a more solid understanding, it is our hope that you become much more confident and feel like an empowered health partner, not just a passive patient in relationship with your health care provider.

We think of blood lab interpretation as layers. In the first layer, you have the good health foundation: Level 1. This covers basic health markers that should be checked in on regularly to confirm you continue to be maintaining foundational basic good health.

We also touched on a few Level 2 topics. These are the most common labs that should be run when someone complains of the most common symptoms that Dr. Berry would see in clinic. These are things like thyroid dysregulation and sex hormone abnormalities, to name a few.

There are many more layers that we do not approach in this book, as beyond the basics of Layer 2, interpreting labs requires much more nuance and multi-factor analysis that we felt it way beyond the scope of what should be tackled in this book.

By getting clear on the basics, we hope to give you a rock-solid foundation to stand on if you ever need to delve deeper into more complex health topics with your medical provider.

Kim

My story is a little different than Dr. Berry's, not the story of a doctor, but a patient. I had my first surgery at 5, was diagnosed with depression at 9, PCOS at 15, and spent most of my young(ish) life suffering from undiagnosed hypothyroidism. Gastritis by 17, followed by ongoing irritable bowel syndrome. Not to mention my ever-worsening eating disorder and growing weight issues.

It turns out that undiagnosed hypothyroidism was a lynchpin, and it took me two decades to actually finally get properly diagnosed. When it finally was, the world shifted for me. Those of you who live with chronic illness probably understand the difference between a good day and a bad day, and when I was undiagnosed, it was always a bad day.

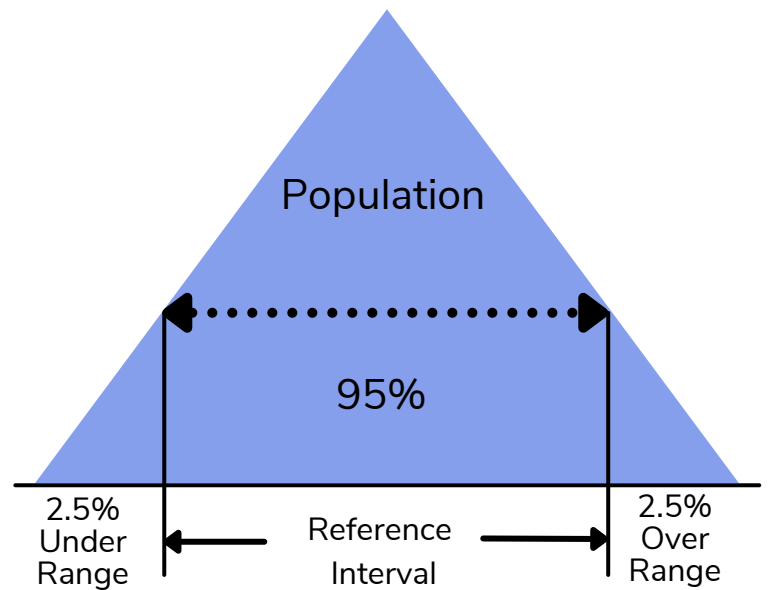
The one-two punch of overhauling what I ate and properly balancing my thyroid levels changed my world. I would not have been able to experience this without doing a deep dive into the labs that actually matter and partnering with a doctor who helped me get properly medicated.

As of the writing of this book, I'm down over 100 pounds and experiencing clarity and energy that I never imagined I could feel in my sicker days.

I want all of you reading this to be **TRULY** empowered on your health journey.

HOW DO BLOOD LABS WORK?

We assume most of you have, at some time, had blood work done. Your doctor has given you paperwork, you went to a lab and had blood drawn, and the doctor's office called with the results. Some of you might even have been sent the results showing you what is in and out of "range."



First, some terminology: On LabCorp's paperwork you'll see the term "reference interval" under which they are classifying your blood test in or out of that range. A reference interval might also be called a reference range or standard range. They determine a reference interval by taking the results for a population then putting them on a curve and determining the range that 95% of the population falls within. This range of values is then considered "normal" within a population - although we argue it would be better to call it common, rather than use the term "normal."

To find the reference range, they'd take a targeted population and determine what lab values 95% of the population fall into for a given test - excluding the top 5% of top and bottom scores.

Reference range data is drawn from the population taking a specific test. While an effort is generally made to remove the data of those with known illnesses, that is not always possible. This is due to the reality that the general population is rife with undiagnosed medical issues. Therefore, the reference range will include some of the population that, if looked at more closely, should have been excluded due to illness.

Many tests also have specific ranges for subsets like age, ethnicity and/or sex.

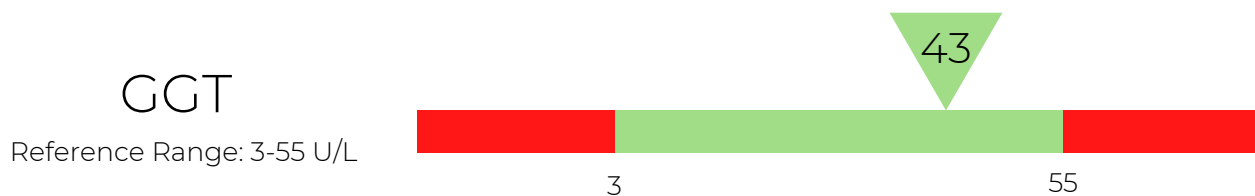
There are also some specific reasons you might see differences in reference ranges. They will vary between lab companies. You'll also sometimes find some regional differences in quoted ranges. And of course, as we discuss in the section on Historical Ranges, ranges vary over time as population health shifts.

Not all ranges are determined by this method (the 95% interval) - some are determined by "consensus" - meaning a medical governing body has set the range, and it's not exclusively based on population statistics. Blood sugar levels are an example of this.



THE PROBLEM WITH REFERENCE RANGES

If you are like most folks, you'd assume that if you got this result of 43 on your GGT lab results, you might reasonably interpret that to mean that you're in good health, at least with regards to that marker. *Green means good right?*



Let's dive a little deeper - GGT (never fear, we will describe GGT in more detail later, for now we are just using it to illustrate a point about ranges). Look at the range on this image - it's showing that any number between 3-55 will be considered "in range" according to this lab. This might lead a person to believe if their GGT was anywhere between 3 and 55, they are equally healthy. After all, there's no degree of greenness showing here - just black and white... err green and red. There's no super-green and sorta-green. Yes or no. In and out.

However, this "everything in range is good" assumption is far from the reality. In practice, having a high GGT is known to be an indicator of either current or likely future liver damage. Many functional medicine doctors aren't happy seeing GGT levels over 30.

So why does this report consider anything up to 55 normal?

The answer is the 95% curve... the reference range.

Reference ranges reflect the numbers we see in society - what is common. This is definitely not the same thing as healthy. Less than 12% of the US population qualifies as metabolically healthy, and yet, for the majority of that unhealthy 88%, this fact would not disqualify them from being included in the reference ranges. It would only be when their condition had advanced to clearly diseased that they might be excluded... *MAYBE*.

In fact, if you imagine the group of the healthiest folks - they might not be included at all because nothing prompted them to get blood work, so they aren't in the data set to begin with!

Some other concerns come up when we look at lab ranges and how they've changed over time. If you think about it, it makes sense - but if nothing triggered the thought, most folks have never considered that ranges will change as the population shifts.

GGT
3-55
considered
"in range"

< 12%
of the US
metabolically
healthy

POP QUIZ

As we discussed earlier, reference ranges are based on current population figures.



If the general health of our population is on a decline...
How will that affect the reference ranges?

A. They will reflect less healthy ranges.

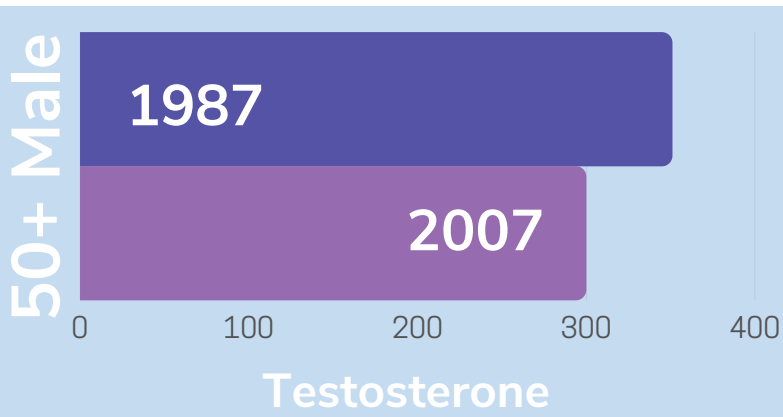
B. Do you really need option B?

HISTORICAL RANGES

To illustrate the issue with historical ranges, we will start with an example -

Testosterone!

What is testosterone? It is a sex hormone found in both men and women, though in much higher amounts in men. When they look at annual averages, numbers for men have been declining at about a rate of 1% per year!



Comparing an average 60-year-old man in 1987 vs one in 2007 and the reference range for testosterone would be close to 20% lower.

(Journal of Clinical Endocrinology and Metabolism, 2007)

This means we'd see our reference ranges dropping in concert -

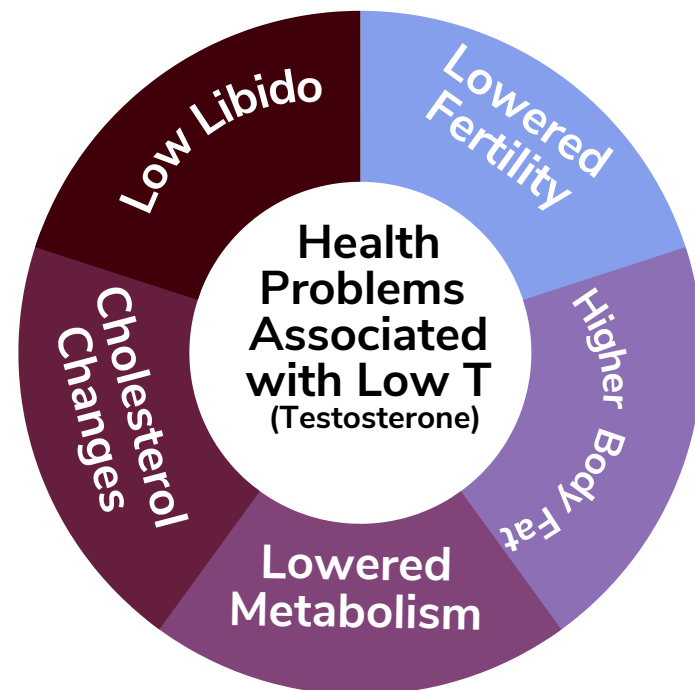
not because men are healthier with lower testosterone, but because Low T is becoming the "new normal."

We could go on about changes in ranges as the health of the population has declined, but we'd be here all week.

Ultimately, I think it is clear that in a population suffering from ever declining health, population-based reference ranges are not a good yardstick of optimal health.

Our honest opinion is, while some reference ranges are giving correct information for a healthy population, not all are.

While some reference ranges are the same as optimal, this isn't always true. In evaluating your doctor to determine if they are a practitioner that will help you optimize your health, they should work from lab values they consider optimal, and not just be blindly following the guidelines.



CONFOUNDERS

What is a Confounder?

A confounder is something that might unexpectedly effect the result of a test. This means that there might be an action or substance that obscures or changes your test results, causing the results to be incorrect or misleading.

Examples of common confounders are: medications and/or supplements, vigorous activity, foods or alcohol.

Here are some often overlooked confounders in blood lab testing.

BIOTIN: Biotin interferes with several blood tests, including SHBG, thyroid tests, and progesterone tests, among others. All biotin supplementation should be discontinued 3-5 days before any testing, or if discontinuation is not advised, the topic should be discussed with your doctor. There are several multivitamin supplements that include biotin, so be sure to review and share your list of supplements with your doctor to discuss if any should be avoided before your blood tests.

IRON: If you are looking at Ferritin or Iron levels, general advice is to discontinue the use of any iron supplements for 5 days before the test. If the test is ordered by your doctor, make sure they agree with this and aren't expecting you to be on your normal dose at the time of testing.

ILLNESS: If you've been ill or had an injury or infection before testing, this could cause your inflammation markers to be extremely elevated. Additionally, hard exercise too close to the day of test could have a similar effect.

DEHYDRATION: Aside from making the draw itself difficult, tests are based on blood concentration, which means if you are dehydrated, levels can look artificially high due to low blood volume. Make sure in the days leading up to, and the day of the draw you are properly hydrated.

These are just a few common examples, not a comprehensive list – make sure your doctor is aware of all supplements and medications that you are taking to confirm any effect they might have on your tests. If you want to investigate on your own, you can do an internet search on the specific drug or supplement and blood test interactions.

How Diet Can Impact Numbers

I don't think it will come as a surprise to readers who are familiar with Kim and Dr. Berry that we think the proper diet is a central part of a healthy life, with a definite preference for what some would call a low carbohydrate diet. Because of our perspective, some of the optimal marker ranges we suggest are influenced by their preferences. This is because your food choices and eating patterns can effect some blood lab ranges.

For example, someone on a low carb diet will generally have lower C-peptide levels than someone on a high carb diet.

As we learned on previous pages, the reference range is based on the average American, and in our opinion the average American is not eating a healthy diet. And for many markers, a better diet will bring blood markers towards the reference range. However, there are some ways of eating that can make a blood marker misleading or confusing when compared to folks on a SAD diet (Standard American Diet).

Most notably, the average American eats way too little protein, and a higher protein diet can change BUN (Blood Urea Nitrogen) in ways that can erroneously cause alarm when reviewing blood labs. Because these labs do not distinguish between protein in serum caused by kidney breakdown (VERY BAD) and higher protein due to eating more protein (not bad), it's good to know this.

Hydration status will significantly impact several markers as blood volume will significantly shift its concentration. If you are de-hydrated, the some markers will appear erroneously high, as your blood is excessively concentrated.

Additionally, as you might already know, for some folks, generally known as 'hyper-responders' - LDL can be significantly raised for some following a low carb diet.

This is not to say to ignore these levels if they come back out of range. Instead, discuss with your doctor that you have concerns your food or hydration may have effected the testing and have a discussion with them if they think retesting is a good idea.

HOW TO PREP FOR LABS: What to Expect

Prepping for labs is pretty simple.

As mentioned in *Confounders*, you want to be properly hydrated when going in for your blood draw. No need to over-hydrate, just make sure you are not dehydrated!

Water only
12-14 hours
prior to test

Some labs need to be run “fasted” and some do not. What does fasted mean?

In this case, fasting means not eating or drinking anything except water. We recommend that you do not eat or drink anything except water and possibly salt (this includes NO COFFEE!) in the 12-14 hours before your test. Because it’s easy to get confused whether tests need to be fasted or not, we actually advise you to assume all tests should be done fasted, unless you are specifically testing a response to eating.

In this world where most folks seem to need to eat every 3 hours, fasting for blood work has started to seem torturous. Because of this, some doctors have started saying it doesn’t matter if you are fasted, but we know of many situations in which a patient was prescribed unnecessary medications based on their non-fasted numbers. There can be a huge downside to allowing some tests to be done when not fasted, especially if you eat a low carb diet - non-fasted numbers can be inordinately out of range on these diets, whereas fasted numbers show a more accurate picture.

When we say 12-14 hours, that is no less than 12, but no more than 14. Even if you are someone usually has a longer fasting window, now is not the time to do so. This is because some tests look increasingly out of range after longer fasting windows (LDL is one example). For example, if you have a 9am test, you want to be finishing dinner no earlier than 7pm, and no later than 9pm.

If you regularly work out in the mornings, we’d suggest skipping your workout the day of the draw. As mentioned in *Confounders*, a workout, especially a hard one, can artificially elevate some lab results. For standard workouts, just that day is all that needs to be altered. If you’ve done any major exercise, such as participating in a marathon, give it a few days before doing blood work to allow inflammatory markers to return to normal.

Additionally, know how your doctor wants you to handle taking or not taking any medications the morning of the blood draw, as this can affect how they interpret results regarding related markers.

INTERPRETING LABS

A doctor will look at your test results and compare your results to the known reference ranges. But a good functional doctor won't stop there. Many doctors will be well aware that reference ranges do not mean optimal ranges and have developed their own parameters for what they like to see in terms of ranges. Sometimes these will look like the standard ranges, but for specific tests, they might be very different.

In this book, we are using Dr. Berry's optimal ranges, well, because it is his book. This does not mean that your doctor's ranges are wrong if they are not identical. However, a good doctor should have questioned the reference ranges and have developed their own preference in what they want to see, not just robotic acceptance of the ranges.

As we said earlier, in this book, we are discussing basic labs that a doctor should run if you do not have any health complaints. While it generally goes beyond what we can do here in this book to work with specific problems, we can talk about some common patterns that present themselves in the clinic.

In the next section, we will dive into specific tests that we recommend be checked yearly - this is most commonly referred to as "Annual Labs."

When your doctor is looking at your labs, they are generally looking for anything that stands out as unexpected or out of range. Then they will apply their training - knowing the appropriate questions to ask or tests to run through as follow up to diagnose or eliminate concerns. Doctors are trained "when you hear hoofbeats, expect horses not zebras" - a phrase that means, don't go for the exotic option when a common one is much more likely. However, if they rule out the common, and the issue persists, they should escalate to the less common.

One last very important thing you should know: Lab Tests aren't perfect. Though they are more accurate than most at home test kits, lab tests still have accepted ranges of accuracy. Also, while not common, there can be lab errors... so if you ever feel like a lab seems wrong, always ask to retest.

ANNUAL LABS



ANNUAL LABS

I think we can all agree that a yearly snapshot of our health via blood labs is a great idea. Unfortunately, as patients and consumers, we have no idea what that effective annual snapshot should include!

We find the list of tests most doctors include in their Annual Labs to be woefully inadequate. In mainstream medicine, an annual order usually looks like:

- BMP (basic metabolic panel)
- CBC (complete blood count)
- Basic Lipids
- Urinalysis

That's considered comprehensive by most, and in fact, some doctors order even less than this!

But is this really all you need? (Hint: **No!**)

Here's the huge problem with checking too few tests: If your doctor is planning to use these labs as the #1 source of objective information on a patient's health, they need to make sure that all the main bases of health are covered. Any given lab in isolation without some supporting confirmation from other labs can result in very inaccurate interpretations of the numbers. In the case that a given lab comes back significantly out of range, a good doctor will order a repeat test to confirm it, as it's not impossible there was a lab error.

But think for a minute - does the reverse ever happen? That a doctor looks at an in-range number and says, "Let's confirm that wasn't a lab error." No, that doesn't happen unless there is evidence to the contrary - and that's what you get when you really get comprehensive about your blood work - you get some degree of confirmation on all the tests in tandem.

The most dangerous lab result is the one that was not checked.

Another good thing to note is that labs are a snapshot. Lab values will shift constantly, in some cases, from minute to minute - so it's good to remember it is not static. This means, don't freak out if something seems weird, just retest.



WHY YOU NEED A CMP NOT JUST A BMP

CMP - Comprehensive Metabolic Panel: A CMP is a panel of tests that look at elements of metabolism, kidney and liver health, and basic electrolyte balance.

Many doctors will order a Basic Metabolic Panel (BMP) instead of a Comprehensive one.

What's the difference? In basic terms:



What does the Basic miss? Well, the answer to that math problem is 6 markers. Beyond the math truth that 14 is more than 8, the BMP misses two ESSENTIAL markers of Liver health - ALT and AST.

Why are ALT and AST so essential? Years ago, the only times we tended to see people with Fatty Liver Disease was when overuse of alcohol or medication was involved. However, in more recent years we've seen an enormous uptick in the diagnosed cases of Non-Alcoholic Fatty Liver Disease (NAFLD). In recent years, some have suggested we actually should use the term: MAFLD - METABOLIC ASSOCIATED Fatty Liver Disease, because the vast majority of cases are metabolic in nature.

Over 25% of the population has been diagnosed with Fatty Liver Disease, and that's a low estimate, as it's a significantly under-diagnosed disorder. One reason for it's under-diagnosis is that most doctors aren't looking for signs in their blood panels - because they test a BMP not a CMP. We find it incredibly scary that as this condition becomes more common, many doctors are suggesting that fatty liver is really no big deal - because they've grown so accustomed to seeing it. But as we know, in a sick society common doesn't mean healthy.

If left unchecked, Fatty Liver Disease can progress to NASH - Non-Alcoholic SteatoHepatitis - a serious liver condition that will lead to liver failure. Since MAFLD rarely results in obvious symptoms, one needs to be proactively looking for it. And since MAFLD is easily reversible, but NASH is not, early detection matters.

JORDAN'S STORY

Jordan was a model patient, never missing his annual checkup. Then one year at his check-up, he mentioned he has a bit of stomach upset, not to mention a growing gut. His doctor advised him to try to eat better – more whole grains and less bacon, to walk more and try to lose a few pounds, suggesting that he was suffering from “middle-age spread” as so many men of his age do. Year after year, Jordan went back, hearing the same advice, doing his best to comply – switching his bacon and eggs to whole-wheat toast and oatmeal.

Several years down the line, his doctor was shocked to see him. Jordan looked run down and his complexion tinged with yellow. Concerned, the doctor sent him for a liver ultrasound and found Jordan had cirrhosis of the liver – a life-threatening liver condition.

Doing some research, Jordan realized that years back, those early days of just a bit of belly pain and gut distention that he thought was just some weight gain were actually very early signs of MAFLD – Metabolic Associated Fatty Liver Disease, which then progressed unchecked to NASH - Non-Alcoholic SteatoHepatitis which then eventually became cirrhosis as the damage continued.

If the doctor had been checking a CMP (complete metabolic panel) not just a BMP (basic metabolic panel) and had added a GGT to his annual tests, the doctor would have known what was happening under the surface with plenty of time to correct the situation. But now that it had progressed so long and far, Jordan was facing possible liver failure and a need for a liver transplant.

Jordan’s doctor was old school, trained when the only times we tended to see people with Fatty Liver Disease was due to overuse of alcohol. And since Jordan didn’t drink to excess, his doctor didn’t even consider this might be an issue.


MAFLD rarely results in symptoms, which makes it crucial to address before it progresses to NASH, which means we need to be looking for it.

When ALT and AST are slightly elevated, it’s an indication that we need to look closer at the function of the liver and take active steps to alter the trajectory of liver health. Then we cross-reference that with the results of the GGT, which completes the look we need into liver function. These conditions can be reversed/prevented with the proper interventions, but unfortunately, because Jordan’s doctor never checked, the condition was discovered too late. Jordan is now on the list for a liver transplant.

COMMON SENSE LABS ANNUAL PANEL

WHAT WE BELIEVE SHOULD BE TESTED ANNUALLY

IF YOU ARE: 30-100 YEARS OLD
& SYMPTOM FREE

- 
- A1c
 - CMP – Complete Blood Count
 - CBC w/ Diff – Comprehensive Metabolic Panel with Differential
 - C- Peptide
 - D -25
 - DHEA-S
 - ESR (sed rate)
 - Ferritin
 - Fasting Insulin
 - GGT
 - Homocysteine
 - hsCRP
 - Lipid Panel
 - Magnesium
 - Phosphorous
 - TSH – Thyroid Stimulating Hormone
 - Urinalysis

INDIVIDUAL TESTS IN YOUR PANEL: WHAT THEY MEASURE

Albumin	A liver protein that helps maintain fluid balance in your bloodstream. It is also imperative in vitamin, hormone and enzyme transport. Out of range numbers can indicate kidney or liver dysfunction or malnutrition.
Calcium	One of the most abundant minerals in the body, though most is contained within our bones. Because circulating calcium is required for many essential bodily functions, including heart function - our body will work hard to maintain proper balance. When concentration of blood calcium gets low, it can cause our body to break down bone to free up calcium for use in the blood. High calcium is rare, and usually indicates a health problem.
Carbon Dioxide (electrolyte)	A waste product. Out of range levels can indicate a dysfunction in the kidney or lung. As with all electrolytes, it is part of the maintenance of proper blood acid/base. This should not be used as a measure of blood acidity/alkalinity. In order to truly evaluate blood acidity, it would require arterial blood, not venous blood.
Chloride (electrolyte)	Tightly aligned with blood sodium levels. This can give a look at proper fluid balance, as well as possibly point to some potential syndromes or diseases when off - though dehydration must be ruled out as that is far more common a cause of being out of range. As with all electrolytes, it is part of the maintenance of proper blood acid/base.
Creatinine	A good indicator of kidney function. It's often viewed in parallel with BUN (Blood Urea Nitrogen) to give a more well-rounded picture.
BUN	(Blood Urea Nitrogen) Another byproduct of kidney function that shows how well your kidneys are working, and/or hydration status. Often evaluated in conjunction with Creatinine. Certain dietary patterns, especially increased protein diets, can affect it.
Glucose	Aka Blood Sugar. Varies throughout the day and based on what you've recently eaten. The body very tightly controls levels of glucose in the blood as being out of range is extremely dangerous.

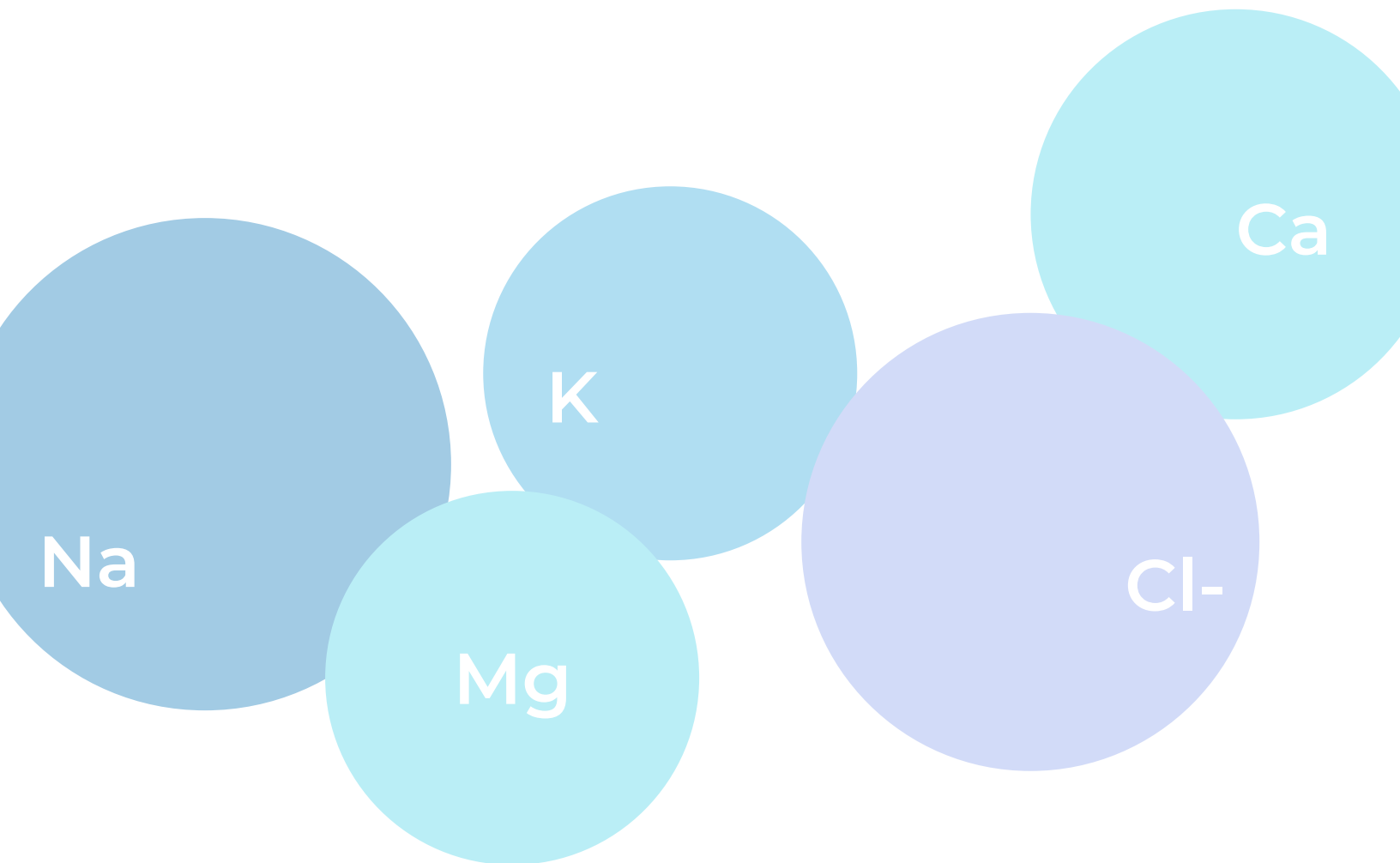
Potassium (electrolyte)	Essential to muscle health, most critically the heart muscle. As part of the electrolyte system, it is crucial for electrical signaling to the heart and nervous system. As with all electrolytes, it is part of the maintenance of proper blood acid/base. Normal Potassium levels depends on a balanced ratio of Potassium and Sodium, and do not work in isolation.
Sodium	Crucial for cell balance and nerve and electrical signaling. Proper balance is essential for health. In the absence of extreme circumstances, the body is excellent at maintaining Sodium balance. Imbalance suggests a need for immediate correction or points to a possible kidney issue.
Alkaline Phosphatase (ALP)	Enzyme used in protein breakdown. Out of range numbers can point to dysfunction in one of several organs, most frequently kidney, liver, bone, gallbladder or intestines.
ALT	(Alanine transaminase) An enzyme made by the liver. While a small amount is found outside the liver, if high quantities are found in the bloodstream this indicates some degree of liver dysfunction to disease.
AST	(Aspartate aminotransferase) An enzyme primarily made in the liver (though also made in small amounts by other organs). Similarly to ALT, if high quantities are in your blood, there is most likely a liver impairment of some kind.
Bilirubin	Part of red blood cell breakdown, processed by the liver then excreted. High levels either mean an issue with red blood cells (such as sickle cell anemia) or an issue with the liver filtration and can indicate liver or bile duct problems.
Globulin	There are actually 4 types of globulins in blood, and are indicated in blood clotting, immune function and liver function.
Protein	Total Protein measures the total globulin and albumin in blood sample. These proteins are essential for cell structure. This test can point to possible malnutrition.
pH	Some Labs will include a venous pH. This is not your actual blood pH and is seldom useful.

ELECTROLYTE BLOOD LEVELS: CAN BE MISLEADING

The serum blood ranges given for electrolytes are not actually a great way to determine your true whole body electrolyte status. While being "out of range" is important to know and fix, being "in range" does not mean that your body's stores of these are adequate or optimal.

The body works to keep blood ranges very narrow. This is because the body needs a very tight control on electrolytes in the bloodstream or it can become fatal rapidly. So when the body senses blood electrolytes are low, it will pull minerals from every nook and cranny to bring levels into a safe range. That means your blood levels might look fine, but your bones, organs and muscles could be depleted of that mineral. This is why checking your blood electrolyte levels tells you very little about your nutritional status with regards to minerals.

We find it important to monitor not only blood levels, but also how you feel and function to dial in optimal nutritional electrolyte intake.



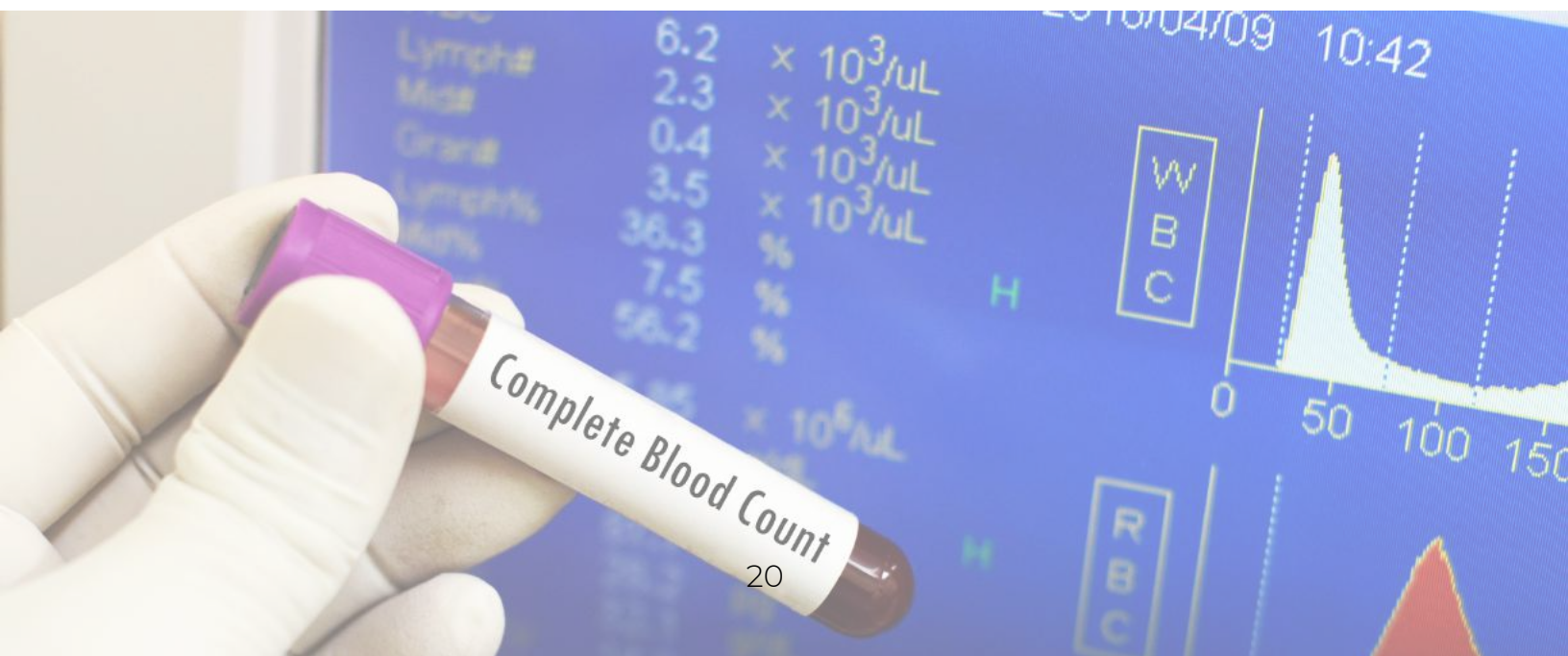
Complete Blood Count with Differential (CBC with Differential)

The CBC with Differential (sometimes listed as CBC w/Diff) looks at a detailed picture of the health of your Red and White Blood Cells (RBC and WBC) and Platelets. By looking for abnormalities in different types of blood cells, your blood can signal possible infections, allergies, inflammation or possibly even cancers. We can also get a peek at your hydration, bone marrow blood cell making ability and possible autoimmune issues.

In general, when looking at a CBC w/Differential, your doctor is looking to see if anything is out of range. If something is out of range, they will cross-reference with known issues and see if that reading is explained by that known issue or medication that you may be taking. If there's something unexplained, that will require further investigation on the part of your doctor.

In evaluating the CBC, overall you are looking to be within range, with an awareness that any current infections, allergies, or autoimmune issues might be affecting your results.

For example, if your WBC count is slightly elevated, but you have a clear issue with infection or inflammation, such as an ingrown toenail, that would be a clear cause and not require further investigation. However, if there were no known or obvious causes, the out-of-range WBC count would require further investigation. What follow up tests need to be run are going through a good doctor's mind when they are reviewing your lab result and see something off. Though they might not always share those thoughts out loud! So when in doubt, ask!



WHAT IS TESTED: CBC with Diff

Red Blood Cell Count – This counts the RBC (red blood cells) within a sample. The Hemoglobin in RBCs carry oxygen to tissues and organs. RBCs also help transport carbon dioxide out of the body. Low RBCs can suggest anemia or other problems. RBCs also interact with glucose, in a process called glycation – which is basically the process of glucose sticking to the Hemoglobin in RBCs. When glycation becomes excessive it impairs the function of the RBCs.

Hemoglobin is a protein molecule that is tasked with oxygen and carbon dioxide transport. Hemoglobin is what makes blood red. There can be variation in what is normal for each person based on gender, age, and fitness level.

Hematocrit is a measure of the volume % of RBCs in blood. While this percentage being off may indicate a health issue, it often points to an over or under hydration issue as this is a measure of the concentration of RBC's in blood volume.

Mean Corpuscular Volume (MCV) is a measure of the size of your RBCs. This can point to certain blood disorders or nutrient deficiencies (especially folic acid and vitamin B-12, and possibly iron).

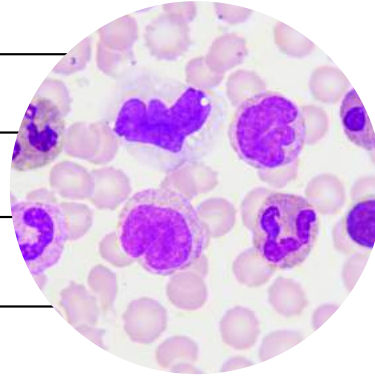
Mean Corpuscular Hemoglobin (MCH) measures the amount of hemoglobin within a single Red Blood Cell. These most often point to anemia or are looked at in conjunction with other tests to indicate wider health issues.

Mean Corpuscular Hemoglobin Concentration (MCHC) is similar to MCH but looks at the average across a unit of packed RBC's. This would also be looked at to evaluate anemia or other blood disorders.

Platelets are a necessary part of our blood as they are responsible for clotting blood as well as the transport of neurotransmitters and cytokines (cells that have an effect on the immune system). Small but mighty!

WHITE BLOOD CELLS (WBC) ARE MADE UP OF 5 TYPES:

- 1: Neutrophils
- 2: Lymphocytes
- 3: Basophils
- 4: Eosinophils
- 5: Monocytes



White Blood Cells are generally fairly stable in a healthy body, but when out of balance can point to inflammation, infections, allergies, or potentially some cancers. It can also be affected by stress, both good and bad – so someone who just ran a marathon might find their WBC abnormally high, but this is temporary and not indicative of long-term issues. You always have to look at the context of any test.

-**Neutrophils:** The majority of our WBCs. They move freely through the body to fight infection.

-**Lymphocytes:** There are three types of Lymphocytes - B cells, T cells and NK cells. These are made from stem cells in the bone marrow. B cells make antibodies to target antigens, while T and NK cells attack the virus and cancer-infected cells.

-**Basophils:** These cells predominantly fight parasitic infection, limit blood clotting and release histamine in response to allergic reactions.

-**Eosinophils:** These are a smaller percentage of our WBCs. They are used to fight off infections and pathogens. They are part of the allergy reaction cycle. Too high a level of eosinophils might be indicative of an over-reactive immune system.

-**Monocytes:** These are the largest WBC type. They have several functions - most notably destroying pathogenic host cells.

WBC Differential: The ratios of each type of WBC within a sample. The relative levels can be used to narrow in on any issues that might be arising with the immune system as well as which WBCs are reacting to it.



LIPID PANEL

Ah, Lipids. Once upon a time doctors erroneously based everything about heart health on your LDL being in or out of range. Oh wait, that's still happening now. As medicine advances, it takes quite a while for doctors to catch wind of the changes.

Lipids are complex, but unfortunately we are led to believe that they are simple. Because of the true complexity, we want to give you a brief overview, but with the understanding that this book will only touch the surface on lipids.

Cholesterol is a type of lipid (fat) called a sterol that is found in your blood. Around 75% of the cholesterol in our body is produced by our liver, the rest comes from food.

Cholesterol is essential to life; it's required for sex hormone production, cell membrane integrity, and bile production. What is often referred to in the lipid panel as cholesterol is actually not specifically just cholesterol - though it is related.

For transport in the body, cholesterol is encased in different "packages" depending on what stage of use and function it is performing. These packages contain a combination of lipids and proteins (hence the term lipoprotein). So when we talk about the lipid panel, we are actually measuring the specific packages (which can contain varying levels of cargo) rather than the cargo directly.

In a basic Lipid Panel, you'll most often see: LDL, HDL, Triglycerides and sometimes VLDL.

LDL - Low-Density Lipoprotein. These have a larger proportion of cholesterol to protein, making them less dense. LDL is the package that carries cholesterol (and many other useful things) to the cells for use. You will sometimes hear this mistakenly called "Bad" Cholesterol.

HDL - High-Density Lipoprotein. These have a larger proportion of protein to cholesterol, making them denser. HDL is the package that returns cholesterol to the liver for recycling.

You will sometimes hear this called "Good" Cholesterol.

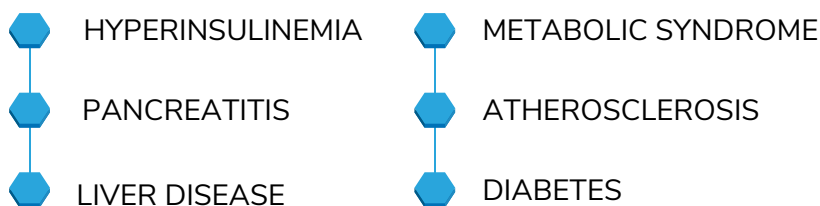


WHAT IS IN A BASIC LIPID PANEL?

Total Cholesterol: This is a calculation of your HDL, LDL, and VLDL (Very Low-Density Lipoproteins) and because of its extremely non-specific nature - it's not extremely useful. While it can be of interest as data on a population level, any doctor who bases YOUR health decisions solely on total cholesterol should be dismissed immediately.

Triglycerides ("Trigs" to the cool kids) are named for their structure: Three fatty acids with a glycerol backbone. Triglycerides are the main lipid (fat) in the blood, and if they are exceedingly high can shockingly be seen in the blood sample, making it cloudy or milky. This is not a scenario you want!

The primary driver of chronic high triglycerides is too much energy, especially in the form of carbohydrates/sugars. High triglycerides are correlated with a variety of serious health problems:



A diet high in refined carbohydrates and sugar can lead to high Trigs.

As we will discuss in a bit, to get a good picture of metabolic health you'll want to know your Trigs and HDL. Surprisingly, not important in the picture of Metabolic Health markers is LDL. If you want to truly understand LDL and its relationship to cardiovascular health, that's a course in and of itself. A basic Lipid Panel is insufficient to seriously evaluate cardiovascular risk.

Truly understanding LDL is beyond an introductory topic, and honestly, beyond the true general knowledge of even your average doctor. If this is an area of real concern for you, you'll want to begin a deeper inquiry. You'll need to learn about things like particle patterns, ApoB and risk scores rather than making decisions on incomplete information like LDL alone.

If you are someone with specific coronary concerns and want to dive further, a few resources:

Some of our favorite voices on Cholesterol can be found at: CholesterolCode.com (especially useful if on a low carb eating approach), Bret Scher, MD at lowcarbcardiologist.com and for a more mainstream but still a nuanced discussion: PeterAttiaMD.com

INDIVIDUAL TESTS: HEALTH A LA CARTE

So far we've discussed several Lab Panels to get tested, these are pre-grouped tests. But there are also individual markers that Dr. Berry wants to see in his patients. Adding these individual tests rounds out the basic annual checkup for that hypothetical average patient who is symptom free, and wanting a baseline health check.

On the following pages, you'll find the specific individual tests that Dr. Berry recommends.

Remember, this is a baseline that all people might want.

Your doctor may suggest additional labs that are unique to you. That's awesome. Because we are talking to the general population, not any specific person, there may be variation. But this is the list we'd start with for everyone.



THE INDIVIDUAL TESTS

These are tests not usually within “panels” – panels are groupings of tests that doctors tend to order together. However, all of these tests are essential to evaluating the health picture of a person.

Magnesium

An electrolyte that can be looked at in the blood. Out of range magnesium can indicate liver filtration issues or other health issues. In range levels might not show the subtlety of optimal magnesium balance. The blood test only indicates gross issues, not subtle ones that would be implicated in perfecting levels- how you feel, and function are required elements for that.

Phosphorus

A mineral measurable in blood that is vital in nerve function as well as bone health. Abnormal levels can point to either deficiencies or liver or kidney filtration/excretion issues.

DHEA-S

(Dehydroepiandrosterone Sulfate) A hormone present in both sexes, though appropriate levels are dependent on gender. This test evaluates adrenal function and hormonal balance.

Vitamin D (25)

Vitamin D is actually a hormone (when it was discovered it was not known that our bodies make it, so it is misnamed). Vitamin D levels are essential to immune function, as well as many other body functions. There are several tests for Vitamin D, make sure to get the D 25 test, as other tests can be inaccurate. This specific test measures Vitamin D in your blood once it's been converted to the usable form.

Homocysteine

An amino acid measured in blood. High levels can indicate inflammatory processes and/or kidney dysfunction and can be an indication of Vitamin B-12 status.

Ferritin

A blood protein related to Iron levels. Specifically, it looks at Iron buildup in the blood, compared to simple gross levels of Iron at any time. High Ferritin tends to be seen in inflammatory reactions.

hs-CRP

(high sensitivity C Reactive Protein) while some will call this Cardio CRP, indicating it's a test specifically related to cardiac issues, hs-CRP is actually a non-specified marker of inflammation. Very often implicated with cardiac issues, it can also be high due to other inflammation issues such as autoimmune issues, injury or illness. Make sure you are testing hs-CRP, not simple CRP as that test is not sensitive enough to deliver useful information.

THE INDIVIDUAL TESTS

ESR
(sed rate)

A test of inflammation. This test looks at the rate of sedimentation from RBCs in a sample. This can indicate issues with inflammation in the body.

Insulin,
Fasting

One of the central tests for diagnosing Insulin Resistance or Metabolic Syndrome. Our bodies need a base amount of insulin to properly function, however, that level is a low number. When fasting insulin levels are high it indicates that the body is overproducing insulin, which can be very damaging on a long-term basis.

C-Peptide

A proxy measure that indicates average insulin levels. It is important to always double check a fasting insulin with a C-Peptide level as any single insulin reading may be misleading due to the fact that insulin at any given time can fluctuate.

hbA1c
(hemoglobin
A1c)

Measures glycation of the red blood cells = glucose molecules attach themselves to the hemoglobin, which is a protein in red blood cells. This glucose attachment = glycation. A small amount of glycation is normal and expected, but too much generally indicates problems with your blood sugar concentration.

Current medical guidelines have hbA1c as the diagnostic tool to confirm diabetes. This makes sense as it generally gives us the average blood glucose, rather than simply a snapshot in time, as with the fasting glucose number. Though we 100% agree folks should be monitoring hbA1c, there are a few caveats one should be aware of:

Because the calculation on hbA1c depends on the average lifespan and size of an RBC, if individuals have longer or shorter living RBCs, or larger or smaller red blood cells (such as in genetic conditions such as beta thalassemia) that can skew the results. Anemia is another condition that can affect hbA1c. In a recent study, about 33% of the participants had RBC lifespans that fell outside of the normal lifespan range. However, the trend in hbA1c will always be very useful information because even if you have longer or shorter living cells, that will remain relatively consistent. hbA1c is often shortened to just A1c.

THE INDIVIDUAL TESTS

GGT

(Gamma-Glutamyl Transferase) an enzyme found throughout the body. An out-of-range number indicates unspecified damage, however, taken in context with the other liver tests, a clinician can cross reference to dial in the likely source of the damage.

Urinalysis

A simple check in that nothing is in your urine that shouldn't be! You want to have clear to yellow urine, and clear, not cloudy appearance, and there should not be traces of protein or blood. Ketones are also tested, and while the test suggests you want to be negative for ketones, in the case someone is on a low carbohydrate way of eating, the presence of ketones is totally normal.

TSH

(Thyroid Stimulating Hormone) A hormone excreted in the brain in response to the body's supply of thyroid hormone. We can hear the thoughts on this one, "Wait – only a TSH? Aren't you guys always cautioning against just checking a TSH and missing thyroid issues!!!" Remember, this is the suggested panel for NON-SYMPTOMATIC people. Folks with more complex thyroid issues will be symptomatic and this is covered in a later section.



SUSIE'S BLOOD SUGAR

For the past 5 years, when Susie went for her annual physical, they always ran a CBC. As her glucose was always between 95 and 99 mg/dL on that panel, every year her doctor told her everything looked great and he'd see her next year.

At this year's physical, she joked that it was time for new glasses as her vision was getting worse. When they ran the blood work this time, they found that her fasting glucose was over 100 mg/dL and the doctor decided to do a follow up lab - the A1c.

They were shocked when it came back at 11%! Susie's blood sugar was not just a little high - she was deeply diabetic! And that blurry vision wasn't from aging - it was damage to the blood vessels in her eyes from chronic high blood sugar.

Turns out, that even though Susie's glucose reading skirted under the problem line, she'd been first pre-diabetic, then that advanced to full-blown diabetic without anyone picking it up. That is because no one ran additional tests to check her blood sugar or insulin levels beyond that one daily snapshot of her fasting glucose.

Glucose levels change minute by minute. It's entirely possible for someone's glucose problems to be disguised because it just so happened that one day was a good one in terms of glucose control. But 99% of the rest of the time, the number might not have been so rosy.

Because Susie's condition was allowed to progress unchecked for so long, her vision is now permanently damaged. The eye is filled with tiny blood vessels that will never recover from those highs she was experiencing.

If her doctor had been running A1cs all those years, which show an average of your glucose, not just a snapshot, this would have been caught. And Susie could still drive at night.

Unfortunately, this story is all too common. There were several signs such as rising C-Peptide and Insulin and A1c. Any of those blood tests would have raised a red flag in time to save her from the lifetime of dealing with the damage caused.

For some, that damage might be to their eyes, others - the kidneys, and still others - the heart. Chronic high blood sugar is a killer, and you don't want to rely on hope that you'll be a lucky one who doesn't have long term consequences.

METABOLIC MATTERS

A huge focus of our recommendations (Kim as a Coach and Ken as a Doctor) revolve around improving metabolic matters.

Getting and staying metabolically healthy is the best investment a person can make to improve their long-term health. But as we mentioned earlier, 88% of Americans fall short of meeting all the criteria of being metabolically healthy. (Arujo, et al., 2019)

In the analysis that determined this shockingly low rate of metabolic health, they defined parameters of metabolic health as:

BLOOD PRESSURE	FASTING BLOOD GLUCOSE / A1C	TRIGS	HDL	WAIST MEASURE*
120/80 mm/Hg or lower	<100 mg/dL / 5.7%L	<150 mg/dL	>50 mg/dL (Women) >40 mg/dL (Men)	<34.6" (WOMEN) <40" (MEN)

We actually think some of these markers are a bit too liberal. We'd prefer to see Trigs <100 mg/dL and A1c under 5.4%.

And we'd add some additional markers to that:

C-Peptide: Optimally between 0.5 to 1.6 ng/dL, though higher may be ok on a mixed diet.

Fasting Insulin: Optimally <5 IU.

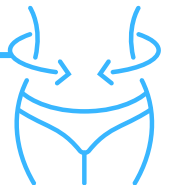
We've added these tests as they sum up a lot of metabolic activity, and dysregulation can show up earlier in these markers, before you see the effects appear in blood sugar or blood pressure measurements. We firmly believe that the sooner the intervention, the easier it will be to fix, and the less long-term damage will be done.

WAIST WHERE?

We recommend defining the waist as the midpoint between your ribs and top of your hipbone, so to find this, feel for the soft gap on your side between your ribs and hips and find the middle point (on many this is their narrowest abdominal measure). We also think using a hard number for waist cut offs regardless of height, as they did in the analysis, has issues, and suggest instead evaluating your waist to height ratio instead.

That waist to height ratio should be .5 or lower. So if you are 60" tall, you want your waist to be no bigger than 30".

You'll often hear the advice to measure the waist at the belly button, but if your belly has ever been stretched (pregnancy, extreme weight loss gain, etc) Your belly button may have drifted several inches lower and will no longer be an accurate guide. This is why we recommend skeletal guideposts instead.



C-peptide & Fasting Insulin

C-peptide is a proxy measurement of how much insulin your body is producing.

Your body produces a molecule of C-peptide for every molecule of Insulin, therefore you can track C-peptide and it will give you an approximation of your average insulin production.

Fasting Insulin is simply testing the amount of insulin in your body in the fasted state. The assumption is that after an overnight fast, your insulin has now fallen to its basal, or low base level.

Therefore, when we look at both, we should have a view to your basal (baseline) level of insulin and how much it fluctuates over the day.

Proxy Measurement:

Something that can be measured directly as an indirect measure of another marker.

HOW IMPORTANT IS METABOLIC HEALTH?

Since you are reading this book, hopefully you know the answer to this:

VERY.

We also want to emphasize that change takes time. If your numbers aren't yet optimal, just seek improvement over time! Target ranges are a goal you can aim towards, but should never be something you beat yourself up about not achieving yet.

In terms of metabolic health, even a 10% improvement in body composition can yield huge health benefits. That might be a tiny fraction of your overall goals, but the body loves improvements and will reward you with significant disease risk reduction. Just get started and keep going!

The goal is Progress, not Perfection.

So many of our patients and clients look at metrics like these markers and throw their hands up because they feel so far from them. We are here to tell you, that's dumb. Human and understandable, but dumb.

We get it. We can be dumb too.

But good friends are the ones who tell you when you need to snap out of it! Don't let your expectations get in the way of improvement!

Now you know which tests should be run annually for a person who is in reasonably good health and living a fairly complaint free life. Well, in terms of health and symptoms that is!

But what if you are not symptom free? What if you suffer from some common issues that folks write off as "just getting old" or some other such nonsense.

What should you do then?

Level 2:

BUT WHAT IF I AM NOT SYMPTOM FREE?

In the scope of this book, it is impossible for us to describe ALL possible symptoms and/or illnesses. If we went into all that detail this book would be 50,000 pages long and come with a medical degree. It would be improper, and frankly, irresponsible to suggest that this little book can approach being a comprehensive medical tool.

However, we felt it was important to discuss some incredibly common (and fairly straightforward) conditions/issues that are not thoroughly investigated by the average doctor and some common diagnoses that are used as a catch-all when a doctor is too lazy (or too time-starved) to look into, though they should.

If you don't find your symptom/situation listed here, it doesn't mean it shouldn't be investigated. You will simply need a custom, in-person approach.

The reality is, most folks seeking out medical advice are not in super great health and symptom-free. It's human nature not to want to address problems preemptively. So, if you are one of the many folks who are saying, "but I DO have symptoms," or "I just don't feel normal," read on. Let's start with a definition.

We throw that word around all the time – Symptom. What does that even mean?

A symptom is any physical/mental manifestation of not-quite-rightness that can be indicative of disease.

A photograph of a man in a dark turtleneck sweater sitting on the floor against a white wall. He is looking off to the side with a thoughtful expression. The background shows a window with blinds and a radiator.

Symptom:
Any physical/mental
manifestation of not
quite rightness

MOST COMMONLY REPORTED SYMPTOMS:

- Tired/Fatigue/Weakness: This includes feeling exhausted, a general malaise, can't quite wake up, constantly wanting a nap, feeling overwhelmed, feeling under-fueled
- Anxiety/Unexplained Emotional Fluctuations/Sadness
- Can't Lose Weight/Unexplained Weight Gain or Loss
- General or specific Gastric Distress including Abdominal Pain
- Brain Fog/Forgetfulness
- Low Libido/Sex Drive
- Headaches/Chronic Migraines
- Hair Loss
- Bodily Aches and Pains
- Lack of Motivation/Low Energy





Symptoms & Testing Reference Sheet

INVESTIGATE	SYMPTOMS
Full Thyroid	Fatigue, Unexplained Weight Gain or Loss, Disturbed Sleep, Libido Issues, Hair Loss, Headaches, Abdominal Pain, Mood Changes, Body Aches & Pain
Comprehensive Metabolic Panel (CMP)	Fatigue, Unexplained Weight Gain or Loss
Sex Hormone Panel MALE	Fatigue, Unexplained Weight Gain or Loss, Disturbed Sleep, Libido Issues, Hair Loss, Headaches, Mood Changes, Body Aches and Pains
Sex Hormone Panel FEMALE	Fatigue, Unexplained Weight Gain or Loss, Disturbed Sleep, Libido Issues, Hair Loss, Headaches, Mood Changes, Body Aches and Pains
Complete Blood Count (CBC)	Fatigue, Unexplained Weight Gain or Loss, Disturbed Sleep, Libido Issues, Hair Loss, Headaches, Abdominal Pain, Mood Changes, Body Aches & Pain
Insulin, Serum	Fatigue, Unexplained Weight Gain or Loss, Libido, Hair Loss, Mood Changes, Body Aches & Pain
Calcium	Abdominal Pain, Mood Changes, Body Aches & Pain, Kidney Stones
Homocysteine	Body Aches, Pain, Inflammation
Ferritin	Body Aches, Pain, Inflammation
hs-CRP	Body Aches, Pain, Inflammation
ESR (sed rate) Male	Body Aches, Pain, Inflammation
ESR (sed rate) Female	Body Aches, Pain, Inflammation
C-peptide	Body Aches, Pain, Weight Issues, Metabolic Syndrome
Iron, Serum	Body Aches, Pain
hbA1c	Body Aches, Pain, Weight Issues, Repeated Infections
Amylase & Lipase	Unexplained Abdominal Pain
Magnesium	Fatigue, Unexplained Weight Gain or Loss, Body Aches & Pain
Zinc	Fatigue, Unexplained Weight Gain or Loss, Body Aches & Pain, Repeated Infections
Vitamin D 25	Fatigue, Unexplained Weight Gain or Loss, Body Aches & Pain, Repeated Infections

Master Hormones & Systems

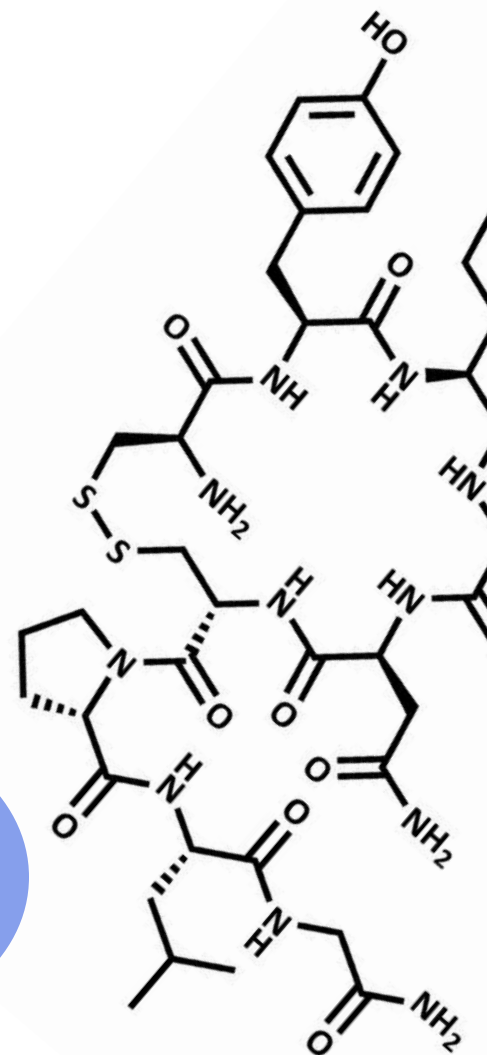
In terms of health, there are a few body systems that tend to be implicated in a majority of health issues. Hormonal systems (especially thyroid), chronic inflammatory processes and nutrient deficiencies are almost always the first things to look at when symptoms arise.

Now, don't get us wrong - these are not always simple things to fix (though some are!), but there are simple blood tests to run that can give incredible insight into what might be going wrong. While these certainly aren't always the culprit, they are good to rule out before proceeding to more complex possibilities.

When Patients present with symptoms, these are the areas that almost always warrant consideration and thorough investigation:

- Thyroid
- Sex Hormones
- Specific Nutrient Deficiencies
- Immunological Markers/
Acute Phase Reactants

Let's break down what these systems are, how they are meant to function and what can go wrong



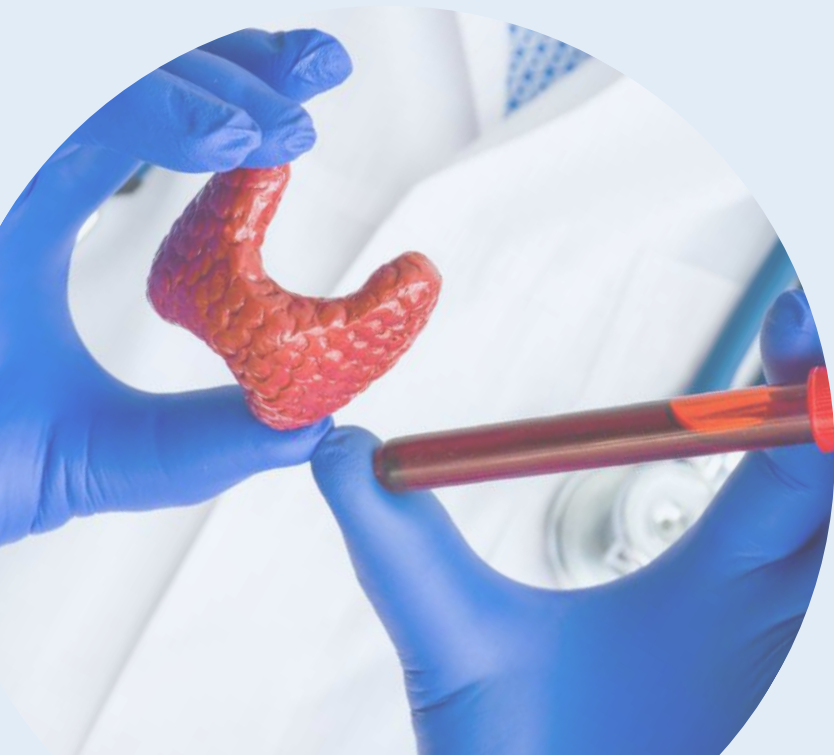
THYROID

The thyroid is a small butterfly-shaped gland at the base of the throat. We've seen an epidemic of thyroid problems in recent years. While the majority of cases of thyroid problems seem to occur in women, they are also common in men. Most doctors will only test one specific number - TSH or Thyroid Stimulating Hormone, and if that's in range pronounce patients' thyroid "fine." However, the reality is TSH is a test that misses the majority of problems. Some doctors will also test T4, which also falls far short of testing needs.

Thyroid issues tend to fall into either Hypo or Hyper. Hypothyroid indicates lower than required thyroid function. Hyperthyroid indicates an overactive thyroid. Both are of significant concern, though hypothyroidism is far more common than hyperthyroidism. In general, hypothyroidism causes a significantly slowed metabolism, while hyperthyroidism causes a significantly increased rate and eventually leads to the breakdown of the thyroid, which then can result in hypothyroidism.

To get a better understanding of what needs to be tested, let's look at the specific markers of thyroid function to get a better understanding of why we need to be more comprehensive in our investigation.

The list of tests one should run for a full thyroid panel are:



THE TESTS

- TSH (Thyroid Stimulating Hormone)
- T4, free (Thyroxine)
- T3, Free (Triiodothyronine)
- T3 Reverse
- Thyroid Peroxidase Antibodies - TPO
- Thyroglobulin Antibodies -Tg

AN OVERVIEW OF THE THYROID

Before we go further, let's get an overview of the Thyroid microcosm to understand how all these elements interact. T4 (thyroxine) is the primary thyroid hormone produced by the body. It has 4 atoms of iodine, hence T4.

Inside our brain, there's a very important gland called the pituitary, inside of which we produce a hormone called TSH – thyroid-stimulating hormone. As our body seeks to maintain proper balance, there's an ongoing conversation between TSH and T4. More TSH is secreted if the body senses T4 is low, less is secreted if T4 seems high.

Thyroid hormones are found in the body in both bound and unbound forms as they bind to carrier proteins for transport; the bound form is unavailable for use, as it's bound to a protein.

Due to other hormone fluctuations, these carrier proteins can vary in concentration, making the unbound form a better gauge in general, when testing available thyroid levels.

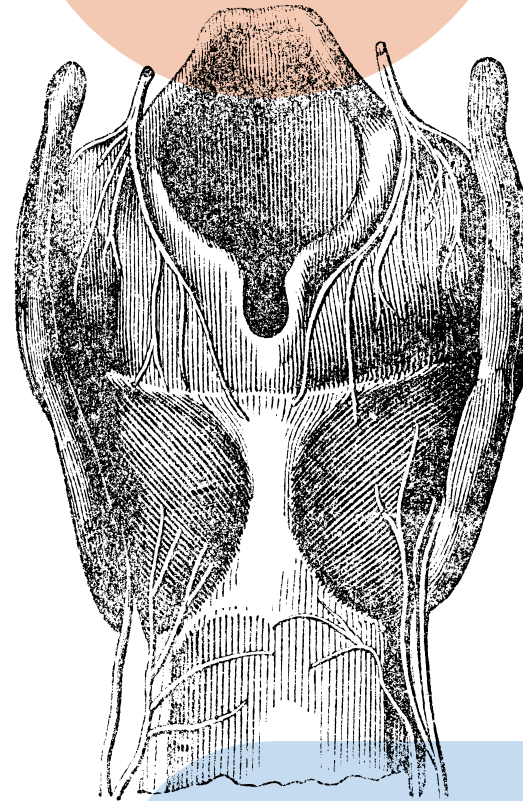
Total T4 reflects the total amount of T4, both bound and unbound.

Free T4 is just the amount of T4 that is not bound to carrier proteins, and therefore it is free in the bloodstream and available for use.

T4 is a mostly inactive hormone – meaning it must be converted to the active form – T3 (which it does by giving up one iodine atom) for it to be used by the body.

T3 is also found in both bound and unbound forms.

THYROXINE
is the primary
thyroid
hormone
produced by the
body. It has 4
atoms



T4
is an inactive
hormone

As T4 is converted to T3 through the removal of an outer iodine atom, reverse T3 is created when that iodine atom ends up in the wrong location.

Reverse T3 (RT3) is a biologically inactive metabolite. Reverse T3 can be high due to many issues – both short-term illnesses, long-term conditions, poor nutrition/nutrient deficiencies/chronic under-eating as well as diseases and/or medicines. In the absence of these issues, it can simply be seen as an indicator of poor T4 to T3 conversion.

Some tuned in doctors will order free T4 and T3, but still totally miss Reverse T3. - Reverse T3 is a detail that is imperative, as it is the best way to see a very common problem - when there is poor T4 to T3 conversion. This problem is especially common in cases of metabolic issues.

One can have good TSH and good T4 numbers, but high RT3 - it's sort of like your packages got delivered, so Amazon says your order is complete but they delivered them to the empty house next door. It's delivered, but you can't access it or use it.

Lastly on our list of tests are two tests to evaluate Thyroid Antibodies – Thyroid Peroxidase (TPO) and Thyroglobulin Antibodies (TGaB).

These antibodies are produced when the body mistakenly targets the thyroid hormones as invaders and mounts an immune response to the thyroid.

The presence of these antibodies indicates that some degree of the auto-immune condition, Hashimoto's Thyroiditis, is present and acting in a hostile manner towards the thyroid gland.

If positive for Hashimoto's thyroiditis (often called just Hashimoto's or Hashi for short) the goal is to get and keep the antibody count as low as possible, as continued high antibodies indicate the immune system is still attacking the gland. Some are able to keep those levels very low to undetectable, and some consider this being "in remission" in terms of this autoimmune condition.

A note on testing - some women find their thyroid levels fluctuate through their menstrual cycle due to changes in sex hormones. At mid-cycle, TSH may be more elevated than the rest of the month. Keep this in mind when comparing labs done at different times in your cycle. Additionally, TSH can vary depending on time of day or in response to heavy exercise prior to testing.

WHY IS PROPER THYROID FUNCTION SO IMPORTANT?

Many of us only think of thyroid as important to metabolism - aka energy utilization. But thyroid function is involved in so many body processes- it is essential to life. You literally can't survive without thyroid hormones, and if your thyroid is removed or damaged, you must supplement. Proper thyroid hormones help us regulate body temperature, mood, blood pressure, immune function, brain and mood health, metabolic issues, growth of skin, hair, bone, muscle and more.

Notably, bone mineral density and glucose uptake into brain and muscle tissue are aided by healthy thyroid function. These functions are essential to healthy aging and maintaining good blood sugar management.

What are the causes of thyroid problems? There can absolutely be some nutrient deficiencies or reactivity that, if fixed, may reverse the thyroid malfunction. As mentioned previously, most cases of hypothyroidism seem to be caused by Hashimoto's. Other autoimmune issues may also be implicated in causes, as well as an overall issue with metabolic health.

For others with thyroid issues, they remain idiopathic - that is - we are unclear on the cause. Even if never reversed, with proper supplementation, these folks can live very healthy lives.

Now that we have a picture of how the main thyroid hormones interact, we can see some of the places the process breaks down.

You might make plenty of T4, but it is remaining in the bound form, and not being freed up to freeform, so not enough is available to convert to T3 in proper amounts. But if you'd only tested total T4, you'd have missed that.

Or you might be making lots of T3, but too much of it is reverse T3, and not available for metabolic needs.

You can see how easily thyroid problems can become a terrible state of "water water everywhere, but not a drop to drink." An apt analogy is that it's as if you have plenty of food in the fridge, but there's a lock on it so you are starving.



THYROID NOTES

Thyroid Supplementation

While we do not go deeply into medications and supplements, we do feel moved to point out a few things.



The most commonly prescribed supplemental thyroid medication is Synthroid.

As its name would indicate, it's synthetic T4. Fake T4 and JUST T4. And as we discussed above, a very common issue is impaired T4 to T3 conversion. For many folks, using T4 supplementation is like pouring water into a sieve, not a cup.

So, we really suggest everyone look into using natural desiccated thyroid supplementation - this means it's animal thyroid hormone-based, which automatically contains T3 and T4, so if your issue is one of conversion, you'll gain a benefit from taking the supplement including the already converted form. Countless patients experience incredible benefits by switching to this form.

However, it's important to track your symptoms and how you feel and function in response to medication. While some forms work for most folks, we do see individual differences and it pays off to work with your doctor to tinker with both dosage and possibly the maker of the meds until you feel optimized.

Something else useful to know- for a lot of us, it took months to possibly a year or more of tinkering to dial in our optimal dose. You also need an awareness that if you gain or lose weight, or other health factors change, you might need a shift in medication doses. Stay with it until it's right and plan have an active and ongoing conversation with your medical team on your supplemental thyroid dosing.

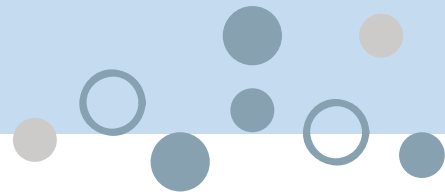
Did you know that a dysregulated thyroid can affect your cholesterol numbers?



Because thyroid is a major player in energy utilization, it makes sense that it can impact your lipids readings.

If you have ongoing issues with your lipid readings, it can be a clue that your thyroid is possibly outta whack (that's the technical term).

THYROID NOTES:



Nutrients

Thyroid hormones are very sensitive to nutrient intake - truly one of the most basic ways to tank your thyroid hormones is plain old under-eating- there are also a few specific nutrients that are especially important to our thyroid function.

Iodine - Selenium - L-Tyrosine - Iron - Vitamin A - Zinc - Copper

Proper iodine intake is essential to thyroid health. Even if you use “iodized” (aka with added iodine) salt, you possibly aren’t getting what you need and a lot of us focused on healthy eating use "cleaner" salt that doesn't add supplemental iodine. That doesn't mean you have to go back the the Umbrella Girl version -it simply means you need to make sure to get it from other sources.

(Note: in health circles there is some discussion of hyper-supplementation of iodine, at much higher than RDA levels. We are not recommending that here. We simply want to make sure you are getting the effective dose.)

Iodine combines with L-Tyrosine (an amino acid made from another amino acid, phenylalanine) assisted by Selenium to create thyroid hormone.

The great news is that the remaining nutrients of concern: Iron, Vitamin A, Zinc and Copper as well as Selenium and L-Tyrosine precursors are all found easily in food. If your diet is based in high quality animal based protein sources like shellfish, fish, beef, pork, chicken, eggs, some aged cheeses, a bit of liver, seeds and some leafy greens, you should get sufficient quantities of these nutrients.

Seaweed is a great source of iodine, as are fish and shellfish. If you are not a fish or seaweed consumer, you may look at iodine supplementation.

Vegetarians and Vegans are the populations at the highest risk for low selenium as well as most of these other essential nutrients and will need to look at supplementing.

A note about Brazil Nuts

Brazil Nuts are often cited as a great source of selenium. They are indeed incredibly high in the nutrient! A single brazil nut delivers well over the daily RDA. The upper safe limit of daily selenium is 400 mg - so exceeding 4-5 nuts per day can lead to selenium toxicity - which should be avoided! So a few is fine, a lot is not. But if you eat sufficient quantities of meat, you get plenty without adding brazil nuts to your diet.

3

What is a goiter?

Have you ever heard of a goiter?

Goiters used to be much more common, but you seldom see them these days.

In the 1920's the US began adding iodine to salt, to help correct the common problem, as iodine deficiency was then understood to be a cause of goiter. Interestingly, this supplementation of the population also raised average IQ in the lowest IQ populations. (GO IODINE!)

One of the reasons for the growth of goiters is your body would get stuck in a loop - TSH was signaling to make more thyroid hormone, but without sufficient iodine it couldn't, so the signal would just keep getting sent, and the poor overtaxed thyroid would keep growing to try to meet the demand that it couldn't because it didn't have the iodine to do it!

What people might not realize is thyroid nodules, which we still do see today, are smaller versions. A goiter is simply a thyroid nodule that grows to the point it is visible externally.

Low iodine was not the only cause of goiter, simply the most common. Hyperthyroid, hypothyroid and autoimmune thyroiditis can also cause nodules and goiters. Some types of nodules need to be biopsied as there is a small chance of cancer.

If you have any swelling in the region of the thyroid, always get that checked out!



One last note on Thyroid:

If you are already on Thyroid Medication, consult with your doctor around dosing the day of the blood draw. Most doctors will have you delay your dose the morning of the blood draw until after the blood is drawn. However, some doctors have different protocols, and timing of meds will effect interpretation of results. So make sure you are on the same page!

SEX HORMONES

While hormone dysfunction can strike at any age, our sex hormones become a specific area of greater concern as we enter our middle years – although, for some of us, dysfunction can happen sooner. Especially when someone suffers from metabolic illnesses, sex hormones can go wonky even in our teens and twenties!

Let's discuss these hormones. We will break this down into Female and Male Specific. Please note, this is not a comprehensive list of sex hormones, but rather what we see the benefit beginning your investigation with.

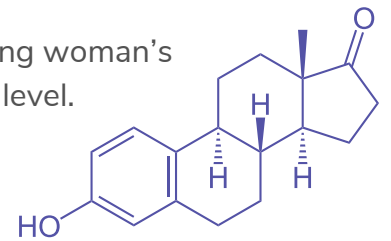
FEMALE SPECIFIC SEX HORMONES (RECOMMENDED TESTS)

Estradiol is a specific type of estrogen produced in the ovaries. This is a central marker of female hormone production, and what is typically evaluated in labs. The level expected in the blood is cycle timing-dependent.

Progesterone is a hormone that rises in the second half of a menstruating woman's cycle, but it is always present and needed at all times in an appropriate level.

Sex hormone-binding globulin (SHBG) is a liver protein that binds to sex hormones for distribution. When hormones are bound, they are unavailable. All hormones are either in bound or free versions. We need to know how much of our hormones are free, as that is the version available to use.

Total Testosterone is traditionally thought of as a male sex hormone however, it is also necessary (in smaller amounts) in females. Yes, women need testosterone! Especially if they want to feel good, sleep well, maintain good body composition and have a sex drive.



MALE SPECIFIC SEX HORMONES (RECOMMENDED TESTS)

Total Testosterone is a traditionally male sex hormone that helps men develop androgenic (traditionally male) features, enhances sex drive and muscular development.

Total Testosterone refers to the combination of free and bound forms, so the total amount.

Free Testosterone is testosterone not bound up with other proteins and free for use in the blood.

Zinc is a vitamin that is essential for the body to properly use testosterone.

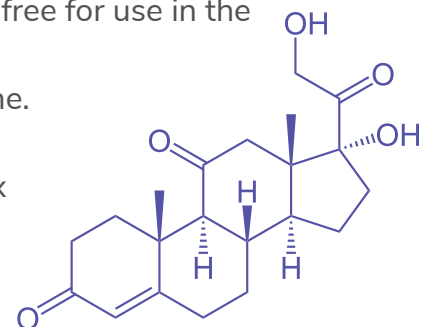
So low zinc levels might be implicated in poor testosterone.

Sex hormone-binding globulin (SHBG) is a liver protein that binds to sex hormones for distribution.

For men over 50, we also recommend testing:

PSA (Prostate-Specific Androgen test).

This can help monitor prostate issues on the (hopefully distant) horizon.



PARATHYROID

Wait, didn't we just cover Thyroid?

Actually, a Parathyroid gland has nothing to do with the Thyroid other than being neighbors – it is simply located behind your thyroid – hence the name: para = near.

There are 4 Parathyroid glands, and their job is to regulate the calcium and phosphorus levels in the body.

Symptoms of an outta-whack Parathyroid:

Chronic Fatigue, Depressed Mood, Bone and/or Muscle pain, nausea or abdominal pain, constipation, frequent urination, mental foginess, heart palpitations, kidney stones, slow thinking/cognition, heartburn, osteopenia or osteoporosis.

Parathyroid dysregulation is so frequently missed, we felt it important to bring it up in this book. This is one reason why it's so important to check a calcium level. If it's AT ALL high, could be an indicator of an issue.

The symptoms associated with parathyroid issues are often shrugged off as "aging," but if the Parathyroid gland is not functioning right, you need to rule out active parathyroid cancer, and confirm that it is benign hyperparathyroidism.

However, even this "benign" form increases the risk of many types of cancer, heart issues and other medical conditions. It can decrease life expectancy and life enjoyment. So it should be managed and monitored.

So...

If the Serum Calcium level is elevated at all, even off by .1, you should be getting follow up tests:

- Intact PTH
- Ionized Calcium
- Phosphorus
- Fractionated Alkaline Phosphatase
- Vitamin D -25

If any of these come back abnormal, you should get an ultrasound or CAT Scan of the Parathyroid glands.

JENNIFER'S PARATHYROID

Jennifer just turned 55, and at her physical she complained of feeling run down and exhausted.

"Just part of getting older," her doctor assured her. "There's nothing of concern on your labs."

If he'd checked her calcium levels, he'd have found them just over normal. A lot of doctors might not pick up on the fact that anything out of range on calcium should be considered a big red flag, so they don't follow up on it.

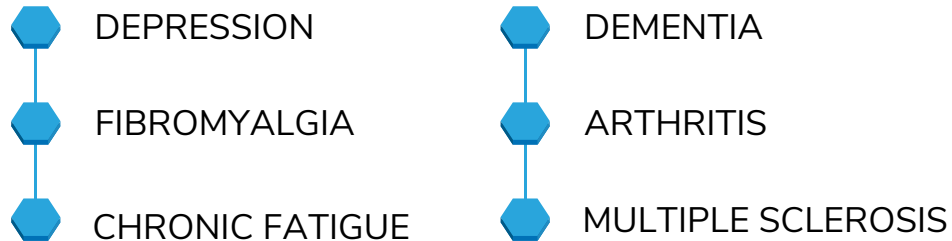
Several months passed, with Jennifer feeling increasingly low. Tired, run down, no energy - she was told to exercise more because being out of shape made you tired. And while it's true regular exercise can help energy levels, she didn't even have enough energy to try to move more. She just wanted to nap all the time.

When the tiredness progressed to rapid weight loss, her doctor initially thought that was great, until she explained it wasn't from her increased exercise, as she was now barely able to leave the couch. That's when he finally ran some additional labs. Her calcium was now elevated by several points - a condition known as Hypercalcemia - which is very dangerous.

More advanced testing revealed the cause of her high calcium was a parathyroid tumor. Once removed, her calcium levels returned to normal and she felt so much better!

It's so easy to dismiss symptoms of true issues as, "Just getting older, I guess." Feeling terrible is NOT a sign of normal aging. Don't let anyone try to tell you it is.

DIAGNOSES OF EXCLUSION



There are a number of conditions that are not supposed to be diagnosed simply by discussion, or from a single lab marker, but often are diagnosed in exactly this way by many doctors.

These are called diagnoses of exclusion because your doctor must run comprehensive lab tests to **EXCLUDE** other similar issues.

You or someone you love may have been diagnosed with one of these kinds of conditions. So it is imperative you understand how they **SHOULD** actually be diagnosed. Because if this is not done properly, it's inevitable that misdiagnosis and mistreatment will occur.

We understand how this might happen in our current medical climate, when doctors aren't given the time they'd need for a complex diagnosis. These diseases don't have a simple test that proves the diagnosis, but rather they are a list of symptoms, many of which might be other conditions. You need to rule out a multitude of other diagnoses presenting with similar symptoms before you can diagnose these with any degree of accuracy. However, we see significant numbers of folks coming into the clinic on medications to treat these conditions, and upon further investigation, we find that they do not actually have that condition - so the meds they were given are at best, ineffective, and at worst, health and wellness damaging.

Misdiagnosis means you may suffer for years, decades, or even your whole life because you aren't getting the treatment that would actually help the condition you suffer from. On top of that, you might be pharmaceutically treated for a totally different condition - one you may not have. A medical double whammy of harm.

KIM'S MISDIAGNOSIS

When I was in elementary school, I suffered a serious bout of depression. Daily tears, thoughts of worthlessness, and a lack of drive or desire to do anything. At that time, I was put in therapy, with no medical check in to see if my symptoms might be related to anything hormonal.

I spent the next several years fluctuating between sort of ok and extremely not ok, but then more symptoms began to appear, most notably hair loss, exhaustion and being cold most of the time. I could function. I could get through my days, I even had good days where I was happy and felt ok, but they were not most days.

This functional, yet not optimal, situation persisted for the next decade and a half, before I had a few months where things got worse. At that time I was escalated to a visit with a psychiatrist to prescribe medication. Anti-depressants. When those had no effect (well, beyond rapid weight gain) they decided I must be bipolar, and they put me on bipolar meds - which also did nothing to help.

After I had had enough of taking pills that didn't help and tapered off, and just went about my life, assuming that was the best I could do.

Fast forward to decades later when I was diagnosed with hypothyroidism. As I was going over my history with my doctor, she said, "I'd bet good money you've been dealing with this since you were a pre-teen." Light bulb moment.

From Dr. Berry, I've learned that my depression as a child was improperly diagnosed. Depression should be seen as a diagnosis of exclusion; running many tests to rule out alternative health issues. They weren't. As a child I was lucky to have very good health insurance. It wasn't due to lack of resources that I wasn't properly tested, it was lack of thorough diagnosis from the doctor. Even in the best scenario, with comprehensive medical insurance, I got under-treated. With the state of medical care now, I imagine it's worse for so many people.

And since I had depression in my chart, when I had worsening symptoms, they automatically assumed it was related to that depression - so I was pigeon-holed into treatment options, rather than anyone taking a good look at the root causes and if a different diagnosis was a better fit.

SPECIAL SECTION: BLOOD GLUCOSE MONITORING

Some lab tests, such as glucose, get checked in the lab panels, but this is an isolated single reading that might not provide enough information to be useful due to its high variability. There are some options for at home monitoring, so we thought we'd discuss a few of the most common (and possibly beneficial) ones. We'd love it if there were more available- like Insulin! - but for now, these are what we see some folks getting benefit from.

We are huge proponents of tracking blood sugar (another way to say blood glucose). Our body's ability to keep glucose in a healthy range is so important to long-term health. Our bodies are brilliant at maintaining glucose homeostasis - our body seeks balance in all things, including glucose in our blood. We are brilliantly created to have a glucose regulation system housed in our pancreas. Is blood sugar too low? Glucagon signals the release of more glucose. Too high? Insulin signals the storage of glucose and turns down the release of your body's store of glycogen (the name for stored glucose). Amazing!

Unfortunately, as many of you are aware, when we become insulin resistant, these systems can break down and we lose our tendency to naturally achieve balance. This can lead to wildly swinging blood sugars.

By monitoring your blood glucose, you can get real-time feedback that you are eating in a way that will help your body improve glucose management. Rather than being prey to the swings of blood sugar, you can "eat to your meter" and keep your blood sugar in healthy ranges. Over time, this can lead to major health improvements.

In a person that has lost good internal glucose management due to insulin resistance, actively physically monitoring glucose at home becomes imperative to healing and long-term health.

You might wonder, "Isn't A1c enough?" Unfortunately, not always. A1c only gives us a proxy for our average blood sugar, and that's only part of the picture. If your blood sugar is sometimes low and other times very high, your average will look fine, but your body is suffering from the high variability and the frequent high blood sugar excursions are causing damage.

Glucose Homeostasis

The automatic balance of insulin & glucagon to maintain steady blood sugars.



HOW TO: GLUCOSE MONITORING

There are two methods to monitor your glucose at home.

The most accessible is the glucometer - no prescription is required and they are relatively low cost. These can be affordably purchased in most pharmacies or online. Often colloquially referred to as "finger-prick testing" - you simply poke your (clean!) finger with a lancet, which allows a small drop of blood to surface, and apply that blood to a test strip inserted into the glucometer, which will give you a reading of your approximate* blood glucose at that time. This method is easy to get, and while not complicated to use, can be a bit tedious as every measurement requires a finger prick and test strip.

The second method is using a Continuous Glucose Monitor (CGM). In the United States, CGM's require a prescription and are more costly than a glucometer. (Although more direct to consumer services such as Nutrisense and Levels are popping up everyday.)

This consists of a little sticky sensor pad that is applied to your arm (or stomach for some models) and has a small filament that measures your interstitial fluid (just under the skin) which tracks pretty closely with your blood glucose. The sensor wirelessly transmits the readings to an app where you can see the readout.

Each of these methods (glucometer or CGM) has pluses and minuses.

The CGM is ever-ready and you can get multiple readings across a day without constantly having to prick your finger. But it requires a prescription to get, not to mention the increased cost. Also, something to be aware of - since it's testing a slightly different fluid, there can be a 10-15 minute delay on changes in readings. Additionally, we find absolute numbers on a CGM to be slightly less accurate than glucometers. Questionable readings always need cross-checking with a glucometer to confirm them.

Because the glucometer is a bit more of a hassle to use, this sometimes that leads to incomplete monitoring as you don't always want to stop what you are doing, clean your finger, open a test strip, prick your finger, test the blood, again and again over a day.

Accuracy

We can't emphasize enough that blood sugar monitoring either with CGM or glucometer has a fairly high margin for error of 20%. While we find the glucometer slightly more trustworthy in terms of accuracy, it is still not sensitive enough to interpret small changes.

We constantly see folks trying to suss out the reason this reading was 89, but this other reading was 94... truth is, based on the sensitivity of the meter, those readings are basically the same. If this imprecision will drive you crazy - perhaps monitoring is not for you.



BLOOD SUGAR RANGES

As we mentioned, A1c is not enough for everyone to confirm they are in good glucose control. While A1c can somewhat stand in for one of the things you want to track, average glucose, it leaves out two other important considerations.

1. Fasting & Between Meal Glucose levels: BG in the "unfed" state.
2. MAGE (Mean Amplitude of Glycemic Excursions) or BG variability over the day.

In simple terms, we want our blood sugar to do this: Your baseline glucose levels should be in a healthy range, then should not go too high due to what you eat, and then should come back to that healthy baseline relatively quickly after your meal. Makes sense, doesn't it?

So, what should the glucose range be fasted/between meals?

There is a bit of individual variability but we believe in most cases, numbers should fall in these ranges when out of the post-prandial (after meal) window.



These ranges are quite different than you see presented in other places such as from the ADA.

However, as we have seen time and time again - cut off points for many readings are way too generous. We are presenting you with what we believe to be optimal based on Dr. Berry's clinical experience, and also studies on achieving optimal outcomes.

Additionally, we don't give different targets for diabetics vs non-diabetics.

While we understand diabetics will struggle more to keep glucose in optimal ranges - that doesn't mean we should lie to them about what is optimal. Rome wasn't built in a day, and a diabetic won't fix their numbers overnight either - however, they can set their GPS on the right target and make steps towards their desired destination daily.

Direction matters more than speed!

Outliers & Exceptions

There are some circumstances when your numbers might fall out of these ranges without it being an area of concern.

Multi-day fasting: Some might experience a fasting glucose in the "low" range, and in the proper circumstances (paired with reasonably high Ketones) is not usually a concern as long as they are feeling and functioning well. Additionally, some individuals on very low carb diets might see morning fasted glucose occasionally in the high 60's.

Dawn Phenomenon: Some folks notice an early morning peak in glucose. This is a short rise in glucose right after waking due to natural higher cortisol production. Dawn Phenomenon is a normal physiological process and occurs in every mammal on earth, to some degree. Don't stress too much if there's a transient reading just after waking, as long as it's under 125ish, and other readings are all in the right range.

Because of Dawn Phenomenon, we recommend testing "fasting" blood glucose once you've been up and about for an hour or two rather than right after hopping out of bed.

Exercise: Vigorous movement can temporarily raise glucose in a short window, but over time, exercise lowers average glucose levels, so it's a benefit on the whole. Never freak if your glucose goes into the high range for a short period of time during and/or right after a workout.

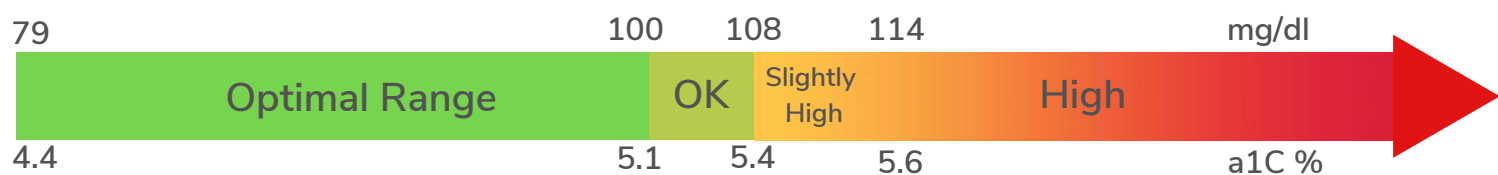
Hot or Cold: Submersion in very hot or very cold water can raise or lower glucose temporarily.

Average Blood Glucose

As mentioned in the description of A1c, most doctors will use A1c as a proxy measure (surrogate marker) for average blood glucose over the last 90 days. While we certainly think tracking A1c a useful measurement for most folks, (barring genetic variants that make it a less accurate measure) there's benefit to instead track average glucose over a shorter time frame, especially if trying to implement changes.

If using a CGM, finding your average glucose is as easy as looking at the reports section of your app. If you are tracking through glucometer, you'd need to be getting regular readings through each day to see the trends and have enough data to pull from to determine an accurate average blood sugar.

Note: Average Glucose is over 24 hour daily cycles, so will include both fed and fasted periods.



Above we've shown average glucose as well as corresponding A1c level. Maintaining anything under 108 mg/dl (5.4% A1c) average glucose keeps you in the range that avoids most damage from chronic high blood sugars, but keeping things under 100 mg/dl seems to have a slight health advantage.

While the ADA doesn't call it pre-diabetes until your average glucose reaches 118 mg/dl (5.7% A1c), we think this is too high a limit marker as when the average glucose rises above 108 mg/dl (5.4% A1c), we start to see increasing damage from occasional high blood sugars. Obviously, the damage increases exponentially the higher these numbers go.

MAGE: MEAN AMPLITUDE of GLUCOSE EXCURSIONS

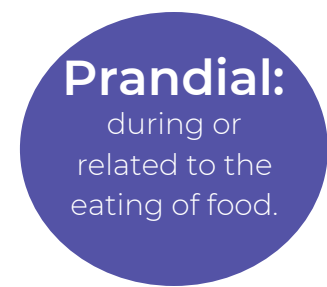
We want to introduce you to the concept of MAGE. MAGE (Mean Amplitude of Glycemic Excursions) is an average of how much glucose levels fluctuate. This is important because you might have two people who both maintain an average blood glucose of 95 mg/dl. But person A has high variability with glucose going as high as 150 mg/dl at times, and as low as 70mg/dl at others. Person B has low variability, with their glucose always staying within 85 to 105 mg/dl. The health of these people will be very different, as higher variability indicates poorer health.

Things that are known to cause Glycemic Excursions (which some call "Spikes"):

- Stress. Some people report their highest blood sugar of the day is on their commute or after an argument.
- Dehydration. This one is not actually raising your glucose, but rather increasing the concentration of sugar, as the blood volume decreased due to lack of water.
- Eating or drinking. Especially high carbohydrate foods and beverages.
 - Side note: Alcohol can actually drop blood glucose - in fact, alcoholics often have very low average glucose. In this case, the low blood sugar is not a good thing as it is caused by normal liver processes being subverted.

For most people, the greatest cause of blood sugar variability is their food choices, which makes testing specifically around eating windows a winning strategy for managing glucose excursions.

A term frequently used in discussing blood sugars in the eating window is to refer to before eating as preprandial, and after eating as postprandial.



When monitoring pre and postprandial glucose, you can learn your degree of carb tolerance. You might also learn that glycemic control is about specific food choices rather than simply a carb or sugar amount. Hummus might spike your blood sugars super high, while bananas do nothing, or vice versa. By testing your glucose response to foods, there can be benefit to learning your unique response as there can be a high degree of personal variability.

There are two important factors in terms of Postprandial numbers, how high the post meal peak goes, and how long BG stays elevated. The period of time blood sugar is elevated from baseline will sometimes be referred to as an "excursion."

MEASURING POSTPRANDIAL BLOOD SUGAR

Postprandial glucose level management is less absolute number based, but instead is a relationship with the pre-meal number. In looking at your postprandial rise, you'd check your glucose right before eating and watch what that number peaks at, then how long it takes to return to baseline. Since optimal blood glucose numbers exist in a range, you need to know your specific number that day, that meal, to determine if your post meal value is good, bad or ugly.

Know we are giving you optimal ranges here. Please do not expect perfection on day one. Small incremental improvements will add up. Use the optimal numbers as a point to aim towards, not a reason to beat yourself up.

We know from previous pages what we want our pre-meal glucose to look like. What should it look like after we eat?

After Meal
Peak
(highest point)

<31 points above Baseline Reading
(in mg/dl)*

Note: Those on low carb diets may see little to no rise in glucose, commonly averaging 10-15 point excursions. This is not problematic in any way!

***Don't forget margin of error when interpreting readings (from page 49.)**

How long to
return to
baseline

Size of meal, not just content, can affect time to return to baseline.

within 1 hour	Great!
within 90 minutes	Good!
within 2 hours	Ok
>2 hours	Not Good

As we've mentioned repeatedly, developing good blood sugar control can take some time. For example, when Kim first went Keto, she'd regularly see her blood sugar go up 40-50 points after a meal. A year later the exact same meals would only cause a 10-20 point elevation. These optimal ranges are your target to aim towards. Just keep heading in the right direction, and trust you'll get there.

While not all blood sugar issues can be managed solely through diet, food choices always play a central role in any long term management strategy.

Important Note: If you have been eating very low carb then suddenly have a high carb food, your blood glucose will over-react due to insufficient insulin readiness. Do not panic, this is a temporary insufficiency due to the down regulation of insulin production. If you ate higher carb for a few days, your insulin production would return to a level better able to handle the higher carbohydrate load. Not that we suggest it - just something to be aware of!

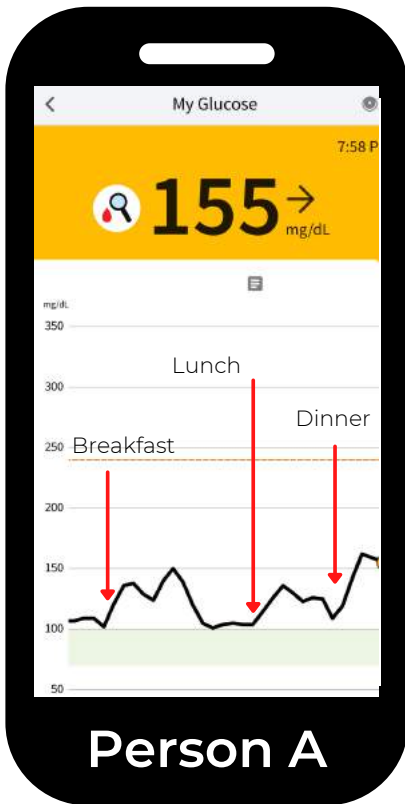
A TALE OF TWO DIETS

Person A's glucose before breakfast was hovering just over 100, so slightly high for a fasting BS, then after eating breakfast we see their glucose rise to 150, well above the desired maximum rise of 30 points. Also, note there's a double peak after breakfast - that can happen when the body is fighting hard to bring the glucose down, but their insulin response gets overwhelmed, and a second rise happens right away. You also see how long glucose remained elevated.

Then after lunch, we see a rise of about 40 points, and right as the glucose began to drop, it was dinner time and boom, blood sugar back up a good 50 points.

You see that Person A spent very little time in their day at lower blood sugar levels, and in fact, spent the whole day over "optimal" levels.

This person might not be diagnosed as diabetic by the mainstream medical system, but we can tell you that if someone's glucose looked like this most days, we'd be very worried about them!!

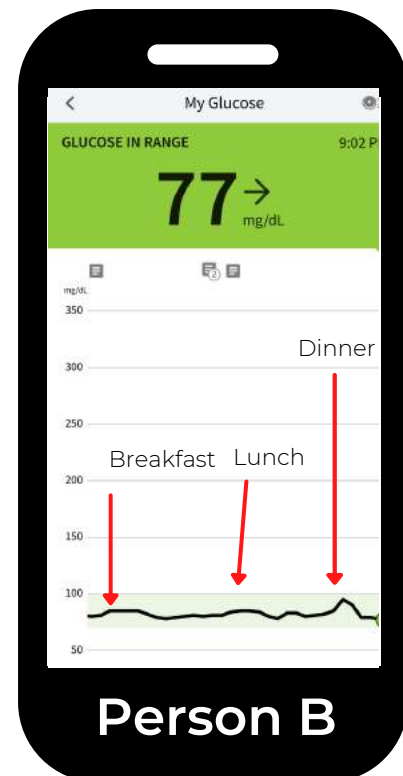


Person B's morning glucose was about 75, and after breakfast, it only rose a very small amount, maybe 5 points, and the same at lunch. The rises from her breakfast and lunch were so minor they are indistinguishable from natural variations without food.

There was a more definitive rise after dinner, about 15-20 points that then dripped back to pre-meal level very quickly.

Does someone have to be this flatlined to be healthy? No, some rise and fall are fine and natural, but there are many folks who find their glucose levels with very little fluctuations- especially when on a low carbohydrate diet.

While young, you might not see significant health differences with Person A and B, but over time, there would be a widening health gap, with Person A seeing a growing level of health deterioration.



SHOULD EVERYONE TRACK?

Ultimately, not everyone will find self monitoring of blood sugar useful. If you are active and metabolically healthy, with no history of blood sugar dysregulation, it's unlikely you need to monitor your blood sugar. However, we see no problem with someone in this state wanting to appease a curiosity and see how their body responds to certain foods. However, ongoing monitoring will be unlikely to provide much benefit once you've confirmed your food choices support good blood sugar management.

We believe blood sugar monitoring to have to most benefit for folks who are not seeing the type of glycemic control they think they should based on their diet. For instance , if someone doesn't understand why their A1C is higher than they think it should be, or they eat a mixed diet and aren't sure if that's ok for their body or not, a period of self exploration can be very useful!

Do I need to track forever?

Some folks freak out over the idea that once they start to track their glucose they'll need to do so forever. Don't fret on that one, it's not true. We are creatures of habit. We tend to eat the same thing over and over. So, if you track for 2 weeks or a month and see your body is responding well to your chosen foods, you can stop and rest easy in the knowledge that trend of good responses should continue.

If you find your body responding unfavorably to your choices, we'd continue tracking until you dial in the best options for your glucose ranges.

OVERTHINKERS BEWARE

I want to bring up one last issue with glucose self monitoring: Over-Thinking.

As we mentioned earlier, there's a limit to the precision and accuracy of these meters (and really all testing!) So if you are going to fixate about why your glucose went from 85 to 90 when you drank that thing... stop and evaluate your expectations. If the imprecision of the meter is going to eat at you, you might be causing yourself INCREASED harm by stressing over things that are out of your hands and actually don't really exist to begin with. You can not make meaning out of changes under the limit of the accuracy of your tools. Many folks try, but they are just spinning in the land of imagination. Keep to reality for sanity sake.

Many low carb folks have such flat lines on their CGM, they describe watching it akin to the excitement of watching paint dry.

HOW TO WIN AN ARGUMENT WITH YOUR DOCTOR

Your doctor should be a partner on your health journey, but it's unfortunately common that we hear from people that their doctor is highly resistant to ordering them the labs that they desire.

It's important to understand why your doctor is resistant, so that you can counter their issue properly.

Perhaps they don't want to order something because they don't know how to interpret that data because it's not a test they normally order - that's an opportunity to educate them. Ask them if they are open to learning more about that marker, and give them reasons it's a good idea.

Or maybe they think that your insurance won't pay for certain tests because they don't know how to code them. On the following page we've listed some IDC codes, these are codes a doctor can submit to insurance to increase the likelihood of getting tests paid for. Feel free to share with your doctor!

Or perhaps it's a test even with a code, they don't believe will be approved. If you are willing to pay cash for the cost of the test, you can tell your doctor you are fine paying directly (make sure you understand the cost of the test).

Doctors are human, but can always do better – like all humans. Requiring your doctor to be perfect is unrealistic. However, they have to be open to PARTNERING with you on your health journey.

Ultimately, just like in a dating relationship, you need to decide if your doc has "potential" and can be worked with. You need to think, "Is there growth potential here I am willing to invest in?"

In the short term, if a doctor refuses a test you want, tell them you need them to write in your chart that they refused to order the test. Many will be hesitant to do that, and will order the test for you.

But this is a short term solution to getting what you want.

Never forget, this is your one life to live. If your doctor will not work with you - find a new one who is open to being a great partner.

We also should mention that in 45 of the 50 US States, you can use services to order tests directly from places such as Own Your Labs, Ulta Labs, Quest Labs, and many others.

Insurance Codes

Please note: These reference codes will vary between lab companies; Listed below is LabCorp codes to submit to your insurance so they are covered.

ICD CODES	SYMPTOMS
R53.8	Fatigue
R07.9	Chest Pain
R73.9	Hyperglycemia
E16.2	Hypoglycemia
E88.81	Metabolic Syndrome
R63.5	Abnormal Weight Gain
R63.4	Abnormal Weight Loss
R03.0	Elevated Blood Pressure without Dx
E06.3	Autoimmune Thyroiditis
R68.82	Decreased Libido
E28.310	Menopause Symptoms
E29.1	Hypogonadism
G44.59	Headache
K76.0	Fatty Liver
R10.10	Upper Abd Pain
E04.9	Goiter
L30.9	Dermatitis, unspec
R06.02	Shortness of Breath
G31.84	Memory Loss
R45.84	Anhedonia

Thank you!

When we look around, we see that much of the world goes about life in denial about their declining health. Lack of awareness about what healthy looks like leaves us vulnerable to living a less fulfilling life. People will say, "Oh that's just part of getting older, can't do anything about it." These beliefs simply normalized poor health.

We've taken it on as our mission to make a stand and tell the world that they do not have to accept others' health limitations as fact. Just because a condition "runs in the family" or "everyone is on blood pressure medication" doesn't mean you have to accept that as your fate. More and more of us are coming to the awareness that rapid health decline doesn't have to be a given. When we take steps to change our habits, we change our future.

Congratulations on taking an active role in better understanding your health. By learning about different aspects of blood lab testing; knowing what questions to ask, and what baseline tests should be checked, you're building a path to a healthier and happier future.

While it is true that we can't change our genetics or health histories, we can change our expectations of what our best self can be. You now have a new set of health tools. You do not have to accept the status quo, and can ask more for yourself - and ask for more from your doctor.

We thank you for taking this journey with us.

In Health,
Dr. Ken Berry & Kim Howerton

The background of the page features a rack of test tubes. The tubes contain liquids of various colors: light blue, yellow, and a darker blue. The rack is dark grey and has the letters 'E' and 'B' visible on its sides. The overall lighting is soft and clinical.

QUICK REFERENCE LAB RANGES/REFERENCE GUIDE

The information provided within the following charts is for informational and educational purposes only and based off serum levels.

Please consult a healthcare physician before making any medication or lifestyle changes. These ranges are not designed to diagnose, treat, or cure any disease. Acceptance of these ranges varies based on practitioner.



Annual Labs List & Ranges

CMP tests reflect blood levels of proteins & electrolytes & glucose levels. These tests reflect the health of your liver, kidneys, bones, muscle cells, nerve and cell function.

TEST/PANEL	LABS	RANGE	UNITS	PERSONAL DATA
<p>COMPREHENSIVE METABOLIC PANEL (CMP)</p> <p>Reflect blood levels of proteins & electrolytes & glucose levels. These tests reflect the health of your liver, kidneys, bones, muscle, nerve and cell function.</p>	Albumin	STANDARD 3.50-5.50 OPTIMAL 4.0-5.0	g/dL	
	Albumin/Globulin Ratio	STANDARD 1.20-2.20 OPTIMAL 1.40-2.10	Ratio	
	Alkaline Phosphatase	STANDARD 39.0-117.0 OPTIMAL 70.0-100.0	IU/L	
	ALT (SGOT)	STANDARD 0.0-44.0 OPTIMAL 10.0-26.0	IU/L	
	AST (SGPT)	STANDARD 0.0-40.0 OPTIMAL 10.0-26.0	IU/L	
	Biliruben Total	STANDARD 0.0-1.20 OPTIMAL 0.10-0.90	mg/dL	
	BUN/Creatinine	STANDARD 9.0-20.0 OPTIMAL 10.0-16.0	Ratio	
	Calcium	STANDARD 8.70-10.20 OPTIMAL 9.20-10.0	mg/dL	
	Carbon Dioxide	STANDARD 20.0-29.0 OPTIMAL 25.0-29.0	MEq/L	
	Creatinine	STANDARD 0.76-1.27 OPTIMAL 0.80 - 1.10	mg/dL	
	Globulin, total	STANDARD 1.50-4.50 OPTIMAL 2.40 - 2.80	g/dL	
	Glucose (Fasting)	STANDARD 65.0-99.0 OPTIMAL 65.0 - 86.0	mg/dL	
	Potassium	STANDARD 3.50-5.20 OPTIMAL 4.00 - 4.50	MEq/L	
	Protein, total	STANDARD 6.0-8.50 OPTIMAL 6.90 - 7.40	mg/dL	
	Uric Acid (females)	STANDARD 1.4-5.8 OPTIMAL 2.5 - 5.50	g/dL	
	Uric Acid (males)	STANDARD 3.7-8.6 OPTIMAL 3.5 - 8.5	g/dL	
	Blood Urea Nitrogen (BUN)	STANDARD 6 .0 - 24.0 OPTIMAL 10 .0 - 16.0	mg/dL	
	Sodium	STANDARD 134.0-144 .0 OPTIMAL 134.0-144 .0	MEq/L	
Sodium to Potassium Ratio	STANDARD 30.0-35.0 OPTIMAL 30.0-35.0	Ratio		



CBC Labs List & Ranges

The CBC looks at levels of components of White and Red Blood cells to evaluate Infections, Allergic Reactions, Blood Volume, Oxygenation, blood clotting and Immune functions.

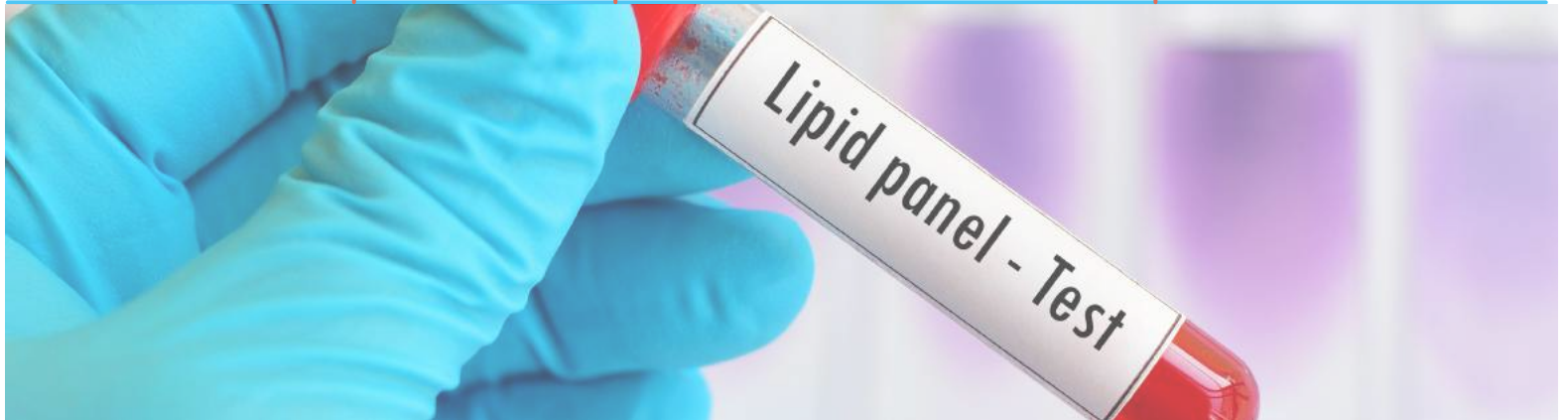
TEST	LABS	RANGE	UNITS	PERSONAL DATA
COMPLETE BLOOD COUNT (CBC)	White Blood Cells (WBC)	STANDARD 3.4 - 10.8 OPTIMAL 3.4 - 10.8	x10E3/uL	
	Red Blood Cells (RBC)	STANDARD 3.77 - 5.28 OPTIMAL 3.77 - 5.28	x10E3/uL	
	Hemoglobin	STANDARD 11.1 - 15.9 OPTIMAL 11.1 - 15.9	g/dL	
	Hematocrit	STANDARD 34 - 36.6 OPTIMAL 34 - 36.6	%	
	MCV	STANDARD 79 - 97 OPTIMAL 79 - 97	pg	
	MCH	STANDARD 26.6 - 33.0 OPTIMAL 26.6 - 33.0	%	
	RDW	STANDARD 12.3 - 15.4 OPTIMAL 12.3 - 15.4	x10E3/uL	
	Platelets	STANDARD 150 - 379 OPTIMAL 150 - 379	%	
	Neutrophils	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	Lymphs	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	Monocytes	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	EOS	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	Basos	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	Neutrophils (Absolute)	STANDARD 1.4 - 7.0 OPTIMAL 1.4 - 7.0	x10E3/uL	
	Lymphs (Absolute)	STANDARD 0.7 - 3.1 OPTIMAL 0.7 - 3.1	x10E3/uL	
	Monocytes (Absolute)	STANDARD 0.1 - 0.9 OPTIMAL 0.1 - 0.9	x10E3/uL	
	EOS (Absolute)	STANDARD 0.0 - 0.4 OPTIMAL 0.0 - 0.4	x10E3/uL	
	Baso (Absolute)	STANDARD 0.0 - 0.2 OPTIMAL 0.0 - 0.2	x10E3/uL	
	Immature Granulocytes	STANDARD & OPTIMAL NOT ESTABLISHED	%	
	Immature Grans (Absolute)	STANDARD 0.0 - 0.1 OPTIMAL 0.0 - 0.1	x10E3/uL	



Annual Labs Lipid Panel

What is often called a Cholesterol test is actually a Lipid Panel. A Lipid Panel measures Lipids in the blood. Lipids are fats and fatty substances that your body uses for energy. Typically on a basic Lipid Panel are cholesterol, triglycerides, HDL and LDL.

TEST	LABS	RANGE	UNITS	PERSONAL DATA
LIPIDS	HDL	STANDARD >39 OPTIMAL >50	mg/dL	
	LDL	STANDARD 0- 99.0 OPTIMAL (IT'S COMPLICATED)	mg/dL	
	VLDL	STANDARD 5.0 - 40.0 OPTIMAL (IT'S COMPLICATED)	mg/dL	
	Triglycerides	STANDARD 0.0 -149.00 OPTIMAL <100	mg/dL	



Annual Urinalysis

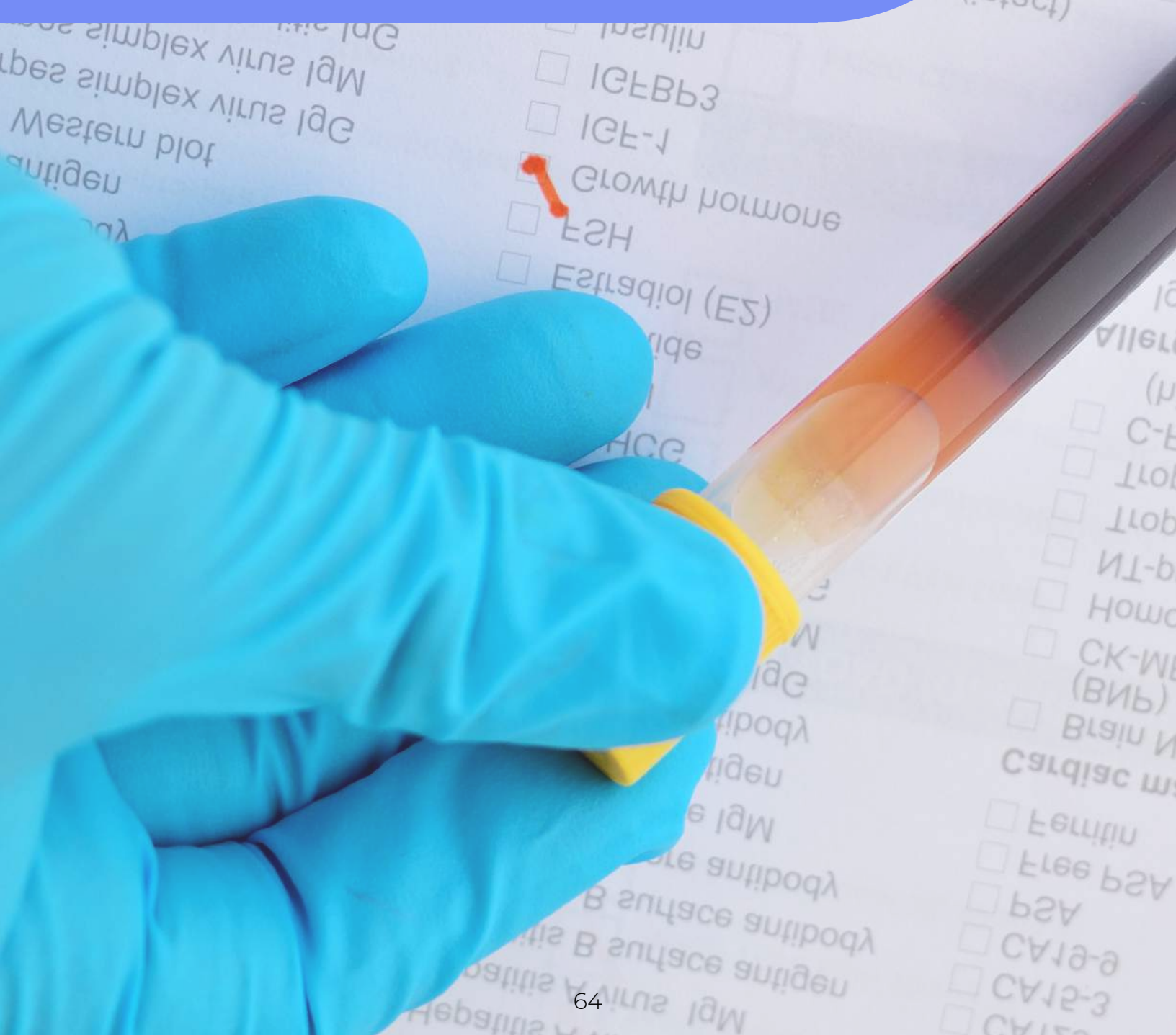
Urinalysis	SPECIFIC GRAVITY	1.005 - 1.030	
	PH	5.0 - 7.5	
	URINE COLOR	YELLOW	
	APPEARANCE	CLEAR	
	WBC ESTERASE	NEGATIVE	
	PROTEIN	NEGATIVE	
	GLUCOSE	NEGATIVE	
	KETONES	NEGATIVE	
	OCCULT BLOOD	IT DEPENDS	
	BILIRUBIN	NEGATIVE	
	UROBILINOGEN	0.2-1.0	mg/dL
	NITRITE, URINE	NEGATIVE	



Individual Test

TEST	LABS	RANGE	UNITS	PERSONAL DATA
INDIVIDUAL TEST	Magnesium serum	STANDARD 1.60 - 2.30 OPTIMAL 1.60 - 2.30	mg/dL	
	Phosphorous (Phosphate)	STANDARD 2.50 -4.50 OPTIMAL 2.50 - 4.50	mg/dL	
	DHEA - S Ranges for age and gender	MEN BY AGE STANDARD RANGE 30'S 120-550 40'S 95 -530 50'S 70-310 >60 42-175	mcg/dL	
		OPTIMAL RANGE: MEN ANY AGE 300-600	mcg/dL	
		WOMEN BY AGE STANDARD RANGE 30-39: 45- 270 40-49: 32- 240 50-59: 26-200 >60 13- 90	mcg/dL	
		OPTIMAL RANGE WOMEN (ANY AGE): 65-380	mcg/dL	
	Vitamin D 25	STANDARD 30.0 - 100. OPTIMAL 50.0 -100.0	ng/dL	
	Iron, Serum	STANDARD 40.0 - 160. OPTIMAL 85.0 - 130.0	nmd/L	
	Homocystine	STANDARD 0.0 - 25.0 OPTIMAL 0.0- 7.20	nmd/L	
	Ferritin	STANDARD 15.0- 150.0 OPTIMAL 30.0 - 70.0	ng/mL	
	hsCRP	STANDARD 0-3.0 OPTIMAL 0 - 1.0	mg/L	
	ESR (sed rate) male	STANDARD 0 - 32.0 OPTIMAL 0 - 20	mm/hr	
	ESR (sed rate) female	STANDARD 0-30.0 OPTIMAL 0 - 18.0	mm/hr	
	C-Peptide	STANDARD 1.0 - 4.4 OPTIMAL 0.5 - 1.6	ng/dL	
	Insulin, Serum (Fasting)	STANDARD 2.6 - 24.9 OPTIMAL 2.0 - 5.0	uIU/mL	
	hbA1C	STANDARD 4.8 -5.6 OPTIMAL 4.5 - 5.4	%	
GGT	STANDARD 0.0 - 65.0 OPTIMAL 10.0 - 30.0	IU/L		
TSH	STANDARD 0.45 - 4.5 OPTIMAL 0.5- 2.0	uIU/mL		
Urine Iodine 24 hr	STANDARD 100 - 460 OPTIMAL 150 - 460	mcg		

DEEPER DIVE MORE COMPLEX HORMONES





Thyroid

TEST	SPECIFIC TEST	RANGE	UNITS	PERSONAL DATA
THYROID (FULL LIST)	T4, free	STANDARD .82-1.77 OPTIMAL 1.00 - 1.50	ng/dL	
	T3, free	STANDARD 2.0-4.4 OPTIMAL 3.0 - 3.5	pg/mL	
	Reverse T3	STANDARD 9.2 - 24.1 OPTIMAL 7.0 - 9.0	ng/dL	
	TSH*	STANDARD 0.450-4.50 OPTIMAL 0.5 - 2.0	uU/mL	
	Thyroid Peroxidase	STANDARD 0 .0 - 34.0 OPTIMAL 0.0 - 6.00	IU/mL	
	Thyroglobulin Antibodies	STANDARD 0.0 - 0.90 OPTIMAL 0.0 - 0.90	IU/mL	

*Note: We find, in most cases, people with hypothyroidism who are on medication feel their best with TSH below 1.0, and in some cases, even below the optimal range lower threshold. Dialing in your dosage with your doctor should include finding the range you feel most optimized.





Male Specific Hormones

TEST	LABS	RANGE	UNITS	PERSONAL DATA
SEX HORMONE PANEL	Free Testosterone, direct	STANDARD 9.3-26.5	ng/mL	
	Total Testosterone	STANDARD 264.0-916.0 OPTIMAL 500.0-1100.0	ng/mL	
	SHBG (Sex Hormone Binding Globulin)	0-49 Y OLD 16.50-55.9 49+ Y OLD 19.3-76.4	nmol/L	
	Zinc	STANDARD 56.0-134.0	ug/dL	
Add if over 50	PSA (Prostate-specific Antigen)	STANDARD 0.0-4.0	ng/mL	





Female Specific Hormones

TEST	LABS	RANGE	UNITS	PERSONAL DATA
SEX HORMONE PANELNEL FEMALE	Total Testosterone	PREMENOPASUAL 10.0-55.0 PREMENOPASUAL 7.0 -40.0	ng/mL	
	Estrodiol	FOLLICULAR PHASE 12.5 - 166.0	ng/mL	
		OVULATORY PHASE 85.8 - 498.0	ng/mL	
		LUTEAL PHASE 43.8- 211.0	ng/mL	
	Progesterone	POSTMENOPAUSAL <6.0 -54.7	ng/mL	
		FOLLICULAR PHASE 0.1 - 0.9	ng/mL	
		OVULATORY PHASE 0.1 - 12.0	ng/mL	
		LUTEAL PHASE 1.8 - 23.9	ng/mL	
	Sex Hormone Binding Globulin	POSTMENOPAUSAL 0.0-0.1	ng/mL	
		0-49 Y OLD 24.6 - 122.0 49+ Y OLD 17.3 - 125.0	nmol/L	
Menstrual Cycle Stages	For a 28 day cycle (if longer or shorter, adjust day # slightly)	Follicular Phase Day 1-7 ish		Day 1= Starts on first day of period
		Ovulatory Phase Day 12-17 ish		
		Luteal Phase Day 18-28 ish		

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