

# **NCI**

*Nutrition Coaching Specialist*

---

## **LEVEL 2 CERTIFICATION**

BY  
Jason Phillips  
&  
Travis Zipper



## **Nutritional Coaching Institute Legal Disclaimer**

The ideas, concepts and opinions expressed in all Nutritional Coaching Institute books are intended to be used for educational purposes only. The books are provided with the understanding that authors and publisher are not rendering medical advice of any kind, nor are the books intended to replace medical advice, nor to diagnose, prescribe or treat any disease, condition, illness or injury.

It is imperative that before beginning any diet or exercise program, including any aspect of the Nutritional Coaching Institute program, you receive full medical clearance from a licensed physician.

Authors and publisher claim no responsibility to any person or entity for any liability, loss or damage caused or alleged to be caused directly or indirectly as a result of the use, application or interpretation of the material in the books.

References are provided for informational purposes only and do not constitute endorsement of any websites or other sources.

The Food and Drug Administration has not evaluated the statements contained in any Nutritional Coaching Institute books.

# A Note From Jason...

Welcome back to The Nutritional Coaching Institute!

If you are in possession of this text, it means a few things:

- 1.** You are still awesome, likely even more awesome than you were when I told you that in the Level 1 manual.
- 2.** You still desire to create impact, which is definitely awesome.
- 3.** You are ready to take your knowledge and your application to the next level.
- 4.** You are ready to become an NCI Level 2-certified coach, which means that you are also attending a Level 2 event.

Just like with the Level 1 manual, this text is not meant to be an independent resource. While we have taken the time to provide you with a comprehensive resource, we continue to emphasize practical application in conjunction with knowledge to make you the best coach you can be. For this reason, this book should be used along with your notes from the lecture in real-life coaching.

## **Science + Application = Results**

Welcome to the next level of SUCCESS!

— Jason

A handwritten signature in black ink that reads "JASON PHILLIPS". The signature is stylized with a large, sweeping initial "J" and "P".













# Table of Contents

<b>Introduction to Level 2:</b> The Role of a Level 2 Coach	2
<b>Section 1: Science</b>	
<b>Chapter 1:</b> Periodization Revisited - Understanding Metabolic Adaptation and Body Fat Overshooting	6 - 9
<b>Chapter 2:</b> Dieting – What Really Works?	10 - 13
<b>Chapter 3:</b> The HPA Axis and Its Role in Dieting	14 - 22
<b>Chapter 4:</b> The Endocrine System and Its Role in Dieting	23 - 31
<b>Chapter 5:</b> Sleep and the Dieting Process	32 - 36
<b>Chapter 6:</b> The Gut Microbiome	37 - 48
<b>Chapter 7:</b> Metabolic Adaptations that Affect Fat Loss and Overcoming Them	49 - 56
<b>Section 2: Application</b>	
<b>Chapter 8:</b> Client Communication, Establishing the Process, and Creating the Vision	60 - 65
<b>Chapter 9:</b> Specialty Protocols	66 - 74
<b>Chapter 10:</b> Advanced Aesthetic Protocols – Peaking	75 - 78
<b>Chapter 11:</b> Performance-Specific Protocols	79 - 82
<b>Chapter 12:</b> Longevity-Specific Protocols	83 - 92
<b>Chapter 13:</b> Reading and Understanding Lab Work	93 - 108
<b>Chapter 14:</b> Advanced Case Studies	108 - 117

# Introduction to Level 2

CONGRATULATIONS, and WELCOME BACK to The Nutritional Coaching Institute.

First of all, I would be remiss to not send a sincere THANK YOU for your trust in our educational services and your desire to create a real IMPACT in our world.

Second, I must commend you on your desire to continue your quest for knowledge. The coaching world as we know it is becoming increasingly competitive, so we, as coaches, must continue to distinguish ourselves by our ability to create solutions for EVERY BODY.

At this point you already know the power you possess as a coach:

The power to change lives.

The power to inspire.

And the power to create success far beyond the physical results seen from a diet.

Most importantly, you recognize that this power comes from your ability to properly APPLY all of the knowledge that you accumulate.

This course will continue to emphasize the same fundamental principles—but with higher-level concepts and higher-level applications.

*Enjoy!*

## The Role of a Level 2 Coach

In Level 1, you learned that you are a nutrition COACH, not a nutritionist, nutrition guru, or any other crazy buzz term that currently exists in our society.

The role of a COACH is to work with a client through the process. This does not mean simply providing macronutrient prescriptions; it goes far deeper. In this Level 2 course, you will learn to help your clients with some of the larger issues we see in society today. From hormonal issues to gut health, to understanding dietary protocols and reading lab work, a Level 2 coach is equipped with the knowledge to truly guide a client through anything they will encounter.

As with all things coaching, context remains king, and everything you are about to learn MUST be applied properly to the individual clients you will encounter. Just as you learned in Level 1, knowledge is not enough; APPLICATION is where success truly lives.

Welcome to the next level of application, and congratulations in advance on the results you will be creating!





# Section 1: Science

**Chapter 1: Periodization Revisited - Understanding  
Metabolic Adaptation & Body Fat Overshooting**

**Chapter 2: Dieting – What Really Works?**

**Chapter 3: The HPA Axis and Its Role in Dieting**

**Chapter 4: The Endocrine System and Its Role in Dieting**

**Chapter 5: Sleep and the Dieting Process**

**Chapter 6: The Gut Microbiome**

**Chapter 7: Metabolic Adaptations that Affect  
Fat Loss and Overcoming Them**

# Chapter 1: Periodization Revisited -

## Understanding Metabolic Adaptation And Body Fat Overshooting

This manual is being written in 2019. Gym memberships are at an all-time high, yet so is obesity. Where is the disconnect?

If we dig a little deeper, we will see that the number of “diets” in our society is also at an all-time high.

This inspires us to ask an alarming question: is our continued pursuit of fitness and nutritional success actually making us FATTER?

Well, in short, the answer, to some degree, is YES!

We know by now that all diets work—in the short term.

However, sustained success only comes through a periodized model, one that accounts for the effects of each dietary endeavor.

As a coach, your role is to not only focus on the end result of the diet, but also to understand the physiology that changes with your client as their diet progresses. Recall from Level 1 that we call this understanding “biofeedback.”

In a periodized model, an active dietary phase is followed by a “post-season” phase, which allows for an individual to restore homeostasis.

Unfortunately, periodized models are not the norm, and what we traditionally see in our culture is a “DIETING” or “NOT DIETING” mentality. More simply stated, we see individuals severely restricting themselves or not caring at all what they consume. There seems to be no middle ground and no entry or exit points of diets.

While this may seem insignificant, it is actually the foundation for the obesity trend due to what is known as “body fat overshooting.”

Dietary endeavors create compensatory physiological change by the body. Every time a diet begins, is sustained, or even completes, the potential to regain fat is greater than it was before the diet. Even worse, the amount of fat gained and the pace at which fat is gained after a diet is greater and faster than pre-diet rates.

**MORE ABILITY TO GAIN FAT + FASTER FAT GAIN = OBESITY TREND**

Here's an alarming statistic for us to consider: diets have less than a 5% success rate! If that's not bad enough, let us also consider that at least 30% of individuals that undertake a diet will not only regain any weight lost, but likely gain EVEN MORE! Lastly, data shows us that there is a correlation between the number of diets attempted and weight GAINED. The more diets an individual has attempted in his/her lifetime, the more likely he/she is to have actually gained weight from their original starting point. (This was actually studied in identical twins. The twin that dieted more frequently GAINED more weight than their sibling.)

Let's briefly examine what happens when a diet begins.

When a diet is structured properly and a calorie deficit is created, weight loss will happen. But our examination needs to go deeper. What is really happening is the beginning of a series of compensatory actions by the body internally to return the body to set point, or homeostasis. It is important to remember that the inner workings of our bodies do not comprehend the culture that we live in today. They don't realize the extreme accessibility to energy (calories) that we have. Instead, when a calorie deficit is created, the body recognizes it as a time of famine and immediately guards against it.

This "defense" is what we refer to as metabolic adaptation, and it includes alteration of several things, ranging from hormone levels to energy levels, as well as performance and recovery. Recall from the Level 1 course that these changes resulting from metabolic adaptation will affect ALL FOUR areas of Total Daily Energy Expenditure:

- BMR
- Exercise Activity Thermogenesis
- Non-Exercise Activity Thermogenesis
- Thermic Effect of Feeding

What you may not realize at this time is that our ability to lose weight is not the only thing affected by a dietary process. Instead, we also need to begin looking at what happens AFTER the diet (calorie deficit). Research is making it relatively clear that after a period of time spent in a calorie deficit, our bodies will not only regain weight (fat) FASTER, but can also gain the ability to create MORE fat cells than we had prior to our time spent in the calorie deficit.

Finally, consider the fact that we are "teaching" our bodies to guard against future deficits every time we actively undertake a deficit.

So although dieting, or actively creating a calorie deficit, is absolutely the only way to create weight loss, we MUST understand that there are future ramifications that will need to be addressed through future dietary phases (hint: periodization).

*\*\*INTERESTING FACT: Dr. Layne Norton recently pointed out that the contestants from “The Biggest Loser” TV show became so metabolically adapted that even after regaining the majority of the weight that they lost on the show, their BMR remained suppressed for SIX YEARS following such extreme diet and training protocols.\*\**

Now let’s be clear about something: This chapter is obviously not being written to suggest that we shouldn’t diet. It’s intended to create awareness. From a dietary application standpoint, knowing how many times a person has attempted to “diet” can explain a lot of frustration with their current inability to lose weight. In fact, the presence of metabolic adaptations is usually associated with one of three factors:

- How large of a calorie deficit is imposed.
- The duration an individual lives in a calorie deficit.
- Number/severity of previous dietary attempts.

When we created the periodized model of nutrition, we understood that restoring homeostasis between subsequent dietary attempts was critical. This allows for multiple diets in an individual’s lifetime, each with the ability to yield the dietary success that the person desires.

However, as previously stated, periodization is rarely observed.

This leaves us with:

- A BMR that has not recovered, and is lower than what it should be relative to our predictive equations.
- NEAT that is reduced.
- EA that is reduced.
- TEF that is largely unaffected, but is reduced solely based on the fact that we are consuming less calories.

But, as we have already noted, the adaptations extend far beyond just the components of Total Daily Energy Expenditure. We are also looking at the following hormonal adaptations:

- Decrease in Leptin (satiety hormone)
- Decrease in T3 and increase in TSH
- Increase in Ghrelin (hunger hormone)
- Increase in cortisol production leading to HPA Axis issues (testosterone, estrogen, etc.)

Combined, we have a combination of physical and physiological adaptations that



guard against weight loss as a survival mechanism but also make it EASIER to regain MORE FAT at a FASTER RATE.

And just because our physiology really loves to kick us when we are down, studies show that post-diet FAT regain is most prominent in the midsection, while post-diet LBM regain is most prominent in the extremities.

### **How and why does this happen?**

It's very important to understand that fat loss typically involves the shrinking of fat cells, not eliminating them. While fat-cell turnover does exist in the body, it is very tightly regulated by the body to keep the overall number consistent.

However, in the period following caloric restriction, our bodies are prone to production of pre-adipocytes, or early production of new fat cells.

This becomes a major problem with repeated dietary attempts.

Every time someone “falls off the wagon,” they are potentially adding new fat cells. At some point, when they “give up” on their dietary pursuits, they begin overfeeding MORE fat cells and will ultimately end up surpassing their start weight and original level of body fat. This higher weight and level of body fat becomes the new “set point” (or homeostasis) and the point at which the body will fight to remain at.

So yes, repeated dietary efforts CAN (and do) make us fatter if executed improperly.

In summary, as we begin our deep dive into the understanding of more advanced nutritional protocols, it is important to remember the foundation upon which all things are built.

Diets **MUST** be sustainable.

Diets **SHOULD NOT** be a short-term fix for anything.

Diets **SHOULD** include an “entry” and an “exit.”

Repeated diets are among **THE WORST** things that anyone can undertake.

NCI Level 2 coaches understand that periodization is the foundation upon which all successful protocols are built, and it will go a long way in preventing the negative effects associated with the dietary process.

# Chapter 2: Dieting - What Really Works?

At this point, you understand that “diets” do not work. Instead, we need a system that evolves as an individual progresses or does not progress. We know that this system must account for the changes that occur both physically and physiologically from the previous phase and must set us up for future success. But what does science tell us actually works, and has successful dieting actually even been studied?

While no studies (to our knowledge) have ever been created purely to observe the best dietary practices, there have been several studies conducted with optimal dietary results from which we can deduce successful strategies.

The following strategies have been put together after reading through thousands of studies and determining the underlying traits that made the subjects successful.

*NOTE: There are no direct “diets” in here, as that will always continue to be relative to the individual, but from a foundational standpoint, these are the strategies that seem to be consistent among every individual that is creating success.*

## 1 - Education

In the Level 1 course, you learned the phrase “Education Drives Compliance.” This is not by accident, as education is the No. 1 variable that must be in place if you desire to create a successful dietary journey for your clients.

Unfortunately, as we also know, there is an abundance of education that already exists in the media and on the Internet. For this reason, we need to make sure that the education we are providing our clients with is relative to THEIR journey.

To a large degree, this comes down to helping clients understand EVERYTHING that will be a part of their dietary endeavor.

We, as professionals, tend to understand that sacrifice will be necessary. We know that a calorie deficit is required, foregoing the pizza and beer at social events will need to happen, and sometimes lacking energy and motivation will be a part of more extreme diets, but do our clients know this?

In short, they likely have some idea, but very rarely do they choose to acknowledge or accept this in the early stages of their diets.

To combat this, we need to execute on the PRE-SEASON protocol.

This will involve understanding what sacrifices a client is willing to make over the course of their journey.

- If a client doesn't like the idea of not having a carb for 12 weeks, KETO is probably a bad idea.
- If a client never wants to weigh or measure food, MACROS might not be the best protocol.
- If a client "needs" daily chocolate, a food-quality emphasis may not work so well.

At the end of the day, education must be shared between coach and client. We, as coaches, need to educate ourselves on what our clients truly desire and need in their protocols, and clients need to understand more about the process they are about to get into.

## 2 - Extreme Ownership

If Jocko can use this as the title of his book, it certainly is fitting of a trait of a successful dieter.

In the Level 1 course, you learned all of the science necessary to create a diet that will work.

However, you are reading (and attending) this course and still experiencing difficulty with some clients, so clearly there is more to the equation than a perfect, science-backed set up.

In line with No. 1, we need to educate our clients, but we also need to help them understand that THEY control the fate of their diet.

Not the food. Not the universe. Not their trainer or coach—but THEM.

As coaches, we must create parameters for them to consistently be aware of whether or not they are truly owning the process, and this can be accomplished in a few ways:

1. Ask process-oriented questions. Ensure that you are asking questions relating to preparation and execution rather than outcomes. This will keep your clients engaged in the PROCESS, which as we know, is where success lives.
2. Provide self-monitoring goals. Obviously we can't be with our clients day in and day out to get them on the scale, monitor their macro intake, and subjectively assess their biofeedback. For this reason, we need to ensure that our clients WILL do these things. Most coaches utilize tracking documents here in an effort to get the daily reporting

needed, but any method that creates the empowerment needed to facilitate self-monitoring will work and is necessary.

3. What will YOU do with your clients to keep them owning the process?

### **3 - Understanding Output**

This is really an extension of No. 1, but it needs to be noted slightly separately. Studies suggest that individuals that engage in regular physical activity have a much higher chance of sustaining their fat loss than those who are sedentary.

Not really a big surprise here, but we need to understand the context of this.

“Regular physical activity” from a societal standpoint continues to evolve. If you are reading this book in 2019, modalities of training are at an all-time high relative to intensity. Perhaps in 2024, just 5 years later, we will see another level of intensity, or we will see our culture finally wake up to the fact that increased intensity does not equal increased results.

The simple truth is that we don’t know what the trends will be, and for this reason, UNDERSTANDING OUTPUT becomes king.

Yes, we should absolutely be advising our clients to work out during their fat-loss endeavors, but we must also educate them on the importance of fuel and recovery in this phase.

From a physiological standpoint, this makes sense. By matching up the appropriate fuel source to the exercise modality and ensuring an adequate environment of recovery, we are minimizing the shift from set point that the body perceives. In turn, we will minimize any adaptive response that the body may be prepared to create.

Additionally, from a purely observational standpoint (but empirically this has been shown to be true), individuals who engage in regular exercise also tend to be more disciplined. We know that sustained changes in one’s life (dietary or otherwise) will always require discipline.

### **4 - Structure**

The number of dietary protocols in existence today continues to rapidly increase. From Keto to carnivore, fasting to vegan, and who knows what else in between, the “options” for a dieter are endless.

While we know this poses several problems, we need to take a step back and recognize WHY so many diets DO work.

Simple: They provide STRUCTURE.

This section is not being written to agree or disagree with any method in existence, but rather to inform that there is validity in virtually all approaches—most specifically because they provide a structure and framework for an individual to live within.

Freedom is always a great idea, but infinite freedom only leads to distraction and complacency. For some, there is too much freedom in flexible dieting, yet for others, it is the exact freedom they need.

Regardless, what we must observe from a distance is simply a need for the APPROPRIATE structure.

## **5 - Periodization, Target Setting, & a Big-Picture**

### **Approach**

As stated previously, and several times in the Level 1 course, periodization is king when it comes to creating SUSTAINABLE results. Obviously, each phase will produce results on a micro level, but when we begin looking for LONG-TERM, sustained results, we must be operating within a framework that allows for recovery and future progression.

The unspoken magic of periodization is the ability to create micro targets for clients.

Telling a client that they will see fat loss in a year after successfully reverse dieting, then actively pursuing fat loss, is not an easy conversation to have. It is even harder for the client to comprehend that while PAYING YOU to lose fat, they must first GAIN WEIGHT. This can lead to a lack of compliance, and subsequently a lack of results.

However, by setting micro targets you are more likely to facilitate compliance.

It is important to note that these short-term targets do not always have to be outcome-oriented, and in most cases probably should not be.

Instead, consider having your clients simply commit to ONE ACTION for 5 days. Regardless of the outcome, make sure that he/she knows how well they did by actually completing the assigned task.

Then, follow this with another short-term target, and again, remind your client of their success for meeting this target.

Repeated wins will build momentum, and momentum usually carries the correct mindset to adhere to a long-term vision.

# Chapter 3: The HPA Axis

## and Its Role in Dieting

### What Is the HPA Axis and What Functions Does It Play in the Body?

The hypothalamic pituitary adrenal (HPA) axis is the master and commander that controls the body's stress response system. The HPA axis is a powerful and always-adapting organization that connects a person's central nervous system and their endocrine system.

#### How Does the HPA Axis Work?

It all starts with the hypothalamus region of the brain, as it is the hypothalamus that serves as the control center for most of the body's hormonal systems. The cells in the hypothalamus create a hormone called corticotropin-releasing factor (CRF) as a reaction to a stressor that may be physical, psychological, emotional, or even chemical. When CRF is secreted, it joins to certain receptors in the pituitary gland, which in response to the CRF produce another hormone called adrenocorticotrophic hormone (ACTH). From that point, ACTH travels to the adrenal glands and stimulates the creation of all the adrenal hormones from the building block materials which consist of mostly cholesterol, some converting enzymes and vitamin B5 that is a cofactor.

The two adrenal glands are responsible for the creation of the body's stress hormones. The adrenal gland's two parts are made up of the inner medulla and an outer cortex. The medulla, or inner portion, creates and releases adrenaline and noradrenaline, also commonly referred to as epinephrine and norepinephrine. The outer cortex of the adrenal glands, which consists of 3 different layers, produces aldosterone in the far outermost layer, cortisol in the middle layer, and the body's sex hormones in the inner layer, the largest one being DHEA.

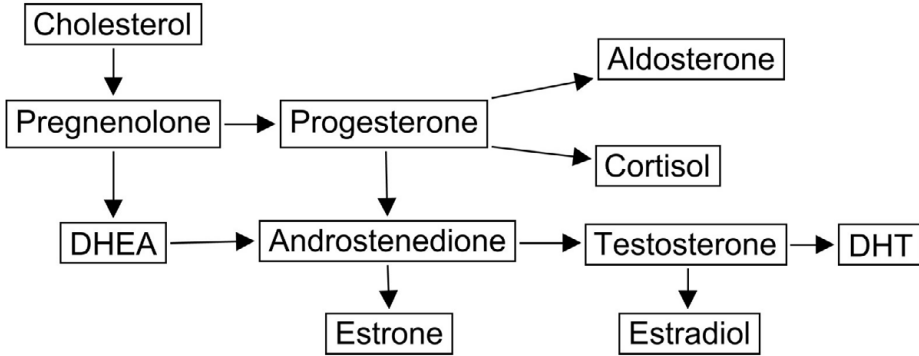
### Negative Feedback Regulation

The release of the adrenal hormones initiates a series of metabolic end products that all have the goal of reducing the negative consequences of stress, and they are referred to as negative feedback loops. As a result of these negative feedback loops, or when the body senses that the stressors that initiated the stress response have been removed or are gone, they trigger both the hypothalamus and the anterior pituitary to reduce the concentration of ACTH, which results in the decrease of the production of adrenal hormones, thus hopefully returning the body back to a state of balance called homeostasis.

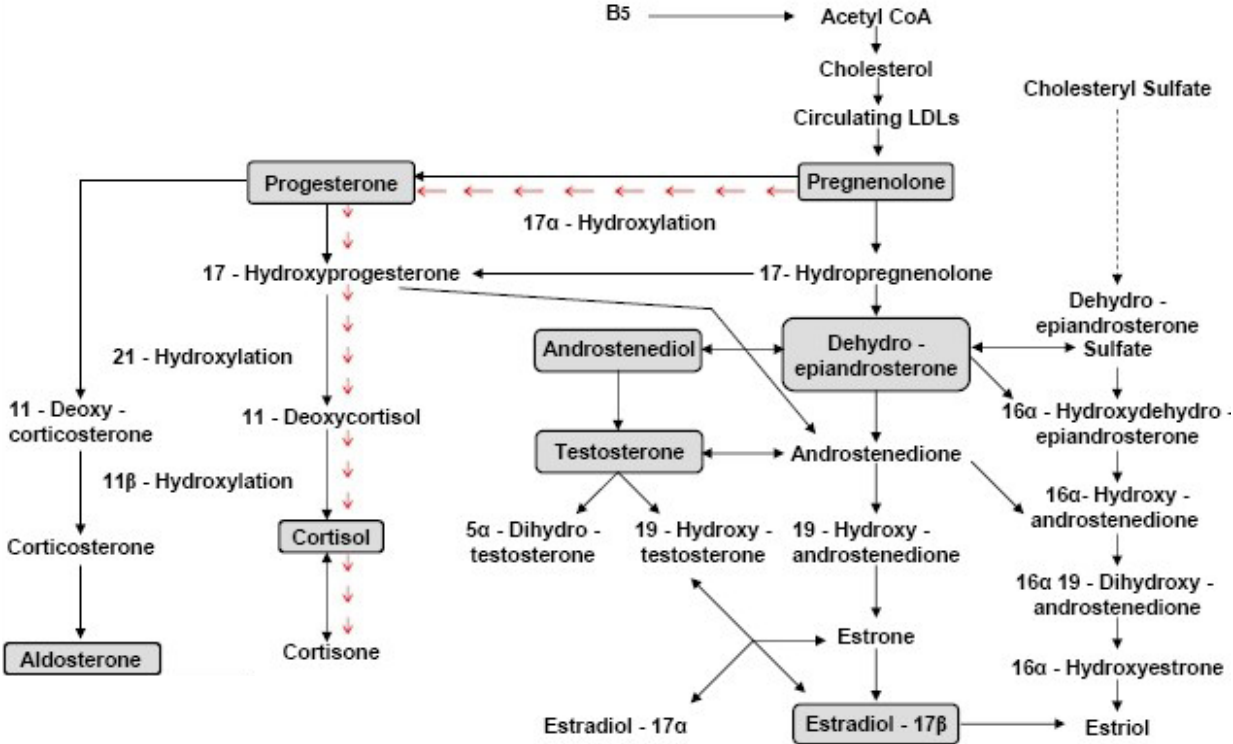
# Adrenal Hormones

All of the body's hormones are created from the mother of all hormones known as pregnenolone. The body's primary stress hormone, which has the largest impact on the body's stress response, is the hormone cortisol. Cortisol is a glucocorticoid that is created through a process of the conversion from pregnenolone to progesterone, eventually ending up as cortisol. Please refer to the following pathway charts.

## Simplified Hormone Pathway Chart



## Extended Hormone Pathway Chart



Cortisol is secreted naturally in the body, normally in the highest quantities in the morning hours around 8 a.m. and in the lowest amounts in the late evening from around 8 p.m. to midnight.

Here are some other facts with regards to cortisol:

- Stimulates the breakdown of fat and protein for conversion into glucose, hence the term glucocorticoid. “Gluco” means glucose, and “corticoid” means steroid hormone.
- It serves as the body’s primary anti-inflammatory substance. It does so by reducing the inflammatory response of the immune system.
- It counters the actions of insulin, and its production elevates blood pressure levels.
- It has a suppressing effect on the immune system by subduing the formation of immune cells, called T-cells.
- Extended periods of cortisol secretion can result in muscle wasting, elevated blood sugar levels or hyperglycemia, suppression of the immune system function, and increased belly or visceral fat accumulation.

## What Happens in the Stress Response

There are two major hormonal systems that get activated in the body’s stress response:

- Primary Catecholamines system
- Secondary Cortisol system

The reason that the Catecholamines are referred to as the primary system is because that system prepares the body to react to the stressor and takes effect in mere milliseconds. Cortisol, referred to as the secondary system, assembles and mobilizes energy (which is mostly glucose, but can be other substances) in order to fuel the action of the body in response to the stress or stressors.

The Catecholamines’ preparatory effects consist of increasing a person’s heart rate so more blood can return to the heart, increasing blood pressure, dilating the pupils to let more light in, and dilating the blood vessels of the skeletal muscles allowing them to take up more oxygen and fuel.

The physical effects of cortisol do more to increase the body’s blood sugar levels by encouraging glucose formation and reducing insulin production from the pancreas, with the purpose of preventing glucose uptake from peripheral tissues. Lastly, it steps up the release of fatty acids and cholesterol in the bloodstream so that it can better fuel the body in relation to a stressful situation.

The steps previously mentioned are how the body deals with a stressor. However, the current human body is not meant to deal with chronic stress. Instead, it is



meant to deal with a stressor and when the stressor is removed, fall back into a state of balance or homeostasis.

During the initial stages of adrenal stress, higher amounts of cortisol will be created in order to keep up with the demand of stress in the body. However, when the stress or stressors continue over time and do not let up, it forces the adrenals to have to work even harder in order to produce more and more cortisol as the body will build up a tolerance to it - just like what happens in insulin resistance. When the body decides that it can no longer continue to release the excessive amounts of cortisol, this is where adrenal dysfunction occurs in the body or when the common term referred to as “Adrenal Fatigue” takes place.

HPA axis dysfunction takes place as a protective mechanism in the body due to the fact that the body just cannot keep creating and releasing cortisol. By doing so, it will eventually break the body down into nothing due to the fact that cortisol is a catabolic hormone.

## What Is Stress?

Stress is technically defined as any force that tends to strain or deform. It can be in a physical, chemical, or emotional form, or any factor for that matter, that can instigate biological or mental tension, or that can influence the formation of a diseased state.

Stressors come in many forms. Physical stressors include fractures of bone, muscle tears or ruptures, or the compression of nerves. There can also be emotional/mental stressors such as anxiety, fear, worry and even excitement. Third, there are chemical stressors like environmental toxins, infections, cigarette smoke, prescription drugs, vaccines, and heavy metals. Lastly, there are what are referred to as predestined stressors. These can include thoughts of the future, feelings about a person’s career or their family, or even their home environments. These are usually types of stressors or factors that cannot be completely removed or avoided.

### **Additional and Potential Sources of Stress:**

- Anger, fear, worry/anxiety, depression
- Guilt
- Overwork
- Physical and mental strain
- Excessive exercise
- Sleep deprivation
- Light-cycle disruption
- Being awake during the late hours
- Surgery
- Trauma/injury

- Whiplash – head injury
- Inflammation
- Pain
- Temperature extremes
- Toxin exposure
- Hidden infections
- Environmental chemicals
- Heavy metals
- Electromagnetic fields (EMFs)
- Radiation
- Nutrient malabsorption
- Illnesses
- Low blood sugar/hypoglycemia
- Poor diet
- Allergies
- Mold and pollens

The above list is large and there are actually many more that could probably be added to it. However, the important part is to understand the effects that stress has on the body while also understanding that it can come in many hidden forms. As a health coach, it becomes important to first identify stress and then secondly, understand the far reach that it can have on all of the systems of the body.

## How the HPA Axis Affects All of the Other Body Systems

The HPA Axis has quite a far reach as the evolutionary process has molded the body in ways that will better help it survive. It does so by diverting certain resources and conserving others. It is that very diversion and conservation of resources that have allowed the human species to evolve into what we are today. The specific areas in which the HPA axis casts its far reach include :

- **Carbohydrate Metabolism** including maintaining glucose balance in the body.
- **Metabolism of fat and protein** including protein turnover, mucosal surface integrity, body weight, and fat distribution.
- **Musculoskeletal health** including muscle integrity and connective tissue turnover.
- **Neural tissue health** including memory and learning, neuron connectivity, quality of sleep, and mood.
- **Endocrine function** including thyroid function, pancreas function, and

gonadal hormone levels.

- **Detox capacities** including heavy metals and toxins.
- **Eicosanoid Modulation** including immune regulation and pro/anti-inflammatory states in the body.
- **Gastrointestinal Function**

The majority of the times when any of the above systems become out of balance is due to the delicate balance of cortisol to DHEA (dehydroepiandrosterone) becoming skewed, with most of the time that being in the favor of elevated cortisol to DHEA levels.

The most impactful areas that can be directly affected by an improper cortisol to DHEA ratio are a person's sex hormone production, or the Hypothalamus-Pituitary-Gonadal Axis (HPG), the Hypothalamus-Pituitary-Thyroid Axis (HPT) or thyroid function, immune system modulation, a person's mood and mental state, and lastly, their GI function. These are all areas that can be highly impacted by an imbalance in the cortisol to DHEA ratio, which is only exasperated by any form of HPA Axis dysfunction.

### **HPA Axis and Sex Hormones**

To begin with the necessities, what is the Hypothalamus-Pituitary-Gonadal Axis (HPG) axis and what are hormones? Simply put, the HPG axis controls the creation and release of the sex hormones in the body. Hormones are the chemical messengers of the body that play the role of interconnecting the brain and the different organs. Hormones synchronize almost every aspect of the human body from hunger control to the stress response, all the way to a female's menstrual cycle.

The primary role of the HPG Axis is to regulate reproductive functions in the body. It is also important for the development of both male and female sexual characteristics during puberty and into old age, and it has a large impact on the immune system. The HPG axis works through the hypothalamus creating and releasing gonadotropin-releasing hormone (GnRH), as it is the GnRH that signals the pituitary gland to secrete two super important hormones: luteinizing hormone (LH) and follicle-stimulating hormone (FSH). It is the LH and FSH that communicate with the sex organs of both men and women in order to create estrogen, progesterone and testosterone. When a person has any form of HPA Axis dysfunction, one of the first areas that gets resources diverted away from it is the body's reproductive functions. The process of doing so should make sense as when the body is attempting to deal with a stressor, the last thing that it should be thinking about is reproducing. There are actually many different ways that the production of a person's sex hormones can be influenced by lifestyle factors such as a person not getting enough sleep, being overweight or obese, or eating the

Standard American Diet (SAD). Unmanaged stress, however, definitely takes the top slot as the number one factor contributing to depressed sex hormones.

Some specific HPG conditions that can be the result of HPA Axis dysfunction include: Premenstrual Syndrome (PMS), Polycystic Ovarian Syndrome (PCOS), non-cyclic anovulatory (lack of ovulation), amenorrhea (lack of menses in women), and andropause or hypogonadism in men.

### **HPA Axis and Thyroid Dysfunction**

HPA axis dysfunction can also negatively alter thyroid function and has even been shown to induce hypothyroidism in a condition called Secondary Hypothyroidism. Excessive production of the chemical messenger hormone that initiates the release and cortisol production, ACTH, will actually inhibit the production of thyroid hormones by shutting down the production of thyroid stimulating hormone (TSH). Then, through a secondary means, excessive levels of cortisol in the blood will inhibit the conversion of T4 thyroid hormone into the biologically active T3 hormone.

### **Immune System Modulation**

HPA axis dysfunction also plays a large role in immune system function. One of the main roles of the HPA axis and cortisol production is the management of inflammation in the body, as inflammation is one of the main ways that the body responds to foreign threats. So, if the HPA axis is compromised, it can reduce the effectiveness of how the immune system responds to any type of threat causing an immuno-compromised situation. However, the door tends to swing both ways as the over stimulation of the HPA axis can also cause the immune system to overreact. This leads to inflammatory conditions such as allergies, asthma, and auto-immune conditions.

### **A Person's Mood and Mental State**

The HPA axis can also be sourced to certain mood disorders, sleep disorders, anxiety, depression, ADHD, and fatigue. All forms of chronic stress can affect the creation and release of certain calming and stimulating neurotransmitters in the body, thus laying the groundwork for depression and fatigue, as well as other mood changes. The vital neurotransmitters of serotonin, dopamine, and norepinephrine are all regulated and controlled by the HPA axis. This is how some medicinal antidepressants exert their effects in the body. Serotonin specifically is involved in mediating the stress response and calming the body down during the relaxation phase, so when there is any dysfunction of the HPA axis, there are multiple ways in which there can be detrimental effects on a person's state of mind.

## Gut Microbiome Alterations

There are a few ways in which stress and HPA axis dysfunction can affect the function of the gastrointestinal system. However, they all mainly revolve around the idea that blood flow to the GI tract becomes restricted during times of stress, as it is just another way in which the body diverts resources to more important areas when attempting to deal with a stressor. High levels of stress will also directly affect the health of the microbiota in the gut as it is the bacteria of the microbiota that produce short-chain fatty acids which serve as the food for the cells of the gut lining. The microbiota also exert an anti-inflammatory effect in the body, help build up the health of the immune system, crowd out any pathogenic bacteria, and maintain healthy gut barrier function. When HPA axis dysfunction is present, all of those duties can become compromised.

## How Does it Affect the Dieting Process?

Just by seeing how far of a reach that the HPA axis can have on a person, it should be easy to see how large of a role that the HPA axis and stress can play when it comes the dieting process. Any person, or client for that matter, will see little to no progress, at least in terms of reaching a particular scale weight, liking how they look in the mirror, or hitting a particular performance goal if they have unregulated levels of stress and HPA axis dysfunction. As a coach, it becomes important to be able to spot the symptoms of HPA axis dysfunction and create the appropriate plan for a client. This way, you can help them get back on track when it comes to healing, compared to just having them spin their wheels and go nowhere with you as a coach.

Some of the common and not so common symptoms that can be associated with HPA axis dysfunction and chronic stress include:

- Poor memory
- Sleep problems-problems falling or staying asleep
- Sugar cravings
- Salt cravings that are usually associated with low adrenal output
- Poor stress tolerance
- Poor wound healing
- Frequent headaches
- General weakness
- Inability to build muscle and overall lack of strength
- Poor concentration or brain fog
- Allergies and asthma
- Recurrent or chronic illnesses
- Depression or mood disorders
- Dizziness when standing up
- Dry or thin skin
- Hair loss
- Immune system problems
- Lower body temperatures

## **What Must be Done Before Balance Can be Restored and Progress Can be Made?**

In order to properly deal with any form of HPA axis dysfunction, there are 5 main areas that will need to be addressed if a person ever wants to bring their body back into a state of balance. All 5 areas are in the scope of what a good nutrition or health coach should be helping clients in bettering. The 5 very important areas are:

1. Blood Sugar Control
2. Maintaining a Balanced Diet of the Proper Macro and Micronutrients
3. Maximized Circadian Rhythm through Proper Sleep
4. Daily Movement and Including the Proper Forms of Exercise
5. Stress Management

# Chapter 4: The Endocrine System

## and Its Role in Dieting

### What is the Endocrine System and What Role Does It Play in the Body?

The endocrine system is a complex network of glands that create and distribute hormones and neurotransmitters throughout the human body. These hormones are often referred to as chemical messengers and they regulate almost every single bodily function, including breathing, energy production, reproduction, intellectual development, walking and talking, sexual maturity/puberty, and even growing old.

The endocrine system helps perform all of these functions by working in conjunction with the nervous system. The actual process of how the body regulates all of its many functions is rather complex. In a very simplified version, what the endocrine system does is send electrical stimuli and neurotransmitters that result in certain muscle contractions that in turn, result in the glands secreting a certain substance or hormone. These contractions can take place in milliseconds and many are even automatic responses by the body, meaning that a person has no direct control of the action. Due to these chemical messengers and hormones, the body grows, advances, and improves.

### What Are the Different Parts of the Endocrine System?

There are numerous components of the body that can manufacture and release hormones, but the big players or glands that do a majority of the work in the endocrine system include the:

- Hypothalamus
- Pituitary
- Adrenals
- Thyroid
- Parathyroid
- Pineal
- Ovaries
- Testes

All of the above glands create and produce certain hormones that enter a person's bloodstream. There, they travel to certain tissues and engage with a specific cell receptor through a method that resembles a lock and key. Once a certain hormone locks into a receptor, it gains access to the cell of that tissue. Once in the nucleus of the cell, it informs the cell's DNA and RNA exactly what it is supposed to do. An imbalance can occur in the body when inadequate amounts of certain hormones are not produced or when the receptors on cells start to malfunction. It is when this occurs that hormonal imbalances can contribute to diseased states in the body and this is where many of the negative hormonal effects originate from.

## **The Mechanism of Hormones**

Some hormones can travel freely throughout the body and others need to be transported throughout the bloodstream on what are known as carrier proteins. Think of the hormone as a pedestrian and a taxi cab as a carrier protein. The pedestrians hold a key and are only able to access a certain door on a certain type of cell. That lock on the door is what is referred to as the incoming receptor. Once the pedestrian uses the key in the receptor, or the lock on the cell, it opens a door. Once the key is turned and the door is opened, only then will they be allowed access to the cell and then the pedestrian and/or hormone will be allowed to complete their task. However, if the key and a receptor site do not match, then the pedestrian/hormone will not be allowed access into the building/cell. Cells have certain receptor locations for specific hormones and some cells have no receptor locations for hormones. The tissues that have target cells for certain hormones can be at the farthest distances in the body. Or, they could be millimeters apart, but wherever they go, their end goal is to alter cellular activity in some way. There are two ways in which hormones can gain access to a cell - they can either connect and lock in with the receptors that are on the surface of the cell, which gives them entrance through the cell membrane (this is how thyroid hormones gain entrance), or they can react with specific receptor sites that are located inside a cell. Most steroid and sex hormones, such as testosterone and estrogen, react on the inside of cells once they gain entrance.

## **A Little Bit Goes a Long Way**

Hormones are powerful compounds that even in the tiniest amounts can have the largest impact on every one of the body's metabolic activities. In order to maintain balance, or homeostasis, in the body, a person's hormonal secretion is tightly controlled within very narrow limits. Homeostasis can be thought of as the body trying to sustain a certain temperature in the home, or as the internal thermostat of a house trying to maintain a constant 75 degrees. However, the specific way in which the body does this is through what are called feedback mechanisms and there are both positive and negative feedback mechanisms. As an example, let's



say that 75 degrees is considered homeostasis in the body. In order to maintain that 75 degrees all year round, the thermostat is going to have to use the heat to raise the temperature when the temperature drops, as well as use the air conditioner to lower the temperature when it raises. It performs both of these actions so that it can always keep the body at that 75-degree goal.

When it comes to hormone regulation and secretion, a certain gland in the body acts as a separate thermostat that is only sensitive to the concentration of a singular hormone in the body and which it also controls. That feedback system will either increase or decrease whatever is required in order to sustain that 75 degree marker in the body, or what we are referring to as the homeostatic level of a certain hormone.

There are even certain portions of the endocrine system, mainly glands, that will produce certain hormones in response to other hormones. For example, a hormone that originates from gland A will then result in gland B producing another separate hormone. The last general method of how the body regulates hormone secretion is through prompts from the nervous system. This concept is pretty simple as a specific nerve excitement results in causing a gland to secrete a specific hormone. An example of this is when the adrenals directly release adrenaline and noradrenaline.

There are numerous internal and external influences that can all affect the level of homeostasis in the body. Understanding how and why those influences do what they do in the body, and how they can be managed or even manipulated, are skills that all good nutrition coaches should have so that they can better educate their clients.

## **What Environmental Factors Play the Biggest Role in Influencing the Endocrine System?**

A person's brain is the master and controller of the entire body. In order for it to maintain control, a continuous level of communication needs to take place between the brain and all of a person's hormones. What that means is that a person's hormone levels are always in a state of flux. When things are always changing, or let's say fluctuating, there is always the possibility of those fluctuations going awry, which can often end in some form of imbalance in the body.

Throughout life, there are numerous reasons as to how and why a hormonal imbalance may develop, with some of the biggest factors being:

- Too much stress
- Imbalanced gut flora
- Improper sleep patterns
- Low vitamin D caused by little to no real sunlight exposure

- Sedentary lifestyles
- A lack of sleep
- Too much or too little exercise
- Smoking
- Alcoholism
- Recreational drug use
- A person's genetics
- Getting older or aging
- And in actuality, there are many more

In the conventional medical realm, a majority of all hormonal problems are either dealt with through the use of medications, or through the use of hormone replacement therapy. Their use is almost always directed towards symptom relief. This can become a problem when doctors never spend any time with regards to possibly finding the underlying cause(s) of the imbalance. Now, many times the use of these types of therapies will help a person by getting rid of their symptoms. However, their utilization may also allow a problem to grow and fester under the cover of a medication that only deals with symptoms instead of the true cause of the problem.

Some of the most common medication therapies that are used today with regards to treating hormonal imbalances include:

- Hormone replacement therapies such as estrogen, progesterone, testosterone, and human growth hormone
- Birth control pills
- Blood sugar regulating medications and insulin injections
- Fertility drugs or in vitro therapies
- Thyroid replacement medications

Many people will gravitate towards the use of these therapies because their use is easy, and the large majority would prefer to take a pill rather than eat a healthy diet and exercise. However, it is going to be the role of a good nutrition coach to help educate clients as to the true causes of most endocrine and metabolic disorders, and that many of those same disorders can usually be changed for the better by simple changes in what a person does in their day to day lives. In addition, a good coach will educate clients on how natural remedies do exist when it comes to a person's ability to balance their hormones levels.

## How Is a Person's Hormonal Profile Affected by the Dieting Process?

The old adage of calories in and calories out has been around for quite some time. Even though calories are King, weight gain and/or weight loss is not simply controlled by just eating more or less calories than a person burns. One of the reasons why this can happen, which is covered extensively in Level One and previously in chapters 1 and 2, is that when calories are restricted, the body's set point or base line metabolism actually lowers itself. When this happens, the body slows down the amount of energy that it consumes on a daily basis, lowering its Basal Metabolic Rate or BMR. The result can be so dramatic that it slows energy production by 30-50% in some individuals in order to conserve its resources. This is the exact same way that a bear's body conserves calories and slows things down when it hibernates.

Unfortunately, many still run with the idea that all a person needs to do is consume a fewer amount of calories than they burn in a single day and that by doing so, their body fat pounds will magically just melt away. However, if anyone has ever attempted to do so more than once in their lives, they know that the human body does not quite work that way. The reason for that is because the human endocrine system is resilient and has evolved throughout time to survive during times of little to no access to food. It is those very same traits and genes from our predecessors that cause the body to hold onto its body fat stores when a person eats in a calorie deficit for longer periods of time. So, when the main goal is to lose fat and a person just eats less and exercises more, the result over time will almost always be some sort of down regulation of their metabolic rate that will physically prevent them from losing fat.

Therefore, we know that simply reducing calories is not going to be a sustainable long-term weight loss method that is going to show a person the results that they are looking for. Restricting calories alone, and in many other times escalating the amount of exercise that a person is doing, will leave the body fighting back by raising hunger levels. This usually increases cravings for those fast digesting foods, which normally means simple carbs and sugars, while at the same time slowing down the quantity of energy that they expend.

Now, there are times when a person first enters into a calorie deficit that they do lose some fat pounds. But, as we detailed above, the body cannot continue to stay in caloric deficit for extended periods of time or it will adapt accordingly.

## Body Weight is Regulated by Hormones

The amount of time that a person spends in the gym, the number of calories that they eat, or even if they are taking the right supplements, doesn't have as much control over their body fat and muscle levels as a person would think. As a person's body weight is more under the control of the body's thyroid hormones, which are controlled by Hypothalamus Pituitary Thyroid Axis (HPT) as well as leptin, the body's fat storage hormone, the hunger regulation hormone, ghrelin, and lastly, the body's fuel storage hormone, (which can also have a huge impact on hunger levels) insulin. Insulin is one of the largest players when it comes to the regulation of a person's homeostatic set point as it has a significant impact on a person's blood sugar and fat storage levels.

## When in a Calorie Deficit

Stating this with an asterisk (\*) next to it! The fact remains that in order to lose weight, technically a person does need to be in caloric deficit. However, I hope by now that everyone understands that there are numerous other factors that do come into play and that it is really a person's hormonal levels, and not the amount of calories that they eat, that is going to be the main driver of their metabolism. In fact, a low-calorie diet over a longer period of time does not lead to a stable and flexible output of hormones from the endocrine system, and it can actually lead to the exact opposite. The reason for this is a concept defined as metabolic adaptation and it is covered in depth throughout this course and in Level One.

## Metabolic Adaptation

Simply put, when a person's fat loss endeavors are no longer producing any results, the major reason why this may be the case is due to the fact that the body has finally adapted to that low calorie intake and it has now become the new homeostatic set point for their body. Besides down regulating the body's main metabolic hormones, which are the thyroid hormones, the two other largest players that are negatively affected are leptin and ghrelin. So let's try to understand their role a bit more when it comes to the endocrine system and how the dieting process affects them.

Leptin and ghrelin regulate appetite and satiety, or a feeling of fullness. So, when a person has the urge to eat, it is leptin and ghrelin that trigger the body to eat and when to say that the body does not need any more food in terms of fuel. In a perfect world there is a balance between the two. When that balance is maintained, a person is able to stay at their ideal weight, both being able to gain weight or lose weight if they deviate too far from that state of balance.

In terms of specific pathways in the body, the hormone leptin is created from

a person's fat cells and acts on the Hypothalamus region of the brain. When it comes to ghrelin, it is secreted primarily from the stomach cells with small amounts also being released by the small intestine, pancreas, and brain. Just like leptin, ghrelin's destination is also the Hypothalamus region of the brain. The hypothalamus region of the brain is in direct control of the body's hunger signals as it alone initiates the secretion of leptin, which decreases hunger, as well as signaling ghrelin's secretion, increasing hunger. Both hormones act as counter regulatory hormones and react to how much food a person has eaten and to the amount of body fat a person currently has. But the balancing act that the two hormones play in the body can be severely disrupted with obesity and what has been coined as "leptin resistance". Leptin resistance is now considered one of the primary driving forces behind the actual development of obesity.

When living in a calorie deficit, the lack of calories is considered a type of stressor on the body. Without the proper recovery from that stressor, or even if the stressor continues to persist, that elevation of stress will only increase the body's stress hormone production. The stress cascade produces increased cortisol as well as increased levels of aldosterone, the body's water retention hormone. When aldosterone production is ramped up, it increases the uptake of cellular sodium and decreases the uptake of cellular potassium, leading to increased levels of water retention and bloating.

## Calorie Surplus

Just as everyone has a different set of fingerprints, they also have different metabolic set points. Therefore, everyone's level of what is considered a caloric surplus is also going to be different.

A caloric surplus is the exact opposite of a caloric deficit. It consists of consuming more food or calories than a person burns in a single day. With that, if a person wants to gain weight, which in almost every situation means gaining muscle, a person will have to eat more than they burn off. The exact opposite will hold true if a person wants to lose weight - in that scenario they will have to eat less than they burn off. As we discussed earlier, the previous two concepts sound simple enough, but if it were just as easy as some simple math when it came to losing body fat or gaining muscle, then every person in this world would have their ideal body. As we all know, that is not how things work.

In Level One, the concept of a basic metabolic rate or BMR was covered in depth and it serves as the starting point for calculating a macro prescription. There are numerous factors that can affect a person's BMR such as their age, the amount of muscle that they have, their training age, their body type, where they hold their body fat (think apple or pear shape), how long they train or exercise per day, their level of daily activity outside of exercise, and the list can go on and on. The main point of that rather long list is that a person's BMR is individual and there are numerous factors that can play a role in determining a person's BMR.

When determining a person's caloric surplus level, the same factors need to be considered. With that fact in mind, a few additional factors to consider when it comes to determining a person's caloric surplus include:

- If they are a male or female as hormone levels will differ greatly.
- Family genetics (some have athletes for a mom and a dad while others have two obese and sedentary parents).
- A person's body fat and muscle levels and how close a person is to their genetic potential. Think body types, ecto, endo, and mesomorph.
- Are drugs or any form of Hormone Replacement Therapies (HRT) being used or are anabolic steroids in the picture?

Considering all the factors that go into calculating a person's BMR, there are also the above factors to take into account. For example, a person who already has low body fat levels and a good amount of lean mass, along with a higher training age, will normally require less of a caloric increase that would put them into a caloric surplus compared to someone who is brand new to exercising and has a higher level of body fat and less muscle.

When determining a caloric surplus, it is always wise to err on the side of caution and start low and go slow as if a person wants to gain muscle over fat. The 100-400 calorie range, or a 10 to 15% increase above a person's current intake, is usually a good starting point if they are in fact consuming maintenance calories. Amounts that go above those amounts run the risk of a person adding on more body fat than they would like. However, just as we said earlier, these numbers are highly individual.

Ultimately, it is the endocrine system and a person's hormone levels, such as testosterone, estrogen, cortisol, growth hormone and their thyroid hormones (among others), that will determine just how much lean tissue a person can add to their frame. In addition, the amount of calories, as well as the types of foods that a person eats, will play a role as they provide the raw materials for those very same hormones that do in fact come from a person's diet. As we say at NCI all the time, it doesn't matter if you are eating salmon and broccoli - if you are the average person eating 5,000 plus calories of salmon and broccoli every day, you are most likely going to be gaining weight, with most of that being body fat.

Just as in a caloric deficit, a person's caloric surplus is immensely determined by their hormonal levels and their resulting caloric needs will normally change over time. It is the proper implementation of targeted nutritional adjustments of the other lifestyle factors that will be the biggest players when it comes to a person gaining muscle or gaining fat when eating over their maintenance level of calories.

## Maintenance Calories

We have talked already in depth about what is referred to as homeostasis. But let's touch on it one more time. Homeostasis is the internal thermostat of a person's insides that allows them to sustain stability and balance in the body. Just as a thermostat is always changing based on the outside conditions, the human body is also changing and regulating things internally so that it can maintain, or attempt to maintain, its homeostatic set point. When it comes to a person's caloric intake, it is that set point that constitutes a person's maintenance calorie intake. It is at that caloric maintenance level where a person's hormone levels and their endocrine system also finds balance, and/or is always trying to get back to, either following a caloric surplus, a caloric deficit, or even after experiencing a series of stressors. The return to a balanced state is exactly what is supposed to occur when a person returns to a maintenance caloric intake. Based on their biofeedback levels, that person should stay at maintenance calories until any and all of the hormonal complications of being in a deficit or a surplus subside, any extreme food cravings fade away, and the person returns to more of a balanced mental state.

A person should plan on spending as long as it takes to return to that healthy baseline so that they can re-regulate their altered hormone levels. The concept that every dose of stress needs to have an adequate dose of recovery is oh so true, especially if homeostasis is ever to be regained.

A general guideline when it comes to how long a person should remain consuming a maintenance level of calories will always depend on the person, but the 8-12-week window seems to be a time frame for those who are not severely depleted both adrenally and mentally. During this time, it is wise to aim for consuming high quality foods, enjoying life and the social interactions that come with eating those foods, and not worrying so much about the consequences of doing so. After all, it is termed the recovery period for a reason.

# Chapter 5: Sleep & the Dieting Process

Sleep is an aspect of life that often times gets taken for granted. For the lucky, or those who do sleep well, sleep is something that a person should be thankful for as there are 50 to 70 million people in the U.S. alone that suffer from insomnia. To an insomniac, getting a good night's sleep is considered a gift. On the other hand, while insomnias suffer, over half of the people who get diagnosed with sleep apnea are unwilling to make the lifestyle changes that are required in order to help themselves. It is that very same unwillingness to make the necessary changes that is also seen in those who are diagnosed with heart disease. Is the population's refusal to change due to the lack of education, or is it the simple fact of "some old habits die hard"? Since sleep is one of the keys to life, is required for every single function in the body and mind to work correctly, and without it a person may be skirting on the edge of death, one might think that it would be taken more seriously in today's world. If we take the stance that it is the role of the health and nutrition coach to educate clients about the upsides to sleep, then let's spend some time learning just how important sleep is to the body in addition to covering some of the long term effects that can surface if a person does not get enough of it.

Below are just a few of the negative statistics that show up on the first page of a Google search with regards to how improper sleep and a disrupted circadian rhythm is affecting the health of the population.

- Today as a race we sleep 20% less than we did 100 years ago.
- Over 50% of the population suffer from some form of insomnia.
- 50-70 million U.S. adults have a sleep disorder.
- 100,000 deaths occur each year in U.S. hospitals because of medical errors caused by sleep deprivation.
- Drowsy driving is responsible for 1,550 fatalities and 40,000 non-fatal injuries annually in the United States.

The list could have filled the whole page, but it is important to understand that a lack of sleep does not just cause fatigue and tiredness. On the contrary, by preventing a person's nightly recharge, it can have some large scale and long-term consequences.

In terms of specifics, disturbed or impaired sleep has been linked to the following conditions:

1. It can significantly slow down the metabolism while at the same time stimulating a person's appetite and hunger response leading to the increased consumption of sugary and processed foods.



2. It lowers a person's resilience to stress and weakens the immune system.
3. It influences the development of cancer, and has been shown to accelerate tumor growth.
4. It impairs a person's memory - it has been shown that even one night of sleep in the duration 4 to 6 hours can negatively affect a person's cognition and problem-solving abilities. [1]
5. It can worsen numerous chronic and degenerative diseases with just a few of them being cardiovascular disease, ulcers, hypothyroidism, autoimmune conditions, depression, anxiety and mood disorders.
6. Poor sleep can accelerate the aging process. It has been documented that chronic insomnia will increase the risk of dying from any cause by three times. [2]

The sleep that someone loses each night, they can never get back, and the consequences from sleep that is lost from a single night is much different than the consequences from the persistent lack of sleep, night in and night out. Considering the cumulative effects that were listed above, it should be the role of a coach to educate clients on the importance of sleep and that without it no goal in the triangle of awareness will ever be fulfilled.

## Why Do We Physically Sleep?

The primary reason for how a person gets to a point at which they cannot hold their eyes open any longer, and the reason that human beings sleep can all be connected to a single neurotransmitter in the body, adenosine. It is the accumulation of adenosine in the body throughout the day that causes a person to feel tired as the day progresses. It is adenosine's main role to signal to the body that its energy reserves are low and that the body is in need of sleep so it can build back up those energy stores.

Therefore, for a person to have optimal energy levels, the body and mind have to physically sleep and sleep well. Sleeping well is not just about being in bed for 8 hours, as there are insomniacs and those who suffer from sleep apnea that spend plenty of time in bed and still wake up feeling terrible in the morning. No, it is more about the amount of deep or delta slow wave sleep and Random Eye Movement (REM) sleep that a person gets each night that combine into what is referred to as sleep efficiency. Most people are just not sleeping enough or as deeply as they need to in order to prepare the body for the next day while recharging the brain.

Now, the following sections have not fallen on deaf ears with the entire population as there are many who understand the power that sleep has on their lives and

take the concept seriously. Many times those are also the types of people who are willing or have already tried all the little sleep hacks or habits that can be found online. However, all those attempts to improve their sleep with those little tricks and tips are in many ways just putting a band-aid on the problem and are most likely not fixing the core of the problem. So, before anyone starts ingesting the entire medicine cabinet of supplements and sleeping pills, or meditating for 2 hours a day, let's first cover what is needed at the core of quality sleep - an optimized circadian rhythm.

## **Optimized Circadian Rhythm**

Simply put, circadian rhythm is the ground work that needs to be laid before anyone can have a high level of sleep efficiency. The reason why is that a person's circadian rhythm controls the depth and the quality of sleep, and it directly modulates a person's health, wakefulness, stress, appetite, energy hormones, neurotransmitters, and even longevity.

The human body is tied to the rise and fall of the sun. This means that every person has a 24-hour natural clock in their brain that controls all sorts of things based on 24-hour cycles of light and darkness. Either the current population does not comprehend this fact, or they choose to ignore it, as 90% of the average person's day is spent indoors ignoring their need for sunlight.

You've heard people say things like, get out in the sun, get some Vitamin D, and for good reason. The human body has evolved to run on sunlight and when you take that away for longer periods of time or neglect to pay attention to the sun, it can throw a huge monkey wrench into a person's quest for good quality and efficient sleep. This is clearly seen by all of the people who do get seven or eight hours of sleep every night, but still claim to feel tired when they wake. Being in bed is often not enough when the cells of the body have not been able to undergo their healing practices. That is why a proper circadian rhythm is the biggest factor when it comes to controlling all of the health benefits that efficient sleep can provide.

## **Autophagy Inhibition**

There is another important process that can and will be disrupted when a person's circadian rhythm is a mess - it is called autophagy.

During the regular course of the day, the cells in the body have to produce energy so the body can function. As a by-product of that energy creation process, oxidative stress develops. If it is not balanced, it can damage certain cell parts which may render parts of those cells dysfunctional. Therefore, the process of autophagy is the recycling of cell parts inside the cell. Think of it as removing, replacing and getting rid of old burned out light bulbs and replacing them with new and more efficient light bulbs.

In more of a technical sense, when a person gets into the restful stages of sleep,

autophagy takes place. Through it, parts of the cells get broken down, chemically digested, and then recycled or rebuilt in new and improved parts of the cell. Therefore, if a person's circadian rhythm is being chronically disrupted, then all of that healthy recycling that should be taking place during the sleep stages gets disrupted.

In this section, we are not going to cover all the tips that are needed to optimize a person's circadian rhythm as that could easily fill a few hours of this course. However, light timing, meal timing, nutrient timing, and movement timing throughout the day all play a huge role in it. This brief section is just meant to establish the foundation that proper sleep habits need to be built upon or no matter what a person does, they will not receive all of the healthy benefits from sleep that they should. Before we end this section on the importance of sleep, let's cover how improper sleep can directly affect hormone and neurotransmitter production and secretion.

## How Poor Sleep Directly Affects Hormone Secretion

Even the modest effects of sleep loss have been clearly shown to have a negative effect on a person's hunger and satiety hormones, leptin and ghrelin. [3] There is also strong evidence showing that the lack of sleep can have a noticeable impact on the amount of testosterone that a male produces as well as being connected to lower libido and infertility levels. [4] Seventy-five percent of a person's Human Growth Hormone (HGH), a hormone that is particularly important for growth and repair of the body's tissues, gets released during sleep with the major period of that HGH release taking place during the first period of deep sleep or slow wave sleep. This is usually around the first hour after a person initially falls asleep. [5]

In addition to leptin, ghrelin, HGH and testosterone, the quantity and quality of sleep also has a huge impact on several additional hormones in the body that many may not know much about. However, the following will all have a big impact on the dieting process:

- **ADH or Antidiuretic Hormone** – it is ADH that tells the kidneys to not release as much water, reducing the need to go to use the toilet during the middle of the night or in general, when just making all of those trips to the bathroom.
- **Prolactin** – this is primarily known for promoting the creation of breast milk production in women. However, most do not know that it also plays a role in 300 separate functions in the body, with two of the biggest being immune system regulation and metabolic rate.
- **Oxytocin** – referred to as the love and bonding hormone, it is required in order for humans to develop many of their bonding behaviors with one of the biggest bonding scenarios being parent-infant bonding.

## Neurotransmitter Suppression

So, when a person does not sleep and they develop a disrupted circadian rhythm, they are also going to be interrupting the production of many of the important neurotransmitters in the brain. It is those same neurotransmitters that regulate a person's mood, level of depression and/or anxiety, cognitive performance, and of course, their super important energy levels.

Sunlight is important. It is so important in certain areas of the world that do not receive enough of it that super high rates of the medical condition called Seasonal Affective Disorder or SAD take place. The main reason behind the development of that condition is that sunlight is vital for the creation of the feel-good neurotransmitter serotonin.

Therefore, lots of sunlight usually means more serotonin and it is that very same neurotransmitter that just happens to be the precursor to another important sleep hormone in the body - melatonin. Since serotonin stimulates melatonin, it makes sense that the more sunlight a person gets, the more serotonin they will produce, which then equates to higher melatonin production, which prepares a person for sleep and is one of the biggest factors that can set the stage for a healthy circadian rhythm. It has also been shown that the brighter the light that a person can experience throughout the day, many times equates to better sleep at night because of that increase in serotonin production and the resulting melatonin. Subsequently, sunlight serves as a trifecta, by the fact that it helps in creating a healthier circadian rhythm, it will make a person feel better and be more energized due to the increased levels of serotonin, and it can improve a person's sleep quality because of their increased melatonin levels.

# Chapter 6: The Gut Microbiome

## What Is It and What are the Many Roles That It Plays in the Body?

You would probably have to be living in a bubble to not hear of the terms gut health and the microbiome the past few years, while also hearing how important both are to a person's overall health. But for those that may have been hiding away in that bubble, the microbiome is the ecosystem in the digestive tract that is made up of trillions of forms of bacteria, microorganisms, viruses and even fungi. It's pretty gross when you realize that all of that lives inside the body, but before this section is over, you will also see just how amazing all of those different microorganisms are to the human body.

There are definitely certain forms of bacteria that are connected with sickness and disease, but there are many more that play enormous positive roles in the body, especially when considering the immune system. There are numerous types of bacteria in a person's microbiome, almost 40 trillion to be exact. That number should be staggering because there are roughly only 30 trillion regular types of cells in the human body.

Give or take, there is estimated to be around 1,000 different species of bacteria in the human gut microbiome, and each of those little critters has a different role to play. If all of the bacteria of the microbiome were to be clumped together, it could weigh up to 5 pounds or over 2 kilograms. That is crazy to think that you have a 5-pound plate worth of bacteria that is living inside you at any one time.

How the microbiome forms and develops will be touched upon in the following sections, but some of the microbiome's primary functions in the body include:

- Breaking down dietary fiber - without our friendly bacteria in the gut, so many of the foods that come from the Earth would be indigestible. This is especially true of all of those healthy fibers, as a majority of the fiber that we eat serves as food for the bacteria of the microbiome. When they consume it, they create what are called short chain fatty acids, or SCFA's, as a by-product. It is those very same SCFA's that feed and nourish the epithelial cells of the gut lining and which help maintain a healthy bacterial balance.
- Regulation of the immune system - it is the bacteria in the gut that serves as the armed forces of the body. It is the bacteria that cooperate with the body's immune cells when determining how the body reacts to an infection.

- The microbiome is also directly connected to the health of the brain. There is actually a direct channel that connects the gastrointestinal tract and the central nervous system. This highway-like connection takes all of the data that comes from the gut and sends it to the brain for processing. This connection is referred to as the gut-brain-axis and it relies on a bundle of nerves known as the vagus/vagal nerve.
- Microbes of the gut create and influence many of the body's hormones and neurotransmitters including melatonin, serotonin, and GABA. It is through the interaction of these super important substances that positively impact a person's appetite, mood, and even their mental state.
- The gut microbiome plays a large part in the regulation and the detoxification of estrogens within the body. Specifically, it is the bacteria of the gut that enables the body to safely excrete all of the used-up estrogens and estrogen metabolites. When the gut becomes compromised, it can be the cause of many of the estrogen-related conditions such as any estrogen dominant related condition or even cancer.

What was listed above are really just some of the many roles that a healthy microbiome performs in the body. The take home point of all of the above is that a person's microbiome is vital to a person's health, and its effects are far reaching on many of the body's systems.

## **How Does the Microbiome Develop and How it is Nurtured?**

As an adult, the goal is to have a fully developed, healthy microbiome so that it can perform all of the vital functions that we just detailed. However, just as all things in the body, if a person's microbiome does not receive the proper care or develop as it should, then the trillions of bacteria that are included in it will not be able to perform their necessary functions and help contribute to a healthy body and mind, both inside and out.

With that being said, how do all those beneficial forms of bacteria end up in a person's gut in the first place? Well, there are some facts that we do know but there are also some that we do not know when it comes to the origins of all the bacteria that end up inside of a person. Let's start by detailing what we do know as fact, and how all of the bacteria in the body eventually start calling the gut their home. In order to do just that, we are going to have to go back to a person's birth.

Theory says that it is the mother that passes a large portion of her gut microbes to the fetus at child birth. During the actual exit from the mother, it is through the birth canal that the child receives his/her first exposure to the mother's bacteria by the physical exposure to the mother's vaginal and fecal microbiota and then afterwards, from the contact with the mother's skin. There are some specific

species of bacteria that colonize the newborn's gut with the biggest player of that group being the Bifidobacterium family of bacteria. It is the Bifidobacterium strains that do most of the work when it comes to colonizing the baby's gut during their initial days of life [6]. The next exposure that is required in order to help continue the building process of the baby's microbiome is what gets transferred to the baby through the mother's breast milk, and to a much lesser degree, cow's milk and even formula. Breast milk also contains something called human milk oligosaccharides or HMOs. HMOs are the main food source for the newly developing bacteria in the baby's microbiome and are a vital source of nourishment for many of the other forms of beneficial bacteria developing in the baby. By the time a child turns one, much of the bacteria in their gut has developed but it really is not until ages of 2-3 years old that their microbiome becomes fully configured [8]. It is the first 1-3 years of a child's life that have the biggest impact on the development of a healthy microbiome and their resulting adult immune system.

Therefore, certain interventions that occur during that initial year, as well as during the following 2 years of childhood development, can play a huge role when it comes to disrupting the progression from a healthy baby to a healthy adult: Three of the largest factors that can disrupt a child's healthy microbiome development include a childbirth through a C-section delivery, early antibiotic usage, and the lack of breast feeding by the mother.

Due to the fact that the first exposure babies have to bacteria as they come into this world is through the birth canal of the mother, if they are born through a C-section birth then their first primary exposure to populating bacteria of their microbiome actually comes from what is in the delivery room when the doctors hold them up in the air for the first time. Next comes the bacteria that they receive from their mother's skin when their mother first holds them. A C-Section birth can disrupt the proper colonization of the Bifidobacterium species from ever properly colonizing in the first place [10].

When the use of antibiotics takes place during birth or right after, their use can wipe out many of the healthy and also newly developing Lactobacillus strains in the baby's gut. A large majority of the Lactobacillus strains should be coming from the mother and her breast milk and if disrupted, they can also prevent the baby's gut from ever having the chance to fully develop [12].

Lastly, when the use of formula milk over breast milk is given early to the child, it can delay the growth of many of the good forms of bacteria in the child's developing gut by starving it from never receiving the mother's human oligosaccharides (HMOs). When this happens, it can actually allow more of the harmful forms of bacteria to take up residence and start calling the baby's gut their home. That would have a much less likely chance of happening if the beneficial forms of bacteria were properly fed to the baby from the beginning. Now, many of the negatives that come from being formula fed may not last forever and a baby's

microbiome may bounce back with the proper training. Without any of the healthy interventions from the parents, however, there can definitely be some negative changes in the newborn's microbial composition that could be rather significant and possibly affect them all the way into adulthood. [13]

With all of that being said, there are still many children that enter this world through a C-section, were exposed to several rounds of antibiotics from the ages 0-3 years old, or were formula-fed instead of being breast fed, and they all ended up turning out perfectly fine. Being exposed to one or even all three of the previously mentioned issues does not equate to a person being condemned to having an unhealthy microbiome and immune system as an adult. However, the studies and data that do exist show that many who have experienced at least one or all three of the above factors, do experience a larger number of health problems that make their way into their adult lives.

A person can choose to push past the negatives that may come about from having a microbiome that is not as robust as someone who was born through a vaginal birth, received zero antibiotics after being born, and was breast fed. They may just have to be a little more diligent during their lives in order to keep themselves on the healthy path, compared to the amount of work that someone else has to put in who may not have experienced any or all of the previous factors. With all of that being said, there is nothing more important than the lifestyle that a person maintains, as that alone will have the biggest impact on the health of the bacteria in a person's gut, regardless of what happened at or around a person's birth.

However, that does not preclude you as health coaches from educating those who do want to listen as to how they may be able to prevent some of those problems from ever presenting themselves in the first place.



## Recognizing Symptoms of an Unhealthy Microbiome

After the information from the previous section has set in a bit, the hopes are that you as a coach may better understand why some people may have a lower stress tolerance and get sick more often and connect some of the possible why's as to how GI problems originate and why they can be so hard to get rid of. However, in moving on, we next shift our efforts from understanding the why's behind the condition to identifying if a person does in fact have an underdeveloped or compromised microbiome.

Obviously, if a person has the standard set of gastrointestinal (stomach) and GI problems such as bloating, gas, indigestion, heartburn, diarrhea, and constipation, they can all be caused by a person's gut flora being imbalanced. However, in many cases, microbiome issues will not have the obvious and clear-cut GI symptoms from above. Knowing how to connect the red flags to a possible condition can become super important when assessing a person's health and the health of their gut and microbiome. So, let's look at some of the other not so obvious red flags of microbiome issues.

### **You're Allergic to Everything and You Get Sick All the Time**

More than 2/3 of the body's immune system resides in the gut, so if the gut is out of whack or in an imbalanced state, it will affect a person's ability to fight off even the simplest of infections and foreign invaders. Allergies and asthma are immune reactions to non-harmful substances that enter the body. Allergies can develop later in life, but asthma actually starts out in a person at birth and is also highly dictated by the health and diversity of the gut. Therefore, if someone is allergic to everything, or if during certain times of the year allergies just seem to be unbearable, that can be a huge indicator of a gut dysfunction.

### **Yeast Infections Are a Common Thing**

Yeast is a type of fungus that can overgrow at an alarming rate when the beneficial bacteria of the gut is not around to keep it in check. Every person has some yeast in the body, but it is only when that yeast overgrows that its harmful effects can impact the body. It is the healthy bacteria of the microbiome that keep the yeast at bay.

### **You Have Taken Antibiotics Regularly**

A vicious circle can be initiated when a person's gut is in an imbalanced state, as many infections are the direct result of the overuse of antibiotics. When antibiotics are used, they do not discriminate in terms of what types of bacteria in the gut they kill. They can target and kill both the beneficial forms of bacteria as well as the pathogenic bacteria, thus setting the stage for a possible bacterial imbalance to form.

### **You Feel Depressed or Have a Low Mood**

Many of the body's feel-good substances or neurotransmitters are actually created in the gut. This means that a person's mental state has a lot to do with what types of bacteria they have in their microbiome and what they are doing to keep it healthy.

### **You Are Intolerant to Numerous Food Types**

Having an unhealthy microbiome can lead to higher states of inflammation. It is the harmful forms of bacteria that occupy the gut that actually produce inflammatory compounds when they die off. The inflammation that gets produced by these forms of bacteria can loosen up the entry points between the tight junctions in the cells of gut lining. When that happens, they allow unwelcome items entrance into the bloodstream. When those junctions become loose, intestinal permeability, or leaky gut, occurs and this can also allow undigested food particles access to the blood stream where they get recognized as foreign invaders and can result in the creation of food intolerances.

### **You Have Chronically Achy Joints**

A person's gut can become just as inflamed as their joints can and in actuality, inflammation in the gut is one of the main areas where many of the body's chronic inflammatory diseases originally develop. Intestinal permeability and gut infections have also been linked to many of the body's autoimmune inflammatory conditions such as psoriasis, rheumatoid arthritis, ulcerative colitis, and Chrons disease. Therefore, if a person's joints are always sore or inflamed, or if they ache all the time, then it might be a wise idea to start looking inward for the cause of the problem.

### **Skin Problems**

Many forms of skin issues that resemble rashes, such as eczema and rosacea, are usually related to a dysfunctional gut. The physical symptoms that materialize on the skin are usually a result of inflammation. One of the largest sources of toxicity in the body originates from the gut and the skin also serves as a detox organ that gets handed the job of detoxing when the liver and kidneys get overburdened.

## The Largest Causes Behind Unhealthy Microbiomes

As a health coach, there are going to be certain gastrointestinal conditions that will be out of your scope of practice, such as Inflammatory Bowel Disease (IBD), Chrons Disease and Ulcerative Colitis. However, the previous conditions are going to be much more infrequent in the general population compared to the numerous other types of gastrointestinal conditions that you will be able to help clients in dealing with. The most common GI conditions that health coaches will be inclined to help clients with include: Intestinal Permeability or leaky gut, inefficient digestion, bacterial overgrowths or dysbiosis, and a lack of regular bowel movements or constipation.

### Intestinal Permeability

Before any of the nutrients that a person eats can enter the body/bloodstream, they have to first be absorbed and then assimilated by the cells. In order for that to happen, those nutrients have to first make it past a single cell barrier wall called the epithelial lining. When the epithelial wall is healthy, it forms tight junctions that decide what can enter the body and what cannot. However, when a person's gut lining has junctions that loosen and form cervices, it can permit undigested food, toxins, and bacteria to enter into the body. When this happens, the body's immune system kicks into gear causing elevations of inflammation which can lead to numerous problems in the digestive tract and in many of the other systems of the body. It is those very same elevated levels of inflammation that are now being directly connected to almost every chronic disease imaginable.

Now, everyone has some variation of intestinal permeability. Otherwise, nothing would be able to enter the bloodstream and then a person would starve and die. However, it is very common these days for people to be experiencing high levels of stress while at the same time eating a poor-quality diet. It is both of those factors that are contributing to extreme levels of gut permeability.

Leaky gut, or intestinal permeability, is a possible gateway to numerous other negative health conditions and often times gets brushed off because its symptoms tend to get grouped into other categories such as food intolerances, skin issues, brain fog, bloating, constipation, and fatigue. Intestinal permeability has even been directly connected to celiac disease, Crohn's disease, irritable bowel syndrome, and all autoimmune diseases. Therefore, it is imperative for a good health coach to understand the far reach that intestinal permeability can have and why it is so important to be able to identify it.

## **Inefficient Digestion**

Many consider the term digestion to be the entire process from when food enters the mouth to the time that it exits the body as stool. However, that is incorrect. Actually, the process of digestion is only the physical and chemical breaking down of macronutrients into micronutrients. The reason why this clarification is so important is because if the food or macronutrients that a person eats do not get properly broken down, the nutrients from that food will not be able to be utilized for energy creation, tissue growth, and cellular restoration and every other function in the body that requires them. Food and nutrients that are in the digestive tract are not even really in the body yet as they first have to be absorbed into the blood stream before they can ever be utilized by the cells. But before that can happen, the food obviously needs to be broken down first. The primary digestive organs that help facilitate that progression include the mouth, stomach, liver, gallbladder, pancreas, and small intestine. Both the physical and chemical breakdown processes take place at each one of those locations.

The first phase of digestion, or the first physical portion of digestion, takes place in the mouth and stomach and to a small degree, in the small intestine. Food in the mouth gets chewed and mixed up and then the chemical means of digestion in the stomach takes over. Then, the stomach acids and protein digesting enzymes continue the process. As the bolus of food moves along and enters into the small intestine, bile is produced by the liver and then released by the gallbladder, along with digestive enzymes from the pancreas. It is the combination of all of the above that break down the food that a person eats into absorbable micronutrients. If any of the processes, substances, or organs listed above are not functioning properly, undigested food can pass through the digestive tract to where it should not be, often times leading to bacterial overgrowths, food intolerances, and nutrient deficiencies, just to name a few.

## **Bacterial Overgrowths or Dysbiosis**

We have already covered in depth that the body is full of bacteria. Most of the bacteria in the body resides in the large intestines and a majority of that bacteria plays a beneficial role in many of the body's functions. However, not all of the bacteria that are in the gut are the beneficial types. On the contrary, some do the exact opposite and can even harm the body. When the harmful types of bacteria in the gut overgrow, it can lead to bacterial overgrowths or a condition known as dysbiosis. When the body or GI tract is said to be in a dysbiotic state, the beneficial to non-beneficial bacteria become imbalanced in the favor of the harmful bacteria.

Some effects of dysbiosis can be simple, such as an upset stomach, whereas others can be more severe and even life threatening. Therefore, it is something that every person should want to avoid if possible, although it is important to remember that the gut is always in a constant state of flux and is usually

attempting to re-establish a healthy balance. Without that balance, a person's gut flora will be unable to maintain a healthy immune system or properly digest the food that a person eats. Consequently, when that ecosystem in the gut becomes imbalanced, both aspects of a person's health can become compromised.

Sadly, when a person's bacteria balance starts to tilt towards the negative, it rapidly begins a vicious cycle of more of the harmful bugs being able to multiply, taking up permanent residence in a person's GI tract. This then prevents the helpful and beneficial bacteria from re-establishing their higher numbers. When this happens, numerous negative symptoms such as indigestion, bloating, constipation, brain fog, fatigue, and malabsorption can materialize. One of the most important factors that a health coach needs to consider when working with clients with GI issues, and when it comes to dysbiosis, is being able to identify if it exists, while at the same time being able to educate a client as to how it may have formed inside them in the first place.

Some of the biggest causes behind the development of bacterial overgrowths or dysbiosis in the gut are:

- Antibiotic consumption or exposure. We have already touched upon antibiotic use quite a bit but it is important to understand that a person can be exposed to antibiotics through medications as well as through eating high amounts of antibiotic-treated animal goods or products.
- A diet high in sugar and processed foods. Sugar is the main fuel source for many of the harmful types of bacteria and a large majority of diets these days are loaded with sugar, lacking in nutrients, and are full of chemicals and food additives.
- Chronic stress or more importantly, unmanaged chronic stress.
- A lack of healthy fiber consumption or a lack of diversity of fiber in the diet. There are 20 types of fiber in the diet and most people only consume 9 of them at best.
- Obesity and insuline resistance.
- It can be both the cause and the result, but the cause of dysbiosis has been connected to numerous hormonal imbalances such as Polycystic Ovarian Syndrome, Hypothyroidism and estrogen dominance.

## **The Lack of Bowel Movements or Inefficient Elimination**

If a person does not have regular and daily bowel movements, then all of the bacteria, metabolized hormones and many of the toxins that were set for excretion will not have the opportunity to get eliminated and can even end up being re-circulated in the bod. All of this can result in an enormous amount of potential problems. In addition, stool can become impacted. This usually occurs higher up in the large intestine and can and will occur if a person does not have regular bowel movements. Additionally, severe bloating, obstructions, nausea and even extreme flatulence are also seen when a person fails to have regular bowel movements.

It is said that over half of America does not have a bowel movement each day and according to current medical recommendations, they state that there is no real medical reason for a person to have a daily bowel movement. They also state that in order for a person to have a normal bowel movement pattern, they have to have just 3 to 5 bowel movements per week and that a person is only considered constipated when they have 3 or less bowel movements per week. With those being the standards set by the medical association in terms of what is considered normal, it should not be a surprise that the rates of GI dysfunctions and inflammatory bowel diseases are starting to be seen at such alarming rates.

A large percentage of the blame of this problem can be sourced back to the fact that most people these days are just consuming poor quality diets that contain little to no fiber. In addition to the lack of fiber, most of those diets are highly acidic and diets that are high in acid can contribute to the creation and formation of mucous in the GI tract. Foods that are acidic include most meats, dairy products, processed sugars, alcohol, and even coffee. It is the over consumption of those types of foods, in addition to the lack of healthy fiber in the diet, that can lead to an elevated PH level of the blood. When this happens, it creates the perfect environment for the high amounts of mucus to build up in the intestines to above what is considered the normal or the safe level. In the proper amounts, mucous in the GI tract is protective but in large amounts, it can lead to delayed bowel transit times and hard and impacted stools, bacterial infections, ulcers, and in the worst case, even inflammatory bowel diseases.

## **How Will an Unhealthy Microbiome Affect the Dieting Process?**

Many aspects of present day living include unhealthy levels of stress, a diet that includes large amounts of processed foods and sugars, a lack of sleep, and the over consumption of prescription drugs and antibiotics. These are all aspects that can serve as a wrecking ball when it comes to destroying a person's healthy gut and/or microbiome. We have already covered how the long-term

effects of an unhealthy gut can impact many facets of a person's health and longevity. However, this is a course designed for health and nutrition coaches. Understanding how an unhealthy gut will prevent a client from potentially reaching their goals is going to be an important factor that coaches should understand and be able to educate clients about, especially when it comes to how it affects the dieting process.

Below are some of the largest obvious, and not so obvious, signs and symptoms of how an unhealthy gut can negatively affect the dieting and coaching process.

### **Weight Loss Resistance and Rapid Weight Fluctuations**

Seeing the scale fluctuate, or when a person is not able to lose a single pound despite the fact that they are eating a healthy diet and participating in a solid exercise routine, is very normal when a person has an unhealthy gut. There are nutrients that the body needs in order to process fuel, burn body fat, and balance blood sugar levels. When a person's gut bacteria ends up being out of whack, it can and will prevent the body from absorbing those super important nutrients that are required in order to facilitate all of the previous processes. The lack of absorption of certain nutrients can result in insulin resistance and the desire to overconsume unhealthy food items. This can then result in even more weight gain, even though a person's calorie consumption may be at a low point or even under their maintenance level of calories.

### **Low Energy or High Levels of Fatigue**

It is hard to get motivated to lose weight if a person does not have enough energy to get off the couch. An unhealthy gut and high levels of fatigue can be directly connected to one another. Unhealthy bacteria in the gut produce toxins when they die off, and that die off creates a tremendous burden on the liver which can result in elevated levels of inflammation in the body. Both of these can materialize as low energy levels and can even present a person with flu like symptoms.

### **Unhealthy Food Cravings**

We have already covered how sugar is the preferred food source for many of the unhealthy forms of bacteria in the gut. Eating a diet that is high in processed foods and/or sugars, be it white sugar or even honey and maple syrup, can create an imbalanced gut microbiome by feeding more of the bad bacteria than good. When this occurs, the bad bacteria can actually start sending out signals to the brain that they want even more sugar. This can lead to severe cravings that usually get met with even more sugar. When consumed over and over, it can result in elevated levels of inflammation in the gut, thus creating the perfect breeding ground for the pathogenic bacteria and creating that vicious cycle we see over and over again.

## **A Lack of Quality Sleep**

An imbalanced microbiome can lead to insomnia and sleepless nights. Serotonin is a neurotransmitter that plays a huge role in sleep regulation and a large majority of a person's serotonin gets produced in the gut by a person's healthy gut bacteria. So, if there is any type of gut dysfunction, it could negatively impact the quality of a person's sleep. When a person's sleep is negatively affected, it will definitely impact almost every other single function in the body.

## **Food Intolerances**

When the body is unable to break down certain foods from the diet, those undigested foods can many times make their way into the bloodstream where they can cause an immune and inflammatory reaction in the body. When this happens over a longer period of time, a person can begin to tolerate fewer and fewer food items, even when many of those foods are in fact healthy food items in the diet. This can lead to a person only eating a small number of foods or foods that they feel safe in eating or know that they can safely digest. What this does is lead to a lack of diversity in the diet and possible nutrient deficiencies. Therefore, if you spot a trend like this in clients, it could be worth looking into further.



# Chapter 7: Metabolic Adaptations That Affect Fat Loss, and Overcoming Them

In Level 1 you learned how to properly structure a dietary set up. As a brief review:

## **Step 1: Calorie Intake**

Establish TDEE

- Create appropriate deficit/surplus

Reverse Diet

- Increase calories 10-20%

Slow Calorie Reduction

- Simply reduce 10-20% from current intake

## **Step 2: Establish Protein Intake**

0.7-1.2g/lb BW

- Use target BW or LBM for obese individuals

## **Step 3: Establish Fat Intake**

20-70% of total cals

## **Step 4: Establish Carb Intake**

Remainder of calories not yet accounted for

While we would love to believe that once a diet is set up, it will work to achieve any goals desired, we also know that this is simply not the case.

Instead, the body will fight to maintain set point, or renavigate itself back towards homeostasis. These “defense mechanisms” against dieting are what we call adaptive thermogenesis.

Metabolic adaptations are a normal part of the dieting process and should be expected. However, becoming “metabolically adapted” is not normal, and should be avoided at all costs. If we revisit Chapter 1, we can understand the importance of this and can also understand why so many people are actually gaining weight in their attempts to lose weight.

In Chapter 2 we discussed “what actually works” when it comes to dieting, but the question now remains - How do we beat the metabolic adaptations that are a normal part of the process?

As noted above, the simple truth is that these adaptations will occur, but long term dietary success will include a plan to help us defend against the body's natural defense system. After all, dieting is not a helpless endeavor, and our clients are coming to us for results, not more failure.

### **Play the Long Game**

First and foremost, we should avoid crash dieting at all costs. As we learned in Chapter 1, repeated crash diets typically lead to subsequent body fat overshooting, only leaving us with more body fat than before we initially began any dieting process. While the desire to lose fat quickly will always be present, we must remember that slow and steady wins the race. Create realistic timelines, allow for “life” to get in the way, and set realistic expectations based on the desired lifestyle that will be achieved concurrent with the dietary process.

### **More is Better**

Second, our goal should always be to diet on as many calories as possible. When we look at the periodized model, this becomes apparent. Most clients come to us with a desire to immediately enter “season” and actively pursue fat loss (or other results), yet typically should be beginning in either “post season” or “off season” to truly maximize the results of any future “season.” With the knowledge that this is likely not their first dietary attempt, we can logically conclude that whatever they have previously tried has produced some sort of metabolic adaptations. For this reason, we should begin looking at the bigger picture, and take some time to build metabolic capacity.

### **Addition, Not Subtraction**

Third, let's remember that this whole process is meant to ADD VALUE to an individual's life, not subtract. Nothing about a protocol should cause additional stress to an individual. In fact, we know a calorie deficit in and of itself is a stressor, so minimizing stress away from this is essential.

This holds especially true when it comes to training.

Some will argue that intense training is advised during a dietary process in an effort to maintain muscle mass, and they would be correct. Furthermore, maintaining muscle mass is a critical part of success for long term metabolic success. So logically we should advise everyone to train hard, right?

Well - kinda.

While intense training is optimal under normal conditions, we know by now that conditions will not always be normal. For this reason, it is imperative that we understand the complete individual!

# Defeating the Defense, Busting Plateaus!

Up until this point, this chapter is largely a review of what you likely already know. What you may not realize is that the information we just reviewed is actually the exact cause for plateaus in a dietary endeavor. So this begs the question: How do we beat the body's natural defense systems that guard intensely against fat loss - or in other words, how do we overcome plateaus?

## 1 - Lifestyle Review

While this may not seem like a “tactic”, it is ALWAYS the first place that you should start as a coach. Before manipulating macros or adjusting caloric expenditure, perform a lifestyle inventory. This should include:

- Hydration
- Sleep
- Nutrient dense value of food
- Parasympathetic inputs
- Life stressors
- Motivation
- Any other underlying factor that may be affecting attitude pertaining to intake or ability to create desired intake.

Before moving onto number 2, it is imperative that we reiterate this is ALWAYS where to start. While the items listed above may lead to implementation of the tactics we are about to discuss, the importance of beginning with a lifestyle review cannot be overstated. If the variables listed above are not accounted for, there truly is no dietary tactic that will yield future success, especially in overcoming a plateau.

## 2 - Temporary Caloric Increase, or “Refeed”

While “refeed” has become a term used colloquially, it is not yet a traditional term - however, for the purposes of this manual, we will use it interchangeably with “temporary caloric increase.”

Refeeds were first used in diets with the thought that you could temporarily restore the metabolic hormones that were declining as a result of metabolic adaptations from the dieting process. While these brief hormonal restorations are supported by science, the key to recognize here is that the effect is SHORT TERM. One refeed will not yield long lasting fat loss.

The biggest question often asked when refeeding is “how much more do I eat?”

There are several schools of thought when it comes to this question, but before we dive into it, let’s first review a quote from Layne Norton and Peter Fitschen:

“If a refeed boosted your metabolic rate by 1000 calories for the day, but you had to eat an extra 2000 calories to get that boost, then that means you actually stored 1000 calories.”

Simple, right? On the surface, this is a “net negative” on your fat loss...or is it?

On the surface - YES, it is - but let’s look a little deeper.

An increased caloric intake typically will yield better performance, and improved performance will typically yield an increased caloric input. The above statement of a 1000 calorie storage creates a MASSIVE assumption that output will not change. Unfortunately, we have no way of calculating how EVERY variable will be affected by a refeed, so the assumption that you will STORE or BURN more calories following a refeed is just that - an assumption...not backed by science.

So we are still left with the question of “how much more do I eat?”

In typical nutrition coaching fashion - the answer is always going to be “it depends”...but what does it depend on?

First, let’s understand that overfeeding should come primarily from carbohydrates. This is where the research is extremely conclusive, and indicates that metabolic hormones like leptin are most impacted from glucose and carbohydrates.

Second, let’s determine the reason for the “refeed.”

If we are using it purely as a plateau buster, the quantity of the refeed will likely be determined by the degree of the deficit. Early in a diet, the rate of adaptation and the actual onset of adaptation will likely be minimal. This is NOT a blanket statement though, as some individuals will absolutely have highly adaptive metabolisms that are much faster in terms of rate of adaptation.

As the diet progresses, the calorie deficit will typically get larger, as will the degree of adaptation. This typically will require a larger refeed, and potentially more frequent refeeds as well to mitigate these adaptations and restore normal levels of leptin and other metabolic hormones.

How to know when to implement these refeeds will be covered later in this section.

Another use of a “refeed” is simply to stagger calories over the course of a week. As we know, assessment of progress in a dietary setting takes place over the course of 7 days, not on a day to day basis. For this reason, some individuals may prefer to have 5 or 6 lower calorie days, combined with 1 or 2 higher calorie days over the course of a week to create the desired calorie deficit.

While this may not be what most people think of in terms of a traditional “refeed,” this still produces the same net effect. It inhibits the body from adapting to a larger calorie deficit on the lower calorie days, and keeps the metabolic hormones elevated in an effort to prolong the efficacy of any dietary set up. Note, this is not a free pass to starve yourself or your clients for 6 days and set them up for an all-out bender style “refeed” day once a week.

The next factor to consider with refeeds is the duration. While most studies have examined single day refeeds, there is very little peer reviewed literature that has studied the effects of multiple day refeeds. However, as of this publishing of this text (2019), the current thought by many top coaches and industry professionals is that multiple day refeeds are superior in efficacy to single day refeeds.

A brief review of “refeeding” tells us that temporary overfeeding is supported by science to temporarily elevate metabolism and metabolic hormones, but the parameters around it are vague at best. For this reason, the application of refeeding (like everything else in nutrition) is individual specific and should be created after considering the following questions:

- How large is the current calorie deficit
- How long has the individual been in a calorie deficit
- How much longer do we anticipate the dieting process to take
- How is biofeedback
- What is the biofeedback response after the implementation of one refeed
- What is the individual’s dietary history relative to adaptive thermogenesis
- How is training being affected by the dietary process
- (insert any question you find effective - there is no “exact science” when it comes to refeeding)

The final question regarding refeeds pertains to how we implement them. You have already learned that carbohydrates have the most impact on leptin and other metabolic hormones, so the majority of the caloric increase will come from carbs. But here are a few general guidelines that you can follow when building a refeed day:

- Consider a return to maintenance calories - recall that in periodization we use the “postseason” phase to return to maintenance and return the body to homeostasis. If we are using refeeds to leverage hormone levels associated with homeostasis, this seems like a logical place to start calorically.
- Reduce protein - consider the fact that in a dietary process you have less protein sparing nutrients, so an individual will likely be directly consuming

more dietary protein. However, on refeed day there will be an abundance of protein sparing nutrients (carbs), so the need for protein is significantly lower.

- Maintain fats, or drop fats slightly - fats are the slowest macronutrient to digest, and will delay digestion of other macronutrients. With this in mind, keeping fats the same or even slightly lower makes sense, as the carbs and their subsequent digestion need to be prioritized. This is NOT to say that fats can't actually be increased, and that if you choose to increase them slightly that there will be a negative effect - this is simply a statement around optimization.
- Fill in the remaining calories with carbohydrates - just like when we discuss initial prescriptions, not much more needs to be said here. (Side note - when working with physique athletes, this is a great time to gauge insulin sensitivity throughout the course of the day, as well as the aesthetics related to “carb loading”).

### **3 - Maintenance Phases, Diet Breaks, and MATADOR Protocols**

Just like the word “refeed,” the notion of a “diet break” is not yet accepted by the science community (as of the publishing of this text in 2019). However, when it comes to practical application, we are seeing a lot of use and with great efficacy, so we find it necessary to include these protocols in this chapter.

As noted in the refeed section above, we must remember that in a periodized setting, a return to maintenance is achieved during the postseason. When we think even deeper, this return to maintenance (homeostasis) is created to provide the ability to create adaptation (change) in the subsequent components of periodization.

#### **Diet -----> RETURN TO MAINTENANCE -----> New Adaptation**

When we take a quick look at that, it is clear to see that using micro versions of this DURING a diet (or season) can potentially provide the continuation of the outcomes we desire.

In the previous section, we noted that in determining refeed calories you should always consider maintenance calories first. Therefore, by definition, a refeed in most cases can be considered a brief “return to maintenance.”

However, what we are discussing here is likely something longer. Perhaps a week, 10 days, or even multiple weeks.

The simple truth is that because this is a relatively newer “tactic,” there are no set guidelines for implementation.

Just like with refeeds above, we need to be prepared to think critically, and ask ourselves the following questions:

- What is the purpose of this maintenance phase
- Was this maintenance phase planned, or being implemented as needed
- What is the desired outcome from this maintenance phase (physically and biofeedback wise)
- Will there likely be future maintenance phases
- (insert any questions that you need answered to create success)

While application of maintenance phases is not concrete, there is one study out of Tasmania that directly studied this approach and with great success - they call this the MATADOR study.

In this study, subjects dieted in a 33% calorie deficit for 2 weeks followed by maintenance calories for 2 weeks for a total of 30 weeks, OR they simply ate in a calorie deficit for 16 straight weeks.

The results showed that the group that dieted intermittently lost more total weight per week of dieting than the other group, and they retained more lean tissue. Sounds like the goal of any diet, right? Perhaps the perfect dietary protocol has been discovered...or has it?

There are a few important notes about this study that must be considered:

- This was performed on obese men - traditionally obese men are able to be more aggressive in general with their dietary approach, and will be slightly more resilient to the metabolic adaptations of the dieting process than their female counterparts
- Stress was not mentioned or accounted for - as we know this is a massive variable in dietary endeavor
- Previous dietary history was not discussed
- Previous training history was not discussed

For these reasons, we cannot immediately claim the MATADOR protocol to be the saving grace of dieting, but we certainly can extract some components that may be useful in our dietary protocols moving forward.

First, we can logically conclude that large calorie deficits are not always a bad idea - especially when paired with brief periods of maintenance.

Second, if our goal is to maintain metabolic health and maximize lean muscle retention, we should plan accordingly in regards to expected duration of the diet.

Third, periodic phases of maintenance calories definitively seem to work - period.

With these in mind, we must also understand that there is likely nothing magical in regards to the duration structure outlined in this study. In fact, empirically speaking, we can guarantee that 2 weeks in a deficit and 2 weeks at maintenance is not the only application that works here.

Other successful protocols that we have implemented with success are:

- 12 day deficit, 5 day maintenance
- 10 day deficit, 3-4 day maintenance
- 7 day deficit, 2 day maintenance

The bottom line seems to be very clear - if you are going to implement a large calorie deficit and you want to “defeat” the body’s natural defense system that guards against metabolic adaptations, you must pair the deficit with brief returns to maintenance calories, or at minimum, periods of increased calories.







# Section 2: Application

**Chapter 8: Client Communication, Establishing the Process, and Creating the Vision**

**Chapter 9: Specialty Protocols**

**Chapter 10: Advanced Aesthetic Protocols – Peaking**

**Chapter 11: Performance-Specific Protocols**

**Chapter 12: Longevity-Specific Protocols**

**Chapter 13: Reading and Understanding Lab Work**

**Chapter 14: Advanced Case Studies**

# Chapter 8: Client Communication,

## Establishing the Process, and Creating the Vision

As a Level 1 Coach, you understand the importance of application when it comes to creating results for your clients. There truly are no “rules” when it comes to building client prescriptions! However, in this section we are going to go deeper and talk about building connection to your client.

Here is a simple truth that you must understand: The first conversation you have with a client can determine whether that client sticks with you for 5 days or 5 years.

This initial conversation not only allows you to illuminate the vision for the client, but also helps you to build trust, overcome obstacles in advance, and understand the needs and desires of the client inside of the coaching process.

*DO NOT OVERLOOK THE IMPORTANCE OF THIS!*

### **The First Conversation**

While this should go without saying, we must reiterate, TELL THE TRUTH!

You will likely feel pressure to meet your client’s expectations and deliver on them instead of holding true to the process you had envisioned. While this is admirable and certainly understandable, it is NOT acceptable.

As coaches, we have an ethical obligation to provide clients what they truly NEED, not simply what they WANT.

While this will absolutely be difficult, it is a MUST. We know that our clients are likely coming to us after having been marketed to, lied to and down right abused by so many other “programs,” so we must become a voice of TRUST, not more unfulfilled promises.

### **Vision**

Let’s be honest, the majority of clients will be coming with a relatively simple goal:

- Lose fat
- Gain muscle
- Perform better
- Etc.

This is completely understandable, but as we, the coaches, know, it is not always so simple.

Recall (if it is not already beaten into your head), the concept of nutritional periodization.

As a Level 2 Coach, this is no longer a process for you to simply understand and implement; it is now a tool that needs to be shared and articulated to your client. From a success standpoint, this does two things:

1. It allows your client to understand that success is not linear.
2. It serves as a retention tool for your business.

When clients can understand a process, they are far more likely to commit and become compliant, and as we know, compliant clients are typically more successful clients.

### **Continued Communication**

Upon establishing the process and creating the vision with your client, your next most important resource will be your ongoing communication with your client.

No, we are not talking about simply checking in weekly or bi-weekly, keeping trackers up to date, and ensuring that you reply to emails in a timely fashion. Instead, we are talking about communication to truly help your clients LEARN and UNDERSTAND why they are doing what they are doing.

A harsh reality that we must understand is that utilizing the connection-based model of coaching will typically leave you with clients that are coming to you after having tried several other approaches—or even several other coaches.

While this is not inherently a bad thing, it must be understood within the coaching process.

By understanding this, we can also logically conclude that inside these other dietary attempts and coaching processes, clients have typically been promised ONE set of results, and likely within a fixed timeline (90-day commitments, 12-week challenges, etc.).

As an NCI Level 2 coach, you understand that a linear and time-based approach will not work. Instead, we will choose to work with the following framework:

- **Awareness**
- **Education**
- **Desire**
- **Application**

# Awareness

The beginning of any conversation or check-in should be awareness. This is simply recalling what has happened in the last several days (since last check-in or before starting with you).

As you already know, education is important, but application is king. Application can NEVER be understood without fully understanding where we currently sit and how we arrived at this spot.

You likely already knew this from the Level 1, but the real question is: HOW DO WE DEVELOP MAXIMAL AWARENESS?

The solution: Ask the right questions! Consider the following when beginning your check-ins or initial start-ups:

## 1. How have things been going?

This is open-ended and will allow you to learn exactly what is on the client's mind. Sometimes you will learn about their nutritional success or failures, but often times this will be a gateway to what exists in other dimensions of an individual's life.

Remember, the actions behind nutritional implementation are often driven by other facets of life. Implementing macros is easy, doing it while under extreme life stress is not always easy. This simple question will help you create awareness to any of these stressors that exist.

## 2. How are you feeling?

This is a simple question that is aimed at creating a conversation leading to biofeedback.

Once again, this is an open-ended question designed to get the client to talk. Yes, we recognize that you will likely have subjective biofeedback markers in your tracker, but this conversational piece is extremely important as numbers can only tell you so much.

*ACTION ITEM: What red flags may exist here? Are there any follow-up questions you may choose to ask here?*

## 3. What went well this week?

Note that this is directed toward identifying SUCCESS, not failure. There will not be a follow-up question of what didn't go well because clients will naturally be inclined to lead with the negative. Instead, challenge your clients to identify an area of success, and this will yield two positive outcomes:

- It will set them in a positive frame of mind for the remainder of the call.
- It will help you identify things that they absolutely CAN execute on when it comes to the implementation portion of the call.

## Education

Recall three key words: EDUCATION DRIVES COMPLIANCE!

This portion of the call serves two purposes:

- Educate the client on WHY we are seeing the results we are seeing (positive or negative).
- Educate the client on WHY you are continuing to move forward in the current protocol.

As stated earlier, an educated client is a compliant client, and a compliant client will create success, so let's consider the following in this section:

### 1. What phase are you in?

Remind your client of the phase of periodization you are in and WHY this phase is happening. This becomes massively important in reverse diets but has application in EVERY phase.

### 2. What observations are you, the coach, making beyond the numbers?

Remember that our clients tend to get caught up in the numbers game—everything from weight, to inches and even picking themselves apart in the mirror.

CLIENTS NEED AN OUTSIDE (and logical) PERSPECTIVE - PROVIDE THEM WITH THIS!

This single piece of the conversation can take a client from frustration to happiness, as they may simply have created false expectations for what should be happening or simply are misinterpreting their data.

### 3. Establish your expertise.

Clients hire experts and subsequently TRUST experts. This phase of the conversation allows you to “flex” your proverbial “knowledge muscles” a bit and impress your client. Continue showing them that YOU are the leader, and that they are in good hands with you.

## Desire

This may be the single most overlooked phase of any coaching process and is what will separate the GOOD coaches from the GREAT coaches.

We know by now that what a client wants and what a client needs are often two very different things. However, a good coach knows how to help a client perceive they are getting what they want while actually giving them what they need.

Here's how to best utilize this part of the conversation:

### **1. Ask what they are enjoying.**

Asking what a client “wants to be doing” is not going to help, but finding out what they enjoy is the key.

You will likely hear answers that pertain to daily structure, certain macro inclusions, or even certain food inclusions. AWESOME. You will want to keep these things in the protocol, and in the next section emphasize their inclusion again.

### **2. Ask if there is anything they are not enjoying.**

We understand that no one really enjoys being hungry all the time, or living in a caloric deficit, but those aren't really the items we are looking for here.

Instead, ask questions about meal preparation, lifestyle difficulties, energy outside of the gym, and anything else that you have previously identified as important to this individual.

This is not a question you want to spend a lot of time on, but one that can provide you clarity in the next section of application.

*ACTION STEP: Ask yourself, what are some things you can expect with either of these two questions, and how can you positively use this data moving forward inside of RETENTION?*

## Application

This is the final piece of the phone call and the time at which you will be providing macronutrient adjustments or having them stay the course.

Let's briefly recall that both you and the client now know:

- What is happening and WHY it is happening.
- Where these results sit relative to the overall process.
- What the client is getting out of the process both positively and negatively.



Now it's time to send the client on their way for the next several days.

### **1 - Provide the change.**

This is the easy part. Make your adjustment, and provide it to the client. Update any necessary documents, and reiterate successful implementation to the client.

### **2 - EXPLAIN the change.**

Even though you spent time earlier educating your client on what is currently happening, they need to understand why you have decided (or not decided) to make the current changes.

### **3 - Identify obstacles around implementation.**

Recall that in the “desire” portion, you learned some things that the client loves and doesn't love. Inside of this application section, you can “pre-troubleshoot” any potential implementation issues and allow their strategy to play more to what they enjoy instead of what they don't enjoy.

This single piece can go a long way toward creating results if done properly!

### **4 - Schedule next meeting.**

Never leave a call or meeting until you have your next call or meeting scheduled.

Yes, cancellations and rescheduling will happen, but doing this proactively will help keep everyone (including yourself) accountable to the process.

# Chapter 9: Specialty Protocols

In Level 1 we discussed the hierarchy of dietary protocols.

As a brief recall:

- Every client has a different entry point to the dieting process.
- Every diet should include an “exit strategy.”
- The pinnacle of results creation is a quantity-based approach with a heavy emphasis on micronutrient value.

As simple as that seems, we must understand that there are several protocols that fall within these guidelines that we as coaches must know how to properly utilize and educate on.

In this chapter we will aim to provide you with three things for each protocol:

**WHAT** - What are the tenants of the protocol

**WHY** - Why you would implement a protocol like this

**HOW** - How you properly implement it

By understanding these three critical components, you will be able to successfully implement the 4-phase model of coaching outlined in chapter 8 and ultimately provide your clients with the success that they deserve!

## Carb Cycling

**WHAT** - Simply stated, carb cycling is one of several variations of alternating low- and high-carbohydrate days. From a caloric standpoint, this SHOULD also include undulation of total caloric intake as well.

**WHY** - There are several reasons to implement a carb cycle with a client, but we have chosen to provide you with the three main reasons why you will likely use this method:

1. Offset metabolic adaptations
2. Increase compliance
3. Provide a more aggressive approach

### *1. Offsetting Metabolic Adaptations*

As you learned in Level 1, and as has been pointed out several times in this course, every “active diet” that yields a caloric deficit or surplus will create compensatory mechanisms by the body, or what we refer to as “metabolic adaptations.”

We know that the longer a deficit is maintained, the more likely the body will be to facilitate these adaptations, and we must take actions to guard against them. This comes in the form of higher-carbohydrate days, and the subsequent “cycling” of carbohydrates.

### *2. Increasing Compliance*

Even coaches have to acknowledge that long-term caloric restriction is not fun. The monotony associated with eating the same macros daily for extended periods of time combined with the physiological feelings (e.g., hunger) that come with the process can sometimes overwhelm a client and cause dietary deviation.

For this reason, carb cycling can be used as a tool of variance.

Personally (Jason, here), I love to begin my diet with a carb cycle. Just simply knowing that I get to change up my food quantity on a semi-regular basis keeps me excited and engaged, and that excitement leads to success with my commitment and ultimately my results.

Obviously, the tail end of a diet leaves us looking forward to the high-carb days, but carb cycling can absolutely be used as a tool of commitment from the beginning as well.

*NOTE: A massive exception to the rule is clients that struggle to commit to one set of macros. If a client fails to provide consistent food logs, or struggles with consistency in any way, adding the stress of multiple sets of macros will only exacerbate the problem.*

### *3. Provide a more aggressive approach*

Because we know that metabolic adaptations are inevitable, and we know that to some degree (not completely) higher-carbohydrate days are a temporary solution, we can combine these two with a more aggressive fat-loss approach.

This means that you can create a larger calorie deficit (over the course of 7 days) than you normally would by staggering low -calorie/-carb days and offsetting them with high -calorie/-carb days intermittently.

In the next section we will explain the application of this.

**HOW** - To explain the application of carb cycling, we will use the three different reasons from above and explain the implementation of each.

### *1. Offsetting Metabolic Adaptations*

In the context of simply guarding your body's natural defense system, we will view carb cycling as an unplanned event.

This is to say that there is no "structure" for when and how often you will have high-carbohydrate days. Instead, the implementation will be purely in reference to the biofeedback associated with the decline of metabolic hormones.

As a brief review, things we SHOULD NOT experience during a diet include:

- Loss of hunger
- Body temperature irregularities
- Inability to sleep
- Extreme mood swings
- Inability to focus
- Extreme decrease in sex drive

Unfortunately, the majority of these things WILL occur in a prolonged dietary phase. This is where the first implementation of carb cycling comes in.

When you begin noticing the presence of one or more of the above symptoms, consider a high-carb day, or "refeed."

As described in earlier chapters, there are no scientific guidelines to establish the quantities of your prescription, but a brief restoration of maintenance calories is a great place to start.

Upon implementation for one day, return back to pre-refeed macros and observe changes physically and physiologically.

If we see positive changes on either end, continue monitoring the physical and physiological feedback until this positive change declines, and implement again. This will be your "cycle." Over time, the frequency of these refeeds is likely to get shorter and shorter.

*NOTE: This is purely the dietary prescription. We must not forget the impact that stress (all stressors) will play in continued progress.*

## 2. Increasing Compliance

A typical calorie deficit will range from 10-30% upon initial setup. With that in mind, if we are using carb cycling to facilitate increased compliance, we need to understand the total quantity of the desired caloric deficit, and then distribute UNEVENLY across the week.

Example:

200lb male with a TDEE of 2,800 calories.

A 20% calorie deficit leaves us with a daily caloric intake of 2,240 calories, or a weekly total intake of 15,680 calories.

If we choose to carb cycle, we can choose to have 2 days at maintenance intake of 2,800, leaving us with 10,080 calories for the other 5 days, or 2,016 daily calories.

$$2,800 \times 2 = 5,600$$

$$15,680 - 5,600 = 10,080$$

$$10,080/5 = 2,016$$

Let's assume that each day contained 30% carb intake (after accounting for protein and fat). This will yield high and low days of 210g carbs and 151g carbs, respectively.

$$2,800 \times .30 = 840$$

$$840/4 = 210\text{g carbs}$$

$$2,016 \times .30 = 605$$

$$605/4 = 151\text{g carbs}$$

You can choose to have 2 low days, 1 high day, 3 low days, 1 high

OR

You can choose to have 5 low days, then 2 high days

ANY STRUCTURE WILL WORK AS LONG AS CALORIES HAVE BEEN ACCOUNTED FOR!

### *3 - Provide a more aggressive approach*

Crash dieting is never acceptable, but accelerated fat loss is.

This is a golden rule that you, the coach, must live by.

With this in mind, if you want to put your foot on the proverbial “gas pedal,” consider this unique carb cycling approach.

If you choose to place your client in a larger deficit from day 1 (e.g., >25%), you know that the rate of adaptation will take place far quicker.

Instead of simply adding activity (caloric output) or decreasing energy intake (lowering food intake), consider brief phases of maintenance.

Example:

2 weeks of a 30% calorie deficit

5 days at caloric maintenance

10 days at a 33% calorie deficit

4 days at maintenance

5-6 days at 35% deficit

2-3 days at maintenance

Continue based on biofeedback.

As you will note, the cycles here get smaller and smaller due to the adaptive thermogenesis that WILL take place. However, because we have taken precautions from day 1, this aggressive approach remains safe and effective.

*NOTE: This approach is relatively unstudied in peer-reviewed literature, so there are no “exacts” around its implementation. With that said, the clues to success will always live in the biofeedback.*

## **Keto**

First and foremost, Keto is neither the savior to everything, nor is it a dirty word. This manual is being published in 2019, and while this will absolutely be a phase, Keto is currently one of the hottest dietary trends discussed in both public and private coaching circles.

**WHAT** - Simply stated, the ketogenic diet is a high-fat, low-carbohydrate diet that when implemented over time leaves your body in a state of ketosis.

**WHY** - The Keto diet has SEVERAL successful applications including:

- Assisting diabetics and pre-diabetics with blood sugar control.
- Resetting insulin sensitivity.
- Reducing inflammation.
- Reducing the risk of heart disease.

**HOW** - Dissimilar to carb cycling, the implementation of the ketogenic diet is actually very straightforward, and very simple.

However, before we give you the caloric and macro breakdown of the ketogenic diet, we must point out who should NOT be using a Keto diet.

(see above for conditions that Keto will help)

The ketogenic diet should not be used by anyone with significant stress. This includes:

- Individuals who regularly resistance train with an exercise modality that utilizes the glycolytic pathway
- Individuals that do not plan to eliminate carbs forever
- Individuals desiring balance in their dietary lifestyle
- Individuals that live a high-stress lifestyle
- Individuals that have previously experienced metabolic adaptation, or HPA issues resulting from metabolic adaptations
- Athletes

If you do decide that the ketogenic diet is the right dietary choice for you, here are the steps for determining caloric and macro breakdown:

**Step 1-** Determine TDEE

- As a review, this is found by multiplying your BMR with an intensity factor

**Step 2** - Create the appropriate deficit

**Step 3** - Use this caloric intake and apply the following macro percentage:

- 70-75% fat
- 20-25% protein
- 5-10% carbs

As progress stalls, decrease calories, and re-create the appropriate macro breakdowns using the above percentages.

## Fasting

Before we jump into the what, why, and how of fasting, it is worth noting that every protocol we have listed thus far, and any other protocol that exists that we are not discussing in this manual work, for one simple reason: They create a caloric deficit or surplus based on the desired goal!

**What** - Fasting in and of itself is quite simply not eating. Intermittent fasting is the name given to cycles of not eating, then eating. Oddly enough, normal human behavior can classify as “intermittent fasting,” as we have yet to meet anyone that actively consumes food during their sleep.

With this in mind, a better definition would be intentional periods of food restriction while minimizing the daily feeding window. In application, this is most commonly seen with a 16 hour fast followed by 8 hours of eating, repeated daily.

**WHY** - Fasting protocols have several uses. The most commonly marketed use is weight loss, and for most people this holds true. However, this net effect comes solely because a calorie deficit was created, not because there is any magical power of simply not eating for an extended period of time.

When calories and macros are not counted, intermittent fasting can be a powerful tool to facilitate weight loss. However, the reverse can also hold true. In the absence of any form of tracking, it can also lead to a lack of recovery if there is a more intense training stimulus present.

Other uses of intermittent fasting include:

- Cellular repair
- Improving insulin sensitivity
- Increasing human growth hormone
- Improving gut health
- Cognitive function improvement

**HOW** - Let's be very clear, the intentional use of fasting protocols will be most associated with aesthetic and longevity-based protocols. This is NOT to say that they do not have application in performance; these applications are just much more limited.

To provide the best illustrations of implementation, we will use the Triangle of Awareness as our guide.



### *Performance*

As mentioned above, fasting protocols will rarely be utilized within this set of goals, most specifically in-season!

However, in the post-season and off-season phases, fasting can absolutely be a useful tool.

Remember that an athlete's post-season is defined by a return to homeostasis. For athletes, this will almost always come with an emphasis on gut health repair.

Consider a 24-hour fast at least once per week in the post-season phase.

We must also recognize that an athletic season will take its toll on the HPA axis of an athlete, most specifically an individual's cortisol curve.

For this reason, a true 16-hour fast with an 8-hour eating window may be applicable to an athlete who needs to normalize their cortisol function during the post-season window.

In the off season, you must begin looking at the desired adaptation. If volume accumulation is an emphasis, and there is a large degree of sympathetic stress, consider a weekly fast combined with extra parasympathetic inputs to truly facilitate maximal recovery and keep a hormonal profile maximized.

### *Aesthetics*

As mentioned previously, the most common use of intermittent fasting is in the area of aesthetics.

We must recognize that the majority of people are not in the habit of tracking or counting their calories or macros, so the simple solution to "eat less" works when it comes to weight loss.

For those that are already counting macros, intermittent fasting will have very little effect on their results. However, it can certainly help to improve insulin sensitivity throughout the process, and for some it may provide a solution to favorable compliance.

Overall, there will be nothing magical here, but it is undoubtedly a viable option.

### *Longevity*

We firmly believe that the main benefits of intermittent fasting live inside of longevity and well-being. As noted earlier, there will be massive benefits in insulin sensitivity, cellular health, and even an individual's hormone profile.

Unfortunately, very few of these benefits are quantifiable in terms of "everyday life," so they often go missing in the discussion of intermittent fasting.

The implementation here will differ from the performance and aesthetic protocols. Here, you certainly still have the option of the traditional 16/8 setup (or other time-restricted setups for that matter), but you also have the option for full-day fasting, or even multi-day fasts.

In longevity-based protocols, we are creating the assumption that training stress is minimal, and that life stress is being controlled, so not providing recovery through nutrition is 100% acceptable.

One area of caution in multi-day fasts is the reintroduction of food. Digestion will not be optimal at this point, and this must be accounted for when prescribing food intake. Consider the use of juices, and even broths initially, before transitioning to foods that are easier to digest and, ultimately, reintroducing a normal dietary intake.

# Chapter 10: Advanced Aesthetic

## Protocol – Peaking

By now, you have all the information you need for a successful diet.

Fat loss is created with a calorie deficit, successfully implementing, and fighting the inevitable metabolic adaptations. However, what about those individuals seeking the extreme levels of fat loss, and ultimately creating the perfectly peaked physique?

That's what we will discuss in this chapter. Let's briefly review what a successful diet will entail:

### **Ensuring that an individual is physically ready to diet**

While most clients that come to us have the desire to immediately begin their dietary phase, the simple truth is that very few are truly ready.

Several clients will require a “post-season” or recovery phase before actively beginning the pursuit of their goals. For some this is a reverse diet. For others it is a period of maintenance, and for most it is a simple foundational understanding of what homeostasis truly looks like from a stress input/output perspective.

Regardless of the person, this piece is essential if you want to truly create maximal results.

### **An appropriate pre-season**

Every diet will have its challenges.

If you can truly connect to a client and understand their desires (see chapter 8), this pre-season could be as short as one conversation.

For most, the beginning of a diet should include simple shifts in habits and more shifts in mindset around what is to come in the future weeks and months.

### **Appropriate caloric intake and macro setup**

In Level 1 you learned how to properly do this, as well as all of the factors that need to be considered.

So far in Level 2 you have learned how to navigate the inevitable metabolic adaptations that will cause plateaus.

When both are done properly, ultimate results will always be achieved.

## **Exit strategy created**

We know that most fat-loss diets will end with a prescribed caloric intake that is far less than is optimal.

As a coach, it is imperative that you do not leave a client in this state. Instead, toward the tail end of the diet you should be educating your client about what is to come and why it is necessary.

THIS IS CRITICAL to long-term success. Do not miss this step.

***When all of these pieces are executed properly, you WILL create success!***

With this in mind, let's talk about the final phase of peaking for a completed transformation.

First and foremost, THERE ARE NO RULES!

As with all things diet, everything is relative. You are about to learn the principles that you will have to identify, interpret and ultimately prescribe around. Peaking is an art, not an absolute; it will take practice to become comfortable, and you will ALWAYS be learning.

Second, there are no peaking protocols that will offset not dieting enough. You can't lose any more fat in the final week of a diet than you can in any other weeks, so don't expect magic here!

Despite what some people will tell you, most individuals do not need to "lose water" to look better. Instead, they simply need to lose more fat. (Sorry, bro.)

Assuming you have lost a sufficient amount of fat, the goal of your peak week will be to move as much water into the cell as possible while minimizing the amount of water between the skin and muscle (the subcutaneous layer). When we consider the fact that our bodies naturally sit at 70% of water in the cell and 30% outside the cell, we are actually set up in a relatively favorable position without even trying.

Re-read that final sentence, and then let it sink in that no peaking protocol should be drastic, and if it is, you may want to re-consider.

In fact, some individuals that are looking to peak should look no further than simplicity and NOT CHANGE ANYTHING.

When you do choose to make manipulations, there are three main variables that you will be adjusting: water intake, sodium intake and carb intake.

While they all need to be paired properly, there are a few things you absolutely should NOT do when attempting to peak:

**Water** - DO NOT CUT WATER EARLY OR TAPER WATER DOWN.

Your body has a unique defense system that prevents it from naturally dehydrating. When you cut water, your body will immediately begin the process of preserving water—and not just in the cell. This will leave your body looking even more “watery” when you try this.

**Sodium** - DO NOT PREEMPTIVELY CUT SODIUM.

Remember that water follows sodium. Not only will you end up flat, but you will also end up with an elevated level of aldosterone relative to your sodium and water intake. Recall from Level 1 that this is the hormone that makes you HOLD water. So once again, you will end up watery and not looking your best.

**Carbs** - DO NOT CUT CARBS, BUT DO NOT LOAD THEM AT THE WRONG TIME EITHER.

Carbohydrate manipulation is very likely during a peaking protocol, but the traditional methods of “loading” hundreds of grams of carbs the days before the desired peak is outdated and leaves little room for error. Understand that glycogen, when not used, remains saturated for up to 5 days. For this reason, consider loading early and then simply making minor adjustments as the week unfolds (more on this to come.)

## Beginning to Put It Together

### Water

In short, don’t manipulate water during the process. If you have been consuming 6 liters, keep consuming 6 liters. Personally, I like to increase water intake around 10-12 days out, then hold that all the way until peaking day.

This increase is more of an insurance policy to ensure adequate water intake and that carbs and sodium have the water necessary to transport.

On peak day, you will want to continue drinking as normal, but begin reducing intake about 4-6 hours from your “peak time” (photo shoot, stage, etc.)

Frequent monitoring inside of this 4- to 6-hour window allows you to easily manipulate with more intake, more carbs, or even more sodium, yet still with enough water to ensure the manipulations are effective.

### Sodium

Around 2-3 weeks out we want to begin monitoring sodium levels. Ideally the goal is to create consistency so that you have a base level to manipulate from.

From here, I borrow from Dr. Layne Norton and his 30% rule.

On days where carbs are increased (carb front-loads), we decrease sodium by 30%.

On days where carbs are decreased, we increase sodium by 30%.

This small manipulation will allow the desired amount of water and carbohydrate to enter the cell.

## **Carbs**

I typically like a 2-phase approach to carbohydrate loading.

Around 10-12 days out (when water is increased), I will begin decreasing carb intake for the carb-depletion phase.

This is not excessive, but enough to truly prime the cells for saturation.

Around 5-6 days out I will load carbs. The quantity will be dependent on what we have noticed throughout the prep. Remember, you will likely have 12+ weeks of data that show a client's response to varying intakes. Personally, I am so neurotic that I even require pictures every day for the final 4-5 weeks to truly understand how the body is handling these varying carb intakes.

Usually I will begin with about 25% more than their most recent high-carb day or refeed, if that was used in prep. If we did not have a refeed, I will typically go about 250% higher than current intake.

From there, we simply watch how the body responds over the final 5 days.

This early load allows us to work with a body that is likely 80-90% full, so the final manipulations are much easier than a body that is around 50% full. The risks are considerably less, and the precision is far greater.

## **Final Takeaway**

As a Level 2 coach, you absolutely know that the body is a finely tuned machine that is consistently creating compensatory mechanisms. Nowhere in our evolution has the body cared about peaking, so attempting to manipulate our sophisticated systems is tricky at best.

Instead, use the above strategies in the minimum effective dose. Do not rely on them, and opt to get yourself in the best shape possible. At that point, the manipulations we have provided are just the icing on the cake!

# Chapter 11: Performance-Specific

## Protocols

There are short-term performance goals such as single-day events like a Tough Mudder, half Ironman races or weightlifting meets, and then there are longer-term performance goals such as increasing relative bodyweight strength or improving cardiovascular endurance.

In this section, we are going to dive into how to prepare for the short-term performance goal, or as we will refer to it, a “special event” and how to properly fuel the body and mind for that event.

Remembering back to the periodized model, there are only two priorities when a person is in-season: performance and recovery, period! A person who is preparing for a performance event, of which they have most likely been building up to and training for, when the event day actually arrives the proper amount of focus still needs to be maintained in order to prevent any form of performance loss. This is especially the case when it comes to multi-event days or multi-day events, in order to avoid any type of adrenal dump or burnout after the first phase or the first day of the event.

Before we get into the actual periods that surround the occasion, let’s quickly cover some of the most significant problem areas that can destroy a person’s performance on game day.

1. Not getting the adequate amount of rest the night before the event. Nerves and cortisol can prevent a person from getting the proper amount of rest that the body needs.
2. Not eating enough on the day of the performance. This usually means not enough calories or not enough carbohydrates.
3. Not fueling the body appropriately in the days before the event. This usually takes place due to a lack of hunger which is caused by nerves and stress.
4. Post-event, not giving the body enough time, fuel and nutrients to fully recover. A person may immediately begin training for the next event or pick up regular training the very next day or two days following an event without giving the body the proper amount of time to re-establish its baseline. The time needed to re-establish homeostasis is determined based on how long the individual has been training for a particular event.

Keeping all of the above four concepts in mind, let’s detail a performance fueling and recovery plan during what is required in the pre-season, on event day and during the days or weeks that follow the event.

## Pre-Season

The pre-season or pre-event schedule usually consists of the 2- to 3-day period before the event and the primary goal of this period is to prep the body and mind for the event.

However, keep in mind that the time frame of the pre-event period could also be 1-2 weeks in duration for specific events.

This time frame usually entails a reduction in training volume and a build-up of glycogen stores in the body, or, in other words, making sure that a person's gas tank is fully topped off.

Means of doing so can include a single high-carb day or carb loading for several days before the event day. The main purpose of adding more fuel during this period, mostly in the form of carbohydrates, is to restore the person to full capacity if they are in any way depleted. This way, they can enter the event with a physical body that is ready, along with an energy system—or let's call it an energy storage tank—that is not in any way depleted.

For instance, a refeed day or a higher carb day could be given the day or two prior to an event if the individual feels in any way run down along with the person getting some additional rest, which usually entails getting in bed an hour or two the night/s before the event.

The decrease in exercise intensity along with increased carbohydrates, possibly a small calorie increase and some more sleep, is the ideal equation for preparing the mind and body for the big day.

## Peri-Event or In-Season

During the day of the event, the focus is on performance and recovery. You may not understand how recovery fits in on the event day, but it could never be more important! If a recovery protocol is not followed during the day of the event, then the person runs the risk of having an adrenal dump during the initial stages of that said event and will not have the reserves necessary in order to finish the event with the energy in which they started it.

Therefore, the amount of recovery that a person gets in on their event day will play the most significant role in the level of performance that they can give.

So, what does this mean in terms of fueling? It means that a person needs to time their nutrient intake so that the stress response of the event's activities are mitigated as much as humanly possible. This is done primarily through carbohydrate intake and precise nutrient timing.



Now, if there are multiple events on the event day or if it is one long event, a person will at some time need to fuel during the day and event with carbohydrates as well as the appropriate amounts of protein and fat.

For events that are brief or are around the 45- to 90-minute mark, a high-quality nutrient-dense meal 2-3 hours prior and a lite and quick-digesting protein and carbohydrate snack 45-60 minutes before the event should be sufficient to fuel the event adequately.

After the event, a carbohydrate and protein shake in the ratio of 2:1 or 3:1 should be mandatory and should be consumed immediately.

Remember that the stress response from the exercise or event should be curtailed down as soon as possible, and that is what the post-workout carbs are doing. It is the insulin response that is ramping down or shutting off the cortisol production, as insulin is counter-regulatory to cortisol.

Then 60-90 minutes after the event, make sure to get in a high-quality protein, carbohydrate, and fat meal with a significant focus on micronutrients. This does not mean go out and eat pizza and beer for that post-workout meal. If that is done, make it later in the day and after the proper post-workout meal is consumed or make it the day following the event if possible.

When it comes to multiple events in a single day or even multiple days of events, the routine for fueling and recovery changes a bit.

Always start the day with a protein, carbohydrate, and a fat-based meal with higher macros than usual. If the event is early in the day, make sure to wake up early enough to fuel the activity and be careful how much added fats are in that meal as fats will take the longest to leave the stomach and enter into the bloodstream.

Therefore, if the event is early, and the individual participating in the event cannot wake up at least 3 hours before the event, keep the added fats low in the breakfast meal.

Depending on when the event is during the day and remembering that at best that meals 2-3 hours prior to the event are what are fueling the body at that point, a carbohydrate and protein snack should be included 45-60 minutes prior to the start of the event. That snack will be used to regulate blood sugar levels, so the person doesn't feel weak or shaky during the first event.

Following the first portion of the event a carbohydrate and protein shake containing high-molecular weight carbohydrates, ideally in the ratio of 1:1, 2:1 or even 3/:1 depending on the event, should be consumed immediately after the event is finished.

Assuming that there is some period of a break in between activities, if possible, an easily digestible meal with protein, carbohydrates and little to no fats should then be added in about 60 minutes after the first post-workout shake. Good examples include rice and chicken breast with a carbohydrate-based sauce.

The same routine from above should also be followed for multi-day events and/or all-day events with breaks for hydration and fueling that last more than 5-10 minutes. If the event is an all-day event that is continuous over a period of more than 3-5 hours, then the individual in that event will most likely not be able to sit down and eat a meal, but they still should aim to get in the adequate amount of carbohydrates for fuel and recovery and, if possible protein—both being in liquid or semi-liquid form, like squeeze packs or apple sauce-types foods—an hour and a half into the event.

Following the day's events, the same high-quality protein, carbohydrate and fat-containing meal with a significant focus on micronutrients should be consumed around 1-2 hours following the day's last carbohydrate and protein shake. If the event continues into the next day, then the meal listed above should be lower in fats, so digestion can be maximized, especially if that meal is to be the last meal of the day or if that meal is close to bedtime. Then the whole protocol from above starts over on the next day if there are second or third day events.

## **Post-Event or Post-Season**

The length of time that a person has been training for a particular event and the amount of stress that they have induced on their body will be huge determinants on their post-event requirements. The amount of stress or individual stressors that a person has imposed on themselves will determine how much recovery time is required.

As a reminder, the goal of the post-season is to bring a person back to homeostatic balance. Under normal circumstances, that usually means a calorie adjustment from either a deficit or a surplus, an improvement in a person's micronutrient profile, an increase in dietary fats to restore proper hormonal function and possibly some gastrointestinal repair work. Usually, the longer the person was training for the event, and the greater the amount of the stress they were under, the longer the recovery time will be and most likely all of the recovery factors that were just mentioned will need to be put in place. Under normal circumstances for every dose of stress, there needs to be an adequate dose of recovery if a person wants to restore balance to all of the body's systems.

Therefore, a person should not go straight back to training at 100% effort—or even training at all for that matter—in the days following the event. There should always be at least 1-3 days of recovery where exercise is reduced, food quality is improved and adequate food quantity and sleep are prioritized. Those are the steps that should be followed post-event or in the post-season, and until all of a person's appropriate biofeedback markers appear favorable, they should not entertain the idea of entering into a different season or putting their foot back on the gas until they are.

# Chapter 12: Longevity-Specific

## Protocols

### Largest Factors Preventing Longevity

Scary Fact Alert: Did you know that this is the first time in human existence in which it is projected that parents will actually have longer lifespans than their children? I truly hope that we as coaches can help change that!

According to certain insurance companies, when they help clients estimate how to prepare for retirement, they have to first factor in what a client's expected lifespan will be. In doing so, there are 9 factors which they consider: the client's gender, genetics, prenatal conditions in utero, marital status, socio-economic status, education, ethnicity and migrant status, access to medical technology and finally their lifestyle. Now, if this was an insurance class on estate planning, then all of those factors would be considered. However, when looking through the lens of the nutrition and health coach, the level of a person's education and lifestyle are the only two factors that should be focused upon. Therefore, when a coach finally leaves a client, he/she should in fact leave them educated about what lifestyle factors are going to be the most important if they want to live long and healthy lives.

This section of the manual is about the largest internal factors that contribute to shortened lifespans or, as they are called, "healthspans." A person can live into old age and have a long lifespan, but if their quality of life is poor for the last 30-40 years of their life, then a person could ask, "What is the point of living that long?" We are also going to cover some of the best tools and tips for realistic protocols that will help clients ensure that they are living those later years with optimum levels of health.

The quantity of time that a person lives and breathes is referred to as a lifespan, however the duration of that time in which a person is healthy and thriving, not just breathing, is known as their "healthspan."

It is customary in the longevity realm to focus on lifespan alone, when the focus should really be more on the overall health of a person and the degree of functionality that they maintain in their later years of life. The concept of healthspan makes a lifespan goal secondary. Healthspan, along with lifespan, can be positively influenced through dietary changes, time in nature, exercise and movement. In addition to that, social interactions and having a strong family bond also play a huge role. Before we dive into means of extending a person's healthspan, let's first talk about some of the biggest hidden factors that can rob a person of their later years in life.

## Inflammation

Inflammation is a big player involved in the aging processes. It promotes conditions that range from arthritis all the way to cancer. If a person wants to live a healthy life, one of their first goals should be to identify all of the ways in which they can reduce inflammation's effects in the body. Some of the best ways to do so include some of the simplest lifestyle changes.

Let's first define inflammation.

Inflammation is a word that gets thrown around often, and the general premise is easy enough to fathom, but many people still really don't know what it is or how it forms. Simply put, inflammation is a reaction in the body to something harmful or damaging. There is damage and harm that is going on in the body at every second of the day, such as when a pathogen or toxin infects a cell, and inflammation steps in to address and correct the problem. Adequate amounts of inflammation are required for the body to function, but when there is too much of it in the body, it can confuse many of the body's systems, resulting in many of the diseases of today and definitely the diseases that arise in old age, such as cardiovascular disease, cancer, diabetes, arthritis, auto-immune conditions and even diseases that destroy the body's joints and limit mobility.

Keeping inflammation in check has been one of the largest factors contributing to people living past the 100 year mark (centenarians). The Newcastle University's Institute for Ageing and Keio University School of Medicine in Tokyo performed a study of 105 centenarians and their offspring. They measured certain health markers, and they identified that keeping inflammation levels down was the largest factor that allowed a person to live past the age of 100. [14]

## Oxidative Stress

Oxidative stress and inflammation could be considered partners in crime, as they are often seen together in the body. However, how and why they each occur is very different. Inflammation differs from oxidative stress in how it is created. Oxidative stress is the direct result of the production of free radicals and the damage that they cause when they exceed the body's antioxidant balancing capacity.

The mitochondria of the body's cells, often referred to as the "powerhouses" of the cells, create the body's cellular energy, but they also produce a form of waste known as reactive oxygen species, or ROS, also commonly called free radicals. Cellular energy is required for almost every function that the body performs, and as a result, the body creates large amounts of free radicals and it is the body's antioxidants that neutralize many of those free radicals, limiting their damage. Just as feedback mechanisms help regulate the body's hormone production, antioxidants are produced to combat the negative effects of free-radical production.

There are several contributors to oxidative stress and the resulting surplus of free radicals. The biggest of those contributors are a person's diet, lifestyle and toxicity levels. Toxicity in the body can be environmental or internal, where the internal toxicity is created from pathogenic bacteria. The instinctive immune system can also be a trigger of oxidative stress, but this type of stress is usually short-lived and fades away quickly after initiated. It is the type that occurs when the immune system has to fight off an acute type of infection or heal an injury.

There are several theories, one called the "free radical theory of aging," that proposes the damage that accumulates in the body from the reactive oxygen species is a primary contributing factor in shorter lifespans and "healthspans." A second, more specific theory, "the mitochondrial theory of aging," states that the damage to the mitochondria portions of the cells from the reactive oxygen species shortens a person's lifespan.

This just so happens to lead us to the next largest factor that contributes to shorter healthspans and lifespans: mitochondrial dysfunction.

## Mitochondrial Dysfunction

Mitochondria are small parts inside most of the cells in the human body. The primary function of mitochondria is to carry out cellular respiration. One might look at the term cellular respiration and think that it means cellular breathing, but it is actually a play on words. Cellular respiration broken down in simple terms is taking nutrients into the cell, breaking them down and then converting them into energy. The energy produced is called adenosine triphosphate (ATP), and it is used to perform almost every function that the cell completes.

The primary set of interactions that make up ATP production are collectively known as the citric acid cycle, or the Krebs cycle.

When these generators of power in the cell become dysfunctional or create more reactive oxygen species than the body can handle, they begin to slow down, and the amount of energy they produce drastically drops. It has been demonstrated that increased levels of ROS and the reduction of mitochondrial function are two of the largest factors that increase the aging process, while decreasing a person's lifespan. [15] [16] Therefore, the goal for those looking to live a long healthy life should be to keep their mitochondria healthy and happy.

Inflammation, oxidative stress and mitochondrial dysfunction, all rather ambiguous terms that many would most likely not consider when rattling off the top three factors that can reduce lifespans and prevent a person from ever becoming a centenarian. All three are also root causes behind the development of almost every chronic condition imaginable. Once we understand how they become a problem, the next step is putting forth a plan to deal with them.

## Longevity Protocols:

### 1 - Ditch the Steak for a Salad if Longevity is the Goal

The leading cause of death in the United States is still heart disease. It is the build-up of plaque that accumulates in a person's arteries that eventually hardens, causing an increase in blood pressure, which will cause the heart to work harder, laying the groundwork for heart disease. A majority of that plaque is formed from processed sugars, inflammatory fats and animal products. Foods that come from the ground do not cause plaque to build up. If the goal is to live and be healthy in the later years of life, then a majority of foods that a person eats should come from whole food plant sources.

Animal proteins should be limited in the diet to one serving per day. Instead, favor plant-based protein sources such as beans and whole grains to fill in the extra protein. Small-mouth, cold-water fish are also considered a good option, 3-4 times per week. The areas of the world that are home to the largest number of centenarians, called blue zones, consume meat in low amounts, or as a side dish, and around 90% of their diets consist of plant-based foods.

The reason for this is that high animal protein consumption has been linked to elevations in IGF-1, a marker that has been highly correlated with lower lifespans [17] compared to those who consume lots of vegetables and fruits. Plant products also have high levels of antioxidants, which are super important free-radical scavengers that aid the body in fixing some of the damage that contributes to aging. Therefore, the more plants that a person eats, the more raw materials the body will have in order to fix the damage that aging causes.

Vegetables will also fill a person up with very few calories. They will keep a person satiated and contain a variety of fiber types that will also make the microbiome happy and healthy, which specifically translates into a healthy immune system.

### 2 - Hormesis

The next protocol when it comes to reducing all-cause mortality while providing a better quality of life and healthspan is through what is called hormesis.

The definition of hormesis is a natural experience by which an advantageous result (improved vitality, stress resilience, growth of the healthy tissues and longevity) occurs through the introduction of low doses of a process that would otherwise be toxic or lethal at higher doses. Said differently, hormesis is the intentional introduction of a stressor to the body in small doses that give the mitochondria of the cells a mini workout so that they can come back bigger and stronger. The process is similar to what happens when a person goes through a

strenuous workout. The body may take days to recover, but if that person were to do the same workout the following week, that same strenuous workout would no longer be quite as hard on them because their body has adapted by increasing its strength and resilience levels and is now better able to cope with the stress of the workout. That is hormesis broken down on a larger scale. Let's say instead of the body's muscles getting a workout, we are giving the mitochondria of the cells a workout so that they can come back stronger and more resilient.

Hormesis can be looked at as the “whatever doesn't kill you will only make you stronger” version of stress. Through regular exposure to certain forms of stress, the body's stress response improves, and the body benefits from it. [18] The brain, muscles and skin require challenges, but none benefit quite as much as the mitochondria of the cells. Healthy and vibrant mitochondria translate into a healthy and vibrant individual. Some of the best forms of hormesis that can be employed in daily and weekly routines include:

- Extreme heat through infrared/regular saunas
- Extreme cold through cryotherapy
- Intermittent fasting or time restricted feedings
- Most forms of exercise
- Oxygen deprivation training
- Red light therapy
- UV sun exposure/tanning

Now some may read the last entry and think that UV sun exposure can cause people to sunburn or bring about cancer, however that is only when certain people get too much of it. When a person gets the right amount, those same rays of the sun build up the health of the cells and actually safeguard a person from cancer by creating the immune system boosting vitamin D which serves as the catalyst for over a 1,000 different reactions in the body. Getting some extra sunlight can be an easy and free bio-hack towards living a long and healthy life. [19] That is just one example of how just the right amount of something can provide a tremendous benefit in the body, when on the other hand, too much can be detrimental.

All of the variations of hormesis listed above create a form of stress that does not harm but rather provides a tremendous amount of health benefits. Society today has little to no forms of hormesis in their day-to-day lives compared to our ancestors who were exposed to all of the forms of stress listed above on a regular basis, depending on where they lived. The lack of exposure to many of the stressors that we learned to thrive on has laid the foundation for the poor health that is seen in most of this world today. The human body is biologically wired to adapt and then come back stronger to stressful conditions. If we negate that concept, then there is a very high likelihood that the population as a whole will continue down a path towards shortened healthspans and lifespans.

### 3 - Fasting and Autophagy

Calorie restriction and time-restricted feeding, or TRF, have both been connected to longer lifespans and healthspans, largely because they initiate a process in the body called autophagy. The term autophagy means to self-eat, and it refers to when cells eat themselves. There is no actual eating that takes place, but the term is used figuratively in describing how certain cleaning processes of a person's cells break down and remove old portions that could be considered faulty or are parts of the cell that are no longer contributing to the health of the cell and, in many situations, can even hinder cell function.

During the process of autophagy and fasting, human growth hormone production is also amplified, as it is HGH that sends the message to start the creation of the new replacement parts of the cell that were just broken down and reused. In that regard, the autophagy caused by fasting and the production of HGH can be thought of as the recycling of old cells into brand new cells.

There are other means that also instigate the autophagy process, such as keeping blood sugar in control, keeping inflammation levels down, reducing body fat, and stimulating brain function, but their impact on increasing autophagy pales in comparison to fasting when it comes to instigating the cellular renewal process.

Calorie restriction—which includes intermittent fasting, time-restricted eating, prolonged fasting and 3-5 day fasts—is a tool that has shown tremendous long-term promise for extending the lifespans of non-human organisms in clinical studies. It is now even starting to show the same promise in clinical trials when it comes to extending the healthspans of humans participants.

A quick note and a word of caution: Extended fasting for long durations of time, 3-5 days or more, should be supervised by a doctor. As a health and nutrition coach, this is an area that can be educated upon, but understand what the scope of practice is before advising someone on implementing an extended day fasting plan.

#### **Intermittent Fasting**

Intermittent fasting (IF), or time-restricted feeding (TRF), is the process of alternating between windows of time in which a person eats and then fasts. Neither IF nor TRF include details on what types of foods should be consumed; they only focus on when a person should or should not be consuming calories, and they should not be viewed as a diet but rather a calorie-consuming window of the day.



### **Extended-Day Fasting (3- to 5-Day Window)**

Studies have detailed how fasting for durations of 3 days or longer can have profound positive health effects in the body. It can increase stem cell growth, build up the health of the immune system, improve the body's usage of ketones and fatty acids in the blood, improve cell recycling and autophagy, improve blood glucose regulation, reduce insulin resistance and lower inflammation significantly. [20]

The body requires a minimum of 2 days of fasting before many of the longevity-increasing benefits come into play. The main reason for this is because the body has evolved to deal with extended durations of time without food, and there is a pretty clear line that can be drawn in the sand when it comes to the difference between a person fasting and a person starving. Likewise the body knows the differences between extended-day fasting and time-restricted feeding.

For example, even during longer term fasts that exceed 5 days, the starvation response will only occur if the body does not get enough essential nutrients. If a person is properly fed nutrient-wise, then the chances of physically starving are close to zero.

A person could restrict their calories over a certain period of time each day and that could still be considered fasting, however, this cannot be attained on an extended-day fast, as only air, water and micronutrients are technically allowed. All fasting routines have potential health benefits, but the longevity benefits drastically improve with extended-day fasting compared to intermittent fasting or time-restricted feeding.

Firm and rigorous fasting or consuming zero calories of any kind initiates hormesis on a much larger scale, which, as we learned in earlier sections, improves a person's resilience to stress, allowing the body to better handle all forms of stressors more effectively.

### **Fast-Mimicking Diets (FMD)**

A fast-mimicking diet (FMD) is a type of modified fast in which a person eats a small amount of certain macronutrients and micronutrients while still receiving the therapeutic benefits of extended-day fasting. It allows a person to still get a small amount of food (800-1,100 calories), but the way in which the food is broken down tricks the body into thinking that it is still fasting. The little food that a person eats is just the right amount of food that allows a person to stick with the fast while still receiving all of its benefits. The foods on the plan are low in carbs and protein, high in fiber, and the bulk of the calories come from fats.

The creators of the FMD and the ProLon Diet describe it as a mostly plant-based diet program designed to attain fasting-like effects while providing micronutrient nourishment (vitamins, minerals, etc.) and minimizing the burden of fasting.

FMD has been tested on yeast, mice and humans, and has shown consistent positive results.

## **4 - Find Ways to Deal With Stress, or the Stress Will Deal With You**

By now everyone should comprehend the direct negative effects that stress can have on the body in both a physical and mental sense. It should also be easy to see how the lack of regulation of a person's stress level is just another factor that can shorten a person's lifespan. The laundry list of stress-related conditions continues to grow, including heart disease, cancer, and even the more common feelings such as irritability, moodiness, and poor sleep. However, one of the biggest problems that stress can cause in a person's life may be less obvious.

Being stressed often leads to the formation of negative behaviors or habits. People form bad habits in an attempt to cope with the stress, and those bad habits can take over a person's life. Comfort eating, smoking, drinking, drug use and caffeine are just some of those forms. When bad habits form, they can lay the groundwork for a shortened life expectancy as well as a terrible quality of life. Therefore, if a person does not proactively take the steps to de-stress their lives, their long-term health and life expectancy goals will be some of the first things that gets crossed off the list.

All a person needs to do is put some relaxation techniques into place so that they can keep their life expectancy goals exactly where they should be. Otherwise, they run the risk of not being able to bounce back from uncontrolled stress levels.

## **5 - Time in Sunlight and in Nature**

It has been well-documented that those who spend more time in nature and get the right amount of sunlight live longer lives. As human beings, our lives are directly connected to the sun. We covered in the circadian rhythm section how the modern world tends to forget that on a biological level, the human body would not survive on this planet without the sun. Therefore, it should make perfect sense that something that gives a human being life can actually give more quality years of that life when introduced in the right ways.

When a person is exposed to sunlight in the appropriate doses, that exposure triggers the cells on the skin to create vitamin D. That super important vitamin/hormone/prohormone helps keep a person's bones strong, keep their immune system healthy, and prevent depression and chronic disease.

It is estimated that over 50% of adults in the United States alone are deficient in vitamin D. This should not be surprising considering that 90% of the population's day is spent indoors. Sitting by a window doesn't count for exposure. It may help in getting the body some much needed brightness, but unfortunately, the window blocks the UV light which stimulates vitamin D production. We already touched upon how sunlight is required for production of serotonin, the body's feel-good hormone, and how it is the precursor to melatonin, the body's sleep hormone. Sunshine and vitamin D alone represent a triple threat of a longer lifespan, happier disposition, and better sleep—all important components that play a role in positively effecting a person's healthspan. All of these benefits are also completely free and rather easy to obtain. All a person needs is 15 minutes of sunshine per day, exposing their hands, arms and face to get their daily dose of vitamin D. Those with lighter skin may require less, and those with darker skin may require a bit more but a good time frame in the sun should be however long it takes to get a slight pinkish tone to the skin.

If a person is not able to get sun exposure due to demographics, weather, or many other factors, their next best bet would be to take a vitamin D supplement. However, it is important to note that the people who naturally raise their vitamin D levels from being outside in the sun have been shown to have longer lifespans and better quality lives than those who just have optimal vitamin D levels in the blood. The sun does way more for the body in terms of health than simply bringing up a person's vitamin D levels. [21]

## 6 - Social Interaction

Do you want to live longer? Well, spending more time with those that bring you joy and laughing more can definitely help. The more connected you are to other human beings, the better your overall health can be, and those who have demonstrated long lifespans really do spend more time with those that they love. Research goes a bit deeper and says that those who maintain positive relationships in their later years by staying connected to family and friends have longer lives and better healthspans.

A study from Innovations in Aging chronicled the lives of over 5,000 Japanese citizens for over 20 years and determined that “without a doubt, the level of social interaction that a person has and maintains is certainly correlated to longevity and having a higher level of life satisfaction.”

In addition to that study, professor Sarah Harper from the Oxford Institute of Population Aging has been quoted in saying, “What we're finally realizing is that it isn't just food and exercise anymore ... Both are still important, but the social world in which we live is also vital. It is social connectivity and healthy friendships, both with those whom we love, with our peers, within a family and even between

generations that can play a huge role in living long and healthy lives. We now know that in many ways that in doing so can have almost the same effect on living a good life as eating well, not smoking, and not drinking too much alcohol.” Or plainly put, those who are engaged in “meaningful” relationships have improved levels of health and longer life expectancies.

So, the take home point is, make more time for those that bring joy into your life. Reach out and maintain those meaningful relationships through e-mail, by phone or in person. It is not the means by which it is accomplished, but more the fact that it takes place on a regular basis that is important. Human beings are social creatures and need to be around other humans to thrive. Aim to do something meaningful or reach out a little bit extra at least once a week, and that should be a great first place to start.

# Chapter 13: Reading and Understanding

## Lab Work - How to Assess & Apply

### Legalities

It has been argued and debated whether anyone other than a doctor should read or interpret a person's blood/serum laboratory reports. So, before we explain anything with regards to understanding a blood panel, let's first cover the legalities and responsibilities of doing so.

Be it a nutritionist, health or nutrition coach, or even a certified functional practitioner, all have the goal of helping clients live healthier lives through motivating and encouraging healthy lifestyle habits. There is tremendous promise of the health and nutrition coach, working hand-in-hand with doctors to help implement treatment plans with patients and clients. However, it is essential to know that a health and nutrition coach is not a registered dietitian (RD) or a certified nutrition specialist (CNS). It is the role of a coach to help employ healthy lifestyle changes that help clients reach a particular health goal, but by law, they cannot identify, distinguish or treat medical conditions.

The term registered dietitian (RD) is tightly regulated due to the training required to become one. RD's have received a bachelor's degree in a specified program, completed a 1,000-hour plus internship and are licensed. A certified nutrition specialist (CNS) is a bit different in that they also have a bachelor's and/or a master's or doctorate degree, and they also have over 1,000 hours of an overseen internship. Then after passing an exam, a CNS also becomes certified and licensed as well.

Understanding those facts, nutrition and health coaches cannot legally interpret blood tests, as they are not qualified to diagnose medical conditions or diseases. This is not something that can be argued with. If they do try to interpret a blood test, and something were to happen to a client, then that nutrition or health coach could be subject to legal action. However, it is legally acceptable for health and nutrition coaches to help clients recognize potential problem areas and identify any health warning signs.

Helping a client identify unhealthy patterns and high-risk circumstances that may materialize on a blood chemistry report aligns with improving their health. If anything on a client's labs possibly leads to a warning sign, then a responsible health and nutrition coach should understand how to refer that client to the appropriate medical authority so that they can receive a further evaluation.

Going over lab reports with clients and helping them identify warning signs is very different than translating them and diagnosing a medical condition, and the difference needs to be crystal clear. Many times an eager and well-intentioned coach can easily cross the line from one realm into the other. So that being said, let me stress this one more time... ***A NUTRITION AND/OR HEALTH COACH CAN HELP A CLIENT IDENTIFY WARNING SIGNS, BUT THEY CANNOT IN ANY WAY DIAGNOSE A MEDICAL CONDITION OR ADVISE TREATMENT FOR A MEDICAL CONDITION BASED ON ANYTHING THEY INTERPRET ON A LAB REPORT.***

## **Blood Chemistry Interpretation Approaches**

The conventional medical model relies heavily on blood chemistry interpretation, and almost every decision that a doctor makes is heavily influenced by what shows up in their blood. However, the very same conventional medical model primarily uses blood chemistry to seek out and identify disease or determine if a person is in a diseased state. A person's blood chemistry is interpreted by using comprehensive reference ranges and many of those interpretations are used in determining if pharmaceutical medications are required or not. Based on a patient's blood chemistry report and their clinical presentation, it is up to the physician to determine if the patient is already in a diseased state and if they would benefit from medication or if the patient is not in a diseased state. In either case, the physician may decide to administer a medication in order to prevent them from ever entering into a diseased state or with the hopes of improving their overall health markers. Unfortunately, the means of treatment almost always involves some form of pharmacology when a person makes a trip to the doctor, and that person does not have a clean bill of health.

Functional, complementary, and many of the forms of integrative medicine take a much different approach when utilizing blood chemistry reporting. They use "individual optimum" ranges with the primary goal of not treating an individual as diseased, but instead looking to discover changes in a person's inner workings and bodily processes. They consider the body as a whole, rather than compartmentalizing each area of the body, with the understanding that the sum is greater than the parts. The primary goal of functional medicine blood chemistry interpretation is to catch a dysfunctional system early so that it can be amended through lifestyle improvements and so that healthy function can be restored before a person ever reaches a state of disease.

## **The Problem with Reference Ranges**

Before anyone attempts to decipher a blood chemistry report, there are a few potential pitfalls they should be aware of. Problem No. 1 is that reference ranges can vary between different labs. Problem No. 2 is that the current reference ranges are created based on the average population, which many would argue is a sick population and far from healthy and optimal.

If we understand that the reference ranges that traditional physicians may be using originate from a sick and unhealthy population, it would make sense as to why more and more people are caught off guard when they hear that they have developed a disease or condition, with the warning signs, in many ways, being hidden from them. Problems such as this could be avoided if their physicians instead used the optimal “functional” ranges when deciphering blood chemistry reports. The optimal or functional ranges originate from markers of a disease-free, healthy population. They are also the markers from clinical studies of individuals who do not in any way show an elevated risk of sickness or disease.

Often, clients are told that their blood work looks “perfectly fine” or that they have nothing to worry about without their doctor ever showing them their blood chemistry reports or ever going over them with the patient. But in that situation, the question needs to be asked, “Am I fine compared to the sick population, or am I fine compared to the healthy population?” Or, perhaps a better way to put it would be to ask, “Am I sick-normal or am I optimal-normal?” Due to any possible discrepancies, it is always advised to ask clients to get a copy of their blood work from their doctor and keep it on hand so that they can use it to historically report how specific markers are trending either positively or negatively. It is also advantageous to work with a second practitioner who can interpret them and possibly offer a second set of eyes on them.

The primary goal of anyone getting their blood drawn is to provide that person with an inside view of the body and to catch a possible dysfunctional state before it evolves into a disease. Therefore, when helping clients decipher their labs, if you choose to do so, interpret them using the individual optimums, not merely the laboratory’s reference ranges.

As of this writing in 2019, some direct-to-consumer websites from which a consumer can order blood chemistry reporting for themselves include:

- Direct Labs
- Health Testing Centers of Life Extension
- Health Check USA
- True Health Labs
- Ulta Labs
- AnyLabTestNow

## Basic Blood Chemistry Interpretation Guidelines

1. Look at the individual markers and identify if it is in the optimal range.
2. Look for patterns. Pattern recognition takes experience and practice. The problems that may be identified from the blood are enormous.
3. If a marker(s) is not optimal, can it be connected to any known pattern that may or may not present? Refer to the charts to do so.
4. Connect any issues with the client's main complaints, symptoms, and their health condition along with any other means of testing that may have been performed such as stool testing, food intolerance testing, and so forth.
5. If no pattern exists, and if a marker is high or low, the following questions should be asked. Is the client producing enough of it on their own in the body? Is the person excreting too much of it from their own body? Lastly, is the person not ingesting enough of it or not ingesting enough of the raw materials that are required in order to create it?
6. Based on those answers, look to identify any possible dysfunctions or refer out for further evaluation.

## Common Blood Chemistry Panels:

Based on the lab that a person goes through, the individual markers that will be included in each of the following panels can vary, so do not rely on the fact that every marker that is listed in the following pages will be included. Although, for simplicity's sake, the markers that are listed are considered traditional for the most part. A list of each marker included in each panel will be discussed in the ensuing pages.

- CMP (Comprehensive Metabolic Panel)
- CBC (Complete Blood Count)
- Lipid/Cholesterol Panel
- Iron Panel
- Thyroid Hormone Panel
- Sex Hormone Panel

Additional individual health markers that can and should be tested through the blood include:

- Vitamin D
- Blood Sugar Regulation Markers: Insulin (Fasting), Hemoglobin A1C
- Inflammation and Methylation Markers: C-Reactive Protein (CRP), Highly Sensitive C-Reactive Protein (HS-CRP) and Homocysteine



# CMP (Comprehensive Metabolic Panel)

The majority of the CMP markers evaluate the overall health of the liver and kidneys.

CMP Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Glucose</b>	The sugar in the blood which serves as a source of fuel to the cells of the body. Glucose is normally closely regulated by insulin.	<b>75 - 86 mg/dL</b>	<ul style="list-style-type: none"> <li>• Insulin Resistance</li> <li>• Diabetes</li> <li>• Metabolic Syndrome</li> <li>• Vitamin B1 (thiamine need)</li> <li>• Fatty Liver / Liver Congestion</li> <li>• Cortisol Resistance</li> <li>• Adrenal hyperfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Hypoglycemia (reactive or liver glycogen problem)</li> <li>• Hyperinsulinism</li> <li>• Adrenal Hypofunction</li> </ul>
<b>Uric Acid</b>	A waste product of protein digestion excreted in urine via the kidneys.	<b>3.5 - 5.9 mg/dL (male)</b> <b>3.0 - 5.5 mg/dL (female)</b>	<ul style="list-style-type: none"> <li>• Gout &amp; Arthralgias (joint pain)</li> <li>• Atherosclerosis</li> <li>• Oxidative Stress</li> <li>• Renal insufficiency / Renal disease</li> <li>• Leaky Gut Syndrome</li> </ul>	<ul style="list-style-type: none"> <li>• Molybdenum deficiency</li> <li>• B12/Folate deficiency anemia.</li> <li>• Copper deficiency</li> </ul>
<b>BUN</b>	Blood urea nitrogen is a medical test that measures the amount of urea nitrogen found in blood. The liver produces urea in the urea cycle as a waste product of the digestion of protein.	<b>12 - 17 mg/dL</b>	<ul style="list-style-type: none"> <li>• Renal (kidney) disease or insufficiency</li> <li>• Dehydration</li> <li>• Hypochlorhydria (low stomach acid)</li> <li>• Excessive protein intake</li> <li>• Dysbiosis</li> <li>• Edema</li> <li>• Anterior pituitary dysfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Low protein intake</li> <li>• Malabsorption</li> <li>• Pancreatic insufficiency</li> <li>• Liver dysfunction</li> </ul>
<b>Creatinine</b>	A waste product produced by muscle metabolism and excreted in urine via the kidneys.	<b>0.8 - 1.1 mg/dL</b>	<ul style="list-style-type: none"> <li>• BPH (Benign prostatic hyperplasia)</li> <li>• Urinary tract congestion</li> <li>• Renal (kidney) disease or insufficiency</li> <li>• Uterine hypertrophy (enlarged uterus)</li> <li>• Creatine supplementation</li> <li>• Overconsumption of protein/meat</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Muscle atrophy</li> <li>• Lack of physical activity</li> <li>• Inadequate dietary protein or impaired digestion</li> </ul>
<b>Sodium</b>	Sodium is an electrolyte and a mineral. It helps keep the right amount of water and fluid inside and outside the body's cells and helps uphold the body's electrolyte balance.	<b>135 - 142 mmol/L</b>	<ul style="list-style-type: none"> <li>• Adrenal hyperfunction</li> <li>• Cushing's disease</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Adrenal hypofunction</li> <li>• Addison's disease</li> <li>• Edema</li> <li>• Diuretics</li> <li>• Excessive fluid loss (vomiting, diarrhea, sweating)</li> </ul>
<b>Potassium</b>	An electrolyte which maintains water balance inside the cells and helps in the transmission of nerve impulses. It is critical for proper functioning of muscles, particularly the heart.	<b>4.0 - 4.5 mmol/L</b>	<ul style="list-style-type: none"> <li>• Adrenal hypofunction</li> <li>• Dehydration</li> <li>• Tissue destruction</li> <li>• Metabolic acidosis</li> </ul>	<ul style="list-style-type: none"> <li>• Adrenal hyperfunction</li> <li>• Diuretics or laxatives</li> <li>• Excessive fluid loss (vomiting, diarrhea, sweating)</li> </ul>
<b>Chloride</b>	Chloride is an electrolyte. It is a negatively charged ion that works with other electrolytes, such as potassium, sodium, and bicarbonate. It helps in regulating the amount of fluid in the body and maintaining the acid-base (pH) balance.	<b>100 - 106 mmol/L</b>	<ul style="list-style-type: none"> <li>• Metabolic acidosis</li> <li>• Adrenal hyperfunction</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Metabolic alkalosis</li> <li>• Adrenal hypofunction</li> <li>• Hypochlorhydria (low HCL production)</li> <li>• Excessive fluid loss (vomiting, diarrhea, sweating)</li> <li>• Diuretics</li> </ul>

# CMP (Comprehensive Metabolic Panel)

CMP Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Carbon Dioxide</b>	A gaseous waste product from metabolism which occurs mostly in the form of Dioxide (CO <sub>2</sub> ) bicarbonate, a negatively charged ion which is used by the body to help maintain the body's acid-base balance (pH).	<b>25 – 28 mmol/L</b>	<ul style="list-style-type: none"> <li>• Metabolic alkalosis (i.e. severe vomiting)</li> <li>• Adrenal hyperfunction</li> <li>• Hypochlorhydria</li> <li>• Respiratory acidosis (i.e. chronic obstructive pulmonary disease)</li> </ul>	<ul style="list-style-type: none"> <li>• Metabolic acidosis (i.e. Diabetes)</li> <li>• Adrenal hypofunction</li> <li>• Vitamin B1 (Thiamine) deficiency</li> <li>• Respiratory alkalosis (i.e. hyperventilation)</li> </ul>
<b>Calcium</b>	A mineral which is controlled in the blood by the glands and kidneys. This value is typically a reflection of the factors influencing calcium metabolism rather than dietary.	<b>9.5 – 10 mg/dL</b>	<ul style="list-style-type: none"> <li>• Parathyroid hyperfunction</li> <li>• Thyroid hypofunction</li> <li>• Impaired membrane health</li> <li>• Excessive Vitamin D supplementation</li> <li>• Osteoporosis</li> </ul>	<ul style="list-style-type: none"> <li>• Parathyroid hypofunction</li> <li>• Calcium deficiency / Low calcium intake</li> <li>• Hypochlorhydria</li> <li>• Diuretics or Antacids</li> <li>• Magnesium and/or Vitamin D deficiency</li> <li>• Intestinal malabsorption (Celiac Disease, gluten sensitivity, etc)</li> </ul>
<b>Phosphorus</b>	A mineral which is regulated by the kidneys. The body needs Phosphorus to build strong bones and teeth. It is also important for nerve signaling and muscle contraction.	<b>3.0 – 4.0 mg/dL</b>	<ul style="list-style-type: none"> <li>• Parathyroid hypofunction</li> <li>• Bone growth and/or repair</li> <li>• Excessive phosphorus consumption (i.e. soda with phosphoric acid)</li> <li>• Excessive Vitamin D supplementation</li> <li>• Renal insufficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Parathyroid hyperfunction</li> <li>• Hypochlorhydria</li> <li>• Hyperinsulinism</li> <li>• Vitamin D deficiency</li> <li>• Diet high in refined carbohydrates</li> <li>• Alcoholism</li> </ul>
<b>Protein Total</b>	The total amount of protein in the blood. It is the sum of albumin and globulin – the two major groups of proteins in the blood.	<b>6.9 – 7.4 g/dL</b>	<ul style="list-style-type: none"> <li>• Dehydration</li> <li>• Liver/biliary dysfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Hypochlorhydria</li> <li>• Digestive dysfunction and/or inflammation</li> <li>• Malnutrition / Malabsorption</li> <li>• Protein deficiency / Low protein intake</li> <li>• Poor protein breakdown</li> <li>• Amino acid need</li> <li>• Liver dysfunction</li> </ul>
<b>Albumin</b>	The group of proteins which makes up approximately two-thirds of the total protein circulating in the blood. Produced mostly in the liver, albumin keeps fluid from leaking out of blood vessels and transports hormones, nutrients, electrolytes, and antioxidants throughout the body.	<b>4.0 – 5.0 g/dL</b>	<ul style="list-style-type: none"> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Hypochlorhydria</li> <li>• Liver dysfunction</li> <li>• Oxidative Stress</li> <li>• Vitamin C deficiency</li> </ul>
<b>Globulin</b>	Globulins are a group of proteins in your blood. They are created by the liver and the immune system. Globulins play an important role in liver function, blood clotting, and fighting infection.	<b>2.4 – 2.8 g/dL</b>	<ul style="list-style-type: none"> <li>• Hypochlorhydria</li> <li>• Liver cell damage</li> <li>• Oxidative Stress</li> <li>• Heavy metal toxicity</li> </ul>	<ul style="list-style-type: none"> <li>• Digestive dysfunction and/or inflammation</li> <li>• Immune insufficiency</li> </ul>
<b>Billirubin Total</b>	A pigment in the bile which is a waste product produced by the liver as it breaks down and recycles red blood cells.	<b>0.2 – 1.0 mg/dL</b>	<ul style="list-style-type: none"> <li>• Biliary stasis (thickening of the bile)</li> <li>• Oxidative Stress</li> <li>• Thymus dysfunction</li> <li>• Biliary tract obstruction or calculi</li> <li>• Liver dysfunction</li> <li>• RBC hemolysis</li> </ul>	<ul style="list-style-type: none"> <li>• Spleen insufficiency</li> </ul>

## CMP (Comprehensive Metabolic Panel)

CMP Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Alkaline Phosphatase</b>	An enzyme found mainly in the liver and bones. Abnormal levels of ALP in your blood most often indicates a problem with the liver, gallbladder, or in the bones.	<b>70 – 100 IU/L</b>	<ul style="list-style-type: none"> <li>• Biliary obstruction / gall bladder problems</li> <li>• Liver cell damage</li> <li>• Bone loss, increased turnover, bone growth and/or repair</li> <li>• Metastatic carcinoma of the bone</li> <li>• Leaky gut syndrome</li> <li>• Estrogen &amp; oral contraceptives</li> </ul>	<ul style="list-style-type: none"> <li>• Zinc deficiency (Alk Phos is a zinc-dependent enzyme)</li> </ul>
<b>LDH</b>	The lactate dehydrogenase (LDH) test looks for signs of tissue damage in the body. LDH is an enzyme found in almost every cell of your body, including your blood, muscles, brain, kidneys, and pancreas. The enzyme also turns sugar into energy.	<b>140 – 200 IU/L</b>	<ul style="list-style-type: none"> <li>• Liver/biliary dysfunction</li> <li>• Cardiovascular disease</li> <li>• Anemia (B12/Folate deficiency), hemolytic</li> <li>• Non-specific tissue inflammation</li> <li>• Tissue Destruction</li> <li>• Viral infection</li> </ul>	<ul style="list-style-type: none"> <li>• Reactive hypoglycemia</li> <li>• Low blood sugar (glucose)</li> <li>• Poor carbohydrate utilization</li> <li>• Excess oxalates</li> </ul>
<b>AST (SGOT)</b>	A metabolic enzyme found mainly in the heart, liver, and muscles. In the Krebs cycle, Vitamin B6 is a major co-factor for AST's reactions.	<b>12 – 25 IU/L (male)</b> <b>10 – 20 IU/L (female)</b>	<ul style="list-style-type: none"> <li>• Dysfunction located outside of the liver and biliary tree</li> <li>• Developing congestive heart failure</li> <li>• Liver cell damage / Liver dysfunction</li> <li>• Excess muscle breakdown or turnover</li> <li>• Viral infections (EBV, CMV, Hepatitis)</li> <li>• Vitamin E deficiency</li> <li>• Alcoholism (alcoholic liver disease: AST/ALT ratio &gt;2)</li> <li>• Celiac Disease / Crohn's Disease / Ulcerative Colitis</li> <li>• Overuse of certain medications (pain relief medications like Aspirin/Tylenol, antibiotics, statins)</li> </ul>	<ul style="list-style-type: none"> <li>• Vitamin B6 deficiency</li> </ul>
<b>ALT (SGPT)</b>	(ALT) is alanine aminotransferase and this is an enzyme in the blood. ALT is found mainly in the liver, but also in smaller amounts in the kidneys, heart, muscles, and pancreas. ALT is measured to see if the liver is damaged or diseased.	<b>12 – 28 IU/L (male)</b> <b>10 – 25 IU/L (female)</b>	<ul style="list-style-type: none"> <li>• Dysfunction located in the liver</li> <li>• Fatty liver / Liver cell damage / Cirrhosis of the liver</li> <li>• Alcoholism (alcoholic liver disease: AST/ALT ratio &gt;2)</li> <li>• Biliary tract obstruction</li> <li>• Excessive muscle breakdown or turnover</li> <li>• Viral infections (EBV, CMV, Hepatitis)</li> <li>• Celiac Disease / Crohn's Disease / Ulcerative Colitis</li> <li>• Certain medications (pain relief medications like Aspirin/Tylenol, antibiotics, statins)</li> </ul>	<ul style="list-style-type: none"> <li>• Vitamin B6 deficiency</li> <li>• Fatty liver</li> <li>• Liver congestion</li> <li>• Urinary tract infection</li> </ul>
<b>GGT (GGTP)</b>	(GGT) or Gamma-glutamyl transferase is an enzyme that is found in several organs in the body. However, the highest concentrations are found in the liver. GGT can become elevated in the blood with most diseases that cause damage to the liver and especially the bile ducts.	<b>18 – 28 IU/L</b>	<ul style="list-style-type: none"> <li>• Dysfunction located outside the liver and inside the biliary tree</li> <li>• Biliary obstruction / Biliary stasis/ insufficiency</li> <li>• Liver cell damage</li> <li>• Alcoholism</li> <li>• Acute/chronic pancreatitis</li> <li>• Pancreatic insufficiency</li> <li>• Viral infections (EBV, CMV, Hepatitis)</li> <li>• Overuse of certain medications (pain relief medications like Aspirin/Tylenol, antibiotics, statins)</li> <li>• Low Glutathione Production</li> </ul>	<ul style="list-style-type: none"> <li>• Vitamin B6 deficiency</li> <li>• Magnesium deficiency</li> <li>• Oral contraceptives (birth control pills)</li> </ul>

## CBC (Complete Blood Count)

A complete blood count (CBC) is a blood panel that evaluates the overall health of a person and helps detect a wide range of disorders, including anemia, infections and leukemia. A complete blood count test measures several components and features of your blood, including red blood cells and white blood cells.

CBC Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>White Blood Cells (WBC)</b>	The white blood cell (WBC) count totals the number of white blood cells in the blood. Also called leukocytes, they are part of the lymphatic system, and tissues and are an important part of the body's defense system.	<b>5.0 – 7.5 x10E3/uL</b>	<ul style="list-style-type: none"> <li>• Childhood diseases (measles, mumps, rubella, chicken pox)</li> <li>• Acute bacterial or viral infection (less common: parasite or fungal infection)</li> <li>• Stress</li> <li>• Diet high in refined carbohydrates</li> </ul>	<ul style="list-style-type: none"> <li>• Chronic bacterial or viral infection</li> <li>• Decreased production from bone marrow</li> <li>• Autoimmune disorders</li> <li>• Raw food diet</li> </ul>
<b>Red Blood Cells (RBC)</b>	The count of the number of red blood cells (RBCs) in the blood. RBCs carry oxygen from the lungs to the rest of the body and carry carbon dioxide away from the cells in your body.	<b>4.2 – 4.9 x10E6/uL (male)</b> <b>3.9 – 4.5 x10E6/uL (female)</b>	<ul style="list-style-type: none"> <li>• Respiratory distress (asthma, emphysema)</li> <li>• Polycythemia (relative or absolute)</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B12/Folate deficiency anemia</li> <li>• Copper deficiency anemia</li> <li>• Vitamin C need</li> <li>• Internal bleeding</li> </ul>
<b>Hemoglobin (Hgb)</b>	The total amount of the iron-rich protein in RBCs that carries oxygen and gives the blood cell its red color. Hemoglobin fills up the RBCs and is a good measure of the blood's ability to carry oxygen throughout the body.	<b>14.0 – 15.0 g/dL (male)</b> <b>13.5 – 14.5 g/dL (female)</b>	<ul style="list-style-type: none"> <li>• Respiratory distress (asthma, emphysema)</li> <li>• Polycythemia (relative or absolute) • Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B12/Folate deficiency anemia</li> <li>• IB6 deficiency anemia</li> <li>• Copper deficiency</li> <li>• Vitamin C deficiency</li> <li>• Internal bleeding</li> <li>• Digestive inflammation</li> <li>• Pregnancy</li> </ul>
<b>Hematocrit (Hct)</b>	The hematocrit test identifies the percentage of blood by volume that is made up of red blood cells. The condition called "anemia" results from having too few red blood cells.	<b>40 – 48 % (male)</b> <b>37 – 44 % (female)</b>	<ul style="list-style-type: none"> <li>• Respiratory distress (asthma, emphysema)</li> <li>• Polycythemia (relative or absolute)</li> <li>• Spleen hyperfunction</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B12/Folate/ B6 deficiency anemia</li> <li>• Copper deficiency</li> <li>• Vitamin C deficiency</li> <li>• Internal bleeding</li> <li>• Digestive inflammation</li> <li>• Thymus hypofunction</li> </ul>
<b>MCV (Mean Corpuscular Volume)</b>	The measurement of the average size of the RBCs. Smaller-sized RBCs result in a lower MCV, while larger-sized RBCs result in a higher MCV.	<b>82.0 – 89.9 fL / red cell</b>	<ul style="list-style-type: none"> <li>• B12/Folate deficiency anemia</li> <li>• Vitamin C deficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B6 deficiency</li> <li>• Internal bleeding</li> </ul>
<b>MCH (Mean Corpuscular Hemoglobin)</b>	MCH tests for the average amount of hemoglobin found in the red blood cells in the body.	<b>28.0 – 31.9 pg / cell</b>	<ul style="list-style-type: none"> <li>• B12/Folate deficiency anemia</li> <li>• Hypochlorhydria</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• Internal bleeding</li> <li>• B6 deficiency</li> <li>• Vitamin C deficiency</li> <li>• Heavy metal toxicity</li> </ul>
<b>MCHC or MCHV (Mean Corpuscular Hemoglobin Concentration)</b>	The calculation of the average concentration of hemoglobin inside RBCs.	<b>32 – 35 g/dL</b>	<ul style="list-style-type: none"> <li>• B12/Folate deficiency anemia</li> <li>• Hypochlorhydria</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B6 deficiency</li> <li>• Vitamin C deficiency</li> <li>• Heavy metal toxicity</li> </ul>

## CBC (Complete Blood Count)

CBC Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>RDW</b>	A test to determine red cell distribution which shows variation in the size and volume of a person's red blood cells.	<b>11 - 13 %</b>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• B12/Folate deficiency anemia</li> <li>• Pernicious anemia</li> <li>• Gluten sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>• Childhood diseases (measles, mumps, rubella, chicken pox)</li> <li>• Acute or chronic bacterial infection</li> <li>• Inflammation</li> </ul>
<b>Platelets</b>	The count of the number of this smallest type of blood cell which is important for normal blood clotting.	<b>150 - 385 x10E3/uL</b>	<ul style="list-style-type: none"> <li>• Atherosclerosis</li> </ul>	<ul style="list-style-type: none"> <li>• Idiopathic thrombocytopenia</li> <li>• Heavy metal body burden</li> <li>• Free radical pathology</li> </ul>
<b>Neutrophils</b>	Neutrophils are a form of a white blood cell (WBC) that fight infections, among other functions. They are the first cells to arrive on the scene when we experience a bacterial infection.	<b>40 - 60 %</b>	<ul style="list-style-type: none"> <li>• Childhood diseases (measles, mumps, rubella, chicken pox)</li> <li>• Infections (bacterial – acute or chronic, viral, parasitical, fungal)</li> <li>• Inflammation</li> </ul>	<ul style="list-style-type: none"> <li>• Blood diseases (aplastic anemia, pernicious anemia, etc)</li> <li>• Chronic infections</li> </ul>
<b>Lymphocytes</b>	The percentage of lymphocytes, a type of WBC which protects the body against bacteria and viruses. There are different types of lymphocytes – T-cells directly attack bacteria and viruses and B-cells produce antibodies that attack and destroy bacteria and viruses.	<b>24 - 44 %</b>	<ul style="list-style-type: none"> <li>• Childhood diseases (measles, mumps, rubella, chicken pox)</li> <li>• Acute or chronic viral infection / Infectious mononucleosis</li> <li>• Inflammation</li> <li>• Systemic toxicity</li> </ul>	<ul style="list-style-type: none"> <li>• Chronic viral infection / Active or chronic bacterial infection</li> <li>• Free radical activity</li> <li>• Suppressed bone marrow function</li> <li>• Steroid medications</li> <li>• Alcoholism</li> <li>• Zinc deficiency or Protein deficiency</li> <li>• Autoimmune diseases</li> <li>• Cancer or (lymphoma/ leukemia), chemo, &amp; radiation</li> </ul>
<b>Monocytes</b>	Monocytes are a type of WBC cell that fight infections, assist other white blood cells in removing dead or damaged tissues, destroy cancer cells, and regulate immunity. Monocytes are produced in the bone marrow and then enter the blood, where they account for about 1 to 10% of the circulating white blood cell.	<b>0 - 7 %</b>	<ul style="list-style-type: none"> <li>• Recovery phase of infection</li> <li>• Liver dysfunction</li> <li>• Intestinal parasites</li> <li>• Tissue Inflammation / Gut Inflammation</li> <li>• Benign Prostatic Hypertrophy (BPH)</li> </ul>	<ul style="list-style-type: none"> <li>• Medical conditions that affect the bone marrow (HIV, Rheumatoid Arthritis, Lupus)</li> <li>• Endotoxemia (toxins released into the blood by certain types of bacteria)</li> <li>• Certain Medications (corticosteroids, oral interferons, chemotherapy drugs)</li> <li>• Vitamin B12/Folate Deficiency</li> </ul>
<b>Eosinophils</b>	The percentage of eosinophils, a type of WBC which kill parasites and is produced as part of the allergic response. Unlike neutrophils, monocytes, and lymphocytes, eosinophils do not scavenge bacteria or viruses.	<b>0 - 3 %</b>	<ul style="list-style-type: none"> <li>• Intestinal parasites</li> <li>• Food and environmental allergies/sensitivities</li> <li>• Asthma</li> </ul>	<ul style="list-style-type: none"> <li>• Increased adrenal steroid production</li> </ul>
<b>Basophils</b>	Basophils are a type of WBC that release histamine, heparin, and other biologically active molecules when reacting to parasite infections and or during allergic reactions.	<b>0 - 1 %</b>	<ul style="list-style-type: none"> <li>• Tissue inflammation</li> <li>• Intestinal parasites</li> <li>• Allergies (high histamine)</li> </ul>	<ul style="list-style-type: none"> <li>• A sign of ovulation or pregnancy in females</li> <li>• Hyperthyroidism</li> <li>• Certain medications (corticosteroids)</li> <li>• Autoimmune Urticaria (hives)</li> </ul>

## Inflammation Markers

A Lipid Panel looks at cholesterol, and how it travels throughout the body (HDL & LDL), as well as triglycerides.

Inflammatory markers are not always added to all lipid panels but they are commonly seen grouped together.

Lipid Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Cholesterol (Total)</b>	A waxy fat-like substance which is transported through the blood by lipoproteins and plays an essential role in numerous functions in the body. It is the primary constituent of all cell membranes (controls membrane fluidity) and myelin (protects nerve fibers), is the precursor of all steroidal hormones, bile acids, and Vitamin D, and it repairs damage in the arterial walls (like a "band-aid"). The overwhelming majority of cholesterol is produced by the liver and is not derived from dietary sources of cholesterol. Total cholesterol is the sum of 3 lipoproteins: HDL, LDL and VLDL.	<b>170-200 mg/dL</b>  <b>Many will go as high as 240 mg/dL</b>	<ul style="list-style-type: none"> <li>• Hypothyroidism</li> <li>• Chronic bacterial and viral infections</li> <li>• Adrenal dysfunction</li> <li>• Cardiovascular disease / Atherosclerosis</li> <li>• Fatty Liver / Biliary stasis</li> <li>• Insulin resistance</li> <li>• Poor metabolism and utilization of fats</li> <li>• Early stage hyperglycemia / Diabetes / Metabolic Syndrome</li> <li>• Multiple Sclerosis</li> </ul>	<ul style="list-style-type: none"> <li>• Oxidative stress</li> <li>• Heavy metal toxicity</li> <li>• Liver/biliary dysfunction</li> <li>• Malnutrition</li> <li>• Manganese deficiency</li> <li>• Hyperthyroidism (or the overdosing of thyroid medication)</li> <li>• Adrenal hyperfunction</li> <li>• Autoimmune disorders</li> <li>• Diets low in fat</li> </ul>
<b>Triglycerides</b>	The fats in the blood which can be derived from the diet or synthesized by the liver. Triglycerides serve as a source of fuel for all the muscles of the body and carry the fat-soluble vitamins in the blood.	<b>70 – 80 mg/dL</b>	<ul style="list-style-type: none"> <li>• Early stage hyperglycemia / Diabetes / Metabolic Syndrome</li> <li>• Fatty liver / Liver congestion</li> <li>• Insulin resistance</li> <li>• Cardiovascular disease / Atherosclerosis</li> <li>• Poor metabolism and utilization of fats (low bile acids / lipase enzyme)</li> <li>• Hypothyroidism</li> <li>• H pylori infection</li> <li>• Adrenal cortical dysfunction</li> <li>• Alcoholism</li> <li>• Oral contraceptives</li> </ul>	<ul style="list-style-type: none"> <li>• Liver/biliary dysfunction</li> <li>• Hyperthyroidism (or excess thyroid medication)</li> <li>• Autoimmune disorders</li> <li>• Adrenal hyperfunction</li> </ul>
<b>HDL Cholesterol (High Density Lipoproteins)</b>	The primary lipoprotein that transports cholesterol (and other nutrients) from the peripheral tissues back to the liver.	<b>55-85 mg/dL</b>	<ul style="list-style-type: none"> <li>• Autoimmune disorders</li> </ul>	<ul style="list-style-type: none"> <li>• Hyperlipidemia / Fatty Liver</li> <li>• Atherosclerosis</li> <li>• Metabolic Syndrome</li> <li>• Oxidative stress</li> <li>• Heavy metals</li> <li>• H pylori infection</li> <li>• Hyperthyroidism</li> <li>• Lack of exercise (sedentary lifestyle)</li> </ul>
<b>LDL Cholesterol (Low Density Lipoproteins)</b>	The primary lipoprotein that transports cholesterol, fat-soluble vitamins, and essential fatty acids from the liver to the peripheral tissues.	<b>80-100 mg/dL</b>	<ul style="list-style-type: none"> <li>• Diet high in refined carbohydrates</li> <li>• Metabolic Syndrome</li> <li>• Atherosclerosis</li> <li>• Hyperlipidemia / Fatty Liver</li> <li>• Oxidative stress</li> <li>• Hypothyroidism</li> <li>• H pylori infection</li> </ul>	<ul style="list-style-type: none"> <li>• There is some indication that low LDL Cholesterol may be associated with a higher susceptibility to infections, inflammation, and free radical damage</li> <li>• Low Hormone Production</li> </ul>

## Inflammation Markers

Lipid Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>CRP (C-Reactive Protein)</b>	C-reactive protein is an annular, pentameric protein found in blood plasma, whose circulating concentrations rise in response to inflammation. It is an acute-phase protein of hepatic origin that increases following interleukin-6 secretion by macrophages and T cells.	<b>&lt; 1.0 mg/L</b>	<ul style="list-style-type: none"> <li>• Depression</li> <li>• Increased Alzheimer's Risk</li> <li>• Atherosclerosis</li> <li>• Increased Risk of Stroke</li> <li>• Infections</li> <li>• Hypertension</li> <li>• Diabetes</li> </ul>	No Known Conditions Associated with low levels
<b>hs-CRP (highly sensitive C-Reactive Protein)</b>	Is a protein that is produced by the body when blood-vessel walls are inflamed. It is a much more sensitive version of CRP.	<b>Men &lt;0.55 mg/L</b>  <b>Women &lt;1.0 mg/L</b>	<ul style="list-style-type: none"> <li>• Depression</li> <li>• Increased Alzheimer's Risk</li> <li>• Atherosclerosis</li> <li>• Increased Risk of Stroke</li> <li>• Infections</li> <li>• Hypertension</li> <li>• Diabetes</li> <li>• Obesity</li> </ul>	No Known Conditions Associated with low levels
<b>Homocysteine</b>	Is an amino acid that gets produced when proteins break down and increased levels in the body occur when the metabolism to cysteine of methionine to cysteine is impaired. It is an indirect marker of inflammation around the heart.	<b>Men &lt;7.2 μ mol/L</b>  <b>Women &lt;7.2 μ mol/L</b>	<ul style="list-style-type: none"> <li>• B-vitamin deficiency</li> <li>• Cardiovascular disease</li> <li>• Heart attacks</li> <li>• Atherosclerosis</li> <li>• Strokes</li> <li>• Cancer</li> <li>• Depression</li> <li>• Alzheimer's disease</li> <li>• Genetic factors</li> <li>• Increasing age</li> <li>• Kidney impairment</li> </ul>	<ul style="list-style-type: none"> <li>• Low vitamin B6</li> <li>• Low vitamin B12</li> <li>• Low folate levels</li> <li>• Renal disease</li> </ul>

## Iron Panel Markers

An Iron Panel measures the amount of iron in the body and the body's ability to use iron. Iron is regularly absorbed from food that a person eats and then most of the iron travels throughout the body after binding to a protein created by the liver called transferrin. Most of the iron that moves throughout the body is utilized in the production of red blood cells in the hemoglobin with what is left over getting packaged and stored in the tissues as ferritin. Any additional iron is utilized to create enzymes. Iron is also used in the creation of thyroid hormones. Low levels of iron can signify anemia whereas high levels of iron are toxic.

Iron Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Iron (Serum)</b>	Measures the level of iron in the liquid portion of the blood.	<b>85 – 130 ug/dL (mcg/dL)</b>	<ul style="list-style-type: none"> <li>• Liver dysfunction</li> <li>• Hemochromatosis (hereditary) / Hemosiderosis (non-hereditary) both mean Iron overload</li> <li>• Viral infection</li> <li>• Excess iron consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• Hypochlorhydria</li> <li>• Internal bleeding</li> </ul>
<b>Ferritin</b>	A test for ferritin is used to understand how much iron the body is storing. It is primarily used to identify a deficiency or an excess.	<b>50-100 ng/mL</b> <b>or...</b> <b>100 ng/mL (male)</b> <b>70 – 90 ng/mL (female)</b>	<ul style="list-style-type: none"> <li>• Hemochromatosis (hereditary) / Hemosiderosis (non-hereditary) meaning Iron overload</li> <li>• Excess iron consumption</li> <li>• Oxidative stress / Liver dysfunction</li> <li>• Inflammation</li> <li>• Infections</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• Heavy metal toxicity</li> <li>• Hypochlorhydria</li> </ul>
<b>TIBC (Total Iron Binding Capacity)</b>	Measures the blood's ability to bind iron with transferrin, the protein that carries iron through the bloodstream.	<b>250-350 ug/dL</b>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> <li>• Internal bleeding</li> </ul>	<ul style="list-style-type: none"> <li>• Hemochromatosis (hereditary) / Hemosiderosis (non-hereditary) -- meaning iron overload</li> <li>• Internal bleeding</li> <li>• Protein malnutrition</li> </ul>
<b>% Transferrin Saturation</b>	How much stored iron is in the body and can be used as an early warning sign of iron deficiency if the value comes back low.	<b>25-30%</b>	<ul style="list-style-type: none"> <li>• Hemochromatosis (hereditary) / Hemosiderosis (non-hereditary) meaning Iron overload</li> </ul>	<ul style="list-style-type: none"> <li>• Iron deficiency anemia</li> </ul>



# Thyroid Hormone Panel Markers

Iron Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>TSH (Thyroid Stimulating Hormone)</b>	Measures the amount of TSH, the hormone produced by the anterior pituitary gland which “talks” to the thyroid gland and tells the thyroid to increase or decrease production of T4 (thyroxine) or conversion to T3 depending on the amounts of T4 and T3 circulating in the bloodstream. TSH secretion is stimulated by the hormone TRH (produced by the hypothalamus).	<b>1.0 - 2.0 uIU/mL</b>	<ul style="list-style-type: none"> <li>Primary hypothyroidism</li> </ul>	<ul style="list-style-type: none"> <li>Hyperthyroidism</li> <li>Secondary hypothyroidism (anterior pituitary communication problems)</li> <li>Tertiary hypothyroidism (hypothalamic communication problems)</li> <li>Overmedication of thyroid hormones</li> <li>Heavy metal toxicity</li> </ul>
<b>Free T4 / (FT4) Free Thyroxine</b>	Measures the amount of unbound/free fraction of the T4 hormone that is available in the body.	<b>1.2 - 1.8 ng/dL (upper 1/3 of reference range)</b>	<ul style="list-style-type: none"> <li>Hyperthyroidism</li> <li>Thyroid hormone replacement overdosing</li> </ul>	<ul style="list-style-type: none"> <li>Primary hypothyroidism</li> <li>Iodine deficiency</li> </ul>
<b>Free T3 / (FT3) Free Triiodothyronine</b>	Measures the amount of unbound/free fraction of the T3 hormone available in the body.	<b>3.0 - 4.0 pg/mL (upper 1/3 of reference range)</b>	<ul style="list-style-type: none"> <li>Overactive Thyroid Production or Hyperthyroidism</li> <li>Hashimoto's</li> <li>Iodine deficiency</li> </ul>	<ul style="list-style-type: none"> <li>Primary hypothyroidism</li> <li>Selenium deficiency</li> </ul>
<b>Thyroglobulin Antibodies / (TgAB or TGB)</b>	Antithyroglobulin antibody is a test to measure antibodies to a protein called thyroglobulin. This protein is found in thyroid cells and the immune system can attack the Thyroglobulin, a protein precursor to thyroid hormone in autoimmune conditions.	<b>Non-measurable (&lt;1)</b>  (ranges and values may vary per lab)	<ul style="list-style-type: none"> <li>Hashimoto's Thyroiditis</li> <li>Grave's Disease</li> <li>Thyroid cancer</li> </ul>	<ul style="list-style-type: none"> <li>No findings for low levels or not clinically significant</li> </ul>
<b>Thyroid Peroxidase Antibodies (TPO)</b>	Measures the amount of antibodies produced by the immune system to attack TPO, an enzyme expressed in the thyroid gland which initiates the synthesis of T4.	<b>Non-measurable (&lt;10)</b>	<ul style="list-style-type: none"> <li>Gluten Sensitivity</li> <li>Hidden Infections</li> <li>Heavy Metal Toxicity</li> <li>Nutrient deficiencies</li> </ul>	<ul style="list-style-type: none"> <li>No findings for low levels or not clinically significant</li> </ul>

## Sex Hormone Panel Markers

Lipid Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Testosterone Total</b>	The total testosterone test measures testosterone that is bound to proteins in the blood (e.g., albumin and sex-hormone binding globulin [SHBG]) as well as testosterone that is not bound (free testosterone).	<b>Male</b> <b>700-900 ng/dl mIU/ml</b>  <b>Female</b> <b>35 – 45 ng/dl</b>	<b>Male:</b> Infertility, decreased sperm count, acne, high libido, excessive hair growth, high blood pressure, high red blood cell count, increased risk-taking behaviors  <b>Female:</b> Masculinization, Hirsutism, Polycystic ovary disease, Increased risk of insulin resistance, Low estrogen, Increase risk of endometrial cancer	<b>Male:</b> Anterior Pituitary Dysfunction  <b>Female:</b> Osteoporosis, Decreased lean body mass, Decreased libido and Depression
<b>Testosterone Free</b>	This test measures the amount of unattached, or “free,” testosterone in your blood. Testosterone is a male sex hormone (androgen) that helps male features develop.	<b>Male</b> <b>20-25 pg/ml</b> <b>Quest Range is 150-224 pg/ml</b>  <b>Female</b> <b>1.0 – 2.2 pg/ml</b>	<b>Male:</b> Same as Above  <b>Female:</b> Masculinization, Hirsutism, Polycystic, ovary disease, Increased, risk of insulin resistance, Low estrogen, Increase risk of endometrial cancer	<b>Male:</b> Diabetes, Alzheimer’s disease, Increased risk of stroke, Increased cardiovascular disease risk, Diminished libido, Erectile dysfunction, Loss of muscle tone, Increased abdominal fat, Low bone density, Depression  <b>Female:</b> Osteoporosis, Decreased lean body mass, Decreased libido and Depression
<b>Estradiol</b>	An estradiol test measures the amount of the hormone estradiol in your blood. It’s also called an E2 test. Estradiol is a form of the hormone estrogen. It’s also called 17 beta-estradiol. The ovaries, breasts, and adrenal glands make estradiol.	<b>Male</b> <b>1.5 – 9.3 mIU/ml</b>  <b>Female</b> <i>(Can vary in a Woman’s Cycle)</i> <b>1 – 16.9 mIU/ml</b>	<b>Male:</b> Coronary artery disease, Abdominal obesity, Excess aromatase activity, Decreased insulin sensitivity, Glucose regulation issues  <b>Female:</b> increased risk of breast or endometrial cancer	<b>Male:</b> Osteoporosis, low libido,  <b>Female:</b> osteoporosis and bone fracture, migraine headaches, lack of menses
<b>Progesterone</b>	Serum progesterone is a test to measure the amount of progesterone in the blood. Progesterone plays a key role in pregnancy. It is produced after ovulation in the second half of the menstrual cycle. It helps make a woman’s uterus ready for a fertilized egg to be implanted.	<b>Male</b> <b>1 – 1.2 ng/ml</b>  <b>Female</b> <b>18-27 ng/ml</b> <i>Please Note: The optimal and “normal” reference ranges above are specific for a menstruating female in the luteal phase (day 21)</i>	<b>Male:</b> Congenital adrenal hyperplasia  <b>Female:</b> Pregnancy and Congenital adrenal hyperplasia	<b>Male:</b> Estrogen dominance, low testosterone  <b>Female:</b> Short Luteal Syndrome, Adrenal Stress, Menopause, Dysfunctional Uterine Bleeding and PCOS

## Sex Hormone Panel Markers

Lipid Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Sex Hormone Binding Globulin (SHBG)</b>	SHBG is a protein made by your liver. It binds tightly to three sex hormones found in both men and women. These hormones are estrogen, dihydrotestosterone (DHT), and testosterone. SHBG carries these three hormones throughout your blood.	<b>Male</b> <b>30 – 40 nmol/L</b>  <b>Female</b> <b>60 – 80 nmol/L</b>	<b>Male:</b> Hypogonadism, Andropause.  <b>Female:</b> bone loss, low estrogen and testosterone	<b>Male:</b> Anterior Pituitary Dysfunction  <b>Female:</b> metabolic syndrome and cardiovascular disease
<b>Luteinizing Hormone (LH)</b>	LH is made by your pituitary gland. In women, the pituitary sends out LH during the ovulation part of the menstrual cycle. This tells the ovaries to release a mature egg. In men, LH causes the testes to make testosterone.	<b>Male</b> <b>1.5 – 9.3 mIU/ml</b>  <b>Female</b> <b>1 – 16.9 mIU/ml</b> <i>(Can vary in a Woman's Cycle)</i>	<b>Male:</b> Hypogonadism  <b>Female:</b> Mid-Cycle LH Surge, Ovarian hypofunction, PCOS and Menopause	<b>Male:</b> Anterior Pituitary Dysfunction  <b>Female:</b> Anterior Pituitary Hypofunction
<b>Follicle Stimulating Hormone (FSH)</b>	FSH is a hormone secreted by the anterior pituitary gland which promotes the formation of ova or sperm. Sometimes, elevated follicle-stimulating hormone (FSH) levels are measured to confirm menopause. When a woman's FSH blood level is consistently elevated to 30 mIU/mL or higher, and she has not had a menstrual period for a year, it is generally accepted that she has reached menopause.	<b>Male</b> <b>1.6 – 8 mIU/ml</b>  <b>Female</b> <b>1.5 – 10 mIU/m</b> <i>(in a menstruating female)</i>	<b>Male:</b> Hypogonadism, Andropause.  <b>Female:</b> Menopause, Mid-Cycle FSH Surge, Ovarian hypofunction or failure, Polycystic Ovary Syndrome (PCOS)	<b>Male:</b> Anterior Pituitary Dysfunction  <b>Female:</b> Anterior Pituitary Hypofunction
<b>Dihydrotestosterone (DHT)</b>	Dihydrotestosterone is an endogenous androgen sex steroid and hormone. The enzyme 5 $\alpha$ -reductase catalyzes the formation of DHT from testosterone in certain tissues including the prostate gland, seminal vesicles, epididymides, skin, hair follicles, liver, and brain.	<b>Male</b> <b>30-50 ng/dl</b>  <b>Female</b> <b>2-7 ng/dl</b>	<b>Male:</b> Acne, Male pattern baldness, Prostate cancer and BPH  <b>Female:</b> excess body hair, excess facial hair, balding, acne. enlarged clitoris, decreased breast size. deepening voice and increased muscle mass.	<b>Male:</b> increased risk of stroke & ischemic heart disease, 5-alpha-reductase inhibitors and Hypogonadism  <b>Female:</b> N/A

## Additional Add On Markers

Some of the more common additional individual markers that may be ordered to complement the CMP / CBC / Lipid Panels.

Blood Sugar Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Insulin (Fasting)</b>	Measures the level of the hormone insulin that is produced by the pancreas, which enables cells to uptake glucose.	<b>1 - 5 uIU/mL</b>	<ul style="list-style-type: none"> <li>• Insulin Resistance (Type II Diabetes, Pre-diabetes, Metabolic Syndrome)</li> <li>• Hypoglycemia or low blood sugar</li> <li>• Polycystic Ovary Syndrome (PCOS)</li> <li>• Obesity</li> <li>• The use of certain medications (corticosteroids, oral contraceptives)</li> <li>• Insulinomas (rare tumors in the pancreas that produce insulin)</li> </ul>	<ul style="list-style-type: none"> <li>• Normally not a problem unless it stays super low at all times.</li> <li>• Diabetes can occur when there is not enough insulin being produced, as glucose can't get into the cells and stays in the bloodstream longer. When that happens, blood sugar stays elevated.</li> <li>• Pancreatitis</li> </ul>
<b>Hemoglobin A1C (HgbA1C)</b>	Hemoglobin A1c, also called A1c, evaluates the average amount of glucose in the blood over the last 2 to 3 months by measuring the percentage of glycated (glycosylated) hemoglobin.	<b>4.5 - 5.2%</b>	<ul style="list-style-type: none"> <li>• Metabolic Syndrome</li> <li>• Insulin Resistance</li> <li>• Pre-Diabetes</li> <li>• Type II Diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Hypoglycemia</li> </ul>

Add On Panel Markers	Description	Optimal Range	Possibilities if HIGH	Possibilities if LOW
<b>Vitamin D</b>	Measures the fat-soluble, hormone-like nutrient Vitamin D in the body. Used to test for a deficiency. The most accurate way to measure how much vitamin D is in your body is the 25-hydroxy vitamin D blood test.	<b>60 - 80 ng/mL</b>	<ul style="list-style-type: none"> <li>• Cardiac problems (&gt;100 ng/mL)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor immune function</li> <li>• Autoimmune Conditions (Rheumatoid Arthritis, Multiple Sclerosis, IBD, Hashimoto's, Etc)</li> <li>• Cardiovascular disease</li> <li>• Cancer</li> <li>• Diabetes</li> <li>• Rickets / Osteoporosis / Tooth decay</li> </ul>





















# References

- [1] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656292/>
- [2] <https://www.ncbi.nlm.nih.gov/books/NBK19961/>
- [3] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3065172/>
- [4] <http://www.telegraph.co.uk/news/health/news/8555899/Lack-of-sleep-kills-a-mans-sex-drive-study-concludes.html>
- [5] <https://www.ncbi.nlm.nih.gov/pubmed/8627466>
- [6] I. G. Pantoja-Feliciano et al., “Biphasic assembly of the murine intestinal microbiota during early development,” *ISME J.*, vol. 7, no. 6, pp. 1112–1115, Jun. 2013.
- [7] “The First Prebiotics in Humans: Human Milk Oligosaccharides : Journal of Clinical Gastroenterology,” LWW. [Online]. Available: [http://journals.lww.com/jcge/Fulltext/2004/07002/The\\_First\\_Prebiotics\\_in\\_Humans\\_Human\\_Milk.8.aspx](http://journals.lww.com/jcge/Fulltext/2004/07002/The_First_Prebiotics_in_Humans_Human_Milk.8.aspx). [Accessed: 10-Mar-2017].
- [8] C. Palmer, E. M. Bik, D. B. DiGiulio, D. A. Relman, and P. O. Brown, “Development of the Human Infant Intestinal Microbiota,” *PLOS Biol.*, vol. 5, no. 7, p. e177, Jun. 2007.
- [10] J. Penders et al., “Gut microbiota composition and development of atopic manifestations in infancy: the KOALA Birth Cohort Study,” *Gut*, vol. 56, no. 5, pp. 661–667, May 2007.
- [12] F. Fouhy et al., “High-Throughput Sequencing Reveals the Incomplete, Short-Term Recovery of Infant Gut Microbiota following Parenteral Antibiotic Treatment with Ampicillin and Gentamicin,” *Antimicrob. Agents Chemother.*, vol. 56, no. 11, pp. 5811–5820, Nov. 2012.
- [13] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4464665/>
- [14] EBioMedicine. DOI: 10.1016/j.ebiom.2015.07.029; <http://dx.doi.org/10.1016/j.ebiom.2015.07.029>
- [15] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3468885/>
- [16] <https://www.ncbi.nlm.nih.gov/pubmed/23633912>
- [17] <https://www.ncbi.nlm.nih.gov/pubmed/18931092>
- [18] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248601/>

[19] <https://academic.oup.com/jnci/article/97/3/161/2544132>

[20] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5988561/>

[21] <https://www.ncbi.nlm.nih.gov/pubmed/22019754>

# NCI

## Nutrition Coaching Specialist

LEVEL 2 CERTIFICATION



about

### Jason Phillips



Completely revolutionized nutrition coaching. Jason's approach is rooted in the foundation that a proper prescription is based on each unique individual, not a template of information based on physical statistics. By creating an unprecedented level of access within the nutrition coaching relationship, Jason gets to know each individual - both who they are and what they need to be successful. Welcome to the new model of nutrition COACHING - the real way to finally find success!

about

### Travis Zipper



As a former Diet Coach for a Medical Weight Loss Clinic, I started to become intrigued as to why some people could lose weight easily and others had such a hard time. Today as a Coach for iN3, as well as two age management clinics and a medical weight loss center, I get to help clients from high level athletes, to extremely overweight, and hormonally challenged people. Every day I see new patients with new challenges in which I must take a different approach for each.