

# THE BIOHACKER'S GUIDE TO GUT HEALTH



ADVANCED TACTICSS TO  
SPEED UP SUPPLEMENT  
EFFECTS



## Chapter 1

# Welcome to Gut Biohacking

Gut health isn't just about digestion anymore. It's about performance — physical, mental, and emotional. That may sound surprising, but if you're here, you already know your gut is the command center of your entire body. What most people don't realize is that there's a faster, smarter way to get results from the supplements they're taking. That's where gut biohacking comes in.

Gut biohacking is about using intentional, science-backed actions to improve the way your gut works — not over months, but sometimes within days. It's about moving beyond general wellness tips into specific, practical strategies that activate your body's natural ability to absorb nutrients, regulate inflammation, and restore microbial balance.

### Why Supplements Sometimes Fall Short

You can buy the best probiotic, enzyme blend, or gut-repair powder on the market — but if your body isn't ready to *receive* them, you'll never unlock their full potential. Many people assume that taking a capsule equals healing. But that's like planting seeds in dry, depleted soil. Without the right environment, those seeds won't grow.

Here's what can block supplement effectiveness:

- Chronic low-grade inflammation in the gut lining
- Disrupted circadian rhythms that affect digestive enzyme production
- Poor blood flow to the digestive organs
- Stress hormones reducing nutrient absorption
- Lack of physical movement slowing intestinal motility

Biohacking doesn't replace your supplements — it **amplifies them**. It creates the conditions your body needs to actually use what you're giving it.

### A New Mindset for Faster Gut Results

Most people approach gut healing passively: they change their diet a little, take a few pills, and wait. Gut biohackers, on the other hand, become **active participants** in their own recovery. They're not waiting. They're working with their biology.

This book is about showing you how.

But it's not about being perfect. It's about **being precise** — small actions that create big shifts when practiced consistently.

You won't need fancy equipment or extreme diets. You just need to understand how your body responds to your environment, your routines, your stress levels, and your sleep. Every

chapter in this book gives you a tool. Stack them, and the impact multiplies. That's the biohacking way.

## One Small Action That Speeds Up Results Today

Let's make this real.

Here's your first gut biohack: **pre-loading your digestion**. It's a technique to activate your digestive system *before* a meal or supplement, making your body more responsive from the start.

Try this 3-step pre-load routine before your next meal or supplement:

1. Drink a small glass of warm water with a splash of lemon juice.
2. Spend 30 seconds practicing slow breathing: inhale for 4 seconds, exhale for 6.
3. Smell your food or supplement container for a moment before consuming it.

This may sound overly simple, but this trifecta stimulates salivary enzymes, primes your vagus nerve, and shifts your nervous system into "rest and digest" mode — all crucial for breaking down and absorbing what you eat.

Do this every day for the next week. You'll likely notice less bloating, more energy, and better digestion with no extra cost or effort.

## What's Next

In the coming chapters, we're going to dive into the systems behind gut performance: your internal clock, the gut-brain axis, and how factors like fasting, cold exposure, movement, and even breath can either accelerate or stall your results.

You're not just going to "heal your gut." You're going to upgrade it — faster, smarter, and more in tune with your biology than ever before.

This is your start. Let's move forward.

## Chapter 2

# The Gut as Command Central – Microbiome & Mitochondria

Most people think of the gut as a food processing system — something that turns meals into nutrients and gets rid of the waste. That's true, but it's also a massive understatement. Your gut is one of the most intelligent, multitasking systems in your entire body. It doesn't just digest. It communicates. It regulates. It defends. And at the center of that activity are two powerful networks: the **microbiome** and the **mitochondria**.

### The Microbiome: Your Hidden Operating System

You're not just human. You're also host to trillions of bacteria, viruses, and fungi — most of which live in your gut. This is your **microbiome**, and it plays a bigger role in your health than your DNA.

Your microbiome helps:

- Break down complex fibers and starches
- Manufacture key nutrients like B-vitamins and short-chain fatty acids
- Train your immune system to respond (or not overreact)
- Balance your mood by producing neurotransmitters like serotonin and GABA
- Communicate with your brain, skin, liver, and even fat cells

A healthy microbiome is like a well-run city — full of diversity, order, and productivity. But when it gets disrupted (by poor diet, antibiotics, stress, or lack of sleep), chaos takes over. You get inflammation, digestive problems, anxiety, fatigue, and slow or no progress from your supplements.

Biohacking your microbiome isn't about adding more bacteria — it's about **supporting the environment** those bacteria need to thrive.

You'll learn exactly how to do that in later chapters, but here's a simple mindset shift now: think of your supplements as tools, not solutions. They work best when your microbiome is already active, not waiting around passively.

### The Mitochondria: Power Plants of the Gut

Mitochondria are the microscopic engines inside your cells that create energy. Without them, nothing works — not your muscles, not your brain, and definitely not your gut.

Your digestive system needs a ton of energy to break down food, absorb nutrients, and coordinate gut motility. When your mitochondria are underpowered (because of poor sleep, stress, toxins, or lack of nutrients), your digestion slows down and your supplements don't get used efficiently.

Here's what that feels like:

- You eat a healthy meal, but feel tired afterward
- You take a probiotic, but still experience bloating or gas
- You try a gut-healing protocol, but don't see results

Mitochondrial dysfunction is a silent block to progress. The good news? You can stimulate mitochondrial activity in your gut cells through specific daily habits — like movement, fasting, light exposure, and strategic nutrients — which we'll cover in upcoming chapters.

## Gut Health Is Energy Health

The most overlooked link in the gut conversation is energy. We focus so much on bacteria and food that we forget the gut needs fuel to function. A high-energy gut repairs faster, digests better, and makes use of supplements far more effectively.

Want a quick way to increase gut energy today? Start your morning with **5 minutes of sunlight on your skin and in your eyes** (no sunglasses). It triggers both your mitochondria and your circadian rhythm — two things directly tied to digestion and nutrient use.

It's free, fast, and shockingly effective when done consistently.

## Connecting the Dots

Think of your microbiome as the software, and your mitochondria as the hardware. Supplements are like apps — they're only useful when the operating system is functioning and the battery is charged.

Gut biohacking means upgrading both. That's how you accelerate recovery, absorption, and long-term gut resilience.

Next, we're going to explore one of the most powerful yet underused tools for gut activation: your internal body clock.

Let's reset your rhythm.

## Chapter 3

# Circadian Rhythm Reset – Aligning Your Gut Clock

Most people associate circadian rhythms with sleep — when you wake up, when you feel tired, when you fall asleep. But what's often missed is that your **gut** follows its own rhythm, too. In fact, your digestive system runs on a 24-hour internal clock that influences when you digest food best, how you produce enzymes, and how your microbiome shifts throughout the day.

When your internal rhythm is synced, your gut performs better — and your supplements are far more likely to get absorbed and utilized. But when you're out of rhythm, everything slows down or gets misaligned. You might be eating the right things and taking the right pills, but they're hitting a system that isn't ready to work.

This chapter is about **getting your gut back in sync** — and how doing so can speed up the results you're already trying to achieve.

### The Gut Has Its Own Clock

Your gut lining, digestive enzymes, and microbiota operate on a time-based system. Here's a simplified version of how your gut behaves in rhythm:

- **Morning:** Digestive enzymes begin to rise; gut motility is low but increasing.
- **Midday:** This is your peak time for digestion and nutrient absorption.
- **Evening:** Digestive capacity winds down; gut motility slows; detox pathways begin to activate.
- **Night:** Gut lining repairs itself; microbiome diversity resets; brain-to-gut communication intensifies.

If you're eating large meals late at night, skipping daylight exposure, or constantly shifting your sleep schedule, you're throwing this system off — and your supplements are landing at the wrong time.

### Why This Matters for Supplement Absorption

Many gut-focused supplements — like probiotics, enzymes, or amino acids — work best when your circadian rhythm is strong. That's because your gut environment (acidity, enzyme activity, blood flow) changes based on the time of day.

For example:

- Probiotics taken early in the morning or before meals tend to have better survival rates in the gut.

- Digestive enzymes work best when taken right before or during your main meal, when your digestive fire is strongest.
- Nutrients like magnesium, zinc, or glutamine are better absorbed at night, when your gut is in repair mode.

If you want faster results, stop thinking just about **what** you take — and start thinking about **when** you take it.

## The Reset Protocol

To reset your gut clock, you don't need to do anything extreme. You just need consistency in a few core areas:

### 1. Anchor Your Mornings

- Get outside within 30–60 minutes of waking. Even 10 minutes of sunlight tells your gut, brain, and hormones that the day has started.
- Avoid caffeine on an empty stomach — have it *after* your first light meal or supplement dose.

### 2. Time Your Eating Window

- Aim to eat meals within a consistent 8–12 hour window (for example, 8am to 6pm).
- This helps train your gut when to produce enzymes and improves microbiome diversity.

### 3. Stop Eating 2–3 Hours Before Bed

- Nighttime eating confuses your system and delays repair processes.
- If you need something, stick to a light, low-carb option that doesn't spike insulin or disrupt melatonin.

### 4. Set a Regular Sleep-Wake Cycle

- Try to go to bed and wake up at roughly the same time every day, even on weekends.
- Gut function and sleep quality are deeply intertwined — better sleep equals better digestion.

## Bonus Hack: Circadian Supplement Timing

Here's a simple timing framework to test:

- **Morning:** Probiotics, vitamin D, enzymes with breakfast or main meal
- **Midday:** Herbal gut support (like peppermint or ginger), prebiotics with lunch
- **Evening:** Glutamine, magnesium, or collagen supplements to aid repair and relaxation

Start here, observe how your body responds, and adjust as needed. Just the act of taking your supplements at more rhythm-aligned times can increase their impact.

## Gut Flow, Not Just Gut Fixes

Think of your body as a system that thrives on rhythm, not randomness. Most gut issues come not from the absence of solutions, but from the lack of flow — mismatched timing, poor sleep, scattered eating, and overstimulation.

Real biohacking isn't about doing more. It's about **doing the right things at the right time**.

And now that your gut clock is back on track, we're ready to explore one of the most potent gut-accelerators of all: intermittent fasting.



## Chapter 4

# Intermittent Fasting for Microbiome Mastery

Fasting is one of the oldest healing practices in human history, and it's making a serious comeback — not just for fat loss or blood sugar control, but for gut health. Intermittent fasting (IF), when used intentionally, can help reset the digestive system, reduce inflammation, improve microbiome diversity, and dramatically increase how your body responds to supplements.

But here's the key: it's not about extreme deprivation or skipping meals forever. It's about **strategic pauses** — giving your gut a chance to clean, repair, and regulate itself before you put something new in.

When your gut isn't constantly overloaded, your supplements don't get buried in chaos. They get absorbed. They get used. And you see results faster.

### Why Fasting Works for the Gut

Your digestive system is like a machine — powerful, but not meant to run nonstop. Every time you eat, your gut shifts into active mode: breaking down food, releasing enzymes, producing acids, coordinating hormones. If you eat constantly, it never catches a break.

Intermittent fasting gives your gut time to:

- Activate something called the **Migrating Motor Complex (MMC)**, which is like a sweep-and-clean wave that removes undigested debris and bacterial buildup
- Reduce inflammation in the intestinal lining
- Allow tight junctions in the gut wall to repair (crucial for leaky gut recovery)
- Shift your microbiome to favor anti-inflammatory, fat-burning bacteria
- Improve insulin sensitivity and nutrient transport to your cells

Even short daily fasts — like 12 to 16 hours without food — can begin this repair cycle.

### But Doesn't Fasting Slow Your Metabolism?

Not if you do it right. Short-term fasting (under 24 hours) has actually been shown to **increase metabolic flexibility**, support hormone balance, and improve mitochondrial efficiency — especially in the gut.

The idea that skipping breakfast wrecks your metabolism is outdated. What actually slows metabolism is eating constantly, spiking blood sugar repeatedly, and never allowing the body to reset.

## How Intermittent Fasting Speeds Up Supplement Results

When your gut lining is inflamed or congested, your supplements hit a wall. By fasting strategically, you create **cleaner, more receptive gut conditions**. Here's how that plays out:

- **Probiotics** settle into a less inflamed, less acidic environment — giving them a better chance to colonize
- **Digestive enzymes** become more efficient when meals are spaced out
- **Amino acids** like glutamine can be absorbed more directly into a cleaner intestinal lining
- **Prebiotics** are used more effectively by microbes after the gut has rested

It's like giving your digestive system a fresh canvas — instead of painting over yesterday's mess, you're starting clean.

## How to Get Started (Without Starving Yourself)

Here's a beginner-friendly plan to begin using IF to support your gut and supplements:

### 1. Start with a 12:12 Window

Eat within a 12-hour window (e.g., 8am–8pm), fast for the other 12. This gives your gut nightly downtime.

### 2. Progress to 14:10 or 16:8

Once 12:12 feels easy, try tightening your window. Many people thrive on 16:8 (e.g., eat between 10am–6pm). This creates a longer repair window without causing energy crashes.

### 3. Use Your Fasting Window for Smart Supplementation

Some gut supplements work well on an empty stomach, like:

- **L-glutamine**: for gut lining repair
- **Probiotics**: when taken 30 minutes before your first meal
- **Herbal gut soothers**: like ginger or licorice root teas

### 4. Break Your Fast Gently

When your body's been resting, your first meal matters. Skip the heavy, greasy foods. Break your fast with:

- Warm bone broth or miso soup
- A gut-friendly smoothie (fermented yogurt, green banana, flaxseed)
- A small protein-fat combo (like eggs with avocado or salmon with greens)

This tells your body: repair mode is over, now it's time to build.

## What to Expect When You Start

In the first few days, your hunger hormones may feel out of sync — that's normal. You're retraining your body to burn fuel efficiently. After a week or two, most people report:

- Less bloating and brain fog
- More regular bowel movements
- Improved energy during the day
- Faster response to supplements

This is your body finally operating without constant interruption.

## **A Word of Caution**

If you're underweight, recovering from an eating disorder, pregnant, or dealing with adrenal fatigue — consult a healthcare professional before trying intermittent fasting. Biohacking is powerful, but it must be personalized.

## **Make It Work for You**

You don't have to fast every day. Even doing it three or four times a week gives your gut a chance to reset. Combine it with the circadian habits from the last chapter — and now your gut has both timing and rhythm working in its favor.

You've cleared the way. Now, it's time to introduce a tool that can reduce inflammation, improve digestion, and shift your nervous system in under 60 seconds: **cold exposure**.

## Chapter 5

# Cold Exposure and Gut Inflammation

You might not associate something as primal as cold with gut health, but it turns out your nervous system, your immune response, and even your microbiome are deeply influenced by temperature — especially cold exposure.

Used correctly, cold exposure is one of the fastest, cheapest ways to reduce inflammation, regulate stress, and activate the vagus nerve — all of which are essential if you want your gut (and your supplements) to actually do their job.

This chapter explores how strategic cold exposure can boost digestion, reset inflammation, and make your gut more responsive — in just a few minutes a day.

### Why Inflammation Slows Everything Down

Inflammation in the gut isn't always dramatic. You might not see it or feel it directly. But if your digestive system is inflamed — even slightly — it becomes reactive, sluggish, and less permeable to nutrients.

You may notice this through:

- Constant bloating, even with “clean” meals
- Feeling foggy or tired after eating
- Random food sensitivities that come and go
- Slow progress despite taking the right supplements

Most of this comes down to an overactive immune response in the gut lining. It keeps the gut in “defense mode” — not “repair mode.”

This is where cold exposure becomes your ally. It gives your body the signal to reduce systemic inflammation and shift into a parasympathetic (rest-and-digest) state. It also activates metabolic functions that support mitochondrial efficiency and blood flow to the gut.

### What Cold Exposure Does to Your Gut

Here's what happens when you expose your body to cold intentionally and briefly:

#### 1. **Activates the Vagus Nerve**

The vagus nerve connects your brain to your gut and controls digestion, motility, and enzyme secretion. Cold exposure, especially to the neck and face, stimulates this nerve — improving gut-brain communication instantly.

## 2. **Reduces Inflammatory Cytokines**

Cold exposure suppresses cytokines like TNF-alpha and IL-6, which are responsible for inflammation in the gut lining. Less inflammation = more efficient digestion.

## 3. **Increases Circulation and Lymphatic Flow**

Cold stimulates blood flow, especially after the body warms up. This enhances nutrient delivery and detox processes — both crucial for supplement absorption.

## 4. **Supports Microbial Balance**

Emerging research shows that regular cold exposure may shift the microbiome in favor of more resilient, anti-inflammatory strains of bacteria.

# How to Use Cold Exposure (Without Going Extreme)

You don't need an ice bath to get started. In fact, small, consistent exposure can create big results.

**Start here:**

## 1. **Cold Face Immersion (30 seconds to 2 minutes)**

- Fill a bowl with cold water and a few ice cubes.
- Submerge your face for short intervals, breathing in between.
- Do this in the morning to kickstart vagus nerve tone and reduce inflammation.

## 2. **Contrast Showers (3 to 5 minutes)**

- Finish your regular warm shower with 30 seconds of cold.
- Rotate between hot and cold if possible (30–60 seconds each for 3 rounds).
- Focus the cold on your upper chest, neck, and back — areas rich in vagal nerve branches.

## 3. **Ice Pack Protocol (2 to 5 minutes)**

- Place a wrapped ice pack on the back of your neck while sitting or lying down.
- Breathe deeply while doing this. Try pairing it with a digestive supplement taken just beforehand.

## 4. **Outdoor Exposure (5 to 10 minutes)**

- Step outside in light clothing in cool weather.
- Walk or stretch while breathing slowly through your nose.
- You don't need to shiver — just get slightly uncomfortable and stay calm.

# When to Use Cold for Best Results

- **In the morning:** Cold exposure can activate your system and set the tone for digestive energy throughout the day.



- **Before meals or supplements:** Especially effective before high-protein meals or when taking probiotics and enzymes — helps stimulate blood flow and enzyme activity.
- **After a high-stress moment:** Use cold to bring yourself back to a calm, digestive state.

## Stack This With Supplements

Here's a powerful 3-step protocol to combine cold with supplementation:

1. **Cold stimulation (face, neck, or shower)**
2. **Breathwork (slow nasal breathing for 2 minutes)**
3. **Supplement dose** (probiotic, glutamine, or enzyme)

This puts your body in an optimal receiving state — calm, alert, and inflammation-reduced. It's a simple shift that can dramatically change how your body uses what you give it.

## No Need to Suffer

Biohacking with cold isn't about discomfort for the sake of discomfort. It's about signaling your body to return to balance — fast. Even two minutes a day can create noticeable improvements in how you digest, recover, and feel.

Next, we'll shift into another foundational tool — one that quietly governs everything from gut movement to microbiome regulation: movement itself.

## Chapter 6

# Movement and Microbiota – The Exercise Effect on Your Gut

We often separate gut health and physical fitness into different categories, but the two are tightly connected. In fact, if you're sitting most of the day, your digestion is likely slowed, your gut lining less oxygenated, and your microbiome less diverse — no matter how perfect your supplement stack is.

Movement isn't just good for your muscles or mood. It literally **moves your gut** — stimulating intestinal contractions, increasing blood flow, lowering inflammation, and shifting the microbial balance in your favor. The science is clear: physically active people tend to have **more diverse, resilient, and less inflammatory microbiomes**.

This chapter is about making your body an ally in your gut healing process — and using intentional movement to amplify the effects of everything you're taking.

### Why the Gut Responds to Movement

Your digestive system is built to function **in motion**. When you walk, stretch, or move with rhythm, your intestines contract in a pattern called peristalsis — the wave-like muscle action that pushes food and waste through the gut.

Without movement, that system gets sluggish. You get bloated. You feel heavy. Nutrients move slowly. Waste lingers too long. This creates an environment where bad bacteria can thrive and good ones struggle to hold ground.

Movement changes that. Here's what's happening beneath the surface:

- **Increased gut motility:** Food and waste move more efficiently, reducing bloating and constipation.
- **Improved blood flow:** More oxygen and nutrients are delivered to the gut lining, enhancing repair and absorption.
- **Reduced systemic inflammation:** Moderate exercise signals your immune system to calm down.
- **Enhanced microbiome diversity:** Physical activity encourages the growth of beneficial bacterial strains linked to better metabolism and immunity.

## The Right Kind of Exercise for Gut Health

You don't need intense HIIT workouts or long runs to unlock these benefits. In fact, high-intensity exercise can sometimes backfire if your gut is already stressed. What works best for most people is **moderate, rhythmic movement** that supports digestion without overloading your system.

Here are a few forms of movement that directly benefit your gut:

### 1. Walking (especially after meals)

- A 10–15 minute walk after eating helps stimulate peristalsis and supports blood sugar balance.
- It's also one of the easiest ways to integrate movement into your day without disrupting your nervous system.

### 2. Yoga and mobility flows

- Gentle yoga poses like Seated Twist, Child's Pose, Cat-Cow, and Bridge help massage internal organs and improve motility.
- Deep breathing in these poses also activates the parasympathetic nervous system, improving digestion.

### 3. Light strength training

- Resistance training builds metabolic efficiency and reduces insulin resistance — both key factors in gut-related inflammation.
- Focus on controlled movements, compound lifts, or bodyweight training.

### 4. Rebounding (mini trampoline)

- Low-impact bouncing stimulates lymphatic drainage and gut circulation — great for detox and nutrient transport.
- Even 5 minutes a day can help with bloating and stagnation.

## Timing Your Movement for Maximum Effect

Just like with supplements and food, **timing your movement** can dramatically change how it affects your gut.

### Morning:

- Light stretching or walking helps “wake up” the digestive system and support your circadian rhythm.
- Try a few yoga poses or a walk before your first meal or supplement dose.

### Post-meal:

- Gentle movement after eating (especially lunch or dinner) helps prevent gas, heaviness, or sluggish digestion.

- Avoid high-intensity workouts immediately after meals — wait at least 1.5–2 hours.

### Evening:

- Gentle stretching or a short walk before bed improves motility and sleep — both critical for gut healing.

## A Movement Protocol to Try This Week

### Gut Flow Protocol (Daily, 20–30 minutes total)

1. **Morning (5–10 minutes):**
  - Light stretching + deep breathing (Cat-Cow, Downward Dog, Seated Twist)
2. **Midday or post-lunch walk (10–15 minutes):**
  - Easy pace, nasal breathing, no distractions
3. **Evening (5–10 minutes):**
  - Gentle mobility or foam rolling + 2 yoga poses
  - Finish with deep belly breathing for 2–3 minutes

You can adapt this however you like. The key is consistency — not intensity. Make movement a digestive ritual, not a punishment.

## Stack Movement With Your Supplements

If you're taking probiotics, enzymes, or other gut-focused supplements, light movement can:

- Stimulate circulation for faster delivery
- Reduce bloating or pressure that slows absorption
- Enhance the gut's receptivity to incoming compounds

Example stack:

- Wake up → Stretch and breathe → Take probiotic → Walk
- Post-lunch → Digestive enzymes → 10-minute stroll
- Evening → Glutamine or magnesium → Gentle yoga → Bed

You're no longer just feeding your gut — you're **activating it**.

In the next chapter, we'll bring in another layer of control: the breath. It's one of the fastest ways to influence gut rhythm, nervous system balance, and nutrient flow — and you're already doing it 20,000 times a day.

## Chapter 7

# Breathwork, Oxygen, and the Gut-Brain Axis

You breathe about 20,000 times a day. But how often do you do it with awareness, intention, or even technique? Probably not often — and yet, this simple, automatic action is one of the **most powerful levers you have to influence your gut**.

The gut and brain are in constant communication through what's called the **gut-brain axis**. This isn't just a concept — it's a literal network of neurons, hormones, and biochemical messengers that allow your digestive system and your nervous system to work together.

When you're stressed, anxious, or distracted, your body shifts into **sympathetic mode** — the “fight or flight” response. Digestion slows, blood flow is diverted away from the gut, and enzyme production drops. This means poor absorption, bloating, inflammation, and wasted supplements.

Breathwork helps reverse that. It's the fastest, most accessible way to **activate the parasympathetic nervous system** — the “rest and digest” state where gut function, healing, and absorption are optimized.

This chapter is about learning to breathe **in a way that turns your gut on**, not off.

### The Vagus Nerve: Your Gut's Remote Control

At the center of the gut-brain axis is the **vagus nerve** — a long nerve that runs from your brainstem to nearly every major organ, including your digestive tract. It regulates:

- The release of digestive enzymes
- The movement of food through the intestines
- The production of stomach acid
- The body's inflammatory response

When you breathe deeply and rhythmically, especially through your nose and into your belly, you stimulate the vagus nerve. This sends a signal to your body that it's safe — and it's time to digest, absorb, and repair.

When you breathe shallowly, through your chest and mouth, you tell your body the opposite: danger, alert, pause digestion.

### How Poor Breathing Sabotages Gut Health

Most people today breathe in a way that *disrupts* gut function without realizing it. Especially if you're:

- Sitting at a desk all day
- Scrolling, multi-tasking, or stressed out
- Drinking coffee on an empty stomach



- Eating in a rush or while distracted

This leads to:

- Incomplete digestion
- Overactive stress response
- Poor nutrient absorption
- Slowed movement through the intestines

Even the best supplements can't work properly in that environment.

## **Breath as a Biohack**

The good news: you can change this instantly. You already have the tool — your breath — and just need to use it intentionally.

Here are three simple, effective techniques you can start with:

### **1. Diaphragmatic (Belly) Breathing – Daily Reset**

- Sit or lie down with one hand on your chest and one on your belly.
- Inhale slowly through your nose for 4 seconds, letting your belly rise.
- Exhale gently for 6 seconds through your mouth or nose, belly falls.
- Repeat for 2–5 minutes.

Do this before meals, after taking supplements, or whenever you feel anxious or bloated. It turns on digestion and turns down stress.

### **2. Box Breathing – Gut-Brain Sync**

- Inhale for 4 seconds
- Hold for 4 seconds
- Exhale for 4 seconds
- Hold again for 4 seconds

Repeat for several rounds to calm the nervous system and increase oxygen delivery to the gut. Great before eating or before bed.

### **3. Extended Exhale Breathing – Anti-Bloat Protocol**

- Inhale for 3–4 seconds
- Exhale slowly for 6–8 seconds

This technique enhances vagal tone and helps relieve gas, tension, and gut spasms. Try it after meals or during moments of gut discomfort.

## **Breath and Supplement Timing**

Here's how to integrate breathwork with your gut-supporting supplements:

- **Before taking a probiotic or enzyme:** Do 2–3 minutes of belly breathing to activate digestion.
- **After meals with gut discomfort:** Use extended exhale breathing to calm the system and reduce bloating.
- **At night before glutamine or collagen:** Try box breathing to shift into repair mode and deepen sleep quality.

This doesn't take extra time — just awareness. And it creates a real physiological shift that allows your body to use what you're feeding it.

## Oxygen, Circulation, and the Gut Wall

Breath also improves **oxygen delivery** to your digestive tract — and oxygen is essential for gut lining repair, microbial balance, and mitochondrial function. Most people live in a slightly oxygen-deprived state due to poor posture and chronic stress.

Fixing this can speed up recovery dramatically.

Simple daily habit:

- Take 5 deep nasal breaths every hour.
- Sit up straight when you do it.
- Make the exhale longer than the inhale.
- Do this while hydrating or between tasks.

It's basic, but it's a reset your body recognizes immediately.

## Summary

You don't need a complicated meditation practice or a yoga studio. You need **control of your breath** — because when your breath is calm, your gut listens. And when your gut listens, everything else you're doing — your food, your supplements, your lifestyle — works better, faster, and more efficiently.

Next, we'll dive into stress — and how the way you **respond** to it can make or break your gut transformation.

## Chapter 8

# Stress Biohacks – Cortisol, Serotonin, and Your Supplement Results

You can have the perfect diet, the best supplements, the cleanest lifestyle — and still struggle with bloating, fatigue, or mood swings if your stress is unchecked. It's not just in your head. It's in your gut.

Stress is one of the most powerful disruptors of gut health. And the worst part? You don't always feel it as "stress." Sometimes it's background tension, low-grade anxiety, or the pressure of constantly being "on." But your body feels it — and your gut responds immediately.

The good news is this: stress is **hackable**. You can learn to regulate your response and shift your body back into healing mode — even during a busy, unpredictable day. When you do, your **gut absorbs better**, your **inflammation drops**, and your **supplements start working more efficiently**.

This chapter is about making that shift happen.

### How Stress Hijacks Your Gut

When you experience stress — physical, emotional, mental, or environmental — your brain signals the release of **cortisol**, your primary stress hormone.

Cortisol does a few things very quickly:

- Diverts blood away from your digestive system
- Decreases stomach acid and digestive enzyme production
- Weakens the gut lining over time
- Disrupts the microbiome, favoring harmful bacteria
- Suppresses serotonin (your "feel good" neurotransmitter, 90% of which is made in the gut)

In short: stress turns off digestion and turns on survival mode. And if you're living in that mode daily, your body won't prioritize healing, absorbing nutrients, or responding to supplements — even if you're doing everything else "right."

### Symptoms of a Stressed Gut

You might not feel panicked, but chronic low-level stress often shows up as:

- Feeling tired after eating
- Random food intolerances
- Loose stools or constipation

- Brain fog or poor sleep
- Mood swings, irritability, or low motivation
- No response to supplements that used to work

These are signs your gut is operating under **stress chemistry**, not rest-and-repair chemistry.

## Rewiring Your Stress Response

You can't eliminate all stress — and you don't need to. The goal is to become **resilient**. To train your body to come back to center faster. That's biohacking at its core: controlling your internal response, even when your external world is chaotic.

Here are stress biohacks that directly benefit your gut:

### 1. Strategic Breathwork (Revisited)

- As covered in Chapter 7, breathing deeply into the belly instantly activates the vagus nerve and turns on digestion.
- Use before meals, after a hard conversation, or when you feel off.

### 2. Movement Micro-Bursts

- Short walks, stretching, or shaking out tension can drop cortisol within minutes.
- Try walking for 3–5 minutes every hour during the day — it resets your nervous system and boosts blood flow to the gut.

### 3. Sunlight and Nature Exposure

- Morning sun helps regulate your cortisol rhythm and boosts serotonin.
- Even 10 minutes of natural light and movement can rebalance your mood and digestion.

### 4. Cold Exposure (Reinforced)

- As detailed in Chapter 5, cold water (face, neck, or shower) quickly lowers stress and inflammation.
- Use it when you feel “stuck” or heavy.

### 5. Nutritional Support

- Magnesium, L-theanine, ashwagandha, and B-complex vitamins support stress regulation and gut repair.
- Pair these with your gut supplements for a synergistic effect.

### 6. Digital Boundaries

- Constant notifications, messages, and multitasking keep your nervous system in a reactive state.

- Try creating buffer zones: no screens during meals, first 30 minutes after waking, or one hour before bed.

## A Gut-Stress Reset Ritual

Try this once a day for a week. You can do it in under 10 minutes.

1. Step outside or by a window for natural light
2. Close your eyes and do 2 minutes of belly breathing
3. Walk slowly for 3 minutes, focusing only on your steps and breath
4. Return, drink a glass of water, and take your gut supplement calmly

You've just created a biochemical environment where your supplement can work.

## The Serotonin Connection

Serotonin plays a huge role in both gut motility (how things move through your system) and mood regulation. And since the majority of it is produced in the gut, you can't improve mood or digestion long-term without supporting this connection.

The fastest way to boost serotonin naturally:

- **Sleep better** (covered in the next chapter)
- **Move daily**
- **Get sun**
- **Eat fermented foods and prebiotics**
- **Lower stress with breath and presence**

Supplements like 5-HTP and tryptophan may help, but they work best when the gut is ready to produce and process them.

## Reframing the Healing Process

Sometimes progress isn't about adding more — it's about removing the **noise** so your body can use what you're already giving it. Lowering stress isn't just a mental win. It's a digestive reset. A microbial shift. A hormonal alignment.

Your gut can't heal when it feels under threat. But when it feels safe, supported, and regulated — even a little — the entire healing process speeds up.

Next, we'll look at one of the most underrated forces in gut health: **sleep**. It's not just recovery — it's where most of your repair and transformation actually happen.



## Chapter 9

# Sleep Optimization for Gut Repair

Sleep isn't downtime. It's **activation time** for your gut's repair crew.

During the night, while your mind is at rest, your body is busy executing complex repair work — regenerating the gut lining, balancing hormones, reprogramming the immune system, and supporting microbial diversity. Without quality sleep, this restoration process falls short. And without that, your supplements don't get a chance to perform at their highest potential.

Gut healing isn't just what you do during the day. It's what your body can *complete* at night.

This chapter is about making sure that happens — every night, consistently.

### What Happens to the Gut During Sleep?

Sleep is when the **gut-brain axis goes into repair mode**. The vagus nerve becomes more active. Inflammation is dialed down. Microbes shift into patterns that restore balance.

Here's what your gut does while you sleep:

- **Activates gut lining regeneration**  
Intestinal cells are replaced every 3–5 days. Most of this regeneration occurs during deep sleep, when cellular repair processes are at their peak.
- **Strengthens the mucosal barrier**  
This helps prevent toxins and pathogens from leaking into the bloodstream — one of the primary issues behind chronic gut problems.
- **Supports microbial diversity**  
Certain bacteria replicate and flourish during sleep, especially the ones linked to emotional balance and metabolic health.
- **Regulates immune system function**  
Over 70% of your immune cells live in the gut. Sleep calibrates their activity, reducing chronic low-grade inflammation.
- **Boosts neurotransmitter balance**  
Sleep helps reset serotonin and GABA levels — critical for mood and digestive motility.

So if you're getting poor or inconsistent sleep, you're *blocking* your gut from repairing itself — and blunting the effectiveness of your supplements.

## Why Your Supplements Need Sleep

Your supplements — probiotics, enzymes, glutamine, collagen, herbs — are all tools. But if your body is running on 4–5 hours of broken sleep, those tools are being handed to a tired crew that can't build.

Here's how sleep affects supplement results:

- **Poor sleep** increases cortisol and gut permeability (bad for glutamine and probiotics)
- **Disrupted circadian rhythm** lowers nutrient absorption (bad for vitamins and enzymes)
- **Short sleep duration** affects microbiota (bad for long-term balance and immunity)
- **Fragmented sleep** impairs hormone regulation (bad for metabolic repair)

When you get deep, consistent sleep, every supplement you take is absorbed more efficiently and utilized more strategically by your body.

## How to Optimize Your Sleep for Gut Repair

This isn't just about "getting more sleep." It's about **getting the kind of sleep** that actually helps your gut regenerate.

Here's how to create a gut-healing sleep environment:

### 1. Set a Consistent Sleep-Wake Schedule

- Go to bed and wake up at the same time every day, including weekends.
- This aligns your circadian rhythm and improves enzyme timing and microbial activity.

### 2. Shut Down Blue Light 1 Hour Before Bed

- Blue light from phones, TVs, and laptops suppresses melatonin production.
- Use amber glasses or apps like f.lux or Night Shift mode.
- Even better: turn off screens altogether and switch to low, warm lighting.

### 3. Cool Your Sleeping Environment

- The ideal sleep temperature for gut and brain repair is 60–67°F (15–19°C).
- Lower temps support deeper sleep and better mitochondrial function.

### 4. Avoid Heavy Meals and Alcohol Before Bed

- Give your digestive system 2–3 hours to process your last meal.
- Alcohol disrupts deep sleep cycles and gut barrier function — even small amounts.

### 5. Use Wind-Down Rituals

Create a nightly routine that tells your body it's time to transition:

- Herbal teas like chamomile or peppermint
- Journaling to offload mental noise

- Gentle stretching or restorative yoga
- Breathwork: try the 4-7-8 method (inhale for 4, hold 7, exhale 8)

## 6. Use Targeted Supplements If Needed

- **Magnesium glycinate or L-threonate:** supports relaxation and sleep depth
- **L-theanine:** calms the mind without sedation
- **GABA or glycine:** supports nervous system and gut motility during sleep
- **Collagen or glutamine:** taken before bed, these repair the intestinal lining overnight

## Example Sleep Stack for Gut Repair

One hour before bed:

- Screen-free time
- Herbal tea or warm water with lemon
- Light stretching or 5 minutes of breathing
- Take:
  - 400 mg magnesium glycinate
  - 3–5 grams of glutamine
  - Optional: low-dose melatonin or glycine if sleep is inconsistent

Sleep isn't passive. It's the most efficient gut-repair protocol your body already has — and it's free.

## Final Thought

So many people stay stuck in the loop of adding more supplements, more protocols, more complexity — when what they really need is *rest*. Not just sleep, but **deep recovery**. When you consistently support your body with sleep, all the other work you're doing finally has space to land and activate.

In the next chapter, we'll go from nighttime recovery to real-time data — and explore how you can **track your gut progress** using biofeedback, testing, and simple tools.

## Chapter 10

# Gut Tech – Tracking, Testing, and Biofeedback Tools

You've put in the work — the breath, the movement, the cold, the rhythm, the nutrition, and the sleep. But now you might ask: *How do I know it's working?*

The answer is **feedback**. Not guesses. Not hope. Real data — from your body, your behavior, and, if needed, lab-level metrics.

Biohacking isn't about obsessively tracking everything. It's about **strategic awareness** — using tools that help you see trends, make adjustments, and move forward faster. The more clearly you understand what your gut is doing, the more effectively you can respond — with supplements, routines, or lifestyle shifts.

This chapter is about empowering you with **techniques and tools** that track your progress and remove the guesswork from gut healing.

### Why Tracking Accelerates Gut Healing

Most people wait until symptoms appear — or return — to respond. But by that point, the gut is already stressed. Tracking allows you to:

- Catch patterns early
- Optimize supplement timing and dosing
- Adjust your food, sleep, or movement strategically
- Stay motivated by seeing progress

Awareness creates momentum. And in the biohacking model, momentum is everything.

### 1. Symptom Tracking: The Foundation

You don't need a lab test to know your gut's state. Your body is giving you feedback every single day. You just need to pay attention.

#### Track these daily:

- Bloating (0–10 scale)
- Stool frequency and form (use the Bristol Stool Chart)
- Energy levels (AM/PM)
- Mood and mental clarity
- Sleep quality (hours + how you feel waking)
- Reactions to food or supplements
- Appetite and cravings

### How to track:

- Use a simple notebook, app, or Google Sheet
- Rate symptoms at the same time each day (e.g., right after lunch, before bed)
- Look for patterns: does bloating go up after certain meals? Does energy dip despite a full night's sleep?

**Bonus:** Create a simple “gut score” — an average of your key markers. Watching it rise over time is powerful motivation.

## 2. Wearables and Biofeedback Devices

You don't *need* tech, but if you like data, these tools can help fine-tune your gut protocols.

### Oura Ring, WHOOP, or Fitbit

- Track sleep stages, HRV (heart rate variability), and recovery
- Low HRV or poor deep sleep can correlate with gut inflammation
- Use trends to know when to push and when to recover

### Continuous Glucose Monitors (CGMs)

- Track how your blood sugar responds to meals
- Gut imbalance often shows up as glucose spikes or crashes
- Helps identify trigger foods, poor digestion, or inflammation

### HRV Tracking Apps (e.g., Elite HRV, HRV4Training)

- Daily HRV can reflect gut stress or recovery state
- Use breathwork or cold exposure to raise HRV over time

### Smart Scales or Body Composition Tools

- Track water retention, inflammation markers, and trends in weight
- Gut inflammation often shows up as unexplained weight fluctuation

### Gut-Specific Apps

- Apps like Cara Care or Bowelle allow daily gut tracking with meal, mood, and symptom logs

These tools aren't about perfection. They're about **pattern recognition**. Once you know your patterns, you can stop wasting time on things that don't work — and double down on what does.

## 3. At-Home Testing (For Deeper Insights)

When progress stalls or you want to validate what's going on, testing gives you a data-backed view of your gut health.

### Recommended functional gut tests:

- **GI-MAP or GI360:** A stool test that reveals pathogens, parasites, dysbiosis, enzyme levels, and more
- **Organic Acids Test (OAT):** Measures gut and detox byproducts in urine — great for hidden yeast, bacteria, and nutrient deficiencies
- **Food sensitivity testing (IgG-based):** Can help identify reactive foods, though results should be interpreted with lifestyle context
- **Zonulin testing:** A marker for leaky gut or intestinal permeability

These aren't usually offered by standard doctors but can be ordered through functional medicine practitioners or online labs. You don't need to run them constantly — even once can give you a roadmap.

## 4. Gut Check-In Questions (Without Any Devices)

Sometimes the most valuable data is internal. Ask yourself these once a week:

- Do I feel lighter or heavier after eating?
- Am I more or less reactive to stress this week?
- How is my sleep rhythm? Do I fall asleep and stay asleep easily?
- Is my mind clearer or foggy than before?
- Do I feel more “in tune” with my body?

You'll know things are working not just by symptom relief, but by a **return of connection** — between your gut, your energy, and your mind.

## 5. A Simple Feedback Loop to Use Weekly

### Every Sunday, do this:

- Review your symptom notes or app logs
- Highlight any improvements or regressions
- Adjust one variable for the upcoming week (e.g., move probiotic to AM, add evening breathwork, extend fasting window)
- Set one gut-focused intention: *“This week I will...”*

Small inputs. Clear awareness. Continuous evolution.

That's what creates transformation — not just knowledge, but consistent, strategic action.

## Moving Forward

Tracking doesn't have to be obsessive or overwhelming. It should feel empowering. Like you're tuning in, not micromanaging. Like you're working *with* your body, not against it.

In the next chapter, we'll take everything we've covered and roll it into one: a complete, step-by-step 21-day blueprint that activates all of these biohacks in a way that's simple, powerful, and personal.

## Chapter 11

# Your 21-Day Gut Biohacking Blueprint

At this point, you've learned a powerful toolkit of gut-focused biohacks — each one designed to create faster, deeper, and more lasting results from the supplements you're already taking.

Now it's time to put it all together.

This chapter is your **21-day blueprint**. A guided, structured plan that integrates the principles from this book into a daily routine. Not perfection. Not complexity. Just clear actions that build on each other and get your system back into rhythm — fast.

Whether you're starting fresh or resetting after a plateau, this is the framework that turns knowledge into transformation.

### How the Blueprint Works

- **Three Phases, Seven Days Each**
  - Phase 1: Reset
  - Phase 2: Rebuild
  - Phase 3: Rewire
- **Daily Core Practices**
  - Breathwork, hydration, supplement timing, movement, and mindfulness
- **Weekly Focus**
  - Each phase introduces one new biohack layer to keep it simple and scalable

### Phase 1: RESET (Days 1–7)

*Objective: Calm inflammation, sync your gut clock, and prepare the system for deeper change.*

#### Daily Actions:

- Wake and hydrate: 1 glass warm water + lemon
- 2–3 minutes belly breathing before your first supplement or food
- Time-restricted eating: 12:12 fasting window (e.g., 8am–8pm)
- 10-minute walk after one meal per day
- Finish shower with 30 seconds of cold water



- Lights out by 10:30pm, no screens 60 minutes before bed

#### **Supplements:**

- Probiotic (morning, empty stomach)
- Digestive enzymes (with main meal)
- Glutamine (evening, empty stomach)

#### **Weekly Focus:**

- Build rhythm. Don't aim for perfection — aim for consistency.

### **Phase 2: REBUILD (Days 8–14)**

*Objective: Support digestion, increase gut repair, and reinforce microbiome diversity.*

#### **Daily Actions (add to Phase 1):**

- Upgrade fasting window to 14:10 (e.g., 9am–7pm)
- Introduce one fermented food per day (kefir, kimchi, sauerkraut, etc.)
- Add one polyphenol-rich food: berries, green tea, dark chocolate, olive oil
- 5-minute breath session after your largest meal
- Evening wind-down: 5 minutes stretching + magnesium or glycine

#### **Supplements:**

- Keep existing; consider adding collagen or L-theanine if sleep is irregular

#### **Weekly Focus:**

- Observe how your body feels after meals, sleep, and breathwork. Log it.

### **Phase 3: REWIRE (Days 15–21)**

*Objective: Lock in new gut habits and shift your system into resilience mode.*

#### **Daily Actions (build on previous phases):**

- Cold exposure upgrade: Face dunk or full cold shower (1 min)
- Micro-movement breaks: 3–5 minutes every 60–90 minutes during the day
- Gratitude journaling or mind-dump before bed (calm the gut-brain axis)
- Adjust supplement timing based on personal feedback (e.g., move glutamine earlier, enzymes before instead of during meal)
- Optional: Introduce intermittent fast day (1 day in this week = 18:6 window)

#### **Supplements:**

- Stay consistent; experiment with minor changes based on tracking

### **Weekly Focus:**

- Intuition over protocol. Feel what's working. Simplify where possible.

### **Weekly Check-In Prompts**

At the end of each week, reflect on:

- How is my digestion? (Better, worse, or same?)
- Am I feeling more or less reactive to food and stress?
- Have I been consistent with sleep and breath?
- Which biohack felt most impactful this week?
- What small change will I carry forward?

### **Example Daily Routine (Any Phase)**

#### **Morning:**

- Wake, water + lemon
- Belly breathing (2 mins)
- Light stretching or walk
- Probiotic
- First meal within 1–2 hours of waking (after breath + movement)

#### **Midday:**

- Eat main meal with enzymes
- 10–15 min walk
- Green tea or herbal tea
- Symptom or food response tracking (2–3 minutes)

**Evening:**

- Fermented or prebiotic-rich dinner
- Glutamine or collagen
- 5-minute wind-down: breathwork or journaling
- Sleep before 10:30pm

**Customize Based on Your Body**

This isn't about following a script — it's about learning how your body responds. Some people will thrive with longer fasts, others need more calories. Some may need more movement, others more stillness.

Track, adjust, and listen. That's the real biohacking process.

In the final chapter, we'll zoom out — and talk about how to make all of this stick, without burnout, obsession, or the all-or-nothing mindset that keeps most people stuck.

## Chapter 12

# The Long Game – Sustaining Gut Health Beyond the Reset

You've made it through the reset. You've learned the science, applied the tools, and started to feel what it's like when your gut isn't fighting you — it's **working with you**.

Now the question becomes: *How do I keep this going?*

Gut biohacking isn't a 21-day program. It's a shift in how you think, respond, and relate to your body. It's not about being strict or perfect. It's about tuning in — and knowing which levers to pull when your gut needs attention, energy, or restoration.

This chapter is about helping you stay in rhythm — without stress, rigidity, or burnout. Because **the long game is what actually transforms your health**.

### What “Maintenance” Really Means

Most people think of maintenance as "doing less." But when it comes to gut health, maintenance means **strategic consistency** — doing fewer things, but doing them well, and knowing when to return to basics.

Here's what real gut maintenance looks like:

- Sleeping well, most nights
- Eating within a consistent rhythm
- Moving often, not perfectly
- Using breath and cold when stress creeps in
- Listening to symptoms early, not after they explode
- Tracking gently, not obsessively

The key word? **Sustainability**. If it's not sustainable, it's not worth keeping.

## Your Gut Health Foundation (Keep These Non-Negotiables)

These are your **anchor habits**. Even if life gets chaotic, return to these:

1. **Hydration + digestion prep every morning**  
Warm water with lemon, slow breath, calm focus.
2. **Meal timing and intentional eating**  
A consistent window. Real food. No rush.
3. **Daily movement**  
Not just workouts — walking, stretching, fidgeting. Motion is medicine.
4. **Evening wind-down**  
Light off, screens off, nervous system down-regulated.
5. **Supplement strategy**  
Adjust based on season, stress, travel, or symptoms. Cycle when needed, don't overdo.

## When Life Gets Busy

Life won't always be controlled. Travel, stress, late nights, or indulgent meals will happen. And that's fine — because gut health isn't about control. It's about recovery.

Here's how to **get back on track fast**:

### 1. 24-Hour Gut Reset

- Fast for 12–16 hours (skip breakfast if needed)
- Hydrate deeply with electrolytes, tea, or lemon water
- Move: walking + light mobility
- Light, fiber-rich meals
- Glutamine or collagen in the evening
- Early night, deep sleep

### 2. Rebuild Your Gut Rhythm

Return to the 21-day protocol for 3–5 days. You don't need a full reset, just a rhythm reset.

### 3. Reflect, Don't Panic

Symptoms are messages. Not failure. Just information that tells you something's off.

## When to Retest, Recalibrate, or Reinforce

You don't need constant change. But once or twice a year, do a deeper check-in:

- Are my symptoms coming back?
- Is my energy and mood stable?
- Have I stayed consistent with my core habits?
- Do I need to reintroduce or pause a supplement?
- Is stress higher than usual?

Every season brings new stressors and demands. Tweak your approach like you'd tweak your wardrobe — based on the weather, the environment, and your goals.

## Build a Gut-Conscious Identity

At the deepest level, this isn't about tactics — it's about identity. You're becoming someone who:

- Feels when their body's off
- Knows how to respond without panic
- Doesn't chase quick fixes anymore
- Respects rest as much as effort
- Stays grounded, not rigid

You're building a system that takes care of itself — because *you* are taking care of yourself.

That's the long game. Not being perfect. Just staying aware, adaptive, and aligned.

## Final Words

Your gut is not just an organ. It's an interface between the outer world and your inner world. It reflects how you eat, move, think, breathe, and rest.

Everything you've done in these pages — every breath, every cold shower, every walk, every night of sleep — has moved you closer to a body that feels good living in.

Biohacking isn't about doing more. It's about understanding more — so you can do less, better.

Your supplements work better now. But so do you.

You're no longer trying to fix your gut.

You've upgraded it.

Keep going.