ANTI-AGING FOR BADASS CHICKS

AGE LIKE A SUPERNOVA

...NOT A DYING OF THE LIGHT

YULIAN Y

"It turned back the clock!"
-Your Muscles

AGE LIKE A SUPERNOVA

…not a Dying of the Light

Anti-Aging for Badass Chicks

By

Yulian Y

Contents

From Flickering Flame to Supernova

In my 50s, I became invisible.

It hit me one lovely spring day. How long had I been able to enjoy sleeveless weather without obnoxious commentary? Get a coffee and caffeinate in peace? Slip in and out of places undetected? When had the peanut gallery finally STFU? It definitely hadn't been before I got sober, but after.

So, 50.

It turns out that pretty much the minute you turn 50, you magically disappear. It's happened to enough of us to warrant a condition: *Invisible Woman Syndrome*.[1] One affecting even the incredibly glamorous and awesome-personality'ed former supermodel Paulina Porizkova (born in 1965). She reports being gussied up at a social event and getting her flirt on with a guy, only to have him walk away *mid-sentence* to hit on a chick 20 years younger. "Like the boiled frog, you don't know until (you're gone)," she says. "It was around the same time my marriage fell apart: my husband was no longer interested in me and, as I started looking around, I realized I was invisible to the population at large."[2]

I took a long look in the mirror….and felt for the frog. Damn. Maybe being invisible was a good thing.

After my pity party concluded, I dived down a research rabbit hole and eventually emerged with some answers. Or should I say *answer*: muscle.

Without muscle, I would morph into…

- Me…but chubbier, slower, and clumsier.
- Me…but with balance issues.
- Me…but with way less muscle – and weaker muscle at that.
- Me…but at increased risk of type 2 diabetes, cardiovascular disease, cancer, and neuro-degenerative disorders such as Alzheimer's disease and dementia.[3]

But muscle promised me a different future.

- I could continue to walk at my normal pace instead of shuffling about, and still be able to carry my groceries whenever I felt like it.[4]
- I could keep doing everyday things like running errands, heading to the store, or even just going for a walk.
- I would be able to keep my appetite in check and avoid becoming too chonky.[5]
- I would have much better balance, and if I did fall, it would be no biggie. Because if you fall when you're older and break a wrist, arm, ankle or hip, you are much more likely to end up in a nursing home – or dead within months.[6], [7] ,[8]
- I would be cutting my risk of type 2 diabetes significantly, [9] slashing my risk of cancer mortality,[10] and generally improving my chances of having more trips around the sun.[11]

Muscle strength - and the training required to develop it - are inextricably linked to healthy aging and living longer.[12]

Plus, everyone looks 10x hotter with more muscle…even if no one can see it. But invisible or not, I still exist and I still have shit to do.

I have come to enjoy having muscle so much, I think I'm actually a gym bro trapped inside the body of a Karen. But I figure my Karen disguise just adds to my invisibility superpowers. Superpowers that come to those who preserve and grow their muscle.

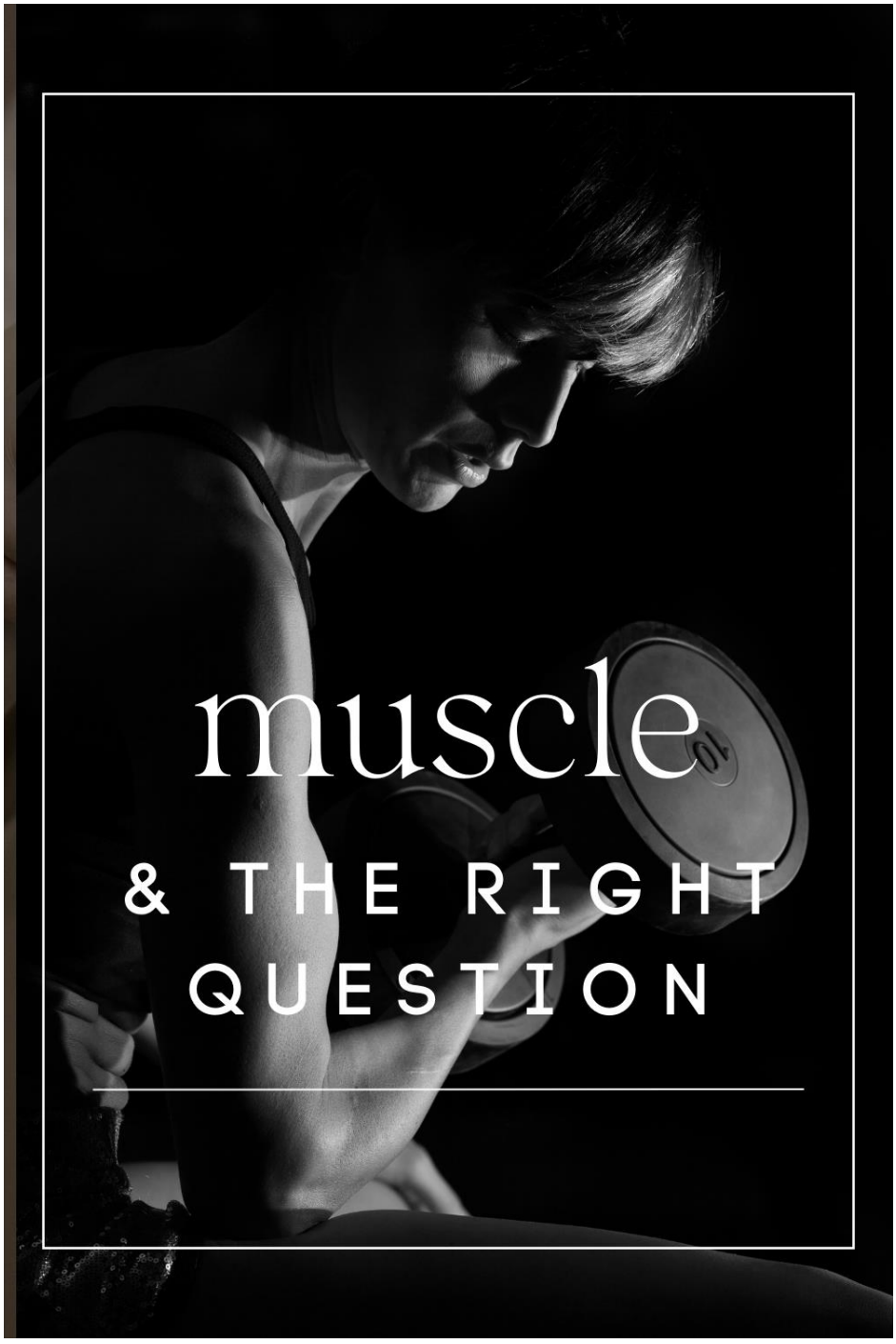
Muscle has helped me turn back the clock. Not in a *magic-wand-plastic-surgery* kind of way, but in a cool new way. That fading flicker? Stomped out by a violently violet haired, Iron Maiden tee wearin', protein obsessed, world-travelin', guzheng-playin', weight liftin' - and very non-invisible - Supernova.

DISCLAIMER

The contents of this book are based upon the research of the author for informational purposes only and are not intended to diagnose, treat, cure, or prevent any condition or disease. You understand that this book is not intended as a substitute for consultation with a licensed practitioner. Please consult with your own physician or healthcare specialist regarding the suggestions and recommendations made in this book. All matters pertaining to your physical health should be supervised by a healthcare professional.

The use of this book implies your acceptance of this disclaimer.

MUSCLE &...



Muscle & the Right Question

Since the mid-1970s, when the obesity epidemic first appeared and began to spread, the global discussion around health has been dominated by fatness.[13] This narrative has been shaped and disseminated by a cast of stock characters such as *the anti-obesity proponent, the obesity alarmist, the obesity crusader,* and, of course, *the obesity epidemic entrepreneur.*[14]

And yet, despite this fat-centric approach, by 2030:

- almost 40% of the world's adult population will be overweight;
- 20% will be obese.[15]

The current paradigm obviously isn't working and needs to change.[16] "Change," says **Dr. Gabrielle Lyon, a muscle-centric** board-certified family physician, "comes from asking the right question…**We're not overfat. We're under-muscled.**"[17]

Having muscle means more than just looking jacked or toned. Muscle is in fact one of the most potent weapons against all the chronic lifestyle diseases, including the #1 killer of us all: heart disease.[18],[19], [20]

Muscle is medicine.

Although muscle seems formidable, it is quite ephemeral. After about age 30, we lose between 3-8% of our muscle mass every decade. This age-related condition is called *sarcopenia*. *Sarcopenia* sounds kind of sciencey and *meh*, but don't be fooled. Its insipid lexical cover conceals a truly scary shitshow of nasty outcomes.[21], [22], [23]

Having sarcopenia means…

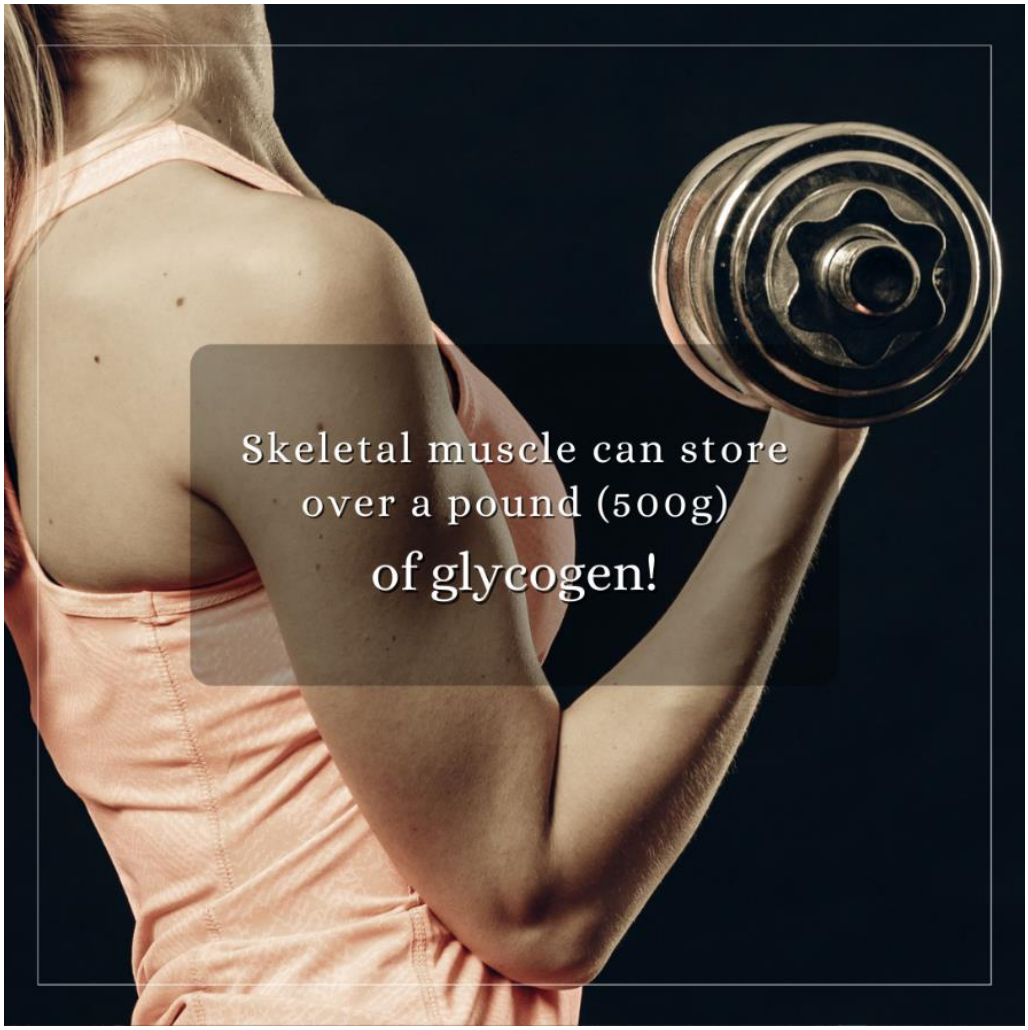
- being less capable of walking places, carrying stuff, going wherever you need to go – and just doing all the normal daily life things;

- having a higher risk of falling, which, when you're older, means hip fractures, head trauma, more medications, less brain function, and less ability to taste, hear, and feel things (sensory deficits);

- facing extended hospital stays and becoming a functionally-dependent senior, disabled, or both…plus chonky.[24] To say nothing of dying early, particularly if you are undergoing vascular surgery, getting a transplant, or facing cancer.[25]

And now that the percentage of people in their sixties or older is on track to double by 2050, many of us around the world could soon end up in the same sarcopenia boat.[26] But female shipmates…*ahoy*! We are particularly at risk. **Women between the ages of 60 and 70 have a significantly higher prevalence of sarcopenia.**[27]

Losing muscle is terrible because muscle is the body's primary storage site for the building blocks of everything that keeps us alive and thriving: amino acids. **When our amino acids run out, so does our time on earth.** "Depletion of muscle mass is incompatible with life," warns **protein expert Robert Wolfe, PhD**.[28],[29]



[30]

Muscle not only guards against an early death, but a wide range of other common conditions including dementia, obesity and diabetes. Insulin resistance and glucose disposal, too. To stay healthy, your blood glucose levels have to be kept at around **4g**.[31] Higher sustained levels – called *hyperglycemia* – can lead to:

- damage to delicate eye tissue, nerves, and kidneys;
- diabetes;
- cardiovascular disease.[32]

When insulin clears glucose from the blood, it is supposed to be repackaged and stored as glycogen in skeletal muscle.[33], [34] But if your skeletal muscle storage is insufficient and insulin comes knocking, wanting to dispose of glucose, its requests will be denied. This situation is called *insulin resistance*.

Insulin resistance means more fuel in the blood than places available to store it. So when the glycogen-making machinery in muscle doesn't function properly, and only stores about half the amount of glycogen it should, this insulin resistance is a huge warning sign: **10-20 years later**, full-blown type 2 diabetes often results.[35],[36]

To solve the problem at its root, you have to build more glucose storage space.

How?

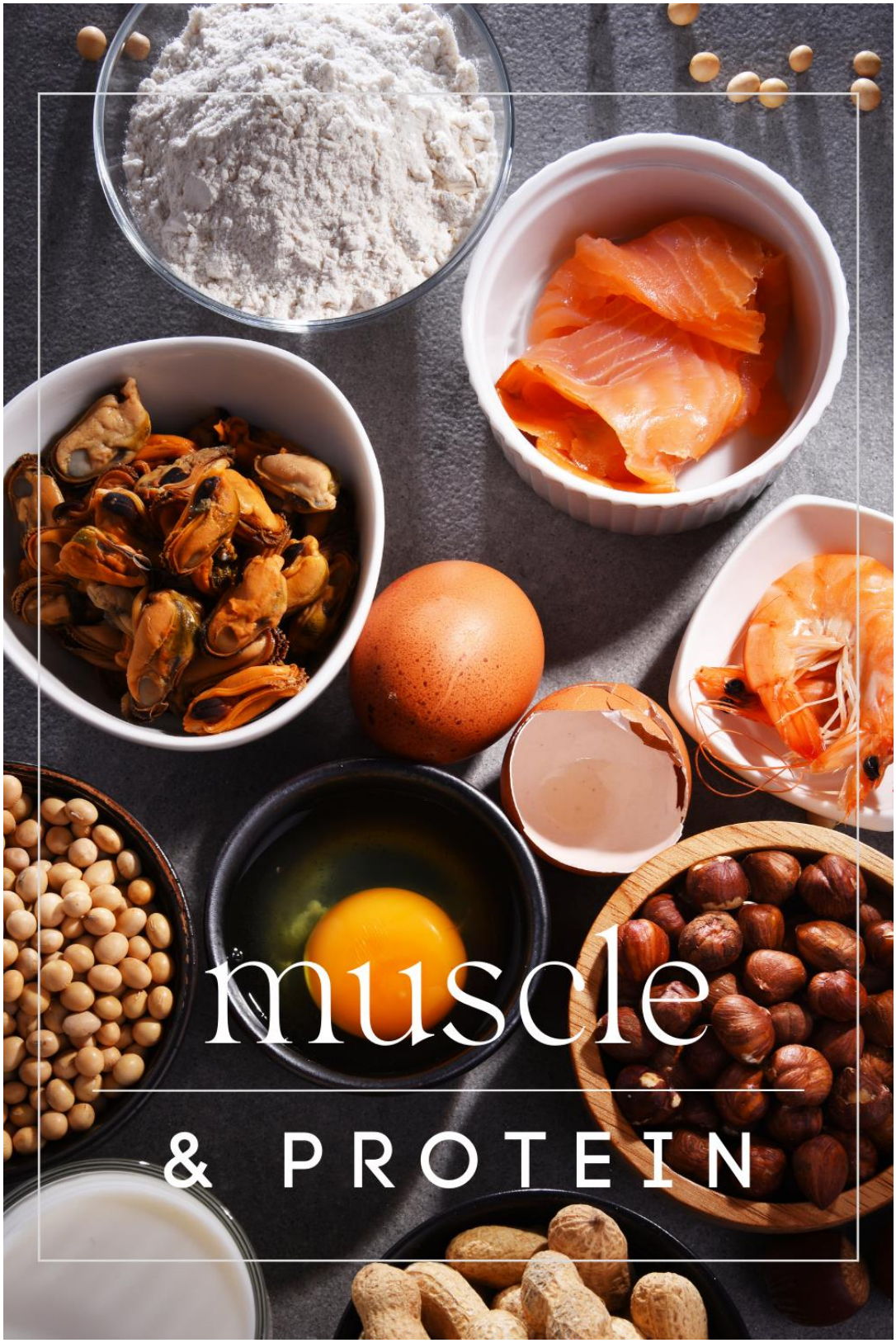
By building more skeletal muscle. [37]

[38], [39]

tl;dr

Skeletal muscle fights insulin resistance, diabetes, obesity, sarcopenia, and most everything dire associated with aging.[40], [41] **The more skeletal muscle you have, the more likely you are to survive.**[42]

HOW TO APPLY THIS: To find out how much muscle you have, ask your healthcare provider about the ***Creatine Dilution test*** **(D_3Cr)**. Instead of just measuring lean body mass - which also includes organs and soft-tissues - this test assesses actual muscle mass quite accurately.[43], [44]


muscle
& PROTEIN

Muscle & Protein

Muscle is made from protein. Protein contains amino acids, which are the molecular building blocks of the body's structural support, biochemical catalysts, hormones, and enzymes.[45]

Protein metabolism and turnover affects your entire body. Human functioning is so complex, it requires anywhere from **10,000 to possibly several billion** different species of protein.[46]

Every…

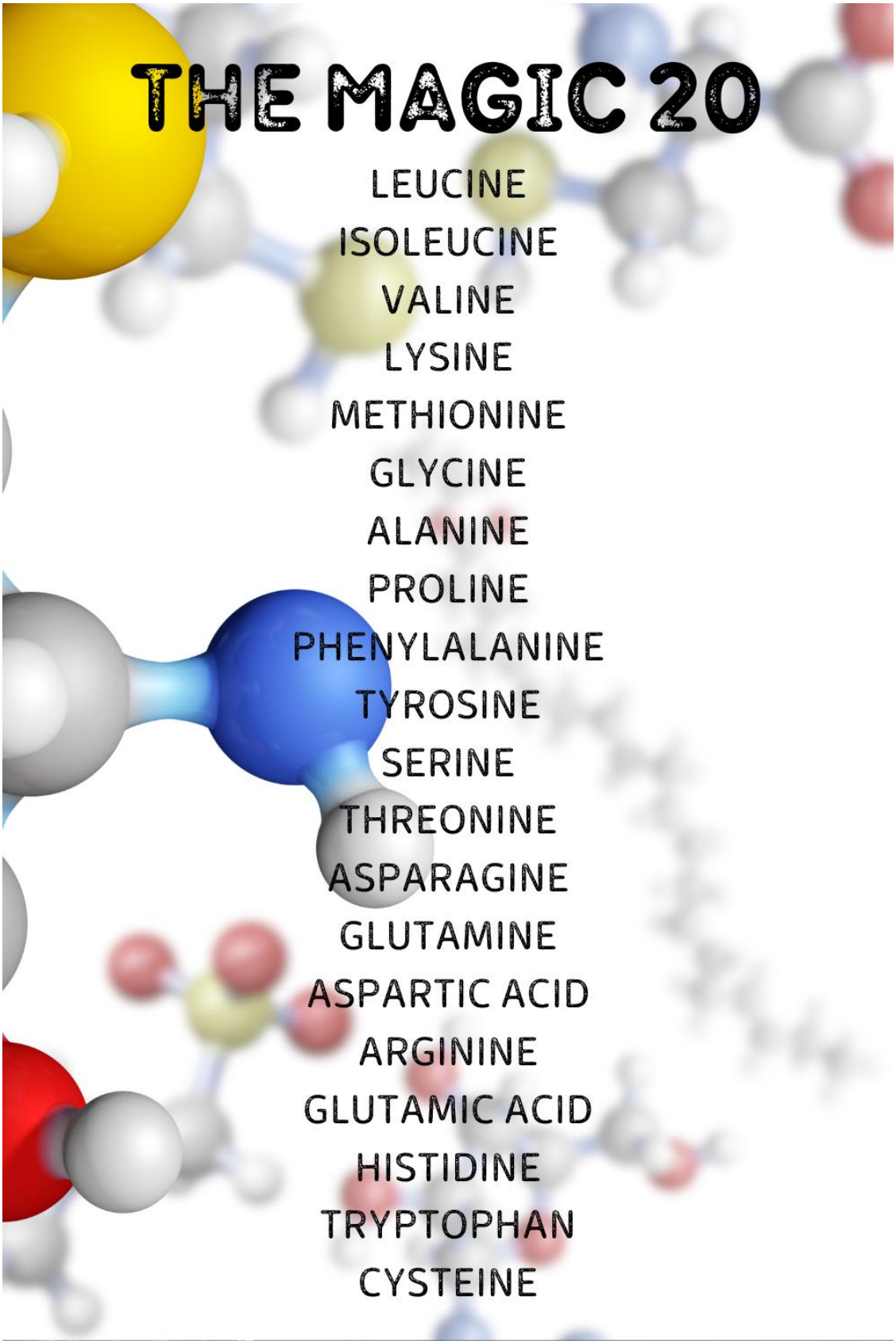
- **hour:** your liver enzymes turn over;
- **month:** your muscle protein turns over;
- **three months:** all your proteins get replaced;
- **six months:** your collagen gets renewed.[47]

Basically, every second, something in your body is being replaced, overhauled, or upgraded – and all the while, various faulty bits are removed and recycled, or discarded.[48] So every day, your body needs to build and repair around **300g of protein**.[49], [50]

300g of protein is what you would find in 3 pounds (1.5kg) worth of steak. Ain't no one eating that much steak daily.

So where does all this new protein come from? From the protein you eat and from your body's recycling of existing amino acids.

Amino acids number around 500 or so, but **Francis Crick** – co-discoverer of DNA structure - singled out a select handful.[51] These same 20 amino acids occur in all proteins - animal, plant and microorganism – and Crick anointed them **the Magic 20**.[52]


THE MAGIC 20
LEUCINE
ISOLEUCINE
VALINE
LYSINE
METHIONINE
GLYCINE
ALANINE
PROLINE
PHENYLALANINE
TYROSINE
SERINE
THREONINE
ASPARAGINE
GLUTAMINE
ASPARTIC ACID
ARGININE
GLUTAMIC ACID
HISTIDINE
TRYPTOPHAN
CYSTEINE

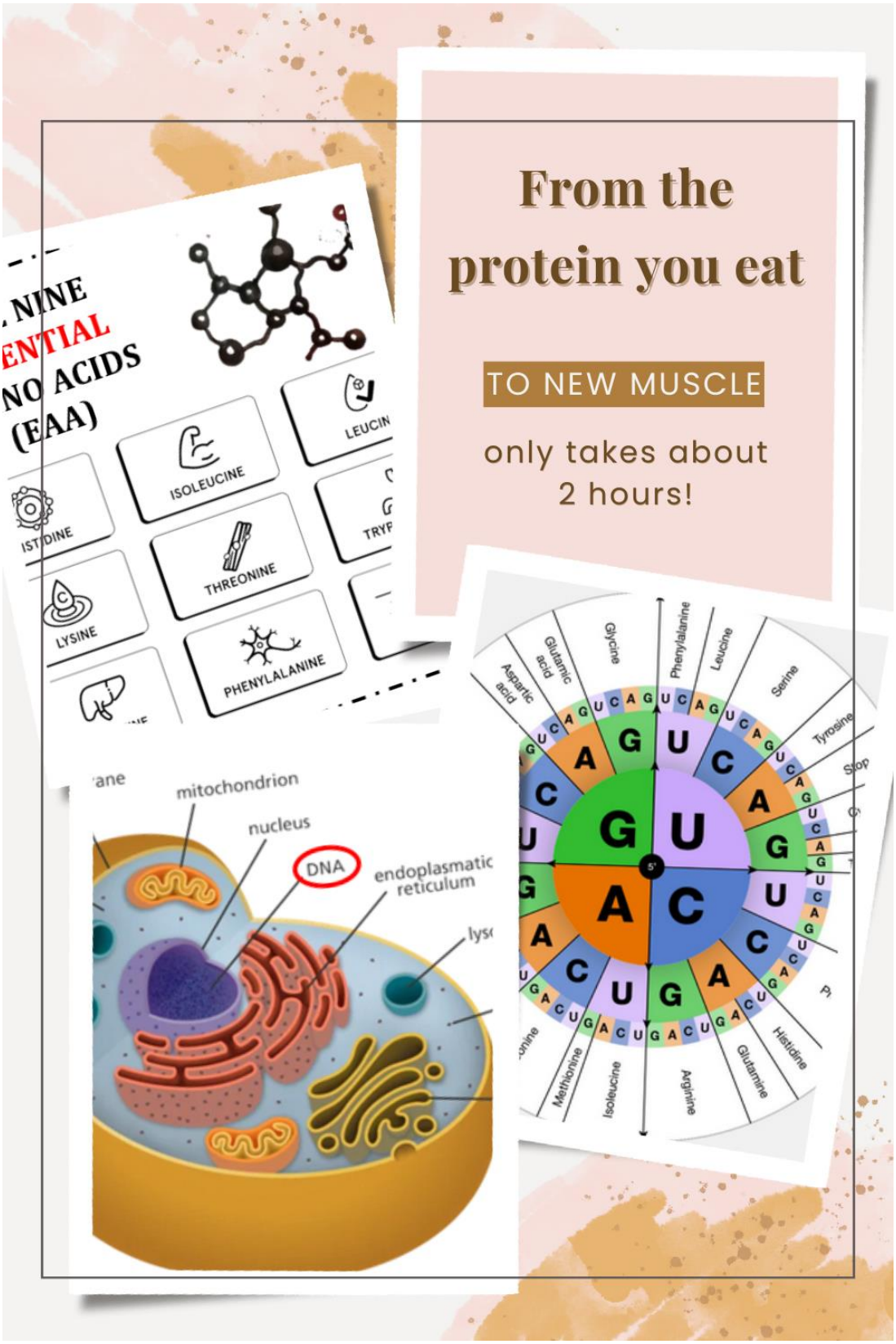
The *Magic Twenty* have two main roles:

- combine with other amino acids to build new proteins;
- facilitate the process of protein synthesis and metabolism.

For example, the amino acid…

- leucine: signals muscle-protein synthesis to rev up.
- methionine: acts as the initial building block of new proteins.
- arginine: facilitates nitric oxide and vaso-restriction.
- lysine & carnitine: help metabolize fatty acids.
- cysteine: facilitates creatinine and glutathione.

Around half of the Magic Twenty *cannot* be made by our bodies, so they have been designated *essential*. The *Essential Amino Acids* (EAA) can only be gotten from one place: the protein we eat. **"Protein is like a vitamin pill," adds protein expert Dr. Donald Layman.** "It's not the pill that matters, but the vitamins it contains. Protein is a 'vitamin pill' for the essential amino acids it delivers."[53]


From the protein you eat
TO NEW MUSCLE
only takes about 2 hours!
NINE
ENTIAL
NO ACIDS
(EAA)
ISOLEUCINE
THREONINE
LYSINE
PHENYLALANINE
mitochondrion
nucleus
DNA
endoplasmatic reticulum
Glycine
Phenylalanine
Leucine
Serine
Tyrosine
Stop
Histidine
Glutamine
Arginine
Isoleucine
Methionine
Aspartic acid
Glutamic acid

54

Each amino acid is represented by three DNA "letters" (the nucleotide bases) called ***codons***. Some amino acids, like tryptophan and methionine, have only one codon each. Others, like leucine, have multiple codons.[55]

[56]

Amino acids get reconnected in a variety of configurations dictated by the "blueprints" stored in our genetic code, our DNA. DNA lives inside the nucleus of our cells and contains the "recipes" for making different proteins.

DNA:	The genetic code in each cell is like an architect's drawing of the design of a building.
mRNA:	To bring a design into reality, messenger RNA (mRNA) copies the DNA instructions and converts them into construction blueprints. mRNA also functions as the construction site - it is the physical template onto which the amino acids are assembled. They are placed in a specific order and in specific amounts. **The amount of mRNA available influences how much protein gets created.**
tRNA:	The construction workers on this site are tRNA molecules. They transport the correct amino acids to the right spots along the mRNA.
EAAs:	All the building materials (essential amino acids) must be available for complete muscle protein synthesis (MPS). **Being short even a single amino acid can stop MPS prematurely.**

57

The cellular "machine" that constructs protein chugs along the mRNA track, overseeing how each individual amino acid is placed. It is called a **ribosome**.

- The ribosome scans a ribbon of DNA letters on the mRNA until it finds "START HERE" - usually the codon for methionine (AUG).
- A methionine amino acid is then shuttled in by tRNA.
- If the next amino along the ribbon is, say, proline, tRNA will shuttle in some proline (CCA) and place it on the mRNA in the neighboring slot. Serine (UCA) might follow, and finally valine (GUU). These aminos link together into a growing chain called ***elongation***.
- Eventually, the ribosome hits "STOP!" (the codon UGA).
- The protein is complete, so the ribosome disengages from the mRNA.

As most proteins begin with the amino acid methionine, if the supply runs out, protein construction will halt prematurely. “Being short of just one amino acid could stop the translation process short of completion,” cautions protein expert Robert Wolfe, PhD. “This requirement explains why all of the amino acids must be available.”

HOW TO APPLY THIS: When you consume protein, make sure it contains sufficient amounts of all the Magic 20.

MPS & MPB

ARE ALWAYS HAPPENING AT THE SAME TIME

58

Your muscle is like a brick wall that is perpetually being upgraded. New "bricks" (muscle tissue) get added during **muscle-protein synthesis (MPS)**. Sometimes new bricks are added at a fast and furious pace, while other times – like when you're asleep - the rate is low and slow at around 20-30%.

At the same time as new "bricks" are being added, muscle-tissue that is faulty or old gets removed and replaced as part of ongoing ***muscle-protein breakdown*** (**MPB**). MPB is at its highest when you're sleeping and presumably not ingesting protein, but your body still needs a steady supply of amino acids, which it gets from your muscles.[59] When more amino acids are removed from muscle than are added, the rate of MPB exceeds MPS, and you are ***catabolic***. You are particularly catabolic when you first wake up in the morning. After not eating all night, your MPS will be at its lowest point – a basal rate of 20-30%.

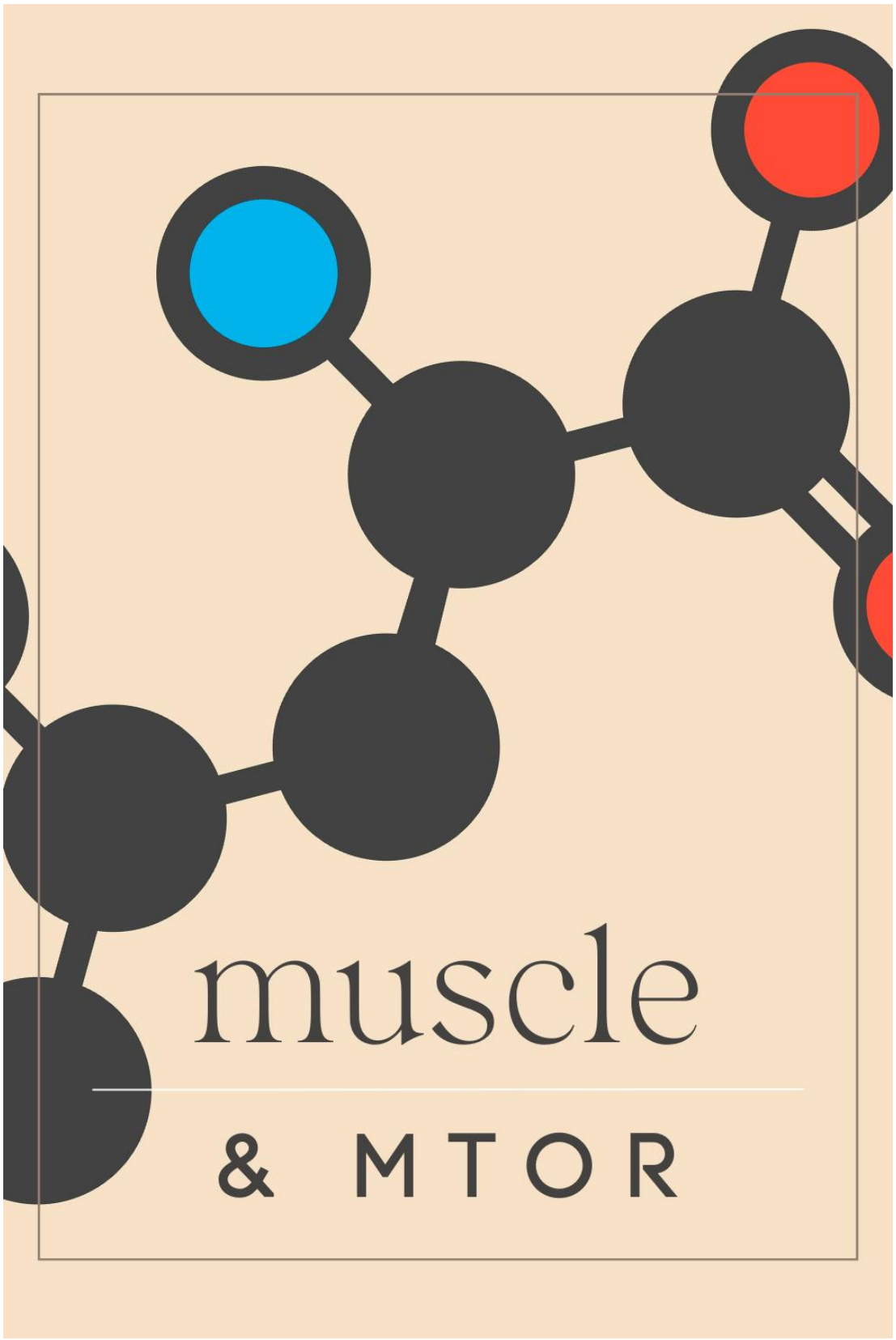
MPS will continue at a much slower rate than MPB until you eat enough protein.[60] Eating the right amount of protein makes the rate of MPS zoom up and hit 100%. When this happens, for the next few hours, MPS will be higher than MPB, and you will be in muscle-building mode aka ***anabolic***.

Neither MPS nor MPB is ever "on" or "off" – rather, both are always ongoing, just at varying rates. I think of them as a pair of competing **health bars in a video game**. MPB will keep chugging along and outpace MPS until you speed up the rate of MPS with a high-protein meal.

HOW TO APPLY THIS:

#1 When you first wake up: Reduce overnight MPB by having a high-protein meal containing at least **50g of protein**. Consuming enough breakfast-protein can **boost the rate of MPS to 100%**, especially in women.[61], [62] For your muscles, the most important meal of the day is breakfast.[63],[64]

#2 Before bed: To delay the onset of overnight MPB, you can have around **40g of protein 30 minutes before going to sleep**.[65], [66] A form of protein called casein, a byproduct of cheese-making, is slow-release and effective at reducing MPB.[67] If you don't like cottage cheese, casein is readily available in powdered form and in a ton of different flavors.


muscle
& MTOR

Muscle & mTOR

The molecular "machinery" that controls MPS is a type of protein which speeds up chemical reactions in the body, called an *enzyme*. The enzyme mTOR (*mechanistic target of rapamycin)*[68] takes its cue to rev up MPS from one of the Magic 20: **leucine**.[69]

Leucine is plentiful in foods such as whey protein isolate, meat, fish, and even corn,[70] and is metabolized differently. Where most amino acids are metabolized in the liver, leucine and its branched-chain buddies, isoleucine and valine, are primarily metabolized and utilized in skeletal muscle.[71], [72]

But synthesizing new muscle protein is metabolically expensive.[73] For it to be worthwhile to rev up the muscle-making machinery, all the amino acids must be present in sufficient quantities. **This threshold amount is gauged by mTOR based on how much leucine is present in a food or protein-shake.**

If there are 3g of leucine, mTOR will trigger MPS in someone who is in their twenties or thirties. But after about age 50, mTOR increases its required leucine minimum – a phenomenon called ***anabolic resistance*** - demanding closer to **5g**.[74]

How do you reach 5g of leucine?

- 2 scoops of whey protein isolate: ~5g leucine
- 170g (6oz) of sirloin steak: 5g
- 170g of chicken breast (skinless): 4.5g
- 170g of grilled tuna: 4g[75]

If you're worried about possibly consuming too much leucine, don't. Even if you had four meals, each of which contained 5g of leucine, you'd still be well below the established upper limits.

Here are some sample upper limits:

- Leucine: 38g/day
- Tryptophan: 8-15g/day
- Lysine: 22-30g/day
- Methionine: 7g/day[76]

mTOR is a Picky Beast

mTOR is not only persnickety about your leucine minimums, but also about *when* you eat protein. After you have 50g of protein, MPS will rev up for 1½ to 2 hours. And then things take kind of a weird turn. Despite the levels of leucine and other amino acids still being high, muscle-protein synthesis starts to taper off. By the 3-hour mark, MPS will have returned to baseline levels. This return-to-baseline - despite all the necessary factors still being active - is called becoming ***refractory***.[77]

Until mTOR un-refractories, which takes 4-6 hours, it will not rev up MPS in response to any additional protein you eat. The protein will certainly go to other uses in the body, but not MPS. Not until 4-6 hours have passed since the most recent bout of muscle making.[78],[79]

That being said…

Recent research has found that **much longer bouts of MPS occur** in response to consuming 100g of protein.[80] 100g of protein…that might as well be a metric fuckton. We're talking trying to down a pound (~450g by weight) of cooked chicken breast or shrimp.[81], [82]

HOW TO APPLY THIS: Leave 4-6 hours between meals that contain 50g of protein. If you have 100g of protein, allow even more time to elapse until your next protein meal.

[83]

To supercharge protein's anabolic'ness, be sure not to give its macronutrient partner in crime, carbohydrate, the short shrift. Carbs are key to optimizing muscle gain.

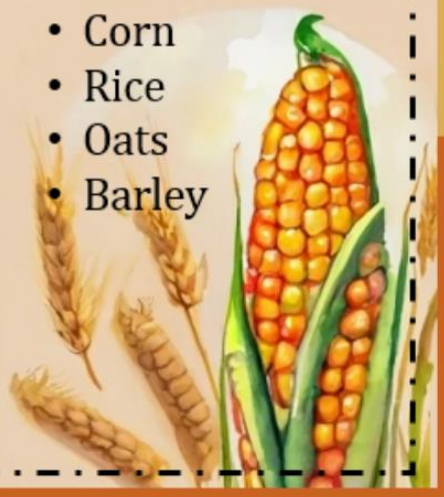
When you lift, carbs provide the energy you need to push hard enough to see good results.[84] And skimping on carbs can actually cost you muscle. People who lift while on a keto diet can lose lean mass![85]

HOW TO APPLY THIS: Consuming less than 50g of carbs per day is counterproductive to the goal of building lots of anti-aging muscle.[86] Instead, let your body save the protein you eat for MPS and other structural functions by consuming **3-8g of carbs** per kg of ideal body weight.[87]

PROTEIN QUALITY

EAA in Plant Proteins

LEGUMES are limiting in Methionine	GRAINS lack Lysine
• Lentils • Peas • Beans Chickpeas • Soybeans • Peanuts	• Wheat • Corn • Rice • Oats • Barley



Understanding protein quality

Protein Quality & Plant-Protein Know How

To ascertain the quality of a protein, the *Digestible Indispensable Amino Acid Score* ***DIAAS*** considers two factors:[88]

#1: Does the protein contain all of the essential amino acids?

Animal-based proteins generally contain all the EAAs.[89] Plant sources are typically lacking in methionine, lysine, cysteine, and tryptophan.

#2: How bioavailable are the EAAs?

Animal sources of EAAs are readily available to our enzymes. Plant proteins, however, were originally created for the needs of the plant, and come attached to leaves, stems, flowers, seeds, and roots. These plant-structures and fibers are indigestible to our enzymes, making plant proteins less bioavailable. As much as **60% to 70% less bioavailable**. (And possibly a bit less satiating.)[90]

Here are some sample DIAAS rankings (1 or higher = best)[91]

- Chicken breast; whole milk; whey protein isolate: > 1.00
- Potato: .91
- Quinoa: .68
- Wheat: .4

Animal protein: Almost all sources (except collagen) contain all the EAAs in the right proportions. The bioavailability is generally well over 80%.

Plant protein: Legumes are limiting in methionine, while grains lack lysine. Typically, plant protein bioavailability is around 60% or lower.[92] Wheat's DIAAS of .4 reflects the fact that less than half of its protein is bioavailable. So even though a nutrition label for wheat bran will say it contains more than 17g of protein per serving, since our digestive enzymes are only able to access 40% - **the bioavailable amount of protein it contains is only 7g**.[93]

GROUP A: limiting in threonine & lysine – pair with GROUP B
GROUP B: limiting in methionine – pair with GROUP A or C
GROUP C: limiting in lysine – pair with GROUP B

HOW TO APPLY THIS:

To shore up the amino acid gaps in plant proteins, combine them.[94] If you're in the mood for…

- **pasta** or rice (GROUP A) – pair with something from GROUP B, such as a creamy vegan sauce with fresh mint & **peas**[95]
- a snack of **nuts** (GROUP C) – create a complete protein by tossing in some crispy air-fryer **chickpeas**[96] (GROUP B)
- succotash made with **sweetcorn**[97] (GROUP A) – replace the lima beans with fresh edamame/**soybeans** (GROUP B)

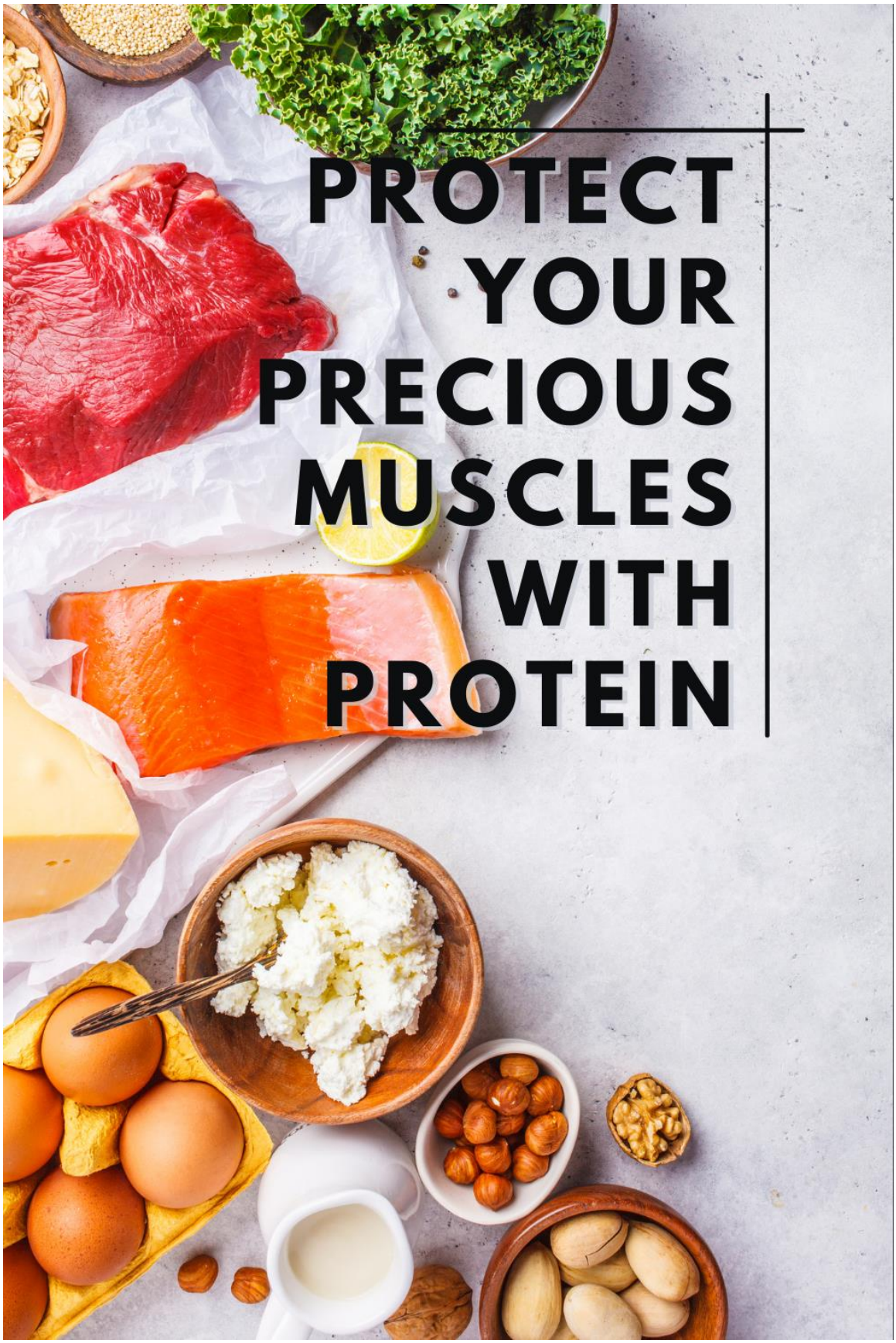
Plant-Protein Isolate Powders

Although plant-protein isolate powders continue to improve, something to know about them is that the resulting blood levels of amino acids fall 30-40% short of what you get with a whey protein isolate.[98], [99] This can be solved by having extra, which means consuming more total calories.[100]

Mix 'n match: Chose one each from groups A, B, and C, and combine. For example: combine a pea protein isolate with a rice-protein isolate and a pumpkin-seed isolate.[101]

Protein potato isolate: Almost completely on-par with whey protein isolate. It's very bioavailable and has a high leucine content.[102] Its only downside is that it's spendy. The main manufacturer is Avebe in the Netherlands, which sells it as *Solanic* on sites specializing in vegan baking ingredients.

Corn protein isolate: Higher than whey in leucine, but lacking in lysine, so it would need to be combined with a pea or soy isolate. Unfortunately, corn protein isolates are even harder to find than potato isolates. Again, vegan baking sites are a good place to start hunting.[103]


PROTECT
YOUR
PRECIOUS
MUSCLES
WITH
PROTEIN

Protein Summary

- **Eat the optimal amount of total protein/day.** This is determined by your ideal weight. If it's 125 pounds (57kg), have *at least* 125g of protein – ie. **1g of protein per pound of ideal body weight (2.2g/kg)**. **Or more.** Protein intake can safely go pretty high.[104] For women who are older, it's definitely better to err on the side of more protein than risk consuming too little.[105], [106], [107]

- **Have 50g of protein/meal.** When you first wake up, have a meal of at least 50g of protein; this amount meets **the minimum leucine requirement** of 5g. For your final meal of the day, again, have at least 50g of protein. And should you feel like having the same again for lunch, go for it.[108]

- **Wait 4-6 hours between protein meals.** To maximize the MPS you get from the protein you eat, **don't snack on it**. Instead, save your protein for meal-sized amounts that are timed around **the refractory period**.

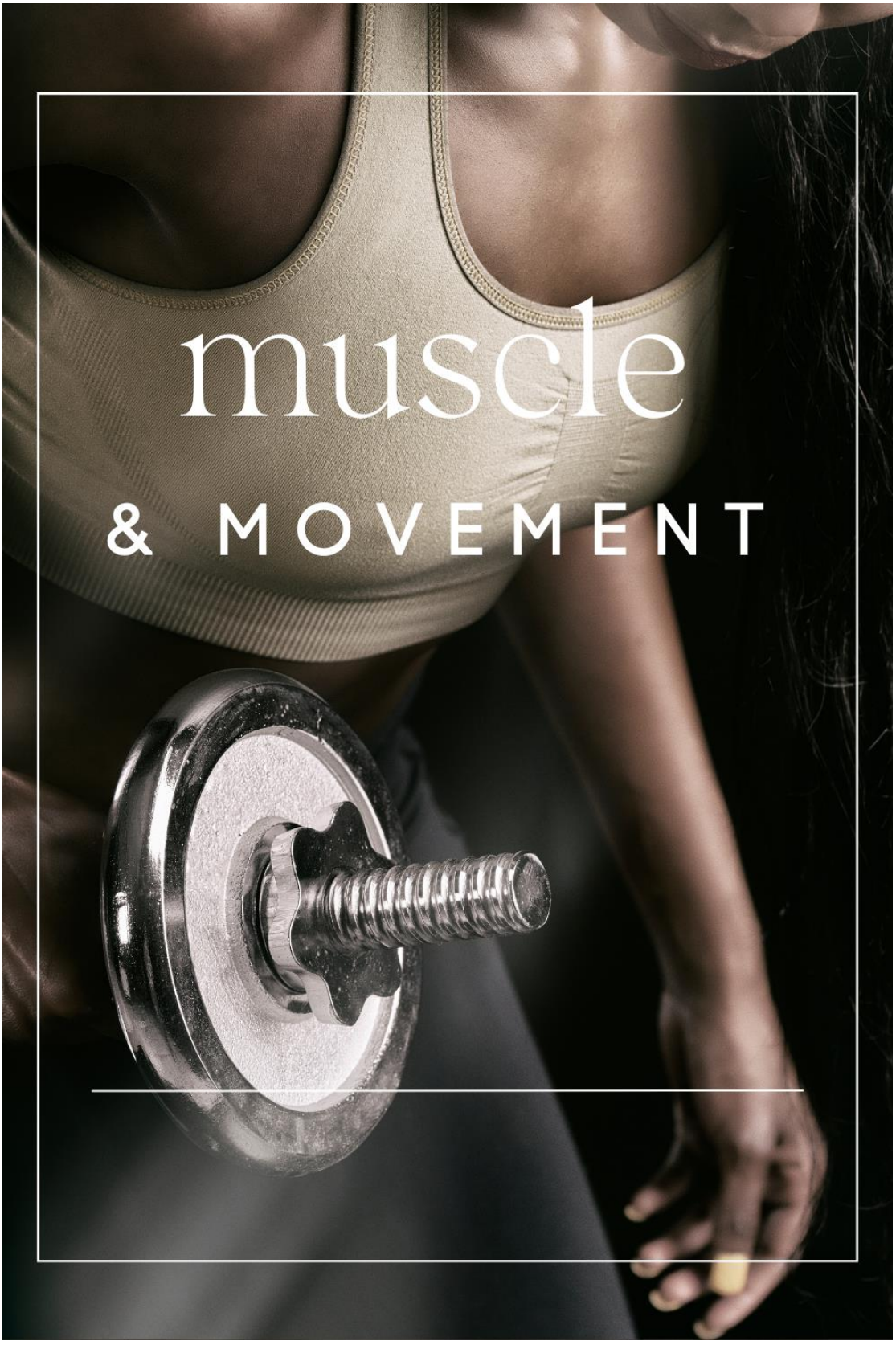
- **Reduce overnight MPB with pre-sleep casein.** About 30 minutes before going to bed, have a snack of 40-48g of casein.[109] Cottage cheese is a possibility, as is something sweeter, like pudding made with almond milk and chocolate-peanut butter casein powder.[110], [111]

- **Choose quality protein quality.** High quality protein has a DIAAS score of around 1. Alternatively, a handy rule of thumb is to choose proteins that contain sufficient amounts of these three EAAs:[112]

  Leucine
  Lysine
  Methionine

- **Combine plant proteins.** Combine your proteins to fill in the amino acid gaps, and eat about 40% more total plant protein.

- **Eat carbs to spare protein.** Have **3-8g of carbs** per kg of ideal body weight.[113]


muscle
& MOVEMENT

Muscle & Movement

As we age, our mTOR gets hard of hearing. Once it revs up, it still makes new muscle just fine, but it takes significantly more leucine to trigger MPS.[114] Where 3g was once sufficient, after 50, we have to "shout" at mTOR by consuming around 5g of leucine.[115], [116]

What causes this age-related ***anabolic resistance*** to occur? According to muscle-metabolism expert **Luc van Loon, PhD**, the most likely cause is becoming inactive.[117]

Inactivity causes rates of MPS to fall, and reduces muscle function.[118] Taking fewer than 1,000 steps per day, for example, wreaks havoc. Within days, muscle and bone get whittled down. At any age. This is what happened to a group of otherwise healthy guys in their 20s who took a week of bedrest - the typical recovery period from illness or injury. In that short amount of time, **they lost 1.5kg (3.3lbs) of muscle mass** and became more insulin resistant.[119], [120], [121]

In a week!

Being sedentary, whatever the reason, is tremendously catabolic warns **protein metabolism expert Stu Phillips, PhD**. "Anything that makes you inactive accelerates that decline."[122],[123] Even though physical activity is safe and healthy for frail older folks, more than 85% of people over 60 endanger their health by ignoring widespread recommendations to exercise and do resistance training at least twice a week. Justifications range from the trivial - going away on holiday or having to wait to use the various weight-training machines – to the legit: injury or illness.[124] Not surprisingly, the most common chronic and disabling conditions that affect 30% of people over 75 are musculoskeletal disorders.[125]

In short, if it interferes with your mobility, it will come between you and your inner Supernova.

Illness and injury are helped and even prevented by regular exercise and weight training.[126] The regular exerciser is rewarded with myriad benefits, including:

- lower risk of type 2 diabetes;[127]
- less fat accumulation around major organs;
- prevention of obesity;
- improved bone strength and protection against falls;
- less age-related cognitive impairment;
- better blood pressure control, which reduces the risk of developing cardiovascular and metabolic disease in a “dose-dependent” manner (more activity = better health).[128]

If you want to become more active, walk more.

- Going from 4,000 steps per day to 8,000 cuts your risk of dying early by 50-70%.[129]
- Accumulating 10,000 steps/day reduces waist circumference, lowers body weight, ameliorates anxiety and depression, and improves vigor.[130]
- Every additional 1,000 steps per day - up to around 10,000 - lowers your risk of all-cause mortality and cardiovascular-disease morbidity.[131], [132]

"High levels of activity, principally walking, can markedly help protect the heart against factors that promote heart disease," says **neuroscientist Dr. Shane O'Mara**. He points out that when we walk, our hearing improves, we become more keen-eyed, and even our reaction times speed up. "It turns out that the brain systems that support learning, memory and cognition are the same ones that are very badly affected by stress and depression…Our sensory systems work at their best when they're moving about the world." [133], [134], [135], [136]

Walking also stimulates the production of the brain-plasticity molecule *brain-derived neurotrophic factor*, or **BDNF**. BDNF stimulates and controls the growth of new neurons from neural stem cells. It also helps regulate appetite and keeps body weight in check. When levels of BDNF are low, it encourages neurodegenerative conditions like Parkinson's disease, multiple sclerosis, and Huntington's disease.[137] "BDNF increases resilience to aging," adds Dr. O'Mara, "and damage caused by trauma or infection."[138]

Muscle turns over at a rate of 1-2% per day, so it needs to be stimulated daily to keep the odds in your favor.[139] Why not use the example set by healthy older adults who tend to average around 9,000 or more steps/day?[140] "You don't stop walking because you're old," says O'Mara, "and you don't get old until you stop walking."

Recommendation: *IN PRAISE OF WALKING - A New Scientific Exploration* (2020) by Shane O'Mara

HOW TO APPLY THIS:

- **Invest in a treadmill desk.** Hopping on and off throughout the day can rack up 3,000 or so steps per hour, even at a leisurely .5 mph (walking speed is typically between 2.5 to 4 mph).[141],[142], [143],[144]

- **Take the stairs.** When I lived in Beijing, I took the subway everywhere and made it a rule that I had to use the stairs. And some of those stations are located pretty far underground. Yes, it was a lot of steps to climb, but I doubt my rear has ever been more perky.

- **Keep track.** People who wear a pedometer or tracker take significantly more steps per day.[145], [146], [147]

- **Set a timer.** Screen time has a way of making us sit way too long. Set an alarm so that once an hour, you get up and walk around.[148]

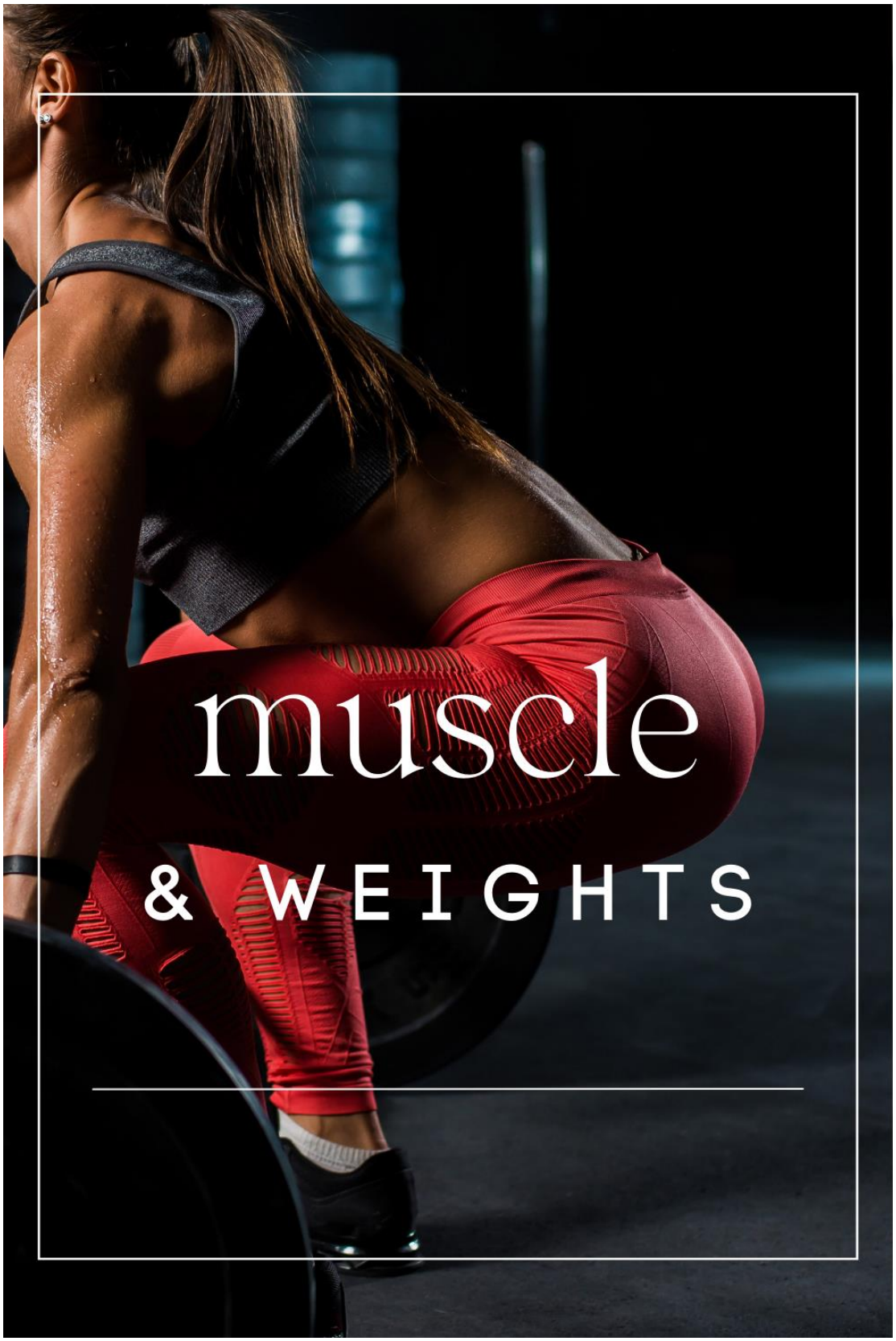
- **Sneak those steps in.** Instead of sitting to caffeinate and catch up, why not take your coffee to a nearby park for a stroll while you chat?[149] Rather than emailing someone down the hall, walk over to them and talk in person. Go nuts and schlep your own grocery bags.

  What other sneaky ways can you come up with to collect more steps throughout the day?

Along with moving more, **women's physiology expert Dr. Stacy Sims** recommends that older women also do sprint training. "High-intensity work creates desirable cardiovascular adaptations with blood pressure control, muscle-uptake of blood glucose, and metabolic control," says Sims. "Sprint training evokes so many metabolic and central-nervous system adaptations, that it is superior to menopause hormone therapy."[150]

HOW TO DO SPRINT TRAINING:

- Jump rope, run in place, or do jumping jacks - or something equally rigorous - as hard as you can for 30 seconds.
- Take 2-3 minutes to recover fully. Repeat 8 times.
- Do it 2-3 times a week.


muscle
& WEIGHTS

Muscle & Weights

Leucine and movement both promote muscle, but they aren't quite enough to prevent age-related decline of muscle. The missing piece is weight training. And it has to involve weights that you find really, really, heavy.[151]

The reason for the "really heavy" part has to do with the way your body recruits muscle fibers.

TYPE I MUSCLE FIBERS: These are the muscle fibers that you use in daily life. They are also called *slow-twitch*. Type I fibers enable you to pick up objects that are light or delicate, as well as do things that last a while, like walking.[152]

TYPE II MUSCLE FIBERS: When you need more power, *Type II* fibers get recruited. But only *after* all the Type I fibers are in use. And if you only ever lift light weights, only Type I fibers get used. When Type II fibers habitually fail to get recruited, they don't get used. **And what you don't use, you lose.**

For women, there is an additional reason to lift heavy – the post-menopause loss of estrogen. Estrogen receptors throughout the body are affected, including the "powerhouses" of cells: the mitochondria.[153] Loss of estrogen is responsible for mitochondria death, reduced MPS, and loss of muscle mass and strength. But when a post-meno woman lifts heavy, her **central nervous system** (CNS) now has to figure out how to mimic the way hormones like estrogen used to help pre-menopause. So nerve signaling gets sped up, muscles get activated in a more coordinated manner, and more acetylcholine is generated to help create a strong muscle contraction.[154], [155], [156]

The nervous system also controls muscle force by varying the number of motor units recruited to make your muscles move, as well as how quickly they perform their duties - called ***rate coding***.[157] Rate coding is heavily influenced by how active you are. A decline in activity results in a corresponding decline in rate coding, which, in older people, is evidenced by a weakening of **grip strength**.[158]

159

Grip strength is like a crystal ball that lets you see the future of your health.[160], [161] It is predictive of:

- Bone mineral density
- Cognitive impairment
- Sleep problems
- Diabetes
- Falls, fractures & problems associated with hospitalization
- Upper limb function & overall strength
- Malnutrition
- Quality of life

Quality of life depends on general health and vitality, avoiding chronic pain, having solid mental health, emotional well-being, and a social life.[162] All these domains – the physical, mental, and emotional – are improved by weight training.[163]

If you're not yet a friend to the iron, here's some basic 411. Reps are classified into ranges:

- Moderate to high: 6-12 reps (can go up to 25'ish or so reps) - this range delivers defined muscle[164], [165]
- low: 1-5reps - this rep range builds serious strength[166]

Each range taxes the body's energy systems and neuromuscular system differently.[167]

The easiest approach to getting started is **3-5**:

3-5 days a week

3-5 different exercises

3-5 sets of each exercise

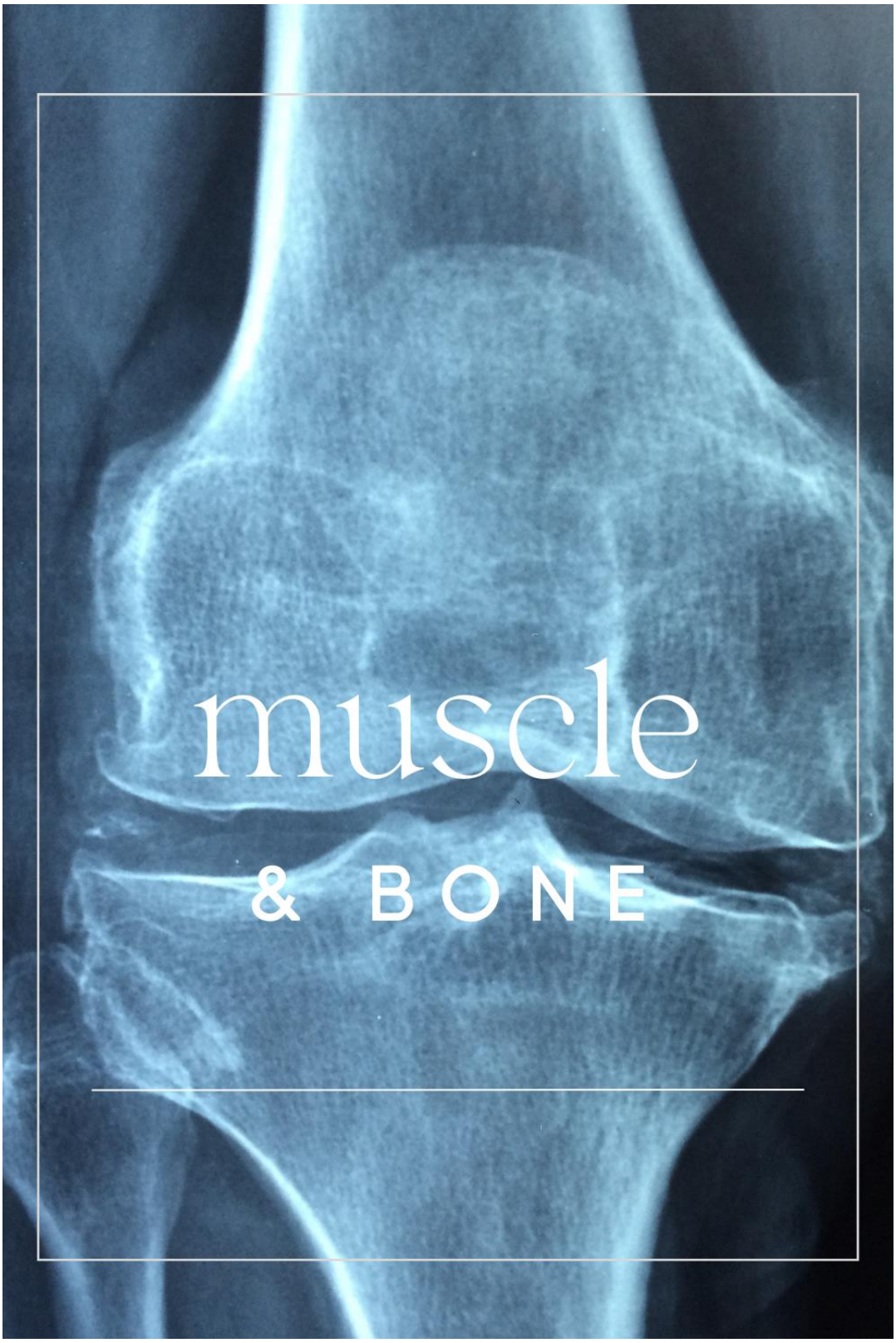
3-5 reps per set

3-5 minutes rest between sets

Feeling fab? Strive for five. But if you're short on energy, enthusiasm, or time, go for the lower end. But don't think that less means the workout is not effective. **Dr. Andy Galpin, Professor of Kinesiology**, advises that it still drives respectable gains in strength.[168], [169]

HOW TO APPLY THIS: If you're new to lifting, hire a personal trainer to teach you how to perform the movements correctly, and ensure you lift heavy enough to get the kind of results that keep you motivated.[170], [171]

Recommendation: *THE RESISTANCE TRAINING REVOLUTION - the No-Cardio Way to Burn Fat and Age-Proof Your Body in Only 60 Minutes a Week* by longtime trainer Sal di Stefano. He provides an excellent road map for incorporating the iron into your life.


muscle
& BONE

Muscle & Bone Health

Hobbling around in the morning because your knees feel 1,000 years old. Swollen, stiff ankles. A posse of unopenable jars that have declared war on your fingers.

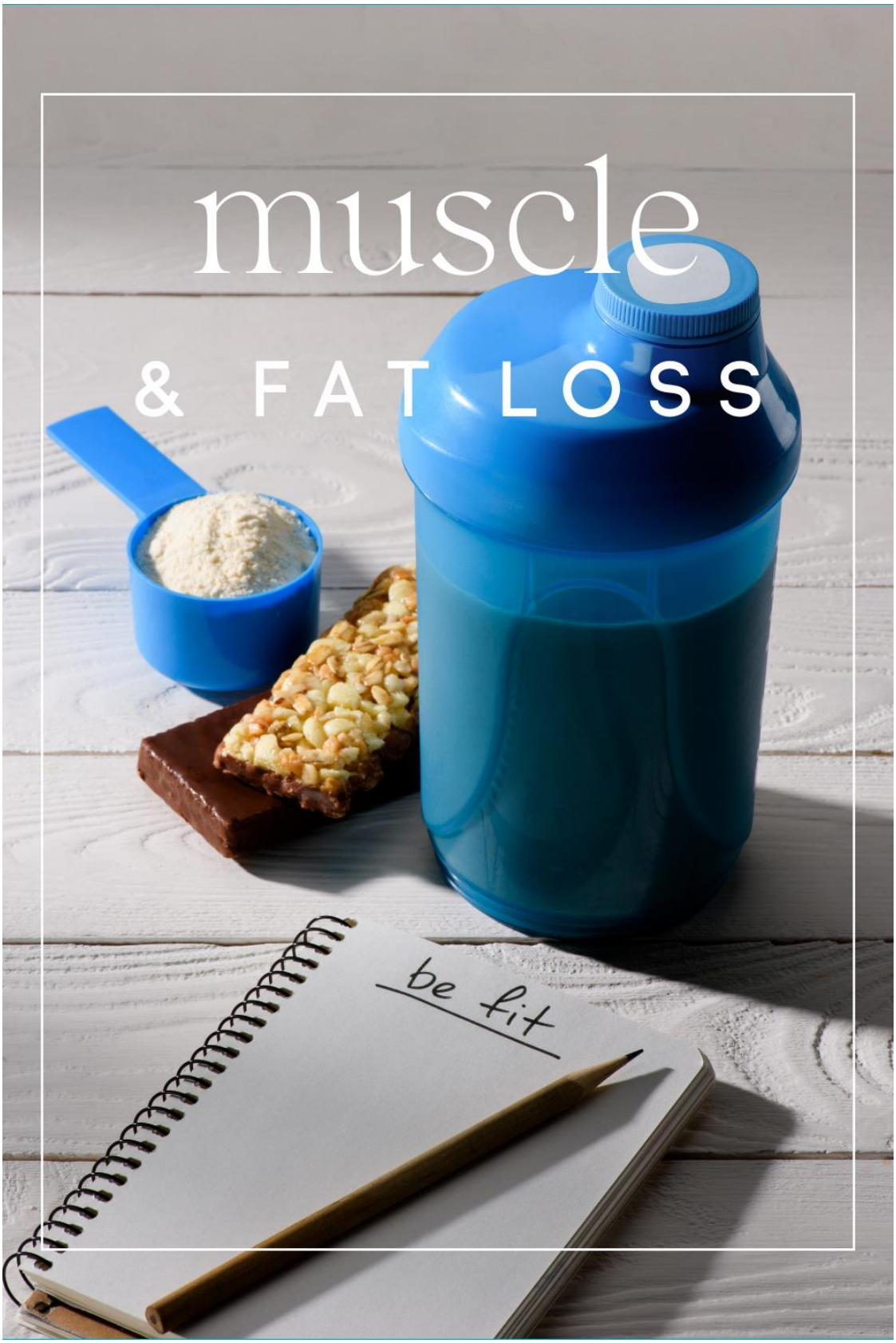
Aging is hell on your joints.

A survey of people in their late 50s and early 60s confirmed that you're not alone when it comes to pain in your neck, back, shoulders, elbows, wrists, hands, hips, knees, ankles, or toes. Interestingly – in a bad way – women reported suffering more pain in all 10 areas. But especially in their necks, knees, and hands.[172]

In all, joints, tendons, ligaments and bones inflict pain via more than 100 different types of arthritis.[173]

While arthritis can feel like a barrier to being physically active, one of the most effective ways to lessen arthritis pain is with regular physical activity.[174], [175] Exercise helps with conditions like rheumatoid arthritis through immune function regulation, which reduces disease activity.[176] Heavy strength training results in *significant* improvements in fatigue and pain, as much as 50% - without exacerbating rheumatoid arthritis activity or joint pain.[177], [178] Daily functioning is directly improved by having muscles that are strong.[179]

My favorite thing, however, was finding out about a taskforce that was convened called the *European League Against Rheumatism* (EULAR).[180] A *league*! I picture them in superhero capes with ***EULAR!!!*** emblazoned across their chests. Armed with workout tips and dumbbells, they zoom about, empowering the masses: *Gather round and listen up, people! Exercise and lifting weights gives you anti-rheumatism superpowers!*[181]


muscle
& FAT LOSS
be fit

Muscle & Fat Loss

Muscles save your metabolic rate

Muscle not only contributes 80% to your metabolic rate, but helps control appetite. So anything that reduces muscle will slow down your metabolism, and also increase your drive to eat.

Case in point: aggressive dieting. Aggressive diets destroy muscle tissue.[182] A good example is the weight loss drug *Ozempic*.[183] *Ozempic butt* has become a thing, but way more worrisome than a pancake posterior is the amount of muscle that people lost during the drug's clinical trials. Of the 14kg (30 pounds) the group lost on average, almost 40% came from lean mass!

To put the 11 pounds of muscle loss in context: the maximum amount of muscle a woman not taking performance-enhancing drugs (steroids) can pack on through nutrition and weightlifting is 16-25 pounds (7-11 kg).[184] So 5kg of muscle loss is worrisome.

As muscle is lost, your body scrambles to replace it using this effective two-part strategy:

#1 Your metabolism slows down, so you burn fewer calories.

#2 Your appetite gets ramped up, making it almost impossible not to keep eating more-more-more. [185]

This one-two combo of burning fewer calories while consuming additional calories is certainly effective. So effective, in fact, that it often results in ending up with even *more* body fat than before you started the damn diet – dubbed ***fat overshooting***.[186], [187]

Fat overshooting sucks, so make it a top priority to preserve your metabolic rate by preserving your muscle tissue.[188] , [189]

Your body caps the number of calories you can burn (aka you can't out-exercise overeating).

Did you know that your body places an upper limit on the amount of calories you can burn?

This facet of our physiology was uncovered by **evolutionary anthropologist Herman Pontzer, PhD.** His team measured the daily energy expenditure of more than 300 men and women around the world, including hunter-gatherers. The Hadza cover miles every day, as well as scale tall trees to get wild honey, stalk prey, dig tubers from the ground, and engage in a lot of hard physical work. "All hunter-gatherers lead lives that would make Westerners melt," says Pontzer. "They get more physical activity in a day than the typical Westerner gets in a week."

Obviously all this activity burns an absolute TON of calories, right?

That's what Pontzer thought. And then he got back the results from the lab. He was floored. "The Hadza data sat right on top of the measurements from the United States and Europe. Hadza men and women were burning the same amount of energy each day as men and women in the United States, England, the Netherlands, Japan, Russia**. Somehow, the Hadza, who get more physical activity in a day than the typical American gets in a week, were nonetheless burning the same number of calories as everyone else**."[190]

Huh?

What was going on was that the number of calories you burn in a day isn't really driven by daily activity. Regardless of lifestyle – be it sedentary or extremely active – the total number of calories you burn is determined by your body. And your body is a boring homebody that likes for things to stay the same every day.[191] Including the amount of calories you burn.[192] So it **constrains your energy expenditure**, and keeps it within a tight range.

Since the calories you expend won't really change that much,[193] you're left with basically one tool to control your weight: how many calories you eat.

Calories count…even if you don't want to count them.

We all know that regularly consuming a lot of sugar is a questionable life choice. Sugar isn't very satiating and it's way too easy to overconsume. But in and of itself, sugar is no weight-gain villain. An interesting study compared the impact of sugar on weight loss. **One group ate less than 10g of sugar per day (~2 teaspoons) and the other ate more than 100g of sugar per day. Both groups consumed the same total calories, and both groups lost the same amount of body fat.**[194], [195], [196]

A professor of human nutrition took one for the team in order to illustrate the same point by following the *Twinkie Diet*.[197] For 10 weeks, he existed on caffeine, sugary processed cereals, Doritos, chips, cookies, brownies, and snack cakes.

His total daily calories were under 1,600. As a result:

- He lost over 12kg (27lbs).
- His body mass index, BMI, changed from *overweight* to *normal*.
- His cholesterol also improved.

Obviously, the Twinkie dietary pattern is devoid of almost every nutrient that makes for vibrant health. (Just thinking about it makes me crave a salad.) However, the point is clear: you could eat the highest quality diet known to mankind, but if you eat too many calories, you will gain body fat. And you could subsist on junk, but as long as the quantity of calories you consume is less than the quantity you burn, you will lose body fat. The fact that the Twinkie Diet made the media splash it did "hammers home one incredibly unfortunate fact," notes obesity specialist Dr. Yoni Freedhoff, "that the world doesn't understand calories."[198]

No macronutrient or particular food is black-magically fattening. Not sugar. Nor high carb. Twinkies. Subway sandwiches.[199] Pizza.[200] Ice cream.[201] Chipotle.[202] Even MacDonald's.[203]

What is fattening? Consuming more calories than you burn.

Calories, even if you don't count them, still count.[204]

Whole foods make dieting way easier.

An eye-opening study compared a whole-food diet to one comprised of ultra-processed foods.[205] The meals on both diets were designed to be as similar looking and tasting as possible.[206] When eating the unprocessed version of the diet, people spontaneously ate far fewer calories and lost 1kg (2.2 lbs). **But on the ultra-processed diet, people spontaneously consumed an average of 500 more calories per day, and gained a 1kg.**

Interestingly, the ultra-processed foods weren't found to be any more "pleasant" or "familiar." However, ultra-processed calories typically feature combinations of fats and carbohydrates not generally found in whole foods; they are incredibly efficient at activating our brains' reward circuitry.[207] As a result, anything **hyper-palatable** is way easier to consume to excess, which is probably why having more than four servings daily of ultra-processed food increases your risk of all-cause mortality.[208] Unfortunately, ultra-processed items are everywhere - in the US alone, they make up almost 75% of the food supply.[209]

So if you don't yet know how to cook, the time has come.

Higher culinary skills are correlated with consuming more homemade meals, a better quality diet, and more veggies and fruits (hello there, fabulous fiber!).[210] The more of your meals you make yourself using ingredients you would find along the perimeter of a traditional grocery store, the better for your health, your weight, and your muscles.[211]

Protein helps prevent the *Fuckits.*

In general, when people lose weight on a higher protein diet, they lose more fat mass and far less lean mass.[212] Eating high protein and lifting weights, even in a caloric deficit, basically eliminates all losses of lean mass.[213] Which is motivating to stay the course, because diets only work if you stick to them.

So when the *fuckits* hit and you want to eat everything, lean in on protein. Celeb dietitian and **fitness expert Alan Aragon** encourages his clients suffering from diet fatigue to occasionally consume up to 2.5 times their normal intake of protein. "Protein hyperfeeds make protein lovers extremely excited about their diet," he explains, "since endless dessert variations can be derived from protein powder."

And no, the extra protein won't harm your kidneys if they are healthy. Just the opposite, actually. Increasing dietary protein *increases* the glomerular filtration rate (a measure of kidney health).[214] Protein intake can safely go pretty high. Research has found that resistance-trained men and women can have up to 4.4g/kg/day, which is well over 300g of protein.[215]

Foods are most satiating when they tick *all* of these boxes:

☒ **CONTAINS PROTEIN:** Protein is the most satiating of all the macros.[216]

☒ **FAVORS FIBER:** Fiber makes foods even more satiating, while also feeding gut microbes so they can produce short-chain fatty acids (SCFAs) which play a key role in satiety.[217]

☒ **HAS LESS INTENSE FLAVORS:** Whole foods like seafood, fresh meat, fruit, vegetables, potatoes, beans, oatmeal, eggs, and plain yogurt don't ding the reward centers in the brain the way ultra-processed foods do. This leaves you more in control of how much you eat.[218], [219]

☒ **LOOKS PLENTIFUL:** Servings that look sizeable have been found to be more satiating. Try adding water to soups or protein shakes, or putting more veggies on your plate.[220]

Yes, your hormones do in fact suck.

If anyone has a valid case for *I'm fat because my hormones hate me*, it's post-menopausal women.

First, we are affected by a loss of estrogen. Loss of estrogen downregulates genes involved in fat-burning (β-oxidation). At the same time, genes related to fat accumulation upregulate.

But why stop there?

Since we're being hormonally primed to burn less fat for fuel and instead store more of it, that would mean more fat is called for…and that's just what happens. The fat cells (adipocytes) made in bone marrow increase. Since they can't be appropriately used for energy, you feel more sluggish. And now there are more of them AND they get stored more efficiently. Why hello, weight gain.

Fortunately, there is a solution. Wait for it…prevent muscle loss and build more muscle.[221]

tl;dr

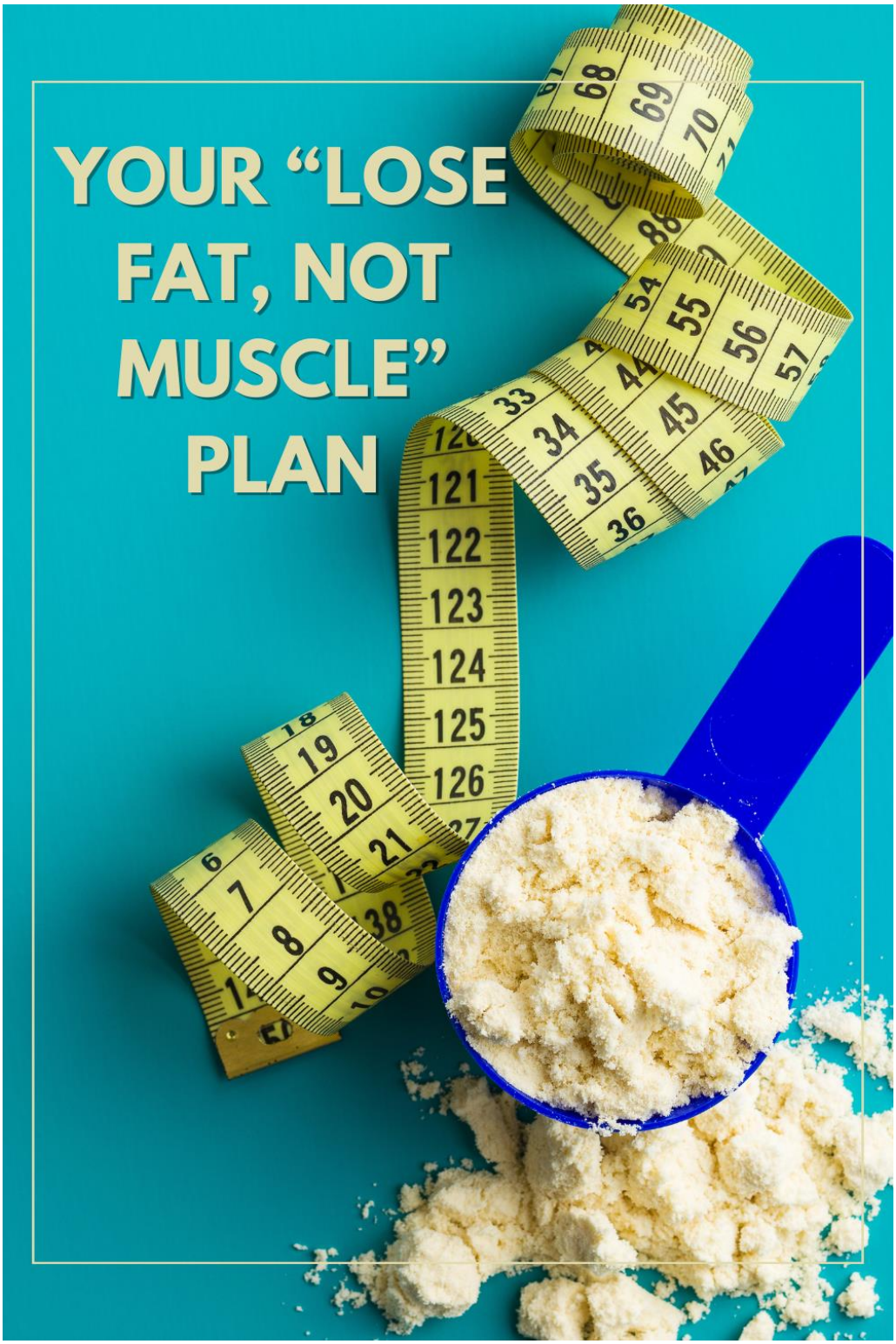
Research confirms that the most effective way to shed body fat is to maintain a caloric deficit, lift weights, and consume high protein.[222]

Recommendations:

FOREVER STRONG: A New Science-Based Strategy for Aging Well (2023) by Dr. Gabrielle Lyon – one of the OGs of *eat protein and lift heavy.*

BURN: New Research Blows the Lid Off How We Really Burn Calories, Lose Weight, and Stay Healthy (2020) by Herman Pontzer, PhD

THE SCIENCE OF SELF-CONTROL: 53 Tips to Stick to Your Diet, Be More Productive and Excel in Life (2021) by Menno Henselmans


YOUR "LOSE FAT, NOT MUSCLE" PLAN

Your "Lose Fat, Not Muscle" Plan

#1 Find out what your maintenance calories are.

For the next two weeks, weigh yourself first thing in the morning. Don't change what you eat and drink, but track everything. If you gain weight, cut back a bit, and if you lose, eat a bit more. The goal after two weeks is to know how much you can eat and neither lose nor gain weight, ie. **your maintenance calories**.[223]

Be mindful of tracking accurately. Almost everyone underreports what they eat - especially if it involves cakes, sweets, and candy. Even when people *know* their body composition will be analyzed using accurate tools, they *still* underreport their calorie intake.[224] In general, people underreport by 20-55% – even dietitians.[225], [226]

Dietitians aside, there are likely two reasons most of us underreport.

1) Being portion unaware. Have you ever measured out a serving of peanut butter, cereal, or ice cream? It's depressingly meagre. However, using a food scale for a week or two will transform you into a portion ninja.

2) Portion growth. In the 1960s, your average dinner plate was around 21cm (8.5-9") in diameter and held about 800 calories. By the 2000s, plates had grown to over 30cm (12") and could hold almost 2,000 calories.[227] But this growth in portions has been happening for a while now, according to one novel study of **depictions of the Last Supper over the last 1,000 years**. Using the diners' head size as their benchmark, the authors found that the size of bread increased over 23%, plates expanded more than 65%, and the main course entrée has grown to become almost 70% larger.[228]

Well-designed food-trackers to try:

MACROFACTOR - from the widely-respected *Stronger by Science* crew

CARBON DIET COACH - intuitive & helpful for hitting your goal weight

CRONOMETER - tracks 84 different micronutrients & other compounds

#2 Take weekly diet breaks.

- **Weekdays:** Eat 25% fewer calories than your maintenance calories. This strategy will enable you to lose body fat at a rate that will help you continue to feel motivated.
- **Weekends:** Eat at maintenance. Taking a slight "break" from dieting will help prevent loss of muscle and possible after-diet fat overshooting. Just remember, though, that eating at maintenance isn't a food free-for-all. It's a strategic tool.[229]

#3 Create a strong anabolic signal.

EAT OPTIMAL PROTEIN:

- Have 1g (or more) of protein per pound of ideal body weight (2.2g/kg). If your ideal weight is 125 pounds (57kg), then have at least 125g of protein daily.
- Make sure to have at least 50g of protein at your first meal, and 50g of protein at your last meal of the day (reduces overnight catabolism).
- Allow 4-6 hours between protein meals (refractory period).
- Eat high-quality protein (leucine, lysine & methionine).

LIFT HEAVY WEIGHTS: 3-5 times/week

MOVE EVERY DAY: Muscle remodels **1-2% per day**. So at the very least, make sure to get your steps in. (Besides, taking a brisk walk is never a bad idea.) The main thing is to ensure that every day, you do your best to make your muscle remodel in your favor. [230] Physical activity also has another big benefit: it sensitizes you to **satiety signals**, which keeps appetite in check.[231], [232], [233], [234]

#4 Prioritize Whole Foods & Beverages

TRUEFOOD DATABASE: It can be challenging to tell how processed something actually is. TrueFood evaluates ingredients, additives, shelf life, and other factors and gives each item a score, making it easy to choose items that are less processed.[235], [236] https://www.truefood.tech/

DON'T DRINK YOUR CALORIES: Daniel Dell'uomo lost 22kg (50lbs) after he stopped drinking *Blue Raspberry Cherry Powerade* during lunch every day.[237] He has since managed to keep the weight off. His top tip is this: aside from milk, no liquid calories. "There's really no reason," he advises, "to ever quench your thirst with added sugar."[238]

I personally love *Diet Coke with Fiber*. Zero calories and filling. And no, I'm not worried that my DC habit is somehow slaughtering my microbiome.[239]

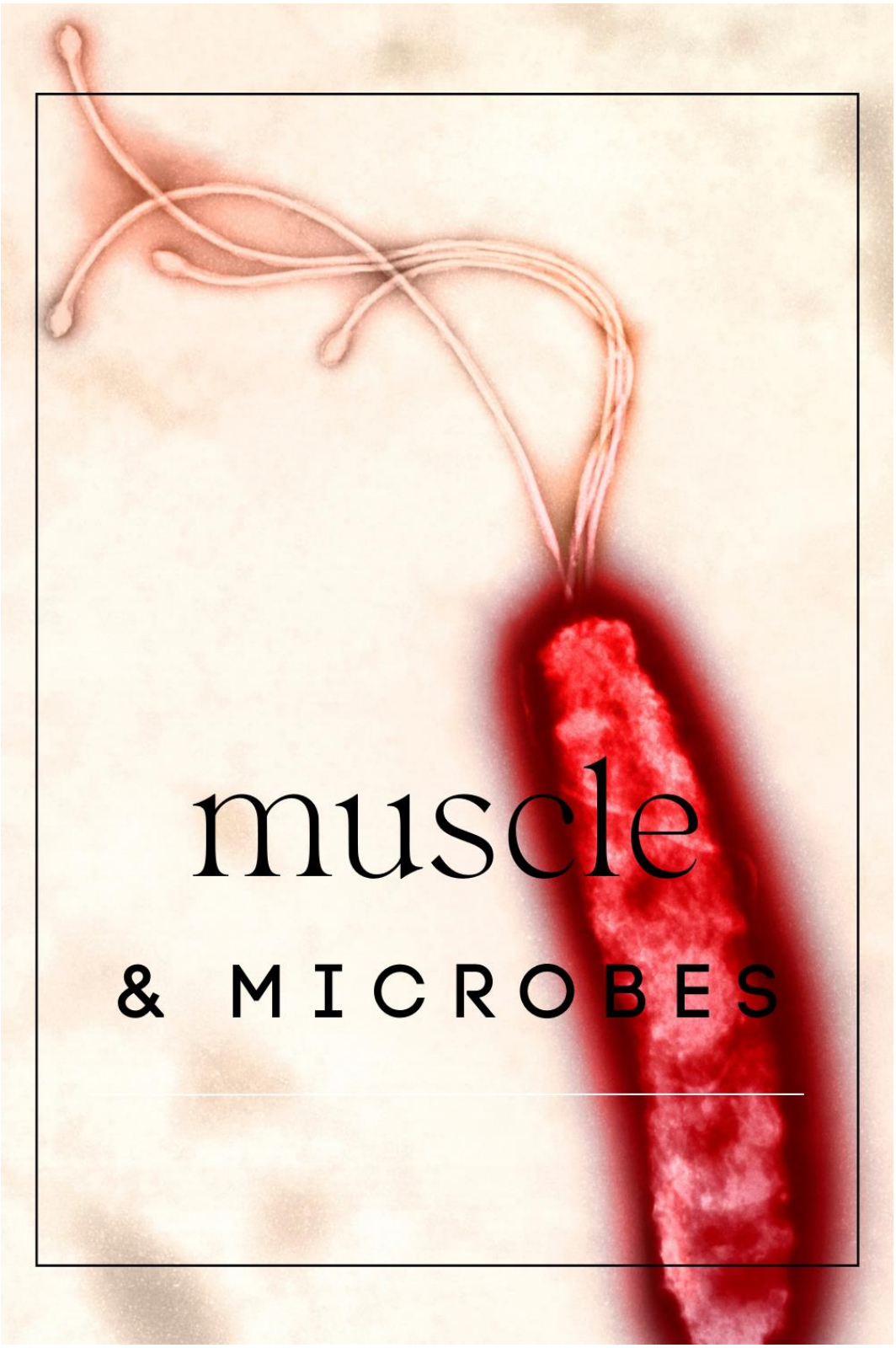
Recommendations:

FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health (2022) by Alan Aragon. AA publishes in peer-reviewed journals regularly, but he also has extensive experience working with actual humans.

THE PE DIET: Leverage your Biology to Achieve Optimal Health (2019) by Ted Naiman, M.D. & William Shewfelt. Makes it a cinch to implement a high-protein way of eating.

*EVERYTHING FAT LOSS: The Definitive No Bullsh*t Guide* (2023) by Ben Carpenter

FAT LOSS FOREVER: How to Lose Fat and KEEP it Off (2019) by Layne Norton, PhD & Peter Baker


muscle
& MICROBES

Muscle & Microbes

Gut microbes are finally getting some respect! It's about time, given how long they have been with us: **millions - if not tens of millions - of years**, according to **microbe expert Dr. Martin Blaser**.[240] Our longtime co-inhabitants[241] do a mindboggling amount of heavy health lifting.

They…

- convert otherwise indigestible foods into molecules that influence almost everything in our bodies;
- help harvest energy from the food we eat;
- manufacture neurotransmitters like serotonin;
- synthesize thiamin, folate, biotin, riboflavin, and vitamin K;
- activate treatments like the chemotherapy drug cyclophosphamide;
- protect us against pathogens.[242],[243], [244], [245], [246]

Our microbes produce short-chain fatty acids (SCFAs). The SCFAs butyrate, acetate and propionate reduce the risk of various diseases, and also **help muscles create power**. This has obvious implications for anabolic resistance.[247] Research has found that mice with gut microbiomes have stronger skeletal muscles than germ-free mice. When germ-free mice receive gut microbes from standard lab mice, their muscles start to grow and function better.[248]

In humans, structural and functional alterations in the intestinal microbiota are thought to contribute to the loss of skeletal muscle mass and function in sarcopenia.[249] **Sarcopenia is connected to gut microbiome composition.**[250]

In order to improve the composition of your gut microbiome, it's important to consume more:

- **fermented foods** – to help restore your microbe populations;[251]
- **dietary fiber** – to feed your microbes.[252]

However, the order in which you add these to your diet makes a difference. Stanford researchers discovered this when they compared the impact on the gut microbiome of consuming more fermented foods vs. more dietary fiber – called the *Fermented and Fiber-rich Food* or ***FeFiFo** Study*.[253], [254]

The study's subjects were divided into two groups:

#1: High fiber group:

This group ate more fruit, vegetables, legumes, whole grains, nuts, and seeds. **Their fiber intake increased from 21g per day to 45g.** Some of the group members reacted with a little inflammation, while others had a lot. Why? Microbial diversity. Many of us no longer have enough variety of microbes to properly utilize dietary fiber. So the trick is to first "pre-load" the gut with fiber-consuming microbes, like the fermented foods group did.

#2 Fermented-foods group:

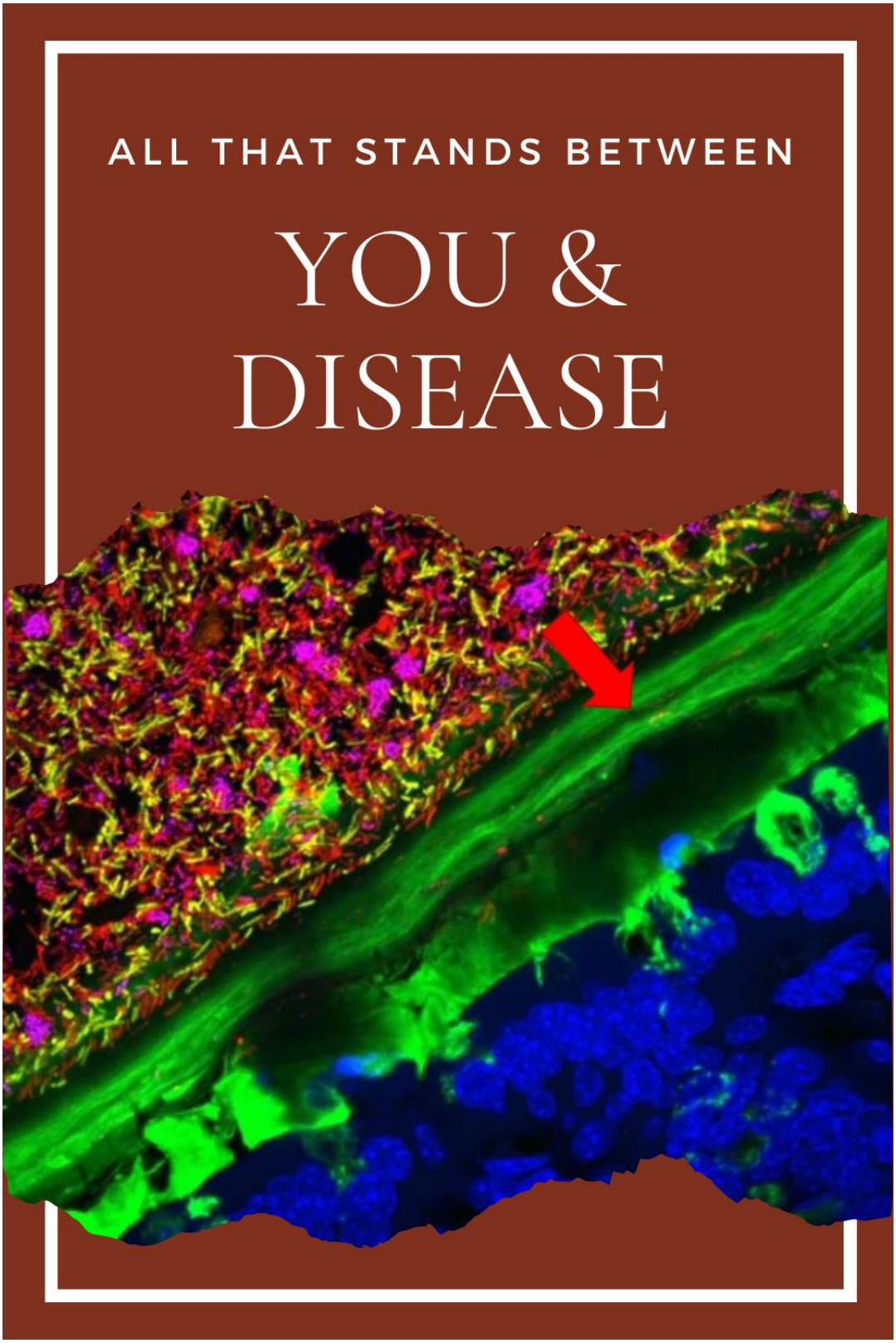
The members of this group started the study consuming less than half a serving per day of fermented foods. They ramped up their intake *gradually* (important tip!) and then spent ten weeks consuming **six servings or more per day of fermented foods** that included:

- cottage cheese;
- kombucha, yogurt, kefir, buttermilk, and/or kvass;
- kimchi, sauerkraut, fermented veggies, and vegetable brine drink.

The number of servings of fermented foods consumed was correlated with an increase in microbial diversity. And increased microbial diversity was, in turn, associated with a reduction in key markers of inflammation.

Interestingly, the increase in microbial diversity didn't come from the foods eaten. Rather, microbes already present in the subjects' guts were coaxed out of hibernation by being fed fermented foods. Continuing to receive six or more servings daily of fermented foods helped their numbers rise to detectable levels.[255]

Fermented foods have been part of our diet for a long, long time – possibly since the dawn of human evolution.[256] This of course makes sense given that our microbes have apparently been with us the same amount of time.



257

The image above was taken inside a gut. The bright green line is a "fence" made of mucus. It protects us, the blue portion, from the explosion of colorful sprinkles on the other side – gut microbes.

Traditionally, our gut microbes were fed whole foods rich in fiber. The Hadza regularly consume leafy greens, the fruit of the baobab tree, vines, edible flowers, squashes, melons, gourds, and tubers. This produce bounty adds up to **100-150g of fiber daily** – the equivalent amount of fiber in 50 bowls of Cheerios. Not surprisingly, Hadza microbiomes are diverse and health-promoting, similar to other groups living a traditional lifestyle in places like Papua New Guinea, South America, and Africa. "They all have common gut microbes," explains **microbiologist Justin Sonnenburg of Stanford University**, "ones that we all lack in the industrialized world."[258, 259, 260,261]

In the industrialized world, we skimp on fiber intake, averaging **17-24g per day**.[262] Not only low in total quantity, but low in variety, too.[263] And in this low-fiber environment, the microbes that thrive like to consume the mucus barrier. As they continue to slowly destroy it, it becomes thinner and thinner. Bacteria, viruses, protozoa (including giardia), and fungi then access the bloodstream. A **permeable (leaky) gut** invites in inflammation, cardiovascular disease, chronic respiratory disease, diabetes, and cancer.[264, 265]

By destroying the mucus barrier which protects us, our industrialized gut microbes are destroying our health. [266,267, 268]

But ultra-processed food isn't the only culprit. Other responsible parties include:

- being born via C-section;
- growing up in cities;
- overuse of antibiotics;
- and living in highly-sanitized environments – called the ***hygiene hypothesis***.[269] Being raised on a farm, for example - and having other such environmental exposures early in life - has been shown to create microbial diversity in the gut, helping prevent allergies.[270, 271]

Unfortunately, the changes in our industrialized gut microbiomes are pretty difficult to reverse.[272]

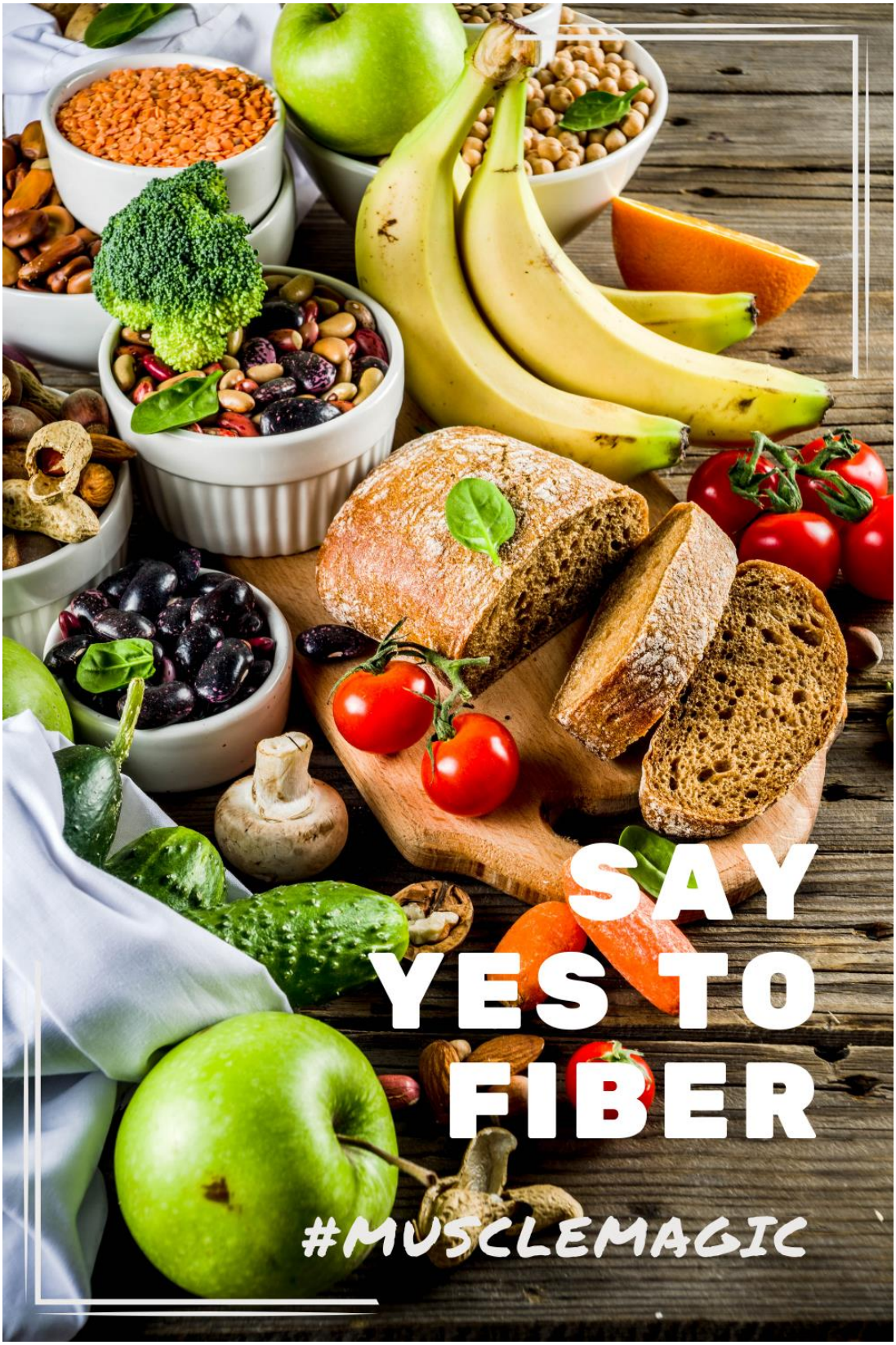
But not impossible.

After all, the Hadza have certain bacterial species that disappear to undetectable levels – and then return again. During the dry season, the Hadza eat far fewer plants and more meat, and previously prevalent microbes disappear. But when the wet season returns and the Hadza dietary patterns shift, the microbes return. “It suggests the shifts in the microbiome seen in industrialized nations might not be permanent, and that they might be reversible by changes in people's diets” notes **Lawrence David of the Department of Molecular Genetics & Microbiology at Duke University**. "The finding supports the idea that the microbiome is plastic, depending on diet."[273], [274]

Recommendations:

THE GOOD GUT: Taking Control of Your Weight, Your Mood, and Your Long-term Health (2015) by Justin Sonnenburg, PhD & Erica Sonnenburg, PhD

MISSING MICROBES: How the Overuse of Antibiotics Is Fueling Our Modern Plagues (2014) by Martin Blaser, MD


SAY
YES TO
FIBER
#MUSCLEMAGIC

Fiber 101

Dietary fiber comes in three types – all of which are important:

#1 INSOLUBLE FIBER

What grandma called "roughage." It doesn't dissolve in water. It helps with regularity, lowers cholesterol, and lessens your risk of various cancers.[275]

It is found in:

- wheat bran
- whole grains
- most veggies

#2 SOLUBLE FIBER

Dissolves in water into a gooey gel. Amongst other things, it helps stabilize blood sugar, and also lowers your risk of cardiovascular disease.[276]

Found in:

- nuts
- whole wheat & barley
- roots[277]

#3 RESISTANT STARCH

This carbohydrate resists being digested in the small intestine. Instead, it ferments in the large intestine, and feeds beneficial gut bacteria. It also helps lower cholesterol and lessens your risk of various cancers.[278]

Found in:

- white beans & lentils
- peas
- oats
- barley
- potatoes & rice that have been cooked and then cooled

Some Sources of Insoluble & Soluble Fiber

10-12g fiber:

- a serving of *All-Bran*: 11g insoluble; 1 g soluble
- 2 Tablespoons of chia seeds: 9g insoluble; 1g soluble[279]

8-9g:

- ½ cup of lentils: 7g insoluble; 2g soluble[280]
- a 125g container of raspberries or blackberries: 6g insoluble; 2g soluble
- 1 cup edamame: 7g insoluble; 1g soluble[281]
- 1 cup sweet potato: 4g insoluble; 4g soluble[282]
- ½ cup cooked red kidney beans: 6g insoluble; 2g soluble

6-7g:

- ½ avocado: 6g insoluble; 1g soluble[283]
- 2 Tablespoons of flax seeds: 4g insoluble; 2g soluble
- ½ cup of cooked pinto beans: 5g insoluble; 1g soluble

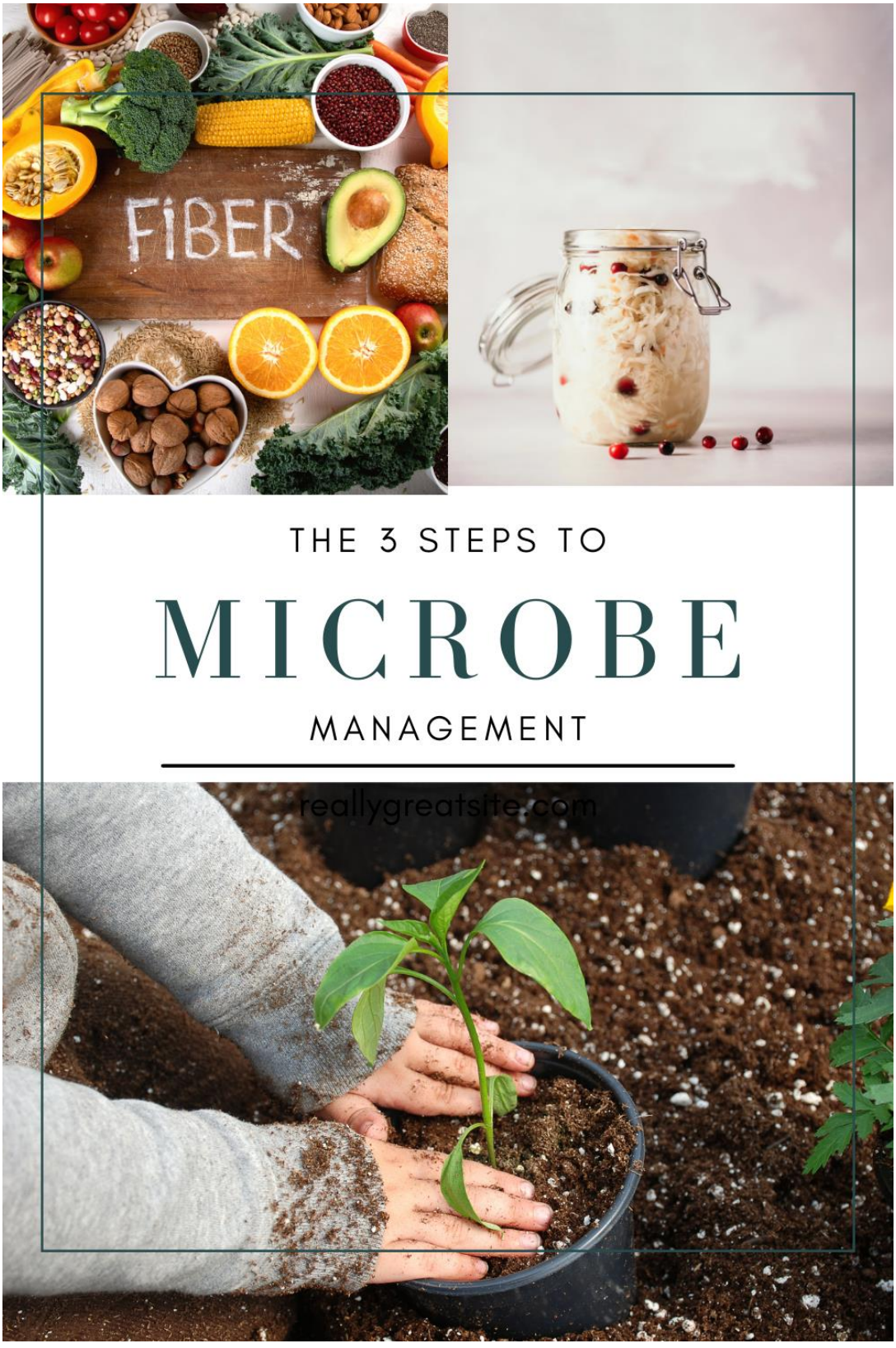
4-5g:

- Bob's Red Mill *Protein Oats*: 2.5g insoluble; 2.5g soluble[284]
- ½ cup of cooked turnip: 3g insoluble; 2g soluble[285]
- ½ cup of cooked peas, chickpeas or okra: 3g insoluble; 1 g soluble

2-3g:

- a psyllium husk supplement like *Metamucil*: 2.5g soluble[286]
- one slice of pumpernickel bread: 2g insoluble; 1g soluble
- a small apple: 2g insoluble; 1g soluble
- ½ cup cooked broccoli: 1g insoluble; 1g soluble
- 2 cups of air-popped popcorn: 1g insoluble; 1g soluble[287]

Although *Metamucil* made the list, the most diverse – and tasty! – way to get a variety of different fibers is by eating a variety of whole foods. The list above is obviously pretty short, but my hope is that it will help you feel inspired to become more adventurous in your own produce shopping.


FIBER
THE 3 STEPS TO
MICROBE
MANAGEMENT
reallygreatsite.com

3 Steps to Microbe Management

#1 GO 30 FOR 30

30g/fiber day:

Our microbes have been with us for millions of years, so it only makes sense that we evolved consuming a diet high in fiber.[288] While you probably needn't go the Hadza route of 100-150g of fiber per day, **30g/day should be your minimum**.[289] And diets containing more than **50g of fiber** are associated with lower risk of cancers, such as colon cancer.

In fact, for each additional 10g of fiber you eat, you lower your risk of all-cause mortality by 10%![290] If ever there were such a thing as a "superfood," it's definitely dietary fiber.

30 different types of fiber per week:

Along with consuming enough fiber, it's just as important to have sufficient variety. According to **Rob Knight, PhD, Co-Founder of the American Gut Project**, people who consume 30 different types of plant fibers and resistant fibers per week thrive.[291], [292]

Cater to all your taste buds: sweet, salty, bitter, sour, and umami. **Gastroenterologist Will "Dr. B" Bulsiewicz, MD**, advises painting a colorful produce "picture" using a cheery palette of bright greens, reds, blues, purples, oranges, and yellows.[293]

- **Red fruits & veggies:** protective against various cancers.
- **Orange & yellow things:** keep your skin glowing & eyes sharp.
- **Blue & purple produce:** help your heart & fight the signs of aging.
- **White & brown stuff:** great at fighting tumors.[294], [295]

The richer your diet is in various fibers, the better the quality of your gut microbiota. **As diversity rises, the bacteria that degrade the mucus barrier get crowded out, and the protective mucus layer gets re-established.**[296]

To really level up your produce game, trying looking beyond your borders. In **Beijing**, I discovered dried wood ear mushrooms, dehydrated goji berries, and dried snow fungus. During a stint in **Romania**, my landlady fed me a chilled summer salad with boiled rutabaga, turnips and beets (you'll recall that roots are rich in soluble fiber). And in **Latvia**, Rye Bread Soup (*Rupjmaizes Zupa*) made with a hearty, fiber-loaded black bread proved delicious.

Why not embark on your own global tasting tour with one of these:

- **Myers+chang At Home**: Recipes from the Beloved Boston Eatery[297]
- **Every Grain of Rice**: Simple Chinese Home Cooking[298]
- **Ethiopia**: Recipes and traditions from the horn of Africa[299]
- **Vegetarian India**: A Journey Through the Best of Indian Home Cooking by Madhur Jaffrey[300]
- **Tibetan Home Cooking**[301]
- **Scandinavian Recipes You Can Cook in an Hour**: Quick & Effortless[302]
- **Oklava**: Recipes from a Turkish–Cypriot kitchen[303]
- **Traditional South African Cooking**[304]
- **Simply West African**: Easy, Joyful Recipes for Every Kitchen[305]
- **Africa**: The Home Cookbook: The most delicious and important recipes from Morocco, Senegal, Ethiopia, South Africa, Ghana, Somalia, Congo, Algeria, Libya, Eritrea & oh so many more[306]
- **Latinísimo**: Home Recipes from the 21 Countries of Latin America[307]
- **Ukrainian Cookbook** - Cooking with Love: 300+ Recipes from a Ukrainian Family[308]
- **From Dill to Dracula**: A Romanian Food & Folklore Cookbook[309]
- **Balkan Food**: 13-Book Series featuring Greek, Turkish, Albanian, Mediterranean, Bosnian, Croatian, Macedonian & more (under $40!)[310]
- **Around the World in Tasty Ways**: 7-book series for under $30. Includes Spanish, Indian, Cali, Chinese, etc.[311]
- **World Cuisines** - 72 book series (for under $150!) featuring Armenian, Georgian, European, Persian, Syrian, Polish, Moroccan, Hungarian, Korean, Portuguese, Israeli, Egyptian, Algerian…[312]

#2 FERMENTED FOODS: 6+ servings daily

- cottage cheese ½ cup – or camembert, edam or gouda cheese[313]
- kombucha – made with tea, yerba mate, or even coffee! [314] - yogurt, kefir, buttermilk, and/or kvass: 6 oz
- ¼ cup of kimchi, sauerkraut, tempeh, gundruk, khalpi or sinki[315]
- vegetable brine drink or Turkish shalgam[316]

Although it might be tempting to pop a probiotic pill, taking one outcome or endpoint of a system is ***not*** the same thing as activating the entire system.[317] Also, any bacteria in the pill that duplicate microbes already living in the gut will be prevented from taking hold, called ***colonization resistance***…aka expensive pee.[318], [319]

HOW TO APPLY THIS: Pick up a copy of *WILD FERMENTATION: The Flavor, Nutrition & Craft of Live Culture Foods* and ferment yourself up something tasty.

#3 GET GARDENING

The microbiomes of people who garden are loaded with an abundance of good" bacteria, especially fiber-fermenting ones. Their guts also house **more unidentified microbes**.[320]

This is what happened when a 28-day "biodiversity intervention" was given to children in Finland. Daycare centers received heathers, wild berries and mosses from the forest floor, sod and meadow grasses, peat blocks for climbing and digging, and planters for growing annuals. The kids then crafted natural materials, planted stuff, and interacted with green materials during outdoor playtime for an average of 90 minutes a day. Their skin and gut microbiota changed for the better, as did their immune function, with decreased cytokine levels and T_{reg} cell frequencies. All this in a month! The researchers advise "letting urban children play in microbiologically diverse dirt and vegetation."[321]

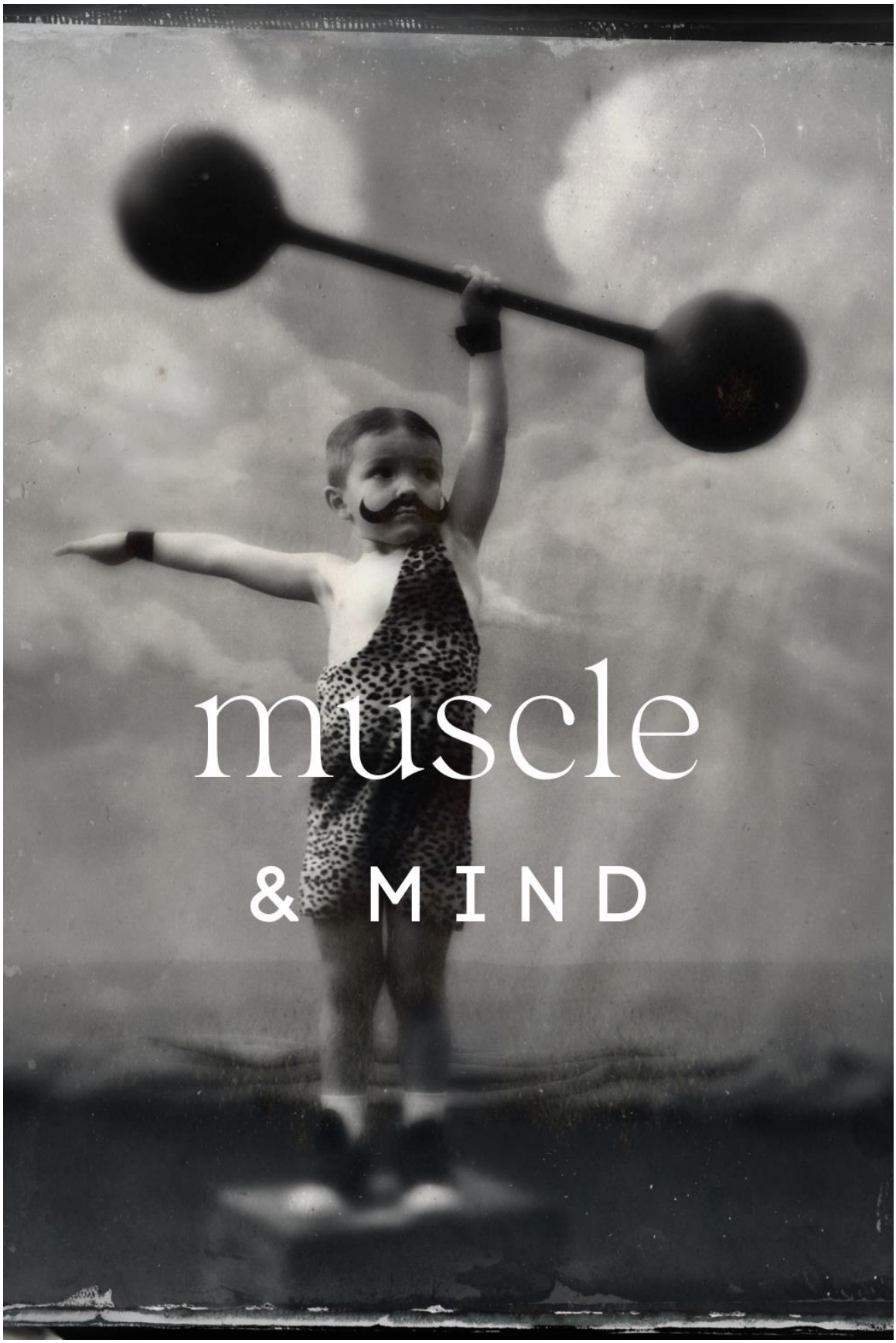
And kids certainly do love soil. Frolicking in it…and even eating it. "My children ate dirt with surprising gusto," recalls **immunologist Dr. Gerald Callahan**. "Garden soil, road soil, leaf-mush soil, sod soil, bug body soil – even gutter soil."[322]

He points out that several species of primate all intentionally eat dirt and clays, including rats, mice, mule deer, birds, elephants, African buffalo, tapirs, and cattle. Clays are also used in aboriginal acorn bread, as well as in dishes in the Philippines, New Guinea, Costa Rica, Guatemala, the Amazon and Orinoco basins of South America. Clays from termite mounds are prized for their high calcium content. And in sub-Saharan Africa, pregnant women bake and consume clays taken from 60cm to 90cm below the surface. Whether it's as a source of additional nutrients or to soothe an upset tummy, the practice of ***geophagy*** is actually so old in places, it could predate *Homo sapiens.*

We evolved with the soil, and it played an essential role in the evolution of the human gut microbiome. From the perspective of the entire ecological system in which we exist, the microbes – both in us and in the soil – can be considered **our "extended" genome**.[323]

HOW TO APPLY THIS: If you don't yet garden, it's time to start digging in the soil. You might join a community garden or even start your own container garden.[324]

Recommendation: *THE VEGETABLE GARDENER'S CONTAINER BIBLE: How to Grow a Bounty of Food in Pots, Tubs, and Other Containers* (2011)


muscle
& MIND

Muscle & Mind

> "To secure full benefit from an exercise, it is essential that the mind be concentrated on the muscles."[325]
>
> - **Maxick**, Renowned Bronze Era Strongman

As a child, Maxick was sickly, bedridden and underdeveloped – so much so, that at the age of 10, he was often mistaken for a 6-year-old. Since his parents confined him to bedrest, lil' Max decided to build up his strength while abed. He would contract his muscles as hard as he could, and then hold the contraction for as long as he was able. By the age of 14, he was stronger than most of the grown males in his hometown.

Later, as a famous strongman standing 163 cm (5'4") tall, and weighing only 67kg (147 lbs), Maxick routinely hoisted beer-hall patrons into the air 17 times with one hand. This while holding a beer in the other hand, and without spilling. He credited his amazing strength to having trained himself to connect muscle and mind.[326]

Fellow strongman **Eugen Sandow**, for whom today's Mr. Olympia trophy is named, was also a proponent of the mind-muscle connection. He advocated using light weights, not for the mechanical tension placed on the muscle so much as the ability of the weight to focus one's mind on the muscle being contracted.[327]

The power of our minds to shape us is difficult to overstate.

Take weight loss, for example. The issue isn't losing it, but keeping the weight off. Those who can are unicorns. What makes them so different? A fascinating systematic review of long term weight loss maintainers discovered something key: those who kept the weight off changed the way they saw themselves.[328] They "reinvented themselves by fundamentally shifting their identity."[329] Just like little Maxick. He used the power of his mind to change his identity and become someone so strong, audiences were left "speechless with amazement."[330]

But the mind-muscle connection goes both ways.

While your mind certainly helps your muscles, it gets helped in return when the muscles contract and release neurotrophic factors that regulate synapses in your brain. As we discussed earlier, **BDNF** is protective and anti-inflammatory; it plays a key role in a demonstrated relationship between skeletal muscle and cognitive function.[331], [332]

Skeletal muscle also releases signaling molecules called *myokines.* Myokines can cross the blood brain barrier and impact various pathways. "Some myokines are known to have anti-inflammatory effects both systemically and in the brain specifically," explains **longevity-centric physician Peter Attia, MD**.[333] Other myokines support the health of your mitochondria, improve mood, and decrease anxiety.[334] Myokines also trigger other myokines downstream, creating a positive loop of healthier mitochondria, less oxidative stress, and more shiny new muscle.

However, myokines don't like it when you are sedentary, especially if you are also eating a diet low in protein. A downward spiral of muscle loss results, along with chronic disease, and declining brain function.[335] A prominent feature of Alzheimer's disease is brain atrophy, as brain volume shares an underlying pathology with muscle mass and strength.[336], [337], [338]

Instead of encouraging cognitive decline by being sedentary and not taking protein seriously, replace brain atrophy with hypertrophy through strength training and eating optimal protein.[339], [340] ,[341]

Recommendations:

OUTLIVE: The Science and Art of Longevity (2023) by Peter Attia, MD

The Lost Secret to a Great Body (2012) by David Bolton – a step-by-step explanation of Sandow's mind-muscle technique for building strength[342]


Review
WHO CAN YOU
trust?

These Days, Who Can You Trust?

Nutrition, Exercise & Body Composition

- Biolayne (Layne Norton, PhD) – nutrition sciences[343]
- Andy Galpin, PhD - strength & endurance performance[344]
- Stronger by Science – the A-team of exercise science MAs & PhDs[345]
- Eugene Teo – evidence-based coach & educator[346]
- Jeff Nippard – evidence-based science communicator[347]
- FoundMyFitness (Rhonda Patrick PhD) – a cell biologist[348]
- The Bioneer – a brawny brainiac who makes exercise fun again[349]
- Mike Israetel, PhD (Renaissance Periodization) – exercise scientist[350]
- Menno Henselmans – evidence-based fitness expert[351]
- American Glutton Podcast (Ethan Suplee) – muscle & weight loss[352]
- James Smith – stomper-outer of toxic fitness & nutrition myths[353]

Muscle, Protein & Healthspan

- Gabrielle Lyon, MD – muscle-centric physician & author[354]
- Ted Naiman, MD – another muscle-centric physician & author
- Stuart Phillips, PhD – protein & aging researcher
- Donald Layman, PhD – protein metabolism expert
- Luc van Loon, PhD – protein metabolism expert
- Stephan Guyenet, PhD – brain researcher
- Bill Campbell, PhD – women's body composition
- Brad Schoenfeld, PhD – muscle & hypertrophy researcher
- Alan Aragon – nutrition researcher & author
- The Drive Podcast (Peter Attia, MD) – how to maximize healthspan[355]

Supplements Backed by Science

FISH OIL

When healthy older women who were resistance-trained took 1.5g of high-quality fish oil per day, they got stronger and the quality of their muscles improved.[356] The EPA and DHA in wild-caught fish and fish oil are not only muscle-preserving, but also anti-inflammatory.[357], [358], [359]

Daily amount: up to 3g

CREATINE MONOHYDRATE

When combined with weight training, creatine supplementation helps combat the substantial loss of muscle-building (anabolic) hormone bioavailability that occurs in older women.[360] Although creatine is mostly associated with skeletal muscle, it also plays a key role in brain health, better bone mineral density, reduced inflammation, and improved sleep.[361], [362] And in people who are elderly, supplementing with creatine appears to aid cognition.[363], [364]

Daily amount: 5g

WHEY PROTEIN ISOLATE

Bone is made of protein, and protein comes from diet. Dietary protein and its value to your bones is impossible to overstate.[365] To hit your optimal protein target, protein isolates definitely make things a lot easier.

Daily amount: Whatever amount ensures you hit your optimal protein total of 2.2g of protein per kg of ideal body weight (1g/pound).

CALCIUM

Calcium affects thyroid and kidney function, and of course, bone mineral density. When the balance of calcium is positive, bones stay strong; but if the balance tips, things head toward osteoporosis. Women typically absorb only **15-45%** of the calcium they ingest, while also losing about **300mg** daily. Plus, every 1000 mg of sodium you consume causes **20mg** of calcium to be excreted in urine.

The best sources of calcium are whole foods like milk, cheese, and yogurt. They combine calcium with other micronutrients including potassium and magnesium, and increase how much calcium is absorbed.[366], [367]

To make your own calcium powder: Save your eggshells (toss them into a bag stored in the freezer until you collect a bunch). Then boil them, dry them, and put 'em through the coffee grinder. Voila![368]

Daily amount: at least 1200 mg/day[369], [370]

VITAMIN D

Calcium balance is heavily influenced by vitamin D, as indicated by Serum 25-hydroxyvitamin D concentration, or **25OHD**. In postmenopausal women, when serum 250HD was raised from 50 nmol/L to > 80nmol/L, intestinal calcium absorption improved almost 70%.[371], [372] Vitamin D also works together **with protein** to improve muscle mass and bone strength.[373], [374], [375]

Daily amount: 800–1000 IU/day[376]

MAGNESIUM

Magnesium is essential to more than **300 enzymatic reactions**.[377] It is exchanged with bone, excreted in urine, and reabsorbed in the kidney, so its overall balance depends on how much is absorbed along the intestinal tract. This figure is typically around 30-50% in healthy individuals.

Magnesium has a biologic half-life in the body of about 42 days (1,000 hours), so correcting a deficiency can take a hot minute.

Daily amount: 300mg to 420mg[378]

NIACIN (VITAMIN B3)

Vitamin B3 is a vitamin family that is central to metabolism and health.[379] It has a few different forms:

- nicotinamide riboside (NR)
- nicotinamide mononucleotide (NMN)
- nicotinic acid amide NAM (aka *Niacinamide*)
- nicotinic acid (NA) (aka *Niacin*)

When taken orally, NR, NMN or NAM all get transformed in the gut to NA[380] - which is also the most affordable of the B3s.

Daily amount: from 14-16 mg on up to 50mg[381], [382], [383]

GLYCINE

For issues with joint pain and connective tissue, collagen supplementation isn't backed by much solid research. Rather, the component in collagen responsible for any effects is most likely glycine.[384]

Daily amount: anywhere from 3-5g on up to 10g[385]

SPECULATIVE, BUT POSSIBLY SOUND

UROLITHIN A

After pre- and probiotics are metabolized in the gut microbiome, what remains are *postbiotics*.[386] They include *Urolithin A,* which removes dysfunctional mitochondria (*mitophagy*), a hallmark of muscle health.[387] It shows promise for joint health, as well as preventing heart disease, cognitive decline, muscle-wasting, and reducing inflammation (C-reactive protein).[388], [389]

Daily amount: 500 mg/day[390]

URSOLIC ACID

Ursolic acid is a phytochemical found in apple peels, rosemary, thyme, and Holy Basil. Examine.com's **Kamal Patel, MPH** looked at the initial research and reports that it not only seems to cut down on fat accumulation, but also preserves - and possibly increases - muscle mass.[391], [392], [393]

Daily amount: 3 x 150mg (take with meals)

GOTU KOLA

The gotu kola plant contains bioactive substances that have traditionally been used to treat dermatitis, acne, and burns.[394] Anecdotally, **strength coach Charles Poliquin** had clients with loose skin from weight loss take gotu kola daily. Apparently, nothing would happen until around the six month mark, when seemingly overnight, the skin would suddenly snap back.[395]

Daily amount: two 500mg capsules three times a day


KNOW
YOUR
NUMBERS

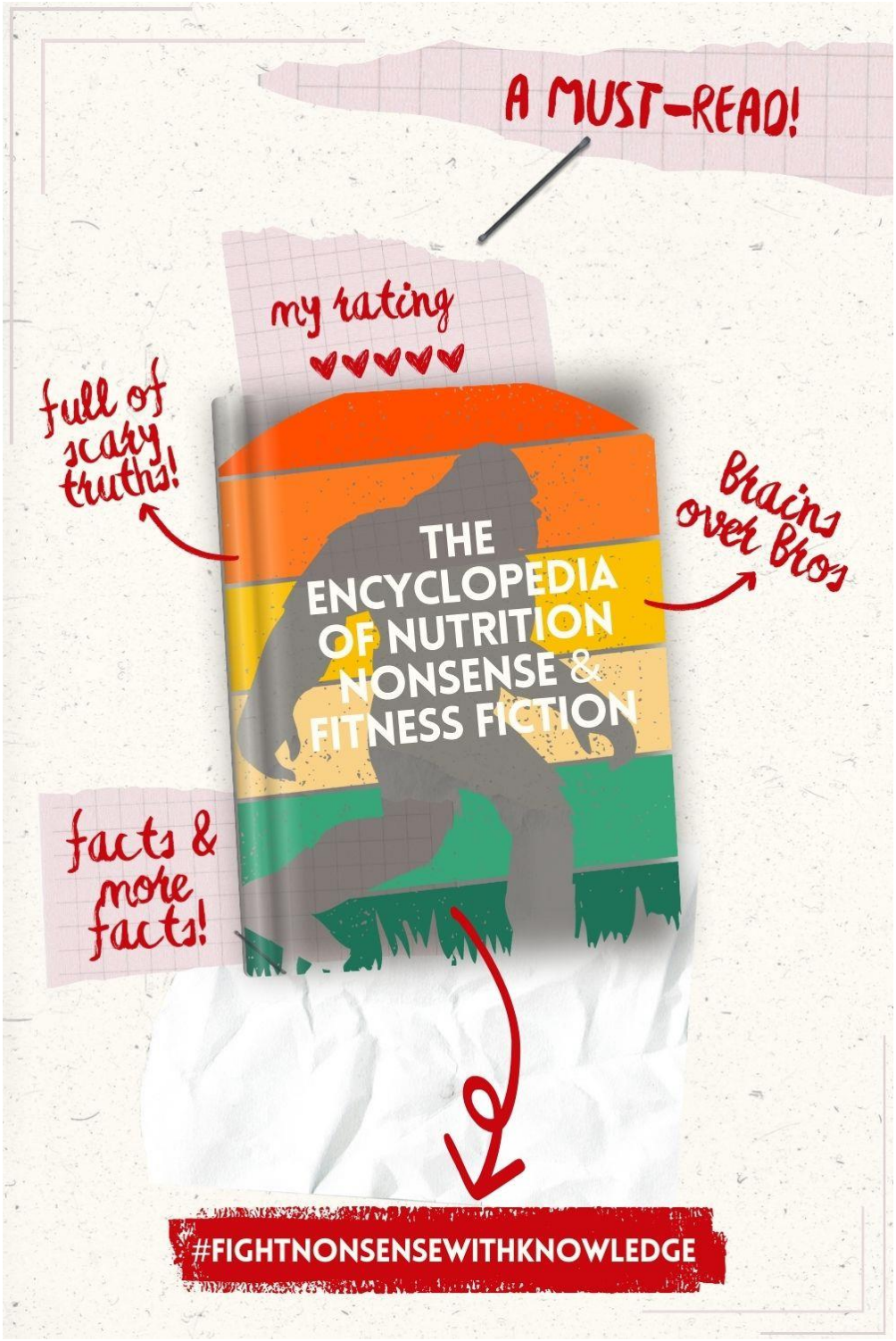
Know Your Numbers

What you can measure, you can maintain - or change. Like your healthspan. Healthspan has two parts. "The first is how *long* you live, your chronological lifespan," says **Peter Attia, MD**. "But the second and equally important part is how *well* you live - the quality of your years."[396]

To optimize your healthspan, schedule an appointment with your healthcare provider and find out your numbers. Otherwise, how will you know whether you are falling behind…or kicking ass?

- **Fasting Levels:**
    - Fasting insulin: < 10 µU/mL
    - Fasting blood sugar: < 100 mg/dL (5.6 mmol/L)
    - Fasting Triglycerides: 2.3mmol/L
- **Glucose Tolerance Test:** < 140 mg/dL (7.8 mmol/L)
- **ApoB:** a measure of heart health; 40-120 mg/dL - lower is better
- **APOE4:** this variant of ApoE is not as good at clearing plaques, so this test is an indicator of Alzheimer's risk
- **Alanine Transaminase (ALT):** > 7 to 55 units per liter (U/L) could indicate liver damage
- **Blood Pressure:** at or < 120/80
- **C-Reactive Protein (CRP):** < .3mg/dL (.3-1.0 mg/dL = slightly elevated)
- **Albumin Level:** 35 to 56 g/L[397] – High albumin levels can be indicative of dehydration, while low levels often point to inflammation and other bad health outcomes.[398] Having inflammation **and** being dehydrated can cause your albumin level to read out as normal, when actually it's just the higher and lower levels canceling each other out.[399]

Encyclopedia of Nutrition Nonsense & Fitness Fiction



- *Breakfast is making you fat!*[400]
- *Overeating doesn't make you fat; the process of getting fat makes you overeat!*
- *Eating 75% of your calories as fat reduces heart disease, prevents cancer and promotes optimal health!*
- *Hibiscus tea works better than a leading hypertensive drug!*
- *Carbs are destroying your brain!*
- *Throwing ice cubes in your water makes it more "structured"!*
- *The idea that people simply eat too much is no longer supported by science!*

These claims by diet, nutrition and fitness bestsellers showcase what a quagmire it is of deliberate distortions, asinine advice, and gym bro BS. "Of the top 100 diet and nutrition-related books, many claims seem very puzzling to us," conclude a group of actual scientists who bravely waded in.[401] "Based on our knowledge of the scientific literature, we would not even be able to *remotely* endorse them."[402] They also warn people that an author's fancy credentials "do not necessarily indicate the quality of the nutritional advice given."

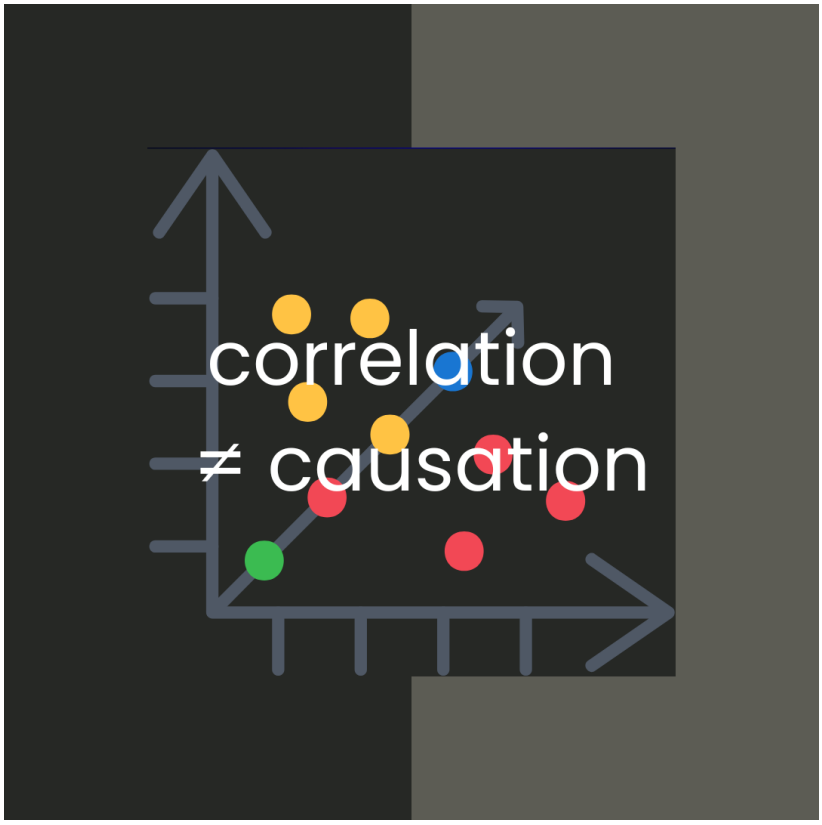
Petri dish studies examine how a system or mechanism works. Mechanisms help explain how things operate within the complex system that is the body.[403] **But a mechanism isn't the same as an outcome in humans.**

For example, the **mechanistic evidence** showed that the drug *Dalcetrapib* increased the ratio of HDL:LDL cholesterol, possibly lowering the risk of coronary heart disease.

- **2011:** "This novel therapy may address a significantly unmet need in cardiovascular disease."[404]

  But in **human trials**, it failed to lower the risk of coronary heart disease.

- **2016:** "Development of *Dalcetrapib* was stopped when a phase 2 clinical trial found the drug to be ineffective."[405]



Cheese consumption and death by tangled bedsheets are correlated – quite closely! - but obviously not connected.[406] Connections are demonstrated by epidemiological studies, but epidemiological studies do not prove what the root cause of something is. Similarly, about 95% of animal studies use mice, even though these studies have "not proven particularly reliable at predicting the outcome of studies in humans."[407] And in nutritional research, rats have traditionally been the animal of choice, despite their natural habit of *coprophagy* (consuming feces), which kinda limits how suitable they are for these studies. **In other words, rodents are not miniature humans.**[408]

This is where **human randomized control trials** (RCTs) come in, as well as **meta-analyses** of studies to determine overall trends.[409]

To make sense of nutrition and fitness data, when presented with a novel idea, **ask these three questions**:

1. *Compared to what?*
2. *At what cost? If I make this choice, what will I give up?*
3. *What data or hard evidence do you have?*[410]

In the 1980s, protein expert **Dr. Donald Layman** had his insights about the role of leucine in muscle-protein synthesis. So he approached the National Institutes of Health (NIH) for funding. And got turned down - repeatedly. *We only study disease. We don't know of any deficiencies of protein, so it's not a priority to us*. "I was left with a revolutionary idea that the NIH wouldn't fund," says Layman. But Kraft Foods, the National Cattlemen's Beef Association, the National Dairy Association, and the American Egg Board did. "They were the funding sources that basically unlocked all of this knowledge about protein for adults, leucine, mTOR, and muscle-centric health. All of that was unlocked because we could get funding from Kraft and Beef."[411]

Funding is a part of research today. But what actually matters is whether research results are replicated in other labs and studies – like the insights about leucine and MPS. These results have not only been replicated, but have become stronger over time.

Some of our early ancestors survived on the open savannah. Others inhabited the forests. Still others lived along lake shores. Not only is the human lineage *not* a single species, it's not even a single time period. The fossil and archeological records are scattered. And there wasn't a single diet that fit all, says **paleoanthropologist Dr. Peter Ungar**.[412] Rather, our dietary patterns were driven by changing climates, habitats, and the food that was available.[413] "The range of 'natural' human diets is vast," adds **evolutionary anthropologist Herman Pontzer, PhD**. Pontzer points out that in Arctic populations more than 50° from the equator, people ate what was readily available: mostly meat. But they actively sought out plant foods, even pillaging rodent burrows for their stores of wild tubers.[414]

The "paleo diet" stance against grains and starch isn't backed up by research.[415] **What research *has* confirmed is that we have been eating very non "caveman" legumes for at least 50,000 years, starches for more than 100,000 years, and baking bread even longer.**[416]

A recent meta-analysis[417] looked at the most popular forms of intermittent fasting (IF):

- alternate-day fasting (ADF);
- 5:2 dieting;
- eating only during a "feeding window," aka time-restricted eating (TRE).

The analysis included 20 randomized-controlled trials and more than 1,000 subjects. A few things stood out:

- there wasn't greater adherence to IF, indicating it *isn't* easier to stick to than normal calorie restriction;
- there were no reported differences in hunger, fullness, or desire to eat;
- losing weight via IF doesn't (magically) improve metabolic risk factors or result in any more weight loss than regular ole' caloric restriction.[418]

In *The Odyssey*, which dates from around the 8th century BCE,[419] Homer writes:

> *"Meanwhile the two in the hut, Odysseus and the goodly swineherd, had kindled a fire, and were making ready their* ***breakfast*** *at dawn…Then the swineherd set before them platters of roast meats, which they had left at their meal the day before, and quickly heaped up bread in baskets, and mixed in a bowl of ivy wood honey-sweet wine…"*[420]

Like the ancient Greeks before them, the Romans also ate breakfast - typically a meal of bread, cheese, honey, and oil.[421], [422] And the popular Chinese portable breakfast pancake, *jianbing*, is thought to date back to 220 CE.[423] So this notion that breakfast is some evil modern scheme dreamed up by evil food marketers planning an evil world takeover - by breakfast, of all things – is just silly.

In the 19th century, your typical worker spent most of their income on food, both for the livestock and the family. So *The Century*, a popular US-based illustrated monthly, turned their attention to nutrition.[424] They published a series of articles in 1888 authored by a chemist with nutrition expertise named Wilbur Olin Atwater.[425]

Atwater had already concluded that Americans were eating too much fat and too many sweets, and did not exercise enough (sound familiar?). He wanted to help his readers understand two things: 1) the amount of energy in foods; 2) the fact that different foods affect the body differently.[426] Therefore, he needed an easily understood measure of energy. He turned to studies of fuel efficiency in steam engines. They assessed the amount of heat that raised the temperature of 1kg of water from 0 to 1°C using a measurement called the *calorie*.

The calorie wasn't some tool dreamed up by the Nutritional Dark Side, but a handy teaching tool popularized by an innovative science educator. His goal? For people to lay off the simple carbs and starches, and instead choose "a cheap and efficient diet that included more proteins, beans, and vegetables."[427]

Sources of calories are not all the same (obviously), but calories themselves are just a way of measuring energy. These units of measurement are all the same. And **what the *calories in, calories out* (CICO) or *energy balance model* (EBM) describes is the impact of different amounts of energy**: the amount you expend per day vs. the amount you consume. If the number of calories you consume is the same as the number you expend, your weight won't change. If you consume fewer calories than you expend, you will lose weight. But you'll gain weight if your current energy expenditure is less than your caloric intake.[428]

Intake, or how many calories we consume, is heavily influenced by our nervous system and brain.[429] Our lizard brain lives in the distant past, when starvation threatened our survival, so it obsessively scrutinizes the environment for calories that are easy to acquire and even easier to digest.[430] Hello, ultra-processed food![431] While we have continued to consume more and more calories,[432] we are also moving less.[433] And since 1980, worldwide obesity has more than doubled[434] – just as the diet-agnostic *calorie-in-calorie-out* math would predict.[435]

We tend to forget that our bodies already come equipped with a detoxification system and pathway: a protein and transcription factor (they turn genes "on" and "off") called Nrf2.[436]

Nrf2 regulates over 500 genes all related to detoxification – the removal of everything from foreign substances (*xenobiotics*) to toxic metals, to dysfunctional organelles. Nrf2 produces major anti-inflammatory changes, improves mitochondrial function, and stimulates autophagy.[437] "There are very clear things that induce its expression or that dampen Nrf2," says **Raja Dhir, Co-CEO of Seed Health**, which specializes in microbiome therapies. "And that's detoxification."[438]

What resveratrol lacks in any scientific validity it more than makes up for with hyperbole, hype, and outright hokum.[439]

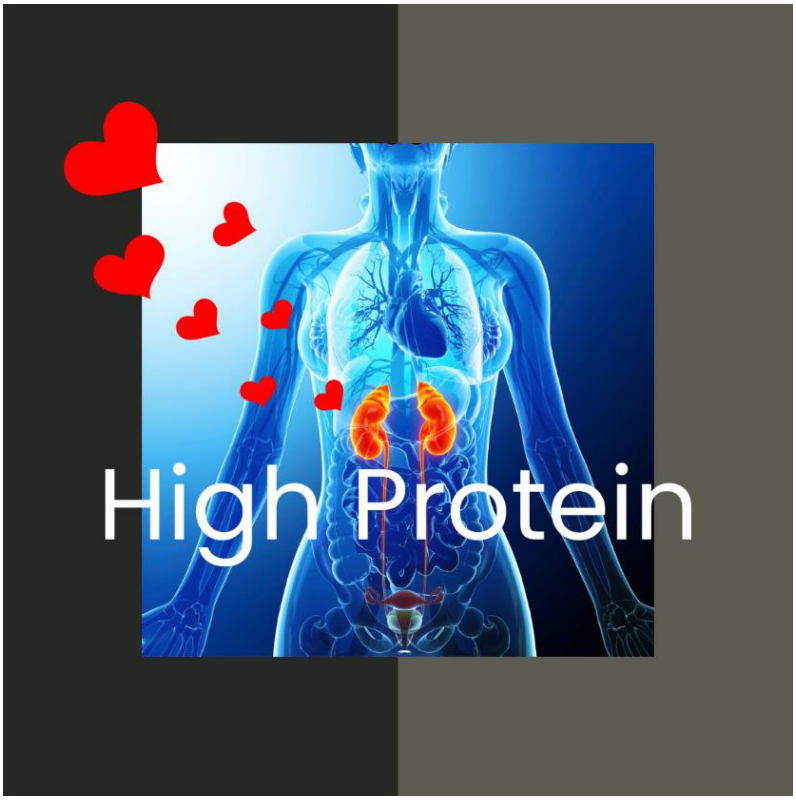
Unfortunately, resveratrol stresses your cells out, and is actually harmful to your health.[440], [441], [442], [443], [444]

Creatine **won't** make you bald, **doesn't** cause muscle cramps, **does not** lead to water retention, **won't** damage your kidneys, and **will not** make you fat.[445]

And yet, crazy claims still abound despite the fact that 500+ peer-reviewed studies and publications have found otherwise. "Creatine's evidence base is not merely speculation, hype, and celebrity endorsements," observes **fitness and nutrition expert Alan Aragon.**[446], [447], [448] Supplementing with *King Creatine*, as he has dubbed it, is effective and safe.

Creatine…
…works synergistically with weight training to increase your muscle;
…helps counteract menopause-related declines in bone mineral density;
…reduces inflammation;
…improves sleep and brain function.[449]

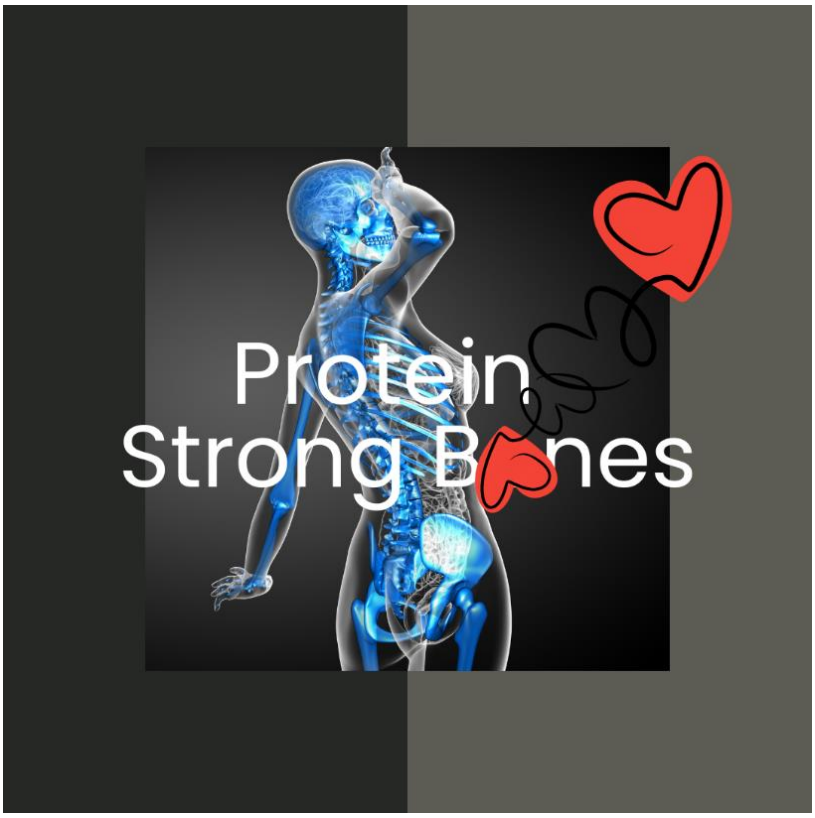
Your muscles – and brain – will thank you for taking **5g of creatine daily**.[450]



The idea that eating a diet low in protein might delay age-related deterioration of kidneys has merit…in rats.[451]

Meanwhile, in humans, there is no evidence linking a higher protein diet and renal (kidney) disease.[452] Rather, any progressive decline in kidney function that occurs with age is, according to the Institute of Medicine, *not* thought to be caused by the protein content of the diet.[453] Rather, **the real danger seems to be diets that are too low in protein.** They are associated with impaired immune responses, low birth weight, a higher risk of mortality, bone loss, and decreased kidney function.[454]

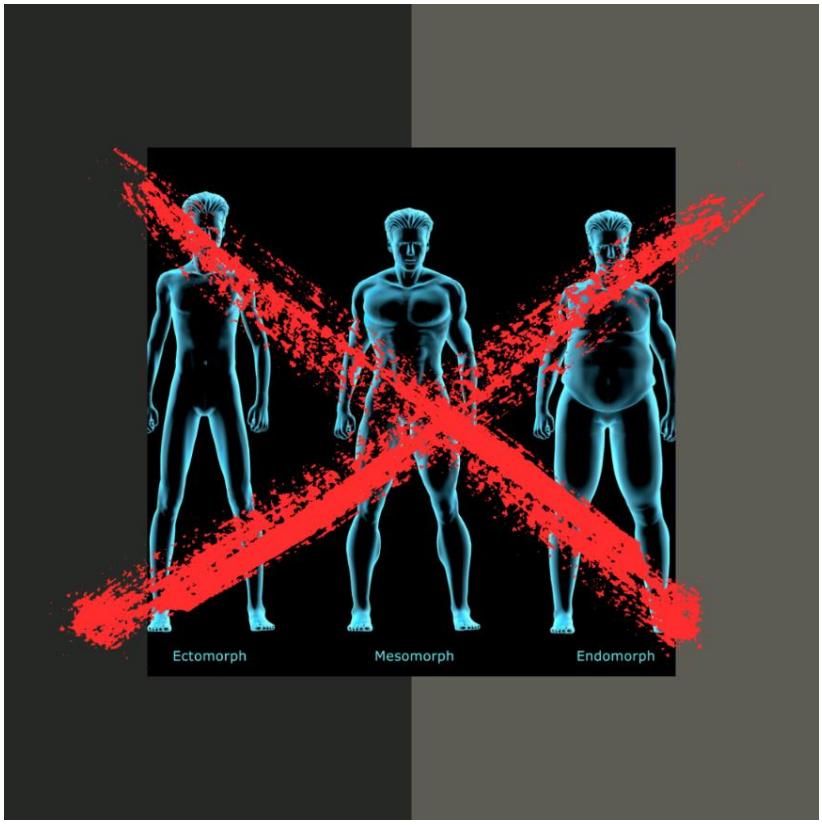
If you don't have diseased kidneys, consuming higher protein *won't* harm them. Just the opposite, in fact: increasing dietary protein actually *increases* the glomerular filtration rate – a measure of kidney health.[455]



The myth that eating protein leads to soft bones goes something like this: LOW INTAKE OF POTASSIUM → A DIETARY ACID LOAD → CALCIUM GETS EXCRETED FROM THE SKELETON → OSTEOPOROSIS. But if you aren't deficient in calcium, the evidence simply doesn't support a causal association between dietary acid load and osteoporosis.[456], [457]

Bone is made of protein, and protein comes from diet. Which is probably why post-menopausal women who eat higher amounts of protein have less risk of fractures.[458] It's almost impossible to overstate the value of adequate protein on the strength and health of your bones.[459]

If you haven't yet acquired a whey protein isolate habit, it makes hitting daily protein targets easy. It's a cinch to consume 50g+ of protein, and won't your inner brat just love having a giant chocolate shake for breakfast?



- ENDOMORPH: carries a lot of fat but finds it easy to build muscle
- ECTOMORPH: skinny; difficult to build muscle
- MESOMORPH: naturally lean & muscular

The only thing missing from this tale of three predetermined and unchangeable body types is *Once upon a time.*

This theory was the work of the American psychologist William Herbert Sheldon. He was attempting to predict a person's intelligence, moral compass, and potential for success based on their physical shape and size. The idea was that you could then breed people selectively, alter the human gene pool, and "improve" society. Eugenics was a hot topic back in the 1940s, when Sheldon's three somatotypes were proposed – and debunked.[460], [461] "Body types are fucking bullshit," adds **exercise scientist Dr. Mike Israetel**. "For the love of god, it's alsortsa wrong."[462]

Metabolism is the process by which all animals, plants, bacteria and fungi break down what we consume in order to extract energy. The basic rate of energy production is the *basal metabolic rate* (BMR). It reflects the many, *many* ways our cells keep us alive, growing, developing, reproducing, and thriving.[463]

So if someone says some version of “these foods will kill your metabolism,” it’s pretty clear that word doesn’t mean what they think it means.

However, if what they are *actually* talking about is how many calories you burn in a day, energy expenditure is remarkably stable and non “killable.” It mostly just varies by age group:

#1 Neonates: Newborn to age 1

#2 Juveniles: Age 1-20

#3 Adults: Age 20-60

#4 Older Adults: Age 61 & older[464]

…there lived a woman with a "slow metabolism." If she even looked at chocolate, she went up a dress size. Her thin friend could "eat anything" and not gain an ounce. The End.

Actually, it's just the opposite: people who are heavy or obese have a higher metabolic rate than people who are lean.[465],[466] The issue is not on the *calories expended* side of the equation, but on the *calories consumed* side. Which is largely controlled by our brains.[467] "Despite our best intentions, non-conscious circuits explain why we overeat," says **brain researcher Stephan Guyenet, PhD**.[468] Our internal fat-o-meter still lives in the distant past when starvation threatened all of us, and having excess calories stored helped stave off death. So if your style-conscious modern self is trying to slim down for sleeveless weather, your lizard brain is busy plotting against you. It not only cranks up your drive to eat, but also dials down your ability to feel satiated.[469]

Satiety is what a drug like *Ozempic* addresses. So does eating protein-rich whole foods that are on the bland side. Go ahead and *try* bingeing on plain boiled chicken breasts (boneless and skinless, of course) with a side of plain boiled potatoes.[470]

How many times have you heard that if you consume more than 20-25g of protein at one time, it won't get "absorbed"?[471]

Absorption is the part of digestion that starts mostly in the small intestine, after which the nutrients get passed along by the circulatory system to other parts of the body – to be stored or used.[472] Even a whopping 100g of protein – we're talking a pound (~450g by weight) of cooked chicken breast or shrimp - not only gets "absorbed," but triggers exceptionally long bouts of MPS.[473]

Any amino acids that are not used for muscle go to vital organs like the brain, heart, and liver.[474], [475] The liver, for example, uses amino acids to synthesize vital compounds including glutathione, creatine, taurine, carnitine, nitric oxide, and many more.[476], [477]

So while not all the protein you consume will go toward new muscle, it will get absorbed.

As a chick who tries to lift as heavy as humanly possible, I only wish it was magically easy to pack on muscle.

Women have more of the muscle fiber type that is great for endurance activities, but far fewer of the type that manufacture massive-muscles. In fact, **the maximum potential muscle that a woman *not* taking performance-enhancing drugs can gain is between 16 to 25 pounds worth. Total.**[478] "Unless you are eating a lot and training really, really, super hard specifically to put on mass," adds female physiology expert **Dr. Stacy Sims**, "you're not going to get bulky."[479]

A common gym-bro myth is that to get strong, you need to train so hard, you can't walk properly for days afterward. But this approach will actually work against you. Training that hard causes a lot of muscle damage. Your body then has to divert scarce resources to do repairs, rather than delivering the results you were after: stronger muscles.

Stronger muscles come from hitting the weights hard but not *so* hard as to cause excessive damage. This sweet-spot occurs between **60%-85% of your maximum**. Within this range, the muscle-fibers fuse together, rebuild, and grow - called **muscle adaptation**.[480], [481], [482]

Finding the balance can be tricky, especially if you're new to resistance training.[483] Learning the biomechanics that align with the muscle adaptations you're after (aka "good" technique) makes it worth every penny to hire a knowledgeable and experienced coach.[484], [485]

When you're exercising and your muscles start to burn, the cause isn't a buildup of lactic acid. Rather, the reason has to do with how your body processes your energy "currency," ATP. As ATP gets broken down, it releases hydrogen atoms.[486], [487] They build up, creating that awful, acid-like burning.[488]

This excess hydrogen gets mopped up by a substance called ***lactate***.[489] Lactate starts off life as glucose. Its chain of six carbons gets broken down into two 3-carbon chains called ***pyruvate***. As pyruvate is created, lactic acid also gets created and released into circulation to help regulate energy, assist with immune function, and promote tissue repair.[490], [491] The pyruvate will either be used right away to produce more ATP, or if a buildup has started to occur, it will begin picking up excess hydrogen, which turns it into lactate. **Lactate, in other words, prevents you from becoming acidic**.

Because lactate can quickly be turned back into pyruvate, it is preferred over glucose as fuel by working skeletal muscles, the heart, and neurons (for signaling).[492] **Brains especially love energy-rich lactate**.[493]

Oxen, too.

And the reason they can both get their Schwarzenegger on while consuming a vegan diet of grasses, twigs, and greenery is, wait for it, biology. Their digestive systems are completely different from ours.[494]

Not only do many herbivores have multiple stomachs, but their guts also contain **specialized bacteria**.[495] These microbes are able to break down tough and fibrous plant materials.

Herbivore digestive tracts are also much longer than ours in order to provide the necessary space and time for microbial fermentation to occur.[496]

When cows graze on grasses, they capture the nitrogen the plant used to make roots, flowers, and seeds - and upcycle it. This upcycling of nitrogen by ruminants creates protein that meets both requirements for being high-quality:

1. It contains all the essential amino acids in the right balance – especially methionine, lysine, and leucine.
2. It is bioavailable.[497]

According to protein expert Dr. Donald Layman, for every 60g of plant-based proteins and nitrogen that a ruminant eats, they can upcycle it to 100g of EAA-balanced protein![498]

The thing about meat is that its impact on human health depends a lot on how processed it is.[499], [500] And whether or not it's actually meat. Meat alternatives come up short when their nutrient profiles are compared to meat that is grass fed and fresh.[501] **Fresh meat can be part of a well-rounded, healthy diet, especially one high in fiber.**[502]

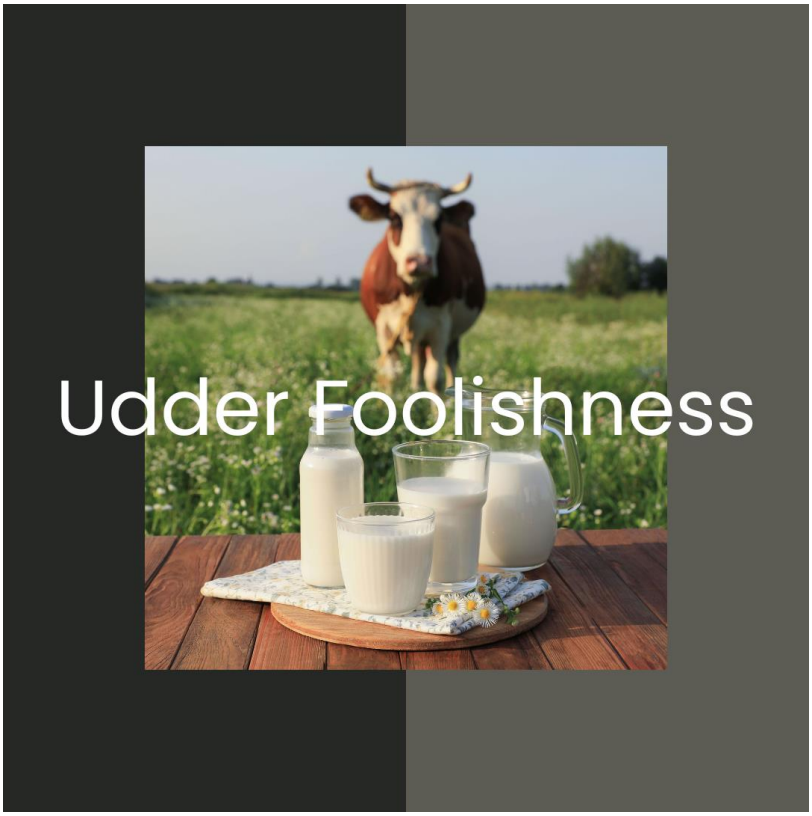
Milk contains two proteins:

- Casein: 80% (gives milk its white color)[503]
- Whey: 20%

The whey gets separated out during the making of cheese. Then its lactose and fat are mostly removed. Lastly, it is put into powdered form – actually three forms:

- **Whey protein isolate (WPI):** ~1% lactose & >90% protein.[504]
- **Whey protein concentrate**: higher in lactose; 80-90% protein.[505]
- **Whey hydrolysate**: pretreated with enzymes to make it absorb faster and easier to digest, and also the most expensive of the three.[506]

For most of us, WPI works well and is considered to be the gold standard for high-quality protein.[507], [508]



The amount of sheer nonsense swirling around dairy products is mind-boggling. Because when you look at the *extensive* scientific literature on dairy product consumption, you'll find it's associated with being leaner, stronger, having increased insulin sensitivity, and better bone mineral density.[509]

Contrary to urban legend, dairy…

…isn't inflammatory (just the opposite, in fact);[510]

…doesn't weaken your bones;[511]

…isn't indigestible;[512]

…doesn't cause mucus (debunked over 30 years ago);[513], [514]

…does not encourage cancer, heart disease, and/or insulin resistance.[515]

Instead of trying to shout over the stupid, which pretty much makes me wanna lay down and give up the ghost, I'll let the science do the talking.

DAIRY & CANCER

We found no evidence of association between either total or individual dairy products and breast cancer risk, but suggestive evidence that consumption of yoghurt may be associated with ***a decreased risk****.*[516]

Consistently, in our meta-analysis, no associations with breast cancer risk were identified for intake of low-fat/skim milk, whole milk, and yogurt.[517]

Total dairy products intake have no significant impact on increased all-cancer mortality risk.[518]

To conclude, consumption of milk, cheese and yogurt was not associated with the risk of pancreatic cancer."[519]

High dairy consumption was associated with lower colorectal cancer incidence and mortality.[520]

The World Cancer Research Fund/American Institute for Cancer Research have reported that there is not sufficient evidence to recommend reducing milk and dairy consumption to reduce the risk of cancer.[521]

DAIRY & HEART HEALTH

Higher total dairy consumption was associated with lower total and cerebrovascular mortality.[522]

Emerging evidence indicates that dairy product consumption is linked to ***lower risk*** *for CVD and metabolic syndrome.*[523]

DAIRY & BONE HEALTH

This meta-analysis provides evidence that dairy products can increase bone mineral density in healthy postmenopausal women. Dairy product consumption should be considered an effective public health measure to prevent osteoporosis in postmenopausal women.[524]

In Malaysia, hip fracture incidence is higher in Chinese women than other ethnic groups. Over 1 year, a high-calcium vitamin D fortified milk suppressed

bone turnover markers in postmenopausal women and tended to increase femoral neck bone-mineral density.[525]

DAIRY & BODY WEIGHT

In thus far the largest Mendelian Randomization (MR) analysis study, including 182,041 adults from 18 cohorts…provided strong evidence that high dairy intake was causally associated with higher lean mass. Results from our observational analyses and our MR analyses were highly consistent, both suggesting higher lean mass in those with high intake of dairy products.[526]

The findings of this study were that under hypocaloric conditions, a high dairy product intervention resulted in greater body weight and fat mass loss, and attenuated lean mass loss compared to control interventions.[527]

DAIRY & INFLAMMATION

An emerging body of evidence indicates that consuming certain foods, including dairy foods like milk, cheese, and yogurt, may be linked to a ***decreased risk*** *for inflammation. While there is insufficient evidence to recommend specific dairy foods as "anti-inflammatory," the substantial body of clinical research discussed in this review indicates that dairy foods do not increase concentrations of biomarkers of chronic systemic inflammation*.[528]

The preponderance of the evidence shows that consumption of dairy products or dairy proteins does not adversely affect biomarkers of inflammation in healthy and overweight or obese individuals and potentially provides beneficial effects.[529]

The current meta-analysis indicated that dairy intake might improve several inflammatory biomarkers in adults.[530]

Dairy product consumption does not exert adverse effects on biomarkers of inflammation in overweight or obese adults.[531]

An anti-inflammatory effect of dairy products was found in healthy subjects; however, this effect was stronger in subjects with metabolic and cardiovascular disorders, including obesity and overweight.[532]

Being deficient in the lactose digesting enzyme lactase is not the same as being lactose intolerant. Unlike being intolerant, lactose maldigesters can still consume *some* dairy – just not supersized amounts. "The trend of larger portion sizes exacerbates amounts of lactose that can be tolerated," notes one group of researchers. "Lactose in large servings of frozen yogurts, shakes, and milk may exceed that which can be tolerated by maldigesters."[533], [534]

The 25g mark - around two cups of milk - seems to be a common threshold below which dairy is doable. Many people can ingest a cup (12g) without abdominal bloating, pain, or diarrhea. Alternatively, fermented dairy, like yogurt or cheese, further lowers the concentration of lactose by 25-50%.[535]

Cutting out milk and dairy unnecessarily runs the very real risk of not consuming enough calcium, vitamin D, phosphorus and other key vitamins that maintain bone mineral density.[536], [537], [538]

The amount of glucose floating around in your blood is tightly regulated.[539], [540] If glucose levels spike and remain high for too long, they can damage many tissues and organs.[541] To prevent damage, the superhero of speedy glucose storage comes to the rescue: insulin!

During the time that insulin is clearing the blood of excess fuel by storing it, your body's ability to burn fat will be temporarily inhibited. But temporary inhibition doesn't mean that fat gets permanently trapped inside of fat cells.[542] When you raise your insulin levels a little, then only a little fat-burning will be inhibited; if you raise insulin a lot, then a lot of fat-burning will be inhibited.[543]

But even if insulin did "trap" fat inside of fat cells, it wouldn't automatically result in weight gain. The drug ***Acipimox*** did just that, and the people taking it didn't overeat or gain weight.[544]

When a low carb diet (75% fat, 10% carb) was compared with a high carb diet (75% carb), the high-carb – i.e. insulin-spiking - group ate **700 fewer calories per day**.

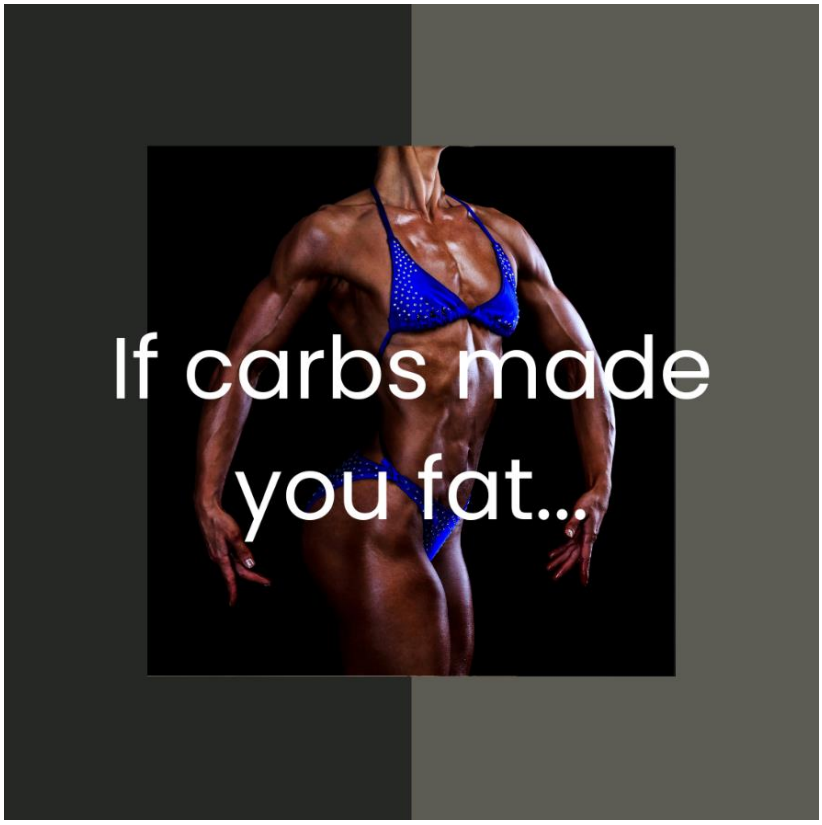
Similarly, the weight loss drug semaglutide (*Wegovy* & *Ozempic*) enables people to feel more satiated by **significantly spiking insulin**.[545], [546]

In short: insulin doesn't juice up appetite or drive overeating.[547]

The apparent logic here is that when you're asleep, you aren't burning as many calories as when you're awake. Therefore, if you eat carbs at night, they won't get used up and will instead turn into fat.

However, when you eat lunch at your desk and then keep working, you burn the same amount of calories as when you're lying down – possibly less.[548]

It's not *when* you eat your carbs or calories that matters to what you weigh, but the difference between how many total calories you take in vs. how many you burn **over a 24 hour period**.[549]



Consider what people who get lean for cash, prizes and on-stage glory eat. Bodybuilders lean down to single digit body fat when competing, 6% (males) and 12% (females), and in the off-season, many will hover around 10-12% (female bodybuilders are closer to 18%).[550][551]

A systematic review of their macronutrient intake[552] found that:

- the female athletes consumed **up to 415g of carbs per day**;
- the male athletes consumed up to **637g/day**; in fact, male competitors who ate *more* carbs consistently placed higher.[553]

Again: 6-18% leanness on 400 - 600+ g/carbs per day.

If carbs were fattening and the carbohydrate-insulin model predicted what actually happens in real life, there is no way that these people could get so lean on so many carbs. But carbs and insulin don't make you fat.[554] Sustaining a caloric surplus does.

Most of the cholesterol we eat comes attached to a fatty acid; it's called a *cholesteryl ester*. Cholesteryl esters are large molecules we lack receptors for. And unless the fatty acid part gets clipped off and it becomes a free (unesterified) cholesterol, the giant cholesteryl esters pass through our bodies and exit in our feces.[555]

The cholesterol that we do absorb is mostly manufactured internally in the liver, and then transported through the bile duct into the intestine.

So for the majority of us, the cholesterol we eat accounts for only 10-20% of the cholesterol that our bodies absorb.[556] Dietary cholesterol just isn't a huge contributor to your average person's serum cholesterol levels.

A scientific paper about how gorilla microbiomes fluctuate seasonally with their consumption of fruit[557] was used to spin a nutritional fairytale about fruit somehow making humans fat. Humans and **gorillas have completely different digestive systems**, which is the reason the great apes can subsist on unripe fruit and mature foliage.[558]

Non-fictitious human research shows that eating fruit reduces the risk of type 2 diabetes,[559] cardiovascular disease and cancer,[560] inflammation,[561] and body fat.[562]

In fact, people given high doses of fructose of 150g per day - the equivalent of 15 huge apples - for two months straight didn't gain weight, liver fat, muscle fat, or even suffer any decreases in insulin sensitivity.[563] So a medium banana (6g of fructose), an apple (9-10g of fructose), or even a snack-pack of raisins (10g of fructose) is nothing to fear.

Fruit is part of a healthy, well-rounded diet.

Rats given additive drugs spiked with a nauseating agent will *still* continue to consume the drug. However, when their beloved sugar water gets spiked, they stop drinking it. Similarly, rats and humans alike will build up tolerance to addictive drugs, and need to consume more and more – or suffer withdrawal. But with sugar water, rats will only consume more up to a certain point, after which they stop.[564], [565] Sugar lacks the properties of **tolerance** and **withdrawal**, meaning it is not addictive.[566]

The prospect of sugar does light up the regions of the brain shared by getting a fix of cocaine or heroin. But so does getting a hug, listening to music, and anticipating winning money.

Just because something gives you pleasure doesn't automatically make it addictive.

Diets consistent with the current dietary guidelines lower the risk of cardiovascular disease in healthy middle-aged and older women, and promote a dietary pattern associated with a lower risk of obesity.[567], [568]

And yet…

- less than 50% of Americans consume the recommended amounts of nuts, seeds & soy products;
- over 80% fail to meet recommended intake of fruit, vegetables, whole grains, dairy, or seafood;
- more than 90% overeat refined grains.[569]

It's not that the government-provided guidelines are a total shitshow, it's the fact that no one ever seems to follow them.[570]

Sometimes your body runs on carbs. Other times, the fuel it uses is fat. Like a fancy hybrid vehicle, your body switches back and forth. And the particular fuel that is in abundance depends on what you eat.

- If you are eating a higher carb diet, carbs are the more plentiful fuel, so more carbs get burned.
- If you are eating low-carb or keto, you will have a lot of fat-fuel available. Sure you will burn more fat (called *beta-oxidation*), but you will also store more of it. So using fat for fuel doesn't automatically mean you're losing body fat.

The type of fuel you happen to be burning is not what matters for fat loss. What matters is, wait for it, the **total amount** of fuel (calories) you take in vs. the amount that you burn.[571]

That festive party hat each of your kidneys is wearing…those are actually your adrenal glands. But rather than whooping it up, these hard-working glands are busy producing steroid hormones like aldosterone, cortisol, and androgens - aka **salt, sugar and sex** as I learned in physiology class. They are also responsible for the catecholamines epinephrine (adrenaline) and norepinephrine.

In Adrenaland, the "party" never stops, fatigue or no. If it did, you would soon die. Like people who suffer actual adrenal insufficiency, called **Addison's disease**.[572] This is true adrenal failure, and it is life-threatening.[573]

This isn't to say that anyone's ongoing fatigue and ennui aren't real, but the cause ain't "overuse" of the adrenal glands. (Although I'm sure your adrenals do get sick of your shit and wish you'd chill the fuck out.)

Stress and its fallout are real, but adrenal "fatigue" isn't.[574]

The pH Miracle diet claims certain foods cause bone loss, muscle loss, and back pain by forcing the body to produce acid. “If the blood becomes overly acidic from eating too much of the wrong kinds of food -- wheat, bananas, meats, and cheese -- it can lead to weight gain, diabetes, heart disease, cancer, and more.”

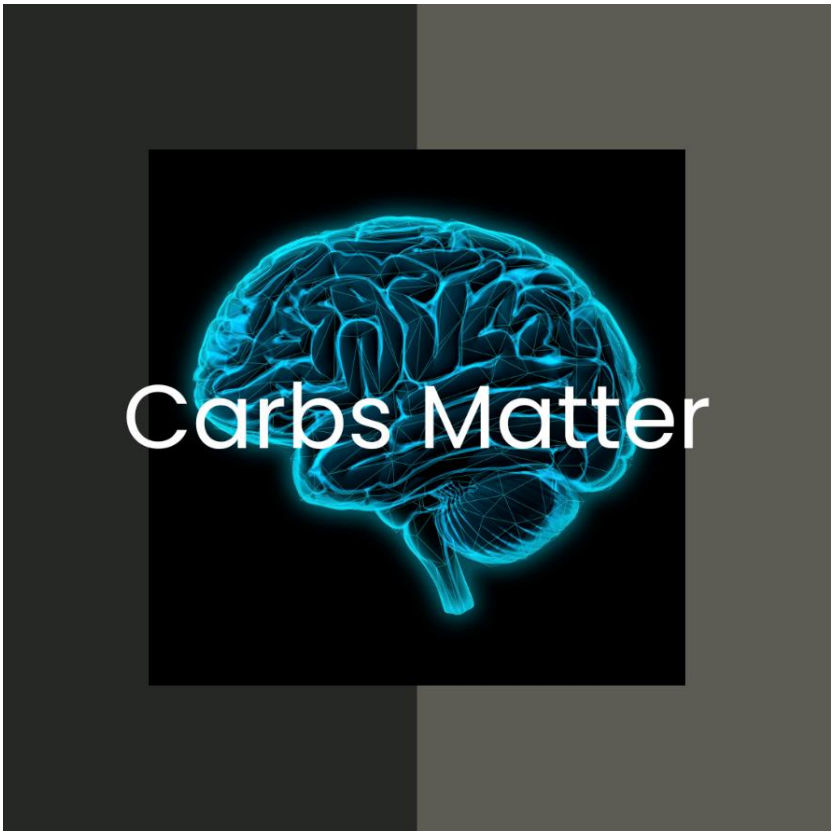
For one thing, whatever enters your stomach gets immersed in a churning vat of stomach acid. So when it exits the stomach, it is - big surprise - acidic. While this acidity *can* change the acidity (pH) of your pee (as can whatever you eat or drink), your urine is contained within your bladder. Its pH *doesn’t* affect the pH of your blood.

So blood pH isn’t affected by pee pH (say *pee pH* five times fast). But pee doesn’t supply nutrients to your organs and cancer cells. Blood does. And blood pH is TIGHTLY controlled. So if blood pH isn’t changing, then according to pH Miracle “logic,” there will be no change in the cancer due to consuming “acid-causing” foods. Or Butterbeer. Or whatever.[575]

Collagen contains **no tryptophan at all**, giving it **a protein quality score of *zero***. It also lacks the mTOR signaler leucine, making it unsuitable for building new muscle.[576] Similarly, for joint pain and connective tissue concerns, collagen supplementation isn't backed by much solid research.

While there does seem to be some support for taking collagen peptides to improve the appearance of skin,[577] when it comes to joints, it's likely that any effects are due to the glycine content.

To regenerate cartilage, try **3-5g of glycine – possibly even up to 10g/day**.[578], [579],[580]



That big brain of yours is picky about food, and its main source of energy is glucose.[581], [582] Carbs matter so much to the brain, it is the only "carbohydrate-dependent organ in the body," advises the ***Institute of Medicine*** (IOM), which established a minimum daily allowance of carbs of **130g**.[583], [584]

Carbs also help fuel exercise, particularly lifting heavy and other high-intensity activities that help us age gracefully.[585]

Consuming carbs ensures that the protein you eat doesn't need to be broken down for energy. In people on a prolonged fast, having 100g of glucose[586] reduced the amount of muscle breakdown significantly, and exerted a near-maximal protein-sparing effect.[587] Since our goal here is to build muscle, nutrition and fitness expert Alan Aragon recommends having **3-8g of carbohydrate per kg of bodyweight**. So if you weigh 56kg (125lbs), your range would be 170-450g of carbs/day.

Despite the constant claims of low carb superiority, the fact is that the people with the lowest levels of heart disease in the world, the Tsimane hunter-gatherers of Bolivia, consume a diet that is over 70% carbohydrate.[588]

Scientific proof that low carb is the "best" diet is lacking. According to a Cochrane review: "Our systematic review failed to show that low-carbohydrate weight-reducing diets are superior to balanced-carbohydrate weight-reducing diets, with little or no difference in weight reduction and cardiovascular risk factors over the short (3 - 8.5 months) and long term (1 to 2 years)."[589]

The review also found that **avoiding whole-food carbs comes with a cost: more risk**.

- The lowest risk of mortality was observed amongst those who consumed a diet containing 50% to 55% carbohydrates.
- low-carb dietary patterns that favor animal fat and protein sources were associated with higher mortality; those favoring plant-based foods were associated with lower mortality.

Not only are plants *not* out to get us, more than 100 years of research confirms just the opposite.[590] "If plants have such toxic compounds, they're really doing a crappy job of killing us," observes **nutrition sciences expert Layne Norton, PhD**. "People who eat plants live longer."[591]

Lectins are proteins found on the surface of beans and wheat that bind to carbohydrates, and interfere with absorption of minerals. However, the foods with the highest amount of active lectins, like beans, are not eaten raw.

Pre-soaking and boiling or stewing them disables the water-soluble lectins, as does any wet, high-heat cooking method.

Consuming legumes and the like is associated with a lower risk of all-cause mortality and stroke.[592] "Lectins can act as an antioxidant, which protects cells from damage caused by free radicals," advises *The Nutrition Source* published by the ***Harvard School of Public Health***. "Lectin-containing foods like legumes, whole grains, and nuts are associated with lower rates of cardiovascular disease, weight loss, and type 2 diabetes. These foods are rich sources of B vitamins, protein, fiber, and minerals, and healthy fats."[593]

A Cochrane review of a number of randomized controlled trials found that reducing saturated fat intake for at least two years resulted in **a 17% reduction in risk** of:

- cardiovascular disease;
- heart disease;
- stroke.

The review also found that replacing saturated fats with polyunsaturated fat or starchy foods gave rise to health benefits.[594]

The **World Health Organization** recommends keeping saturated fat **below 10% of total daily calories**.[595]

The narrative that seed oils are toxic is simply not backed up by human control trials, a consensus of the research, and the body of evidence. Rather, they have all concluded just the opposite.[596], [597], [598], [599]

Here's a fun fact: the artificial sweeteners used in diet soda can actually increase the output of **the beneficial short-chain fatty acid *butyrate***.[600] "Based on human randomized control trials, I could argue that artificial sweeteners have a positive effect on the gut microbiome," says Dr. Layne Norton.[601] Randomized controlled trials have also found that compared to drinking plain water, diet soda proved "superior for weight loss and weight maintenance."[602]

If you're just craving something sweet or trying to take the edge off when the munchies strike, a diet soda can definitely help. To reach the acceptable upper limits of intake of sucralose or aspartame, you'd have to drink a lot of diet soda. For example, in Canada, you would have to down 14 diet iced teas (341 mL) or 20 Diet Cokes (355 mL) daily.[603] But your average "heavy drinker" only consumes about three cans per day, with no issues.[604], [605]

This isn't to try and position diet sodas as "healthy" but they definitely aren't evil. Especially in the broader context: as a tool to fight back against the obesity epidemic.

GROUP 1	GROUP 2A	GROUP 2B	GROUP 3
BOOZE	FRYING FOODS	CARPENTRY & JOINERY	TANNING LEATHER
H. PYLORI INFECTION	GETTING MALARIA	GINKGO BILOBA	CONSUMING WARM MATE
BURNING COAL	BEING A BARBER	ALOE VERA EXTRACT	COLORING YOUR HAIR
BEING A FIREFIGHTER	NIGHT-SHIFT WORK	TRADITIONAL ASIAN PICKLED VEGETABLES	DRINKING COFFEE
GETTING HIV, HEPATITIS B OR C	ANABOLIC STEROIDS	ASPARTAME	FLUORESCENT LIGHTING

606

There are 87mg of the non-nutritive sweetener aspartame in a can of *Coke Zero*.[607] If you started drinking one every day for the next 10 years, your risk of cancer would rise from around 3.1% to, drumroll, 3.3%. "This is why most regulatory agencies across the world have deemed aspartame safe at levels of human intake," says **public-health expert Gideon Meyerowitz-Katz**.

However, aspartame was recently added to the World Health Organization's ***International Agency for Research on Cancer*** (IARC) database of substances that cause – or *might* cause – cancer. Class 1 items have confirmation from mechanistic, animal, and human data. But Class 2 is vague, 2Bs especially with their tenuous rating of *possible*. "Other things that are on the class 2B list don't get quite the same attention as aspartame," adds Meyerowitz-Katz, "presumably because there's nothing we love to hate quite as much as something *artificial*."[608]

The amount of acid in your stomach isn't fixed. Rather, enzymes in the stomach adhere to food particles, generating whatever amount of stomach acid is needed to digest everything. Whether or not you drink water with a meal, the rate of digestion and stomach-emptying is the same. "Even if you had a stomach full of water," says **gastroenterologist Dr. Deborah Proctor**, "it would not interfere with digestion of the food."[609]

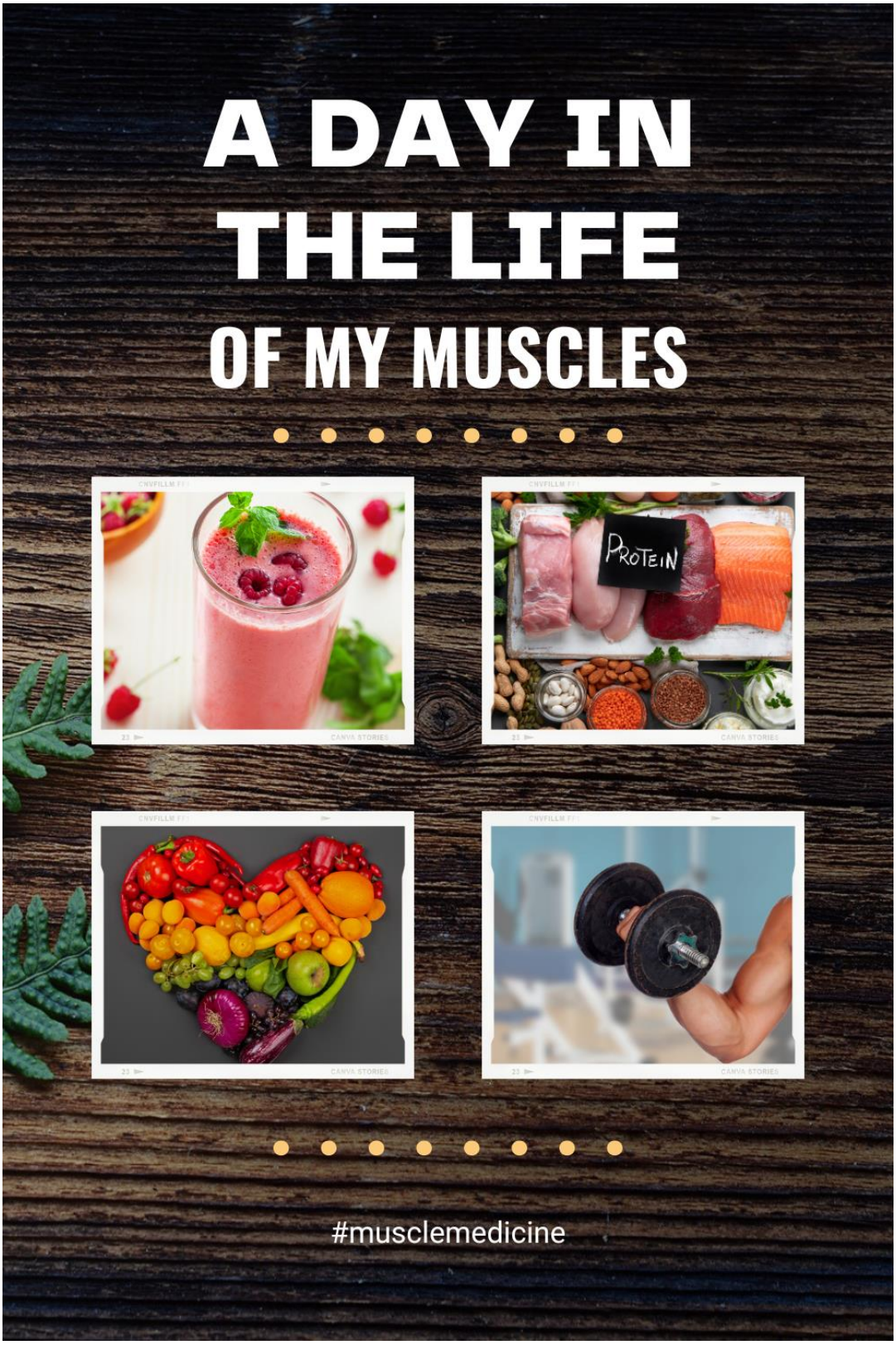
Your body's fluid balance is determined by macronutrient content, electrolytes like sodium and potassium, and a variety of other factors. This is good news because non-insane amounts of coffee – meaning moderate doses of 250-300 mg of caffeine – count toward your daily fluid intake, according to the UK's NHS.

Tea, sugar-free beverages and lower fat milk also count as well.[610], [611]

When you're trying to lose weight and you're sleep-deprived, not only do you eat more junk, but your body similarly makes poor choices in fuel. Instead of choosing body fat, it preferentially tears down muscle. "Sleep curtailment decreased the fraction of weight lost as fat by 55% and increased the loss of fat-free body mass by 60%."[612]

When you prioritize sleep, you prioritize muscle.

And muscle, as we know, is the price of entry to Supernova'dom.


A DAY IN
THE LIFE
OF MY MUSCLES
PROTEIN
#musclemedicine

A Typical Day in the Life of my Muscles

5-5:30	get up & whip up a whey protein isolate shake with frozen berries: 50g protein;10g fiber
8:30'ish	have an orange & a bowl of All-bran with milk or yogurt: 15g fiber
12'ish	my usual gym bro Tupperware lunch of poached chicken breast or fish, rice or sweet potato with veggie-galore stew[613] & an apple: 50g protein; 10g fiber
4-4:30	pre-workout mini-meal - a quick protein shake and some rice, or a turkey sandwich and a banana: 40g protein; 5g fiber
	For ideas about what to eat around training, my go-to is Jeff Nippard, a brawny, brainy fitness nerd.[614]
5:30-6:30	lift heavy shit
6:30	post-workout protein shake & some fruit: 50g protein; 5-10g fiber
9:00	Zzzzzzzzzzzz.

Total: ~175g protein & 50g Fiber


supernova strategy

SUMMARY: Supernova Strategy

MUSCLE

Protein:

- Optimal daily total:1g/lb (2.2g/kg) of ideal bodyweight
- Amount: 50g of protein at meals (leucine threshold)
- When: 50g protein soon after you awake & for your final meal as well (reduce overnight MPB)
- Timing: 4-6 hours between protein meals (refractory period)
- Protein Quality Test: leucine, lysine & methionine
- Pre-bed casein: 40-50g of protein (suppress overnight MPB)
- Every protein meal is an opportunity to stimulate MPS, transforming meals into food-as-medicine weapons against sarcopenia.[615]
- Creatine Dilution Test (D_3Cr)

Microbes:

- Fiber: 30 for 30
- Fermented foods
- Gardening

Supplements:

- Fish oil: ~3g
- Creatine: 5g/day
- Calcium: 1,200 mg/day
- Vitamin D: 800-1,000 IU/day
- Magnesium: 300-420 mg
- Niacin (Vitamin B3): 16mg to 50mg
- Glycine: 3-5g to 10g
- Urolithin A: 500 mg
- Ursolic Acid: 3x150mg (with meals)
- Gotu Kola: 2x500mg capsules

Weights:

- Lift heavy 3-5 times per week
- Pre-Workout mini-meal: carbs & protein
- Post-Workout: 40g of protein within 30 minutes

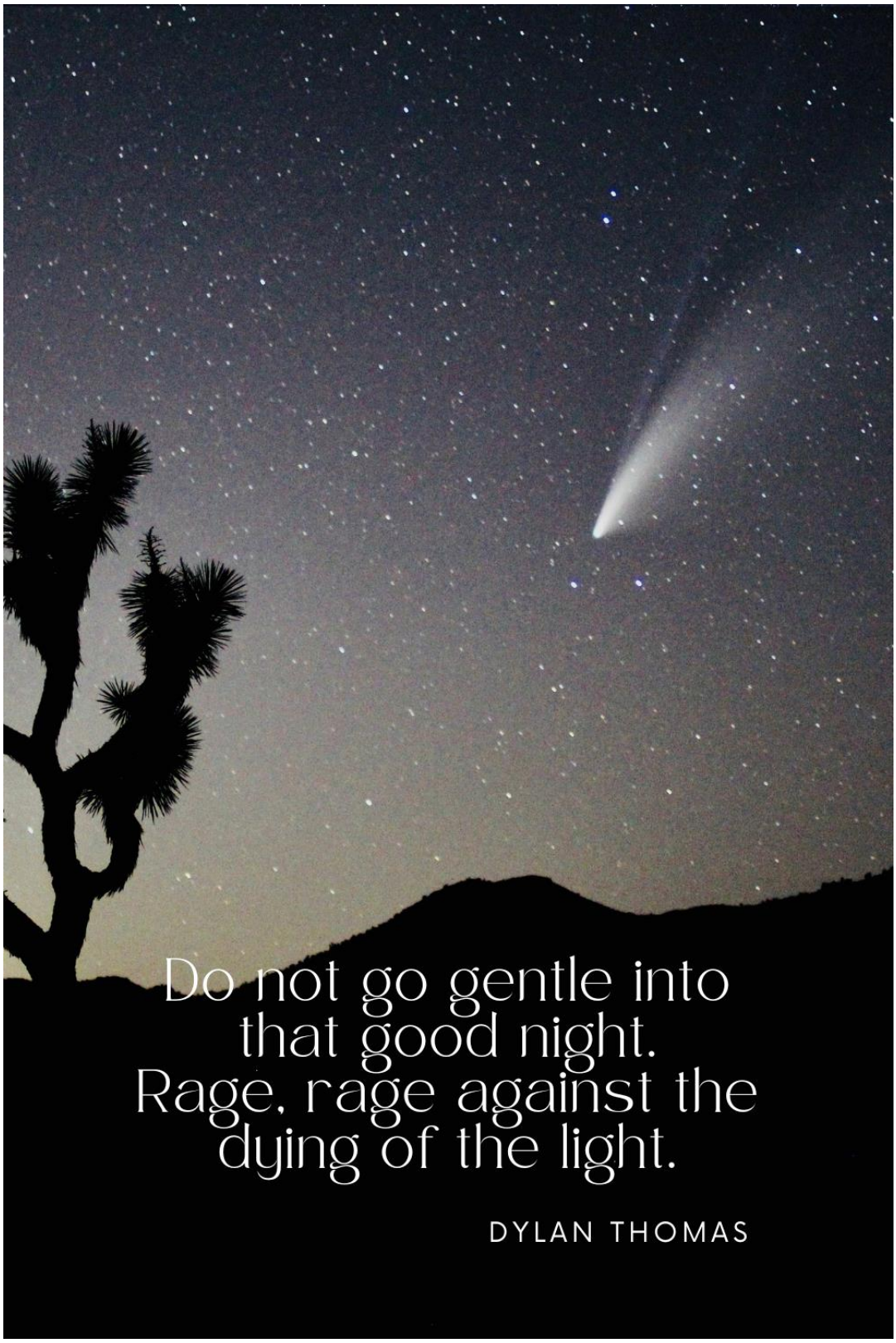
Movement:

- Walk at least 8,000-9,000 steps a day; maybe get a treadmill desk
- Do sprint training twice a week
- Remember: muscle turns over at a rate of 1-2% per day & needs to be stimulated with movement daily

FAT LOSS

- Optimal protein & heavy weights
- Take weekly diet breaks
- Track your calorie intake accurately
- Favor whole foods (TrueFood database)
- Other than milk, avoid liquid calories
- For satiety: protein, fiber, less intense flavors, looks plentiful
- High-quality sleep

RAGE!


Do not go gentle into
that good night.
Rage, rage against the
dying of the light.
DYLAN THOMAS

616

About the Author

One of Yulian's friends once told her she doesn't have an inner child, but an inner gym bro. (You mean not everyone has at least 15 different kinds of protein powder taking over the kitchen?) When she's not lifting heavy shit or meal-prepping something with, what else, protein, she's geeking out over research that actually moves the health & fitness dial.

She rocks violet-purple hair, ridiculous eyeliner, and way too many Iron Maiden tees. She is also obsessed with cheap and chunky gunmetal jewelry that looks like it probably fell off of an industrial machine. Her other hobby is playing the guzheng, an ancient Chinese zither which she named for the famous Chinese woman pirate Madame Ching.

You can tag along on her exploits at YulianYuniverse.com.


SOURCES

Sources

[1] https://www.thenewdaily.com.au/life/relationships/2016/07/30/invisible-woman-syndrome; https://www.wildwomenontop.com/inspiration/will-you-become-invisible-as-you-age/; https://www.dailynews.com/2022/07/24/how-older-women-can-combat-feeling-invisible-or-unseen-in-social-situations/; https://www.theatlantic.com/entertainment/archive/2019/02/akiko-busch-mrs-dalloway-shows-aging-has-benefits/583480/; https://pcar.org/blog/invisible-woman-syndrome-can-make-aging-hard

[2] https://dlisted.com/2022/01/10/paulina-porizkova-says-shes-invisible-to-men-now-that-shes-56/

[3] Dietary Protein, Muscle and Physical Function in the Very Old, *Nutrients* (2018) PMID: 30037048 https://pubmed.ncbi.nlm.nih.gov/30037048/

[4] Growing Older with Health and Vitality: A Nexus of Physical Activity, Exercise and Nutrition, *Biogerontology* (2016) PMID: 26878863 https://pubmed.ncbi.nlm.nih.gov/26878863/

[5] "This systematic review revealed that exercise and physical activity may modulate resting hunger and satiety in older adults. Decreases in fasting leptin and glucose hormones suggest that exercise promotes satiety sensitivity in adults aged 60+." The Effects of Exercise on Appetite in Older Adults: A Systematic Review and Meta-Analysis, *Frontiers in Nutrition* (2021) https://www.frontiersin.org/articles/10.3389/fnut.2021.734267/full

[6] Worldwide, falls are the second leading cause of unintentional injury deaths, and the greatest number of fatal falls is suffered by people over 60. In China, for example, with every death due to a fall, there are 4 cases of permanent disability, 13 cases requiring hospitalization for more than 10 days, 24 cases requiring hospitalization for 1–9 days and 690 cases seeking medical care or missing work/school. *Falls*, World Health Organization (2021) https://www.who.int/news-room/fact-sheets/detail/falls

[7] Falls in the Elderly, *American Family Physician* (2000) https://www.aafp.org/pubs/afp/issues/2000/0401/p2159.html; One-Year Mortality Among Elderly People After Hospitalization Due to Fall-Related Fractures: Comparison With a Control Group of Matched Elderly, *Cademos de Saude Publica* (2012) PMID: 22488325 https://pubmed.ncbi.nlm.nih.gov/22488325/;

[8] *Facts About Falls*, Centers for Disease Control and Prevention https://www.cdc.gov/falls/facts.html https://www.cdc.gov/falls/facts.html

[9] The elevated blood glucose of type 2 diabetes is inextricably connected to the ability of skeletal muscle to uptake glucose and store it as glycogen. Quantification of Muscle Glycogen Synthesis in Normal Subjects and Subjects with Non-Insulin-Dependent Diabetes by 13C Nuclear Magnetic Resonance Spectroscopy, *The New England Journal of Medicine* (1990) https://pubmed.ncbi.nlm.nih.gov/2403659/ via https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3248697/

[10] Live Strong and Prosper: The Importance of Skeletal Muscle Strength for Healthy Ageing, *Biogerontology* (2016) https://link.springer.com/article/10.1007/s10522-015-9631-7

[11] A study of 8,000 people looked at their cardiovascular fitness, as well as their strength. Compared to those who don't make getting strong a priority, folks over 60 who cultivate muscle strength are about 50% less likely to die of all-cause mortality. Muscular Strength and Adiposity as Predictors of Adulthood Cancer Mortality in Men, Cancer *Epidemiology, Biomarkers & Prevention* (2009) https://aacrjournals.org/cebp/article/18/5/1468/164679/Muscular-Strength-and-Adiposity-as-Predictors-of via https://link.springer.com/article/10.1007/s10522-015-9631-7

[12] Muscular Strength and Adiposity as Predictors of Adulthood Cancer Mortality in Men, *Cancer Epidemiology, Biomarkers & Prevention* (2009) https://aacrjournals.org/cebp/article/18/5/1468/164679/Muscular-Strength-and-Adiposity-as-Predictors-of

[13] The Origins of the Obesity Epidemic in the USA–Lessons for Today, *Nutrients* (2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9611578/

[14] What's Wrong with the 'War on Obesity?' A Narrative Review of the Weight-Centered Health Paradigm and Development of the 3C Framework to Build Critical Competency for a Paradigm Shift. *SAGE Open* (2018) https://journals.sagepub.com/doi/10.1177/2158244018772888

[15] Obesity Statistics, *Primary Care* (2016) https://pubmed.ncbi.nlm.nih.gov/26896205/

[16] "We do not need another diet trial; we need a change of paradigm," editorialized Katan (2009) in *The New England Journal of Medicine* in response to yet another study demonstrating at best, moderate short-term effects. Weight-Loss Diets for the Prevention and Treatment of Obesity (2009)

https://www.nejm.org/doi/abs/10.1056/NEJMe0810291 via What's Wrong with the 'War on Obesity?' A Narrative Review of the Weight-Centered Health Paradigm and Development of the 3C Framework to Build Critical Competency for a Paradigm Shift. *SAGE Open* (2018) https://journals.sagepub.com/doi/10.1177/2158244018772888

[17] https://drgabriellelyon.com/; Interview with Dr. Lyon (2022) https://www.youtube.com/watch?v=50_WNgrR15A

[18] Increased lean, and especially skeletal, muscle mass has been associated with better cardiometabolic health in various epidemiological studies, even in younger age groups." The Role of Skeletal Muscle Mass on Cardiovascular Disease Risk: An Emerging Role on Modulating Lipid Profile, *Current Opinion in Cardiology* (2023) PMID: 36928171 https://pubmed.ncbi.nlm.nih.gov/36928171/

[19] "Sarcopenia, defined as skeletal muscle loss and dysfunction, is attracting considerable attention as a novel risk factor for cardiovascular events." Impact of Skeletal Muscle Mass on Long-Term Adverse Cardiovascular Outcomes in Patients with Chronic Kidney Disease, *The American Journal of Cardiology* (2017) PMID: 28215411 https://pubmed.ncbi.nlm.nih.gov/28215411/

[20] "Cardiometabolic disease remains a leading cause of morbidity and mortality in developed nations...These data demonstrate a potential link between myofiber composition and cardiometabolic health outcomes in a cohort of premenopausal women." Associations of Human Skeletal Muscle Fiber Type and Insulin Sensitivity, Blood Lipids, and Vascular Hemodynamics in a Cohort of Premenopausal Women, *European Journal of Applied Physiology* (2017) PMID: 28497385 https://pubmed.ncbi.nlm.nih.gov/28497385/

[21] Falls, *World Health Organization* (2021) https://www.who.int/news-room/fact-sheets/detail/falls; Falls in the Elderly, *American Family Physician* (2000) https://www.aafp.org/pubs/afp/issues/2000/0401/p2159.html

[22] Older Adult Fall Prevention, CDC (2022) https://www.cdc.gov/falls/index.html

[23] Sarcopenia: Burden and Challenges for Public Health, *Archives of Public Health* (2014) https://archpublichealth.biomedcentral.com/articles/10.1186/2049-3258-72-45

[24] Muscle Tissue Changes with Aging, *Current Opinion in Clinical Nutrition and Metabolic Care* (2004) https://pubmed.ncbi.nlm.nih.gov/15192443/

[25] Sarcopenia is also expensive to society at large. It already cost more than $18 billion in the US alone in the year 2000. The Health Economics Burden of Sarcopenia: a Systematic Review, *Maturitas* (2019) https://www.sciencedirect.com/science/article/pii/S0378512218306996

[26] Ageing and Health, *World Health Organization* (2022) https://www.who.int/news-room/fact-sheets/detail/ageing-and-health

[27] Prevalence of Sarcopenia in the World: A Systematic Review and Meta- Analysis of General Population Studies, *Journal of Diabetes & Metabolic Disorders* (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5434551/

[28] "Muscle plays a central role in whole-body protein metabolism, and prevention of many common pathologic conditions and chronic diseases." Declining strength is closely associated with declining health-span; under drastic conditions, like starvation, when muscle mass runs out of amino acids, death occurs. The Underappreciated Role of Muscle in Health and Disease, *The American Journal of Clinical Nutrition* (2006) https://www.sciencedirect.com/science/article/pii/S0002916523290450

[29] In the case of trauma, cancer, and other critical illnesses, having more muscle is associated with longer lengths of survival, as well as improved recovery. The Underappreciated Role of Muscle in Health and Disease, *The American Journal of Clinical Nutrition* (2006) https://ajcn.nutrition.org/article/S0002-9165(23)29045-0/fulltext

[30] The Role of Skeletal Muscle Glycogen Breakdown for Regulation of Insulin Sensitivity by Exercise, *Frontiers in Physiology* (2011) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3248697/

[31] https://en.wikipedia.org/wiki/Glycogen

[32] Problems Associated with Glucose Toxicity: Role of Hyperglycemia-Induced Oxidative Stress, *World Journal of Gastroenterology* (2009) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2738809/

[33] Skeletal Muscle Insulin Resistance: Roles of Fatty Acid Metabolism and Exercise, *Physical Therapy* (2008) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2579902/

[34] The repackaging of glucose into glycogen involves various enzymes. The enzyme glycogenin forms a core protein around which branches of glucose units get added. A single granule of glycogen can contain 30,000 glucose units. Glycogen Synthesis, *Encyclopedia of Sleep* (2013) https://www.sciencedirect.com/topics/immunology-and-microbiology/glycogen-synthesis | *Glycogen* https://encyclopedia2.thefreedictionary.com/glycogen | *Difference Between Glycogen and Glucose* (2011) https://www.differencebetween.com/difference-between-glycogen-and-vs-glucose/ | *Glycogen* https://en.wikipedia.org/wiki/Glycogen

[35] The vast majority of whole-body glucose uptake is due to synthesis of muscle glycogen. Cellular Mechanisms of Insulin Resistance, *The Journal of Clinical Investigation* (2000) https://www.jci.org/articles/view/10583

[36] The offspring of diabetics also suffer. "Compared to age- and weight-matched control subjects, the children of diabetics had a 50% reduction in the rate of insulin-stimulated whole-body glucose metabolism, mainly due to a decrease in rates of muscle glycogen synthesis." Cellular Mechanisms of Insulin Resistance, *The Journal of Clinical Investigation* (2000) https://www.jci.org/articles/view/10583

[37] Glucose Uptake by Skeletal Muscle within the Contexts of Type 2 Diabetes and Exercise: An Integrated Approach, *Nutrients* (2022) https://pubmed.ncbi.nlm.nih.gov/35277006/

[38] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2579902/

[39] The Role of Skeletal Muscle Insulin Resistance in the Pathogenesis of the Metabolic Syndrome, *PNAS* (2007) https://www.pnas.org/doi/full/10.1073/pnas.0705408104

[40] Exercising for Insulin Sensitivity – Is There a Mechanistic Relationship with Quantitative Changes in Skeletal Muscle Mass? *Frontiers in Physiology* (2021) https://www.frontiersin.org/articles/10.3389/fphys.2021.656909/full

[41] Role of Skeletal Muscle in Insulin Resistance and Glucose Uptake, *Comprehensive Physiology* (2020) https://onlinelibrary.wiley.com/doi/10.1002/cphy.c190029

[42] Live Strong and Prosper: The Importance of Skeletal Muscle Strength for Healthy Ageing, *Biogerontology* (2016) https://link.springer.com/article/10.1007/s10522-015-9631-7

[43] D3-Creatine Dilution to Assess Muscle Mass, *The Journals of Gerontology* (2018) https://academic.oup.com/biomedgerontology/article/74/6/842/5095925 via The Association of Muscle Mass Measured by D3-Creatine Dilution Method With Dual-Energy X-Ray Absorptiometry and Physical Function in Postmenopausal Women, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* (2021) https://pubmed.ncbi.nlm.nih.gov/33475725/; Because this test assesses actual muscle mass, it is more accurate than dual-energy x-ray absorptiometry (DXA).

[44] Creatine in Humans with Special Reference to Creatine Supplementation, *Sports Medicine* (1994) https://pubmed.ncbi.nlm.nih.gov/7817065/

[45] As such, we don't have a daily protein requirement but we do have a requirement for the 20 amino acids. So we would do well to think of protein the way we do a vitamin pill – it's not the pill we want but the vitamins it contains. Interview with protein-synthesis expert Dr. Donald Layman https://www.youtube.com/watch?v=BqmG2y4IeY8

[46] The Size of the Human Proteome: The Width and Depth, *International Journal of Analytical Chemistry* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889822/

[47] Interview with protein synthesis expert Dr. Donald Layman https://www.youtube.com/watch?v=6NNBgm0c3zY

[48] The Underappreciated Role of Muscle in Health and Disease, *The American Journal of Clinical Nutrition* (2006) https://ajcn.nutrition.org/article/S0002-9165(23)29045-0/fulltext

[49] Interview with Dr. Donald Layman https://www.youtube.com/watch?v=BqmG2y4IeY8&t=2265s

[50] Protein Turnover, Amino Acid Requirements and Recommendations for Athletes And Active Populations, *Brazilian Journal of Medical and Biological Research* (2012) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3854183/

[51] https://www.ajinomoto.com/amino-acids/20-amino-acids

[52] *On Protein Synthesis* by F.H.C. Crick, Symp. Soc. Exp. Biol., 12 (1958), pp. 138-163. Crick, together with James Watson, deciphered the structure of DNA in 1953.

[53] Interview with Dr. Layman https://www.youtube.com/watch?v=BqmG2y4IeY8

[54] essential amino acid emojis: https://soylent.com/blogs/news/a-guide-to-the-9-essential-amino-acids-and-why-we-need-them; codon image *via Genetic Code* (2023), National Human Genome Research Institute https://www.genome.gov/genetics-glossary/Genetic-Code; illustration of a cell: https://discover.hubpages.com/education/Cell-Cell-Theory-NucleusCell-Wall-and-Cytoplasmic-Organelles

[55] The codon for tryptophan is UGG, and methionine's codon is AUG. Leucine has four codons: CUU, CUC, CUA & CUG. *Genetic Code* (2023), National Human Genome Research Institute https://www.genome.gov/genetics-glossary/Genetic-Code

[56] images: construction plans - https://unsplash.com/@sxoxm; bricks - https://unsplash.com/@mufidpwt; construction workers - https://unsplash.com/@jramos10

[57] *A Guide to Amino Acid and Protein Nutrition* (2017) by Robert R. Wolfe, PhD

[58] "Muscle protein breakdown (MPB) is an important metabolic component of muscle remodeling, adaptation to training, and increasing muscle mass…Muscle proteins are constantly turning over, i.e., broken down (or degraded) and synthesized. The balance between the rates of synthesis and degradation of muscle protein pools, i.e., net muscle protein balance, determines the amount of that protein in muscle." Assessing the Role of Muscle Protein Breakdown in Response to Nutrition and Exercise in Humans, *Sports Medicine* (2018) https://pubmed.ncbi.nlm.nih.gov/29368185/

[59] "Provided adequate muscle mass is available…the ability of net muscle protein breakdown to maintain plasma amino acid concentrations is remarkable." The Underappreciated Role of Muscle in Health and Disease, *The American Journal of Clinical Nutrition* (2006) https://ajcn.nutrition.org/article/S0002-9165(23)29045-0/fulltext

[60] "Protein intake at breakfast might have relatively stronger effects on skeletal muscle mass than at lunch and dinner…Adequate protein intake in the morning is important for maintaining muscle mass and strength, **with the effect being more pronounced in women**." Supplementation of Protein at Breakfast Rather Than at Dinner and Lunch is Effective on Skeletal Muscle Mass in Older Adults, *Frontiers in Nutrition* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8724572/

[61] When typical daily protein distribution of ~10g for breakfast, 15g for lunch, and 65g for dinner was redistributed to triple the amount at breakfast, **24-hour MPS went up a full 25%**. Dietary Protein Distribution Positively Influences 24-H Muscle Protein Synthesis in Healthy Adults, *The Journal of Nutrition* (2014) https://pubmed.ncbi.nlm.nih.gov/24477298/

[62] A high-protein breakfast has been found to reduce food cravings later in the day, especially on high-fat and/or high-sugar snacks in the evening. In the long term, a high-protein breakfast prevents gaining body fat. Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, *Applied Physiology, Nutrition, and Metabolism* (2016). https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550

[63] Dietary Protein Distribution Positively Influences 24-h Muscle Protein Synthesis in Healthy Adults, *The Journal of Nutrition* (2014) https://pubmed.ncbi.nlm.nih.gov/24477298/

[64] Interview with protein-synthesis expert Dr. Donald Layman https://www.youtube.com/watch?v=6NNBgm0c3zY

[65] Consuming 40-48g of casein protein before going to bed increases the rates of overnight protein synthesis. Pre-Sleep Protein Ingestion Increases Mitochondrial Protein Synthesis Rates During Overnight Recovery from Endurance Exercise: A Randomized Controlled Trial, *Sports Medicine* (2023) https://link.springer.com/article/10.1007/s40279-023-01822-3 | Pre-Sleep Protein Ingestion to Improve the Skeletal Muscle Adaptive Response to Exercise Training, *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5188418/

[66] 30–40 g of casein (milk protein) 30 minutes before bedtime increased muscle protein synthesis overnight in both young and elderly men. Increasing Muscle Mass in Elders through Diet and Exercise: A Literature Review of Recent RCTs, *Foods* (2023) https://pubmed.ncbi.nlm.nih.gov/36981144/; https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550

[67] Casein particles are coagulated both by the enzyme pepsin, which markedly slows the rate of gastric emptying. Formation of a Structured Clot During the Gastric Digestion Of Milk: Impact on the Rate of Protein Hydrolysis, *Food Hydrocolloids* (2016) https://www.sciencedirect.com/science/article/abs/pii/S0268005X15300333

[68] It is named for the remote location on which it was discovered in the mid-1960s: *Rapa Nui*, which is what the Easter Island locals call their island home. A Treasure from a Barren Island: the Discovery of Rapamycin, *Clinical Kidney Journal* (2022) PMID: 36158154 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9494524/

[69] https://www.cancer.gov/publications/dictionaries/cancer-terms/def/kinase; https://en.wikipedia.org/wiki/MTOR

[70] Corn is surprisingly high in leucine. Unfortunately, it's also limiting in lysine, which makes it less than ideal for stimulating MPS on its own. Protein Content and Amino Acid Composition of Commercially Available Plant-Based Protein Isolates, *Amino Acids* (2018) https://link.springer.com/article/10.1007/s00726-018-2640-5

[71] Regulation of Skeletal Muscle Function by Amino Acids, *Nutrients* (2020) PMID: 31963899 https://pubmed.ncbi.nlm.nih.gov/31963899/

[72] A good 80% of leucine goes toward synthesizing protein. The Role of Leucine and its Metabolites in Protein and Energy Metabolism, *Amino Acids* (2016) PMID: 26255285 https://pubmed.ncbi.nlm.nih.gov/26255285/

[73] "An adult human being synthesizes some 5·7 g of protein/kg body weight/day, accounting for 18·8 % of fasting metabolic rate or 12·9 % of total energy expenditure…Much of the thermogenesis associated with protein intake can be attributed to increased protein synthesis and catabolism (both of which are ATP expensive)." The Metabolism of "Surplus" Amino Acids, *British Journal of Nutrition* (2012)

https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/metabolism-of-surplus-amino-acids/83AA18D847252C78AF8EA42958D50101

[74] Optimizing Adult Protein Intake During Catabolic Health Conditions, *Advances in Nutrition* (2020) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7360447/

[75] https://fdc.nal.usda.gov/fdc-app.html#/?component=1213

[76] Defining Meal Requirements for Protein to Optimize Metabolic Roles of Amino Acids, *The American Journal of Clinical Nutrition* (2015) https://www.sciencedirect.com/science/article/pii/S0002916523274286

[77] "Leucine is the primary factor directing postprandial mTOR signaling and peak stimulation of MPS, but…elevated plasma Leu is not sufficient to produce sustained elevations of MPS." The Leucine Content of a Complete Meal Directs Peak Activation but Not Duration of Skeletal Muscle Protein Synthesis and Mammalian Target of Rapamycin Signaling In Rats, *The Journal of Nutrition* (2009) https://pubmed.ncbi.nlm.nih.gov/19403715/

[78] Timing and Distribution of Protein Ingestion During Prolonged Recovery from Resistance Exercise Alters Myofibrillar Protein Synthesis, *The Journal of Physiology* (2013) https://physoc.onlinelibrary.wiley.com/doi/full/10.1113/jphysiol.2012.244897

[79] "It appears that the signal to maintain elevated protein synthesis is still being 'transmitted' but for some reason protein synthesis is becomes refractory after a certain period of time," explains Layne Norton, PhD, Nutrition Sciences https://simplyshredded.com/the-truth-about-protein.html

[80] MPS seems to be modulated by how much substrate (amino acids) is available. The Anabolic Response to Protein Ingestion During Recovery from Exercise Has No Upper Limit in Magnitude and Duration In Vivo In Humans, *Cell Reports Medicine* (2023) PMID: 38118410 https://pubmed.ncbi.nlm.nih.gov/38118410/

[81] https://cheatdaydesign.com/what-does-100g-of-protein-look-like/

[82] https://www.medicalnewstoday.com/articles/protein-in-shrimp

[83] *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[84] The Functions of Carbohydrates in the Body, *Human Nutrition* (2017) https://ecampusontario.pressbooks.pub/humannutrition/chapter/the-functions-of-carbohydrates-in-the-body/

[85] Effects of Combining a Ketogenic Diet with Resistance Training on Body Composition, Strength, and Mechanical Power in Trained Individuals: A Narrative Review, *Nutrients* (2021) PMID: 34578961 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8469041/

[86] "A recent (massive) review by Ashtary-Larky and colleagues examined the ketogenic diet literature spanning from 1921 to the present day. Among their conclusions was that in resistance-trained individuals, lean mass loss tends to be greater with ketogenic diets versus higher-carb/lower-fat control diets. A 13-study systematic review and meta-analysis led by the same authors reinforces the finding that restricting carbohydrate to ketogenic levels (<10 percent of total energy, or less than ~50 grams per day) is counterproductive to the goal of maximizing rates of muscle hypertrophy or retention." *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[87] *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[88] Can the Digestible Indispensable Amino Acid Score Methodology Decrease Protein Malnutrition, *Animal Frontiers* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6952019/; https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score

[89] Except collagen, which is entirely lacking in the EAA tryptophan.

[90] When a protein lacks key EAAs, it can affect how satiating it is. "The quality or type of protein appears to be involved in hunger suppression." Dietary Protein – Its Role in Satiety, Energetics, Weight Loss and Health, *British Journal of Nutrition* (2012) https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/dietary-protein-its-role-in-satiety-energetics-weight-loss-and-health/CCA49F7254E34FF25FD08A78A05DECD7

[91] https://en.wikipedia.org/wiki/Digestible_Indispensable_Amino_Acid_Score

[92] Interview with protein expert Dr. Donald Layman https://www.youtube.com/watch?v=BqmG2y4IeY8

[93] To hit 17g of protein, you would have to eat 50-60% more wheat bran.

[94] Protein quality: What is it, What Affects It, and How Much Does it Matter? *Stronger by Science* (2022) https://www.youtube.com/watch?v=UOcbKkznFOg

[95] https://www.feastingathome.com/creamy-pea-pasta/

[96] https://www.skinnytaste.com/air-fryer-chickpeas/

[97] https://highlandsranchfoodie.com/corn-succotash-recipe-edamame/

[98] Even when plant-based protein blends are mixed to have a DIAAS score equivalent to whey protein isolate, and equivalent leucine, the resulting levels of essential amino acids in the blood are not bio-equivalent to whey protein isolate. Differential Responses of Blood Essential Amino Acid Levels Following Ingestion of High-Quality Plant-Based Protein Blends Compared to Whey Protein—A Double-Blind Randomized, Cross-Over, Clinical Trial, *Nutrients* (2019) PMID: 31817691 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6950667/ via Dr. Layne Norton, *Vegan Protein Sources vs Animal Protein Sources* https://www.youtube.com/watch?v=TbhnG7xFOUU.

[99] "This suggests that even when you equate leucine and EAAs and digestibility/bioavailability, whey protein is still about 30% better at increasing the area under the curve over 4-hour period of blood levels of EAAs and blood leucine." Nutrition sciences expert Layne Norton, PhD. He also points out that the study was funded by Danone Research, which sells both regular dairy products and vegan products & Sequel Naturals (the Vega brand of vegan protein supplements) so the research wasn't concealing any secret pro-animal-product agendas. https://www.youtube.com/watch?v=TbhnG7xFOUU

[100] "When the energy content of the protein source is accounted for, the caloric intake needed to meet the EAA requirements from plant sources of protein is considerably higher than the caloric intake from animal sources of protein." Protein Consumption and the Elderly: What Is the Optimal Level of Intake? *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4924200/

[101] "There are ample data to show that protein supplementation with plant-derived proteins can (also) support greater gains in muscle mass and strength when combined with prolonged resistance-type exercise training…Most plant-based proteins have a low(er) essential amino acid content and are often deficient in one or more specific amino acids, such as lysine and methionine. The proposed lower anabolic properties of plant- versus animal-derived proteins may be compensated for by (i) consuming a greater amount of the plant-derived protein or plant-based protein source to compensate for the lesser quality; (ii) using specific blends of plant-derived proteins to create a more balanced amino acid profile; or (iii) fortifying the plant-based protein (source) with the specific free amino acid(s) that is (are) deficient." The Anabolic Response to Plant-Based Protein Ingestion, *Sports Medicine* (2021) PMID: 34515966 https://pubmed.ncbi.nlm.nih.gov/34515966/

[102] Layne Norton, PhD Nutrition Sciences, *Vegan Protein Sources VS Animal Protein Sources* https://www.youtube.com/watch?v=TbhnG7xFOUU; Potato Protein Isolate Stimulates Muscle Protein Synthesis at Rest and with Resistance Exercise in Young Women, *Nutrients* (2020) https://pubmed.ncbi.nlm.nih.gov/32349353/

[103] Agricultural behemoth Cargill apparently has a corn isolate in the works. http://meatreality.org/?p=758480

[104] Research has found that resistance-trained men and women can safely have up to 4.4g/kg/day, which is well over 300g of protein. The Effects of Consuming a High Protein Diet (4.4g/kg/d) on Body Composition in Resistance-Trained Individuals, *Journal of the International Society of Sports Nutrition* (2014) https://pubmed.ncbi.nlm.nih.gov/24834017/

[105] The trouble with calculating protein as a percentage of total calories is that, as you get older, you run the risk of not consuming enough protein. So, based on decades of research and trials, protein expert Dr. Donald Layman recommends women go no lower than 100g of protein per day. "If women fall below about 100g of protein per day, a lot of the metabolic effects (of protein) are lost," he explains. "We try to target them in the 100-120g/day range as this number seems to work well." Interviews with Dr. Layman https://www.youtube.com/watch?v=LwepGFlrnQA & https://www.youtube.com/watch?v=H5ADrn0e41Y

[106] It starts with knowing what to eat, particularly protein. In a study of how people's knowledge of the importance of protein impacted how much muscle mass they retained after the age of 60, those with "normal" muscle had indeed had a much higher intake of protein. Low protein intake was correlated with "insufficient" awareness of the importance of consuming protein. Association Between Dietary Knowledge and Muscle Mass in Chinese Older Adults: A Cross-Sectional And Longitudinal Study, *BMJ Open* (2023) PMID: 38056943 https://pubmed.ncbi.nlm.nih.gov/38056943/

[107] Strategies to Prevent Sarcopenia in the Aging Process: Role of Protein Intake and Exercise, *Nutrients* (2022) https://www.mdpi.com/2072-6643/14/1/52

[108] Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, *Applied Physiology, Nutrition, and Metabolism* (2016) https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550; Intake of protein can safely go pretty high. As long as your kidneys are healthy, research has found that resistance-trained men and women can have up to 4.4g/kg/day, which is over 300g of protein. The Effects of Consuming a High Protein Diet (4.4g/kg/d) on Body Composition in Resistance-Trained Individuals, *Journal of the International Society of Sports Nutrition* (2014) https://pubmed.ncbi.nlm.nih.gov/24834017/

[109] Pre-Sleep Protein Ingestion Increases Mitochondrial Protein Synthesis Rates During Overnight Recovery from Endurance Exercise: A Randomized Controlled Trial, *Sports Medicine* (2023) https://link.springer.com/article/10.1007/s40279-023-01822-3 | Pre-Sleep Protein Ingestion to Improve the Skeletal Muscle Adaptive Response to Exercise Training, *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5188418/ |

[110] https://healthystepsnutrition.com/wprm_recipe/wprm-casein-pudding/

[111] I quite like the casein from Optimum Nutrition. https://www.optimumnutrition.com/en-us/Products/Shakes-&-Powders/Gold-Standard-100%25-Casein/p/100-casein-time-release-proteine

[112] Proposed by protein expert Dr. Donald Layman https://www.youtube.com/watch?v=BqmG2y4IeY8

[113] *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[114] "Anabolic resistance describes the reduced stimulation of muscle protein synthesis to a given dose of protein/amino acids and contributes to declines in skeletal muscle mass." Defining Anabolic Resistance: Implications for Delivery of Clinical Care Nutrition, *Current Opinion in Critical Care* (2018) PMID: 29389741 https://pubmed.ncbi.nlm.nih.gov/29389741/

[115] Optimizing Adult Protein Intake During Catabolic Health Conditions, *Advances in Nutrition* (2020) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7360447/

[116] This means less muscle gets made, and since muscle functions as the body's storage for precious amino acids, it's vital that the body is as sensitive as possible to any protein you eat. Regulation of Skeletal Muscle Function by Amino Acids, *Nutrients* (2020) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7019684/

[117] *Why Do We Need Protein and Physical Activity?* (2021) https://www.youtube.com/watch?v=huTlXfKHtVQ

[118] Growing Older with Health and Vitality: A Nexus Of Physical Activity, Exercise and Nutrition, *Biogerontology* (2015) PMID: 26878863 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889705/

[119] One Week of Bed Rest Leads to Substantial Muscle Atrophy and Induces Whole-Body Insulin Resistance in the Absence of Skeletal Muscle Lipid Accumulation, *Diabetes* (2016) https://pubmed.ncbi.nlm.nih.gov/27358494/

[120] "Muscle atrophy during prolonged (>10 days) disuse is brought about primarily by declines in post-absorptive and post-prandial muscle protein synthesis rates…successive short periods of muscle disuse, due to sickness or injury, accumulate throughout an individual's lifespan and contributes considerably to the net muscle loss observed with aging." Skeletal Muscle Atrophy During Short-Term Disuse: Implications For Age-Related Sarcopenia, *Ageing Research Reviews* (2013) PMID: 23948422 https://pubmed.ncbi.nlm.nih.gov/23948422/

[121] Relevant losses in muscle functionality are well documented in the elderly during the first ten days of bed rest. Strategies to Prevent Sarcopenia in the Aging Process: Role of Protein Intake and Exercise, *Nutrients* (2021) https://www.mdpi.com/2072-6643/14/1/52

[122] This includes osteoarthritis and inflammatory conditions around rheumatoid arthritis. Interview with Dr. Phillips https://www.youtube.com/watch?v=9VwXfzZwwng

[123] "Specifically, physical activity guidelines for older adults should discourage prolonged periods of muscle disuse and should be refined to include reference to performing some form of resistive-type exercise as being fundamental to preserving muscle mass and function." Growing Older with Health and Vitality: A Nexus Of Physical Activity, Exercise and Nutrition, *Biogerontology* (2015) PMID: 26878863 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889705/

[124] Why Do Seniors Leave Resistance Training Programs?, *Clinical Interventions in Aging* (2017) PMID: 28392682 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5375632/

[125] Physical Activity in Older Age: Perspectives for Healthy Ageing and Frailty, *Biogerontology* (2016) PMID: 26936444 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889622/

[126] "A relatively short-term exercise intervention is associated with enhanced rates of wound healing among healthy older adults". Exercise Accelerates Wound Healing Among Healthy Older Adults: A Preliminary Investigation, *The Journals of Gerontology: Series A* (2005) https://academic.oup.com/biomedgerontology/article/60/11/1432/623101

[127] "Muscle disuse can lead to insulin resistance and type II diabetes, which is fundamentally a disease of muscle." The Danger of Weight Loss in the Elderly, *The Journal of Nutrition, Health and Aging* (2008) https://www.sciencedirect.com/science/article/pii/S1279770723023722

[128] Physical Activity in Older Age: Perspectives for Healthy Ageing and Frailty, *Biogerontology* (2016) PMID: 26936444 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889622/

[129] Association of Step Counts Over Time with the Risk Of Chronic Disease in the All of Us Research Program, *Nature Medicine* (2022) https://www.nature.com/articles/s41591-022-02012-w

[130] Effects of 10,000 Steps a Day on Physical and Mental Health in Overweight Participants in a Community Setting: A Preliminary Study, *Brazilian Journal of Physical Therapy* (2016) PMID: 27556393 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5015672/

[131] Systematic Review of the Prospective Association of Daily Step Counts with Fisk of Mortality, Cardiovascular Disease, and Dysglycemia, *International Journal of Behavioral Nutrition and Physical Activity* (2020) https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-020-00978-9

[132] Taking more than 10,000 steps per day was not associated with further reduction in mortality risk. Steps Per Day and All-Cause Mortality in Middle-Aged Adults in the Coronary Artery Risk Development in Young Adults Study, *JAMA Network Open* (2021). https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2783711

[133] *IN PRAISE OF WALKING: A New Scientific Exploration* (2020) by Shane O'Mara

[134] https://www.theguardian.com/lifeandstyle/2019/jul/28/its-a-superpower-how-walking-makes-us-healthier-happier-and-brainier

[135] *THE EXTENDED MIND: The Power of Thinking Outside the Brain* (2022) by Annie M. Paul

[136] A 30-60 minute walk every day is a great way to maintain your health. The Importance of Walking to Public Health, *Medicine & Science in Sports & Exercise* (2008) https://journals.lww.com/acsm-msse/Fulltext/2008/07002/The_Importance_of_Walking_to_Public_Health.2.aspx

[137] Brain-Derived Neurotrophic Factor and Its Clinical Implications, *Archives of Medical Science* (2015) PMID: 26788077 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4697050/

[138] *IN PRAISE OF WALKING: A New Scientific Exploration* (2020) by Shane O'Mara

[139] Dr. Luc van Loon, *Why Do We Need Protein and Physical Activity?* (2021) https://www.youtube.com/watch?v=huTlXfKHtVQ

[140] How Many Steps/Day Are Enough? For Older Adults and Special Populations, *International Journal of Behavioral Nutrition and Physical Activity* (2011) PMID: 21798044 https://pubmed.ncbi.nlm.nih.gov/21798044/

[141] *THE SCIENCE OF SELF-CONTROL: 53 Tips to Stick to Your Diet, Be More Productive and Excel in Life* (2021) by Menno Henselmans

[142] https://www.verywellfit.com/should-you-use-a-treadmill-desk-3436654

[143] To calculate how many steps you would get per hour using a treadmill desk, count how many steps you take in a minute, and multiply that number by 60. https://scarysymptoms.com/2016/11/many-steps-day-treadmill-desk-offset-sitting-disease/

[144] A Systematic Review and Meta-Analysis of the Effect Of Treadmill Desks on Energy Expenditure, Sitting Time and Cardiometabolic Health In Adults, *BMC Public Health* (2021) https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-12094-9 | A Systematic Review of Standing and Treadmill Desks in the Workplace, *Preventive Medicine* (2015) https://pubmed.ncbi.nlm.nih.gov/25448843/

[145] Pedometer Use Increases Daily Steps and Functional Status in Older Adults, *Journal of the American Medical Directors Association* (2011) PMID: 21450191 https://pubmed.ncbi.nlm.nih.gov/21450191/

[146] Impact of Activity Tracker Usage in Combination with a Physical Activity Intervention on Physical and Cognitive Parameters in Healthy Adults Aged 60+: A Randomized Controlled Trial, *International Journal of Environmental Research and Public Health* (2022) PMID: 35409466 https://pubmed.ncbi.nlm.nih.gov/35409466/

[147] Active Wearable Device Utilization Improved Physical Performance and IGF-1 Among Community-Dwelling Middle-Aged and Older Adults: A 12-Month Prospective Cohort Study, *Aging* (2021) PMID: 34343970 https://pubmed.ncbi.nlm.nih.gov/34343970/

[148] https://www.everydayhealth.com/fitness/how-to-fit-in-more-steps-every-day/

[149] via https://www.onegreenplanet.org/lifestyle/25-ways-to-sneak-in-more-exercise-every-day/

[150] *Can Women's Health Get Better with Age?* Interview with Stacy Sims, PhD (2023) https://www.youtube.com/watch?v=NGxjCrQGWQs

[151] How to Save Your Muscles From Aging, *Institute of Human Anatomy* (2023) https://www.youtube.com/watch?v=YGKiOtERMpk

[152] Effects of Various Muscle Disuse States and Countermeasures on Muscle Molecular Signaling, *International Journal of Molecular Sciences* (2022) https://www.mdpi.com/1422-0067/23/1/468

[153] Aging of the Musculoskeletal System: How the Loss of Estrogen Impacts Muscle Strength, *Bone* (2019) https://pubmed.ncbi.nlm.nih.gov/30930293/

[154] *Can Women's Health Get Better with Age?* Interview with Stacy Sims, PhD (2023) https://www.youtube.com/watch?v=NGxjCrQGWQs

[155] Neuromuscular Adaptations During Intensive Strength Training in Middle-Aged and Elderly Males and Females, *Electromyography and Clinical Neurophysiology* (1995) https://pubmed.ncbi.nlm.nih.gov/7649060/

[156] Neural Adaptation to Resistance Training, *Medicine and Science in Sports and Exercise* (1988) https://pubmed.ncbi.nlm.nih.gov/3057313/

[157] Your small motor units outnumber your large motor units. "This is why you have a lot of fine control and dexterity when you are manipulating something small and light, but far less when lifting something heavy. In other words, you could not write your name with a 100kg pen!" *Functional Training and Beyond: Building the Ultimate Superfunctional Body and Mind* (2021) by Adam Sinicki aka **The Bioneer** (https://www.youtube.com/@TheBioneer) https://www.amazon.com/Functional-Training-Beyond-Building-Superfunctional/dp/164250503X

[158] "Interventions that manipulate the amount of physical activity for several weeks can produce significant adaptations in rate coding…For example, the decline in maximal voluntary contraction [MVC] force after a period of reduced activity is attributable to both the loss of muscle mass and a decrease in muscle activation." Rate Coding and the Control of Muscle Force, *Cold Spring Harbor Perspectives in Medicine* (2017) PMID: 28348173 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5629984/ via https://terrygodier.com/blog/grip-strength/

[159] "People who maintain their grip strength age more slowly. They stay healthier longer and are stronger throughout their bodies," explains **geriatric medicine specialist Ardeshir Hashmi, MD**. "The more you maintain your grip strength, the slower the cells age. If you don't maintain your grip strength, the cells actually start to metabolize and age faster. And that shows in what you're physically able to do, or not do." https://health.clevelandclinic.org/grip-strength

[160] Grip Strength: an Indispensable Biomarker for Older Adults, *Clinical Interventions in Aging* (2019) PMID: 31631989 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6778477/

[161] "Low hand-grip strength (HGS) is associated with increased arterial stiffness." Arterial Stiffness is Associated with Handgrip Strength in Relatively Healthy Chinese Older Adults, *Frontiers in Nutrition* (2024) PMID: 38406190 https://pubmed.ncbi.nlm.nih.gov/38406190/; "Handgrip strength, a known diagnostic tool for sarcopenia, is a predictor of several diseases…The incidence of diabetes mellitus (DM) decreased with the increase in the relative handgrip strength." Relationship between Handgrip Strength and Incident Diabetes in Korean Adults According to Gender: A Population-Based Prospective Cohort Study, *Journal of Clinical Medicine* (2024) PMID: 38276133 https://pubmed.ncbi.nlm.nih.gov/38276133/; "Handgrip strength and walking pace were significantly inversely associated with incident CKD in the general population." Association of Handgrip Strength and/or Walking Pace with Incident Chronic Kidney Disease: A UK Biobank Observational Study, *Journal of Cachexia, Sarcopenia and Muscle* (2023) PMID: 36708151 https://pubmed.ncbi.nlm.nih.gov/36708151/; "Low handgrip strength and slow walking pace were significantly associated with a higher risk of incident PD, regardless of the individuals' genetic risk profile." Association of Handgrip Strength and Walking Pace With Incident Parkinson's Disease, *Journal of Cachexia, Sarcopenia and Muscle* (2024) PMID: 37990960 https://pubmed.ncbi.nlm.nih.gov/37990960/

[162] "An emphasis on vitality can also encourage [people] to become more cognizant of their level of energy and manage it through health-promoting behaviors rather than quick fix behaviors." The pursuit of health: A vitality based perspective, *Progress in Cardiovascular Diseases* (2023) PMID: 37037404 https://www.sciencedirect.com/science/article/pii/S0033062023000312?via%3Dihub

[163] The Effect of Resistance Training on Health-Related Quality of Life in Older Adults: Systematic Review And Meta-Analysis, *Health Promotion Perspectives* (2019) PMID: 30788262 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6377696/

[164] "Bodybuilders generally train with moderate loads and fairly short rest intervals that induce high amounts of metabolic stress…A hypertrophy-oriented program should employ a repetition range of 6-12 reps per set with rest intervals of 60-90 seconds between sets…Powerlifters, on the other hand, routinely train with high-intensity loads and lengthy rest periods between sets." The Mechanisms of Muscle Hypertrophy and their Application to Resistance Training, *Journal of Strength and Conditioning Research* (2010) https://pubmed.ncbi.nlm.nih.gov/20847704/

[165] Resistance Training Prescription for Muscle Strength and Hypertrophy In Healthy Adults: A Systematic Review and Bayesian Network Meta-Analysis, *British Journal of Sports Medicine* (2023) https://bjsm.bmj.com/content/57/18/1211.full via Menno Henselmans https://www.youtube.com/watch?v=UU2dpLFIOHU

[166] "Resistance training (RT) intensity (load) and weekly frequency impacted RT-induced increases in muscular strength but not muscle hypertrophy." The Influence of Resistance Exercise Training Prescription Variables on Skeletal Muscle Mass, Strength, and Physical Function in Healthy Adults: An Umbrella Review

(2023), *Journal of Sport and Health Science* https://www.sciencedirect.com/science/article/pii/S2095254623000601 via Menno Henselmans https://www.youtube.com/watch?v=UU2dpLFIOHU

[167] https://pubmed.ncbi.nlm.nih.gov/20847704/

[168] Interview with Dr. Galpin, *How to Build Strength, Muscle Size & Endurance* (2022) https://www.youtube.com/watch?v=IAnhFUUCq6c&t=4130s

[169] https://twitter.com/DrAndyGalpin/status/1487463966695587840

[170] *Can Women's Health Get Better with Age?* Interview with Stacy Sims PhD (2023) https://www.youtube.com/watch?v=NGxjCrQGWQs

[171] Twelve weeks of supervised heavy-resistance training with a personal trainer elicited significantly greater adaptations in strength and performance. The Influence of Direct Supervision of Resistance Training on Strength Performance, *Medicine and Science in Sports and Exercise* (2000) https://pubmed.ncbi.nlm.nih.gov/10862549/

[172] Prevalence and Risk Factors for Joint Pain Among Men And Women in the West of Scotland Twenty-07 Study, *Annals of the Rheumatic Diseases* (2005) PMID: 16126799 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1798081/

[173] https://www.arthritis.org/health-wellness/healthy-living/managing-pain/understanding-pain/sources-of-arthritis-pain

[174] https://www.cdc.gov/arthritis/data_statistics/national-statistics.html

[175] "The data from over 400 published reviews and original articles suggests there are benefits of exercising for a range of outcomes important to people with rheumatic and musculoskeletal diseases (RMDs)." Effects of Physical Exercise and Body Weight on Disease-Specific Outcomes of People with Rheumatic and Musculoskeletal Diseases (RMDs): Systematic Reviews and Meta-Analyses Informing the 2021 EULAR Recommendations for Lifestyle Improvements in People with RMDs, *RMD Open* (2022) PMID: 35361692 https://pubmed.ncbi.nlm.nih.gov/35361692/

[176] Clinical Effect and Biological Mechanism of Exercise for Rheumatoid Arthritis: A Mini Review, *Frontiers in Immunology* (2022) PMID: 36685485 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9852831/

[177] "High-intensity strength training in RA patients with varying levels of disease activity and joint damage had a large, significant effect on strength, and led to improvements in pain and function." Assessment of a Sixteen-Week Training Program on Strength, Pain, and Function in Rheumatoid Arthritis Patients (Randomized Controlled Trial), *Journal of Clinical Rheumatology* (2009) https://pubmed.ncbi.nlm.nih.gov/19279507/

[178] The Effect of Progressive Resistance Training in Rheumatoid Arthritis. Increased Strength Without Changes in Energy Balance or Body Composition, *Arthritis & Rheumatism* (1996) PMID: 8607890 https://pubmed.ncbi.nlm.nih.gov/8607890/

[179] Strength Training in Older Adults: the Benefits for Osteoarthritis, *Clinics in Geriatric Medicine* (2010) PMID: 20699165 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3606891/

[180] Rheumatic and musculoskeletal diseases (RMDs) include osteoarthritis, rheumatoid arthritis, systemic lupus erythematosus, axial spondyloarthritis (axSpA), psoriatic arthritis, systemic sclerosis and gout.

[181] Effects of Physical Exercise and Body Weight on Disease-Specific Outcomes of People with Rheumatic and Musculoskeletal Diseases (RMDs): Systematic Reviews and Meta-Analyses Informing the 2021 EULAR Recommendations for Lifestyle Improvements in People with RMDs. *RMD Open* (2022) PMID: 35361692 https://pubmed.ncbi.nlm.nih.gov/35361692/

[182] Interview with physique expert Bill Campbell, PhD. https://www.youtube.com/watch?v=FKFukaoM_mo

[183] Once-Weekly Semaglutide in Adults with Overweight or Obesity, *The New England Journal of Medicine* (2021) https://www.nejm.org/doi/full/10.1056/NEJMoa2032183

[184] *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[185] "The drive to eat is enhanced after muscle loss secondary to intentional weight loss…The evidence suggests loss of both fat mass and skeletal muscle mass directly influences the trajectory and magnitude of weight regain highlighting their potential role in long-term appetite control." The Influence of Skeletal Muscle on Appetite Regulation, *Expert Review of Endocrinology & Metabolism* (2019) https://pubmed.ncbi.nlm.nih.gov/31106601/

[186] How Dieting Might Make Some Fatter: Modeling Weight Cycling Toward Obesity From a Perspective of Body Composition Autoregulation, *International Journal of Obesity* (2020) https://www.nature.com/articles/s41366-020-0547-1

[187] "Through overeating, excess fat is deposited as a result of the body's attempt to counter a deficit in lean mass." Collateral Fattening in Body Composition Auto-Regulation: its Determinants and Significance for Obesity Predisposition, *European Journal of Clinical Nutrition* (2018) https://www.nature.com/articles/s41430-018-0138-6

[188] Interview with physique expert Bill Campbell, PhD https://www.youtube.com/watch?v=FKFukaoM_mo

[189] The lower your BMR, the greater your chances of osteoporosis and sarcopenia. Skeletal Muscle Metabolism is a Major Determinant of Resting Energy Expenditure, *The Journal of Clinical Investigation* (1990) https://pubmed.ncbi.nlm.nih.gov/2243122/ | "Our data suggest that low BMR might be an early predictor…of osteoporosis and sarcopenia in postmenopausal women." The Lower Basal Metabolic Rate is Associated with Increased Risk of Osteosarcopenia in Postmenopausal Women, *BMC Women's Health* (2022) https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-022-01754-6

[190] *BURN: The Misunderstood Science of Metabolism* (2021) by Herman Pontzer, PhD.

[191] Constrained Total Energy Expenditure and Metabolic Adaptation to Physical Activity in Adult Humans, *Current Biology* (2016) PMID: 26832439 https://www.cell.com/current-biology/fulltext/S0960-9822(15)01577-8; https://www.eurekalert.org/news-releases/887958

[192] "Exercise interventions typically result in less average weight loss than expected, based on the exercise calories expended, and individual weight changes are highly variable even when exercise is supervised to ensure adherence." Obesity Energetics: Body Weight Regulation and the Effects of Diet Composition, *Gastroenterology* (2017) PMID: 28193517 https://pubmed.ncbi.nlm.nih.gov/28193517/

[193] Besides which, wearable trackers are about 80% inaccurate at estimating calories burned. All of them. Accuracy and Acceptability of Wrist-Wearable Activity Tracking Devices: Systematic Review of the Literature, *Journal of Medical Internet Research* (2022) https://pubmed.ncbi.nlm.nih.gov/35060915/

[194] "Our study failed to find any adverse metabolic or behavioral effects of high sucrose consumption in a low-fat, weight-loss diet...As long as total energy intake is restricted, the use of sucrose in a weight-loss regimen is unlikely to cause problems for the average patient." Metabolic and Behavioral Effects of a High-Sucrose Diet During Weight Loss, *The American Journal of Clinical Nutrition* (1997) https://academic.oup.com/ajcn/article/65/4/908/4655511?login=false via Layne Norton, PhD, *Fed Up with Sugar?* https://www.youtube.com/watch?v=ApKsdvGCGJw "Sugar itself is not inflammatory or detrimental to health," says Dr. Norton, "But it's not that satiating. It's also very palatable and easy to overeat, leading to more calories and adipose tissue, and that *is* inflammatory." https://www.youtube.com/watch?v=i3D1SMCw550

[195] *Why Sugar Did Not Cause the Obesity Epidemic*, Biolayne.com (2022) https://biolayne.com/articles/nutrition/why-sugar-did-not-cause-the-obesity-epidemic/ originally from http://www.stephanguyenet.com/references-for-my-debate-with-gary-taubes-on-the-joe-rogan-experience/

[196] Overweight subjects were randomly assigned to one of 4 different groups: one group drank an extra liter of water per day, one group consumed a liter of diet cola sweetened with aspartame, one group drank low-fat milk, and one group drank sugar-sweetened cola**. At the end of six months, "no significant differences in the changes in body weight or total fat mass (determined by DXA) were found between the 4 groups.**" While the sugar-sweetened group showed a tendency for increase in fat mass, "the overall effect on lean body mass was not significantly different between the 4 beverages." While drinking an extra liter of sugar-sweetened cola isn't the most healthy life choice ever, neither is it the worst. And definitely nothing like the world according to the anti-sugar agenda'ists. Sucrose-Sweetened Beverages Increase Fat Storage in the Liver, Muscle, and Visceral Fat Depot: a 6-Mo Randomized Intervention Study, *The American Journal of Clinical Nutrition* (2012) PMID: 22205311 https://pubmed.ncbi.nlm.nih.gov/22205311/

[197] The Twinkie Diet: Being Mindful of How Much You Eat Matters, *Psychology Today* https://www.psychologytoday.com/us/blog/comfort-cravings/201011/the-twinkie-diet

[198] https://www.latimes.com/archives/la-xpm-2010-dec-06-la-he-fitness-twinkie-diet-20101206-story.html

[199] One guy lost 111kg (245lbs) eating only Subway sandwiches twice a day: a 6-inch turkey sub for lunch (290 calories) and a 12-inch Veggie Delite sub (460 calories) for dinner. Hold the mayo & cheese on both. That's under 900 calories per day. https://healthfully.com/464704-jareds-subway-sandwich-diet.html

[200] https://nypost.com/2016/01/27/how-i-lost-nearly-100-pounds-eating-pizza/

[201] https://www.theatlantic.com/magazine/archive/2023/05/ice-cream-bad-for-you-health-study/673487/

[202] https://www.dailymail.co.uk/femail/article-11908533/I-lost-FOUR-pants-sizes-six-months-eating-CHIPOTLE-order.html

[203] *Nashville Grandfather Reveals Whopping Weight Loss from 100-day McDonald's Diet* https://nypost.com/2023/06/02/kevin-maginnis-reveals-weight-loss-from-mcdonalds-only-diet/

[204] "Weight gain or loss is not primarily determined by varying proportions of carbohydrates and fat in the diet, but instead by the number of calories ingested." *Calories in, Calories out* and Macronutrient Intake: the Hope,

Hype, and Science of Calories, *American Journal of Physiology-Endocrinology and Metabolism* (2017) PMID: 28765272 https://pubmed.ncbi.nlm.nih.gov/28765272/

[205] Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake, *Cell Metabolism* (2019) https://pubmed.ncbi.nlm.nih.gov/31105044/

[206] The ultra-processed meals were much lower in fiber, so the researchers had to supplement them with Nutrisource Fiber, a soluble fiber product made from guar gum by Nestle that dissolves in beverages and foods. https://www.nestlehealthscience-me.com/en/brands/nutrisource/nutrisource-fiber

[207] Hyper-Palatable Foods: Development of a Quantitative Definition and Application to the US Food System Database, *Obesity* (2019) PMID: 31689013 https://pubmed.ncbi.nlm.nih.gov/31689013/

[208] "A higher consumption of ultra-processed foods (>4 servings daily) was independently associated with a 62% relatively increased hazard for all-cause mortality." Association Between Consumption of Ultra-Processed Foods and All Cause Mortality: SUN Prospective Cohort Study, *BMJ* (2019) https://pubmed.ncbi.nlm.nih.gov/31142450/ | https://pubmed.ncbi.nlm.nih.gov/30744710/

[209] Machine Learning Prediction of the Degree of Food Processing, Nature Communications (2023) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10121643/ | https://www.medrxiv.org/content/10.1101/2021.05.22.21257615v5

[210] Influence of Culinary Skills on Ultraprocessed Food Consumption and Mediterranean Diet Adherence: An Integrative Review, *Nutrition* (2024) https://pubmed.ncbi.nlm.nih.gov/38458144/

[211] Owing to their significant consumption of ultra-processed foods, children and adolescents are more vulnerable to food addiction. Dietary Intake in Children and Adolescents with Food Addiction: A Systematic Review, *Addictive Behaviors Reports* (2024) PMID: 38322322 https://pubmed.ncbi.nlm.nih.gov/38322322/; "More frequent cooking at home was associated with lower intake of ultra-processed foods and higher Healthy Eating Index HEI-2015 scores." Associations Between Household Frequency of Cooking Dinner and Ultraprocessed Food Consumption and Dietary Quality Among US Children and Adolescents, *Childhood Obesity* (2024) PMID: 36795986 https://pubmed.ncbi.nlm.nih.gov/36795986/; "Cooking dinner frequently at home is associated with consumption of a healthier diet whether or not one is trying to lose weight." Is Cooking at Home Associated with Better Diet Quality or Weight-Loss Intention? *Public Health Nutrition* (2015) PMID: 25399031 https://pubmed.ncbi.nlm.nih.gov/25399031/; "More frequent cooking at home is associated with better diet quality overall and among lower- and higher-income adults". More Frequent Cooking at Home is Associated with Higher Healthy Eating Index-2015 score, *Public Health Nutrition* (2020) https://pubmed.ncbi.nlm.nih.gov/31918785/

[212] Effects of Dietary Protein Intake on Body Composition Changes after Weight Loss in Older Adults: a Systematic Review and Meta-analysis, *Nutrition Reviews* (2016) PMID: 26883880 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4892287/; Skinny-fat women who followed a high-protein diet for 3 months significantly improved their body composition. The Effect of Euenergetic High-Protein Diet in Regulating Appetite and Body Composition of Women with Normal-Weight Obesity: a Randomised Controlled Trial, *British Journal of Nutrition* (2020) https://pubmed.ncbi.nlm.nih.gov/32513334/

[213] Higher Compared with Lower Dietary Protein During an Energy Deficit Combined with Intense Exercise Promotes Greater Lean Mass Gain and Fat Mass Loss: a Randomized Trial, *The American Journal of Clinical Nutrition* (2016), https://www.sciencedirect.com/science/article/pii/S0002916522065595?via%3Dihub & Resistance Training Prevents Muscle Loss Induced by Caloric Restriction in Obese Elderly Individuals: A Systematic Review and Meta-Analysis, *Nutrients* (2018) PMID: 29596307 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5946208/

[214] Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, Applied Physiology, *Nutrition & Metabolism* (2016) PMID: 26960445 https://pubmed.ncbi.nlm.nih.gov/26960445/

[215] The Effects of Consuming a High Protein Diet (4.4g/kg/d) on Body Composition in Resistance-Trained Individuals, *Journal of the International Society of Sports Nutrition* (2014) https://pubmed.ncbi.nlm.nih.gov/24834017/

[216] Dietary Energy Density, Satiety and Weight Management, *Open Access Scientific Reports* (2013) https://www.omicsonline.org/scientific-reports/2157-7110-SR-585.pdf

[217] Host-Diet-Gut Microbiome Interactions Influence Human Energy Balance: A Randomized Clinical Trial, *Nature Communications* (2023) https://pubmed.ncbi.nlm.nih.gov/37258525/

[218] *THE HUNGRY BRAIN: Outsmarting the Instincts that Make Us Overeat (2017)* by Stephan Guyenet, PhD

[219] A study involving almost 100 obese subjects with Type II diabetes divided them into 2 groups: (1) a low-calorie diet (1,000-1,200 calories/day) in which they could eat anything in moderation; (2) a very low-calorie diet (400 calories/day) in which they could only eat lean meat, fish, and chicken or turkey (fowl). Over the 20 weeks

of the study, the very-low calorie dieters with extreme restriction of food choices had the most pronounced decrease in food cravings. The researchers concluded: "There was no evidence to support the belief that restricting intake of certain foods leads to increased craving for these foods or that the magnitude of weight loss is related to food cravings." Effects on Food Cravings of a Very Low Calorie Diet or a Balanced, Low Calorie Diet, *Appetite* (1993) PMID: 8285649 https://pubmed.ncbi.nlm.nih.gov/8285649/ via *THE SCIENCE OF SELF-CONTROL: 53 Tips to Stick to Your Diet, Be More Productive and Excel in Life* (2021) by Menno Henselmans

[220] Optimising Foods for Satiety, *Trends in Food Science & Technology* (2015) https://www.sciencedirect.com/science/article/pii/S0924224414002386

[221] Energy Metabolism Changes and Dysregulated Lipid Metabolism in Postmenopausal Women, *Nutrients* (2021) PMID: 34960109 https://pubmed.ncbi.nlm.nih.gov/34960109/

[222] Nutrition and Exercise Interventions to Improve Body Composition for Persons with Overweight or Obesity Near Retirement Age: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials, *Advances in Nutrition* (2023) https://www.sciencedirect.com/science/article/pii/S2161831323002867 via Menno Henselmans, *The BEST ways to lose fat ranked according to 92 studies* https://www.youtube.com/watch?v=DrRP0VfmjwE

[223] Interviews with physique expert Dr. Bill Campbell: https://www.youtube.com/watch?v=9ALKPcKmrGI & https://www.youtube.com/watch?v=FKFukaoM_mo

[224] The failure of some obese subjects to lose weight while eating a diet they report as low in calories is due to an energy intake substantially higher than reported and an overestimation of physical activity, not to an abnormality in thermogenesis." Discrepancy Between Self-Reported and Actual Caloric Intake and Exercise In Obese Subjects, *The New England Journal of Medicine* (1992) https://pubmed.ncbi.nlm.nih.gov/1454084/

[225] Do Dietitians Accurately Report Their Food Intake? *Weightology* https://weightology.net/do-dietitians-accurately-report-their-food-intake/ | Assessing dietary intake: Who, What and Why of Under-Reporting, *Nutrition Research Reviews* (1998) https://pubmed.ncbi.nlm.nih.gov/19094249/

[226] Even when people *know* they will be subject to analysis of body composition and indirect calorimetry, they *still* underreport their calorie intake by almost 50% and over-report physical activity by 75%. Indirect Calorimetry: From Bench to Bedside, *Indian Journal of Endocrinology and Metabolism* (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5477450/ | https://pubmed.ncbi.nlm.nih.gov/1454084/

[227] https://foodandarts.blogspot.com/2011/05/history-of-plate-sizes.html

[228] The Largest Last Supper: Depictions of Food Portions and Plate Size Increased Over the Millennium, *International Journal of Obesity* (2010), PMID: 20308996 https://pubmed.ncbi.nlm.nih.gov/20308996/; https://www.researchgate.net/publication/42389970_The_largest_Last_Supper_Depictions_of_food_portions_and_plate_size_increased_over_the_millennium via Portion Size: What We Know and What We Need to Know, *Critical Reviews in Food Science & Nutrition* (2015) PMID: 24915353 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4337741/

[229] Physique expert Bill Campbell, PhD: https://www.youtube.com/watch?v=FKFukaoM_mo

[230] Dr. Luc van Loon, *Why Do We Need Protein and Physical Activity?* (2021) https://www.youtube.com/watch?v=huTlXfKHtVQ

[231] A study was conducted in West Bengal (now Calcutta), India, of workers at a mill. Many were physically active workers, like blacksmiths and bale carriers, while others were sedentary (shopkeepers and supervisors). The more active someone was, the more that the calories they consumed were connected to the calories they expended. The sedentary group, however, consumed almost the same number of calories as the active group. They not only weighed more than their active peers, they also reported less restraint with food - called ***disinhibition***. Relation between Caloric Intake, Body Weight, and Physical Work: Studies in an Industrial Male Population in West Bengal, *The American Journal of Clinical Nutrition* (1956) https://academic.oup.com/ajcn/article-abstract/4/2/169/4787034?redirectedFrom=fulltext&login=false

[232] Low Levels Of Physical Activity are Associated with Dysregulation of Energy Intake and Fat Mass Gain Over 1 Year, *The American Journal of Clinical Nutrition* (2015) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4658461/

[233] "This systematic review revealed that exercise and physical activity may modulate resting hunger and satiety in older adults. Decreases in fasting leptin and glucose hormones suggest that exercise promotes satiety sensitivity in adults aged 60+." The Effects of Exercise on Appetite in Older Adults: A Systematic Review and Meta-Analysis, *Frontiers in Nutrition* (2021) https://www.frontiersin.org/articles/10.3389/fnut.2021.734267/full

[234] Strategies to Improve Adherence to Dietary Weight Loss Interventions in Research and Real-World Settings, *Behavioral Sciences* (2017) https://pubmed.ncbi.nlm.nih.gov/28696389/

[235] "There may be no indication on a package that a product is ultra-processed." https://news.northeastern.edu/2022/05/25/ultra-processed-food-database/

[236] These items, despite looking suspiciously food-like, are chemically altered formulations made with ingredients not typically found in home kitchen, like high-fructose corn syrup, hydrolyzed protein, emulsifiers, anti-foaming agents, and other cosmetic additives designed to make the final product more palatable and appealing. Ultra-Processed Foods: What They Are and How to Identify Them, *Public Health Nutrition* (2019) https://pubmed.ncbi.nlm.nih.gov/30744710/

[237] Author interview https://www.youtube.com/watch?v=MF56eOigYSM

[238] *FAT FUNERAL: The Scientific Approach to Long-Term Weight Loss* (2019) by Daniel Dell'uomo

[239] The artificial sweeteners in diet soda can actually increase the output of the beneficial short-chain fatty acid (SCFA) butyrate. Effects of Sweeteners on the Gut Microbiota: A Review of Experimental Studies and Clinical Trials, *Advances in Nutrition* (2019) https://academic.oup.com/advances/article/10/suppl_1/S31/5307224?login=false

[240] "Such a long period of cohabitation suggests that there are important adaptations of the microbes to their obligate primate hosts," observes microbiologist **Martin Blaser, MD,** in Hypothesis: The Changing Relationship of Helicobacter pylori and Humans - Implications for Health and Disease, *The Journal of Infectious Diseases* (1999). https://academic.oup.com/jid/article/179/6/1523/964963?login=false. Blaser is also the author of *MISSING MICROBES: How the Overuse of Antibiotics Is Fueling Our Modern Plagues* (2014)

[241] The hunter-gatherer Tsimane of Bolivia have guts full of parasites and worms. "Over two- thirds of adults suffer from intestinal helminths at any given time." At the same time, the Tsimane also have the lowest levels of heart disease in the world. Coronary Atherosclerosis in Indigenous South American Tsimane: a Cross-Sectional Cohort Study, *The Lancet* (2017) PMID: 28320601 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6028773/ via https://www.inverse.com/article/50572-tsimane-amazon-healthy-heart-high-calorie-diet. The Tsimane "live in a highly pathogenic environment and are chronically infected with a wide range of pathogens and parasites…Tsimane show elevations in most measures of immune function across all age groups, including levels of all four major classes of antibodies, levels of lymphocytes and many lymphocyte subsets, neutrophils, eosinophils, and ESR." Immune function in Amazonian horticulturalists, *Annals of Human Biology* (2016) PMID: 27174705 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4976077/

[242] *THE GOOD GUT: Taking Control of Your Weight, Your Mood, and Your Long-term* Health (2016) by Justin & Erica Sonnenburg, PhDs

[243] Contributions of Intestinal Bacteria to Nutrition and Metabolism in the Critically Ill, *Surgical Clinics of North America* (2011) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3144392/

[244] "The healthier the gut, the better the chance of fighting off cancer with this drug." *FIBER FUELED: The Plant-Based Gut Health Program for Losing Weight, Restoring Your Health, and Optimizing Your Microbiome* (2020) by Will Bulsiewicz, MD, MSCI

[245] Chemical substances foreign to animal life, including drugs, pesticides, cosmetics, flavorings, fragrances, food additives, industrial chemicals & environmental pollutants; Xenobiotic Metabolism – A View Through the Metabolometer, *Chemical Research in Toxicology* (2010) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2872059/

[246] Carbohydrate Quality and Human Health: A Series of Systematic Reviews and Meta-Analyses, *The Lancet* (2019) https://www.thelancet.com/article/S0140-6736(18)31809-9/fulltext

[247] Health Benefits and Side Effects of Short-Chain Fatty Acids, *Foods* (2022) https://pubmed.ncbi.nlm.nih.gov/36140990/; Aging muscle benefits strongly from supplementing with protein and resistance exercise, but additionally targeting the gut microbiota could help overcome anabolic resistance. The Ancestral and Industrialized Gut Microbiota and Implications for Human Health, *Nature Reviews Microbiology* (2019) https://www.mdpi.com/2072-6643/10/7/929 https://pubmed.ncbi.nlm.nih.gov/30036990/

[248] *Link Between Gut Microbes and Muscle Growth Suggests Future Approach to Tackle Muscle Loss* (2019) https://www.sciencedaily.com/releases/2019/09/190910095415.htm

[249] Alterations in Intestinal Microbiota Diversity, Composition, and Function in Patients with Sarcopenia, *Scientific Reports* (2021) https://www.nature.com/articles/s41598-021-84031-0

[250] Gut-Muscle Crosstalk: A Perspective on Influence of Microbes on Muscle Function, *Frontiers in Medicine* (2023) https://www.frontiersin.org/articles/10.3389/fmed.2022.1065365/full; Patients with Low Muscle Mass Have Characteristic Microbiome with Low Potential for Amino Acid Synthesis in Chronic Liver Disease, *Scientific Reports* (2022) https://www.nature.com/articles/s41598-022-07810-3

[251] "This review clearly shows that fermented foods can affect the gut microbiome in both the short and long term, and should be considered an important element of the human diet." Fermented Foods, Health and the Gut Microbiome, *Nutrients* (2022) https://pubmed.ncbi.nlm.nih.gov/35406140/

[252] "Given the plethora of scientific evidence that corroborate the multiple and varied health benefits of dietary fibre, and the risks associated with a diet that lacks fibre, the optimization of fibre within our diets represents an important public health strategy to improve both metabolic and overall health." The Health Benefits of Dietary Fibre, *Nutrients* (2022) https://pubmed.ncbi.nlm.nih.gov/33096647/

[253] The Stanford University Fermented & Fiber-Rich Food or FeFiFo Study, Randomized Controlled Trial, *Cell* (2021) https://pubmed.ncbi.nlm.nih.gov/34256014/

[254] *Gut-Microbiota-Targeted Diets Modulate Human Immune Status: Fe-Fi-Fo Study*, https://med.stanford.edu/nutrition/research/completed-studies/fefifo.html

[255] "These data suggest that the increase in microbiota diversity in the high-fermented food diet arm was not primarily due to consumed microbes, but rather a result of shifts in or new acquisitions to the resident community. These data support that fermented food consumption has an indirect effect on microbiota diversity, rendering the microbiota receptive to the incorporation or increased representation of previously undetected strains within the gut."

[256] Fermented Foods, their Microbiome and its Potential in Boosting Human Health, *Microbial Biotechnology* (2024) PMID: 38393607 https://pubmed.ncbi.nlm.nih.gov/38393607/

[257] This award-winning image of the mucus layer and microbes was taken by the Sonnenburg Lab at Stanford University Medical School in the Microbiology + Immunology Department. https://sonnenburglab.stanford.edu/

[258] Vulnerability of the Industrialized Microbiota, *Science* (2019) https://www.science.org/doi/10.1126/science.aaw9255

[259] Gut Microbiome of the Hadza Hunter-Gatherers, *Nature Communications* (2014) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3996546/

[260] https://www.npr.org/sections/goatsandsoda/2017/08/24/545631521/is-the-secret-to-a-healthier-microbiome-hidden-in-the-hadza-diet | https://www.science.org/doi/10.1126/science.aan4834

[261] *Is the Secret to a Healthier Microbiome Hidden in the Hadza Diet?* (2017) https://www.npr.org/sections/goatsandsoda/2017/08/24/545631521/is-the-secret-to-a-healthier-microbiome-hidden-in-the-hadza-diet

[262] Fibre Intake for Optimal Health: How Can Healthcare Professionals Support People to Reach Dietary Recommendations? *BMJ* (2022) PMID: 35858693 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9298262/

[263] People who consume the same 10 or fewer sources of plant fiber fare significantly worse. *Diet, Antibiotics and Geography Can Influence the Microbial Make-Up of the Gut*. Discussion with Rob Knight on the World Microbiome Day 2019 https://www.gutmicrobiotaforhealth.com/diet-antibiotics-and-geography-can-influence-the-microbial-make-up-of-the-gut-discussion-with-rob-knight-on-the-world-microbiome-day-2019/

[264] Starving mice of fiber also made them more susceptible to the bacterial pathogen *Citrobacter rhodentium* - a mouse-specific pathogen used to model infections in humans - highlighting the importance of the mucus layer as a mechanical barrier against bacterial invasion. The Gut Microbiome: Connecting Spatial Organization to Function, *Cell Host & Microbe* (2017) https://pubmed.ncbi.nlm.nih.gov/28407481/

[265] The Ancestral and Industrialized Gut Microbiota and Implications for Human Health, *Nature Reviews Microbiology* (2019) https://pubmed.ncbi.nlm.nih.gov/31089293/

[266] Diet, Microbiota, and the Mucus Layer: The Guardians of Our Health, *Frontiers in Immunology* (2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9513540/

[267] such as *Oscillibacter* & *Desulfovibrio*

[268] including *Akkermansia muciniphila*, *Bifidobacterium*, *Bacteroidetes*, *Lactobacillus* & *Clostridiales*

[269] In 1989, the term "hygiene hypothesis" was coined to explain the rise in allergies. Responsible factors included households becoming smaller and cleaner, both of which was impaired immune tolerance. The Hygiene Hypothesis: Current Perspectives and Future Therapies, *ImmunoTargets and Therapy* (2015) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4918254/

[270] "Growing up on a farm is associated with an asthma-protective effect." Maturation of the Gut Microbiome During the First Year of Life Contributes to the Protective Farm Effect on Childhood Asthma, *Nature Medicine* (2020) https://pubmed.ncbi.nlm.nih.gov/33139948/

[271] Food allergies affect 8% of children and 11% of adults in the US, and there are currently no cures available. The Role of the Microbiome in Food Allergy: A Review, *Children* (2020) https://www.mdpi.com/2227-9067/7/6/50

[272] Vulnerability of the Industrialized Microbiota, *Science* (2019) https://www.science.org/doi/10.1126/science.aaw9255

[273] *Is the Secret to a Healthier Microbiome Hidden in the Hadza Diet?* (2017) https://www.npr.org/sections/goatsandsoda/2017/08/24/545631521/is-the-secret-to-a-healthier-microbiome-hidden-in-the-hadza-diet

[274] Seasonal Cycling in the Gut Microbiome of the Hadza Hunter-Gatherers of Tanzania, *Science* (2017) https://www.science.org/doi/10.1126/science.aan4834

[275] Associations between Dietary Fiber Intake and Mortality from All Causes, Cardiovascular Disease and Cancer: A Prospective Study, *Journal of Translational Medicine* (2022) https://pubmed.ncbi.nlm.nih.gov/35918724/

[276] https://www.medicalnewstoday.com/articles/319176#what-are-the-benefits-of-fiber

[277] Therapeutic Benefits and Dietary Restrictions of Fiber Intake: A State of the Art Review, *Nutrients* (2022) PMID: 35807822 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9268622/

[278] *What is Resistant Starch?* https://hopkinsdiabetesinfo.org/what-is-resistant-starch/

[279] The Chemical Composition and Nutritional Value of Chia Seeds—Current State of Knowledge, *Nutrients* (2019) PMID: 31159190 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6627181/

[280] https://www.lentils.org/health-nutrition/nutritional-information/

[281] https://parade.com/1381821/emily-laurence/edamame-nutrition/; https://reeis.usda.gov/web/crisprojectpages/0232322-soybean-dietary-fiber-a-functional-ingredient-for-prevention-of-childhood-obesity.html

[282] https://www.weekand.com/healthy-living/article/fiber-content-sweet-potatoes-18009636.php

[283] https://www.greenmatters.com/p/foods-high-in-soluble-fiber

[284] https://www.weekand.com/healthy-living/article/insoluble-fiber-oats-18014010.php

[285] https://cookwithkathy.files.wordpress.com/2014/05/sifibre.pdf

[286] https://www.metamucil.com.au/en-au/articles/metamucil/metamucil-for-healthcare-professionals-faqs; Psyllium comes from the shrub-like herb *Plantago psyllium*. The outer coating, or husk, of the psyllium seed is the source of the fiber. https://www.hollandandbarrett.com/the-health-hub/vitamins-and-supplements/supplements/psyllium-husk-benefits/

[287] https://www.popcorn.org/All-About-Popcorn/Nutrition; https://www.livestrong.com/article/370725-is-popcorn-a-good-source-of-fiber/

[288] The Need to Reassess Dietary Fiber Requirements in Healthy and Critically Ill Patients, *Gastroenterology Clinics of North America* (2018) PMID: 29413014 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6312100/

[289] Fibre Intake for Optimal Health: How Can Healthcare Professionals Support People to Reach Dietary Recommendations? *BMJ* (2022) PMID: 35858693 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9298262/

[290] Association Between Dietary Fiber and Lower Risk of All-Cause Mortality: a Meta-Analysis of Cohort Studies, *American Journal of Epidemiology* (2015) https://pubmed.ncbi.nlm.nih.gov/25552267/

[291] *Diet, Antibiotics and Geography Can Influence the Microbial Make-Up of the Gut.* Discussion with **Rob Knight** on the World Microbiome Day 2019 https://www.gutmicrobiotaforhealth.com/diet-antibiotics-and-geography-can-influence-the-microbial-make-up-of-the-gut-discussion-with-rob-knight-on-the-world-microbiome-day-2019/

[292] https://www.gutmicrobiotaforhealth.com/diet-antibiotics-and-geography-can-influence-the-microbial-make-up-of-the-gut-discussion-with-rob-knight-on-the-world-microbiome-day-2019/

[293] *THE FIBER FUELED COOKBOOK: Inspiring Plant-Based Recipes to Turbocharge Your* Health (2022) by Will Bulsiewicz, MD

[294] *Phytonutrients: Paint your Plate with the Colors of the Rainbow*, Harvard Health Publishing (2019) https://www.health.harvard.edu/blog/phytonutrients-paint-your-plate-with-the-colors-of-the-rainbow-2019042516501

[295] Carbohydrate Quality and Human Health: A Series of Systematic Reviews and Meta-Analyses, *The Lancet* (2019) https://www.thelancet.com/article/S0140-6736(18)31809-9/fulltext

[296] Interactions Between Dietary Fibre and the Gut Microbiota, *Proceedings of the Nutrition Society* (2021) https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/interactions-between-dietary-fibre-and-the-gut-microbiota/0BEF28B809F38D02AC0B1D4E4990210C

[297] Asian comfort food that's both decadent and approachable. Celeb food personality Padma Lakshmi particularly praises the dan noodles. https://www.amazon.com/Myers-Chang-Home-Recipes-Beloved-ebook/dp/B073XCB16B/

[298] Vibrant everyday cooking of southern China starring all the veggies. https://www.amazon.com/Every-Grain-Rice-Chinese-Cooking-ebook/dp/B00E6L8LOG/

[299] Showcases both traditional cuisine and culture through the lens of both festive and everyday recipes. By a French-trained chef who worked in California before returning to Addis Ababa. https://www.amazon.com/Ethiopia-Recipes-traditions-horn-Africa-ebook/dp/B07D2BFQXZ

[300] Praised by no less than Yotam Ottolenghi for conveying the breadth of history and variety in a condensed and accessible how-to for the home cook. https://www.amazon.com/Vegetarian-India-Journey-Through-Cooking-ebook/dp/B00TCI48GS/

[301] 27 wonderful recipes - including some featured in the New York Times - that have been passed down in Tibetan families for hundreds of years. https://www.amazon.com/Tibetan-Home-Cooking-Lobsang-Wangdu-ebook/dp/B00MUB9VKC/

[302] 30 authentic, tasty Scandinavian recipes from Norway, Finland, and Iceland featuring bold flavors such as dill, juniper, and cardamom. https://www.amazon.com/Scandinavian-Recipes-You-Cook-Hour-ebook/dp/B0CP8XSHZC/

[303] Zucchini, Feta & Mint Fritters or Chili-Roasted Cauliflower, anyone? https://www.amazon.com/Oklava-Recipes-Turkish-Cypriot-Selin-Kiazim-ebook/dp/B01MFI23AH/

[304] South African cuisine is a unique blend of cultures, including Dutch, French, German, British, and Malay. https://www.amazon.com/Traditional-South-African-Cooking-Magdaleen-ebook/dp/B00MPOD7QI/

[305] Culinary influences in this interconnected region span Senegal, Ghana, Côte d'Ivoire, Cameroon, and Nigeria. This cookbook also includes the recipe for Fonio, Kale and Mango salad with Ginger Vinaigrette dressing that is beloved by patrons of the author's restaurant, Teranga. https://www.amazon.com/Simply-West-African-Recipes-Kitchen-ebook/dp/B0BQLVTCPQ/

[306] Some of the recipes have been helpfully modified so you can use closer-to-home ingredients but still get the same results. https://www.amazon.com/Africa-Cookbook-delicious-important-Ethiopia-ebook/dp/B0917SBS3L/

[307] Brings together real recipes from home cooks in Argentina, Brazil, Belize, Bolivia, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela. Features more than 300 everyday dishes which are helpfully divided by ingredient, including Beans, Corn, Yuca, Quinoa, and almost two dozen more. https://www.amazon.com/Latin%C3%ADsimo-Recipes-Twenty-One-Countries-Cookbook-ebook/dp/B0BRMN7WMV/

[308] Full of tried-and-true recipes passed down from generation to generation. https://www.amazon.com/Ukrainian-Cookbook-Cooking-Recipes-Family-ebook/dp/B0CK5NW57V/

[309] Food, folklore & fiber...what more could you want? https://www.amazon.com/Dill-Dracula-Romanian-Folklore-Cookbook-ebook/dp/B08D7425NY/

[310] https://www.amazon.com/gp/product/B0874VGPGB

[311] https://www.amazon.com/dp/B0CVQTF98D

[312] https://www.amazon.com/gp/product/B089WG394Y

[313] Fermented Foods, Health and the Gut Microbiome, *Nutrients* (2022), PMID: 35406140 https://pubmed.ncbi.nlm.nih.gov/35406140/

[314] Kombucha is typically made with tea – black, green, white, oolong, yellow, pu-erh (any Camellia sinensis leaves). But you can also make it with yerba mate or coffee for even more diversity of microbes. https://www.sciencedirect.com/science/article/abs/pii/S002364382100133X

[315] Health-Promoting Components in Fermented Foods: An Up-to-Date Systematic Review, *Nutrients* (2019), PMID: 31137859 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6567126/

[316] *Shalgam* is a fermented beverage made of black carrots and turnips that is rich in vitamins, minerals and polyphenols. Fermented Foods, Health and the Gut Microbiome, *Nutrients* (2022), PMID: 35406140 https://pubmed.ncbi.nlm.nih.gov/35406140/

[317] Interview with Raja Dhir, co-CEO of Seed Health. https://www.youtube.com/watch?v=1DP8RaQVDKc

[318] Probiotic Gastrointestinal Transit and Colonization After Oral Administration: a Long Journey, *Frontiers in Cellular and Infection Microbiology* (2011) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8006270/

[319] **VSL#3 costs over $7/serving** & takes an average of 90 days to effect any noticeable difference. https://www.vsl3.com/collections/vsl-3-collection via *THE MICROBIOME SOLUTION: A Radical New Way to Heal Your Body from the Inside Out* (2016) by Robynne Chutkan, MD. VSL#3 doesn't actually affect the microbiota; rather, it works through the satiety pathway. Gut Microbiota is Not Modified by Randomised, Double-Blind Placebo-Controlled Trial of VSL#3 in Diarrhea-Predominant Irritable Bowel Syndrome, *Probiotics Antimicrob. Proteins* (2011) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3255476/ Interestingly, VSL#3 has

also been found to be correlated with morning melatonin levels. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9686962/;

[320] Fecal and Soil Microbiota Composition of Gardening and Non-Gardening Families, *Scientific Reports* (2022) https://www.nature.com/articles/s41598-022-05387-5

[321] Biodiversity Intervention Enhances Immune Regulation and Health-associated Commensal Microbiota among Daycare Children, *Science Advances* (2020) https://www.science.org/doi/10.1126/sciadv.aba2578.

[322] Eating Dirt, *Emerging Infectious Diseases* (2003) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3020602/

[323] Does Soil Contribute to the Human Gut Microbiome? *Microorganisms* (2019) https://www.mdpi.com/2076-2607/7/9/287

[324] Here is a list of recommendations for container-gardening books: https://www.urbanabroad.com/container-gardening-books/

[325] *MUSCLE CONTROL* (1911) by Maxick.

[326] "I found out that mechanical exercise will only produce good results if interest is directed to the muscles being used." *MUSCLE CONTROL* (1911) by Maxick.

[327] Weight lifting belts function in a somewhat similar way. By providing your abs with something to contract against, the belt gives "tactile feedback" that you are contracting the way you're supposed to when you inhale and brace your core to perform a big lift, called the Valsalva maneuver. The Valsalva maneuver uses air to build up intra-abdominal pressure and create a protective cylinder around your spine. The trick is to take a full breath in which only your belly expands, but not your shoulders. *The Ultimate Guide to Weightlifting Belts (and How to Use Them Properly)* https://barbend.com/how-to-wear-weightlifting-belt/ & Professor of Kinesiology Dr. Andy Galpin https://www.youtube.com/watch?v=nE4mvAWZKXw & https://medium.com/podcast-notes-unleashed/how-to-build-strength-muscle-size-and-endurance-with-dr-andy-galpin-huberman-lab-podcast-65-f3f059a3f47

[328] Anecdotally, I discovered this when I became sober. Drinking had been so integral to both my day and my social life, that the old model of who I was – based on what I did – no longer applied. I had to do new things, find new hangouts, and most importantly of all, hang out with new people. To stay sober, I had to change my identity.

[329] Perspectives into the Experience of Successful, Substantial Long-Term Weight-Loss Maintenance: A Systematic Review, *International Journal of Qualitative Studies on Health and Well-being* (2021) https://www.tandfonline.com/doi/full/10.1080/17482631.2020.1862481 via https://biolayne.com/videos/educational/new-study-on-how-to-lose-weight-keep-it-off/

[330] *MARVEOUS MAX – The Story of Maxick* by Ron Tyrell https://www.naturalstrength.com/2011/09/marvelous-max-story-of-maxick-by-ron.html

[331] Skeletal Muscle Health and Cognitive Function: A Narrative Review, *International Journal of Molecular Sciences* (2020) PMID: 33383820 https://pubmed.ncbi.nlm.nih.gov/33383820/

[332] Pathophysiological Mechanisms Explaining the Association Between Low Skeletal Muscle Mass and Cognitive Function, *The Journals of Gerontology Series A* (2022) https://academic.oup.com/biomedgerontology/article/77/10/1959/6602136?login=false

[333] *Muscle Mass and Cognitive Function* (2022) https://peterattiamd.com/muscle-mass-and-cognitive-function/

[334] Sarcopenia and the Common Mental Disorders: a Potential Regulatory Role of Skeletal Muscle on Brain Function? *Current Osteoporosis Reports* (2015) PMID: 26228522 https://pubmed.ncbi.nlm.nih.gov/26228522/

[335] Sarcopenia and the Common Mental Disorders: a Potential Regulatory Role of Skeletal Muscle on Brain Function? *Current Osteoporosis Reports* (2015) PMID: 26228522 https://pubmed.ncbi.nlm.nih.gov/26228522/

[336] Muscle Strength is Independently Related to Brain Atrophy in Patients with Alzheimer's Disease, *Dementia and Geriatric Cognitive Disorders* (2019) https://karger.com/dem/article-abstract/47/4-6/306/103511/Muscle-Strength-Is-Independently-Related-to-Brain?redirectedFrom=fulltext

[337] In fact, an underlying contributor to all hallmarks of brain aging is dysregulated energy metabolism. Novel Strategies for Healthy Brain Aging, *Exercise & Sports Sciences Review* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7967995/

[338] Glucose is a key energy source for neurons, but as we age, our bodies become less effective at utilizing insulin to transport glucose into cells. Neurons get less of the fuel they need, and fasting glucose levels rise. Elevated fasting glucose and insulin resistance are linked with worsening cognitive function, dementia, and increased brain aging. "Memory improvement was associated with improved glucose metabolism and lower fasting

plasma insulin concentration." Recent Neurotherapeutic Strategies to Promote Healthy Brain Aging: Are We There Yet?, *Aging Dis.* (2022) https://pubmed.ncbi.nlm.nih.gov/35111369/

[339] "The study findings demonstrated a negative correlation between muscle mass and glucose utilization levels." Impact of Muscle Mass on Blood Glucose Level, *Journal of Basic and Clinical Physiology and Pharmacology* (2021) https://pubmed.ncbi.nlm.nih.gov/34856088/

[340] Resistance Training Restores Skeletal Muscle Atrophy and Satellite Cell Content in an Animal Model of Alzheimer's Disease, *Scientific Reports* (2023) https://www.nature.com/articles/s41598-023-29406-1

[341] *Muscle Mass and Cognitive Function* (2022) https://peterattiamd.com/muscle-mass-and-cognitive-function/

[342] This book came to my attention thanks to https://www.youtube.com/@GoldenEraBookworm.

[343] https://www.youtube.com/@biolayne1

[344] https://www.youtube.com/@drandygalpin

[345] https://www.youtube.com/@strongerbyscience

[346] https://www.youtube.com/@coacheugeneteo

[347] https://www.youtube.com/@JeffNippard

[348] https://www.youtube.com/@FoundMyFitness

[349] https://www.youtube.com/@TheBioneer

[350] https://www.youtube.com/@RenaissancePeriodization

[351] https://www.youtube.com/@menno.henselmans

[352] https://www.youtube.com/@AmericanGlutton

[353] https://www.youtube.com/@JamesSmithPT

[354] https://www.youtube.com/@DrGabrielleLyon

[355] https://www.youtube.com/@PeterAttiaMD

[356] For whatever reason, it didn't have the same effect in older men. Nutritional Supplements to Support Resistance Exercise in Countering the Sarcopenia of Aging, *Nutrients* (2020) https://www.mdpi.com/2072-6643/12/7/2057

[357] During periods of being immobilized, supplementing with EPA and DHA appears to alleviate muscle atrophy.

[358] Older adults who consume more than 500g of fish per week and do regular resistance training significantly mitigate decreases in strength and loss of muscle mass. Nutritional Supplements to Support Resistance Exercise in Countering the Sarcopenia of Aging, *Nutrients* (2020) https://www.mdpi.com/2072-6643/12/7/2057

[359] Fish oil–derived n−3 PUFA therapy has also been shown to slow the normal decline in muscle mass and function in older adults. Fish oil–Derived n−3 PUFA Therapy Increases Muscle Mass and Function in Healthy Older Adults, *The American Journal of Clinical Nutrition* (2015) https://academic.oup.com/ajcn/article/102/1/115/4564326

[360] The Additive Effects of Creatine Supplementation and Exercise Training in an Aging Population: A Systematic Review of Randomized Controlled Trials, *Journal of Geriatric Physical Therapy* (2020) PMID: 30762623 https://pubmed.ncbi.nlm.nih.gov/30762623/

[361] Creatine Supplementation and Brain Health, *Nutrients* (2021) https://pubmed.ncbi.nlm.nih.gov/33578876/

[362] Nutritional Supplements to Support Resistance Exercise in Countering the Sarcopenia of Aging, *Nutrients* (2020) https://www.mdpi.com/2072-6643/12/7/2057; Common Questions and Misconceptions about Creatine Supplementation: What Does the Scientific Evidence Really Show?, *Journal of the International Society of Sports Nutrition* (2021) https://pubmed.ncbi.nlm.nih.gov/33557850/; Creatine Supplementation in Women's Health: A Lifespan Perspective, *Nutrients* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7998865/; In the Elderly Population does Creatine Supplementation Play a Beneficial Role in Memory and Cognition A CAT Manuscript, *International Journal of Sports and Exercise Medicine* (2022) https://clinmedjournals.org/articles/ijsem/international-journal-of-sports-and-exercise-medicine-ijsem-8-224.php?jid=ijsem; Creatine Supplementation in Women's Health: A Lifespan Perspective, *Nutrients* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7998865/; Effects of Creatine Supplementation on Brain Function and Health, *Nutrients* (2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8912287/

[363] Creatine Supplementation and Cognitive Performance in Elderly Individuals, *Aging, Neuropsychology, and Cognition* (2007) PMID: 17828627 https://pubmed.ncbi.nlm.nih.gov/17828627/

[364] "Although the direct mechanism through which creatine supplementation improves cognitive processing is not known, the best explanation is that increasing brain creatine levels improves brain energy metabolism…Improved cognitive processing subsequent to creatine supplementation has been shown during

increased brain activity, [and] increased brain and muscle activity." Creatine supplementation in the aging population: effects on skeletal muscle, bone and brain, *Amino Acids* (2016) https://link.springer.com/article/10.1007/s00726-016-2239-7

[365] Nutrient Effects on the Calcium Economy: Emphasizing the Potassium Controversy, *The Journal of Nutrition* (2008) https://academic.oup.com/jn/article/138/1/166S/4665009?login=false

[366] Nutrient Effects on the Calcium Economy: Emphasizing the Potassium Controversy, *The Journal of Nutrition* (2008) https://academic.oup.com/jn/article/138/1/166S/4665009?login=false

[367] Calcium Absorption from Food Products: Food Matrix Effects, *Nutrients* (2022) https://www.mdpi.com/2072-6643/14/1/180

[368] "Clinical and experimental studies showed that eggshell powder has positive effects on bone and cartilage and that it is suitable in the prevention and treatment of osteoporosis." Eggshell Calcium in the Prevention and Treatment of Osteoporosis, *International Journal of Clinical Pharmacology Research* (2003) https://pubmed.ncbi.nlm.nih.gov/15018022/

[369] 1,200mg * .25 efficiency = 300mg. Many women aren't even getting 700mg/day, which is nowhere near enough to offset typical calcium losses, to say nothing of achieving maximal calcium retention.

[370] Calcium Fact Sheet for Health Professionals, *National Institutes of Health Office of Dietary Supplements* https://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/

[371] Nutrient Effects on the Calcium Economy: Emphasizing the Potassium Controversy, *The Journal of Nutrition* (2008) https://academic.oup.com/jn/article/138/1/166S/4665009?login=false

[372] Vitamin D and Sarcopenia: Potential of Vitamin D Supplementation in Sarcopenia Prevention and Treatment, *Nutrients* (2020) https://pubmed.ncbi.nlm.nih.gov/33086536/

[373] Effects of Whey Protein, Leucine, and Vitamin D Supplementation in Patients with Sarcopenia: A Systematic Review and Meta-Analysis, *Nutrients* (2023) PMID: 36771225 https://pubmed.ncbi.nlm.nih.gov/36771225/

[374] Vitamin D and Sarcopenia: Potential of Vitamin D Supplementation in Sarcopenia Prevention and Treatment, *Nutrients* (2020) https://pubmed.ncbi.nlm.nih.gov/33086536/

[375] A combination of vitamin D and high-quality (ie. high in leucine) whey protein elicited improved muscle-protein synthesis and muscle-mass in older adults with sarcopenia. Effects of a Vitamin D and Leucine-Enriched Whey Protein Nutritional Supplement on the Measures of Sarcopenia in Older Adults, the PROVIDE Study: A Randomized, Double-Blind, Placebo-Controlled Trial, *Journal of the American Medical Directors Association* (2015) https://pubmed.ncbi.nlm.nih.gov/26170041/

[376] 800 IU/day has been used in successful fracture-prevention studies. "50 nmol/l is the appropriate serum 25(OH)D threshold to define vitamin D insufficiency. Supplementation should therefore generally aim to increase 25(OH)D levels within the 50-75 nmol/l range." Reducing Fracture Risk with Calcium and Vitamin D, *Clinical Endocrinology* (2010) https://pubmed.ncbi.nlm.nih.gov/20796001/

[377] The Importance of Magnesium in Clinical Healthcare, *Scientifica* (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5637834/

[378] Magnesium: Nutrition and Homoeostasis, *AIMS Public Health* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5690358/

[379] Niacin Cures Systematic NAD+ Deficiency and Improves Muscle Performance in Adult-Onset Mitochondrial Myopathy, *Cell Metabolism* (2020) https://pubmed.ncbi.nlm.nih.gov/32386566/

[380] via Balancing NAD+ Deficits with Nicotinamide Riboside: Therapeutic Possibilities and Limitations, *Cellular and Molecular Life Sciences* (2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9345839/

[381] https://www.mayoclinic.org/drugs-supplements-niacin/art-20364984

[382] Definition of a Tolerable Upper Intake Level of Niacin: A Systematic Review and Meta-Analysis of the Dose-Dependent Effects of Nicotinamide and Nicotinic Acid Supplementation, *Nutrition Reviews* (2017)

[383] Brad Stanfield, MD https://www.youtube.com/watch?v=e7CDgE9nWkE

[384] Glycine - aka *2-Aminoacetic acid* - also plays a role in activating the N-methyl-D-aspartate (NMDA) receptor in the brain, which has been shown to improve symptoms of schizophrenia. Glycine also acts as a neurotransmitter, and as a precursor to various biomolecules like heme and creatine. https://examine.com/supplements/glycine/

[385] High Glycine Concentration Increases Collagen Synthesis by Articular Chondrocytes in Vitro: Acute Glycine Deficiency Could be an Important Cause of Osteoarthritis, *Amino Acids* (2018) https://link.springer.com/article/10.1007/s00726-018-2611-x via https://master-athlete.com/nutrition/10-grams-of-glycine-per-day-makes-your-joints-stronger/

[386] What Are Postbiotics?, *Harvard Health Publishing - Harvard Medical School* (2021) https://www.health.harvard.edu/nutrition/what-are-postbiotics

[387] Urolithin A Improves Muscle Strength, Exercise Performance, and Biomarkers of Mitochondrial Health in a Randomized Trial in Middle-Aged Adults, *Cell Reports Medicine* (2022) https://pubmed.ncbi.nlm.nih.gov/35584623/; The Role of Alternative Mitophagy in Heart Disease, *International Journal of Molecular Sciences* (2023) PMID: 37047336 https://pubmed.ncbi.nlm.nih.gov/37047336/

[388] Potential of Urolithin A to Improve Joint Health, *Aging* (2023) PMID: 36988500 https://pubmed.ncbi.nlm.nih.gov/36988500/; The Potential of Flavonoids and Flavonoid Metabolites in the Treatment of Neurodegenerative Pathology in Disorders of Cognitive Decline, *Antioxidants* (2023) PMID: 36978911 https://pubmed.ncbi.nlm.nih.gov/36978911/; Urolithin A Improves Muscle Function by Inducing Mitophagy in Muscular Dystrophy, *Science Translational Medicine* (2021) https://www.science.org/doi/10.1126/scitranslmed.abb0319

[389] via Dr. Gabrielle Lyon https://www.youtube.com/watch?v=fZY6Uh6fAgQ

[390] Direct Supplementation with Urolithin A Overcomes Limitations of Dietary Exposure and Gut Microbiome Variability in Healthy Adults, *European Journal of Clinical Nutrition* (2021) https://www.nature.com/articles/s41430-021-00950-1

[391] via Dr. Gabrielle Lyon https://www.youtube.com/watch?v=fZY6Uh6fAgQ

[392] https://examine.com/supplements/ursolic-acid/

[393] https://en.wikipedia.org/wiki/Ursolic_acid

[394] Pharmacological Effects of *Centella Asiatica* on Skin Diseases: Evidence and Possible Mechanisms, *Evidence-Based Complementary and Alternative Medicine* (eCAM), (2021) PMID: 34845411 https://pubmed.ncbi.nlm.nih.gov/34845411/

[395] Interview with Charles Poliquin https://tim.blog/2016/11/06/charles-poliquin-mass-building-program/

[396] *OUTLIVE: The Science & Art of Longevity – Rethinking Modern Medicine to Live Better Longer*, Harmony Books (2023) by Peter Attia & Bill Gifford

[397] Albumin acts as a transport for hormones, bilirubin, metals, vitamins, and drugs; it also binds to fatty acids to keep them in a soluble form in the plasma. Serum Albumin and Globulin, *Clinical Methods: The History, Physical, and Laboratory Examinations*. 3rd edition https://www.ncbi.nlm.nih.gov/books/NBK204/

[398] "**Low serum albumin concentration (C_p) is an indicator of the existence of a myriad of pathologies, some of which are so subtle that the subject appears "healthy" while harboring a lethal illness**…serum albumin concentration is a powerful predictor of a poor prognosis in nonsurgical as well as surgical patients. The pathological process in these conditions can be **inflammatory**, degenerative, or malignant as evidenced by statistically significant associations between albumin and a poor outcome in community-acquired pneumonia, chronic obstructive pulmonary disease, pancreatitis, inflammatory bowel disease, coronary and peripheral vascular disease, Alzheimer's disease, multiple forms of malignancy, and all intensive care admissions. Even patients with psychiatric conditions such as schizophrenia and depression tend to have low C_p." Human Serum Albumin Homeostasis: A New Look at the Roles Of Synthesis, Catabolism, Renal and Gastrointestinal Excretion, and the Clinical Value of Serum Albumin Measurements, *International Journal of General Medicine* (2016) PMID: 27486341 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4956071/

[399] Dr. Andy Galpin, Professor of Kinesiology https://www.youtube.com/watch?v=hQ78Hpwrt80

[400] Skipping breakfast is actually less healthy and is associated with increased risk of cardiovascular disease-related death. https://www.jandonline.org/article/S2212-2672(22)00874-7/fulltext

[401] **Rebecca M. Marton**, a researcher with a PhD in stem cell biology; **Xindi Wang**, a PhD in Network Science; **Albert-László Barabási**, a physicist & professor of Network Science; **John P. A. Ioannidis**, a professor of medicine and biomedical statistics

[402] Science, Advocacy, and Quackery in Nutritional Books: an Analysis of Conflicting Advice and Purported Claims of Nutritional Best-Sellers, *Nature* (2020) https://www.nature.com/articles/s41599-020-0415-6

[403] *Evaluating Evidence of Mechanisms in Medicine: Principles and Procedures* (2018) https://www.ncbi.nlm.nih.gov/books/NBK543865/

[404] https://www.sciencedaily.com/releases/2011/09/110912193259.htm

[405] https://www.sciencedaily.com/releases/2016/04/160403200139.htm

[406] *Spurious Correlations* https://www.tylervigen.com/spurious-correlations

[407] Use of Rodents as Models of Human Diseases, *Journal of Pharmacy & BioAllied Sciences* (2014) PMID: 24459397 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3895289/

[408] The Laboratory Rat: Relating Its Age With Human's, *International Journal of Preventive Medicine* (2013) PMID: 23930179 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3733029/

[409] https://www.dictionary.com/e/tech-science/meta-analysis/

[410] *Thomas Sowell. The Three Questions.* https://www.youtube.com/watch?v=KyevJU0cbPE

[411] Interview with Dr. Layman https://peterattiamd.com/donlayman/

[412] Interview with Dr. Ungar https://www.youtube.com/watch?v=1IfjqwJCxoM

[413] The Real Paleo Diet, *Scientific American* (2018) https://www.scientificamerican.com/article/the-real-paleo-diet/

[414] "It's a common misconception among many in the Paleo crowd that our hunter-gatherer ancestors were somehow only hunting. Perhaps this view reflects the inherent biases in fossil and archaeological record. Bones preserve much better than plant foods, as do the tools used to hunt. Hunting technologies often involved stone flakes or points, which don't rot or degrade. As we see with the Hadza, collecting plant foods requires nothing more than strong hands and a wooden stick." *BURN: The Misunderstood Science of Metabolism* (2021) by Herman Pontzer, PhD. Pontzer is a Professor of Evolutionary Anthropology at Duke University.

[415] "Some Keto and Paleo proponents have pushed this supposed ancestral mix even further. David Perlmutter, author of the popular book *Grain Brain*, argues—without providing any evidence—that the ancestral diet was only 5 percent carbs and 75 percent fat!" *BURN: The Misunderstood Science of Metabolism* (2021) by Herman Pontzer, PhD

[416] Cooking in Caves: Palaeolithic Carbonised Plant Food Remains From Franchthi And Shanidar, *Antiquity* (2022) https://www.cambridge.org/core/journals/antiquity/article/cooking-in-caves-palaeolithic-carbonised-plant-food-remains-from-franchthi-and-shanidar/0CB510C9E528CD7AD923469D78E14E42 | Mozambican Grass Seed Consumption During the Middle Stone Age, *Science* (2009) https://pubmed.ncbi.nlm.nih.gov/20019285/ | Stone Age Sorghum Found in African Cave, *Nature* (2009) https://www.nature.com/articles/news.2009.1147

[417] The Effect of Intermittent Fasting on Appetite: A Systematic Review and Meta-Analysis, *Nutrients* (2023) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10255792/

[418] Calorie Restriction With or Without Time-Restricted Eating in Weight Loss, *The New England Journal of Medicine* (2022) https://www.nejm.org/doi/full/10.1056/NEJMoa2114833

[419] "The Iliad and Odyssey are conventionally dated to the late 8th or early 7th century BC." https://www.britishmuseum.org/blog/who-was-homer

[420] Book XVI https://www.theoi.com/Text/HomerOdyssey16.html via *Food in the Ancient World* (2006) by Joan Alcock, p.181.

[421] Breakfast in Human Nutrition: The International Breakfast Research Initiative, *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5986439/

[422] "The historical, bio-psychological and educational value of breakfast in our culture is extremely important and should be recognized and stressed by the scientific community." Breakfast: a Multidisciplinary Approach, *Italian Journal of Pediatrics* (2013) PMID: 23842429 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3726409/

[423] http://www.chinadaily.com.cn/food/2016-08/01/content_26294857.htm

[424] https://en.wikipedia.org/wiki/The_Century_Magazine

[425] "Atwater's nutritional studies were motivated by a desire to provide nutritious yet inexpensive food for people who were accustomed to physical work. In explaining the Calorie, he indicated that the heat unit was equivalent to about 1.53 foot-tons mechanical energy." Does the History of Food Energy Units Suggest a Solution to "Calorie Confusion"? *Nutrition Journal* (2007) PMID: 18086303 https://pubmed.ncbi.nlm.nih.gov/18086303/

[426] https://en.wikipedia.org/wiki/Wilbur_Olin_Atwater

[427] *Wilbur Olin Atwater* https://www.whonamedit.com/doctor.cfm/3343.html

[428] The Energy Balance Model of Obesity: Beyond Calories In, Calories Out, *The American Journal of Clinical Nutrition* (2022) PMID: 35134825 https://pubmed.ncbi.nlm.nih.gov/35134825/

[429] The EBM explicitly recognizes the massive role of the nervous system and brain on how much we consume. "Given that nervous systems have evolved to control energy intake, it is not surprising that every known monogenic disorder that causes human obesity involves a gene intimately involved in the control of energy intake by the hypothalamus." The Energy Balance Model of Obesity: Beyond Calories In, Calories Out, *The American Journal of Clinical Nutrition* (2022) PMID: 35134825 https://pubmed.ncbi.nlm.nih.gov/35134825/

[430] *THE HUNGRY BRAIN: Outsmarting the Instincts That Make Us Overeat* (2017) by Stephan Guyenet, PhD

[431] "The EBM proposes that high dietary energy density is a potentially important driver of excess energy intake, and several trials have demonstrated significant long-term effects of diets differing in energy density." The

Energy Balance Model of Obesity: Beyond Calories In, Calories Out, *The American Journal of Clinical Nutrition* (2022) PMID: 35134825 https://pubmed.ncbi.nlm.nih.gov/35134825/

[432] Food Supply, *Our World in Data* (revised in 2023) https://ourworldindata.org/food-supply

[433] Worldwide Trends in Insufficient Physical Activity from 2001 to 2016: a Pooled Analysis of 358 Population-Based Surveys with 1·9 Million Participants, *The Lancet Global Health* (2018) PMID: 30193830 https://pubmed.ncbi.nlm.nih.gov/30193830/

[434] What is Driving Global Obesity Trends? Globalization or "Modernization"? *Globalization & Health* (2019) PMID: 31029156 https://pubmed.ncbi.nlm.nih.gov/31029156/

[435] The evidence is overwhelming "that numerous variables in the food environment beyond high-glycemic foods can result in increased energy intake, and if any one or more of these factors are in play…the EBM posits that obesity can arise." The Energy Balance Model of Obesity: Beyond Calories In, Calories Out, *The American Journal of Clinical Nutrition* (2022) PMID: 35134825 https://pubmed.ncbi.nlm.nih.gov/35134825/

[436] The Dubious Practice of Detox, *Harvard Health Publishing* (2008), https://www.health.harvard.edu/staying-healthy/the-dubious-practice-of-detox

[437] Nrf2, A Master Regulator of Detoxification and Also Antioxidant, Anti-Inflammatory and Other Cytoprotective Mechanisms, is Raised by Health Promoting Factors, *Sheng Li Xue Bao (Acta Physiologica Sinica)* (2015)

[438] Interview with Dhir https://www.youtube.com/watch?v=1DP8RaQVDKc

[439] Resveratrol researcher faked data, report says; what drives academic fraud? *Los Angeles Times* (2012) https://www.latimes.com/health/la-xpm-2012-jan-12-la-dipak-das-resveratrol-diederik-stapel-20120112-story.html; Charges of scientific fraud add a bizarre twist to the controversial resveratrol story, *MinnPost* (2012) https://www.minnpost.com/second-opinion/2012/01/charges-scientific-fraud-add-bizarre-twist-controversial-resveratrol-story/

[440] Genome-Wide Screens Reveal that Resveratrol Induces Replicative Stress in Human Cells, *Molecular Cell* (2020) https://pubmed.ncbi.nlm.nih.gov/32755594/ via Brad Stanfield, MD *Longevity Influencers are Killing You* (2023) https://www.youtube.com/watch?v=vLATzbt9Io8

[441] "We recently confirmed the absence of a life-span effect in…mice, reporting that feeding RES at doses of 50 and 200 mg/kg/day, beginning at 12 months did not extend life span, although these doses led to detectable levels of RES in blood at each dose." Evaluation of Resveratrol, Green Tea Extract, Curcumin, Oxaloacetic Acid, and Medium-Chain Triglyceride Oil on Life Span of Genetically Heterogeneous Mice, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* (2013) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3598361/

[442] "Our resveratrol data thus serve to confirm the absence of any effect of this agent on mouse life span." Rapamycin, But Not Resveratrol or Simvastatin, Extends Life Span of Genetically Heterogeneous Mice, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* (2011) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3021372/

[443] Available research does not provide sufficient evidence to support any effect, beneficial or adverse, of four to five weeks of 10 mg to 1000 mg of resveratrol in adults with type 2 diabetes. Resveratrol for Adults with Type 2 Diabetes Mellitus, *The Cochrane Database of Systematic Reviews* (2020) https://pubmed.ncbi.nlm.nih.gov/31978258/

[444] Evaluation of Resveratrol, Green Tea Extract, Curcumin, Oxaloacetic Acid, and Medium-Chain Triglyceride Oil on Life Span of Genetically Heterogeneous Mice, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* (2013) PMID: 22451473 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3598361/; Resveratrol Blunts the Positive Effects of Exercise Training on Cardiovascular Health in Aged Men, *The Journal of Physiology* (2013) PMID: 23878368 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3810808/; Genome-Wide Screens Reveal that Resveratrol Induces Replicative Stress in Human Cells, *Molecular Cell* (2020) PMID: 32755594 https://pubmed.ncbi.nlm.nih.gov/32755594/; No Beneficial Effects of Resveratrol on the Metabolic Syndrome: A Randomized Placebo-Controlled Clinical Trial, *The Journal of Clinical Endocrinology & Metabolism* (2017) PMID: 28182820 https://pubmed.ncbi.nlm.nih.gov/28182820/ via Brad Stanfield, MD *Resveratrol – The Unfortunate (& Scandalous) Story* https://www.youtube.com/watch?v=JAFnD27ffqE

[445] Common Questions and Misconceptions About Creatine Supplementation: What Does the Scientific Evidence Really Show? *Journal of the International Society of Sports Nutrition* (2021) https://pubmed.ncbi.nlm.nih.gov/33557850/

[446] *At 3-5g/Day, Creatine Supplementation Increases Muscle Size & Strength* Interview with Alan Aragon https://podclips.com/ct/at-35gday-creatine-supplementation-increases-muscle-size-strength

[447] Interview with Aragon https://podclips.com/ct/at-35gday-creatine-supplementation-increases-muscle-size-strength

[448] FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving & Maintaining Your Optimal Physique, Performance & Health (2022) by Alan Aragon

[449] Creatine Supplementation and Brain Health, *Nutrients* (2021) https://pubmed.ncbi.nlm.nih.gov/33578876/; Nutritional Supplements to Support Resistance Exercise in Countering the Sarcopenia of Aging, *Nutrients* (2020) https://www.mdpi.com/2072-6643/12/7/2057; Common Questions and Misconceptions about Creatine Supplementation: What Does the Scientific Evidence Really Show?, *Journal of the International Society of Sports Nutrition* (2021) https://pubmed.ncbi.nlm.nih.gov/33557850/; Creatine Supplementation in Women's Health: A Lifespan Perspective, *Nutrients* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7998865/; In the Elderly Population does Creatine Supplementation Play a Beneficial Role in Memory and Cognition A CAT Manuscript, *International Journal of Sports and Exercise Medicine* (2022) https://clinmedjournals.org/articles/ijsem/international-journal-of-sports-and-exercise-medicine-ijsem-8-224.php?jid=ijsem; Effects of Creatine Supplementation on Brain Function and Health, *Nutrients* (2022) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8912287/

[450] "Older females supplementing with creatine experience significant gains in muscle strength, especially when resistance training lasts for at least 24 weeks in duration." Efficacy of Creatine Supplementation Combined with Resistance Training on Muscle Strength and Muscle Mass in Older Females: A Systematic Review and Meta-Analysis, *Nutrients* (2021) PMID: 34836013 https://pubmed.ncbi.nlm.nih.gov/34836013/

[451] "The **decline in kidney function in the rat** is mostly due to glomerulosclerosis, whereas in humans it is due mostly to a decline in filtration by nonsclerotic nephrons." DIETARY REFERENCE INTAKES for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids. **Institute of Medicine** of the National Academies http://www.nap.edu/catalog/10490.html via https://posnutricao.ufv.br/wp-content/uploads/2019/08/DRI-for-Energy-Carbohydrate-Fiber-Fat-Fatty-Acids-Cholesterol-Protein-and-Amino-acids.pdf

[452] Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, *Applied Physiology, Nutrition, and Metabolism* (2016) https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550

[453] "When creatinine clearance was measured in men at 10- to 18-year intervals, the decline with age did not correlate with dietary protein intake. Correlation of creatinine clearance with protein intake showed a linear relationship with a positive gradient, suggesting that **the low protein intake itself decreased renal function**." DIETARY REFERENCE INTAKES for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids. **Institute of Medicine** of the National Academies http://www.nap.edu/catalog/10490.html via https://posnutricao.ufv.br/wp-content/uploads/2019/08/DRI-for-Energy-Carbohydrate-Fiber-Fat-Fatty-Acids-Cholesterol-Protein-and-Amino-acids.pdf

[454] Effects of Low-Protein Intake on All-Cause Mortality in Subjects with an Estimated Glomerular Filtration Rate Higher than 60mL/Min/1.73 M2 With or Without Albuminuria, *International Journal of Clinical Practice* (2020) https://pubmed.ncbi.nlm.nih.gov/32239620/

[455] Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, *Applied Physiology, Nutrition, and Metabolism* (2016) https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550

[456] Protein "Requirements" Beyond the RDA: Implications for Optimizing Health, *Applied Physiology, Nutrition, and Metabolism* (2016) https://cdnsciencepub.com/doi/10.1139/apnm-2015-0550

[457] Defining Meal Requirements for Protein to Optimize Metabolic Roles of Amino Acids, *The American Journal of Clinical Nutrition* (2015) https://academic.oup.com/ajcn/article/101/6/1330S/4564493?login=false

[458] Safety and Efficacy of High-Protein Diets for Weight Loss, *Proceedings of the Nutrition Society* (2012) https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/safety-and-efficacy-of-highprotein-diets-for-weight-loss/88D02B63EC2E41F9C8DDF33220A0538D

[459] Nutrient Effects on the Calcium Economy: Emphasizing the Potassium Controversy, *The Journal of Nutrition* (2008) https://academic.oup.com/jn/article/138/1/166S/4665009?login=false

[460] https://en.wikipedia.org/wiki/Somatotype_and_constitutional_psychology; https://en.wikipedia.org/wiki/Eugenics

[461] https://blog.nasm.org/body-types-mesomorph-ectomorphs-endomorphs-explained

[462] *What Body Type Are You ACTUALLY, and Does it Even Matter??* https://www.youtube.com/watch?v=luNynS97eJQ

[463] *Physiology, Metabolism* (2022) https://www.ncbi.nlm.nih.gov/books/NBK546690/

[464] Daily Energy Expenditure through the Human Life Course, *Science* (2021) PMID: 34385400 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8370708/ via Dr. Layne Norton - *V SHRED is (NOT) a Fad Diet!* https://www.youtube.com/watch?v=Hq7rSjOdBB4

[465] Even when both are on a very low calorie diet. Basal Metabolic Rate, Fat-Free Mass, and Body Cell Mass During Energy Restriction, *Metabolism* (1992) PMID: 1556954 https://pubmed.ncbi.nlm.nih.gov/1556954/

[466] "Energy expended at rest is…greater in people with obesity because they have more metabolically active fat-free mass in addition to greater body fat." Obesity Energetics: Body Weight Regulation and the Effects of Diet Composition, *Gastroenterology* (2017) PMID: 28193517 https://pubmed.ncbi.nlm.nih.gov/28193517/

[467] More Complex Than You Might Think: Neural Representations of Food Reward Value in Obesity, *Appetite* (2022) https://pubmed.ncbi.nlm.nih.gov/35863505/ via Layne Norton, PhD - *Oprah Falls For Fitfluencer CICO Nonsense* | What the Fitness | Biolayne https://www.youtube.com/watch?v=stwA1usZl50; Reward Mechanisms in Obesity: New Insights and Future Directions, *Neuron* (2012) PMID: 21338878 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3057652/; Reward, Dopamine and the Control of Food Intake: Implications for Obesity, *Trends in Cognitive Sciences* (2011) PMID: 21109477 https://pubmed.ncbi.nlm.nih.gov/21109477/; Hedonic and Incentive Signals for Body Weight Control, *Review of Endocrine & Metabolic Disorders* (2011) PMID: 21340584 https://pubmed.ncbi.nlm.nih.gov/21340584/

[468] author of *THE HUNGRY BRAIN: Outsmarting the Instincts that Make Us Overeat* (2017)

[469] "While there is a growing consensus that human energy expenditure is actively controlled to resist weight loss, the evidence for active control of energy intake is less clear...Establishing that energy intake is under active control in humans is challenging under laboratory conditions and extremely difficult under free-living conditions...The molecular mechanisms of appetite regulation strongly suggest that feedback control of energy intake acts as part of a complex neurobiological system integrating social and environmental influences with homeostatic signals related to body weight, such as leptin, to control both short-term feeding behavior and long-term energy intake." Obesity Energetics: Body Weight Regulation and the Effects of Diet Composition, *Gastroenterology* (2017) PMID: 28193517 https://pubmed.ncbi.nlm.nih.gov/28193517/

[470] The plain boiled potato scores the highest on the Satiety Index of commonly eaten foods. A Satiety Index of Common Foods, *European Journal of Clinical Nutrition* (1995) PMID: 7498104 https://pubmed.ncbi.nlm.nih.gov/7498104/

[471] How Much Protein Can the Body Use in A Single Meal for Muscle-Building? Implications For Daily Protein Distribution, *Journal of the International Society of Sports Nutrition* (2018) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5828430/

[472] *Your Digestive System & How it Works*, National Institute of Diabetes and Digestive and Kidney Diseases https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works

[473] MPS seems to be modulated by how much substrate (amino acids) is available. The Anabolic Response to Protein Ingestion During Recovery from Exercise Has No Upper Limit in Magnitude and Duration In Vivo In Humans, *Cell Reports Medicine* (2023) PMID: 38118410 https://pubmed.ncbi.nlm.nih.gov/38118410/

[474] Human functioning is so complex and involved, it requires anywhere from 10,000 to possibly several billion different species of protein. The Size of the Human Proteome: The Width and Depth, *International Journal of Analytical Chemistry* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4889822/

[475] Dietary Essential Amino Acids for the Treatment of Heart Failure with Reduced Ejection Fraction, *Cardiovascular Research* (2023) https://academic.oup.com/cardiovascres/article/119/4/982/6982756?login=false

[476] "The liver plays a central role in amino acid (AA) metabolism in humans and other animals. In all mammals, this organ synthesizes many AAs (including glutamate, glutamine, alanine, aspartate, asparagine, glycine, serine, and homoarginine), glucose, and glutathione (a major antioxidant)." Amino Acid Metabolism in the Liver: Nutritional and Physiological Significance, *Advances in Experimental Medicine and Biology* (2020) PMID: 32761568 https://pubmed.ncbi.nlm.nih.gov/32761568/

[477] Defining Meal Requirements for Protein to Optimize Metabolic Roles of Amino Acids, *The American Journal of Clinical Nutrition* (2015) https://www.sciencedirect.com/science/article/pii/S0002916523274286

[478] *FLEXIBLE DIETING: A Science-Based, Reality-Tested Method for Achieving and Maintaining Your Optimal Physique, Performance & Health* (2022) by Alan Aragon

[479] Lifting Heavy Won't Make You Bulky—Here's What It'll Do Instead, *Tonal* https://www.tonal.com/blog/lifting-heavy-wont-make-women-bulky/

[480] Effects of Resistance Training Performed to Repetition Failure or Non-Failure on Muscular Strength and Hypertrophy: A Systematic Review and Meta-Analysis, *Journal of Sport and Health Science* (2022) https://pubmed.ncbi.nlm.nih.gov/33497853/

[481] Rethinking Proximity to Failure for Strength Gains, *myojournal* (2020) https://myojournal.com/rethinking-proximity-to-failure-for-strength-gains/; Dr. Mike Israetel: Exercise Scientist's Masterclass On Building Muscle (2024) https://www.youtube.com/watch?v=dfYBMPCA5pg&t=0s

[482] "Muscle rebuilding – for example, hypertrophy – can be initiated **independent of any discernible damage to the muscle**." Muscle damage and Muscle Remodeling: No Pain, No Gain?, *Journal of Experimental Biology* (2011) https://journals.biologists.com/jeb/article/214/4/674/10714/Muscle-damage-and-muscle-remodeling-no-pain-no#sec-13

[483] Ability to Predict Repetitions to Momentary Failure is Not Perfectly Accurate, Though Improves with Resistance Training Experience, *PeerJ* (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5712461/

[484] *What is 'good exercise technique' exactly?* Menno Henselmans https://www.youtube.com/watch?v=MA_-yJfXFAI

[485] Twelve weeks of supervised heavy-resistance training with a personal trainer elicited significantly greater adaptations in strength and performance. The Influence of Direct Supervision of Resistance Training on Strength Performance, *Medicine and Science in Sports and Exercise* (2000) https://pubmed.ncbi.nlm.nih.gov/10862549/

[486] "The metabolic generation of protons during heavy exercise is a consequence of the rise in glycolytic ATP turnover with increasing work rate." Biochemistry of Exercise-Induced Metabolic Acidosis, *Regulatory, Integrative and Comparative Physiology* (2004) https://journals.physiology.org/doi/full/10.1152/ajpregu.00114.2004

[487] https://recoupfitness.com/blogs/news/3-myths-about-lactic-acid-debunked

[488] To indicate something is acidic, it has a low pH, which stands for "potential of hydrogen." https://en.wikipedia.org/wiki/PH

[489] "The cause of metabolic acidosis is not merely proton release, but an imbalance between the rate of proton release and the rate of proton buffering and removal…It is important to note that lactate production acts as both a buffering system, by consuming H+, and a proton remover, by transporting H+ across the sarcolemma, to protect the cell against metabolic acidosis." Biochemistry of Exercise-Induced Metabolic Acidosis, *Regulatory, Integrative and Comparative Physiology* (2004) https://journals.physiology.org/doi/full/10.1152/ajpregu.00114.2004

[490] Lactic Acid and Lactate: Revisiting the Physiological Roles in the Tumor Microenvironment, *Trends in Immunology* (2022) PMID: 36319537 https://pubmed.ncbi.nlm.nih.gov/36319537/

[491] Lactic Acid: No Longer an Inert and End-Product of Glycolysis, *Physiology* (2017) https://journals.physiology.org/doi/full/10.1152/physiol.00016.2017

[492] Lactate is so important that disruption of its transport is implicated in Alzheimer's disease. The Science and Translation of Lactate Shuttle Theory, *Cell Metabolism* (2018) PMID: 29617642 https://pubmed.ncbi.nlm.nih.gov/29617642/

[493] The fact that exercise creates an abundance of lactate is probably the reason why people who exercise prior to a test tend to perform better. Dr. Andy Galpin, Professor of Kinesiology, *What Lactate Is & What It ACTUALLY Does...* https://www.andygalpin.com/25-minute-physiology

[494] *The Ruminant Digestive System* https://extension.umn.edu/dairy-nutrition/ruminant-digestive-system

[495] https://www.livescience.com/53452-herbivores.html

[496] https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book:_General_Biology_(Boundless)/34:_Animal_Nutrition_and_the_Digestive_System/34.02:_Digestive_Systems_-_Herbivores_Omnivores_and_Carnivores

[497] Interview with protein expert Dr. Donald Layman https://peterattiamd.com/donlayman/

[498] Interview with Dr. Layman https://peterattiamd.com/donlayman/

[499] Processed meat is considered carcinogenic to humans. A Review of Healthy Dietary Choices for Cardiovascular Disease: From Individual Nutrients and Foods to Dietary Patterns, *Nutrients* (2023) PMID: 38068756 https://pubmed.ncbi.nlm.nih.gov/38068756/

[500] Consuming processed meat is significantly associated with all-cause mortality. **But not red meat that is unprocessed.** Red Meat and Processed Meat Consumption and All-Cause Mortality: A Meta-Analysis, *American Journal of Epidemiology* (2013) https://academic.oup.com/aje/article/179/3/282/103471 via Processed meat: the real villain?, *The Proceedings of the Nutrition Society* (2016) PMID: 26621069 https://pubmed.ncbi.nlm.nih.gov/26621069/

[501] Nutrients such as docosahexaenoic acid (ω-3), niacinamide (vitamin B3), glucosamine, hydroxyproline and the anti-oxidants allantoin, anserine, cysteamine, spermine, and squalene were amongst those only found in beef. "Metabolomics analysis found that metabolite abundances between the plant-based meat alternative and grass-fed ground beef differed by 90%A." Metabolomics Comparison of Plant-Based Meat and Grass-Fed Meat Indicates Large Nutritional Differences Despite Comparable Nutrition Facts Panels, *Scientific Reports* (2021) PMID: 34226581 https://pubmed.ncbi.nlm.nih.gov/34226581/

[502] Effect of Dietary Fiber on Properties and Acceptance of Meat Products: A Review, *Critical Reviews in Food Science and Nutrition* (2015) PMID: 24915339 https://pubmed.ncbi.nlm.nih.gov/24915339/

[503] https://www.livescience.com/32501-why-is-cows-milk-white.html

[504] Whey protein isolate is about 90% protein, and contains virtually no lactose or fat. *Whey Protein and the Metabolic Syndrome* (2019) https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/whey-protein-isolate

[505] https://www.mindbodygreen.com/articles/whey-protein-isolate-vs-concentrate

[506] https://examine.com/supplements/whey-protein/faq/whats-the-difference-between-the-various-types-of-whey-protein/

[507] The Impact of Protein Quality on the Promotion of Resistance Exercise-Induced Changes in Muscle Mass, *Nutrition & Metabolism* (2016) PMID: 27708684 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5041535/

[508] Protein – Which is Best? *Journal of Sports Science & Medicine* (2004) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3905294/

[509] *Is Dairy Bad for You?* (2022) Dr. Layne Norton https://youtu.be/M17gtH5TfQk

[510] "The available literature suggests that dairy products and dairy proteins **have neutral to beneficial effects on biomarkers of inflammation.**" The Effects of Dairy Product and Dairy Protein Intake on Inflammation: A Systematic Review of the Literature, *Journal of the American College of Nutrition* (2021) PMID: 32870744 https://pubmed.ncbi.nlm.nih.gov/32870744/

[511] "Vitamin D enhances calcium absorption. It is noteworthy that the US-based Nurses' Health Study, which reported baseline intakes of 9·7 μg vitamin D and 1060 mg calcium per day, found a protective effect of milk intake." Overall, studies looking at the impact of yogurt and cheese on hip fractures found an inverse relationship: the more you consume, the lower your risk of breaking your hip. The power of cheese was even highlighted by the researchers: "A seemingly protective association with cheese may be surprising." Dairy Intake and Risk of Hip Fracture in Prospective Cohort Studies: Non-Linear Algorithmic Dose-Response Analysis in 486,950 Adults, *Journal of Nutritional Science* (2023) PMID: 37706070 https://pubmed.ncbi.nlm.nih.gov/37706070/

[512] Protein and dairy absorption is influenced heavily by the rate of gastric transit. The authors conclude that along with being a high-quality source of dairy, because of its digestibility, "yogurt may be a particularly good source for increasing muscle mass." Nutritional Value of Yogurt as a Protein Source: Digestibility/Absorbability and Effects on Skeletal Muscle, *Nutrients* (2023) PMID: 37892442 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10609537/

[513] "We conclude that no statistically significant overall association can be detected between milk and dairy product intake and symptoms of mucus production in healthy adults, either asymptomatic or symptomatic, with rhinovirus infection." Relationship Between Milk Intake and Mucus Production in Adult Volunteers Challenged With Rhinovirus-2, *The American Review of Respiratory Disease* (1990) PMID: 2154152 https://pubmed.ncbi.nlm.nih.gov/2154152/

[514] "There is no evidence (and indeed evidence to the contrary) that milk leads to excessive mucus secretion." Milk, mucus and myths, *Archives of Disease in Childhood* (2019) PMID: 30190283 https://pubmed.ncbi.nlm.nih.gov/30190283/

[515] Myths and Fallacies in Relation to the Consumption of Dairy Products, *Nutricion Hospitalaria* (2019) https://pubmed.ncbi.nlm.nih.gov/31368336/

[516] Intake of Milk and Other Dairy Products and The Risk Of Bladder Cancer: A Pooled Analysis Of 13 Cohort Studies, *European Journal of Clinical Nutrition* (2019) https://www.nature.com/articles/s41430-019-0453-6

[517] Milk and Yogurt Intake and Breast Cancer Risk, *Medicine* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709252/

[518] "However, whole milk intake in men contributed to elevated prostate cancer mortality risk significantly." (Note: this could be due to the saturated fat content of full-fat dairy.) Dairy Products Intake and Cancer Mortality Risk: a Meta-Analysis Of 11 Population-Based Cohort Studies, *Nutrition Journal* (2016) https://pubmed.ncbi.nlm.nih.gov/27765039/

[519] Dairy Intake and the Risk of Pancreatic Cancer: The Japan Collaborative Cohort Study (JACC Study) and Meta-Analysis of Prospective Cohort Studies, *British Journal of Nutrition* (2021) https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/abs/dairy-intake-and-the-risk-of-pancreatic-cancer-the-japan-collaborative-cohort-study-jacc-study-and-metaanalysis-of-prospective-cohort-studies/598B0DB8BDD2662638FA5B67643E65FB

[520] Dairy Consumption and Risks of Colorectal Cancer Incidence and Mortality: A Meta-analysis of Prospective Cohort Studies, *Cancer Epidemiology, Biomarkers & Prevention* (2020) https://aacrjournals.org/cebp/article/29/11/2309/72050/Dairy-Consumption-and-Risks-of-Colorectal-Cancer

[521] Milk and Dairy Product Consumption and Prostate Cancer Risk and Mortality: An Overview of Systematic Reviews and Meta-analyses, *Advances in Nutrition* (2019) https://pubmed.ncbi.nlm.nih.gov/31089741/

[522] Consumption of Dairy Product and its Association with Total and Cause Specific Mortality - A Population-Based Cohort Study and Meta-Analysis, *Clinical Nutrition* (2019) https://pubmed.ncbi.nlm.nih.gov/30595374/

[523] The Effects of Dairy Product and Dairy Protein Intake on Inflammation: A Systematic Review of the Literature, *Journal of the American College of Nutrition* (2021) https://pubmed.ncbi.nlm.nih.gov/32870744/

[524] Effects of Dairy Products on Bone Mineral Density in Healthy Postmenopausal Women: A Systematic Review and Meta-Analysis of Randomized Controlled Trials, *Archives of Osteoporosis* (2020) https://pubmed.ncbi.nlm.nih.gov/32185512/

[525] Calcium and Vitamin D Fortified Milk Reduces Bone Turnover and Improves Bone Density in Postmenopausal Women Over 1 Year (Randomized Controlled Trial), *European Journal of Nutrition* (2018) https://pubmed.ncbi.nlm.nih.gov/28975432/

[526] Dairy Intake and Body Composition and Cardiometabolic Traits among Adults: Mendelian Randomization Analysis of 182041 Individuals from 18 Studies, *Clinical Chemistry* (2019) https://pubmed.ncbi.nlm.nih.gov/31138550/

[527] Dairy Intake Enhances Body Weight and Composition Changes during Energy Restriction in 18–50-Year-Old Adults—A Meta-Analysis of Randomized Controlled Trials, *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4963870/

[528] Exploring the Links between Diet and Inflammation: Dairy Foods as Case Studies, *Advances in Nutrition* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8502778/

[529] The Effects of Dairy Product and Dairy Protein Intake on Inflammation: A Systematic Review of the Literature, *Journal of the American College of Nutrition* (2021) https://pubmed.ncbi.nlm.nih.gov/32870744/

[530] Effects of Dairy Products Consumption on Inflammatory Biomarkers Among Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials, *Nutrition, Metabolism & Cardiovascular Diseases* (2020) https://pubmed.ncbi.nlm.nih.gov/32409275/

[531] Impact of Dairy Products on Biomarkers of Inflammation: A Systematic Review of Randomized Controlled Nutritional Intervention Studies in Overweight and Obese Adults, *The American Journal of Clinical Nutrition* (2013) https://pubmed.ncbi.nlm.nih.gov/23446894/

[532] Association of Dairy Product Consumption with Metabolic and Inflammatory Biomarkers in Adolescents: A Cross-Sectional Analysis from the LabMed Study, *Nutrients* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6835390/

[533] Tracing the Distribution of European Lactase Persistence Genotypes Along the Americas, *Frontiers in Genetics* (2021) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493957/

[534] Lactose Intolerance Symptoms Assessed by Meta-Analysis: A Grain of Truth that Leads to Exaggeration, *The Journal of Nutrition* (2006) https://pubmed.ncbi.nlm.nih.gov/16549489/; Lactose Digestion in Humans: Intestinal Lactase Appears to be Constitutive Whereas the Colonic Microbiome is Adaptable, *The American Journal of Clinical Nutrition* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6669050/

[535] "Yogurt is made of milk incubated mainly with two species of lactic acid bacteria, *L. bulgaricus* and *S. thermophilus*. These microorganisms participate in lactose hydrolysis both during fermentation processes and after lactose ingestion. It has been calculated that fermentation decreases lactose content by approximately 25-50%." Management and Treatment of Lactose Malabsorption, *World Journal of Gastroenterology* (2006) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4066025/

[536] "Dairy foods are nutrient-rich sources of high-quality protein that need to be emphasized as a critically important part of an older person's diet…Protein quality bears greater consideration for older persons with lower energy and protein intakes and for persons who have a need to retain lean body mass (LBM)…Protein-containing foods such as meat, poultry, fish, eggs, soy, and dairy foods (milk, cheese, and yogurt) provide all 9 indispensable (essential) amino acids and are considered to be sources of high-quality protein." Nutrient-Rich, High-Quality, Protein-Containing Dairy Foods in Combination with Exercise in Aging Persons to Mitigate Sarcopenia. *Nutrition Reviews* (2019) https://academic.oup.com/nutritionreviews/article/77/4/216/5250741?login=false

[537] Management and Treatment of Lactose Malabsorption, *World Journal of Gastroenterology* (2006) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4066025/

[538] Lactose Digestion in Humans: Intestinal Lactase Appears to be Constitutive Whereas the Colonic Microbiome is Adaptable, *The American Journal of Clinical Nutrition* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6669050/

[539] *Physiology, Glucose*. StatPearls Publishing (2024) PMID: 31424785 https://pubmed.ncbi.nlm.nih.gov/31424785/

[540] Through its various hormones, particularly glucagon and insulin, the pancreas maintains blood glucose levels within a very narrow range of 4–6 mM. Pancreatic Regulation of Glucose Homeostasis, *Experimental & Molecular Medicine* (2016) PMID: 26964835 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4892884/

[541] Problems Associated With Glucose Toxicity: Role of Hyperglycemia-Induced Oxidative Stress, *World Journal of Gastroenterology* (2009) PMID: 19725147 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2738809/

[542] Glucose plus Insulin Regulate Fat Oxidation by Controlling the Rate of Fatty Acid Entry into the Mitochondria. *The Journal of Clinical Investigation* (1996) PMID: 8941640 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC507673/

[543] One big reason fat oxidation doesn't "stop completely" is that **fatty acids are the preferred fuel source of the heart**. Lipid Metabolism and Toxicity in the Heart, *Cell Metabolism* (2012) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3387529/

[544] The Impact of Acipimox Therapy on Free Fatty Acid Efflux and Endothelial Function in the Metabolic Syndrome: A Randomized Trial, *Obesity* (2019) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6832806/; Not only did the people taking Acipimox not get fatter, but relative to the placebo group, they did not eat more calories. Layne Norton, PhD Nutritional Sciences https://biolayne.com/articles/research/science-stories-and-side-stepping-the-stephan-guyenet-vs-gary-taubes-debate/ | https://academic.oup.com/jcem/article/101/3/1123/2804888?login=false

[545] Semaglutide belongs to a class of drugs called glucagon-like peptide-1 (GLP-1) agonists. GLP-1 agonists work by increasing insulin levels and decreasing appetite. https://www.medicalnewstoday.com/articles/drugs-saxenda-vs-victoza#ingredients

[546] "This absolutely crushes the idea that insulin is the central player in the development of obesity and not energy balance," notes nutrition sciences expert Dr. Layne Norton. "It absolutely puts the nail in the coffin of this theory." *Science, Stories, and Side-Stepping: The Stephan Guyenet vs. Gary Taubes Debate* (2019) https://biolayne.com/articles/research/science-stories-and-side-stepping-the-stephan-guyenet-vs-gary-taubes-debate/ | A Randomized, Controlled Trial of 3.0 mg of Liraglutide in Weight Management, *The New England Journal of Medicine* (2015) https://pubmed.ncbi.nlm.nih.gov/26132939/

[547] Effect of a Plant-based, Low-fat Diet Versus an Animal-Based, Ketogenic Diet on Ad Libitum Energy Intake (Randomized Controlled Trial), *Nature Medicine* (2021) https://pubmed.ncbi.nlm.nih.gov/33479499/

[548] "Whereas some studies reported no energy expenditure differences between lying and sitting, others have shown that **EE was 20% higher in lying than in sitting**." Energy Expenditure Differences across Lying, Sitting, and Standing Positions in Young Healthy Adults, *PLoS One* (2019) https://pubmed.ncbi.nlm.nih.gov/31188863/; via strength coach Jeff Nippard, *10 Fitness Myths Busted In 10 Minutes* (2018) https://www.youtube.com/watch?v=YspLU2ttOlc

[549] "Components of energy balance are interdependent, and…a positive energy balance, in which **energy intake exceeds expenditure causes weight gain**, with 60–80 % of the resulting weight gain being attributable to body fat." The Importance of Energy Balance, *European Endocrinology* (2013) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6003580/

[550] Weight Loss Induces Changes in Adaptive Thermogenesis in Female and Male Physique Athletes, *Applied Physiology, Nutrition, and Metabolism* (2023) PMID: 36645885 https://pubmed.ncbi.nlm.nih.gov/36645885/

[551] Body Composition of Competitive Bodybuilders: A Systematic Review of Published Data and Recommendations for Future Work, *Journal of Strength and Conditioning Research* (2023) PMID: 36727905 https://pubmed.ncbi.nlm.nih.gov/36727905/

[552] Nutritional Recommendations for Physique Athletes, *Journal of Human Kinetics* (2020) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7052702/ via https://www.youtube.com/@biolayne1

[553] "Placed male competitors had a greater carbohydrate intake at the start of contest preparation (5.1 vs 3.7 g/kg bodyweight) than non-placed competitors." Nutritional Strategies of High Level Natural Bodybuilders During Competition Preparation, *Journal of the International Society of Sports Nutrition* (2018) PMID: 29371857 https://pubmed.ncbi.nlm.nih.gov/29371857/

[554] When total calories and protein are equated, people following a diet that is low carb (high fat) and people on an extremely high carb (low fat) diet ***both lose the same amount of weight***. Actually, the high carbers lose a tad bit more. Obesity Energetics: Body Weight Regulation and the Effects of Diet Composition, *Gastroenterology* (2017) PMID: 28193517 https://pubmed.ncbi.nlm.nih.gov/28193517/

[555] Interview with lipidology expert, Thomas Dayspring, MD, FACP https://www.youtube.com/watch?v=GkWMDnTyxfo

[556] Interview with lipidology expert, Thomas Dayspring, MD, FACP https://www.youtube.com/watch?v=GkWMDnTyxfo

[557] Gut Microbiomes of Wild Great Apes Fluctuate Seasonally in Response to Diet, *Nature Communications* (2018) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5934369/

[558] https://www.theatlantic.com/science/archive/2018/03/gorilla-guts/554636/

[559] Fruit Intake Decreases Risk of Incident Type 2 Diabetes: An Updated Meta-Analysis, *Endocrine* (2014) https://link.springer.com/article/10.1007/s12020-014-0351-6

[560] Fruit and Vegetable Consumption and Changes in Anthropometric Variables in Adult Populations: A Systematic Review and Meta-Analysis of Prospective Cohort Studies, *PLoS One* (2015) https://pubmed.ncbi.nlm.nih.gov/26474158/

[561] Effects Of Fruit and Vegetable Consumption on Inflammatory Biomarkers and Immune Cell Populations: A Systematic Literature Review and Meta-Analysis, *The American Journal of Clinical Nutrition* (2018) https://academic.oup.com/ajcn/article/108/1/136/5042153?login=false

[562] Fruit and Vegetable Intake and Body Adiposity Among Populations in Eastern Canada: the Atlantic Partnership for Tomorrow's Health Study, *BMJ Open* (2018) PMID: 29643151 https://pubmed.ncbi.nlm.nih.gov/29643151/

[563] Metabolic Effects of A Prolonged, Very-High-Dose Dietary Fructose Challenge in Healthy Subjects, *The American Journal of Clinical Nutrition* (2020) PMID: 31796953 https://pubmed.ncbi.nlm.nih.gov/31796953/

[564] No, You're Not Addicted To Sugar, *Weightology* (2017) https://weightology.net/no-youre-not-addicted-to-sugar/

[565] Brain scans of responses to various foods consistently fail to show the perturbed responses of addictive drugs. "The lack of consistent findings across a large set of studies militates strongly against the addiction model." Obesity and the Brain: How Convincing is the Addiction Model? *Nature Reviews Neuroscience* (2012) https://www.researchgate.net/publication/221892901_Obesity_and_the_brain_How_convincing_is_the_addiction_model

[566] No, Sugar Isn't the New Heroin, *Behavioral Scientist* (2017) https://behavioralscientist.org/no-sugar-isnt-new-heroin/

[567] How Effective are Current Dietary Guidelines for Cardiovascular Disease Prevention in Healthy Middle-Aged and Older Men and Women? A Randomized Controlled Trial, *The American Journal of Clinical Nutrition* (2015) PMID: 25787998 https://pubmed.ncbi.nlm.nih.gov/25787998/

[568] Adherence to National Food Guide Recommendations: Can It Slow the Obesity Epidemic? A Systematic Review, *Current Nutrition Reports* (2020) https://pubmed.ncbi.nlm.nih.gov/33145722/

[569] Americans are massively undereating recommended foods, and mainly replacing them with refined grains." Gil Carvalho, MD, PhD, *Are the Dietary Guidelines Making us all Fat and Sick*?! (2023) https://www.youtube.com/watch?v=-jxdjHMjRK4

[570] https://usafacts.org/articles/are-americans-meeting-federal-dietary-guidelines/

[571] *Fat Loss vs. Fat Burning* by Chris Schnare, Clinical Exercise Physiologist https://www.synergytc.ca/post/fat-loss-versus-fat-burning

[572] "In critical illness, the adrenal glands are submaximally stimulated and frequently do not mount the incremental cortisol response of 250 nmol/L following the synthetic adrenocorticotrophic hormone (ACTH) stimulation test …The diagnosis of Addison's disease or true adrenal failure is confirmed by the simultaneous measurement of early-morning serum cortisol and plasma ACTH." We are Tired of Adrenal Fatigue, *South African Medical Journal* (2018) https://pubmed.ncbi.nlm.nih.gov/30182895/

[573] Addison's Disease, *Mayo Clinic* https://www.mayoclinic.org/diseases-conditions/addisons-disease/symptoms-causes/syc-20350293

[574] Adrenal Fatigue Does Not Exist: a Systematic Review, *BMC Endocrine Disorders* (2016) https://pubmed.ncbi.nlm.nih.gov/27557747

[575] *Acid/Alkaline Theory of Disease is Nonsense*, Gabe Mirkin, MD, https://quackwatch.org/related/dsh/coral2/

[576] Research Spotlight: Collagen Protein Isn't Great for Promoting Muscle Hypertrophy, *Stronger by Science* (2022) https://www.strongerbyscience.com/research-spotlight-collagen/

[577] "Collagen can not only promote an improvement in skin structure but also enhance skin barrier function to resist the adverse effects of the external environment on the skin…In a retrospective clinical trial on the effects of oral collagen, a total of 120 participants participated in a 90-day study. The subjects took collagen orally at

prescribed doses every day. Participants' skin was assessed by a variety of biomarkers and skin imaging techniques. The results showed significant improvement in the collagen fiber tissue of the vast majority of the subjects. In addition, many subjects also reported increased smoothness and elasticity of the skin and reduced wrinkles and fine lines." Research Progress on Bioactive Factors against Skin Aging, *International Journal of Molecular Sciences* (2024) PMID: 38612608 https://pubmed.ncbi.nlm.nih.gov/38612608/

[578] Glycine - aka *2-Aminoacetic acid* - also plays a role in activating the N-methyl-D-aspartate (NMDA) receptor in the brain, which has been shown to improve symptoms of schizophrenia. Glycine also acts as a neurotransmitter, and as a precursor to various biomolecules like heme and creatine. https://examine.com/supplements/glycine/

[579] High Glycine Concentration Increases Collagen Synthesis by Articular Chondrocytes in Vitro: Acute Glycine Deficiency Could be an Important Cause Of Osteoarthritis, *Amino Acids* (2018) https://link.springer.com/article/10.1007/s00726-018-2611-x via https://master-athlete.com/nutrition/10-grams-of-glycine-per-day-makes-your-joints-stronger/

[580] "Glycine is the most abundant amino acid in collagen and is essential for maintaining the skin's elasticity and structural integrity…Glycine is believed to help support the production and stimulation of healthy collagen and to be able to penetrate the skin as one of the smallest molecular amino acids. In skin care, glycine is mainly used to improve moisturizing ability, increase collagen production, and promote skin repair and regeneration. These properties make it a valuable ingredient in anti-aging skin care products." Research Progress on Bioactive Factors against Skin Aging, *International Journal of Molecular Sciences* (2024) PMID: 38612608 https://pubmed.ncbi.nlm.nih.gov/38612608/

[581] Sugar for the Brain: the Role of Glucose in Physiological and Pathological Brain Function, *Trends in Neurosciences* (2013) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3900881/

[582] Brain physiology depends upon tight regulation of glucose metabolism.https://posnutricao.ufv.br/wp-content/uploads/2019/08/DRI-for-Energy-Carbohydrate-Fiber-Fat-Fatty-Acids-Cholesterol-Protein-and-Amino-acids.pdf p.265.

[583] Carbohydrates, *Advances in Nutrition* (2014) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4224210/

[584] The Dietary Guidelines for Americans, as well as the European Food Safety Authority, the Australian National Health and Medical Research Council, the New Zealand Ministry of Health, the Nordic Committee of Senior Officials for Food Issues, and the UK's Scientific Advisory Committee on Nutrition all recommend getting between 45% to 65% of total daily calories from carbohydrate. Low-Carbohydrate versus Balanced-Carbohydrate Diets for Reducing Weight and Cardiovascular Risk, *The Cochrane Database of Systematic Reviews* (2022) https://pubmed.ncbi.nlm.nih.gov/35088407/ & Carbohydrates: How Carbs Fit into a Healthy Diet, *Mayo Clinic* https://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/carbohydrates/art-20045705

[585] Scientific Challenges on Theory of Fat Burning by Exercise, *Frontiers in Physiology* (2021) https://www.frontiersin.org/articles/10.3389/fphys.2021.685166/full

[586] 16oz (473mL) of grape juice has just over 30g of glucose. 16oz of cola = 20g glucose. Honey has 7.5g of glucose per tablespoon, while a cup of cooked sweet corn has about 5g. https://www.myfooddata.com/articles/high-glucose-foods.php

[587] Protein Sparing Therapies in Acute Illness and Obesity: A Review of George Blackburn's Contributions to Nutrition Science, *Metabolism* (2018) PMID: 29223678 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5809291/

[588] They consume non-processed carbohydrates including rice, plantain, manioc, and corn, as well as wild nuts and fruits. Coronary Atherosclerosis in Indigenous South American Tsimane: a Cross-Sectional Cohort Study, *The Lancet* (2017) PMID: 28320601 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6028773/ via https://www.inverse.com/article/50572-tsimane-amazon-healthy-heart-high-calorie-diet.

[589] Low-Carbohydrate versus Balanced-Carbohydrate Diets for Reducing Weight and Cardiovascular Risk, *The Cochrane Database of Systematic Reviews* (2022) https://pubmed.ncbi.nlm.nih.gov/35088407/

[590] Carbohydrate Quality and Human Health: A Series of Systematic Reviews and Meta-Analyses, *The Lancet* (2019) https://www.thelancet.com/article/S0140-6736(18)31809-9/fulltext

[591] https://www.youtube.com/watch?v=nySEnIEl_Sg

[592] Legume Consumption and Risk of All-Cause and Cause-Specific Mortality: A Systematic Review and Dose-Response Meta-Analysis of Prospective Studies, *Advances in Nutrition* (2023) PMID: 36811595 https://pubmed.ncbi.nlm.nih.gov/36811595/

[593] https://www.hsph.harvard.edu/nutritionsource/anti-nutrients/lectins/

[594] Reduction in Saturated Fat Intake for Cardiovascular Disease (Meta-Analysis), *The Cochrane Database of Systematic Reviews* (2020) https://pubmed.ncbi.nlm.nih.gov/32827219/

[595] Fat Intake, *The Global Health Observatory* https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3418

[596] Does Cooking with Vegetable Oils Increase the Risk of Chronic Diseases?: a Systematic Review, *British Journal of Nutrition* (2015) https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/does-cooking-with-vegetable-oils-increase-the-risk-of-chronic-diseases-a-systematic-review/AF44097B0E9C4FF9BD44F1D55CD353D6

[597] Linoleic-Acid-Enriched Diet: Long-Term Effects on Serum Lipoprotein and Apolipoprotein Concentrations and Insulin Sensitivity in Noninsulin-Dependent Diabetic Patients (Clinical Trial), *The American Journal of Clinical Nutrition* (1989) https://pubmed.ncbi.nlm.nih.gov/2923077/

[598] Effects of Saturated Fat, Polyunsaturated Fat, Monounsaturated Fat, and Carbohydrate on Glucose-Insulin Homeostasis: A Systematic Review and Meta-analysis of Randomised Controlled Feeding Trials, *PLoS Medicine* (2016) https://pubmed.ncbi.nlm.nih.gov/27434027/

[599] Dietary Linoleic Acid and Risk of Coronary Heart Disease: A Systematic Review and Meta-Analysis of Prospective Cohort Studies, *Circulation* (2014) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4334131/ via https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5492028/

[600] Effects of Sweeteners on the Gut Microbiota: A Review of Experimental Studies and Clinical Trials, *Advances in Nutrition* (2019) https://academic.oup.com/advances/article/10/suppl_1/S31/5307224?login=false

[601] *Diet Soda Kills Your Gut with Paul Saladino* https://www.youtube.com/watch?v=7MZPru73Pw0

[602] The Effects of Water and Non-Nutritive Sweetened Beverages on Weight Loss and Weight Maintenance: A Randomized Clinical Trial, *Obesity* (2016) PMID: 26708700 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4744961/

[603] Assuming you weigh 68kg (150 pounds).

[604] The Effects of Non-Nutritive Artificial Sweeteners, Aspartame and Sucralose, on the Gut Microbiome in Healthy Adults: Secondary Outcomes of a Randomized Double-Blinded Crossover Clinical Trial, *Nutrients* (2020) PMID: 33171964 https://pubmed.ncbi.nlm.nih.gov/33171964/

[605] High-Dose Saccharin Supplementation Does Not Induce Gut Microbiota Changes or Glucose Intolerance in Healthy Humans and Mice, *Microbiome* (2021) https://microbiomejournal.biomedcentral.com/articles/10.1186/s40168-020-00976-w

[606] https://monographs.iarc.who.int/list-of-classifications

[607] https://melmagazine.com/en-us/story/is-coke-zero-bad-for-you

[608] https://www.theguardian.com/australia-news/commentisfree/2023/jul/06/does-diet-coke-cause-cancer-aspartame

[609] https://www.washingtonpost.com/lifestyle/wellness/disregard-that-persistent-myth-you-can-drink-water-while-eating/2019/04/19/7f8f9b44-5ca6-11e9-a00e-050dc7b82693_story.html

[610] Water, Drinks and Hydration, *NHS* https://www.nhs.uk/live-well/eat-well/food-guidelines-and-food-labels/water-drinks-nutrition/

[611] A Randomized Trial to Assess the Potential of Different Beverages to Affect Hydration Status: Development of a Beverage Hydration Index, *The American Journal of Clinical Nutrition* (2016) https://academic.oup.com/ajcn/article/103/3/717/4564598?login=false

[612] Insufficient Sleep Undermines Dietary Efforts to Reduce Adiposity, *Annals of Internal Medicine* (2010) PMID: 20921542 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2951287/ via Menno Henselmans https://mennohenselmans.com/2017-summer-research-roundup/

[613] I make this once a week in my beloved workhorse Le Creuset (the fiery red one.) After training, I stop off at the store and make it a game to pick up as many different veggies as possible for this week's stew. Then I throw them in the Le Creuset, along with some dried wood-ear mushrooms and white fungus (a staple of Asian cooking). When the pot is boiling, I turn it down to a simmer and add some millet or wild rice, and lastly, my protein – usually chicken or seafood. After an hour, I turn off the heat and let cool completely. Put into portion-sized glass containers & freeze. I grab one of these every day for my lunch. I have no issues with eating my lunch unheated, and don't tend to zap anything I eat. But I have no doubts it would be that much tastier with a quick spin in the microwave.

[614] https://www.youtube.com/watch?v=PM8kiHcAD7Q

[615] "The muscle protein synthetic response to each meal may be additive." Pre-Sleep Protein Ingestion to Improve Skeletal Muscle Adaptive Response to Exercise Training, *Nutrients* (2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5188418/ | Each protein-rich meal contributes to the overall war on sarcopenia. "If practiced over months and years, it may slow the progression of sarcopenia." Dietary Protein to Maintain Muscle Mass in Aging: A Case for Per-meal Protein Recommendations, *The Journal of Frailty & Aging*

(2016) https://www.researchgate.net/publication/304939781_Dietary_Protein_to_Maintain_Muscle_Mass_in_Aging_A_Case_for_Per-meal_Protein_Recommendations; Defining Meal Requirements for Protein to Optimize Metabolic Roles of Amino Acids, *The American Journal of Clinical Nutrition* (2015) https://pubmed.ncbi.nlm.nih.gov/25926513/

[616] Dr. Stuart Phillips, an expert on protein and aging, advises wielding all the weapons in the war of living well until the very end, including the most important: rage! Interview with Dr. Phillips https://www.youtube.com/watch?v=9VwXfzZwwng