

Your metabolic foundation: a 1-page review before launching into nutrition

While metabolism is complex, in simple terms it is a superficial gauge of how many Calories we burn per pound of body weight each day. Metabolism is highest in our lean tissue, as opposed to body fat. Managing our metabolism therefore comes down to managing our lean tissue by both protecting and nourishing it. If the body does not get enough of what it needs it will partly shut down to survive. Metabolic rate can drop by up to ~1000 Calories per day [ref] from strict dieting, exercise and particularly when doing both.

People competing to lose the most weight on the Biggest Loser television show had a suppressed metabolism by as much as 800 Calories per day 6 years after being on the show, making it practically impossible for them to maintain the weight loss [ref]. Similarly, the Calories burned from the fight-or-flight response of stress, or from working at the expense of sleeping, raises metabolism at the moment but hurts it afterwards. Cutting Calories (by dieting) or burning up more Calories (with hard exercise) can therefore backfire in the long term by suppressing metabolism. This is particularly true when the cutting and burning are done at the same time. However, we can control our metabolism and avoid metabolic suppression by protecting our lean tissue.

Protecting lean tissue (PLT) means minimizing stress hormones that break lean tissue down. PLT requires sufficient sleep, stress management, and from a nutrition perspective stabilizing both blood protein and blood sugar levels. PLT avoids the body using itself as fuel, meaning we must eat at least 75% of our daily needed Calories somewhat evenly through the day. This equates to a Caloric bare minimum equal to our Resting Metabolic Rate (RMR) if we are sedentary (more if we are not). Hydration facilitates the digestion, delivery, and use of nutrients, making hydration central to both protecting and nourishing lean tissue. Nourishment implies growth and vitality, so nourishing lean tissue (NLT) goes beyond PLT. Nourishing lean tissue starts with DNA gene expression and therefore begins with deep quality sleep and any stress management that contributes to sleep. Omega fats and veggies then build upon sleep to nourish the body further. Movement, including physical activity and exercise, drive metabolism further, going beyond protection and nourishment.

Managing your metabolism: protect, nourish, and drive lean tissue (PLT, NLT, and DLT)

Protecting Lean Tissue: PLT	Nourishing Lean Tissue: NLT	Driving Lean Tissue: DLT
Blood protein & blood sugar levels Hydration & Calorie flow (> RMR) Sleep & stress management	Vegetables & omega fats Sleep quality Stress management to help sleep	Movement through the day Endurance exercise Strengthening exercise

How to Gauge Your Metabolism Subjectively: Sleep, Soreness and Energy

Our waking restfulness gives us a sense of our sleep quality, which is correlated to the efficiency of DNA gene expression. Our genes encode our proteins and are therefore the first step of protein production to maintain the vitality of our cells. Muscle soreness and weakness tells us how well we are recovering from exercise or from everyday wear-and-tear, giving us a sense of how well we are producing the proteins encoded by our genes. Our mental and physical energy levels tell us how well we are fueling basic function and the entire recovery process. Sleep, soreness, and energy therefore give us a direct perception of the three key physiological steps of cellular maintenance. Protein production is a crude measure of vitality, and yet it is the simplest starting point from which all else follows.

Subjective measure of metabolism	Contribution to our metabolism
How rested you feel when you wake	Sleep quality is correlated to DNA gene expression
Muscle soreness or weakness	Recovery is correlated to protein production
Mental and/or physical energy levels	Energy levels are correlated to energy supply

Building metabolic nutrition from 3 key concepts your body needs: Macronutrient & Fuel Timing/Flow

Metabolic nutrition means eating to facilitate body function, which can be measured superficially simply by how many Calories per pound your body is burning. Body function requires that its cells are maintained and fueled, just like a car. Maintaining our cells requires specific macronutrients whereas fueling them generally does not. Since we are alive every moment of our lives, not only when we are eating, cells will partly consume themselves if we go for extended periods of time without eating either enough Calories overall or of any one macronutrient. Some regularity in the delivery of both Calories and of each macronutrient is therefore important. Regularly supplying nutrients (by eating) to match the nutrient demand (by your cells) creates a supply-and-demand “nutrient flow.” Macronutrients for cellular maintenance, Calories (of any macronutrient) for fuel, and timing (for nutrient flow) make up the three key concepts upon which metabolic nutrition is based.

Macronutrient balance maintains your cells whereas they can be fueled by any macronutrient

Your body has protein, fat, and carbohydrate needs for specific purposes in your cells that only those macronutrient food groups can supply. Your body also needs fuel that can be provided by any combination of protein, fat, and carbohydrate. You therefore have cellular needs that must be fulfilled by specific macronutrients, as well as fuel needs that can be fulfilled by any of them in any combination. Providing the minimum amounts of protein, fat, and carbohydrate for your macronutrient-specific cellular needs leads to the concept of eating a “balanced” diet. An “unbalanced” diet would fall short of providing enough of one of the food groups to keep your system humming along smoothly. The additional Calories for fuel do not need to be balanced so long as they digest slowly enough to be used as fuel (as opposed to chronically being stored in adipose). Your nutrition is therefore composed of 2 layers: a bottom foundational layer requiring balance to meet specific cellular needs, and a top layer not needing to be balanced to meet Calorie needs for fuel.

The bottom layer is best broken up into cellular needs with and without exercise since exercise can more than double the amount of food needing to be balanced (such as doubling the amount of protein you need). Breaking up the bottom layer into 2 layers makes it clear how much the balanced part of your diet is for normal everyday wear-and-tear and how much is sports nutrition to recover from exercise, neither of which change from day to day since recovery continues on rest days. The fuel layer above these not needing to be balanced can also be more than doubled with exercise but depends on how physically active you are on any given day. For intensive exercise, refueling muscle with glucose is critical to enable gene expression for healing, making the fueling part of intensive exercise partly macronutrient specific. All other fueling is flexible, enabling anyone to follow practically any diet imaginable so long as they meet their macro-specific needs and refuel workouts.

Nutrition to raise metabolism consists of 3 functional layers: 2 for maintenance and 1 for fuel

3 nutrition layers	Human body	Automobile metaphor
Fuel	Calorie type & daily use varies*	Fuel type & daily use varies
Exercise recovery & maintenance	Damage recovery & maintenance	Sports car: increased maintenance
Basic everyday maintenance	Each macro needed maintenance	Build & maintain car so it can drive

*High glucose use during exercise can incapacitate healing so refueling exercise is part of the recovery base as is fueling the brain. These are both glucose specific (pizza!) whereas the conceptual top layer exclusively for fueling the body can be any food. There is overlap between physiological maintenance and fuel.

Balanced macros/eating applies to body structure & maintenance	Maintenance demands specific macronutrients, fuel does not	Car built with specific macros; 4 tires, 1 engine, 1 transmission etc.
Protecting & Nourishing Lean Tissue are the maintenance layers	PLT : water, protein, blood sugar NLT : quality veggies & Ω fats	Protect engine from breakdown Nourish it for health / performance
Fuel is > 1/2 of daily needed Cal	Allows flexibility to follow any diet	Car design can allow for any fuel

A car has more maintenance needs if it is driven more. Likewise, the human body has basic maintenance needs that increase with exercise. Our basic maintenance needs are defined by the Institute of Medicine (IOM), and for exercise include guidance from the International Olympic Committee (IOM), the International Society for Sports Nutrition (ISSN), and the American College of Sports Medicine (ACSM). The minimum water, protein, carbohydrate, and fat recommendations target specific physiological functions in the same way that automobile parts target specific functions. We can't build essential nutrients from each other in the same way that you can't use tires as an engine or a windshield as a transmission. "Meal balance" for a car would be providing it 4 wheels, 1 engine, and 1 transmission, whereas the type of fuel we provide can be anything we design the engine for. Likewise, meal balance for us provides our core protein, fat, and carbohydrate that we need to build and maintain our body, where any of these can then be used in any combination to fuel it. This means that building and maintaining our body requires the concept of balance, whereas fueling it does not.

Building and maintaining our body makes up less than half of our needed Calories, balance only applies to less than half the food on our plate. The rest can be whatever we want, allowing us to follow and succeed with practically any diet so long as we balance the smaller maintenance part. For the fuel part making up most of our plate, digestion must be slow enough to sustain an even blood sugar. If your choice for fuel is highly processed food such as most fast food, you can easily end up with less energy instead of being fueled by it. Eating anything you want for the fueling portion of a meal therefore implies either choosing foods that are not highly processed, or at the very least combining healthier foods such as vegetables together with the processed foods so they digest slower together. We have tremendous dietary freedom if we consider how the body works.

The 4 macronutrients are best represented by 5 food groups to emphasize the importance of veggies

The body needs 4 nutrients in relatively large amounts, making them "macro" nutrients. These are water, protein, fats, and carbohydrates. Water is the medium within which the others operate in the body and contains no Calories, whereas the others do and can therefore be used as fuel. However, protein, fats, and carbohydrates are not only used as fuel. The genes in our DNA encode for proteins, which are the active molecules driving all activity in our cells. Fats make up the membranes of our cells and the intricate compartments within them. Carbohydrates enable cell signaling and adhesion, create viscosity in cartilage, and are the only fuel that can maintain a fully sufficient nerve signaling rate. Carbohydrates are best separated into two groups, one that provides more Calories to fuel the body (including starches and fruits) and the other providing more micronutrients and fiber, meaning the foods that we more commonly think of as "vegetables."

Food group "macro" needs for cellular maintenance do not account for even 1/2 of our Calorie needs

The Institute of Medicine's (IOM) macronutrient recommendations do not provide for even half of someone's Calorie needs. This is because the minimum amounts of protein, carbohydrate, fats, and vegetables are not based on getting enough Calories. Instead, they are based on physiological targets such as cellular protein production, fueling the brain, and providing enough micronutrients. These targets are unrelated to Calories.

A quick calculation shows how far our macro needs are from meeting our Caloric needs. The minimum amount protein needed is based on how much new protein our cells produce each day, which is 30 grams (120 Cal) for a sedentary 50 kg person, double this if they weigh twice as much or are athletic. The minimum amount of carbohydrate is based on feeding the brain 60 grams (240 Cal) of glucose. The minimum veggies are 2 cups per day, which for broccoli would be 60 Calories. Essential fat requirements add up to ~150 Calories, bringing the grand total for a 50 kg person to 570 Calories per day. But a 50 kg person has a resting metabolic rate (RMR) of ~1,200 Calories per day, which is at a bare minimum a 25% Calorie restriction since RMR does not include any food digestion or movement. Their actual Calorie use is closer to a minimum of ~1,600 Calories per day. The 570 Cal from obtaining the minimum macronutrients is not even 33% or 1/3 of the actual Calories being used up by the body per day. Even if only eating enough Calories to satisfy your RMR, basic macro needs still only account for 42% of Calories. Restricting Calories by more than 25% reduces metabolism substantially, in turn reducing the benefit of any further restriction. No matter who you are or how much you exercise, you need more than double the amount of food that it takes to meet your minimum

macro food-group needs. It should not be a surprise to us that meeting our minimum protein, carb, fat, and veggie needs does not even get us to half our needed minimum Calories. Calories include getting enough fuel for our entire system to work properly and, of course, would exceed the bare minimum protein to build new protein and the amount of fuel for the brain. We are more than just building protein and fueling our brain.

Macronutrient (food group) needs do not meet 1/3 of daily Calorie needs or 1/2 our RMR bare minimum Cal:

Macros v Cal	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
General & IOM average targets / day	0.6 grams per kg body weight per day	60 g/day for brain (none if in ketosis) + non-exercise activity	2-3 cups minimum average for fiber & micronutrients	1.35 g Ω -3 14.5 g Ω -6 Fats 20-35% of Cal
50 kg person	30 grams = 120 Cal	60 grams = 240 Cal	30 Cal/cup = 60 Cal	150 Cal Ω -3 & 6
~ 42% RMR ~1,200 Cal	Of resting metabolic rate: 10% of RMR	20% of RMR	Cal part of carb fuel	12% of RMR
~ 32% of ~1,600 daily Cal needed	Of the total Cal the body actually uses: 7.5% of needed Cal	15% of needed Cal	Part of carb fuel	9% of needed Cal

Meal balance applies to the bottom layer of our nutrition meeting our macro needs, not to total Calories

In Greece over 2,000 years ago Hippocrates stated “let food be thy medicine” as the original Olympic athletes experimented with diet to stay healthy during intensive training. The concept of “balance” in a diet therefore raises the question as to what we “need” and how needs change under different conditions. Fortunately, scientific research reviewed by credible organizations such as the Institute of Medicine in the National Institutes of Health, and for sports nutrition the International Olympic Committee, help guide us. Their guidance shows that we have both macro-specific maintenance needs as well as additional fueling needs that are not macronutrient specific, making total Calorie needs more than double the minimum macronutrient sum.

The concept of balancing a meal therefore only applies to the balance of food groups making up less than half of the meal’s Calories to provide your macro needs. By the time you add the additional food from any food group to get enough Calories, a plate for one person might look radically different from someone else’s while both provide for all their needs equally well. It is therefore the relatively small amount of food in a meal making up your macronutrient needs that provides what is called meal “balance.” If, for example, you had an egg and some lentils as both your protein and carbohydrate, and some broccoli with olives as your vegetable and omega fat, your macronutrient needs for the meal might only give you a couple hundred Calories, to which you could add triple the amount of any 2 of the 4 foods to get enough Calories. You might end up with a plate loaded up with protein and vegetables, looking like a low-carb diet, or else high in lentils so it is moderately high in slow-digesting carbs, or extra olives for a plate high in fat that looks like someone targeting ketosis. These meals look like completely different diets and have different responses in the body. But stripped of the extra options to get enough Calories, all of them at their core have a balance of food groups underneath making them identical in meeting the core macronutrient needs and therefore provide equally well for body function and growth. They will all succeed for whomever follows the dietary pattern they enjoy most.

Since over half of what we put onto a plate is to meet Caloric needs with less than half needing to be balanced for macronutrient needs, there is no one diet that is better than another. Instead, it is how a diet is managed that determines whether it is helping you achieve your goals or not. And it is the foods you choose while managing it that determines whether you are enjoying that diet or not. Applying the guidelines derived from the Institute of Medicine, a healthy diet can sustain someone even when the portions on a plate look nothing like the expected ideal standards we are used to, regardless of what standard you have been taught. The best diet for any one person is therefore made up of foods they like with up to half being balanced with a bit of food from each food group, the other half made up by any food, and any processed carbohydrate slowed by veggies. Your best diet lets you enjoy what you want right now together with enough balance underneath to enjoy achieving your goals in the future.

Basic nutrition needs are defined by the Institute of Medicine (IOM) & credible sports organizations: Nutrient needs are determined by the Institute of Medicine (IOM) and for **sports** includes the International Olympic Committee (IOC) & American College of Sports Medicine (ACSM). Macronutrient food group needs are < 1/2 of daily Calorie needs even when restricting Cal by 25% (beyond which dieting benefits steeply decline as metabolism drops). Metabolism is highest in lean tissue so **protect lean tissue (PLT) with protein and slow carbs in each meal and nourish lean tissue (NLT) with vegetables & Ω-fats at least 1-2 x/ day.**

	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Daily targets using IOM & IOC/ACSM	0.6 g / kg / day + for exercise up to an additional 1.2 g/kg/d	0-60 g/day for brain + non-exercise activity + match exercise protein	≥ 1 cup / 800 Cal; x2 if density low = raw leafy greens	1.35 g Ω-3 14.5 g Ω-6 Fats 20-35+% of Cal
Hourly need X hours until next meal = meal portion	Daily needs divided by waking hours = hourly needs used to estimate meal portion	Hourly need x hours till next meal = portion; slow digestion to last that many hours w/veg	Veg not needed to PLT so are not needed every meal; ideally ≥ 1-2 x / day	Fats not needed to PLT so are not needed every meal; ideally ≥ 1-2 x / day
Per 100 kg body weight gram / meal	60 g protein / day 3 g protein / hour 3 x 6 hr = 18 g /meal	60 g carb/day for brain <u>same all body weights</u> 3 g carb/hr ~18 g/meal	2-4 cups vegetables or 4-8 cups salad split up into meals	Same daily fat AI (IOM's "adequate intake") for everyone
Athletic	1-3 x protein to heal	0.5-1 x healing protein	Same ≥1cup/800Cal	1-3 x minimum (AI)
Overtraining, health/weight	Minimally processed; steady protein supply	Minimally processed; steady blood sugar	1-3 times minimum; dark colorful variety	1-3 x minimum (AI) not from supplements
Choose what foods you like: happy is sustainable	Vegan: legume & soy Vegetarian: dairy egg Omnivore: muscle (poultry fish beef etc.)	Starch: tuber, grains Legume: lentil, beans Whole fruits Higher-Cal Veg: HCV*	Veggie parachute: Raw veggies/snack Light cook veggies Leafy salad	Ω-3: chia / flax, walnut, fatty fish Ω-6: nuts & seeds Ω-9: avocado, olive
Macro levels in foods: Vegan & vegetarian proteins are color coded Most veggies are too low in Cal to PLT*	<u>grams protein /unit</u> 7 g /egg or oz cheese 7 g /oz muscle (beef, poultry, seafood) 4 g /egg white 3 g /oz CC = cott chs firm tofu, Grk yog 2 g /oz soft tofu, yog 2 g /oz bean or lentil 1 g /oz milk dairy/soy	<u>grams carb fuel /CUP</u> 40 white starch: pasta potato, rice, noodle 30 coarse starch: oat, quinoa, wild rice, yam, potato w/skin 30 sweeter fruit: grape mango, banana 15 fruit Also protein: 30 beans, 25 lentils	<u>Carb fuel not fiber</u> 1 g/cup low-Cal veg: leafy greens, celery 3 g/cup med-Cal veg broccoli, cauliflower, grn bean, cucumber High-Cal Veg: HCV* 5 tomatoes* ~7 g 7 bell pepper* /cup 9 carrots, beets*	<u>Ω-3 daily options</u> 1 Tbsp chia / flax 4 Tbsp walnuts 3 oz salmon sardine <u>Ω-6 daily options</u> 1 Tbsp nut butter 2 Tbsp any nut/seed <u>Ω-9 portion in Tbsp</u> 1 olive oil, 3 olive, 4 avocado or hummus
Macro range	1 – 8 oz to get ~ 8 g	1 cup to get 15 – 30 g	1 cup to get 1 – 9 g	Daily vol by density
6-hr MEAL portions for 50-100 kg body weight linear adjust w/weight/hrs	<u>9-18 grams protein</u> 1 – 2 eggs or oz tissue, cheese 3 – 6 oz yogurt, CC, tofu, bean, lentil 1+ cup milk dairy/soy	<u>18 g for every brain</u> 3/4 cup fruit 1/2 cup sweeter fruit beans, lentils coarse starch 1/4 cup white starch	2-6 cups veg / day depends on goals (health, weight loss) & Cal; double if leafy Only provides fuel to PLT if ≥1 cup HCV*	1, 2, 3, or 4 Tbsp <u>Ω-3</u> chia / flax walnut salmon/srdine <u>Ω-6</u> seed nut, nut btr <u>Ω-9</u> olive oil, olive, avocado, hummus
2-4-6 options PLT / meal NLT / day	2 oz meats or 2 eggs 4 firm tofu, Greek yog 6 soft tofu, bean, yog	2 oz processed starch 4 coarse starch, fruit 6 oz berries, legumes	2 cups dense veg 4 = 1 c veg+3 c leafy 6 cups leafy greens	2 T chia, flax, olive oil 4 T nuts or nut butter 6 avoc olive hummus
Minimums “BY HAND”	1/2 ± ¼ PALM (cup) vol or 1 palm of milk	1/2 ± ¼ PALM (cup) vol or 1 palm HCVs*	1 ± ½ FIST (pint) or 2 ± ½ fists salad vol	1-4 THUMB volumes same as 1-4 Tbsp
Athletic	1+ PALMS = 1+ cups	1+ PALMS = 1+ cups	1+ FISTS = 1+ pints	8 thumbs = 1/2 palm

*HCVs: Higher-Cal Veg (tomato, carrot, beet, bell pepper & some squash) only PLT if ≥ 1 cup (palm) in a meal

Example meal portions by the VOLUME of parts of your HAND: match your plate to the hand holding it
 1/2 – 1 **PALM** (cup) protein & carb portions, 1/2 – 1 **FIST** (pint) veggies & **THUMBS** (Tbsp) of healthy fats

MEALS:	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Eggs	1-2 eggs	1/2 palm beans/toast*	1/2-1 palm veggies	4 thumbs avocado
Yogurt w/fruit	1/2 palm yog/cott chs	1/2 palm berries / fruit	In lunch & dinner	1-2 thumb chia seed
Pizza	Tofu & cheese on...	Pizza crust*	VEG PARACHUTE*	No Ωs this meal
Salad	1/2 palm tofu/beans	Beans or HCVs on...	Salad	Olive oil vinaigrette
Roasted veg	Soy or seafood	Quinoa* / wild rice*	Roasted veggies	Olive oil or avocado
Raw veggies	Lentil, poultry or meat	Yam* or a side of fruit	Raw veggies to dip	...into hummus/pesto
Bottom line: PORTIONS	1/2 palm volume or milk 1 palm volume	1/2 palm volume or HCV/lowCal frt 1 palm	1/2 – 1 fist vol or leafy salad 1-2 fists	1-4 thumb volumes; less dense higher vol
AVERAGE	~1/2 (¼ - 1) palm vol	~1/2 (¼ - 1) palm vol	~1 fist; x2 vol leafy	less dense higher vol
ATHLETE:	Double portion	2+ portions post exrcs	Parachute if starch*	Double Ω-3 & 6

***VEGGIE PARACHUTE:** veg coarse enough (raw or lightly cooked) to slow the digestion of starches in a meal

Recipes and meals easily accommodate your needs with what you like, adjusting relative portions for any diet regardless of what foods your diet focuses on to include or exclude. Here are some vegetarian examples:

Vegetarian	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Salad	Yogurt dressing*	High-Cal veggies	Leafy green, veggie	Avocado or olive/oil
Sandwich	Bean/yogurt spread**	Slice hearty bread	Leafy green, tomato	Pesto (olive oil)
Pizza	Cheese, tofu on top	Thin crust	On pizza, salad side	Put into side salad
Smoothie	Soy milk or pea	Fruit	Spinach, kale	Almond butter, chia

*Yogurt dressing: add 1 Tbsp oil, 1 Tbsp vinegar, 1 tsp maple syrup & 1 tsp salt/pepper to a pint of yogurt

**Bean/yogurt spread: beans or Greek yogurt blended with spices /herbs /olive /citrus peel /sun-dried tomato

The profound fact that macro needs don't meet 1/2 our Cal needs means any diet can be made healthy

To avoid restricting Calories by more than the ~25% the body can tolerate before significantly reducing its metabolic rate, we must eat more than double the amount of food than it takes to meet our minimum macro (food group) needs of protein, carb, fat, and veggies. The large gap between meeting macronutrient and Calorie needs gives us tremendous freedom in how we eat. In a bottom-up approach, if you put foods from the four food groups onto a plate to meet your basic macronutrient needs, you would then have to at least double the number of Calories with additional food, adding whatever else you want regardless of food group. In a top-down approach, you would put whatever foods you want onto a plate (think pizza) and then look for the food groups on that plate, adding a bit of a food group if it is missing (think salad). Whether using a bottom-up or top-down approach, you end up choosing the foods you want while at the same time protecting and nourishing your lean tissue. The only difference is whether you start out or end up considering your macro needs. Whether you check off the macros at the beginning or the end doesn't matter.

With macro (food group) needs being as small as they are, and satisfied by any food within each group, it is relatively simple to work them into any dietary pattern with foods we like. This simplicity applies whether we tend to eat randomly or are trying to follow a strict diet. If you are trying to follow a strict diet, charting out the food options in each group shows you the foods you can build meals from to satisfy your macronutrient needs. If you eat randomly, chart out your favorite foods for typical meals to do the same thing. The food options are based on the dietary pattern you are following and what you like to eat. Whether the macronutrient ratios are similar from meal to meal or are random, you will easily be able to adjust because of how small an amount of food it takes to meet our macro needs compared to our minimum Calorie needs.

A comparison of randomly eating what you like (such as pizza) versus focusing on what you like that is healthy (such as salad) demonstrates how both can benefit from simple food group adjustments. The pizza might have enough protein, but it is likely high in fat and carbohydrate while being low in vegetables even if there are veggies on top. Have a salad with it. On the other hand, if you are having a salad as a meal, it might be low in the other food groups, in which case you could add a bit of protein (such as chicken or tofu chunks), carbohydrate (such as corn kernels or beans), and fats (such as olive oil, olives, or avocado). A pizza with salad after a hard workout might be better for you than a balanced salad by itself since pizza has carbohydrate to refuel the workout, but without physical activity a salad balanced with all the food groups is healthier. It is therefore not always the case that what is usually healthiest is always healthiest since pizza after hard exercise refuels your muscles so that you can heal better. On the other hand, you might want pizza when you don't need the carb or Caloric load, but you can slow its digestion with coarse vegetables (salad) and balance the core macros to protect and nourish your lean tissue while you enjoy it.

An EFFECTIVE diet meets needs so it is EFFICIENT & lets you eat what you like so it is SUSTAINABLE

Having a sense of what the average minimum needs might be for the human body provides us a foundational platform from which to build up whatever diet we would like to follow to help ensure that our dieting efforts do not backfire. Specific diets suggest different guidelines ranging from high to low of the various macronutrients. However, even the most extreme diets generally have at least enough flexibility to accommodate at least half (if not all) of the minimum guidelines from the Institute of Medicine to stay healthy. Simply integrate the minimum amounts of each food group to protect and nourish your lean tissues using the foods you like or that are allowed by the dietary pattern you are trying to follow. Diets are not sustainable if they do not meet the small amounts to meet our basic needs or do not allow us even small amounts of the foods that we enjoy most. Regardless of what diet you try out, do not exclude foods you cherish, and always consider protecting and nourishing lean tissue to avoid a diet potentially backfiring into feeling worse instead of better.

Why dieting is hard: our brain rewards us for eating carbohydrate, fats, and particularly both together

Eating things that target our propensity for what is fast, cheap, and tasty can have us eating things that barely qualify as food in a functional sense. Fast-digesting carbohydrate might generate an insulin response that lowers blood sugar, tending to reduce lean tissue instead of protecting it – a phenomenon I refer to as “anti-eating” since blood sugar can end up lower than before eating, reducing mental focus and physical energy an hour later while increasing hunger for the rest of the day [ref]. Fast food therefore might *not* PLT, and generally does not nourish us unless we eat nourishing foods together *with* the fast food, like having a salad together with some pizza. Traditionally, the word “food” meant what you eat that provides nourishment or benefits your body. Therefore, in a stricter sense, “food” would refer to minimally processed food, such as potatoes, as opposed to highly processed foods more likely to hurt than help the body, such as potato chips.

Highly processed foods are more likely to appear in higher-carbohydrate diets, such as the “SAD” (Standard American Diet) or what healthier eaters sometimes call “cheat” snacks, “cheat” meals, or “cheat” days. “Cheating” refers to breaking a healthy-eating pattern for the psychological reward response of sugar and grease; think donuts, burgers, fries, pizza, tacos, and most other “fast foods.” “Cheat snacks” might also mean straight sugar by itself such as candy and liquid candy (meaning soda) or sugar mixed with fats (like ice cream, shakes, and chocolates).

We are born liking sugar so much (particularly when combined with fats) that a sugar sucker reduces crying in newborns almost double as much as maternal breast feeding [ref]. That we are soothed more by a sugar hit than by breast feeding in the first days of life gives us a sense of the strength of our brain's drive for sugar. Sensors for digested sugars in our intestines trigger an equally powerful reward response, driving us to eat carbs that aren't sweet like pasta, bread, and rice. Unfortunately, that reward has contributed to the creation of food environments low in nourishing options called “food deserts” in places without socioeconomic stress. Food deserts occur frequently in stressed neighborhoods with low availability of nourishing foods, but can also occur as the result of food low in nourishment delivered to a work meeting, in a hotel's continental breakfast, in

many restaurants, your fun evening at a carnival, or that carnival eating pattern expanded into a “cheat” day or even every day if your kitchen is a desert, with only the foods in it that trigger your ingrained reward response. A friend once joked with me that a bachelor’s kitchen had to exclude pickles because they qualified as vegetables, making anything potentially healthy an infraction against the goal of an entirely free-spirited life. Intentional food deserts are an adult’s surrender to their reward response, meaning the brain’s drive for Caloric survival in the short term at the expense of the body’s nourishment and therefore survival in the long term. Instead of deleting the reward-response foods from your life when dieting, include those foods in a sustainable way by combining them with healthier foods at the same time. Ignoring your body’s needs when enjoying yourself can easily put you in a position where your doctor is warning you that your body demands the opposite. It is easy to simply combine what we need with what we want, putting equal value on our happiness both today and tomorrow at the same time.

Choose one processed food at a time; doubling or tripling up treats your body like a garbage can

Combining three processed carbohydrates, such as a burger, fries, and soda with only a single slice of tomato and lettuce might look like a meal but would not qualify as “food” if food is meant to satisfy our body’s needs. This does not mean we cannot choose foods that we are born to be rewarded for within our brain. Instead, it means that if you have metabolic goals, choose which food desert (or literally dessert with one more “s” in the spelling) you most want right now, getting rid of the ones you don’t want as much until a different meal or different day. For example, you could choose a burger wrapped in lettuce if you wanted fries, or a regular burger without fries, or split the fries with someone else to not get the full double dose. If you had some vegetables or salad this would make up for the lower fullness of having cut back on the processed food, adds nourishment, and slows the digestion of the less healthy part of the meal, reducing its negative impact. Adding healthier foods to a less healthy meal therefore benefits you in more ways than when eating those healthier foods by themselves. A strategy might be eating meals that are entirely healthy half the time, and then adding something healthy to the other meals where you are eating whatever you want for a reward response.

Slowing your digestion with protein, dietary fats, and particularly with a “vegetable PARACHUTE”

Protein and fats trigger a hormonal response that slows stomach emptying, which slows digestion. This hormonal effect takes at least ten minutes, by which time processed carbohydrate can already get past the stomach and even all the way to the bloodstream. Vegetables, on the other hand, slow stomach emptying immediately because of their coarseness, which requires no lead time in advance of eating carbs to slow them down. In both type-2 diabetics and normal controls the rise in blood sugar from eating carbs is twice as high when vegetables are eaten 10 min after compared to 10 min before the carb [ref], but the benefit of veggies is likely just as high when eating them at the same time as the carb. Spinach eaten together with pizza tastes a lot like pizza, and kale eaten together with a burger and baked yam fries tastes a lot like a burger and fries. Combining them dramatically improves overall impact of the meal on the body, allowing you to enjoy whatever food you were after in a sustainable way.

The benefit of slowing digestion is profound. Slowing down the carbs gives our lean tissues more time to absorb them, reducing how much is stored as body fat. It also reduces the insulin response, which a) further reduces how much goes to fat and b) increases the rate fats are released from fat cells to be burned by lean tissue. Reducing how much goes to fat cells and increasing how much fat is released by fat cells together with more carb going directly to lean tissue is a triple thread against body fat resulting from a slower digestion. Wholesome unprocessed foods of course achieve this on their own without vegetables and are slowed even more with vegetables, but vegetables are an amazing tool to manage social eating and cheat meals so that we don’t always have to cook separately for ourselves to adhere to a strict diet for the rest of our lives.

The reverse of slowing digestion is therefore a triple threat against healthy weight loss. A large insulin response from fast-digesting processed carbs (such as candy, soda, or chips) can increase body fat more than you would expect from the Calorie count. There is only ~25 Calories of sugar in your entire bloodstream, so even just half a soda or one piece of candy can double your blood sugar in minutes if not cleared by insulin, triggering a momentary insulin response to a small dose of processed carbs as large as for an entire meal.

Insulin sends more to fat to be stored instead of to lean tissue, reduces fat release so the fat already stored gets stuck in storage, and can end up reducing your blood sugar so you are hungrier for the next 24 hours or more [ref]. The triple thread of insulin spikes makes frequent small sugar hits catastrophic to fat burning.

The slowing of stomach emptying with protein or fats requires some lead time to get their hormonal response, so you would need to have a protein or fat “pre-load” in advance of the meal for them to slow down processed carbs. The slowing effect is also less, requiring a large Caloric load of protein and fats to accomplish the same effect that less than one-tenth the Calories of vegetables would provide instantaneously. Vegetables therefore give the protein and fats time to further slow digestion ten minutes later, enabling the entire meal to work together for your benefit.

The magnitude of vegetables effect would be based on how much you eat and how coarse it is. Iceberg lettuce would slow digestion more than softer leaves (such as red leaf and butter lettuce) even though iceberg is low in nutrients. Blended veggies would not slow digestion much, relying entirely on the fiber to slow digestion in the intestines as opposed to having some coarseness to slow stomach emptying, which dominates the slowing effect. On the other hand, you do not want to restrict your chewing to make larger vegetable particles in your stomach since large vegetable particles in our stomach will not mix as well with the processed carbohydrate. If you imagine whole broccoli florets in your stomach with the ground up carbs that made the bread, chips, or rice you just ate, those carbs will not really mix with the broccoli florets. Instead, the carbs would pass out of the stomach as quickly as if the veggies were not there. Imagine the broccoli florets as bowling balls and the processed carb particles as marbles that just pass right through them without mixing. If the bowling balls are broken down to the size of ping pong balls, the marbles will start to mix in and get trapped. Keep the vegetable and carbohydrate particle sizes within an order of magnitude of each other. The carb particle size is that of the flour that was used to make the product. Chewing enough to get the veggie particles small enough mix with the carbs, but large enough to slow them down, corresponds to the regular amount that people tend to chew their food. Therefore, add veggies to carb meals and chew normally.

Engineer your diet so you can sustainability continue eating things you love; think pizza or ice cream

Having vegetables with meals containing a carb is so effective at slowing digestion that it has been shown to have a significant impact on reducing diabetes [ref], making vegetables something of a carbohydrate parachute. The strategy of adding vegetables to meals containing a processed carb (particularly starch) can be combined with limiting the amount of processed carb in that meal to further the benefits. For example, a burger with fries has two large carb portions without much in the way of vegetables. Choosing between a bun or fries plus having a salad first or with the meal will both cut down and slow down the processed carb by providing a parachute to either buns or fries but not both. The power of vegetables to shift nutrient delivery away from body fat towards lean tissue is profound. Vegetables in cheat meals reduce how much cheat foods you need to get full, reduce the digestion of whatever cheat foods you eat, and nourish your body while the cheat foods do not. The tripling of the benefits of vegetables when combining them with processed foods makes them even more important to health than when eating them by themselves.

So why bother with processed food at all when it is so bad for you? Protecting and nourishing lean tissue form a foundation for providing your body’s nutritional needs. But providing physical needs does not necessarily fulfill the psychological needs of pizza or ice cream. In a top-down approach to creating meals, you start at the top: what do you want? Then you add whatever is needed for your body. In the bottom-up approach you start with what your body needs and then add whatever you want to get enough Calories depending on what you feel like eating or whatever type of diet you are practicing. Top-down starts with what you want, whereas bottom-up ends with what you want.

Two classic examples of a top-down approach to meeting nutritional needs are the addition of healthy foods to pizza or ice cream. If you like pizza but it conflicts with your metabolic goals, have it with a salad to slow its digestion (protecting lean tissue), add nutrients (nourishing lean tissue), and to get fuller so that you don’t want that last piece (shifting the balance towards protecting and nourishing lean tissue even further). You get the pizza you want and the salad you are at least willing to eat since you are choosing the type of salad. It can

even be iceberg lettuce, which is low in nutrients but slows digestion more than softer leafy greens such as red leaf or butter lettuce, giving iceberg lettuce an advantage despite its low nourishment value. If you want ice cream and like to really spoon it in as I do, put some on top of cottage cheese or yogurt with chia seeds and nuts so you get a larger combined portion with the ice cream on top, making sure to get some ice cream directly onto your tongue with each spoonful. The sugar hit is mild instead of overwhelming, and this dessert has been turned into a complete meal because of the addition of protein and healthy fats.

Two classic examples of a bottom-up approach to meeting nutritional needs are the addition of a missing food group to what is already healthy eating, such as salad or the canonical salmon with broccoli dinner. If you are eating a salad that you love as your meal, you might need to add a protein or carbohydrate fuel to protect your lean tissue. The protein could be beans or lentils, a yogurt-based dressing, or some chicken or tofu chunks. The carb fuel on the salad might be the same beans or lentils, or the addition of squash, cut up fruit or berries, or a starch, such as cut up yam or a whole grain like wild rice or quinoa. The canonical salmon with broccoli dinner will not recover an active person's blood sugar sufficiently to fully protect lean tissue. The brain will stimulate the release of cortisol to break down lean tissue to increase blood sugar levels regardless of how much protein there is in the meal.

We have the freedom to choose both which foods from each food group we want to eat to meet macro needs, as well as what larger amount of food beyond that from any food group you would like to eat to get enough Calories. Together with our ability to combine healthy foods with less healthy foods (such as salad with pizza or cottage cheese with ice cream), we have a toolbox enabling both our freedom and efficiency.

Diet strategies manipulate macronutrients, food options, feeding schedule, or our reward response

To say that we “have” or are practicing a diet could mean we are manipulating our macros, our food choices, how we combine those food choices, the total amount we are eating, when or how often we should eat, or any combination of these. The word “dieting” or saying you are “on” a diet usually implies that your eating pattern involves some level of Caloric restriction. More generally, someone's diet is their dietary pattern whether they are trying to manipulate anything or not, even though popular diets are so ubiquitous that the word “diet” has started to imply dieting.

Diets focusing on high or low amounts of a macronutrient or food group include those referred to as high-fat, low-fat, or low-carb. Diets focusing instead on specific foods you should or should not eat include vegetarian and low gluten. Some diets (such as typical Paleo and Mediterranean patterns) do both, not necessarily strictly defining macronutrient ratios and specific foods, but suggesting ideal macro ranges food choices that are better than others. Diets generally suggest we should avoid or limit highly processed foods. This makes sense since eating highly processed foods contributes to our needing to consider dieting to begin with and can increase body fat without overeating because of the insulin response and in the long term reduced health.

Diets can also focus on timing, either suggesting that you eat many small meals evenly spaced throughout the day, or that you do the complete opposite, intermittently fasting without eating for up to a day or more. While fasting provides benefits, it also slowly loses lean tissue, which can ultimately backfire for someone who is already losing lean tissue from natural aging, stress, a lack of exercise, poor sleep, or poor nutrition.

Even extreme diets can usually accommodate needs & foods you like to make them more effective

Even the most extreme diets can be manipulated to make room for you to meet at least half of your macro needs. Meeting your basic needs is therefore easy to integrate into diets no matter what they focus on.

Concept	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
General & IOM average targets / day	0.6 grams per kg body weight per day	0-60 g/day for brain + non-exercise activity	2 cups minimum average; goal based	1.35 g Ω-3 14.5 g Ω-6 Fats 20-35% of Cal
Typical % of daily needed Cal to P/NLT	≤ 10 % of Cal	≤ 15% of Cal	Part of carb fuel	≤ 10 % of Cal
Diets generally suggest...	15 – 30 % of Cal	5 – 50 % of Cal	Part of carb fuel	20 – 80 % of Cal
Diets tend to add beyond P/NLT by...	Doubling the minimum protein needed to PLT	Double or more (as with protein) but diets often restrict carbs	Low-carb diets can have veg as main or the only “carb” fuel	20-35% Cal as fats (IOM) doubled or more by some diets

PLT & NLT account for **LESS THAN HALF** of your needed Cal: accommodate **ANY DIET** with the rest.

Basic needs (P/NLT) are easily integrated to fix any diet in this ladder comparison: **Athletic keto** has refuel carb & recovery protein, **SB = South Beach Diet**, **SAD = standard American diet**, **Carnival diet / food = “cheat” meals**

% Cal & Vol	% Protein Palms	% Carb Palms	Ladder of easiest carbs	Nourish: Fats
Lowest P/NLT	10 ±5 % 1/2	20 ±15 % 1/2	Carb fuel includes veg	15 ±5 % 1-4 thumbs
Diet ranges	10-30 % 1/3-1	5-60 % 1/6-2	Carb fuel includes veg	20-80 % 1/4-1 palm
Keto	10-15 1/3-1/2	5-10 2 palms of:	Low-Cal veg only	80 1+ palm fats
Mild Keto	15-20 1/2-2/3	10-15 2 palms of:	Any vegetable	70 1+ palm
Athletic keto	20-25 2/3+	15-20 for ex refuel	Exercise refuel critical	60 1+ palm
High prot Atkins	30 1	15 1/2 palm of:	Low-Cal fruit & legume	55 1 palm=16 thm
Paleo & Zone	30 1	30 Paleo:	No grain legume potato	40 2/3 palm=12 thm
2g/kg*40/40/20	40* 1.3*	40 1/2 palm of:	Any fruit & legume	20 1/3 palm=6 thm
Stepladder SB	25 5/6	35 1/2 palm of:	Small portions starch	40 12 thumbs
Mediterranean	20 2/3	40 1/2 palm of:	Moderate starch	40 12 thumbs
Balanced IOM	20 2/3	45-60 1/2-1 palm	Starch only w/ veggies	20-35 6+ thumbs
High veggie**	15 1/2	65 1+ palm	Starch only w/high veg	20 6 thumbs
“SAD” Carnival	15 1/2	50 1+ palm	Processed carb w/veg	30 9 thumbs

*40/40/20 = 400 Cal (100 g) protein /1000 Cal must avoid >2 g/kg protein long term so exclude refuel from ratio

**Pritikin & Ornish = plant based; traditionally targeted 10-20% protein, 70-80% carb w/high veg & only 10% fat

As the carb level of a diet increases, the carb foods you can eat expands from vegetables only in diets lowest in carb, to a stepwise addition of legumes, fruits, and ultimately starches as more carbs are allowed. Diets higher in carbohydrate should use minimally processed carb sources and use veggies to slow digestion:

As a diet goes up in protein and/or fats it becomes more important to choose foods with high quality fats in them to avoid a reduction in health. As a diet goes up in carbohydrate more types of carbohydrates become options. Low-carb diets might only allow vegetables because fruit and starches (meaning tubers and grains) are simply too high in carb Calories for that diet. As you go from very low to higher carbohydrate diets you get to have both a larger selection and larger portions of carbohydrate foods. Increased flexibility with respect to carbohydrate allows you a stepwise addition of carbohydrate options starting with vegetables only in the lowest-carb diets, to fruits and legumes in more moderate diets, and tubers and whole grains in the more balanced diets. It is highly processed foods, including carbohydrate foods, that is problematic for health and weight loss. High-fat and high-carb diets using wholesome minimally processed foods drop body fat by 10 kg in one year equally well regardless of a person’s genetics or insulin response [ref]. Cutting out some or most

of the carbs instead of eating healthier versions might be a good idea if healthier options are unavailable but is an overreaction to hearing about carbs being bad for you when you have the healthy options available. Besides eating healthier options, the vegetable parachute allows cheat meals to have a more neutral rather than a negative effect so that even processed carbs can be included in a diet with minimal detriment.

Fixing your natural pattern: small adjustments in what you do can provide large benefits

To adjust your diet to meet basic needs, start with what you like and build from there. How you eat should feel like your authentic self, both in terms of the foods you enjoy and your goals. By choosing foods you like in each food group to meet basic needs you are paying equal attention to the present moment and your future goals simultaneously. Your adjustments might include adding a bit of vegetables to a meal, or some omega-3 fats, or having a snack that protects your lean tissue when you wake instead of skipping breakfast. Keep any adjustments small since these will be more sustainable, and the body can adapt to almost anything so long as it has something to work with, making larger adjustments unnecessary. Since there is no “best” way to eat, there is certainly no “perfect” way to eat other than what is perfect for your life experience.

The 80/20 principle of nutrition: most benefits from nutrition come from relatively small adjustments

In summary, meeting our basic macronutrient (food group) needs does not meet even half of our Caloric needs. This minor part of our eating serves as the basis for physiological function (without a consideration of having enough fuel or Calories to get through the day) and therefore serves as the part of our eating that must be “balanced.” The larger part of our eating making up most of our Calories is therefore not the part meeting our basic macronutrient (food group) needs, instead providing us the fuel to function without a loss in metabolic rate. Since most of our Calories can come from any food group, any diet can maintain our health so long as the bottom layer of our eating that makes up a smaller part of our Caloric intake is balanced, and the larger part of our Calories are not primarily processed food that hurt us.

Processed food hurts us because of their usually having a faster digestion rate and because healthy molecules can turn unhealthy by processing. Since processed foods are tasty, heap and convenient, they are inherently a part of our lives and will continue to be indefinitely. The goal should therefore not be their elimination but rather their management. Manage the pizza or burger by having them with a large portion of vegetables or salad and manage the ice cream by having it after a healthy meal so it mixes with vegetables and protein in the stomach to slow its digestion. Adjusting the bottom layer of our nutrition to meet food group needs rarely accounts for more than a 10% change in our eating. Nor does the management of the top layer to meet Calorie needs account for more than a 10% change. Put together combined, it is therefore rare that more than 20% of anyone’s eating needs adjusting to both provide the underlying required balance together with avoiding a hurtful Caloric fueling top layer.

Since the bottom (macro) and top (fuel) layers of nutrition rarely demand more than 10% adjustments each, it is rare that someone’s diet is so inconsistent with their goals that they need a complete overhaul. Instead, make small adjustments to what you are doing to fill in one or two gaps that were holding up the system. It is like fixing a small part of a car’s engine, enabling all the other parts to finally work at full capacity as one coordinated system. No need to replace the engine. Figuring out what small adjustments to try out should be based on validated research reviewed by recognized competent organizations. If you are following a diet, consider the general guidelines derived from the IOM to ensure you are protecting and nourishing your lean tissue while on that diet, and then stack your sports nutrition on top of this when exercising hard. And if you just want to be who you are, eating the way you like to eat while also achieving your personal goals related to metabolism, chart out your typical eating pattern and compare it to the same IOM and sports nutrition guidance. If you are short on protein it is easy to add a protein you like, and if your sports nutrition falls short on refueling workouts you can add a carb that you like. You can even merge how you like to eat with other dietary ideas you have been wanting to try out. Or you can go a step further and stack how you naturally like

to eat together with both a diet you want to try and with sports nutrition all at the same time. The possibilities for creatively discovering what works best for you are endless, and you will enjoy the process much more having a sense of what the average person needs for health as a foundation so that your dieting efforts do not potentially backfire as you go along. Because macronutrient needs are so easily met with meal balance being less than half of your total Calorie needs, small changes of $\leq 20\%$ of what you are doing can provide $\geq 80\%$ of the benefits you are after.

There is no best way to eat, but there are basic needs

We have the freedom to choose what foods we want to eat to meet our food-group (macronutrient) needs as well as to add enough Calories beyond that to match practically any diet type with any food group combination. And we can use protein, fats, and particularly vegetables to slow the digestion of the processed carbohydrate that might be in a meal. This gives us almost complete freedom in how we manage our diet. Protecting and nourishing lean tissue is therefore consistent with practically every diet imaginable with at most very minor modifications, including any natural eating pattern someone follows by habit. Eating processed including “fast” foods do not stabilize blood sugar or nourish the body, but if half our eating is healthier, the healthier half will meet our needs while we are enjoying our social time, carnival food, or “cheat meals.” Charting out how you eat or what a diet prescribes easily exposes any gaps. Filling a gap significantly reduces the chances of a diet failing to achieve your goals because of basic needs not being met or backfiring by either suppressing your metabolism or creating cravings. The simplicity of meeting basic needs with less than half the Calories in a diet makes it clear why diets that look not only different but completely opposite to each other are equally valid.

If there were a best diet, there would not be a wide variety of eating patterns between societies that live the longest, between different modern-day hunter-gatherers, and between different diets used in high-quality weight loss studies. For example, a high-fat versus a high-carbohydrate diet focused on wholesome minimally processed foods, mostly cooked at home, reduced body fat levels equally by roughly 10 kg over one year in a large prospective study regardless of the insulin sensitivity or genetics of the subjects [ref]. Regardless of the type of diet, highly processed food can hurt metabolism, whereas more wholesome food improves it, as shown with long-lived, or hunter-gatherer, or dieting individuals. But cutting down processed foods to at most half your meals and reducing the digestion rate of those processed meals might be enough to move you towards your metabolic goals.

Metabolic nutrition protects & nourishes lean tissue to achieve goals, which includes sports nutrition

Our goals determine what matters. Without goals, there is no reason to consider changing what you are already naturally doing because you are happy as is. However, when you are not reaching goals easily, consider whether you are meeting the body’s basic needs with your efforts. If you aren’t, even the best diet for your goals will fall short of enabling your body to function at a basic level, eliminating much of the benefits of an otherwise great diet.

Having a sense of what the average minimum needs might be for the human body provides us a foundational platform from which to build a metabolic diet, meaning one that protects and nourishes our lean tissue. Nutrition to protect lean tissue (PLT) maintains blood protein and blood sugar levels to avoid a destructive stress hormone response. Nutrition to nourish lean tissue (NLT) adds omega fats and vegetables, which shifts our cells from simply surviving to flourishing and thriving. Water facilitates the digestion, transport, and use of nutrients, putting hydration at the heart of both PLT and NLT. Exercise can easily deplete and damage our muscles, which is why hard workouts create soreness and increase our basic nutrient needs.

Protect lean tissue (PLT) to STAY FASTED instead of allowing your body to transition to starved

After 25% of your day, or 6 hours, your body uses up roughly 25% of your daily Calories. When food is digesting, which typically lasts about 6 hours after a healthy meal, the Calories that the body needs are being supplied by your meal and with a bit of Caloric restriction fats from fat cells will be used up as well (unless

blocked by an insulin response to fast-digesting carbs like sugar). After those 6 hours of being “fed” our blood sugar and blood protein levels fall enough to trigger the brain to release stress hormones which, in turn, trigger cells to start breaking down proteins they have within them to make up for the shortfall. The protein breakdown clears out damaged proteins at a faster rate than usual, so fasting creates something of a “cellular cleanse.” However, functional proteins are also destroyed, and after 6 hours of fasting, which is a dozen hours after the last meal, the loss of proteins in your muscle exceeds fat loss by a factor of two [ref]. This means that for 6 hours after eating a healthy meal we tend to be “fed,” that for the next 6 hours we become “fasted” with a Caloric deficit of about 25%, and beyond this our deficit exceeds 25% with detriments that might exceed the benefits. When a fit person does a hard workout, they can use up the same number of Calories as they would have at rest for 6 hours, putting them into a deep Caloric deficit in a very short amount of time. A Caloric deficit exceeding 25% of daily needs for more than a few hours raises stress hormones but lowers the hormones that keep us healthy increasing body fat by ~0.3% for each hour that we delay eating [ref]. Caloric restriction should therefore be practiced evenly through the day as opposed to flip-flopping between undereating the first half of your day and then overeating in the second half. Even if you restrict Calories overall, you might not achieve your weight loss or health goals if you lose too much muscle during the “flip” (when not eating much) and gain body fat during the “flop” (while eating too much to compensate later). This flip-flop eating pattern where we don’t eat earlier because we don’t notice any hunger and then eat too much when hunger is exacerbated with cravings (from insufficient eating earlier) contributes to “nighttime eating syndrome.”

If you do not want to eat at times when your Caloric deficit likely exceeds 25% of your daily needs, such as when waking up or right after hard exercise, at the very least have a PLT snack, meaning one with a bit of protein and a bit of carbohydrate that digests neither too fast (which would generate excess insulin) or too slow (vegetables generally take too long to get your blood sugar up). A PLT snack is based on providing basic blood sugar and blood protein needs to your cells, as opposed to providing enough Calories. A PLT snack therefore does not get you very far out of a Caloric deficit since that is not the point. The point of a PLT is to protect your lean tissue, not to provide all the Calories you need. Think of it as your minimum safety net at a time when you need food but don’t want to eat. A PLT snack does not provide enough Calories for what you need at that moment, it just serves to PLT. From that perspective, having PLT snacks, even if they include some nourishment, LEAVE you in the fasted state. Fasting does NOT mean you are not eating anything at all, but rather that your BODY is in the fasted state. Fasting is extremely good for the body, but starving is not.

Restricting Cal for weight loss: spread out the Cal for a continuous mild fast instead of “fasting”

A Caloric deficit deeper than 25% of daily Calories for more than a few hours can result in losing twice as much muscle as fat in nonathletic people [ref] and an increase in body fat with overtraining symptoms in athletic people [ref]. There is also a potential long-term suppression in resting metabolic rate by as much as 800 Cal per day even 6 years after very hard exercise combined with strict dieting [ref]. The theoretical limit of this metabolic suppression was shown in my research to be as much as ~1000 Cal per day [ref]. These issues arise because we are living organisms with continuous needs every moment that we are alive, not just when we have eaten food. The transition from fasting helping versus hurting us appears to occur when Calories are restricted by more than 25% of daily needs for more than a few hours. This implies that a 25% Caloric restriction is the most we could undereat while still fully maintaining our health. The more you cut Calories the more important the health quality of your food since the body has less to go on, and the more important it becomes that you meet your basic macronutrient food-group needs. Basic needs includes sports nutrition since sports nutrition is fundamentally about recovering, not simply performing well. The Calories we need per day are for basic existence meaning our RMR (Resting Metabolic Rate), another 25% of RMR for food digestion and a bit of movement, plus up to another 25% for exercise healing. Non-exercise movement can burn more than your RMR per day [ref]. At the very least our RMR is therefore a Cal restriction by $\geq 25\%$.

Eating only enough food to cover macronutrient food-group needs would be a Caloric restriction by over 50%, hurting your metabolic rate and ultimately your health. Strict rigorous diets are therefore only recommended under direct supervision of a physician to ensure health is being maintained. The “Biggest Loser” contestants were under medical supervision and stayed healthy, but they still lost not only muscle mass but long-term

metabolic rate by hundreds of Calories per day, making sustainable weight loss practically impossible. When it comes to weight loss, as with all things in life, more is not better. Only better is better. Restrict Calories by up to 25% by eating healthy minimally processed foods and enough veggies to fill up so you don't have to count any Calories at all. Natural food fills you up so you are less likely to overeat and digest slower so that less goes to body fat whether you overeat or not. The longest-lived people do not diet; they eat unprocessed food.

Protect lean tissue (PLT) to STAY FASTED instead of allowing your body to transition to starved:

Fasting is good for the body and should be maintained to some extent continuously, whereas starving is not and should not. The body switches from fed to fasted to starved (increased muscle loss) regardless of hunger perception every 6 hours after a healthy meal. Hunger is usually lowest due to stress hormones after waking and exercise, reducing our eating at the very times when we are in our deepest deficit, leading to lean tissue loss at that time and both hunger and cravings later: stay in the fasted **state** instead of fasting into starvation.

FASTING Snacks = Sports Recovery Snacks = PLT Snacks. PLT reduces lean tissue loss during fasting and boosts lean tissue growth during sports recovery, which includes pre-exercise & the refuel right after exercise.

PLT snacks	PLT: Protein	PLT: Carb fuel	Veg are low in fuel	Omega fat
Sports Recovery & FASTING snacks	Consider protein if last meal > 3 hours	Energy: legume or fruit or whole grain	Veg too low to PLT unless in ketosis	Fats do not impact blood sugar/protein
Before exercise	As needed to PLT	Slow carb	Not likely tolerated	Optional if tolerated
Refuel within 10 min post exercise	≤ 0.3 g/kg protein to initiate recovery	Up to 1 g/kg fast digesting starch	Starch post ex is critical even in keto	Optional if tolerated Enjoy!

Refueling workouts is critical to a) protecting lean tissue, b) recover & c) reduce sports injury risk

After a hard workout it is the loss of sugar (glucose) in your muscles that will keep your blood sugar low for many hours or even days. You therefore must refuel while your muscles are still absorbing glucose at a high rate from having just worked out. Glucose is in starches, meaning tubers and cereal grains, and since muscle is absorbing fuel quickly you want the glucose source to digest quickly. You read that right: eat a fast-digesting starch such a baked good, chips, pretzels, or dry cereal right after a hard workout. Fruit is the wrong sugar, half its sugars going to the liver instead of muscle, therefore failing to refuel you sufficiently unless you overload the liver at the same time. You could use fruit after a moderate workout that does not need refueling as much since the muscle will at least get half the sugars (that are glucose) in the fruit. After a workout that uses up less than about 10% of your daily Calories you might not need to refuel at all since the losses in might not be large enough to trigger to chronically rob your blood sugar. Failing to refuel hard workouts therefore makes it difficult to maintain high levels of recovery, physical energy, mental focus, and over the long term reduces health. A systematic review of the literature has shown that most symptoms of overtraining in athletic individuals stems from poor nutrition, in particular from eating only half as much carbohydrate as they need [ref]. How much carbohydrate we eat does not tell us how we space those carbs out through our day or what carb foods we are choosing to eat. To get a sense of the best approaches for overall timing we look to the Calorie-deficit research showing that while it is fine to be “fasted” there is a transition to being “starved” even if you do not notice any hunger after a) not eating for a dozen hours, b) doing a hard workout for even just one hour, or c) combining these so that you are doing hard workouts not only in the fasted state but in the starved state. Hard workouts while starved could put you into a Caloric deficit exceeding 50%, after which the body will be breaking down more day by day than building up [ref]. This is true even if you overeat healthy foods later in the day. The harder your body must work the more it has to recover. The more it must recover the more it depends on every hour of the day to succeed in recovering.

The strongest driving force in our muscle fibers for DNA gene expression for recovery and growth is the target of rapamycin (TOR). TOR is shut down by excess adenosine mono-phosphate kinase (AMPK) activation. AMPK is the strongest driving force for DNA gene expression for fat burning. A complete absence of refueling after hard workouts maximally activates AMPK but at the cost of deactivating TOR. This means that focusing entirely on depleting the body to burn more fats shuts down healing at the DNA level.

Failing to refuel after a hard workout leaves the muscles used in that workout low in fuel for the next workout, leading to earlier fatigue in those muscles compared to the surrounding muscles not were not used as heavily. When your main muscles fatigue sooner, your other muscles try to make up for the loss. This changes the forces across the joint, increasing the risk of joint injury [ref].

A fast-digesting starch after hard workouts is “ESSENTIAL garbage”

In the end refueling hard workouts is more than just about performance. It is about recovering, protecting lean tissue, and reducing sports injury risk. Right after hard exercise is the only time that fast-digesting starches are needed to keep you healthy, which is why I refer to it as “essential garbage.” This is a term coined during a discussion with my friend Ranna Modir, a clinical registered dietitian who came to me for help when her clinical knowledge was not helping her to stay healthy in the face of her strenuous workout program.

Sports nutrition is fundamentally based on protecting and nourishing damaged exhausted lean tissue

Sports nutrition at its core protects and nourishes lean tissue by replacing perspiration and fuel losses, and by recovering damaged lean tissue by supplying recovery needs. The hardest workout schedule someone can maintain for extended periods of time uses up to three times their baseline protein needs. Triple baseline is roughly 2 grams of protein per kg body weight per day, of which anything over the baseline 0.6 grams of protein / kg / day is specifically for healing recovery. That recovery protein should be matched roughly 1-to-1 with dietary carbohydrate to fuel the protein assembly process central to healing. As Calories increase, the amount of fats should increase as necessary to not fall below the minimum 20% of Calories. The lower your dietary fat intake, the more important it is to make sure your essential (omega-3 and -6) fats meet your minimum needs, and the more you should consider increasing your essential fat intake by a factor of 2 or 3.

As carbohydrate needs increase in meals to maintain recovery levels, having vegetables in those meals to slow digestion becomes more important. Slower digestion increases the time your lean tissues have to absorb (and therefore use) the nutrients you are delivering to them, increasing their recovery. Harder training increases free radical production in the body, also increasing the need for vegetables. Antioxidant supplements can cut exercise adaptation in half [ref], which is why the IOC and ISSN recommend against antioxidant supplementation for athletes. That antioxidant supplements can significantly hurt an athlete’s progress highlights the importance of the concept of “food first.”

All food groups are important for sports nutrition. Overtraining symptoms can arise from a) being low in any of the four food groups, b) from falling short in Calories by more than 10-25% for even a part of your day [ref], or c) from failing to refuel workouts that exceed roughly 10% of your regular daily Caloric needs. These targets respectively address a) basic health, b) having enough energy, and c) replacing Calories where its losses are the greatest. Unfortunately, failing to replace fuel losses in muscle soon after hard exercise (when the absorption rate of fuel into muscle is still high) easily results in muscle chronically robbing your blood sugar to refuel for a day or more, keeping your energy low and hunger high, particularly late at night when excess eating in response to the hunger triggered by under-fueling causes further damage by disrupting sleep.

Meal frequency can be anywhere from 1 – 12 feedings per day

The fewer times you eat in the day the slower the digestion of meals should be so that nutrients are delivered slowly for as many hours as possible. The more frequently you eat the less important this becomes. Since most protein and carbohydrate foods that are unprocessed protect your lean tissue for 4-6 hours, eating more frequently than 6 hours would eliminate the need to protect lean tissue every time you eat. You could alternate between feedings that protect lean tissue every 4-6 hours, with feedings that nourish lean tissue in between.

Eating once per day would supply nutrients to your body for 6 to 12 hours depending on the digestion rate of the foods in the meal. Legumes, fats, and raw vegetables digest slowly enough for a 12-hour nutrient delivery. This would leave the next 6 hours fasted, and then only 6 more hours “starved” before you eat your once-daily meal. Eating more frequently (2-3 or even a dozen times / day) increases your flexibility in what foods you eat.

How to break and go into a fast

Research shows that people lose twice as much muscle tissue as body fat when fasting by skipping breakfast [ref] with any benefits coming only from the extent of Caloric restriction from having fasted. Caloric restriction can of course be practiced without fasting simply by cutting down how much you eat. Since the body transitions from “fed” to “fasted” to “starved” in 6-hour increments, when you have not eaten in 12 hours you are transitioning to “starved” where the detriments of not eating might be as great or greater than the benefits. It is best to rescue your body coming out of a fast that has transitioned to starved with foods that digest at a moderate speed, as opposed to eating either the slowest (healthiest) or fastest (processed) digesting foods. This rescues your body from the starved state faster so long as you avoid highly processed foods that generate a large insulin response – rescuing your body with a donut, pastry, bagel, or dry cereal is no rescue at all. Foods that digest at a moderate speed include soft proteins (such as yogurt and soft tofu) and carbs high enough in Calories to get your blood sugar up at a pace neither fast nor slow, such as fruit or coarse whole grains. On the other hand, your meal before entering a fast should digest as slowly as possible to maintain your blood sugar and blood protein levels for as long as possible into your fast. The fast might be the dozen hours between dinner and breakfast the next day, or it might be an intentional fasting regimen.

I use uncooked oats (with chia seeds, nuts, and milk) or else yogurt (with chia and fruit) to “break my fast,” referring it to my “PLT snack” since it is very low in total Calories. Soft protein sources do not take as long to digest so I do not use them in meals meant to last over 4 hours until the next feeding. My full “breakfast” is a couple hours later using slower foods – cottage cheese with walnuts and either berries or a sprinkle of granola, or else an egg with at least a cup of vegetables and some beans. My dinner is generally at least 5 hours before going to sleep so I want it to last as long as the breakfast did and therefore has equally slow foods as my breakfast. If I have a snack one or two hours before bed it tends to be slightly faster digesting like my morning PLT snack since I do not want much undigested food in my system when trying to get quality sleep.

Intermittent fast	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Ω fat
Breaking fast with “faster” foods	Yogurt, soft tofu, milk or soy milk	Whole fruit Whole grains, tuber	Cooked vegetables including in soup	All dietary fats digest slow
Entering fast with slow foods	Firm tofu, poultry, meats, eggs, cott chs	Legumes, berries, high-Cal veggies	Raw or light-cook (still crunchy) veg	All dietary fats digest slow

If you are suffering from hunger a) balance your entire meal, b) eat earlier & c) refuel hard workouts

If you are incessantly hungry your blood sugar was or is too low, or you are low in some other macronutrient. If you are high or low in one food group, try eating a meal that is not only balanced in your basic needs but also in the extra food you add to get enough Calories. Meeting basic macro needs makes up not even half of our Caloric needs, meaning you can have more than half of your food coming from any food group that you want. However, your needs for one food group might be more than you realized, such as if you are exercising hard and underestimated the damage to your body from the workouts. Balancing out the food groups of the entire meal, not just the core portion meeting macro needs, allows you to test out if your basic needs are being met.

Regardless of your macro needs and how balanced your eating is, if you go too long with too low a Calorie intake, your body will remember the low levels of nutrients in your bloodstream. This will increase your perception of hunger later. Meals that digest faster increase insulin more, resulting in a larger blood sugar drop an hour or two after the meal, which raises hunger for at least the next 24 hours [ref]. Therefore, eating processed foods can increase hunger later in the same way as having not eaten at all, which is why I refer to processed meals as anti-eating since they can have an effect potentially even worse than not eating. Hard workouts not only drop your blood sugar, but if you do not refuel them sufficiently will also keep your blood sugar low for hours or even days depending on how low your carbohydrate levels are in your meals. Under-eating meals, under-fueling workouts, and processed foods therefore increase the risk of hunger.

Cravings can stem from earlier low blood nutrient levels and are not satisfied by eating enough food

Hunger is your current perception of nutrient needs. It tells you that you need to eat. But sometimes we eat to fullness and want to keep eating anyway. While hunger can be satisfied, cravings can persist regardless of how satiated we are. The stress hormones adrenaline and cortisol associated with waking from sleep and with exercise inhibit hunger perception in some people to the point where they perceive no hunger at all. The brain will drive cravings to compensate for low nutrient levels earlier in the day. Hunger is satisfied when it is perceived, but cravings must be satisfied in advance, meaning they can be avoided but not eliminated once they are there. Simply add some vegetables and other bulky foods to your meal and eat earlier the next day.

There is relief in simplicity: Once we have a sense of how to meet minimum needs, it becomes clear both how important those needs are and how easy it is to meet them. Otherwise, we might not supply that minimum need, making the rest of our healthy diet efforts less effective. Fix the small things we need, and the rest works very well. This is how any system works, with each part depending on the other parts. Chart out what you are doing or planning to do, focusing first on what you want to eat, and then fill in any gap(s) with small adjustment(s) using foods that you like but might not have included in that meal.

Examples meals, all of which can be modified for any type of diet

Switch out vegan, vegetarian, or meat protein sources in any recipe to make it your own. Increase or reduce the portions of any food group for how you like to eat and for your goals, always meeting bare minimum needs (which includes sports nutrition) so that your diet does not potentially backfire. Creating an eating pattern from scratch is easily accomplished by building meals that protect lean tissue a few times per day, and then adding vegetables and fats to nourish the body one or more times per day beyond that.

Example **breakfasts:** At the very least protect lean tissue (PLT) with a bit of protein & healthy carbohydrate

PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Yogurt	Berries	n/a	Optional chia / flax
Cottage cheese	Sprinkle granola	n/a	Optional chia / flax
Milk or soy milk	Oatmeal	n/a	Optional chia / flax
Eggs	Beans or hearty toast	In eggs or on side	Avocado

Example **lunches:** Go beyond PLT to include some nourishment

PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Sandwich: bean spread, tofu, or any meat	Hearty bread	Lettuce, tomato, etc.	Optional avocado
Pizza cheese etc.	Thin pizza crust	Salad to slow digestion	Optional on salad
Soup bean, tofu, or meat	Beans, corn kernels, etc.	Cooked veggies in soup	Optional
Salad topping (bean, tofu, chicken, etc.)	Corn, quinoa, wild rice, bake yam, high-Cal veg*	Salad, colorful veggies	Olive oil, olive, avocado, sunflower seeds, etc.

*high-Calorie veggies provide enough blood sugar if > 1/2 cup: tomato, carrot, snap peas, beets, jicama

Example **dinners:** Put the most nourishment where you have the most time to eat

PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Meat or veggie balls	Bean-based pasta	Pasta sauce, veg/salad	With veggies or salad
Fish or tofu dish	Wild rice	Roasted or steamed veg	Already in the tofu or fish
Any protein entrée	Baked yam / potato	Raw veggie tray	Pesto & hummus dips
Chicken, salmon, beef, or veggie patty	Hearty hamburger bun	Roasted or steamed veggies and/or salad	Avocado on patty or dressing for veg/salad

Eating anywhere from 1 to 12 times per day: The cells in your body don't know what you ate, how much, or when. They only know what is available in the bloodstream. Whatever is delivered to your cells is the environment or ecosystem within which they are interacting and jostling to meet their needs. The closer you get to providing nutrients at the rate they need it, particularly for nutrients they cannot store well such as water and protein, the happier they will be.

- **Eating once per day:** It could take 12 hours to fully digest a meal of nuts, raw veggies, and cooked lentils. Your cells will benefit almost the same as if you had eaten three smaller meals over the same time period. Physical activity when you are fasted or starved is harder on the body than when you have eaten at least something recently, but if you are only going to eat once in a day it should be soon after any workout since exercise will leave you depleted until you eat, at which point recovery can finally begin.
- **Eating 2-4 times per day:** Eating once per day leaves you only one opportunity to nourish your body, whereas more than once per day allows you to eat without necessarily having veggies and omega fats each time. Multiple feedings also allow you to eat less at any one time while still getting at least ~75% of your Calorie needs, below which metabolism slows more significantly.
- **Eating 5 or more times per day:** When there are only a few hours between feedings, you can alternate which nutrients dominate the feedings. For example, protein in meal 1 can last your body until meal 3 so that you don't need much protein in meal 2 between them. Macronutrient balance through your day becomes balance between multiple feedings considered together instead of balance within each individual feeding.

Eating once per day: choosing slower-digesting food sources

Food group	Slowest Protein	Slowest Carb fuel	Slowest Veggies	Omega fats
Slowest digestion	Legume: lentil/bean	Legume: lentil/bean	Digests slowest raw	Nuts, seeds, olives
Medium-slow digestion	Tofu, tempeh	Squash, berries, high-Cal veggies	Lightly cooked so still crunch in mouth	Soft: avocado, hummus, olive oil
Slow non-vegan sources	Cottage cheese, cheese, eggs, meats including seafood	n/a	n/a	Includes seafood

Eating 2-4 times per day: choosing slower-digesting food sources is less critical at each meal

Food group	Slowest protein OR...	Slowest carb OR...	Slowest veggie OR:	Omega fats
Softer foods digest faster	Yogurt, soft tofu, milk or soy milk	Whole fruit Whole grains, tuber	Cooked vegetables including in soup	All dietary fats digest slow

Eating 5 or more times per day: leaves you the option of alternating which food group dominates each time.

Food group	PLT: Protein	PLT: Carb fuel	Nourish: Veggies	Nourish: Omega fat
Choose what you like: happy is sustainable	<u>Vegan:</u> legume, soy <u>Vegetarian:</u> dairy egg <u>Omnivore:</u> muscle	<u>Legume:</u> lentil, beans <u>Whole fruits</u> <u>Higher-Cal veggies*</u> <u>Starch:</u> tuber, grains	<u>Raw</u> veggies/snacks <u>Cooked</u> veggies <u>Leafy salad</u>	Ω-3: chia / flax, walnut, fatty fish Ω-6: nuts & seeds Ω-9: avocado, olive
Always start with a PLT	Choose any source	Choose any source	Optional	Optional
After that	You have the option of alternating protein every other feeding	Slow carbs deliver fuel for long enough to alternate feedings	Ideally every other feeding but can be bunched into a few	Can be bunched into a few feedings since stored & digests slow

Your body cares about the availability of nutrients, not how you made them available. The slower digesting your foods the more evenly they are delivered over time, making frequent meals or having each food group every time you eat less important. Slow-digesting foods and eating more frequently achieve the same goal of evening out nutrient delivery. There is a diminishing return on the benefits of trying to do both at the same time since the digestion of closely spaced feedings of slow-digesting foods will overlap. Slow-digesting foods eaten

every hour has no advantage over every 2 – 3 hours, or for the slowest healthiest foods every 4 – 6 hours. Choose how often you want to eat and manage the feedings from there to keep your body happy.

EXAMPLE	Alternating*	Later alternating*	Bunched into 3-7	Shown spread out
1 starts day**	Yogurt /Greek yogrt**	Sprinkle of granola**	n/a	Chia seeds
2 nd feeding**	An egg**	A small fruit**	n/a	6 walnut halves
3	n/a	Higher-Cal veggie***	High-Cal veggie***	Hummus
4 “balanced”	Bean spread, cheese	1 slice coarse bread	Small salad	Olive oil
5	n/a	n/a	Veggie pieces	Pesto
6 “balanced”	3 oz seafood or tofu	Small yam	Cooked veggies	Olives
7	n/a	n/a	Celery	Nut butter
8	Yogurt or cottage chs	Berries	n/a	Almonds
Additional	n/a every other snack	Less as you go along	Not last hour of day	Monitor total Calories
Right after any exercise	Optional 0.3 grams per kg body weight	Refuel with starch: tuber or grain product	n/a	Optional

*If the protein portions are enough to PLT in only every other snack, the alternating snacks don't need protein. Similarly, a bit of carb to break the fast & when active mentally or physically is important, but otherwise less so.

**The body wakes up in transition from the fasted to the starved state making the PLT (both protein & some carbohydrate) a priority. If physically active or athletic consider having the 2nd & 3rd feeding as PLTs too.

***High-Calorie veggies provide enough blood sugar if ≥ 1/2 cup: tomato, carrot, snap peas, beets, jicama

Designing your SNACKS for the specific reason you are snacking

Energy snacks: For mental and/or physical energy, first reduce any dehydration by having a glass of water. Then bump up your blood sugar with an unprocessed carbohydrate. Processed carbohydrate such as crackers, chips, muffins, scones, or other baked goods digest faster than lean tissue can absorb them, triggering an insulin response that increases body fat at the expense of a stable blood sugar, ultimately lowering your energy levels, which is exactly the opposite of what you were snacking for.

Dehydration can make you feel tired, so start with a glass of water. Then stabilize your blood sugar with:

- A legume salad: cooked lentils or beans combined with some flavor
- OR some whole fruit, which can be cut up but not blended or juiced: apple, pear, berries, etc.
- OR for slower carb, use a high-Calorie veggie: bell pepper, carrot, snap peas, jicama, cherry tomato
- Vegetables even lower in carb Calories will provide fullness but are unlikely to raise energy levels
- SPORTS NUTRITION: any of the above options that provides a significant amount of slow-digesting carbohydrate will boost subsequent energy levels in a workout. Use a faster carb to refuel afterwards.

Hunger snacks target a protein OR fat together WITH a veggie OR carb: The hormones that reduce hunger for several hours respond particularly well to proteins and fats, whereas vegetables put coarse bulk into the stomach and carbs bump up blood sugar, either of these reducing hunger in the short term. Only eating protein and/or fats as a snack, such as cheese or nuts, might take an overload of Calories to satisfy a strong hunger, whereas veggies or carbs by themselves would only satisfy hunger for an hour before you likely want to snack again. To satisfy hunger both immediately and for hours, combine both a protein or fat together with a vegetable or carb. Using the chart you would pick one food from the OUTSIDE **BLUE** columns, meaning a protein or fat, and COMBINE this with one food from an INSIDE **RED** column, meaning a carb fuel or veggie. It is the COMBINATION that that reduces hunger BOTH in the short and the long term.

Hunger snacks	Protein	Carb fuel	Veggie	Omega fat
Basic principle:	A protein OR a fat	Carb fuel OR veg	Veggie OR carb	A fat OR protein
Lower carb with unsaturated fats			Veggie pieces	Pesto, olive oil, hummus, guac
Lower carb with protein	Yogurt-based dressing		Veggie pieces	
Variable carb with protein / animal fats	Cheese or salami	Fruit pieces...	...or veggie pieces	
Omega fats with variable carb		Fruit pieces...	...or veggie pieces	2 Tbsp any nut
Protein with slow carbs	Legume salad i.e. beans or lentils	Already in the legumes		
Higher protein with moderate carb fuel	Cottage cheese or Greek yogurt	Berries or a bit of other fruit		
Slow carb fuel and omega fats		Cherry tomato, snap pea, jicama, baby carrots		Hummus or olives

Sports snacks: recovery snacks to PLT for any time including before exercise, then refuel right after exercise

Exercise snacks	Protein	Carb fuel	Veggie	Omega fat
Recovery snacks	Consider protein if last meal > 3 hours	Energy: legume or fruit or whole grain	In recovery meals more than snacks	In recovery meals more than snacks
Before & after workouts	As needed to PLT before & after	Slow carb before, fast carb afterwards	Wait until next meal	Wait until next meal