WHAT TO EAT BEFORE, DURING, AND AFTER TRAINING



INTRODUCTION

Running is a demanding physical activity that exhausts our energy reserves and damages our muscles. The right nutrition therefore plays a key role as fuel and in recovery.

THE UNDERLYING PRINCIPLES YOU SHOULD KNOW

Food as fuel

During a run, our body primarily sources its energy from carbohydrates and fats. While other nutrients like proteins also contribute to energy production, their contribution is relatively minimal, making them less pertinent to this discussion. Carbohydrate stores (in the form of liver and muscle glycogen) typically become exhausted after 1.5 to 2 hours of running. In contrast, fat stores are virtually limitless. However, fats are less oxygen-efficient; they require more oxygen to produce the same amount of energy (in the form of ATP) compared to carbohydrates.

Carbohydrates

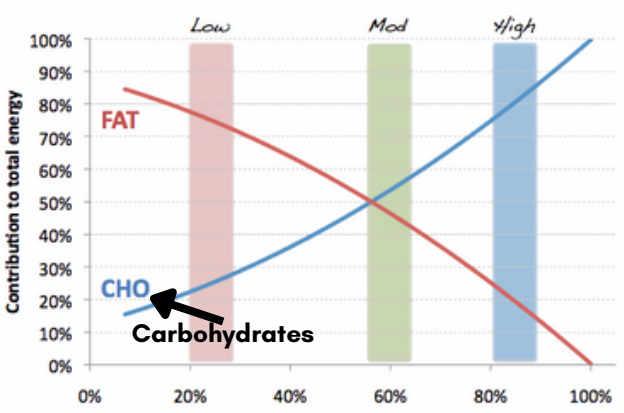


- Stored in liver and muscles
- Efficient in terms of oxygen
- limited energy resource (1h30-2h running)

Lipids (fats)



- Stored in fat cells
- Inefficient in terms of oxygen
- Virtually limitless resource



Source: Riderx.info

Understanding this information allows us to interpret the graph above. As the intensity of your workout increases, your body shifts from utilizing fats to carbohydrates for energy. Since the body has a limited supply of carbohydrates, it tends to favor the use of fats (despite their lower oxygen-efficiency) as long as there is an adequate oxygen supply, meaning as long as we are not out of breath. Therefore, the more intense the exercise, the more the body relies on carbohydrate metabolism for energy.

Food for recovery

During a run, two major physiological responses occur: sweating and muscle breakdown. Sweating is coupled with the loss of vital electrolytes. As you sweat more or push yourself longer, electrolyte replenishment becomes critical. Also, as your run intensifies, your muscles experience more stress and deterioration. In such cases, proteins, the primary materials for muscle repair, become essential.

Summary

The higher the intensity of the workout

- The more carbohydrates you need to refuel for energy, instead of fats
- The more proteins you need to repair the damaged muscles
- The more electrolytes you need to cover electrolyte loss through sweat

MY PHYLOSOPHY IN NUTRITION

In case you're interested, here's my personal phylosophy on nutrition. Being a science-based guy, I base my knowledge on what has been demonstrated in research. A big issue when reading literature about nutrition, is finding neutral and unbiased research.

In 2019, 37 leading academics went through all available research to come with the healthiest possible reference diet. One we can all adapt to our own food cultures. Here's the **research paper**, and some of its key insights :

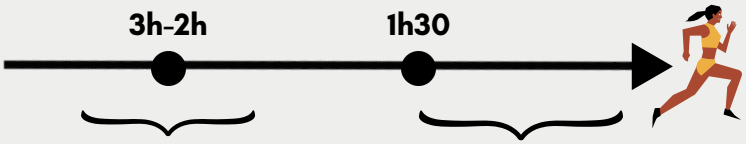
- Rougly 1/3 of food should come from fruits and vegetables (in terms of weight)
- 1/3 of daily calories from whole grains
- Opt for 40% of proteins from animal sources, and let the rest come from legumes and nuts
- When it's meat, choose white over red
- More than 70% of your daily calories should come from plants: whole grains, veggies, fruits, and legumes

I adapt this 2500 kcal reference diet to my daily 3500 kcal calory need. For example, I eat more carbs, and **I do not hesitate to eat sweets and pasteries every day to hit my calory goals. ;) They are also crucial for my mental health and well-being!**

	Macronutrient intake (possible range), g/day	Caloric intake, kcal/day
Whole grains*		
Rice, wheat, corn, and other†	232 (total gains 0-60% of energy)	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0-100)	39
Vegetables		
All vegetables	300 (200-600)	..
Dark green vegetables	100	23
Red and orange vegetables	100	30
Other vegetables	100	25
Fruits		
All fruit	200 (100-300)	126
Dairy foods		
Whole milk or derivative equivalents (eg, cheese)	250 (0-500)	153
Protein sources‡		
Beef and lamb	7 (0-14)	15
Pork	7 (0-14)	15
Chicken and other poultry	29 (0-58)	62
Eggs	13 (0-25)	19
Fish§	28 (0-100)	40
Legumes		
Dry beans, lentils, and peas*	50 (0-100)	172
Soy foods	25 (0-50)	112
Peanuts	25 (0-75)	142
Tree nuts	25	149
Added fats		
Palm oil	6·8 (0-6·8)	60
Unsaturated oils¶	40 (20-80)	354
Dairy fats (included in milk)	0	0
Lard or tallow‖	5 (0-5)	36
Added sugars		
All sweeteners	31 (0-31)	120

For an individual, an optimal energy intake to maintain a healthy weight will depend on body size and level of physical activity. Processing of foods such as partial hydrogenation of oils, refining of grains, and addition of salt and preservatives can substantially affect health but is not addressed in this table. *Wheat, rice, dry beans, and lentils are dry, raw. †Mix and amount of grains can vary to maintain isocaloric intake. ‡Beef and lamb are exchangeable with pork and vice versa. Chicken and other poultry is exchangeable with eggs, fish, or plant protein sources. Legumes, peanuts, tree nuts, seeds, and soy are interchangeable. §Seafood consist of fish and shellfish (eg, mussels and shrimps) and originate from both capture and from farming. Although seafood is a highly diverse group that contains both animals and plants, the focus of this report is solely on animals. ¶Unsaturated oils are 20% each of olive, soybean, rapeseed, sunflower, and peanut oil. ‖Some lard or tallow are optional in instances when pigs or cattle are consumed.

Table 1: Healthy reference diet, with possible ranges, for an intake of 2500 kcal/day



- **Consistent dinner**
- **Pre-workout snack**

NUTRITION BEFORE TRAINING

When it comes to energy requirements, eating before a workout only becomes significant for extended (over 75 minutes) or more intense exercise sessions. For all other runs, your body already has ample energy reserves accumulated from food consumed in the previous days. However, if you want to avoid running on an empty stomach, such as during a morning run, a pre-workout snack is always a good idea. As for recovery needs, it's recommended to eat prior to training. This approach initiates the recovery process as early as possible.

3H-2H BEFORE WORKOUT: CONSISTENT DINNER

This is the time to consume a substantial meal composed of carbohydrates, fats, and proteins. The primary purpose of this meal isn't to provide energy for your run, but rather to supply nutrients that your body will use for recovery afterward.

WITHIN 1H30 BEFORE YOUR WORKOUT

This is referred to as a pre-workout snack, and consuming the wrong types of food can negatively impact your run! A pre-workout snack is only necessary if you haven't had a substantial meal beforehand or if you're feeling hungry.

Your choice of snack should align with the nature of your workout. For longer sessions, snacks can boost energy during your run, while for shorter ones, they can prevent the discomfort of running on an empty stomach.

Pre-workout snacks

- Banana
- Energy bar
- Crackers
- Toast with fruit
- Low-fat cheese
- Coconut oil (easy absorbed fats)
- Greek yoghurt and maple syrup or jam



Food to avoid pre-run :

- **High-fiber or fatty foods**: These require significant digestion and can lead to a feeling of heaviness in your stomach.
- **Foods high in lactose**: For those who are lactose intolerant, these can upset your stomach!
- **Sour foods**: If you have a sensitive stomach, consider avoiding sour foods as they can potentially cause discomfort.

Brands Of Energy Gels











DURING TRAINING

Nutrition during a workout is only essential for longer runs. It's important to replenish sugars, electrolytes, and water. Energy gels serve as one method to restore sugars. Isotonic drinks present another option that simultaneously replenishes both sugars and electrolytes. Replenishing electrolytes and sugars is advised for any running effort longer than 1h30.

Nutrient	Digestion	Building block
Proteins	→	Amino acids
Polysaccharides (carbohydrates)	→	Monosaccharides (glucose, fructose, etc.)
Lipids (fats)	→	Fatty acid chains + glycerol

Before our muscle cells can utilize energy from food, the nutrients must undergo digestion to break them into their basic components (building blocks), be absorbed into the bloodstream, and finally be assimilated by the cells. This digestive process takes time. Therefore, if your workout snack still requires digestion, it is unlikely to provide immediate energy for your workout. To ensure a readily available energy source, opt for foods in their more refined form. Since carbohydrates are the primary nutrient in limited supply during your run, choose snacks rich in refined sugars (monosaccharides). Energy gels, for example, are a condensed source of refined surgars.

WHAT FOODS TO AVOID

As mentioned above, avoid snacks that require digestion. The probability is high that you won't extract energy from it during your effort. Below are some examples of snacks that I do not recommend during running:

Energy bar with nuts	Energy bar with granola	Banana
		
Nuts are a source of lipids, which require a lot of digestion	Granola are a form of polysaccarides, which need to be digested into monosaccharides	While it has refined sugars, it still requires some digestion

WHAT QUANTITY OF CARBOHYDRATES AND ELECTROLYTES SHOULD YOU TAKE ?

As a general rule, runners typically expend around 1g of carbohydrates per kilogram of body weight per hour. For example, an 85kg individual would burn approximately 85g of carbohydrates per hour. However, determining precise carbohydrate intake during running is challenging due to substantial individual variability in factors such as:

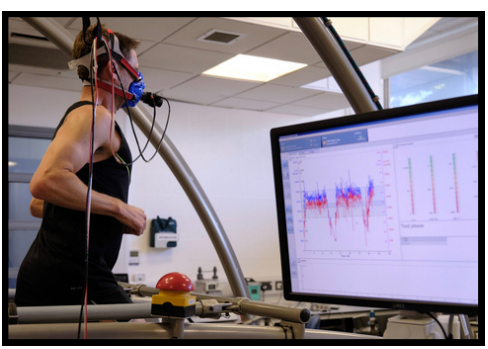
1. Carbohydrate storage capacity in the liver and muscles.
2. Metabolic efficiency in extracting energy from carbohydrates.
3. Digestive system responses during running.

Hence, the optimal carbohydrate intake during running varies from person to person. It is advisable to experiment with different quantities of carbohydrate intake to identify what works best for your specific needs.

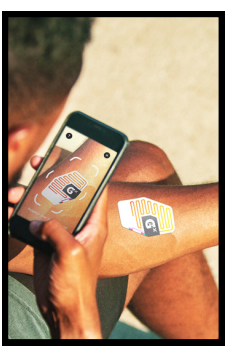
The variability between individuals also extends to the loss of electrolytes.

HOW TO MEASURE CARBOHYDRATE AND ELECTROLYTE LOSS ?

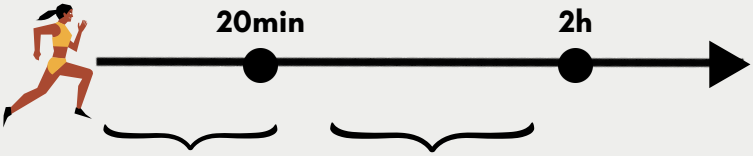
The good news is that you can assess your carbohydrate consumption rate and electrolyte depletion. Carbohydrate consumption can be quantified through metabolic testing, typically conducted in sports laboratories, albeit at a cost. If you wish to explore this further, here's a link providing an explanation of how this can be measured. Assessing hydration and electrolyte loss is more accessible with various products available in the market, such as Precision Hydration, Nix Hydration, or Gx Sweat Patch .



METABOLLIC TESTING



ELECTROLYTE AND HYDRATION PATCH



- **Cells are highly receptive**
- **Quick absorbing nutrients**

- **Slow absorbing nutrients**

NUTRITION AFTER TRAINING

After your run, you're left with lower glycogen levels, micro-tears in the muscles, and lower/depleted electrolyte and mineral levels. Eating afterwards is essential as it helps your body to replenish these reserves and repair the micro-tears. Without it, you won't make the intended gains from training!

WITHIN 20 MINUTES AFTER YOUR WORKOUT

During this period, your metabolism is operating at full speed; your cells are highly receptive to nutrients. This is an excellent opportunity to nourish your muscles with key recovery foods, which are high in quick-absorbing carbohydrates (refined sugars), proteins (and amino acids, their buidling blocks), and electrolytes. Recovery powders, fresh fruit smoothies, or recovery bars are ideal choices as they are rapidly absorbed by your body.

Post-workout snacks, within 20min post run

- Chocolate milk
- Toast with honey and fruit
- Nut butters, such as peanut butter
- Smoothie
- Blueberries

After an intensive workout

After intensive workouts, consider having a protein shake. However, be mindful that consuming too much protein can inhibit the metabolism's ability to absorb sugars optimally. An ideal ratio of 3:1 or 4:1 between sugars and proteins is recommended. Therefore, avoid protein shakes used by bodybuilders, as their protein to carbohydrate ratio is often excessively high.

After a long, low intensity, workout

If your exercise was prolonged but of moderate intensity (such as endurance or long runs), isotonic recovery powders are an excellent choice. They contain the necessary electrolytes and carbohydrates to replenish muscle glycogen.

WITHIN 2 HOURS AFTER YOUR WORKOUT

The second recovery window is the time to consume a hearty meal. This meal should include slow-release carbohydrates, a larger portion of proteins, and importantly, good fats and micronutrients.

For example, my slow-release carbohydrates mainly consist of brown rice and whole grain pasta. My sources of protein and good fats vary widely. I frequently consume a variety of nuts and seeds, or an avocado.

Essentials after a run



Hydration



Carbohydrates, lipids, proteins, and vegetables