Metabolic.ie
National Centre for Inherited Metabolic Disorders

Sláinte Leanaí Éireann
CHI
Children's Health Ireland

Sports Nutrition

for an Active Individual

on a

Low Protein Diet

Contents

Introduction

Nutrition is an essential part of any sport or training programme.

A well-nourished athlete has:

Sufficient energy (calories) to **perform** optimally

Enough nutrients to support **muscle growth and adaptation**

Right combination of nutrients (protein and carbohydrate) at the right times to allow for **proper fuelling and recovery**

Adequate **fuel for the brain** (carbohydrate) to support focus, quick decision making and strategizing

Adequate hydration (fluid and electrolyse) to regulate body temperature

This booklet takes established sports nutrition guidelines and applies them to the athlete who requires a low protein diet* to help –

- ✓Maximise **performance** and training outcomes.
- ✓Promote **health, wellbeing** and good **metabolic control**
- ✓**Reduce the risk of illness and injury**

**Research on sports nutrition practices specific to individuals following a low protein diet is limited. There is also little known about the way physical activity affects metabolic control. Each individual should work closely with their metabolic dietitian to help encompass these guidelines. There are no specific recommendations for carbohydrate, protein or energy intakes in young athletes.*

Eating to Compete

Nutrients act as **members of a team** - you need them all in the proper proportions to win the game

Energy

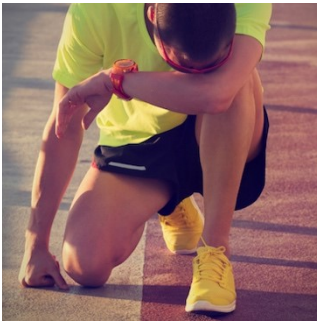
The amount of additional energy needed to support exercise depends on the **type and intensity** of exercise you do. The amount of energy you need may be higher on days you have a training session than on rest days.

Eating sufficient calories is important to ensure –

1. You have enough energy to **perform** at your best during competition and training
2. Supports muscle **growth and recovery**
3. **Good metabolic control**. Not eating enough calories can cause catabolism (muscle breakdown) causing high blood phe levels
4. **Maintain good health** – eating enough ensures there is enough energy left over after exercise to provide energy to all other body systems such as the immune system.

What are the signs you may not be eating enough?

- You feel tired
- You have an increased susceptibility to illness e.g. coughs and colds
- You lose weight
- Your levels may start to increase with no other apparent reason
- Your performance starts to dip



How can you increase your calorie intake?

- Eat an extra snack(s) before and/or after training.
- Eat larger portions of free foods at meals e.g. low protein pasta, rice or bread
- Have an additional light meal e.g., supper before bed, after school lunch
- Drink high energy drinks e.g. smoothies, low protein milks
- Add extra spreads to your current foods e.g. butter, oils, jam, honey

Examples of high energy snacks and light meals -

Banana

Prozero

Smoothie (made with prozero)

Dried Fruit

Cereal bar (see exchange list for ideas)

Vegetable Soup

Low protein pancakes or waffles

Nesquick made with prozero

Low protein crackers

Low protein bread

Low protein biscuits/cakes fruit bars

Low protein recipes - like energy balls/ scones etc

Carbohydrates

Carbohydrate foods are the body's main fuel and energy source. Carbohydrates are crucial in any athletes diet. Some types of carbohydrate foods include cereals, breads, pasta, rice, crackers.

After eating a carbohydrate food, your body breaks this down into glucose (sugar). Glucose is then used as the main fuel source for energy or stored in our muscles. This stored glucose is called glycogen.

During exercise, our bodies can use glucose or breakdown glycogen to fuel our movements and our brain. During fast, short bursts of exercise e.g. sprinting up and down a basketball or GAA pitch, carbohydrates are the main fuel source. In longer endurance sports e.g. marathon running, our bodies use a combination of carbohydrates and fats as fuel sources. Therefore, no matter what sport, carbohydrates are particularly important.

Key roles of carbohydrates for athletes–

Provides **energy** for the working muscles

Fuels the **brain** which supports reaction time and strategizing

Starting exercise with adequate glycogen (carbohydrate) stores can **delay fatigue**

Role in supporting the **immune system** during exercise by reducing stress on the body

Spares protein and prevents muscle breakdown as protein does not need to be used as a fuel source. This can raise your levels

How much carbohydrate do I need?

Approximately half your calories should come from carbohydrate every day. Carbohydrates should be included in all meals and snacks. The amount of carbohydrate needed depends on the type and intensity of exercise you do.

On days with hard training sessions, extra carbohydrates are needed to top up glycogen and fuel the exercise task. Following exercise, extra carbohydrates may be required to again refuel these glycogen stores.

Types of carbohydrate:

There are two types of carbohydrate foods. It is important to understand the best carbohydrate source to pick depending on the timing around exercise.

Slower-releasing carbohydrates

Provides steady and long-lasting releases of energy

Easy to digest, fast releasing carbohydrates

Provides a short burst of energy soon after eating

Aim for slower-releasing carbohydrates most of the time. Faster-releasing carbohydrate can be useful as a snack, as they are easier for the stomach to tolerate and release energy quicker. However, they should be limited to only around intense exercise.

Top tips for healthy teeth

Eating sugary carbohydrate foods and drinks such as jellies and sports drinks make your teeth more at risk of decay. Use a straw if having juice or smoothies can help protect the teeth. After sugary foods, rinse mouth out with water. And of course, ensure you are brushing your teeth twice a day.

Carbohydrate sources

On a low protein diet, high carbohydrate rich foods can come from exchanges foods or low protein foods and snacks. These can be used before, during and after training .

See the table over the page for ideas and visit https://metabolic.ie/patient-family-information/low-protein-product-corner/ for our up to date GMS list for low protein foods and diet sheets for carbohydrate foods with exchanges

Carbohydrate foods with exchanges	Low Protein (LP) carbohydrate foods
Breakfast cereals	LP Pasta or Rice/Imitation Rice
Readybrek	LP Bread or Bread rolls
Weetabix	LP Couscous or Noodles
Porridge	LP Loprofin and Promin Cereal
Potato	LP Hot Breakfasts
Sweet Potato	LP Breakfast Bars
Rice	LP Crackers
Pasta	Juice or smoothies
Gluten Free Bread	Dried Fruit
Gluten Free Fruit Loaf	Fruit
Gluten-free wraps	Vegetables
GF Pitta Bread/Crumpets/Brioche/ Bagel	Prozero milk/ LP milk
Potato Farls	Taranis Cake
Cereal bar*	Mevalia Cake Bas
Popcorn	Jam, Honey, Marmalade
Coconut Fruit Yoghurt	Nesquik Milkshake Powder
Jaffa Cake*	

*Always ensure you are checking labels for aspartame

Carbohydrate intake BEFORE exercise

Glycogen stores are key for fuelling exercise, but its stores are limited. Eating carbohydrate-rich foods can ensure glycogen stores are full to supply energy and perform at your best.

Before exercising you should aim for:

- A high carbohydrate meal (low fat low fibre) **3-4 hours** before exercise
- Carbohydrate rich snack **1-2 hours** before you exercise

Examples of pre-exercise meals	Examples of pre-exercise snacks
Bowl of cereal + banana + low protein milk + a glass of juice + synthetic protein	Slice of low protein toast or low protein pancakes/crumpets/ bagels + jam/honey
Bowl of pasta + vegetables, tomato sauce + synthetic protein	Crackers with jam
Sweet potato + low protein potato mix + vegetables + synthetic protein	Low protein biscuits
Homemade mild vegetable curry + low protein rice	Handful of dried fruit
Low Protein toast + a coconut yoghurt and fruit	Banana
Porridge + dried fruit with juice	Smoothie made on low protein milk
Low protein pancakes or waffles	2 Jaffa cakes (1ex)

What about Carbohydrate loading?

There is evidence to suggest that increasing your carbohydrate intake in the 24-48 hours before a big event such as a match or competition can improve performance.

In the days leading up to the event, include carbohydrate regularly at all meals and snacks. The night before the game have a carbohydrate rich supper. Then follow the advice on the previous page for fuelling on match day. This ensures glycogen stores are full.

Example of football match day plan – 11am kick off

Before bed	The night before the game	High carbohydrate meal
8am	3 hours before Kick-off	High energy breakfast
10am	1 hour before Kick-off	Easy to digest pre-exercise snack *(May need to pack in your kitbag!)*
	11am Kick-off	Fully fuelled and ready to go

Athletes with a nervous stomach, may prefer 2 small snacks, a lighter meal or a liquid meal such as a smoothie before exercise.

Play around with your timings to find a routine that works. This can ensure you get your fuel in and don't start exercise too full or too hungry.

Carbohydrate intake DURING exercise

For shorter duration exercise or exercise which is less intense, there is no benefit from taking extra carbohydrate. However, for **intense** exercise lasting for **60 minutes or longer**, topping up with additional carbohydrate during exercise can help performance. It provides more fuel for your muscles and brain and could help the athlete work longer and harder before becoming exhausted.

Recommendations for intense exercise which lasts longer than 45 minutes -

Exercise lasts **1-2.5 hours**	Aim for 30-60g Carbohydrate **per** hour
Exercise lasts **2.5-3hours**	Aim up to 90g carbohydrate **per** hour

Remember: Never try anything new before or during exercise on a competition or match-day! Always practice your pre-game meal in training first in case you don't tolerate the new food or drink!

Carbohydrate content of foods	
1 Banana	20g carbohydrate
1 medium apple	20g carbohydrate
Cereal Bar	20g (Check exchanges)
Low Protein Fruit Bar	18g carbohydrate
Low Protein Breakfast Bar	27g carbohydrate
3 Low Protein Cracker with jam	25g carbohydrate
2 Fig Rolls	25g (1.5 ex) carbohydrate
1 slice LP bread with jam	35g carbohydrate
Gluten Free Crumpet with jam	15g carbohydrates (2.5 ex)
1 packet Gluten Free Pretzels	40g (½ exchange)
Handful dried fruit	20g carbohydrate
Vitafriends Mini Crackers	30g carbohydrate
500ml Sports Drinks (6-8%)	30g carbohydrate
25g Jelly Beans**	20g carbohydrate
Coated Rice Cakes*	10g (1ex)

*Always ensure you are checking labels for aspartame. carbohydrate content may vary depending on prodcu.t always check labels.

Sports drinks and gels contain carbohydrate and may be useful if you struggle to take enough from other sources.

Carbohydrate intake AFTER exercise - REFUEL

The main purpose of carbohydrate intake after exercise is to **replenish** glycogen stores.

After an intense session, a carbohydrate-rich food/s snack as soon after exercise as possible will help refill your glycogen stores. This is particularly important if you have multiple training sessions a day or are training on consecutive days.

Protein helps the absorption of carbohydrate into the muscle as fuel, therefore having your **synthetic protein** soon after training is a good idea. In fact, your synthetic protein is also a good source of carbohydrate in addition to protein.

After your exercise snack, aim to include a carbohydrate foods at **regular intervals** in your meals and snacks to continue to fully replenish your glycogen stores.

Light-moderate session	Extra carbohydrate snack with your synthetic protein after training and carbohydrate foods throughout the day
Heavy session/ Match/ Competition/ Multiple sessions	Recovery snack of **1-1.2g** of carbohydrate per kg of body weight with your synthetic drink as soon after exercise as possible Regular carbohydrate containing meals and snacks throughout the rest of the day

Protein

Protein is needed for muscle growth and repair after exercise and for general health. Protein provides structure to cells in the body including muscle, skin, hair and framework for bones and teeth

Your body needs protein for growth, development as well as for muscle building, maintenance, and repair.

How much do I need?

For most recreational athletes, your usual amount of protein prescribed by your dietitian is plenty. However, some athletes who engage in high intensity, long duration endurance or strength sports may require more on performance days.

It is important to note that there is **no evidence** that taking additional amino acids beyond what your body needs will increase your muscle mass, strength, or endurance. Eating additional protein **will not be stored by the body or used to build muscle**. In fact, eating too much protein could lead to inadequate carbohydrate intake which can compromise performance .

Remember: it's all pieces of a puzzle – not eating enough calories or carbohydrate "wastes" protein as it is broken down and used for energy. To support muscle growth and performance, it is important to consume enough protein, carbohydrates and calories.

Timing your protein intake:

After exercise, muscles start to rebuild and get stronger. However, this will only take place if an athlete consumes protein and essential amino acids which are the building blocks to building new muscle. Your synthetic protein drinks are made up of essential amino acids. Combining these with your prescribed exchanges will ensure you are getting all the amino acids needed to support muscle growth and repair.

- Within **1 hour** post exercise, the optimal dose of protein to consume is 15-25g synthetic + natural protein (10g may be sufficient for younger athletes).

- To maximise muscle growth and recovery, natural and synthetic protein should be consumed regularly throughout the day e.g. **every 3-4 hours** in approx. 10-20g portions of protein*

**These are recommendations and can vary from athlete depending on sport and athlete weight*

How to maximise your response to protein intake, in order of importance -

1. Ensure full compliance with synthetic protein and exchanges
2. Ensure eating sufficient calories
3. Ensure distributing synthetic protein and exchanges evenly throughout the day (Every 3-4 hours)

Muscle growth is enhanced for at least 24-48 hours after resistance, sprint, and endurance exercise. In addition, the muscle becomes more responsive to protein consumed over this period. Therefore, you should ensure full compliance and careful protein distribution throughout each day to maximise muscle growth and recovery.

What about protein supplements?

Commercial protein supplements contain large amounts of whole protein and will cause increases in levels. They are therefore **not** suitable for individuals with disorders of protein metabolism. Athletes competing at high levels need to be aware that many supplements are not regulated and therefore may contain banned or prohibited substances.

The only way to increase protein intake on a low protein diet is through the synthetic formula.

This does not mean that athletes with an inherited metabolic disorder are at a disadvantage. It has been shown that there is no benefit to consuming protein supplements or bars over food products or formulas containing a similar quality and amount of protein. The nutritional profile of a synthetic protein products prescribed for metabolic disorders is an ideal alternative protein supplement to support physical training.

Important: Please speak with your dietitian before planning to increase your synthetic formula as most of these drinks also provide you with vitamins and minerals, which if consumed in large amounts can be toxic.

Putting it into practice:

- For optimal muscle repair and growth, the total daily allowance (synthetic + natural) should **be fully consumed** and taken in **across the day in 3-5 servings**.

- Ideally one protein substitute would be taken at each meal, one immediately after training and at bedtime

- The natural protein from the food exchanges can be divided between the main meals and/ or in a pre or post exercise snack or meal.

Hydration

As with all nutrients, regular and sufficient water intake is required to maintain health and physical performance. Fluid is extremely important and often overlooked in many training programs.

Hydration is **KEY** for good performance as it -

- Improves concentration and decision making
- Assists in maintaining skill level
- Prevents you from becoming too hot!
- Reduces the risk of getting a 'stitch'

Exercise and the risk of dehydration:

During exercise you start to feel hot because your body is producing heat from

1. **Your Muscles:** As they work hard running, kicking the ball, sprinting etc.
2. **Food:** is broken down by your body to create energy, which creates heat

To prevent your body overheating**,** your body releases heat by sweating which causes fluid loss and increases risk of dehydration.

How does dehydration affect performance?

1. Exercise feels harder
2. You become too hot to concentrate
3. You fatigue more easily

Dehydration poses a serious health risk because it increases the risk of cramps, heat exhaustion, and life threatening heatstroke.

Signs of dehydration include dry mouth, lethargy, dizziness, poor concentration, headaches, and muscle cramps.

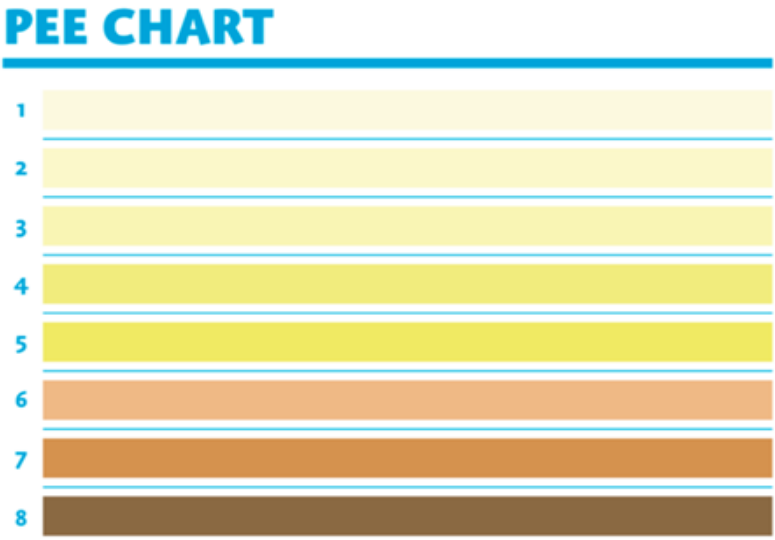
How to try and prevent dehydration

- **Start** exercise hydrated!
- Drink **during** training or competition
- Rehydrate properly **after** exercise.
- You need to drink more on the days you exercise

Don't wait until you feel thirsty! Thirst is a sign your body needed fluids for a while!

Monitor your hydration every day with the Pee Chart

1. Your pee should be colours **1-3** on the chart
2. If your pee is completely clear, you may be drinking too much
3. If your pee is darker than **3** on the chart you need to drink more



How much should I drink?

The amount of fluid you need depends on your body weight. Your dietitian will calculate your fluids requirements for you (_____ml) Exercise increases the amount of fluid your body needs, on the days you exercise you should follow the hydration game plan.

What types of fluids should I drink?

Water	Drink Plenty. It is easily absorbed and tooth kind.
Low Protein Milk	Rich in carbohydrates and a goof recovery drink
Juice/Smoothie	1 of our 5 a day. Limit to 1 glass per day
Sugary/ Sports Drinks	Only on occasion as they are high in sugar and can cause stomach upset

Hydration game plan

	When?	**What?**
Before	• Drink regular fluids throughout the day before your training/ competition	Cold Water
During 	• Drink every 15-20mins if rules of sport allow	• Cold Water • Consider a sports drink if high intensity sports longer than 60mins or hot conditions
After	• Sweat losses vary between people (see pg. 37 for calculations) • Start to rehydrate as soon as exercise ends and continue this for the next couple of hours after	• Cold Water • Low Protein Milk (Contains additional Carbohydrate) • Synthetic Protein (Contains Carbohydrate + Protein)

What about sports drinks or isotonic drinks?

The key ingredients in sports drinks are fluid (rehydrate), carbohydrate (fuel), sodium and potassium (electrolytes to help replace fluid losses). Optimal rehydration after intense exercise can be achieved if sodium lost in sweat is replaced with water. After a lower intensity or short session, you can replace the electrolytes lost in sweat by consuming fluids with your meals which likely contain electrolytes.

When should you consider sports drinks?

- Intense Exercise lasting longer than one hour
- Exercise that takes place in hot or humid weather
- Exercise performed wearing heavy sports equipment
- When participating in more than one sporting event per day, such as a football tournament
- When you need to get in extra calories

Benefits of sports drinks:

1. Provide fuel (carbohydrate) and electrolytes
2. Hydration is more effective
3. Flavour may promote fluid intake
4. Added carbohydrate and calories may *decrease protein catabolism in intense exercise > 1 hour*

Sports drinks can be expensive. Please see the next page recipes for a cost-effective way of making a DIY sports drink.

What do you need?	
3 Ingredients in the *right* proportions*	
Recipe option 1	**Recipe option 2**
• 500ml fruit juice • 500ml water • 1g salt (Pinch)	• 200ml high juice / cordial (full sugar version) • 800ml water • 1g salt (Pinch)
Use cool boiled water and mix all ingredients together until dissolved. Drink **at regular intervals** during exercise. Recipe not an indication of quantity that should be drank. *Incorrect preparation can lead to tummy upset.	

Isotonic sports drinks contain **added sugar** which can lead to tooth decay. Limit consumption of these drinks to hard training sessions or competitions

Putting it all into practice

- **Drink throughout the day** and monitor your urine (above)
- If you're exercising for up to 60 minutes, water is your best drink
- For **hard play** lasting more than 60 minutes, or taking place during hot, humid weather individuals should have drinks with carbohydrate and electrolytes e.g., sports drinks, around exercise
- Water or low protein milk should be the drink of choice most of the time

Sports Supplements

There are many different types of ‘sports supplements’ and ‘sports foods’ including drinks, protein powders and bars, liquid meal replacements, creatine, caffeine, herbal preparations, and more.

Are they safe?

Sports supplements have not been tested on teenagers or children so there is no evidence to show they are safe for a growing body.

The following **are not encouraged** for people under 18 years of age:

- Protein powders
- Creatine
- Caffeine tablets
- Individual AAs
- Bicarbonate buffers
- Herbal preparations
- Fat burners

The sports supplement industry is not regulated and supplements can contain ingredients that are not listed on the label. Therefore, there is a risk that they could contain a prohibited substance leading to a positive doping test.

In addition, there is no guarantee these supplements are not contaminated with an amino acid such as ‘phenylalanine’. You should speak to your dietitian or doctor before taking any form of sports supplement.

What actually improves performance?

- Eating enough to meet your growth and energy needs
- Taking your synthetic protein and sticking to your exchanges

Your **synthetic protein drink** not only provides synthetic protein but also provides a source of iron and calcium. Iron is important and adequate stores can promote performance. While, calcium is essential to ensure bones grow to maximum capacity.

- Drinking enough to replace lost fluids and stay well hydrated
- Individual talent and improving your sporting skills
- Planning your training and recovering properly

Putting it all into Practice!

2-4 hours before Competition

Goal:

1. Fuel Up – Carbohydrate based meals and synthetic protein
2. Hydrate – Fluid

Guidelines:

- High carbohydrate foods
- Moderate protein – 15-25g (from synthetic protein)
- Low fat & fibre
- Fluids 400-600mls or 5-10ml/kg

High energy meal

(see page's 14,15 for ideas)

+

Synthetic protein drink

+

500ml water

30-60 minutes before Exercise (Kit Bag Snack)

Goal:

1. Top-up the muscle carbohydrate stores
2. Hydrate – Fluid

Guidelines:

- Carbohydrate snack
- Top up hydration

Pre-exercise snack
(see page15 for ideas)
+
Around 300ml of water or homemade sports drink

During Exercise (if Longer than 1 hour)

Goal:

1. Keep energy supply topped up with carbohydrates
2. Hydrate

Guidelines:

- Simple and easy to digest carbohydrate

During-exercise snack
(see page18 for ideas)
+
Have a drink every 15-20 minutes from cold water or homemade sports drink

Post Exercise

Goal:

1. Refuel – Carbohydrate
2. Repair—Protein
3. Rehydrate – Fluid + Electrolytes

Guidelines:

- High carbohydrate snack (1-1.2g Carbohydrate per kg)
- 15-25g protein from synthetic protein drink
- Start to rehydrate straight away! Within the 2-4 hours after exercise, aim to meet fluid requirements

High carbohydrate snack (page 18 for ideas)

+

Synthetic protein drink

+

Fluids from water, low protein milk, homemade sports drinks

Then:

Balanced Meals throughout the rest of the day

- Include carbohydrates
- Include a source of vegetables or fruits or low protein meat substitutes
- Consume prescribed exchanges and synthetic protein intakes spread out throughout the day

Notes:

Calculating your carbohydrate snack goal

Example

45kg female gaelic football player requires 1g carbohydrates/kg/ day

45kg x 1 gram of carbohydrate = 45g carbohydrate snack

Your own carbohydrate recommendation

_____kg x 1 gram carbohydrate = _____ g carbohydrate

**** see the list on page 18 for carbohydrate content of snack foods****

Calculating your fluid goal

If you find that you are still get symptoms of dehydration after exercise, there is a calculation for older athletes to replace your fluid losses

1. weigh yourself before and after a session/competition
2. take into account fluids consumed during exercise
3. Replace with 1.25-1.5litre per kilogram of body weight

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