THE ESSENTIAL GUIDE TO NUTRITION FOR EVEREST IN THE ALPS

ENSURING A WELL-BALANCED TRAINING DIET

Most of us know what we should and shouldn't eat to stay healthy. But what does it mean to eat to achieve better performance in a physically demanding sport?

The main difference between healthy eating and sports nutrition is the extra attention to detail. In healthy eating, the ultimate goal is to promote long-term good health and to fend off increased risks of disease, while maintaining a balance so that food is still enjoyable. Although based on the principles of healthy eating to an extent, sports nutrition is performance driven and sports specific; fine tuning which nutrients your body needs so that you maximise your training and make the optimal progress.

Nutrition is an essential part of your preparation for Everest in the Alps and should always be at the forefront of your mind. Following a well-balanced training diet will provide you with the nutrients you need to improve your health, prevent illness and change your body weight and composition, ensuring you're in peak condition for the start of the challenge.

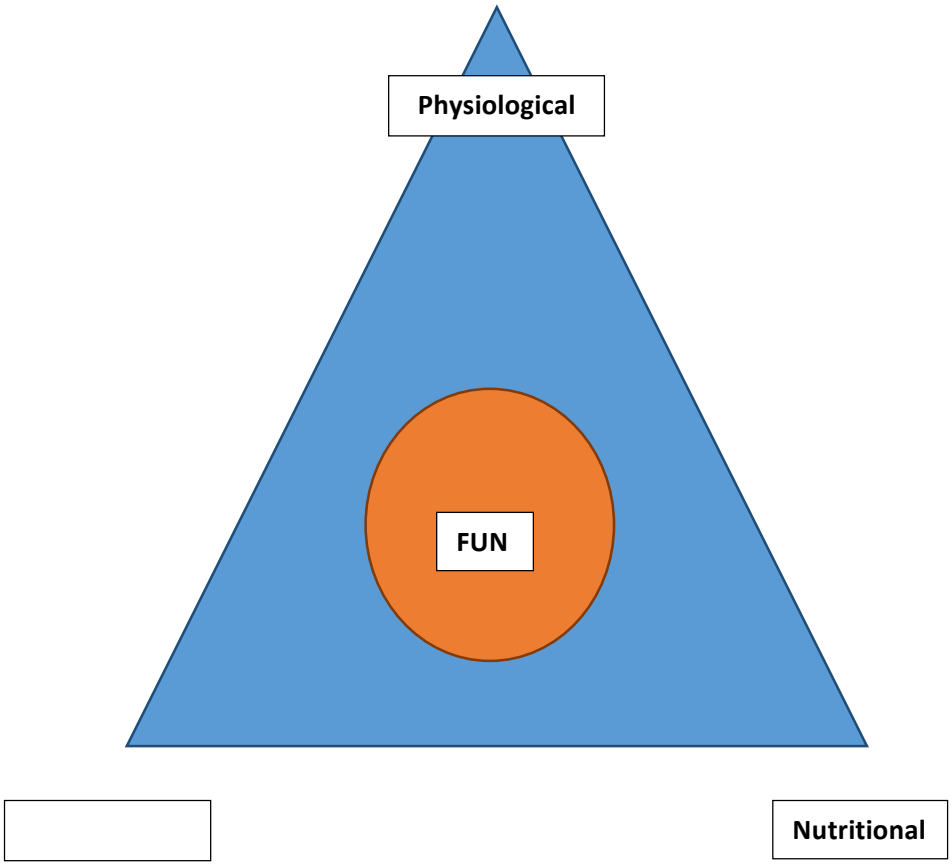
By making good, balanced nutritional choices, you will ensure the following adaptions from your training:

- Increases in cardiovascular fitness
- Increases in strength and lean muscle mass
- Good consistency in each training session, ensuring you can perform to the best of your ability and make solid progress
- Improved health, better sleep patterns, a good mood and high energy levels

THE THREE CORNERSTONES OF ENDURANCE TRAINING

Preparation for Everest in the Alps combines physiological training, psychological application and nutritional concepts.

Having a sound nutritional plan and sticking to it will help you enormously in the physiological and psychological aspects of your training. It will help you to physically adapt and recover, as well as to stay motivated.



Adhering to performance-based nutrition is not a simple equation of energy in must equal energy out. By only meeting energy demands you may not see any actual improvements in your day-to-day training or overall performance. You need to know how to fuel your body what it needs, when it needs it.

The key to consistent good sports nutrition is to tailor your nutrition to the exact training session you are performing. Different types of exercise and sports have different nutritional needs, for instance a strength and conditioning session will differ to a cardio workout.

Analysing your training intensity, frequency and volume will ensure that you:

1. Put the right amount and type of fuel into your body to meet the demands of your training session, both before and during, allowing you to perform to your best ability.

2. Make the correct nutrition choices after your training to help your body recover, repair and adapt.

GETTING THE RIGHT NUTRIENTS

To give your body the nutrients and energy it needs, it's essential you achieve the right balance of carbohydrates, protein and fat.

CARBOHYDRATE

Carbohydrates are an important source of energy and come in the form of either fibre, starch or sugar. Carbohydrate is stored in our muscles and liver as glycogen. When your body signals that it needs energy, it converts this glycogen into glucose and transports it to the working muscles to sustain your level of activity. Inadequately fuelled muscles will lead to fatigue and poor performance and will potentially depress your immunity, increasing your risk of illness and injury.

There are a lot of mixed messages about carbohydrate fuelling when it comes to timing, type and portion size. In general, your carbohydrate requirement depends on your activity level, intensity and duration.

Some carbohydrates are more desirable than others, so it's important to understand the different types that are available. Over the years, carbohydrates have been classified in many different ways. The most common types are *simple* (sugar) or

complex (fibre and starch) but you may be familiar with *high GI* (glycaemic index) and *low GI*.

The glycaemic index is a ranking of carbohydrate-containing foods which shows the overall effect of each food on blood glucose levels. Foods that the body absorbs slowly have a low GI rating, while foods that are more quickly absorbed have a higher rating. Low GI foods are ideal for your pre-workout and day-to-day diet because they maintain your energy levels, as well as keeping you feeling fuller for longer. Higher GI foods are beneficial post workout (and during, depending on the type of exercise) because they quickly replenish the energy you've lost to aid recovery.

Recently, sports nutritionists have started to use the terms "nutrient dense" and "nutrient poor" or "high fat" to describe carbohydrates. Nutrient-dense carbohydrates are those that provide carbohydrate as well as other nutrients. Examples include wholegrains, fruit, vegetables and dairy, and these should be included regularly in your diet. Nutrient-poor carbohydrates provide carbohydrate but no other beneficial nutrients. Think energy drinks and sugar. High fat options provide carbohydrate but also a high percentage of fat, such as milk chocolate and pastries. Try to keep these foods to a minimum.

Different types of carbohydrates

Category	Description	Examples	Use for athletes
Nutrient-dense carbs	Foods and fluids that are rich sources of carbs and other nutrients, including protein, vitamins, minerals, fibre and antioxidants.	Wholegrain breads, wholegrain cereals and wholegrains (e.g. oats, pasta, rice), fruit, starchy vegetables (e.g. potato, butternut squash), legumes (e.g. lentils, beans,	Everyday food that should form the basis of an athlete's diet. Helps to meet other nutrient targets such as good fats, protein, vitamins and minerals.

		peas and peanuts), low-fat dairy products (e.g. milk, yoghurt).	
Nutrient–poor carbs (eat sparingly)	Foods and fluids that contain carbs but minimal or no other nutrients.	All sugars (e.g. dextrose, sucrose, agave nectar, honey, molasses), soft drinks, energy drinks, sports drinks, cordials, CHO gels, sweets, and any type of white bread.	Should not be a major part of the everyday diet but may provide a compact carb source around training.
High-fat carbs (eat sparingly)	Foods that contains carbs but are high in fat.	Pastries, cakes, chips, crisps and chocolate.	Occasional foods that are best not to consume around training.

It is difficult to quantify the percentage of overall diet that should be formed of carbohydrate, but the guidelines below can be useful. However, these are approximate figures and will vary from individual to individual and with gender. Women generally utilise a much lower amount of carbohydrate than men for the same level of intensity. Women's carbohydrate use will also vary according to where they are in their menstrual cycle.

Carbohydrate intake requirements for different training intensities

Exercise intensity	Situation	Carbohydrate targets for women	Carbohydrate targets for men
Low	Low intensity or skill-based activities such as	2g-4g/kg bodyweight	3g-5g/kg BW

	plyometrics or movement patterns, core work or exercising less than 3 times per week.		
Moderate	Training for about an hour a day at a steady pace that enables you to have a conversation.	3-5g/kg BW	5g-7/kg BW
Moderate-high	Training at moderate-high intensity for 1-3 hours a day, including double sessions.	5-7g/kg BW	6-10g/kg BW
High	Extreme high-intensity workouts or long runs (20+ miles) at moderate-high volume.	6-10g/kg BW	8-12g/kg BW

For a moderately active 70kg/132lb adult, who trains across all three disciplines (endurance, high-intensity cardio, strength and conditioning) for 45 minutes, three times per week, the daily carbohydrate intake works out at 210g (3x70g).

It is recommended that you get this solely from nutrient-dense foods. Even within this group, there is variance. 100g/3 ½oz of rolled oats provides 60g carbohydrate but 100g/3 ½oz of butternut squash only provides 20g, so you would therefore need to eat three times as much for the same return.

Here are some other examples:

- 100g/3 ½oz wholegrain bread will provide 60g of carbohydrate
- 1 banana will provide 25g of carbohydrate
- 400g/14oz drained can of chickpeas will provide 39g of carbohydrate

By consuming more vegetables, fruit and legumes as your carbohydrate source, your allowance will go further. For instance, many gym-goers advocate eating jelly

babies as a source of carbohydrate. Ten jelly babies will provide 60g, but a 300g/100oz (medium) potato or six large carrots provide the same. It's obvious which option is the more filling, healthier choice.

This example also demonstrates how easy it is to overconsume simple carbohydrates and put on excess weight. Most people could easily polish off a big bag of jelly babies, which would provide in the region of 152g of carbohydrate, but would struggle to consume the equivalent in potatoes or carrots.

Simple carbohydrates do have their place in certain training situations. During training for Everest in the Alps, you're recommended to fuel your body with nutrient-dense carbohydrates such as grains and oats. This will build up good glycogen stores, but these tend to only last between 60-90 minutes, depending on your training intensity. So it can be useful to 'top-up' your stores during longer training sessions by choosing foods such as energy gels/drinks, which provide you with instant energy.

Remember: As athletes, it's important to consume carbohydrates to help fuel your training sessions. However, it is essential to choose the right type, at the right time, in the right portion.

PROTEIN

Proteins are often called the building blocks of the body. Protein consists of combinations of structures called amino acids, and these combine in various sequences to make muscles, bones, tendons, skin, hair and other tissues. They serve other functions as well, including transporting nutrients and producing enzymes.

Eight of your body's 20 amino acids are essential and must come from your diet because your body cannot produce them. Complete proteins found in animal protein foods such as dairy, meat, fish and eggs, contain all eight essential amino acids. Whereas incomplete proteins, found in many plant-based proteins, like vegetables, grains, nuts and legumes, don't contain all eight.

It is possible to get all your essential amino acids from plant sources by combining plant foods in the right way. Some good combinations include mixed beans on rye toast, wholegrain rice and dhal, and wholegrain bread with nut butter.

Most moderately active adults will meet their protein requirements without any problems. The suggested amount is 0.8-1g/kg BW per day, with women needing the lower end and men the upper end of this range. For a 57kg/125lb woman, this means her daily protein requirements will be 46g/1 1/2oz, which should be consumed throughout the day.

For example, these food portions provide 15g of protein:

- 2 large eggs
- 75g/21/2oz chicken fillets
- 150g/5oz Greek yoghurt

If you are training for Everest in the Alps more than four times a week with varied sessions, you will need protein primarily for repair, recovery and adaptation.

When you train for endurance events, or during very high intensity interval training or threshold (fast but comfortable) workouts, there is an increase in the breakdown of protein in the muscle. By ensuring good protein choices throughout the day, you will help to counteract this and remain in a positive protein balance. This means there is more protein available than will be broken down during training.

How much protein does an endurance athlete need?

The latest guidelines recommend “protein pulsing”, where protein is consumed more frequently throughout the day rather than as a large amount straight after exercise. This is based on scientific findings which demonstrate that our bodies can only absorb and utilise a certain amount of protein at any given time.

Following this principle, you need to consume up to 0.4g/kg BW from your three daily meals. For most endurance athletes this will equate to around 20-30g of protein.

Those of you who also include weight training would also benefit from an additional 0.4/kg BW portion before you go to bed to enhance your recovery.

Examples of food portions that provide that 20g of protein:

- 3 large eggs
- 100g/31/2 salmon fillet
- 200g/7oz tofu
- 80g/2 3/4oz pork loin
- 1x400g/14oz can baked beans in tomato sauce
- 100g/3 1/2oz chicken fillet

This can be supplemented with 10g of protein from snacks during the day. Good examples include:

- 50g 1 3/4oz almonds
- 15g/1/2oz beef jerky
- 300ml 10 1/2fl oz glass of milk
- 100g/31/2 Greek yoghurt

Choosing a protein snack over a carbohydrate one is particularly beneficial if you are trying to watch your weight, as protein helps to keep you fuller for longer and prevents blood sugar fluctuations. Studies have also demonstrated that a higher protein intake can reduce your overall energy intake, by helping to prevent the loss of lean muscle mass. Lean muscle mass is metabolically active, which means it burns calories even when you are resting, and therefore helps with weight loss.

FAT

Contrary to popular belief, not all fat is bad for you. In fact, it is vital that everyone eats some fats to help absorb the fat-soluble vitamins A, D, E and K, and to provide essential fatty acids that the body cannot make. These nutrients have important roles to play within the body, especially for athletes. As with carbohydrates, there are different types of fat in the diet and some are more desirable than others.

Saturated fat is the kind of fat found in animal products, like butter and lard (found in pies, cakes and biscuits/cookies), fatty cuts of meat, sausages, bacon and cream. These saturated fats should be kept to a minimum in your diet because they can raise cholesterol levels. The same applies to trans-fat, which is often found in processed foods.

The one exception in saturated fats is dairy. Studies report that a component of milk fat in dairy products such as cheese and yoghurt actually reduces the absorption of saturated fat, as well as dairy being a good source of protein and calcium.

Although some fat is essential to have in our diet, it's important to remember that eating too much fat can lead to weight gain. 1g of fat provides 9 calories, whereas 1g of carbohydrate provides just 3.87 calories and 1g of protein provides 4 calories. If you overconsume calories it can lead you to become overweight which will also increase your risk of getting certain clinical conditions, such as type 2 diabetes. Most of us eat too much saturated fat – about 20% more than the recommended maximum amount, which is no more than 30g of saturated fat per day for the average man, and no more than 20g for the average woman.

To put this into context, eating two pieces of buttered toast, a bacon sandwich and a bar of chocolate can clock up around 35g of saturated fat.

Ideally, you should replace these saturated fats with 'healthy' fats or unsaturated fats. These include:

- Oily fish, such as salmon, sardines and mackerel, which are an exceptionally good source of omega-3 fatty acids
- Nuts and seeds, including their oils and butters
- Sunflower, rapeseed/canola and olive oils
- Avocados

However, these healthy fats are high in calories and should be eaten with that in mind. It is generally recommended that you consume around 1g/kg BW fat in total in a day and that the majority of this comes from healthy fats. So for a 60kg/132lb athlete, this means 60g.

You are encouraged to choose fats from the list below and to choose servings to meet your daily requirements.

- 25g/1oz nut butter (14g of fat)
- 100g/3 ½oz avocado (15g of fat)
- 20ml/2/3fl oz rapeseed/canola oil (18g of fat)
- 25g /1oz sunflower seeds (13g of fat)
- 1 mackerel fillet (16g of fat)

For a 60kg/132lb athlete, the correct servings would be two slices of wholegrain toast with 25g/10z nut butter, avocado and sunflower seeds in a salad, and a portion of mackerel with their evening meal.
In certain situations, this recommendation of 1g/kg BW may need to be increased; for instance, if you need to bulk up.

FAT ADAPTATION

Both carbohydrate and fat are used as fuel during exercise. The higher the intensity of exercise the more your body will use carbohydrate as fuel in preference to fat. At low-moderate intensity, the body will use a higher proportion of fat for fuel. But if we provide the body with carbohydrate prior to low-intensity activity, it becomes the body's preferred fuel source, as it's a more readily available form of energy.

In recent years there has been a lot of interest in the concept of becoming "fat adapted", which simply means that the body becomes trained to use fat stores for fuel even when we are working at higher intensity. This in turn conserves glycogen and carbohydrate fuel stores so that you can go faster, harder, for longer – especially beneficial for multi-day endurance events like Everest in the Alps.

For most of us, full glycogen stores will fuel high-intensity exercise for up to 90 minutes. The idea of becoming fat adapted is to spare glycogen stores by using more fat stores and thereby significantly prolong the reduction in glycogen stores.

If you train low-moderate intensity in a carbohydrate-depleted state, the body will rely even more on fat as fuel.

Training in this way means that the body gets better at using fat as fuel. Even during high-intensity sessions or events, although the body will still rely on carbs as a source of energy, being more efficient at using fat will enable carbohydrate stores to last a lot longer.

Practically, this means aiming to do low-moderate intensity training in a fasted state or avoiding carbs for up to 6 hours before, and during, training. Get your energy from fat and protein and use electrolytes if you sweat a lot. Salted peanuts are a good option as they contain salt, fat and protein but no carbohydrate.

KETOGENIC DIET

Many ultra-distance athletes favour a complete ketogenic diet that keeps carbohydrate intake below 50g a day, meaning that the diet is predominately fat and protein based.

We do not advocate the use of ketogenic diets and feel that such a regime should not be sustained for long periods of time. It is still a relatively new area of sports nutrition so there are no long-term studies to show its lasting effects on the body. Current observations on ketogenic diets have been done on experienced, well-trained athletes, so they are especially inadvisable if you are new to endurance sports.

Insufficient carbohydrate intakes in athletes can lead to a depressed immune system and excessive training without adequate recovery (over-reaching syndrome).

NUTRITIONAL PERIODISATION

Your physical training is split into different phases, or blocks. Known as “periodisation”, this promotes varying training intensity, specificity and volume, to ensure you see incremental gains in your performance, avoid plateauing and peak in time for the start of the challenge. Like the physical side of your preparation, your nutrition will also benefit from periodisation.

A periodised approach advocates “training low and competing high”. This means that you still choose high carbohydrate fuel for high-intensity training sessions, but for low-moderate intensity you avoid carbohydrates before and/or during training to ensure that you use fat stores only to fuel that session.

Training for Everest in the Alps can be split into three distinct periodisation cycles. These cycles are known as mesocycles, which are focused on specific targets and together form the overall training plan.

- **Preparation mesocycle** (aka base cycle)**:** Typically 12-16 weeks long, this is sometimes broken down into general and specific cycles. Training intensity and volume begin at a lower, moderate level and gradually increase as the cycle progresses. In this cycle you may be trying to lose some weight. That is fine to do in the beginning but don't try to actively lose weight as you near the next cycle of your training, as it may have a negative impact on your performance levels.

The nutritional focus for this cycle should be towards a low-moderate intake of carbohydrates, with good amounts of fibre, moderate protein and moderate fats. Try new foods and experiment with different drinks and food during training. Ensure a regular intake of fluids to stay hydrated.

After the preparation mesocycle, the next phase is the competition mesocycle, which can be split into pre-challenge and challenge cycles, each typically 8-12 weeks long.

- **Pre-challenge cycle:** During the pre-challenge cycle, the intensity will be increasing and the volume may be slowly decreasing to allow you to rest and recover sufficiently between sessions. In general, your pre-challenge cycle should be geared towards improving your lactate threshold and VO2 max, in order to develop and improve the speed and strength you need for Everest in the Alps.

During this cycle, aim for a high-moderate intake of carbohydrates, high-moderate protein and moderate fats. Remember the importance of keeping fully hydrated.

- **Challenge cycle:** In the challenge phase of the competition mesocycle, training intensity will continue to increase while training volume will be carefully tapered in order for you to peak for the start of the challenge.

At this stage, you should be focusing on a high intake of carbohydrates, high-moderate protein and moderate fats. Increase your fluid intake as well.

PRE-WORKOUT NUTRITION

Like most people, you probably eat carbohydrates before you exercise to give you energy. But do you ever stop to think about how much carbohydrate you really need to fuel your exercise? Would the choice be different if you were going flat out for 45 minutes or if you were just doing a recovery workout? Your body would struggle to maintain a prolonged high intensity workout without carbohydrates.

Although your body could get energy from fat stores for low intensity workouts, the processes to convert fat to glucose takes too long and so cannot support high-intensity exercise. This is why it is so important to fuel your body with carbohydrates prior to hard training, such as a threshold run or a high-intensity cardio gym session.

So what happens, if for example, you have a bowl of porridge and then head out for a slow recovery workout? Your body still uses the carbohydrate provided by the porridge as it is still the most available fuel source. What's so bad about that? Well nothing really, unless you want to lose some body fat or you want to become fat adapted.

To use fat as fuel you need to train at a moderate to low intensity because this level of activity is slow enough to allow your body time to provide the energy it needs from fat stores. A high percentage of training for Everest in the Alps will be low-moderate endurance workouts that predominately burn fat, so fat adaptation can be beneficial. Adding two to three low-moderate intensity workouts of 45-90 minutes in duration will help towards fat adaptation. Also, if you have a few pounds to shift or are trying to become a bit leaner, you can achieve your goal with this type of training session as long as you do it in a fasted state, or ensure that your last meal did not contain carbohydrates.

When you think about training nutrition, ask yourself:

1. What type of session is this going to be? High, moderate or low intensity?
2. How long is this training session going to be?
3. What are my body composition goals?

Answering these questions will help you to choose the correct fuel and the correct portion size.

FUELLING DURING YOUR WORKOUT

Remember that a long training session is not high intensity, so it does not need carbohydrate as an available fuel source. If you follow our example meal plans, you will have full glycogen stores to provide you with fuel for about 90-120 minutes at a low-moderate intensity. Once your body has used up the available glycogen it will switch to using fat stores to enable you to keep training.

When you are training for long durations, you will most likely face a mental challenge as well as a physical one. As carbohydrate is not a necessary fuel in these situations, you're advised to choose foods that you'll want to eat. If you have treats and snacks that you are looking forward to, you are more likely to complete your training successfully.

Hydration is vitally important. Take electrolytes or add a quarter teaspoon of table salt to every 500ml of water. This will help replace the salt you lose through sweat while helping you to draw more water into your body and stay hydrated. If you use energy or sports drinks, remember that they contain sugar and provide you with carbohydrate, so you will need to adjust your food intake accordingly. Your body can absorb a maximum of only 90g/30z of carbohydrate an hour. Overconsuming carbohydrates can cause stomach discomfort and problems for some individuals.

POST-WORKOUT NUTRITION

Recovery from endurance exercise is extremely important. Although you may not have put a huge amount of stress on your cardiovascular system or muscles, your glycogen stores will be depleted so you need to replenish them quickly.

A combination of carbohydrate and protein is essential as soon as is practically possible; certainly within the first hour of finishing your workout and then every 2 hours after that until your next meal. Aim for 1-1.2g/kg BW of carbohydrate and up to 0.4/kg BW of protein.

As a guideline, a 65kg/143lb male athlete who has been for a 3-hour ski cross training session or bike ride followed by an hour run, finishing at 2 pm, will need 65-78g carbohydrate and up to 26g protein.

Protein becomes more important for immediate recovery when carbohydrate intake is not sufficient.

The following is a suggested meal plan:

- **2.30pm** 500ml 17fl oz chocolate milk and banana (75g carbohydrate and 18g protein)
- **4.30pm** 2 slices of wholegrain toast with ½ can baked beans, 150g/5oz Greek yoghurt (65g carbohydrate, 25g protein)
- **6.30pm** 3 slices malt loaf, 50g 1 ¾ unsalted nuts (60g carbohydrate, 10g protein)
- **8.30pm** main meal

This type of refuelling is even more important if you are planning on a further training session within 24 hours.

NUTRITIONAL CONSIDERATIONS FOR ENDURANCE TRAINING

The majority of your endurance workouts for Everest in the Alps will be of low-moderate intensity for long durations. You may do 75 percent of your overall training at low (25 percent) and moderate (50 percent) intensities. This will include at least one training session lasting over 90 minutes. Longer endurance sessions help your heart to adapt at a cellular level so that you are able to maintain exercising for a long duration.

Endurance sessions are nutritionally demanding because they deplete your body's glycogen stores. You will need to prepare 24-48 hours prior to these sessions, taking on sufficient amounts of carbohydrate, as well as during your training.

ENDURANCE TRAINING FUEL REQUIREMENTS

So how do you ensure you have full glycogen stores? The human body can store around 1500-2000 calories of carbohydrates as glycogen. For men, this means consuming 500g of carbohydrate in the 24 hours prior to a long endurance training session, and for women 400g.

The most important thing is for you to consume sufficient complex carbohydrate at all your meals and snacks 24-48 hours prior to an endurance training session. The endurance meal plans we suggest below fulfil this requirement, but typically, carbohydrate should make up around a third of your plate at meal times. Snacks should be comprised of nutrient-dense options such as oatcakes, a piece of wholegrain toast, banana or a couple of slices of homemade malt loaf or similar.

This “little and often” approach allows for more efficient glycogen storage, aids digestion and causes less stomach discomfort during a long training session. Getting into the habit of this fuelling strategy early in your training will make it easier during the challenge.

ENDURANCE TRAINING MEAL PLANS

Below are meal plans which take into consideration your nutritional requirements for endurance training sessions. They ensure that you have full glycogen stores prior to training in order to fuel your endurance session and also offer good recovery choices to start rebuilding glycogen stores as soon as possible. However, these guidelines will need to be adapted to your weight and body composition goals.

Breakfast: Toasted walnut, berry, cacao and raw honey porridge

Lunch: Chicken/tofu and quinoa salad

Snack: Homemade date and nut raw energy balls

Endurance activity: Fuel as required

Post training: Homemade recovery smoothie (fruit, milk, nuts, seeds)

Dinner: Salmon and roasted mixed vegetables

Evening: Yoghurt and fruit

Breakfast: Buckwheat banana pancakes with hemp seeds

Endurance activity: Fuel as required

Post training: Root vegetable chips with dippy eggs

Lunch: Mackerel salad on wholegrain rye toast and fruit

Dinner: Black-eyed bean and chill beef served with wholegrain rice and stir-fry vegetables

Evening: Recovery spiced warm milk with cinnamon and ginger

Breakfast: Teff/amaranth porridge with mixed berries and seeds

Endurance activity: Fuel as required

Post training: Recovery tropical fruit smoothie

Lunch: Avocado and feta salad on sweet potato

Snack: Oatcakes and Hummus

Dinner: Spicy turkey/tempeh stir fry with soba noodles

Evening: Kefir yoghurt and roasted fruit and spices (cardamom and cloves)

ALTITUDE EFFECTS

Performance levels drop as the air thins. You can adapt to altitude but even among mountain dwellers, max VO2 decreases about 2% for every 1,000 feet you go above 5,000 feet of elevation. True adaption to high altitude takes weeks, sometimes months, as your body learns to make the most of the limited available oxygen.

At high altitudes, your body makes more red blood cells to carry oxygen, and these become more efficient at delivering oxygen to your tissues. At the same time, your cells' mitochondria (energy-producing furnaces) multiply to take in as much oxygen as possible.

Interestingly, men and women acclimatise differently from one another. After acclimation, women burn fewer carbs and more fat for exercise fuel. Men tend to use more carbs for fuel at altitude. Since women have more body fat and are better fat-burners at altitude than men, they might be better suited for exercise at high elevations. However, intense exercise may be harder for women because estrogen demands the body's spare carbs and progesterone increases breathing rates (which are already pretty high at altitude).

Altitude acclimation tips

The reality for most of us is that unless we live in the mountains, we generally don't have the luxury of spending weeks at high elevations to adapt before a high altitude endurance event.

Exercising at high altitudes when you're not adapted can cause altitude sickness, which in mild form causes headache, fatigue and lack of appetite.

But there are ways you can prepare for exercise at high elevation:

1. **Apply heat–acclimation strategies**. Mountain air is very dry and dehydrating. During the challenge it can also be very hot with lots of sun exposure. Athletes often have good success at high altitude events by using heat acclimation and permissive dehydration strategies in their preparation.
    - Sauna training is good for both heat and altitude acclimation. But be careful. Sauna bathing is similar to hard exercise in terms of your cardiovascular system and the hormones involved in controlling your blood and body-fluid volumes. Therefore, sauna bathing should be maintained only for as long or as hot as you feel comfortable. The general guidelines call for 25-30 minute sessions in which the temperature should not exceed 165f. It should not be undertaken in a competitive manner.
    - Schedule a week of post-exercise sauna training in your overall training plan. Your resting heart rate will be high (around 140), so during the sauna week you should decrease training intensity.
    - Go into the sauna within 30 minutes of completing a workout. Do not rehydrate in these 30 minutes (your protein recovery drink is ok, but no other fluid) as some dehydration is key to the adaptation of this technique. Reduced blood flow occurs during dehydration because there is less blood volume. As soon as you enter the sauna, the hot environment signals blood to come to the skin for thermoregulation. This causes decreased blood flow and oxygen to other organs, in particular the kidneys, which stimulates red blood cell production and plasma volume.

Tips to get the most out of sauna training:

- Try not to drink while in the sauna. Pour water over your head and neck. Take a cold shower then get back in.

- Upon exiting the sauna, slowly rehydrate over the course of 2-3 hours. Gulping down fluid in large amounts after sauna bathing will cancel out the heat-stress response to the kidneys.
- Do not use the sauna if you recently consumed alcohol, as it increases the risk of heart attack and stroke.
- If you have any muscle or joint aches, swelling, redness or tenderness at rest or with light exercise, do not use the sauna.
- Remain in the seated position and take a warm shower after the sauna. If you want to take a cold shower wait at least 10 minutes to prevent light-headedness from sudden, dramatic changes in temperature.

Follow this practice for 7 days in a row for optimum results. The first day you may only be able to tolerate 5-10 minutes but by the seventh day 25-30 minutes should be attainable.

2. **Pump up the fluids**. Stay on top of your hydration once you are at altitude. When you first arrive at high elevation, you'll notice your heart rate is higher than normal and you are thirsty. Your breathing rate will be up and you'll be going through more body water. Sipping a hyper-hydration drink during the day will help with total body water stores. Don't drink plain water because it won't hydrate you; add a pinch of salt to your water for optimal absorption. Do not drink to thirst during exercise. Your thirst mechanism is a bit askew from the chemical changes that occur as your body adjusts to altitude. Sip a hydration drink during exercise and keep rehydrating through fluids and watery fruits and vegetables throughout your time at altitude.

3. **Eat more carbohydrates**. Even if you have become fat adapted, you still need carbs at altitude. The additional carbon dioxide that carbohydrates produce enhances your breathing response and helps to prevent altitude sickness. Choose nutrient-dense carbs as much as possible.

4. **Avoid alcohol**. Alcohol is a dehydrating diuretic and it depresses the normal breathing response to high altitude. It also increases the risk of altitude sickness and can make recovery from exercise harder.

5. **Pre hydrate**. Special pre-hydration beverages can help you to hyper-hydrate by pulling fluid back into your blood stream where you need it. You can also make your own drink by mixing 7.7g of sodium citrate and 4.5g of sodium chloride per litre of water. Drink a large bottle of a low carbohydrate (no more than 9g of carbohydrate per 8fl oz) hydration drink every hour you are out exercising in the elements.
    - Separate your fuelling from your hydration.
    - Do not depend on a typical sports drink for hydration. These sports drinks are about 5-8% carbohydrate with a low level of sodium and other key electrolytes. This provides some energy for exercise, but it comes at the expense of hydration because the carbohydrate concentration is too high to maximise fluid absorption in your gut.
    - An ideal sports drink for fluid absorption should contain 3-4% carbohydrate from glucose and sucrose with sodium and potassium.
    - Premenopausal women are predisposed to hyponatremia (water intoxication with salt and electrolyte balance) during the luteal (high-hormone) phase of the menstrual cycle. Aim for about 16-24oz of fluid an hour, but not more than 27.

FREEZING COLD CONDITIONS

Skiing can leave you more vulnerable to the effects of cold weather, because you are exposed to a lot of air flow and your body is still for long periods of time. You can be more prone to wind chill – the combined effect of low air temperature and air movement on the skin – which may account for as much as 80% of all heat lost from the body in cold air.

In cold temperatures your body tries to hang onto all the heat it can by shutting down blood flow to your skin and shivering to keep warm, while pulling warm blood into your core to protect vital organs. That blood is kept warm by the fat layer of your skin, which acts as insulation.

Fit individuals have more efficient thermoregulatory abilities than unfit individuals, producing more body heat from their metabolism and better insulation of the body's core. Women are better at conserving body heat and maintaining core temperature because they have more fat under the skin; it's also thicker and more evenly distributed. Female hormonal fluctuations also affect core temperature. The female body runs hottest during high-hormone phase and lower when hormone levels drop. Premenopausal women are also more sensitive to the cold during certain times of the month.

Your body has to work harder when it's cold so you burn more calories, and therefore you need to plan regular fuel and hydration breaks. These breaks may be more frequent than you have rehearsed in training, as the effects of the cold and altitude will require you to consume more calories.

Endurance exercise for long periods in cold weather can suppress the appetite and you may not feel like eating or drinking. Having regular planned drink and food breaks will ensure you are fuelling even when not feeling hungry.

Cold weather can also move body fluids from your extremities to your core, causing you to urinate more often, which can further increase your risk of dehydration.

To help combat the effects of the cold, follow these tips:

1. **Warm up from the inside**. Have a hot drink before heading out. By getting warm liquid into your stomach you can help keep your body temperature up when you get outside.

2. **Ease into it**. It takes longer for your muscles and metabolism to get going in the cold. Do a short warm-up inside to jump-start the system, then ease your way into the day's skiing.

3. **Layer up**. Layers trap warm air which gives extra insulation, as well as being easy to shed if you get warm, and put back on if you get cold. Start with a light base layer, add an insulating mid-layer and top it off with a breathable outer layer that protects against wind and moisture. Moisture wicking clothing allows sweat to leave the body quickly and will ensure you stay dry when it's cold.

FUELLING DURING EVEREST IN ALPS

Everest in the Alps will require multiple hours skiing at varying altitude and in harsh environmental conditions which are changeable and unpredictable. A successful event in extreme conditions takes extra nutritional planning and preparation. The following has been created as a guideline to keep your energy levels and performance at the required level during your Everest in the Alps challenge.

Pre-challenge:

- 36-48 hours before the challenge, increase your carbohydrate intake during meals and snacks, then 24 hours before, keep it at normal levels. Remember to hydrate with electrolytes too.
- When it comes to the morning of the event, your breakfast choice may come down to what you can stomach. If you have fuelled prior to endurance events, your glycogen stores will be full and ready for action. Your breakfast is simply a top-up.
- Eat approx. 150-250 calories 20-30 minutes before the event starts. This is in addition to your usual meals.
- Drink something warm. The warm fluids will help keep your body temperatures up at the start.

During the challenge:

- After 45 minutes, ensure you intake 1.13-1.4 food calories per lb BW per hour.
- Ensure 0/10-0.16oz per lb of fluid per hour but do not exceed 27fl oz per hour.
- A mix of protein, fat and carbs goes further than carbs alone in maintaining even energy in extreme conditions.
- Keep unwrapped bites of food in your pocket and start eating these 35-40 minutes into the event. Small bites of salted new potatoes, sandwiches, pretzel bites, bars, energy chews and jelly babies are all good options for instant energy hits.
- During the last 60 minutes of the day, have a quick hit of sugar in the form of glucose tablets - one every 10 minutes could be taken.

Post event each day:

Proper nutrition is essential for recovery. For most nutrients, food is still your best source.

- Have a recovery drink with made with milk within 15 minutes of finishing and a real quality meal within 2 hours.
- Have another serving of recovery drink 2-3 hours later (pre bedtime).

Sports foods

These specialised products provide a source of nutrients when it is impractical to consume every day foods. They include:

- Sports energy drinks
- Sports gels
- Sports confectionery such as bars, beans and chews
- Liquid meal supplements
- Whey protein and other protein supplements
- Electrolytes

Performance supplements

These contribute directly to optimal performance. They should only be used after receiving creditable advice on recommended amounts and how to use them. You are advised to conduct your own research on supplements and how they may affect you. The supplements most commonly linked to endurance events are:

- Beetroot juice
- Caffeine
- Cherry juice

The main difference between branded and real food options is the ingredients list and the way in which they are marketed. Sports products can be more convenient at times but, as you will see in the next section, you can use real food alternatives. You can generally opt for real food that will provide you with the same benefits, but often without the unnatural additives.

Sports drinks

Example ingredients: Water, glucose syrup, citric acid, acidity regulator (sodium citrate), stabiliser (acacia gum), preservative (potassium sorbate), antioxidant (ascorbic acid), sweeteners (aspartame, acesulfame potassium), flavouring, vitamins

(niacin, pantothenic acid, B6, B12), colouring (beta-carotene). Contains a source of phenylalanine.

Real food alternative: 300ml/10/1/2fl oz fruit juice diluted with 200ml/7fl oz water + ¼ tsp salt. **Ingredients**: Pure orange juice, water, salt.

Both provide 30g of carbohydrate in 500ml/17fl oz, as well as sodium to aid hydration. Although the homemade drink is cheaper, you may struggle to take enough for an ultra, all-day event.

Energy Gels

Example ingredients: Maltodextrin, water, fructose, electrolytes, matric acid, natural flavouring, preservative (potassium sorbate).

Real food alternative: 6 jelly babies. **Ingredients**: Sugar, glucose syrup, water belatine (bovine), concentrated fruit juices (1%), acids (citric, acetic), natural flavouring, concentrated vegetable extracts (black carrot, spinach, stinging nettle, turmeric), colouring (vegetable carbon, paprika extract, lutein). Equivalent to 5.5% fruit.

Both provide instant energy in the form of 30g carbohydrate. The gel may be easier to consume during a high-intensity workout than trying to chew jelly babies. Jelly babies are cheaper and possibly more palatable and easier to digest, as you can eat small amounts whereas a gel provides a concentrated amount of sugar in one larger hit.

Protein shakes

Example ingredients: Skimmed milk (94%), sugar flavouring, colouring; beetroot, vitamin and mineral mixture (maltodextrin, magnesium hydroxide, vitamin C, zinc lactate, ferric pyrophosphate, vitamin E, vitamin B3, sodium selenite, biotin, manganese sulphate, vitamin B5, Vitamin A, copper sulphate, vitamins B6, B9, D3, B1, B2, potassium iodide, stabilisers, carrageenan, guar gum.

Real food alternative: Flavoured milk, homemade milkshakes (tropical fruit milkshakes or mixed berry smoothies). **Ingredients**: Shop brought flavoured milk: semi skimmed milk, skimmed milk, sugar (4.5%), strawberry juice from concentrate (1%), natural flavouring, stabiliser (gellan gum), colouring (beta-carotene).

The majority of protein shakes are milk based. Some studies demonstrate benefits of whey over milk, but these gains are not significant enough to warrant the use of whey, especially from a cost perspective as whey proteins are often 3 times more expensive than milk or flavoured milk. Protein shakes may be more convenient in certain training situations.

Sports bars

Example ingredients: Organic brown rice syrup, organic rolled oats, soy rice crisps (soy protein isolate, rice flour, rice starch, barley extract), organic roasted soybeans, organic soy flour, dried apricots, evaporated cane juice, rice flour, citric acid, ascorbic acid, organic oat fibre, inulin (chicory root), organic milled flaxseed, organic oat bran, organic psyllium, organic cane syrup, dried apricots, organic date paste, organic sunflower oil, natural flavourings, lemon juice concentrate, citric acid, sea salt, colouring (annatto).

Real food alternative: Options include Chia Charge and Nookie bars, homemade banana and nut butter sandwiches, dark chocolate and ginger muffins, sweet potato brownies, jam/yeast extract sandwiches, homemade energy bars, homemade fruit and grain energy balls or dried fruit and nuts. **Ingredients**: For a real-food sports bar: oats, butter, demerara sugar, chia seeds, golden syrup, sea salt flakes.