



Mountain Biking

Characteristics of the Sport

Mountain biking has rapidly developed from a recreational activity to a serious sport with cross-country events now being included in the Olympic Games. Competitive mountain biking involves a number of disciplines including cross-country and downhill and is contested in a number of different formats including circuit, stage, trials, 4-cross and dual slalom. Serious athletes tend to specialise in one discipline only. Cross-country mountain biking requires strength, endurance and anaerobic capacity. Downhill is primarily a strength, power and anaerobic sport.

Training

Elite cross-country mountain bikers need a good endurance base as well as a high degree of skill. Training commonly involves a combination of road and cross-country riding. The cross-country season includes a relatively small number of events compared to the road season, therefore cross-country mountain bikers often compete in a number of road events throughout the year to supplement their training. Elite downhill riders typically do the majority of their training on the trails. Some riders include some aerobic work in their programs in the form of cross-country riding. Others include a strength component to develop power. As the sport becomes more competitive, downhill riders are taking a more professional approach to training and including more land-based training in their programs.

Recreational mountain bikers like to ride regularly. Most riders enjoy a variety of types of cycling including road, cross-country and downhill (provided they can afford all the bikes!) Many improve their fitness and skills through regular rides but don't tend to view this as 'training'.

Competition

The focus at the elite level is the World Cup series and World Championships. These events are held at a number of locations worldwide. Riders qualify for events by accumulating points in events such as the Australian Championships, Oceania Championships or NORBA series (national series held in the USA). Some riders are involved in professional teams. Others compete individually. In Australia, various mountain biking associations organise a variety of events Australia wide. Some of these events contribute to national points, others are merely to encourage participation. Events cater for a range of abilities with novice, sport, expert and veteran classes commonly available.

The format of events varies widely. Common formats are described below:

Cross Country	
Circuit	Competitors race on a circuit for a designated time period. The circuit must be at least 6 km and the race duration typically ranges from 1-2 hours depending on the level of riders. 12 and 24-hour events are also popular, with riders competing solo or in teams of 2, 3, 4, 6 or 10.
Point to Point	The course starts in one location and finishes in another. The course distance is usually between 25-100 km. The race may be conducted as a mass start or time trial format.
Short Course	This event is similar to Circuit however each lap must be a maximum of 6 km.
Enduro	This event takes place over one or more days and incorporates speed averages and special tests such as bike handling and mechanical skills.





Downhill	
Downhill	Solo competitors race downhill over a distance of 1.5-3.5 km. A run typically takes 2-5 minutes to complete. Very little pedalling is required. The course is usually a mixture of rapid and technical sections and includes a mixture of single track, forest roads and rocky tracks.
4-Cross	A downhill event where 4 riders compete against each other and must pass through a series of gates. The course typically takes about 30-40 seconds to cover.
Dual Slalom	Two riders race head to head down two parallel slalom courses. Conducted as a series of elimination races. Each run is typically 20-45 seconds.

Other	
Observed Trials	A highly technical event where competitors must make their way around a series of obstacles. Points are deducted for mistakes in clearing sections.
Hill Climb	A point to point course containing at least 80% of uphill riding.

Physical Characteristics

Elite cross-country riders are generally lean and lightly muscled. Low body fat levels help keep the power-to-weight ratio high which is important for hill climbing. Downhill riders tend to be larger and more muscular. A larger body weight may result in greater speeds due to gravitational effects. Surprisingly, downhill riders have demonstrated high degrees of aerobic fitness in testing conducted at the AIS.

Common Nutrition Issues

Training Nutrition

The long hours of training undertaken by elite cross-country mountain bikers calls for a high-energy diet - high in protein, vitamins and minerals, and high in carbohydrate for muscle fuel stores. Adequate carbohydrate during prolonged rides is important to maintain a strong immune system and prevent riders breaking down mid-season. Daily recovery between heavy training sessions requires a high total carbohydrate intake, but also clever timing of meals and snacks to enhance muscle glycogen restoration.

Carbohydrate and other nutrients such as protein and vitamins immediately after a long training session will kick-start muscle glycogen synthesis and prepare fuel stores for the next training sessions, as well as promote other recovery processes. Recreational riders also need a diet that is proportionally high in carbohydrate and sufficiently varied to provide enough protein, vitamins and minerals. Total needs are lower than elite cyclists and vary according to training loads.

Iron status may be an issue, particularly for female riders. Often the desire to maintain low body fat levels can cause female mountain bikers to over-restrict their food intake and miss out on nutrients such as iron. Riders need to include sources of iron such as lean red meat, chicken, fish, green vegetables, wholegrain cereals and fortified products such as breakfast cereal regularly in the diet. Iron supplements should only be used when a blood test indicates an iron deficiency. Inappropriate use of iron supplements may weaken the immune system.

Less is known about the nutritional requirements for downhill mountain bikers. Needs will vary according to the degree of training undertaken. A varied diet that includes sufficient carbohydrate and protein to meet training needs, optimise strength and maintain a healthy immune system is important. The diet should also provide a wide variety of vitamins and minerals and moderate to low amounts of fat.





Body Fat Levels

Most elite mountain bikers take care of their body fat levels through heavy training. In some situations, particularly in the case of female athletes or athletes coming back from a break, there may be an additional effort needed to help lower skinfolds. Riders needing to lower skinfolds should target excess kilojoules from fat, alcohol, refined carbohydrate and other energy dense foods. It is important to maintain an adequate intake of nutrient-dense carbohydrate such as bread, cereals, fruit, vegetables and low-fat dairy products. Some riders fall into the habit of consuming large quantities of foods when in heavy training then fail to cut back when they are less active. Recreational riders can overestimate carbohydrate needs and consume too many products such as gels, sports drinks, bars and powders.

Some mountain bikers have unrealistic goals for body fat. It is true that reducing body fat can help to improve performance especially when hill climbing. However the level of improvement achieved is often only noticeable at the elite level when performance is very consistent. Most recreational riders would gain greater improvement from improving technique and fuelling strategies than from small losses of body fat. Striving to maintain an unrealistic body fat level can have adverse implications on long-term health and psychological well-being. It can also be detrimental to factors such as power and strength. Riders need to judge if the effort really is worthwhile.

Fuelling and Hydrating Pre Rides

Whether you are out for a social ride or aiming to perform your best during an event, you will enjoy the mountain biking experience a lot more if you begin the ride with well-stocked carbohydrate and fluid stores. There are many suitable options for the pre-ride meal. The most important considerations are to consume carbohydrate and fluid and to allow adequate time for digestion before riding. Use the following suggestions as a guide and experiment to find the best routine for you:

- Have a normal-sized meal approximately four hours before riding and a snack one to two hours before riding (see below for suggestions).
- If you are riding early in the morning, have a high-carbohydrate meal the night before and a snack one to two hours before riding.
- Choose high-carbohydrate, low-fat foods to ensure easy digestion and to top up carbohydrate fuel supplies.
- Experiment with the type, timing and amount of food that works best for you.
- Drink 200-600ml of fluid approximately 2 hours before riding. Follow this up with another 200-400 ml of fluid immediately before hitting the trails. This helps to prime the stomach and improves gastric emptying during the ride.
- If you find it difficult to eat before riding, try a liquid meal supplement such as PowerBar Protein Plus powder, Sustagen Sport or a fruit smoothie.

Pre-ride meal ideas include:

- breakfast cereal with skim milk and fruit + toast + juice
- muffins or crumpets + fruit + yoghurt + water
- pancakes + syrup + fruit
- baked potatoes with low fat filling + juice
- pasta with low fat sauce + juice/cordial
- rolls/sandwiches + fruit + yoghurt + water
- liquid meal (supplements or homemade fruit smoothies)

Pre-ride snack ideas include:

- cereal bar
- fruit
- yoghurt
- toast





- sports drink
- fruit bun
- sports bar

What About Downhill?

As downhill events are over in a matter of minutes, many riders feel it is unnecessary to eat and drink before an event. However, there is often a 2-hour period set aside for practice before an event and most events require at least 2 runs of the course. When the time to travel to the event is added on, riders can be on the trails for a number of hours before riding. Concentration, skill level and judgement are impaired by fuel depletion and quite minor levels of dehydration. Therefore, it is important for downhill riders to eat and drink before competing. Downhill riders do not require as much carbohydrate as cross country riders, however it is still important to drink regularly leading up to the event and to have a light meal or snack 1-3 hours before racing.

Recreational riders often spend hours in the bush looking for trails, setting up jumps and practising runs. Often transport to the top of runs is not available, as it is during competition. Riding or pushing a downhill bike uphill requires a large amount of physical effort. It is therefore important to optimise fuel and fluid levels before heading out to the trails. The guidelines above apply in these circumstances.

Should Cross-Country Riders Carbohydrate Load Before a Race?

In most situations, combining your usual carbohydrate intake with light training or rest 24-36 hours before racing will be sufficient to fully stock carbohydrate stores. In some situations, special strategies to carbohydrate load may be required. Carbohydrate loading is a method of eating which helps to optimise the amount of glycogen stored within the body. It should only be necessary for very long or multistage events. Carbohydrate loading requires an exercise taper combined with a very high-carbohydrate intake.

Hints for carbohydrate loading:

- Plan an exercise taper. Reduce your training load by 50% going into the last week before an event and then by another 50% over the last 3 days.
- Consume 8-10 g of carbohydrate per kilogram body weight for the 72-hour taper period.
- Be extra careful with fat intake. This is not an excuse to binge. Over consumption of food may cause gastric problems in the short-term, and weight gain in the long-term.

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Sample Carbohydrate Loading Plan for a 70 kg Athlete:

- Breakfast:** 3 cups low-fibre breakfast cereal with 1.5 cups reduced fat milk
1 medium banana
250 ml orange juice
- Snack:** toasted muffin with honey
500 ml sports drink
- Lunch:** 2 sandwiches (4 slices of bread) - filling as desired
200 g low fat fruit-yoghurt
375 ml can soft drink
- Snack:** banana smoothie made with low-fat milk, banana, honey
cereal bar
- Dinner:** 2 cups cooked pasta with 1 cup pasta sauce
3 slices garlic bread
- Late Snack:** 2 glasses cordial
toasted muffin and jam
500 ml sports drink

This sample carbohydrate loading meal plan provides roughly 14 200 kJ, 590 g carbohydrate, 125 g protein and 60 g fat.

Fuelling and Hydrating During Rides

Good performance during training, racing and recreational riding requires looking after fluid and carbohydrate needs. Fluid needs will vary among individuals and according to exercise intensity and environmental conditions. It is reasonable to expect fluid losses of 500 -1500 ml/hr. In hot conditions, losses may be even greater. This applies to both cross-country and downhill riding. Fluid losses are exacerbated in downhill riders by the need to wear heavy protection - full face helmets, back, knee, elbow and shoulder protection, thigh padding, shin padding, long pants, long sleeved shirt and full finger gloves. Fortunately, mountain bikers make good use of hydration packs (small backpacks which contain a fluid bladder linked to a tube and mouthpiece). These ensure fluid is readily available and easily accessible. However, it is important to ensure that you leave home with sufficient supplies. It is often difficult to find additional fluid when on the trails.

Depletion of body carbohydrate stores may cause heavy legs due to glycogen depletion of the quads or 'hunger flatting' due to reduced blood sugar levels. It can also affect concentration and increase the risk of accidents and stacks. While some athletes are more affected by low blood sugar levels than others, all riders need to consider the need for additional carbohydrate when riding.

Carbohydrate should be organised for all rides over 1-hour in duration. This includes time spent waiting around to race downhill. Be prepared and ensure you have access to sufficient supplies. Plan to consume carbohydrate before you hit a hunger flat. Aim for about 30-60 g of carbohydrate per hour (see table on following page).

Sports drinks are a great choice - providing both carbohydrate and fluid. In hot conditions, when fluid needs outstrip carbohydrate needs, you may require additional fluid such as water. A good strategy is to carry a hydration pack filled with water and 1-2 bidons filled with sports drink. Other good portable food options include bananas, dried fruit, sports bars, cereal bars and gels.

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**50g Carbohydrate**

800-1000 ml sports drink
 2 carbohydrate gels
 3 medium pieces fruit
 2 cereal bars
 800 ml cordial
 500 ml juice
 50 g jelly beans or jelly lollies
 1 jam sandwich

The Challenge of Recovery

Complete recovery can take up to 24-hours after a ride. Elite riders who train and compete regularly need to speed up the recovery process to allow better preparation for the next session. Recovery is enhanced when a snack that provides carbohydrate and other nutrients such as protein and vitamins is consumed immediately after exercise. If there is more than an hour before your next meal and you are planning to ride again within less than 24 hours, you will need to choose from the following options:

Male Athlete (Target 60-80 g carbohydrate)	Female Athlete (Target 40-50 g carbohydrate)
200 g fruit yoghurt* + jam sandwich 200 g fruit yoghurt* + cereal bar + 250 ml juice 200 ml liquid meal* + 1 large banana sports bar* + 500 ml sports drink 200 ml flavoured milk* + cereal bar + banana 750-1000 ml sports drink	200 g fruit yoghurt* + cereal bar 200 g fruit yoghurt* + banana 200 ml liquid meal* sports bar* 200 ml flavoured milk* + cereal bar 750 ml sports drink

*indicates a valuable source of protein, vitamins and minerals in addition to carbohydrate

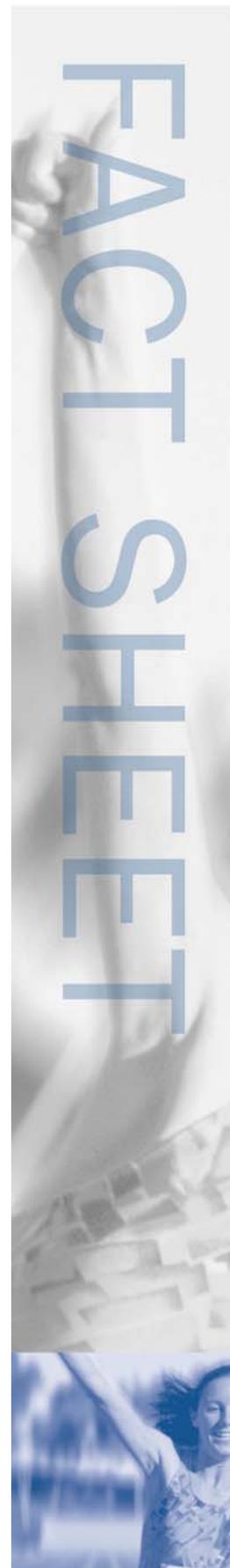
Case Study

24-hour races are becoming popular events in the mountain bike world. These events involve completing as many laps of a cross-country circuit as possible within 24 hours. A single lap typically takes between 40-90 minutes to complete depending on the calibre of the rider. Some riders contest 24-hour races as solo riders. However, most opt for groups of 2, 3, 4, 6 or 10. Nutritional preparation can be a huge challenge for solo riders and small teams whereas teams with more members can take a more social approach to food. The following provides a guide to nutritional strategies for various team types.

Solo Riders

Solo riders aim to ride continuously with only short stops to refuel and rehydrate. They need foods that are easily digested and absorbed. It is a huge challenge to keep pace with carbohydrate, fluid and sodium requirements without causing gastrointestinal distress. Solo riders are encouraged to carbohydrate load in the days leading up to the event to optimise fuel stores prior to the race. During the race, riders need to work at consuming fluid regularly during each lap. A planned approach is important to ensure adequate fluid is consumed. Riders may choose to consume fluid every 15-20 minutes or at specific stages of the course (i.e. easy fire trail sections, interchange station).

Theoretically, riders should aim to consume 30-60 g of carbohydrate per hour. However, riders may need to compromise between what is ideal and what is practical. Some riders may choose to consume food at the completion of each lap after passing through the interchange. Others may consume smaller amounts of food more frequently as they make their way around the course. The majority of foods should be





carbohydrate-based and low in fat, protein and fibre (e.g. sports drink, gels, lollies, bars). However, riders should prepare a variety of food options as taste preference can change throughout the event. It is important to replace sodium losses in long events. This means including fluids and foods that contain sodium throughout the event. Sports drinks provide sodium but this may not be sufficient to keep pace with losses throughout the whole event. It can be useful to include savoury options such as Vegemite sandwiches, crackers, crisps, soups and noodles. A change to savoury foods can also be very welcome after consuming large amounts of sweet foods.

Pairs

Riders competing as pairs generally swap after every 1-2 laps. This allows one rider to recover and refuel while the other is on the course. Recovery time will vary according to the calibre of the riders and the number of laps completed in successions but is most likely between 50-120 minutes. Carbohydrate loading in the days prior to the event is recommended for pair riders. It is necessary to consume fluid regularly while on the bike - a mixture of water and sports drink is ideal. As soon as each rider comes off the bike, it is necessary to begin refuelling in preparation for the next lap. As the time between laps is short, it is necessary to consume carbohydrate-based foods that are easily digested (gels, sports bars, cereal bars, fruit, yoghurt, plain sandwiches, lollies etc.) Again, it is useful to include a variety of sweet and savoury options and to include some foods that are a good source of sodium.

Teams of 3-4

Riders in teams of 3-4 generally have at least 2.5 hours to recover between laps (longer if riders are slower or do double laps). Riders are therefore able to tolerate a greater variety of foods and there is also less pressure to consume significant amounts of carbohydrate and fluid on the bike. Riders are advised to consume food as soon as they come off the bike. This allows maximum time for digestion and absorption and increases the likelihood of the fuel being available to the muscles by the time the next lap is due. Foods such as meat and salad sandwiches, pasta with sauce, rice salad, noodles etc. are more likely to be tolerated. A good strategy is to consume sports drink and/or water on the bike, consume food such as a sandwich, banana and cereal bar immediately after completing a lap, consume fluid every 20-30 minutes leading up to the next lap, have a small snack such as lollies or a piece of fruit approximately 1-hour before the next lap.

Common mistakes made by riders include:

- delaying the consumption of food and therefore having to ride on a full stomach
- over eating, especially high-fat and high-protein foods which take longer to digest
- over consuming high-carbohydrate foods such as sports drink, gels, lollies when the rider is not used to these foods
- failing to consume a variety of food and fluid options and therefore ending up with 'flavour fatigue'
- failing to include some foods which are a source of sodium

Teams of 6-10

Riders in larger teams have ample time between laps. Riders need to prepare for each lap by consuming a 'meal' 3-4 hours before the lap and a 'snack' 1-2 hours before the lap. See the guidelines above in the Fuelling and Hydrating Pre Rides section. Riders should also aim to consume fluid regularly throughout each lap then replace any additional fluid at the completion of each lap. The most common mistake made by riders is to over consume food and to allow inadequate time for digestion before each lap.

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