Nutrition for enhancing physical performance
Outline

• What is Sports Nutrition
• General Nutrition Recommendations
• Sports Science Recommendations
• Sport Specific Nutrition Advice
• Case Studies
• Further Information and resources
• Who is SDA?
What is Sports Nutrition

• Is the science of using food and nutrients found in foods to improve exercise performance
• Manipulation of timing and make-up of nutrients within a meal
• Supply of nutrients to sustain metabolic energy production
What does Health Science Say

• Australian Guide to Healthy Eating
• Dietary Guidelines for children and Adolescents
• Nutrient Reference Values/RDI’s
Watch this space for new guidelines
Bread, Cereal, Rice and Pasta

- High in Carbohydrates
- Provide energy (fuel)
- B group vitamins
- Fibre
Vegetables and Legumes

- Vitamins and Minerals
- Fibre
- Antioxidants
- Carbohydrates

5+
Fruit

- Vitamins and Minerals
- Fibre
- Antioxidants
- Carbohydrates
Milk, Yoghurt and Cheese

- Calcium – Bones & teeth
- Protein – Muscle growth

3+
Lean Meat, Fish, Poultry, Eggs, Nuts and Legumes

- Protein – Muscle growth
- Iron – Oxygen transporter

[Image of a plate with meat and vegetables]
Extra Foods

- Fat
- Sugar
- Salt
- LOW in nutrients
- HIGH in kilojoules

0–3 max
So, where does sports nutrition fit in???
Sports Nutrition in Competition

- HIT running
- Endurance running
- Thermoregulation
- Skills & Tactics
- Repeat efforts

Nutrition

- Carbohydrate
- Protein
- Fluids
What does sport science say

- Nutrition can affect training adaptation and performance
- Carbohydrate improves exercise capacity
- Hydration can affect sporting performance
  - Decision making, Skill acquisition
  - Endurance Performance
- Protein and carbohydrate can improve muscle adaptation to Resistance exercise
- Timing of meals and snacks
Nutrition Knowledge Development Pathway

- Junior Athlete
- Healthy eating focus
- Age group Athlete
- Basic Sports nutrition whole food focus
- Age Group Targeted Development Swimmer
- Sports Nutrition
  - Focus on timing, nutrient make up and volume
- National Elite Swimmer
- Advanced Sports nutrition
  - Focus on nutrient manipulation, supplementation where appropriate.
Carbohydrate

• Carbohydrate can improve exercise capacity
• Can improve endurance performance
• Can affect intensity
• Can affect pacing
• Can improve concentration
• Can improve decision making
• Can improve immune function
• Can enhance nutrient utilisation
What’s the Catch?

• Glycogen stores can supply about 60-90 minutes of intense activity.
• Unlikely that fuel will be a limiting factor in a junior match.
• Regardless, it is important that these stores are both maximised before games and where necessary, replaced or fatigue will result.
Carbohydrate Rich Foods

- Breads and Breakfast cereals
- Pasta, rice, noodles
- All fruit (whole, juiced, tinned)
- Starchy Vegetables – potatoes and corn
- Legumes – lentils and beans
- Cereal, muesli and breakfast bars'
- Pancakes, crumpets, scones, muffins
Carbohydrate Rich Foods
Lollies Vs Oranges?

• Both are sources of carbohydrate.
• Oranges at half time will not increase risk of cramps.
• Oranges at half time will not increase dental erosion.
• Always identify the over-arching nutrition issues of young athletes BEFORE sports nutrition goals (consistent health message)
Fluids are Important
But be clear on this!
How does Fluid Loss Occur?

- Fluid losses occur mainly through sweat during sport
  - Also through urine, breathing, spitting, crying and vomiting

- Sweat rates
  - can be anywhere between 1 – 4 litres/hour

- Rates are affected by
  - Temperature
  - Humidity
  - Exercise intensity
  - Individual variation e.g. sweat rate, size, age etc

- How can you tell if you’re well hydrated?
  - Urine colour, weight changes, monitoring fluid intake

- What happens when we lose too much fluid?

Note: Thirst is a poor indicator of hydration status
Dehydration Warning Signs

- Dizziness and light-headedness
- Muscle cramps
- Nausea and headache
- Dark urine and infrequent urination
- Dry mouth and throat
- Higher body temperature
- Greater perception of effort
Which fluids?

- **Best fluids for sport:**
  - Water
  - Sports drink
  - Milk
  - Juice
  - Cordial

- **Avoid diuretics**
  - encourage the kidneys to remove more fluid
  - alcohol
  - caffeine: cola, coffee, tea, ‘energy drinks’

> These types of drinks may slow rehydration
Sports Drinks

- Provide a convenient and practical source of both carbohydrate and fluid.
- Contain sodium which enhances water absorption.
- Sweet and cool drinks are palatable and therefore may promote greater fluid intake.
- Suitable for Junior Athletes
- Encourage water chaser for dental health
Protein Requirements

• Protein is vital for the growth and repair of muscle tissue.
• Athletes do have higher protein needs (often achieved through increased energy intake because larger appetite).
• Requirements based on athlete’s nutrition goal e.g. increasing muscle mass Vs. maintenance of LBM
Sources of protein...
## Protein Counter

<table>
<thead>
<tr>
<th>Food</th>
<th>Typical Serve</th>
<th>Protein Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>100g</td>
<td>31g</td>
</tr>
<tr>
<td>Chicken</td>
<td>100g</td>
<td>28g</td>
</tr>
<tr>
<td>Seafood</td>
<td>100g</td>
<td>23g</td>
</tr>
<tr>
<td>Milk</td>
<td>250ml</td>
<td>9g</td>
</tr>
<tr>
<td>Cheese</td>
<td>20g</td>
<td>5g</td>
</tr>
<tr>
<td>Yoghurt</td>
<td>200g tub</td>
<td>10g</td>
</tr>
<tr>
<td>Pasta</td>
<td>1 C cooked</td>
<td>7.5g</td>
</tr>
<tr>
<td>Bread</td>
<td>1 slice</td>
<td>3.5g</td>
</tr>
<tr>
<td>Legumes</td>
<td>1 C</td>
<td>10g</td>
</tr>
</tbody>
</table>
Sports nutrition for school-aged athletes

• Situational
• Age dependant
• Often over emphasised
• Healthy eating as basis
• Development over time to elite level
Case studies

Start thinking about priorities for…

• 14yo male soccer player
• 16yo female gymnast
• 18yo male rugby player
• Tournament eating: group on tour
Pre Game Meals and Snacks

Goals:
- 1-4 hours before game
- High carbohydrate
- Low fat
- Moderate protein
- Accompanied by fluid

Examples...
Pre Game Meals and Snacks

- Breakfast Cereal + low fat milk + fruit
- Muffins or Crumpets + honey or jam
- Pancakes + Syrup
- Baked Beans/Tinned Spaghetti + Toast
- Creamed Rice (low fat milk)
- Rolls/Sandwiches/Wraps – honey, jam, banana
- Pasta + low fat tomato sauce
- Baked Potato with low fat filling
- Sports Bars or cereal bars + Sports drink
- Sustagen/Fruit smoothie (low fat)
During Matches

- Concentrate mainly on fluids
- Encourage players to use every opportunity for a drink, rather than trying to consume only at $\frac{1}{2}$ time.
- Alternate between water and sports drink for higher levels
- Water alone should be adequate for junior players
Post Game Meals and Snacks

Goals:
- Within 30min of finishing game
- High carbohydrate
- Little protein
- Accompanied by fluid
- Quick and easy to prepare and eat
- Needs to be practical
Post Game Meals and Snacks

- Savoury Jaffles or toasted Sandwich
- Milkshake or Smoothie
- Soup + Toast
- Pasta with low fat tomato sauce
- Baked Beans/Tinned Spaghetti + Toast
- Rolls/Sandwiches/Wraps – honey, jam, banana
- Baked Potato with low fat filling
- Sports Bars or cereal bars
A few case studies?
Training nutrition

- 14 Year old male soccer player
- Speed and acceleration training x 3 mornings/week.
- Soccer training (club) x 3 nights per week.
- Soccer training (regional) x 2 nights per week.
- 3 x matches per week
- Sessions often back to back immediately after school
- Child regularly tired and lethargic at school
Training nutrition

**Nutrition goals**
- Meet kJ (energy) and nutrient requirements
- Adequate carbohydrate & fluid intake to meet training and growing needs; look at timing of meals
- Sufficient recovery?

**Barriers**
- Organisation: having meals and snacks prepared
- Access to suitable food/fluid, time available?

**Solutions**
- Decrease training load?
- Increase freq. of meals and snacks, carbohydrate base
- Encourage fluids +/- CHO during training (CHO if >1hr)
- Recovery snack if next meal is >1hr away
Female teenage Gymnast

- 16 years old
- Completing year 12 over 2 years
- Difficulty controlling body fat to coaches recommendations
- Training 10 sessions per week 2-3 hours per session
- Delayed menses (primary amenorrhoea)
Female teenage Gymnast

**Nutrition Goals**
- nutrient rich vs. kilojoule rich food selections
- appropriate food intake incorporating kJ restriction, timing of meals and snacks to maximise performance and prevent hunger
- provide appropriate nutrition education on bone health (Ca) and iron-rich foods
- refer on to health professionals e.g. GP for medical opinion

**Barriers**
- Coach and peer input
- unrealistic expectations
- insufficient nutrition knowledge

**Solutions**
- Structured appropriate meal plan (timing, amt & quality)
Increasing lean muscle tissue

- 18 yo Rugby Union player (father late bloomer)
- Height 172cm, Weight: 65kg
- Gym x 3 mornings per week
- 2 Rugby specific sessions per week
- 2 Rugby matches per week
- Coach has recommended supplements
Increasing lean muscle tissue

**Nutrition Goals**
- Positive kilojoule balance, timing and composition of training nutrition

**Barriers**
- Misinformation, poor organisation and lack of awareness of appropriate requirements

**Solutions**
- Increase frequency of meals
- Increase CHO and PTN intake around gym sessions
- ? Supplementation e.g. Sustagen sport
Tournament eating

• You are the manager of a U/13 regional netball team travelling to compete at state titles
• 2 full days competition
• 5 games per day (2 x 20min halves)
• 4 girls selected to trial for state team

...What needs to be done before during and after matches?
Tournament eating

Nutrition Goals
• Meet specific carbohydrate and fluid requirements for each player (will vary)

Barriers
• Timing of meals and snacks
• elite sport solutions (lollies/sports drinks/gels) Vs practical health message (fruit/water/milk etc)
• nerves

Solutions
• Steady supply of nutrition snacks throughout the day
• 1-2 hrs between games aim to include a “meal”
• check adequacy of food available at the canteen and liaise with motel (?catering options)
Who are SDA?

• A professional organisation of dietitians specialising in the field of sports nutrition

What does SDA do?

• Promotes the expertise of sports dietitians
• Promotes the importance of sports nutrition to the Australian community
• Provides credible sports nutrition information to the general public and other health professionals
Further Information

• Sports Dietitians Australia
  www.sportsdietitians.com.au

• Australian Institute of Sport
  www.ais.org.au/nutrition

• Nutrition Australia
  www.nutritionaustralia.org

To register your interest for Sports Nutrition Courses for PE Teachers, email info@sportsdietitians.com.au
Thanks and questions?
Le Tour de France Nutrition Plan

The nutritional requirements for competition vary depending on the length and intensity of the event in addition to environmental conditions. To achieve optimal performance it is important for the athlete and coach to identify the main cause of fatigue during the event, and implement nutritional strategies before, during and after the event with the goal to minimise or delay fatigue.

Le Tour de France is without doubt, a strenuous endurance event. This year, the 100th Tour de France is made up of 21 stages and will cover a total distance of 3,404 km. The high energy demand in the three week race requires the rider to carefully monitor their kJ intake and hydration status. While limited lab research simulating the Tour’s conditions has been conducted, one article published in 1989, ‘Eating, Drinking, and Cycling: A Controlled Tour de France Simulation Study, Part II; Effect of Diet Manipulation,’ found that on average, athletes consumed 24,700 kJ per day and expended 25,500 kJ. For perspective, the typical sedentary male adult consumes about 8,700 kJ per day. The extreme kJ intake required on Le Tour de France poses a challenge for most athletes and a tailored plan, including the athlete’s likes and dislikes is paramount. By consuming food they enjoy, athletes are likely to eat more and avoid any gastrointestinal stress.

The goal of the post-race meal is to replace fuel as well as enhance CHO availability for the next day, by increasing muscle and liver glycogen stores. The ‘pre-stage’ meal should include CHO rich foods to further build muscle glycogen supplies. Riders should also consume CHO during the event to manage energy requirements at the muscle and prevent blood glucose depletion, or central fatigue.

<table>
<thead>
<tr>
<th></th>
<th>Fuel Source</th>
<th>Food Source example</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast/</td>
<td>CHO</td>
<td>Toast, rice, cereals + fruit,</td>
<td>Maintain blood glucose level</td>
</tr>
<tr>
<td>Pre-Stage Meal</td>
<td></td>
<td>pancakes + syrup</td>
<td>Restore liver and muscle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>glycogen stores</td>
</tr>
<tr>
<td>During (every hour)</td>
<td>CHO</td>
<td>Rice cake, jam sandwiches, bananas, carbohydrate gels,</td>
<td>Maintain high plasma glucose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>chews and bars.</td>
<td>concentration</td>
</tr>
<tr>
<td>Post event</td>
<td>CHO, protein</td>
<td>Chicken wraps, rice or WPC (Whey protein concentrate)</td>
<td>Refuel, recover and repair</td>
</tr>
<tr>
<td>Snack</td>
<td>CHO, protein</td>
<td>Rice, pasta, potatoes, chicken, eggs, and fruit.</td>
<td>Refuel, recover and repair</td>
</tr>
</tbody>
</table>

Fluid Intake

Before competing in Le Tour de France, riders undertake long hours of training and testing to help determine the optimal balance between hydration, body-mass and power output. Fluid loss will vary dramatically between individuals, with influencing factors such as body size and genetics demanding a tailored hydration plan for each athlete.

Some research states that dehydration where as little as 2% of body mass is lost in sweat is sufficient to cause a detectable change in work output and perception of effort. It is important for riders to maintain their performance output as a change of just 1% can have devastating results in a race where the difference between first and second can be a little as a couple of seconds. Balancing hydration is vital as over-replenishing fluid may also hinder performance. Superfluous fluid leads to unnecessary weight gain, which increases energy expenditure when climbing a steep hill.
Case Study – Le Tour de France

1. Design a sample race day nutrition plan for a ‘Tour cyclist’

<table>
<thead>
<tr>
<th>Fuel Source</th>
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<tbody>
<tr>
<td>Breakfast/</td>
<td></td>
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<tr>
<td>Pre-Stage Meal</td>
<td></td>
</tr>
<tr>
<td>During (every hour)</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
</tr>
</tbody>
</table>

2. List the dominant food fuel during the race? Explain why this is the case.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. Other than nutrition, list two recovery methods? Explain how these methods assist in recovery?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Explain the concept of ‘hitting the wall’ and how can you prevent this?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Exam hint: Question 13 on the 2009 exam specifically asks students to discuss the role of carbohydrates at various stages of the Tour de France.
Case Study – Le Tour de France

1. Design a sample race day nutrition plan for a ‘Tour cyclist’

<table>
<thead>
<tr>
<th>Meal</th>
<th>Fuel Source</th>
<th>Food Source example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast/ Pre-Stage</td>
<td>CHO</td>
<td>Any CHO rich food e.g. rice, bread, cereal, oats</td>
</tr>
<tr>
<td>Meal</td>
<td>CHO</td>
<td>Easy to eat and digest foods e.g. carbohydrate gels, chews &amp; bars</td>
</tr>
<tr>
<td>Post</td>
<td>CHO, protein</td>
<td>Foods with CHO/protein combination e.g. chocolate milk, rice and eggs, noodles or WPC (Whey protein concentrate)</td>
</tr>
<tr>
<td>Snack</td>
<td>CHO, protein</td>
<td>Lighter foods with CHO/protein combination e.g. fruit, chocolate milk, bread</td>
</tr>
</tbody>
</table>

2. List the dominant food fuel during the race? Explain why this is the case.

CHO is the dominant food fuel during the race. It is the preferred fuel for muscular contraction during high intensity exercise due to its quick rate of energy production. Additionally, CHO ingested during an event helps manage energy requirements at the muscles and prevents blood glucose depletion, or central fatigue.

3. Other than nutrition, list two recovery methods? Explain how these methods assist in recovery?

Active recovery: Maintaining exercise at a low intensity helps deliver nutrients to the muscle and clears metabolic by-products while preventing venous pooling via a muscle pump.

Massage: Aims to increase circulation through a passive muscle pump. This in turn may aid in the delivery of nutrients and oxygen to the muscles and removal of by-products.

Contrast bathing: Alternating between hot and cold submersion redirects blood flow towards the muscle (hot – vasodilation of blood vessels) and away from the muscle (cold – vasoconstriction). This may increase nutrient delivery and enhance by-product removal.

4. Explain the concept of ‘hitting the wall’ and how can you prevent this?

During prolonged exercise, glycogen stores start to deplete, resulting in an increased contribution from triglycerides. As triglycerides require a greater oxygen investment to breakdown, their rate of energy production is slower. Hitting the wall occurs when triglycerides takes over as the dominant fuel, the athlete must decrease intensity. Delaying its occurrence can be achieved through CHO loading as well as ingestion of CHO during exercise.