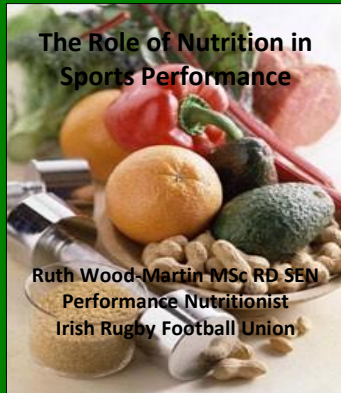


## The Role of Nutrition in Sports Performance

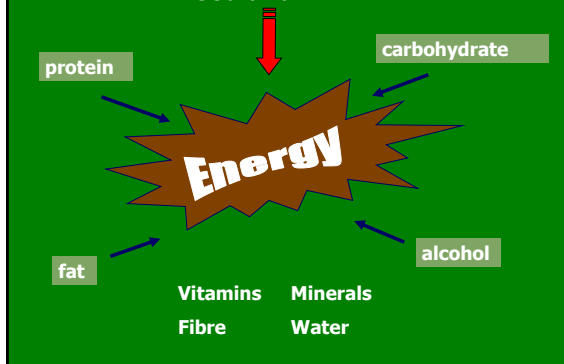


Ruth Wood-Martin MSc RD SEN  
Performance Nutritionist  
Irish Rugby Football Union

## Overview of session

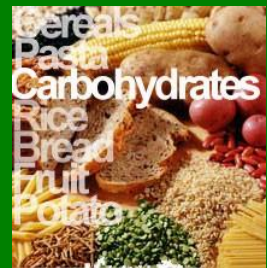
- Refresh the nutrition basics
- Nutrition goals for training and competition
- Energy requirements
- Macronutrient requirements for exercise
  - Carbohydrate
  - Protein
- Hydration for exercise
- Nutrient Timing – before, during and after exercise
- Use of Sports Supplements
- Examining learning outcomes for students

## Food and Drink



## Carbohydrate

- major energy provider in everyday diets
- Storage form is glycogen in liver and muscle
- essential to maintain blood sugar levels and fuel brain activity
- Essential fuel for high intensity exercise



## Fluids

11 – 14 yrs: 55mls/kg  
15 – 18 yrs: 50mls/kg  
18 yrs + 35mls/kg



## Protein

- Raw material for
  - Structure of the body
  - Hormones
  - Antibodies
  - Blood clotting
  - Enzymes
- Not stored in the same way as fat or carbohydrate
- 20 amino acids, 8 essential



## Fat

- essential for insulation, nerves, fat soluble vitamins, essential fatty acids
- a rich source of energy
- main fuel used in aerobic or lower intensity exercise
- good and not-so-good fats



## Nutritional Goals for Training

- Provide and maintain energy to working muscles
- Promote tissue adaptation in response to training stimulus
- Promote growth and repair
- Maintain and promote immune function to stay well
- Refuel and hydrate adequately between sessions

## Nutritional Goals for Competition

### *Nutritional factors associated with fatigue:*

- Depletion of muscle glycogen stores (fuel supply)
- Low blood sugar levels (hypoglycaemia)
- Dehydration
- Gastrointestinal (GI) discomfort

## Energy (Calorie) Requirements

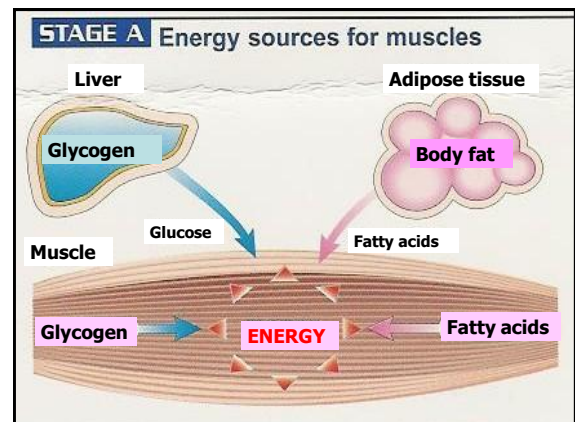
- Techniques to assess energy requirements

- Doubly Labelled Water (Ebine et al 2002)
- Indirect Calorimetry (Fogelholm et al 1995)
- Equations to estimate RMR  
(Schofield 1985, Harris-Benedict 1919, Cunningham 1980)
- Accelerometry – Multi-sensor armband



## Manipulating Energy Intake

- **Increased Energy RQs**
  - Heavy training schedule
  - Heavy competition schedule
  - Growth
  - Increase in lean body mass
- **Decreased Energy RQs**
  - Off-season
  - Injury
  - Fat loss programme



### Carbohydrate

- Only fuel that can be used at high intensities
- Can become a limiting factor to performance after 60 – 70 minutes of high intensity exercise
- Needs to be replaced to prepare for the next session

Daily recovery or fuel needs	Carbohydrate amount
Athletes in light training, with large body mass or need to lose weight	3 – 5g/kg BW/day
Athletes with moderate exercise programme	5 – 7g/kg BW/day
Endurance athlete (1 – 3hrs/day)	7 – 12g/kg BW/day
Extreme exercise programme (>4 - 5hrs/day)	≥ 10 – 12g/kg BW/day

Burke et al 2004

### Food quantities containing 30g carbohydrate

Food	Amount – handy measure
Porridge (made on milk)	5 tablespoons
Cornflakes	4 tablespoons
White or Wholemeal bread	2 slices
White or Wholegrain rice, cooked	3 tablespoons
White or Wholemeal pasta	3 tablespoons
Potatoes, boiled	2 medium
Baked beans	½ large tin
Milk, all types	1 pint
Banana	1 large
Cola drink	1 can (330mls)
Sports drink	1 bottle (500mls)

### Protein ... how it supports growth

**Protein**

**Amino Acids**  
8 essential (includes 3 BCAAs)  
12 non-essential

**Protein Synthesis**  
↑ muscle mass  
Muscle conditioning and repair  
Support immune function

**Fuel**  
if CHO supply is limited

**Stored** - glycogen - fat

### Protein requirements

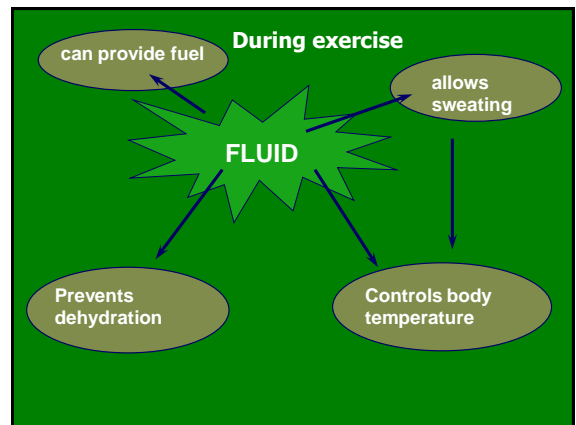
Group	Protein intake (g/kg/day)
Sedentary men and women	0.8-1.0
Elite male endurance athletes	1.6
Moderate-intensity endurance athletes <sup>a</sup>	1.2
Recreational endurance athletes <sup>b</sup>	0.8-1.0
Football, power sports	1.4-1.7
Resistance athletes (early training)	1.5-1.7
Resistance athletes (steady state)	1.0-1.2
Female athletes	~15% lower than male athletes

<sup>a</sup>Exercising approximately four to five times per week for 45-60 min  
<sup>b</sup>Exercising four to five times per week for 30 min at <math>\dot{V}O\_{2max}</math>  
 From Burke and Deakin, Clinical Sports Nutrition, 3<sup>rd</sup> Edition, McGraw-Hill Australia Pty Ltd, 2006

Timing of protein intake is as important as total daily amount  
 (Hawley et al 2006)

### Food quantities containing 10g protein

Food	Amount – handy measure
Red meat, e.g. beef or lamb sliced	1 small slice
Beef mince	2 tablespoons
Chicken	2 small slices
Fish, white or oily	½ small fillet
Milk, all types	½ pint
Eggs	2
Yogurt	2 small tubs
Cheese	1 medium slice (40g)
Lentils, cooked	3 tablespoons
Nuts	Handful (40g)



## Sweat losses



- Your body sweats to keep you cool
- The amount you sweat depends on
  - Temperature
  - Humidity
  - Work rate
  - Length of session
  - Clothing

## Measuring Hydration



Your target is to make sure that your pee is the same colour as numbers 1, 2 or 3. Colours 4 and 5 suggest dehydration and 6, 7 and 8 severe dehydration.



- PEE test – aim 1 – 3
- Signs of dehydration
  - Thirst, headaches, dark coloured urine, irritability, dizziness, cramps, nausea, decreased performance
- Pre and post training weights

## Weight monitoring

- Weigh before and after exercise session to gauge fluid losses
- 1kg weight loss = 1 - 1 ½ litres lost
- Aim to drink 80% of losses in exercise session



## Nutrient timing

*Providing the right nutrients at the right time*

- To fuel up and re-fuel
- To maintain steady blood sugar levels
- To hydrate and re-hydrate
- To provide raw materials for growth and repair

## Nutrient timing – pre-exercise

### Carbohydrate (CHO)

- CHO-rich meal increases muscle glycogen levels and improves performance
- Tailor the timing
  - 3 – 5 hours before
  - ? Within hour before

### Fluids

- Pre-hydrate: 5 – 7ml/kg, 4 hours before
- Drink with pre-exercise meal or snack

ACSM Nutrition and Athletic Performance 2009

## Fuel-up before training or competition

- high carbohydrate, low fat, low fibre
- low/moderate protein

eg

Meal with pasta/potato/rice  
Sandwich or roll  
Yogurt and fresh fruit  
Pancakes or scones  
Breakfast cereal with milk



## Nutrient timing – during exercise

- CHO during exercise longer than 45 minutes can improve performance (Jeunckendrup et al 1997)
- 30 – 60g/hour, glucose based
- Drink at regular intervals
  - Sports drinks
  - Sports gels
  - Homemade sugar-containing fruit squash
- May be some opportunities to eat in some sports

## Choice of drinks during exercise

- Water
- Diluted fruit juice
- Diluted fruit squash
- Sports drinks
  - hypotonic
  - isotonic
  - hypertonic



## Recovery ... nutrition management

### The theory ...

- Replace the fluid and electrolytes lost in sweat
- Refuel the muscles and liver of expended energy
- Support the immune system
- Maintain protein balance
- Repair any injury

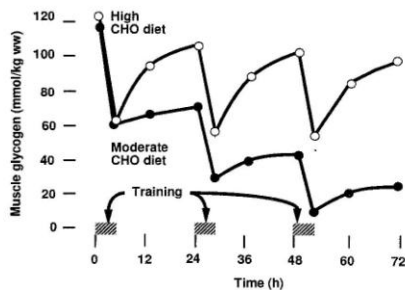
### The practice ...

- Drink to start re-hydrating
- Get carbs and some protein in as soon as possible after the session – amount needed will depend on the session
- Focus on carbohydrate foods for main meal

## Nutrition Factors affecting recovery

- **Timing of carbohydrate intake**
  - Within ½ hour
- **Amount of carbohydrate**
  - 1g per kg BW after hard session
- **Type of carbohydrate**
  - Foods or fluids with high GI
- **Protein intake**
  - Carb/protein mix beneficial for muscle protein re-synthesis and glycogen storage

## High carbohydrate diet promotes daily recovery of muscle fuel stores



## Snacks and drinks for recovery

- ✓ Water, diluted fruit juices, squash or sports drink, recovery drinks
- ✓ Sandwiches or filled rolls
- ✓ Bananas, grapes, apples, mandarin oranges
- ✓ Sultanas, raisins, dried apricots
- ✓ Fruit loaf, pancakes, scones
- ✓ Jaffa cakes, fig rolls
- ✓ Cereal and energy bars
- ✓ Yogurts, Yogurt drinks
- ✓ Smoothies



## Practice guidelines for rehydration

- ✓ Adequate supply of cool palatable drinks available
- ✓ Re-hydrate with a fluid that contains some carbohydrate and sodium
- ✓ Fluid continues to be lost during recovery period
- ✓ Alcohol intake can increase urine losses



## What are sports supplements?

Sports supplements come in many forms:

- Normal foods
- Sports drinks, bars etc
- Meal replacements
- Herbal products
- Nutraceuticals



## Nutrition supplements include:

- Dietary supplements
- Nutritional ergogenic aids

**Nutritional supplements are not licensed**

## Category 1 Dietary supplements

- provide nutrients found in everyday foods in a form that is convenient or practical
- or are designed to prevent or treat a nutritional deficiency
- allow athletes to meet a specific need in training or competition, if not met through diet

- Sports drinks
- Sports gels
- Sports bars
- Liquid meal replacements
- Carbohydrate powders
- Protein powders
- Multi-vitamins/minerals
- Iron supplements, Calcium supplements

## Category 2 Nutritional Ergogenic Aids

- contain larger amounts of nutrients than would be typically found in everyday foods
- claim to have a direct work enhancing effect on performance
- often rely on theoretical or anecdotal support rather than on scientific evidence

Commonly used ergogenic aids include:

- Creatine
- Caffeine
- Individual amino acids
- Herbal preparations

And lots more ....

## Why use supplements?

### Reasons:

- To benefit health
- To compensate for an inadequate diet
- To meet demands of hard training
- Because 'team-mates' take them
- Recommended by coach or other influential person
- To improve performance

### Athletes want 'the edge'

- Enhance energy supply
- Promote tissue growth and repair
- Promote immune function
- Maintain joint function
- Weight loss/fat loss
- Support quick recovery
- Central nervous system effects

## Are supplements necessary?

Simple answer is NO but .....

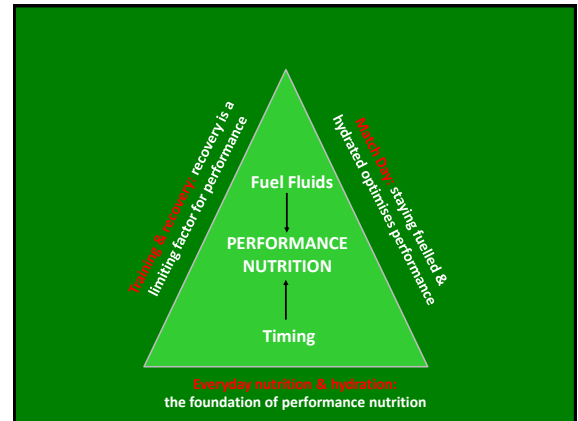
- Not all athletes eat a varied diet
- Not all athletes have/need a high energy intake
- Diagnosed deficiency needs supplementation
- Dietary assessment leading to dietary change
- Clinical examination
- Biochemical analysis



## Adults vs adolescents

- Young athletes should not need supplements
- Greatest performance gains result from maturation in age and training
- Long-term safety of some supplements on a growing body is unknown
- IRFU guidelines and recommendations

[www.irishrugby.ie/supplements](http://www.irishrugby.ie/supplements)  
[www.irishrugby.ie/eat2compete](http://www.irishrugby.ie/eat2compete)



## Learning outcomes

### Suggest and justify advice for individuals involved in sport

- Increased energy RQs due to increased energy expenditure
- Increased carbohydrate RQs to fuel intense training and competition
- Increased fluid RQs to stay well hydrated
- Timing of food and fluid intake to best support training and competition
- Smart use of sports supplements

### Plan, make and evaluate meals and menus and modify recipes

- Make sure carbohydrate is the main part of every meal
- Include protein foods at each meal
- Make sure menus include a wide variety of food choices
- Modify recipes to lower fat content
- Develop plans for snack ideas