

# Endurance training Strength training

## Nutrition



# Endurance training

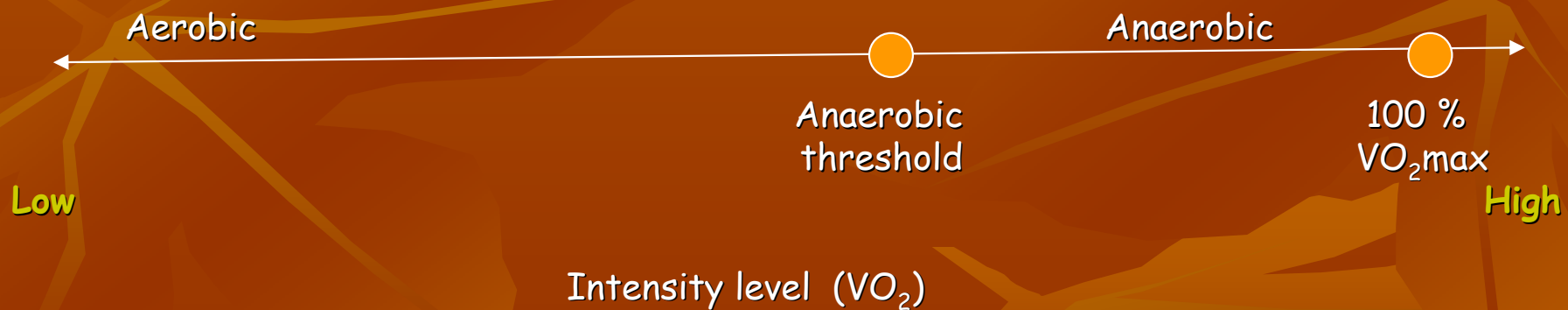
Endurance, aerobic, cardiorespiratory exercise

*Any activity that incorporates large muscle groups sustained in rhythmic activity for an extended time (> 5 minutes)*

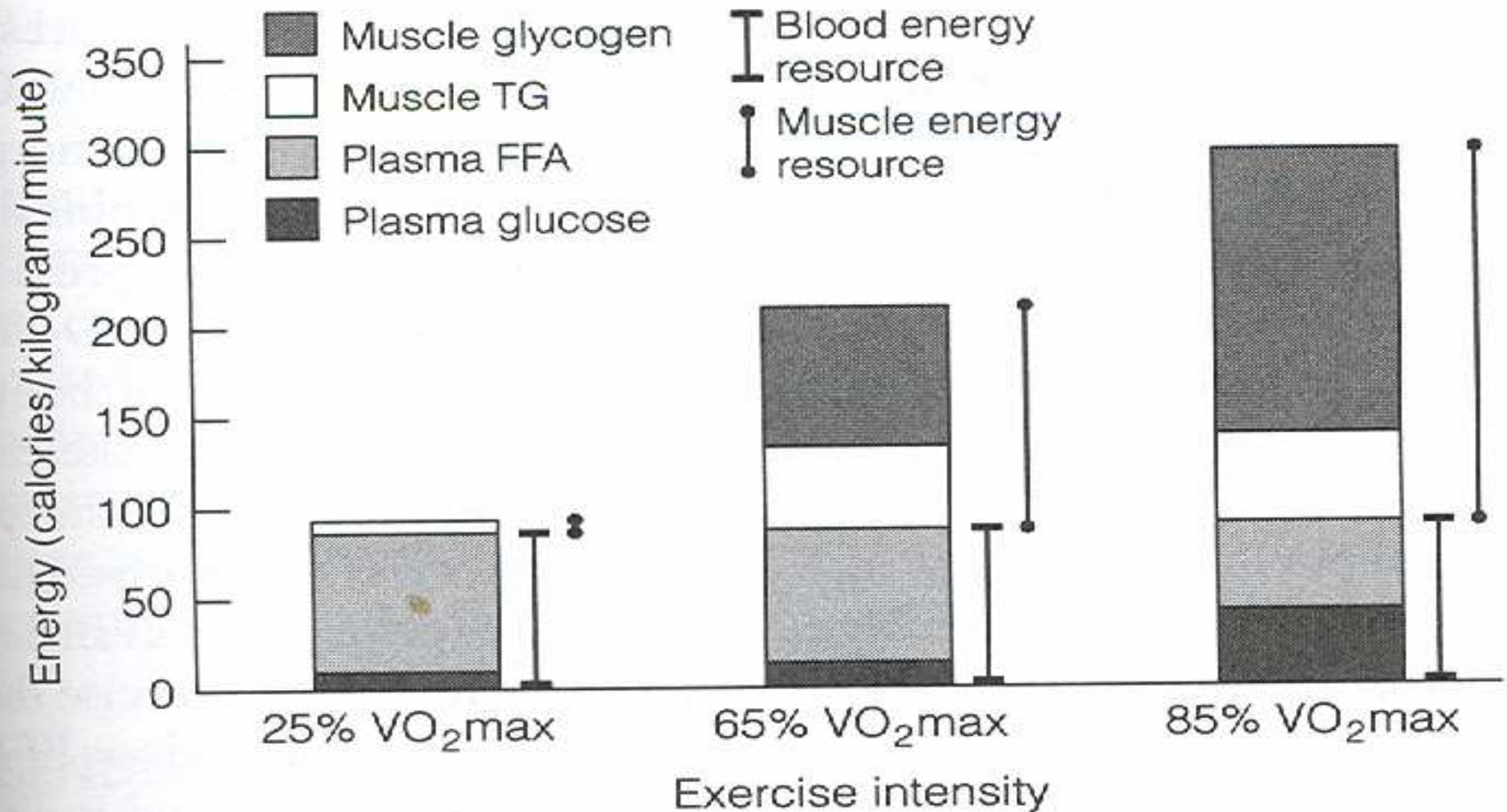
- walking, jogging, cycling .....

# Endurance training

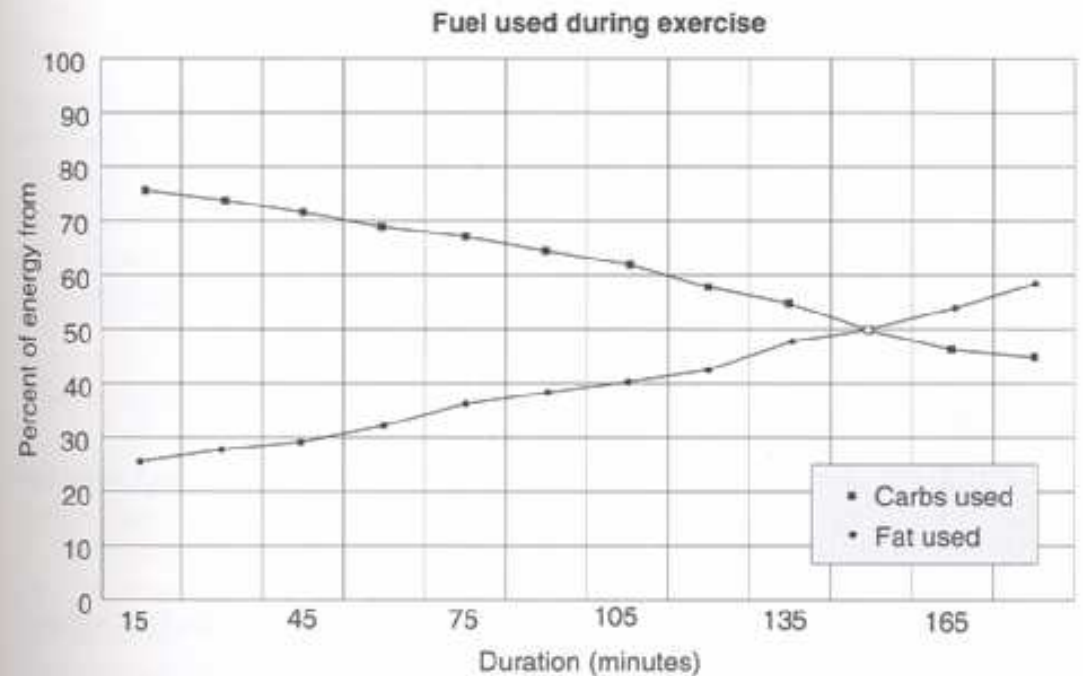
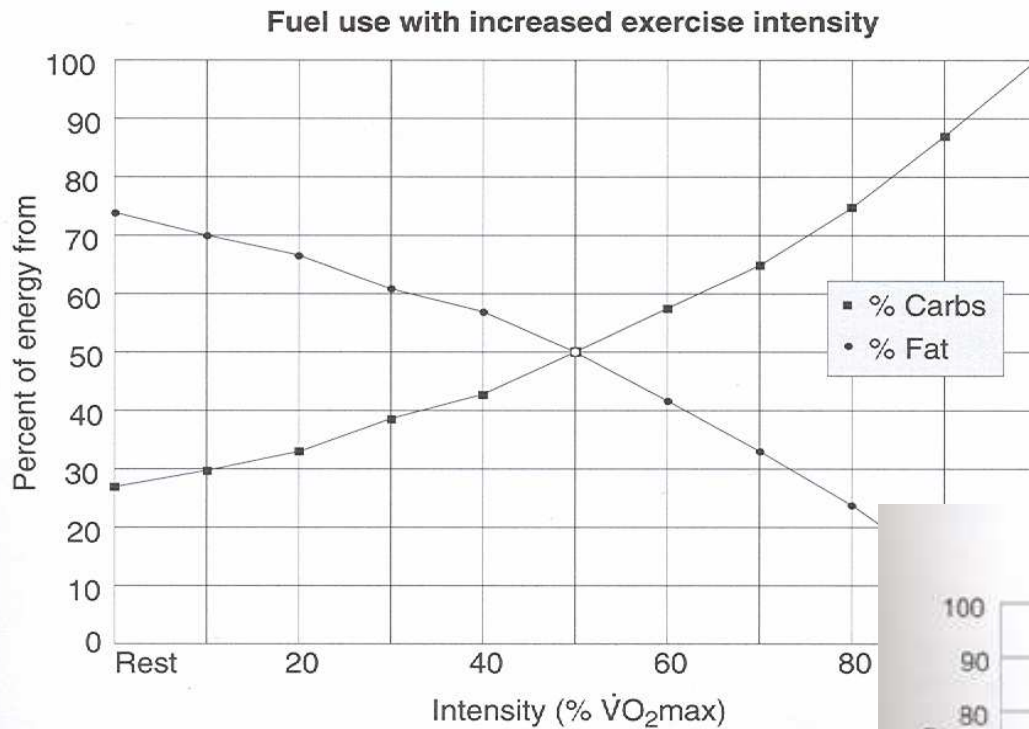
- **Aerobic activity**
  - Lower intensity, adequate oxygen availability, adequate oxidation of fuel sources
  - Increase of intensity => increase consumption of  $\text{O}_2$ , anaerobic energy production, increase production of lactic acid
- **Anaerobic threshold**
  - The accumulation of lactate in the blood
  - Anaerobic exercise
  - Source of fuel - carbohydrates
  - Level of lactate - limiting factor to performance



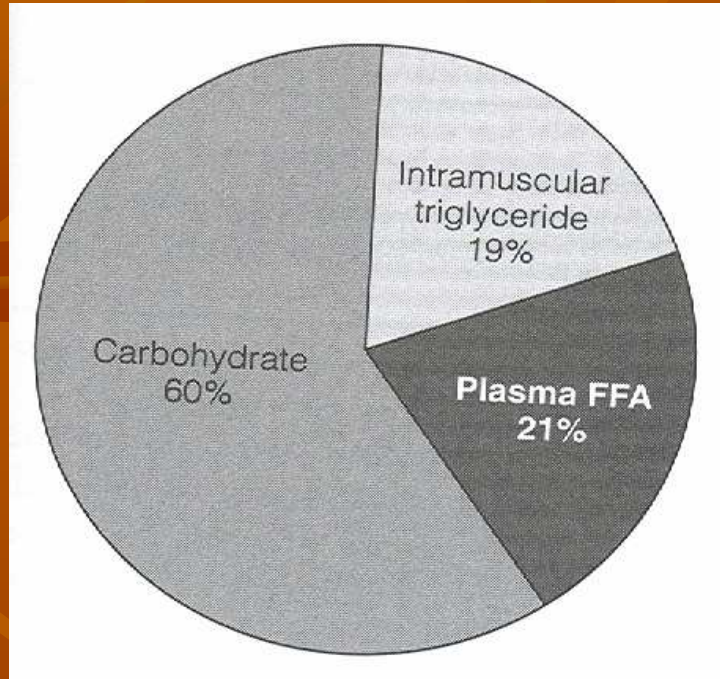
# Energy system and endurance training



# Duration of endurance training and energy metabolism

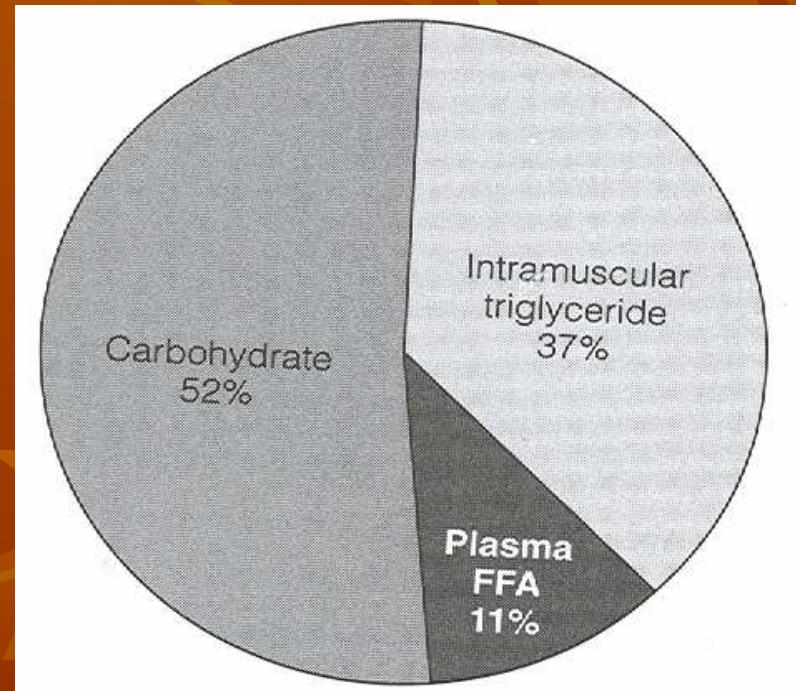


# Adaptation from endurance training



→ Before training

After training →



# How much carbohydrate to eat

Situation	Recommended Carbohydrate Intake
Daily refuelling needs for training programs less than 60-90 min per day or low intensity exercise	Daily intake of 5-7 g per kg BM
Daily refuelling for training programs greater than 90-120 min per day	Daily intake of 7-10 g per kg BM
Daily refuelling for athletes undertaking extreme exercise program - 6-8 hours per day (cycling tour)	Daily intake of 10-12+ g per kg BM
Carbohydrate loading for endurance and ultra-endurance events	Daily intake of 7-10 g per kg BM
Pre-event meal	Meal eaten 1-4 hours pre-competition 1-4 g per kg BM
Carbohydrate intake during training sessions and competition events greater than 1 hour	1 g per min or 60 g per hour
Rapid recovery after training session or multi-day competition, especially when there is less than 8 h until next session	Intake of 1 g per kg BM in the first 30 min after exercise, repeated every 1-2 hours until regular meal patterns are resumed

# What should I eat ?

The following foods are suitable to eat **3-4 hours** before exercise:

- crumpets with jam or honey + flavoured milk
- baked potato + cottage cheese filling + glass of milk
- baked beans on toast
- breakfast cereal with milk
- bread roll with cheese/meat filling + banana
- fruit salad with fruit-flavoured yoghurt
- pasta or rice with a sauce based on low-fat ingredients (e.g. tomato, vegetables, lean meat)



# What should I eat ?

The following snacks are suitable to eat **1-2 hours** before exercise:

- liquid meal supplement
- milk shake or fruit smoothie
- sports bars (check labels for carbohydrate and protein content)
- breakfast cereal with milk
- cereal bars
- fruit-flavoured yoghurt
- fruit

# What should I eat ?

The following foods are suitable to eat if there is less than 1 hour before exercise\*:

- sports drink
- carbohydrate gel
- cordial
- sports bars
- jelly lollies

# Food portions providing 50 g of carbohydrate

## CEREAL

Wheat biscuit cereal (e.g. Weet Bix)	60g (5 biscuits)
'Light' breakfast cereal (e.g. Cornflakes)	60 g (2 cups)
'Muesli' flake breakfast cereal	65 g (1-1.5 cups)
Toasted muesli	90 g (1 cup)
Porridge - made with milk	350 g (1.3 cups)
Porridge - made with water	550 g (2.5 cups)
Rolled oats	90 g (1 cup)
Bread	110 g (4 slices white or 3 thick wholegrain)
Bread rolls	110 g (1 large or 2 medium)
Pita and lebanese bread	100 g (2 pita)
Chapati	150 g (2.5)
English muffin	120 g (2 full muffins)
Crumpet	2.5
Muesli bar	2.5
Rice cakes	6 thick or 10 thin
Crispbreads and dry biscuits	6 large or 15 small
Fruit filled biscuits	5
Plain sweet biscuits	8-10
Cream filled/chocolate biscuits	6
Cakestyle muffin	115 g (1 large or 2 medium)
Pancakes	150 g (2 medium)
Scones	125 g (3 medium)
Iced fruit bun	105 g (1.5)
Croissant	149 g (1.5 large or 2 medium)
Rice, boiled	180g (1 cup)
Pasta or noodles, boiled	200 g (1.3 cups)
Canned spaghetti	440 g (large can)

## FRUIT

Fruit crumble	1 cup
Fruit packed in heavy syrup	280 g (1.3 cups)
Fruit stewed/canned in light syrup	520 g (2 cups)
Fresh fruit salad	500 g (2.5 cups)
Bananas	2 medium-large
Large fruit (mango, pear, grapefruit etc.)	2-3
Medium fruit (orange, apple etc.)	3-4
Small fruit (nectarine, apricot etc.)	12
Grapes	350 g (2 cups)
Melon	1,000 g (6 cups)
Strawberries	1,800 g (12 cups)
Sultanas and raisins	70 g (4 Tbsp)
Dried apricots	115 g (22 halves)

# Food portions providing 50 g of carbohydrate

## VEGETABLES

Potatoes	350 g (1 very large or 3 medium)
Sweet potato	350 g (2.5 cups)
Corn	300 g (1.2 cups creamed corn or 2 cobs)
Green Beans	1,800 g (14 cups)
Baked beans	440 g (1 large can)
Lentils	400 g (2 cups)
Soy beans and kidney beans	400 g (2 cups)
Tomato puree	1 litre (4 cups)
Pumpkin and peas	700 g (5 cups)

## DAIRY PRODUCTS

Milk	1 litre
Flavoured milk	560 ml
Custard	300 g (1.3 cup or half 600 g carton)
'Diet' yoghurt and natural yoghurt	800 g (4 individual tubs)
Flavoured non-fat yoghurt	350 g (2 individual tubs)
Icecream	250 g (10 Tbsp)
Fromage frais	400 g (2 tubs)
Rice pudding/creamed rice	300 g (1.5 cups)

## SUGARS and CONFECTIONERY

Sugar	50 g
Jam	3 Tbsp
Syrups	4 Tbsp
Honey	3 Tbsp
Chocolate	80 g
Mars Bar and other 50-60 g bars	1.5 bars
Jubes and jelly babies	60 g

## MIXED DISHES

Pizza	200 g (medium -1/4 thick or 1/3 thin)
Hamburgers	1.3 Big Macs
Lasagne	400 g serve
Fried rice	200 g (1.3 cups)

## DRINKS

Fruit juice - unsweetened	600 ml
Fruit juice - sweetened	500 ml
Cordial	800 ml
Soft drinks and flavored mineral water	500 ml
Fruit smoothie	250-300 ml

## SPORTS FOODS

Sports drink	700 ml
Carbohydrate loader supplement	250 ml
Liquid meal supplement	250-300 ml
Sports bar	1-1.5 bars
Sports gels	2 sachets
Glucose polymer powder	60 g

# Strength and resistance training

- Exercise providing a constant external resistance
- Energy system aspects of strength training
  - Energy from anaerobic system
    - ATP and CP - a first couple of seconds
    - Anaerobic glycolysis - predominant ATP regenerating system

# Strength and resistance training



## ■ Frequency

- 1 - 7 days per week
- Typical 2 - 4 days per week - each muscle group at least twice a week
- Is determined by the intensity and duration
- Higher intensity = longer regeneration (2 - 3 days)
- Usually 1 - 2 days of rest

## ■ Intensity

- Is based on the number of repetitions maximum (RM)
- RM - maximum number of repetitions that can be performed for a given weight
- Lower number of reps (1-5 RM) - muscular strength
- Higher number of reps (15-20 RM) - muscular endurance
- 8 - 12 RM - muscular hypertrophy

# Strength and resistance training

## ■ Time

- For a single training session is determined by the type of exercise, number of sets and repetitions, length of rest intervals

## ■ Periodization

Factor	Hypertrophy	Strength	Power	Peaking
No. of weeks	6 - 10	4 - 8	3 - 6	1 - 6
Sets	3 - 6	3 - 6	3 - 5	1 - 3
Reps	8 - 15	2 - 6	2 - 3	1 - 3
Intensity	Low to moderate	High	High	Very high

# How to grow muscle ?

- 1. Start with a good training program
- 2. Set realistic goals
- 3. Support your training with a high-energy diet that provide adequate protein
  - At least 2000 - 4000 kcal/day
  - 1,2 - 2 g protein/kg/day
- 4. Get organised - organise a consumption a high-energy intake
- 5. Eat and drink frequently



# How to grow muscle ?

- 6. Time meals and snacks appropriately
  - A small serve of protein with all meals
  - Eat a carbohydrate rich, moderate-protein snacks or meal immediately after training
  - 1g carbohydrate/kg + 10 - 20 g protein within 30 minutes of finishing training

# Suitable snacks

## 60kg Athlete

200g fruit yoghurt + cereal bar

200g fruit yoghurt + 250ml juice

200g fruit yoghurt + banana

50g PowerBar Protein Plus Powder in 250ml water + cereal bar

30g PowerBar Protein Plus Powder in 250ml milk + cereal bar

200ml flavoured milk + cereal bar

200ml flavoured milk + 200g fruit yoghurt

200ml flavoured milk + banana

## 80kg Athlete

200g fruit yoghurt + 2 cereal bars

200g fruit yoghurt + cereal bar + 400ml sports drink

200g fruit yoghurt + cereal bar + 250ml juice

200g fruit yoghurt + cereal bar + banana

75g PowerBar Protein Plus Powder in 250ml water + cereal bar

60g PowerBar Protein Plus Powder in 250ml milk + cereal bar

200ml flavoured milk + 2 cereal bars

200ml flavoured milk + cereal bar + 200g fruit yoghurt

200ml flavoured milk + cereal bar + banana

# How to grow muscle ?

- 7. Be patient and consistent
  - Increases in body mass of 2 - 4 kg/month
- 8. Seek qualified advice before taking a supplements
- 9. Monitor your progress and adjust when necessary

# The meal plan for a 70 kg athlete with strength training

	Quantity of food required to provide high carbohydrate and high protein needs for a 70 kg athlete	Amount of carbohydrate (g)	Amount of protein (g)
Breakfast	2 cups cereal	39	6
	300 ml milk	16	12
	2 slices toast	30	8
	2 tablespoons jam	36	0
	1 cup juice	19	2
Lunch	2 bread rolls each with 50 g chicken + salad	78	41
	1 banana	20	2
	1 fruit bun	34	6
	250 ml flavoured low fat milk	17	13
Dinner	Stir-fry with 2 cups pasta + 100 g meat + 1 cup vegetables	100	50
	1 cup jelly + 1 cup custard	82	13
Snacks	750 ml sports drink	51	0
	1 carton yoghurt	33	10
	1 piece fruit	18	1
	1 cereal bar	24	2
Analysis		594 g 8 g/kg	166 g 2.3 g/kg

# Protein rich food for athletes (10 g P)

Animal Foods	Plant Foods
<p>2 small eggs 30 g (1.5 slices) reduced fat cheese 70 g cottage cheese 1 cup (250 ml) low-fat milk 35 g lean beef, lamb or pork (cooked weight) 40 g lean chicken (cooked weight) 50 g grilled fish 50 g canned tuna or salmon 200 g reduced fat yoghurt 150 g light fromage frais</p>	<p>4 slices (120 g) wholemeal bread 3 cups (90 g) wholegrain cereal 2 cups (330 g) cooked pasta 3 cups (400 g) cooked rice 3/4 cup (150 g) lentils or kidney beans 200 g baked beans 120 g tofu 400 ml soy beverage 60 g nuts or seeds 1 cup (250 ml) soy milk 100 g soy meat</p>

# Protein requirements for different athlete groups

Type of Athlete	grams protein per kilogram body mass per day
Sedentary individual	0.8
Athlete undertaking general training program	1.0
Endurance athlete undertaking moderate to heavy training	1.2-1.6
Endurance athlete undertaking extreme training program or competition	2.0
Strength athlete undertaking heavy training program	1.2-1.7
Adolescent Athletes	2.0