



S P O R T S F O O D S & S U P P L E M E N T S

# DID YOU KNOW



If an athlete **unknowingly/ unintentionally** consumes a prohibited substance, they will still be held **liable** according to the **World Anti-doping Code**.

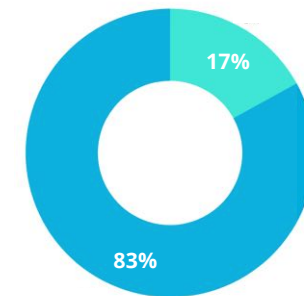
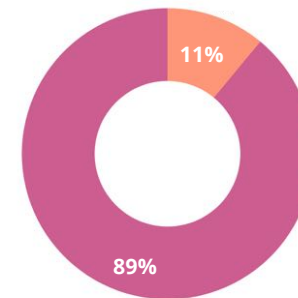
This may lead to a loss of medals won, or records set and may even lead to temporary/ permanent suspension from competition.

(Maughan et al., 2018)



# WHO TAKES SUPPLEMENTS?

- Women:
  - Health/ inadequate diet
- Men:
  - Improve speed, agility, strength/ power
  - Help build body mass & reduce weight or excess body fat
- (e.g.) Track & field athletes:



(Maughan et al, 2007)



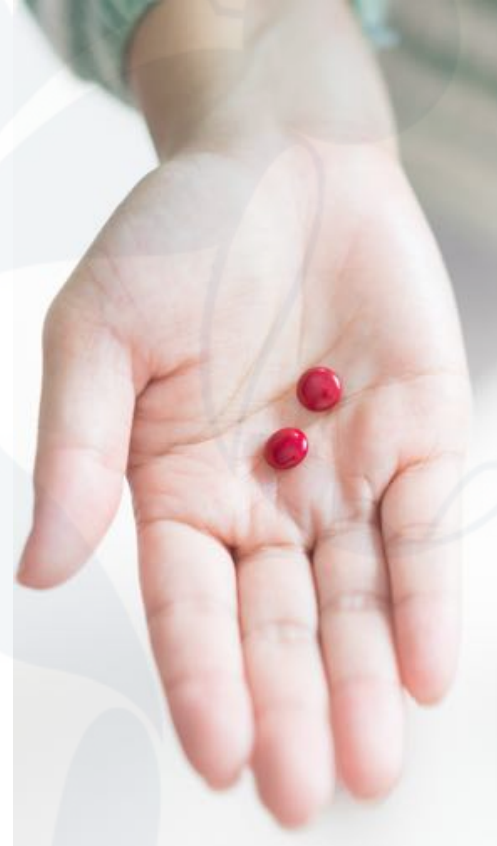
# ERGOGENIC AID



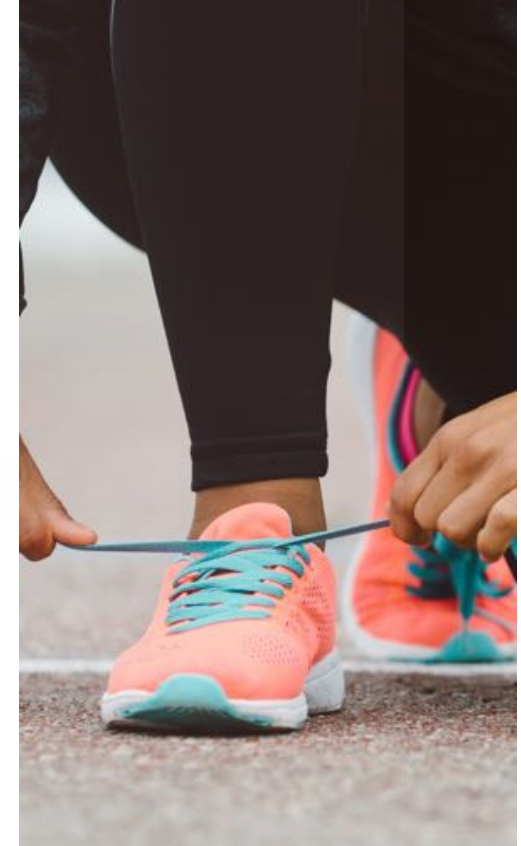
TRAINING  
TECHNIQUE



NUTRITION  
PRACTICE



PHARMACOLOGIC  
METHOD



PHYSIOLOGIC  
TECHNIQUE

(Mahan & Raymond, 2017)



# PREVALENCE OF SUPPLEMENT USE

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- Varies across different sports and activities
- Increases with level of training/performance
- Increases with age
- Is often higher in men than in women
- Is strongly influenced by perceived cultural norms (both sporting and nonsporting)

(Garthe & Maughan, 2018 )



# WHAT IS A SUPPLEMENT?

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- No single definition (either legal or within nutritional science) of what constitutes a dietary supplement
- A **food, food component, nutrient, or non-food compound** that is purposefully ingested **in addition to** the habitually-consumed diet with the aim of achieving a specific health and/or performance benefit



(Maughan et al., 2018)

# HEIRARCHY OF SCIENTIFIC EVIDENCE

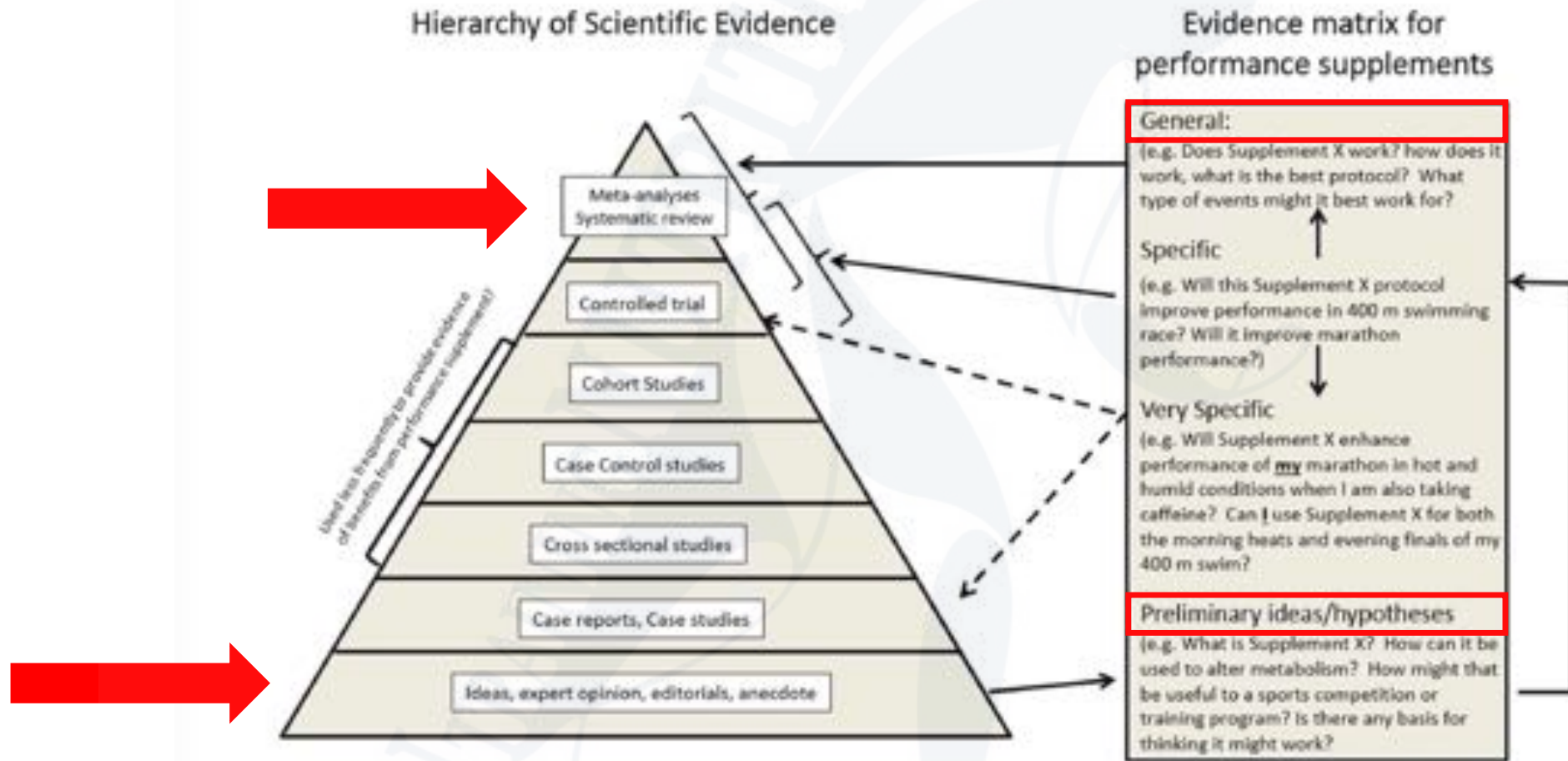


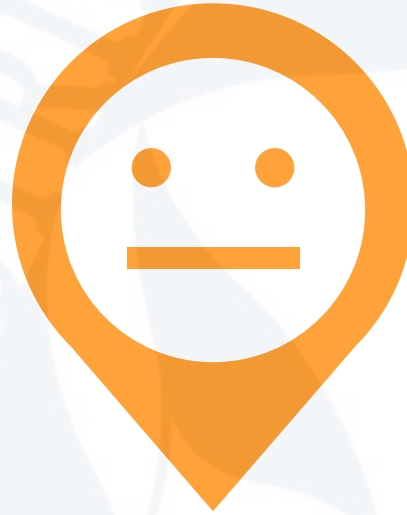
Figure 1 — Hierarchy of evidence used to establish good practice. Adapted from Burke and Peeling (2018).

(Maughan et al., 2018)

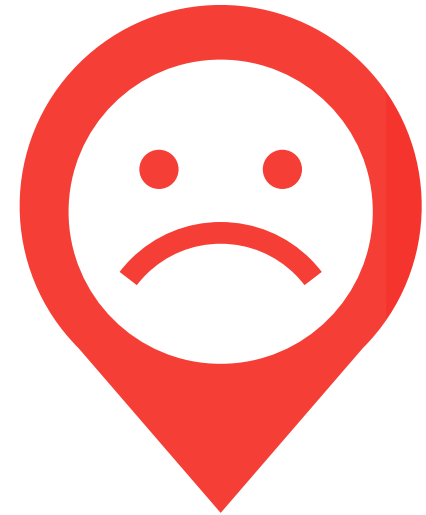
# Is ANECDOTAL EVIDENCE a better form of evidence than a SYSTEMATIC REVIEW?



**YES**



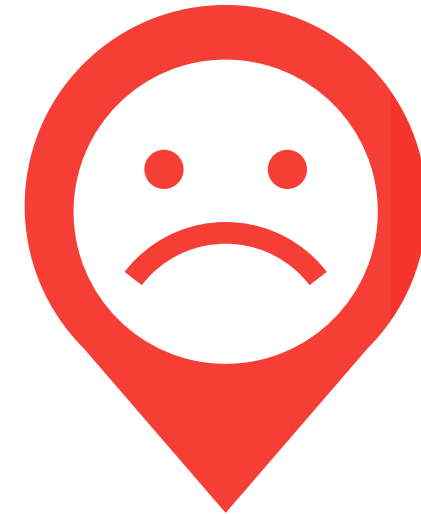
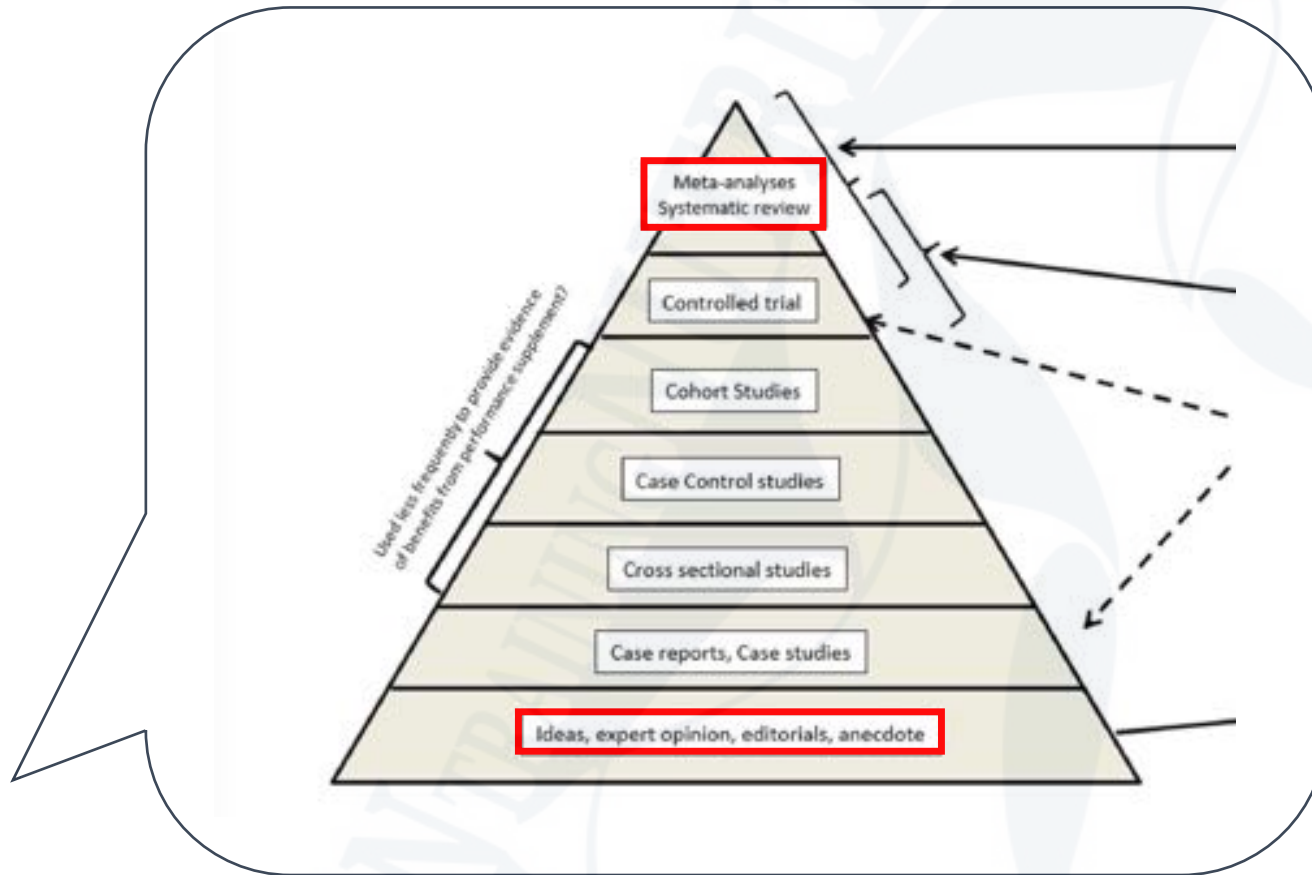
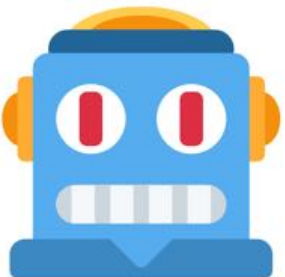
**UNSURE**



**NO**



# Is ANECDOTAL EVIDENCE a better form of evidence than a SYSTEMATIC REVIEW?



**NO**



# FORMS

## OF SUPPLEMENTS

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- Functional foods
- Formulated foods & sports foods
- Single nutrients & other components of foods or herbal products provided in isolated or concentrated forms
- Multi-ingredient products containing various combinations of those products described above that target similar outcomes

(Maughan et al., 2018)



# WHY SPORTS FOODS?

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- When eating food is impractical
  - Convenient (albeit expensive)
- Issues about preparation/ storage
- Ease of consuming the food
  - Training schedules, gut comfort
- Challenge of meeting nutrient targets within available energy budget

(Maughan et al, 2007)



# COMMON

## SPORTS FOODS & SUPPLEMENTS

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- Sports drinks (CHO & electrolytes)
  - Fluid & CHO during exercise
  - Post-exercise rehydration & refuelling
- Energy drink (CHO  $\pm$  caffeine, taurine, B vit...)
  - Pre-exercise caffeine
  - Caffeine & CHO during exercise
- Sports gel/ confectionary
  - CHO intake during exercise



(Maughan et al., 2018)



# COMMON

## SPORTS FOODS & SUPPLEMENTS

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- Electrolyte replacement supplements
  - Sodium & potassium (low CHO)
  - Rapid rehydration
- Protein supplement
  - Usually HBV protein
  - Post-exercise recovery
- Liquid meal supplement
  - Usually mixed macro nutrients (with added MN)



(Maughan et al., 2018)

# COMMON

## SPORTS FOODS & SUPPLEMENTS

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- Sports bar
  - CHO, protein & MN
  - Post-exercise nutrition
  - Portable nutrition
- Protein enhanced food
  - Value added food to achieve protein targets



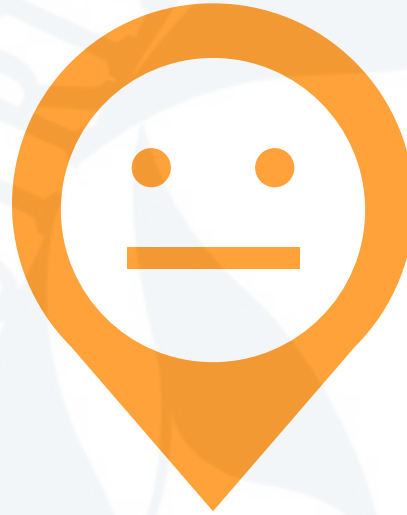
(Maughan et al., 2018)



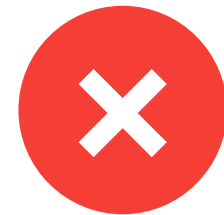
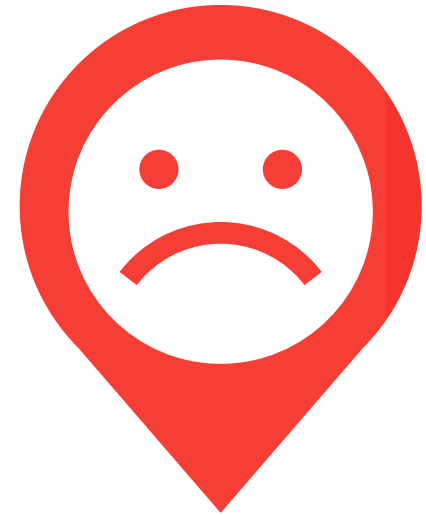
# Sports foods can be ergogenic aids (depending on their ingredients)



**YES**



**UNSURE**



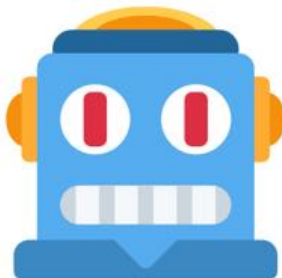
**NO**

# Sports foods can be ergogenic aids (depending on their ingredients)



**YES**

'An ergogenic aid is any training technique, mechanical device, **nutrition practice**, pharmacologic method, or physiologic technique that can **improve exercise performance capacity** and training adaptations.'





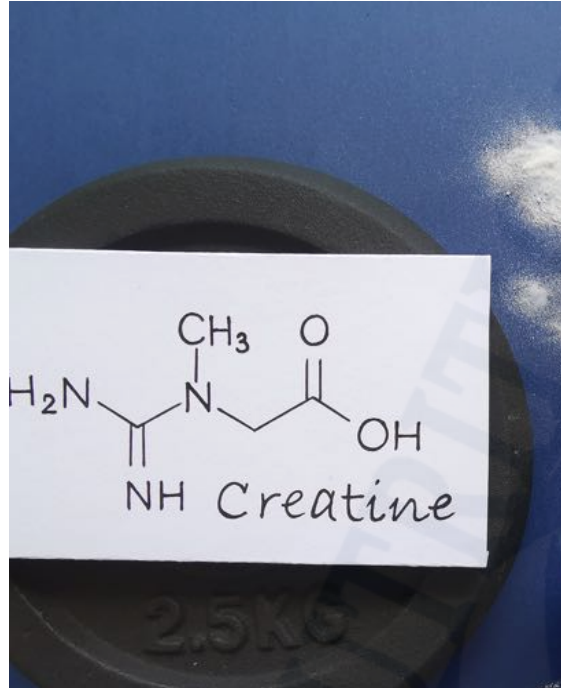
# WHY SUPPLEMENTS?

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- For financial gain (sponsorship) or because products are provided free of charge
- As a “just in case” insurance policy
- Because they know or believe that other athletes/competitors are using the supplement(s)

(Garthe & Maughan, 2018 )





# SUPPLEMENTS

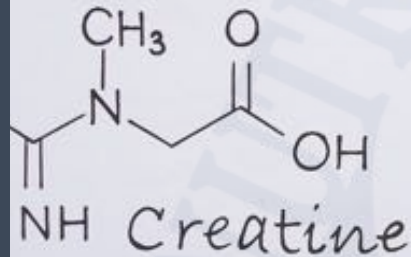
## THAT IMPROVE PERFORMANCE

- Creatine
- Caffeine
- Nitrate
- Beta alanine
- Sodium bicarbonate

(Maughan et al., 2018)

Supplements that  
directly improve  
performance

# CREATINE



- Creatine loading:
  - ~20g/d (5g, 4 x daily) for 5-7 d
- Improved performance
  - Repeated high intensity exercise
- Greater gains in lean muscle
- Increase in muscular strength & power
- Maintenance:
  - 3-5g/d
- NOTE: Consumption with mixed protein/ CHO
- Long term safety likely

(Rawson & Persky, 2007; Volek & Rawson, 2004, Buford et al., 2007, Lanhers et al., 2017, Hultman et al., 1996, Schilling et al., 2001, Deminice et al., 2013; Powers et al., 2003)

Supplements that  
directly improve  
performance

# CAFFEINE

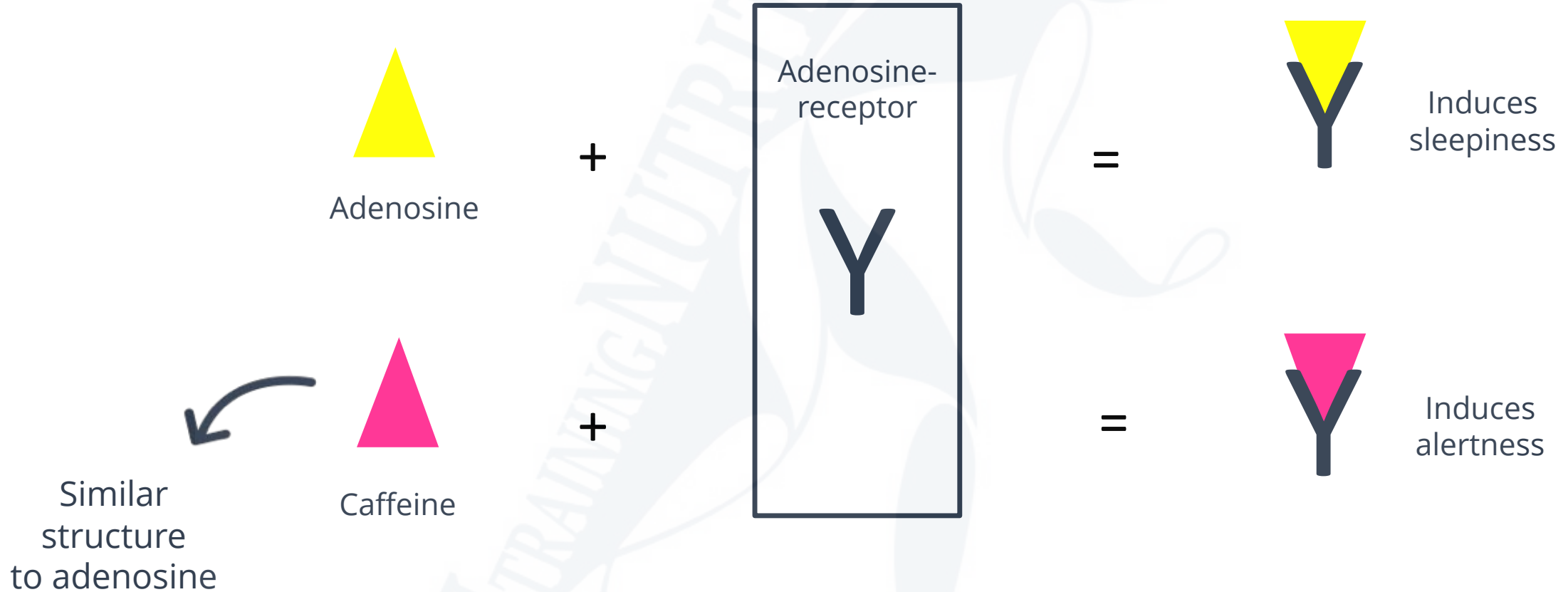


- Stimulant
- Improved performance:
  - Endurance, supramaximal & repeated sprints
- Adenosine receptor antagonism

(Maughan et al., 2018)



# CAFFEINE HOW DOES IT WORK?



(Image: airlevate.org, 2016 ; Ker et al, 2010; Glade, 2010; Nawrot, 2003)

Supplements that  
directly improve  
performance

# CAFFEINE



- Stimulant
- Improved performance:
  - Endurance, supramaximal & repeated sprints
- Adenosine receptor antagonism
- Increased endorphin release
- Improved neuromuscular function
- Improved vigilance & alertness
- Reduced perception of exertion during exercise
- 3-6mg/kg consumed 60 min before exercise
- >9mg/kg = increased risk

(Maughan et al., 2018; Burke, 2008; Spriet, 2014; Talanian & Spriet, 2016)

Supplements that  
directly improve  
performance

# NITRATE



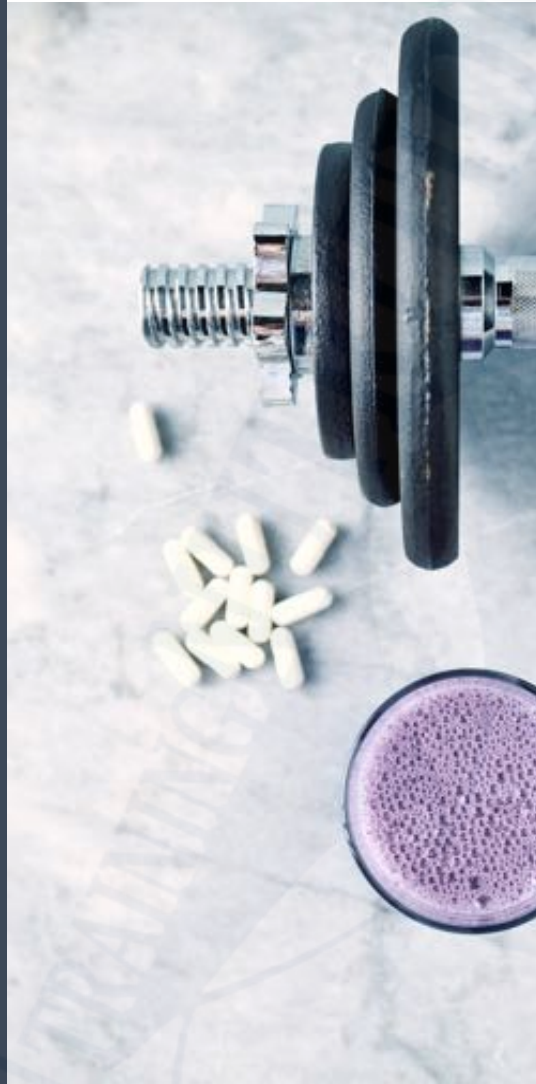
- Prolonged submaximal exercise & high intensity, intermittent, short duration efforts
- Improvements in exercise time to exhaustion
- High nitrate foods leafy green & root vegetables
  - Spinach, rocket, celery & beetroot
- Benefits are seen 2-3 hours after intake of 310 -560mg

(Maughan et al., 2018; Bailey et al., 2009; Thompson et al., 2015; Wylie et al., 2016; Hoon et al., 2014; Thompson et al., 2015, 2016; Jones, 2014b)



Supplements that  
directly improve  
performance

# BETA ALANINE



- Increases buffering capacity in the cell
  - Carnosine
- Potentially beneficial for sustained high intensity exercise performance
  - Continuous & intermittent exercise
  - 30s – 10 minutes
- ~65mg/kg split into 0.8-1.6g every 3-4 hours for 10-12 weeks
- Side effects: Skin rashes & transient skin sensations (l.e. tingling etc.)

(Lancha Junior et al., 2015; Saunders et al., 2016; Baguet et al., 2010; Chung et al., 2012; Nassis et al., 2016; Bellinger, 2014; Hobson et al., 2012)

Supplements that  
directly improve  
performance

# SODIUM BICARBONATE



- Increases buffering capacity outside the cell
- Enhanced performance for short term, high intensity sprints
  - ~60 s (reduced efficacy if >10 min)
- Single dose 0.2-0.4g/kg
- Consumed 60-150minutes before exercise
- Side effects: GI upset
  - Consume with CHO rich meal
  - Use sodium citrate
  - Split dose

(Maughan et al., 2018; Carr et al., 2011b; Siegler et al. 2012; Lambert et al., 1993; Burke, 2013; Douroudos et al., 2006; Mc Naughton & Thompson, 2001; Requena et al., 2005 )

# PHYSIQUE CHANGES

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## MUSCLE GAINS:

- Protein:
  - Isolated from various sources
- Leucine:
  - Stimulates muscle protein synthesis
  - Supresses muscle breakdown
- ~20g, 3-4 x per day
  - < 2g/ kg/d



(Maughan et al., 2018, Hector & Phillips, 2018)





# CHOCOLATE MILK

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- Post-exercise CHO
- Combo of CHO & protein
- Improve:
  - Subsequent exercise performance
  - Muscle glycogen synthesis
  - Greater intracellular signaling stimulus
- Affordable

(Mahan and Raymond, 2017; Lunn et al, 2012)

# CONCLUSION

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- Small role (not magic bullet)
- Various forms
- Meet nutrition goals, train hard, stay healthy & injury free
- Can directly enhance competition performance
- NB to identify which are appropriate



(Maughan et al., 2018)

# EXAMPLE

EXERCISER- 65kg

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25 - 35kCal/ kg = 1625 - 2275kCal/d

3-5g/kg CHO = 195 - 325g/d

Protein: 10- 35% (aim for <2g/kg/d)

Fat: 20 - 35% (depending on what is left)







1g CHO/ Protein = 4kCal; 1g Fat = 9kCal

# EXAMPLE

**EXERCISER- 65kg**

---

$$35\text{kCal} \times 65 = 2275\text{kCal}$$

**CHO:**  $4\text{g} \times 65$

$$= 260\text{g} (\times 4 = 1040\text{kCal} = 45.7\%)$$

**Protein:** 20%

$$= 20\% \text{ of } 2275\text{kCal} = 455\text{kCal} / 4$$

$$= 113.75\text{g} (1.75\text{g}/\text{kg})$$

$$100 - (45.7 + 20) = 34.3\% \text{ **fat**}$$

$$= (34.3 \times 2275) / 100$$

$$= 780.3\text{kCal} / 9 = 86.7\text{g fat (or } 1.3\text{g}/\text{kg)}$$



1g CHO/ Protein = 4kCal; 1g Fat = 9kCal

# EXAMPLE

EXERCISER- 65kg

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$$35\text{kCal} \times 65 = \mathbf{2275\text{kCal}}$$

$$\mathbf{CHO:} 4\text{g} \times 65$$

$$= \mathbf{260\text{g}} \text{ (} \times 4 = 1040\text{kCal} = 45.7\text{%)}$$

$$\mathbf{Protein:} 20\%$$

$$= 20\% \text{ of } 2275\text{kCal} = 455\text{kCal} / 4$$

$$= \mathbf{113.75\text{g}} \text{ (} 1.75\text{g/kg)}$$

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$$= (34.3 \times 2275) / 100$$

$$= 780.3\text{kCal} / 9 = \mathbf{86.7\text{g}} \text{ fat (or } 1.3\text{g/kg)}$$

# EXCHANGE LISTS

The Diabetic Exchange List

	Carbohydrate (grams)	Protein (grams)	Fat (grams)	Calories
<b>I. Starch/Bread</b>	15	3	trace	80
<b>II. Meat</b>				
Very Lean	-	7	0-1	35
Lean	-	7	3	55
Medium-Fat	-	7	5	75
High-Fat	-	7	8	100
<b>III. Vegetable</b>	5	2	-	25
<b>IV. Fruit</b>	15	-	-	60
<b>V. Milk</b>				
Skim	12	8	0-3	90
Low-fat	12	8	5	120
Whole	12	8	8	150
<b>VI. Fat</b>	-	-	5	45



(www.diabetesed.net)





# PORTION

## SIZES- GENERAL RULES

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### Vegetable:

- ½ cup cooked
- 1 cup raw

### Fruit:

- ½ cup fresh fruit
- ¼ cup dried fruit

### Milk:

- 1 cup (250mL)

### Starch/ bread:

- ½ cup cooked
- 30g/ 1 oz (1 slice) bread

### Meat:

- 30g/ 1 oz beef, pork, chicken
- ¼ cup tuna/ salmon
- 1 egg

### Fat:

- 1 teaspoon

(www.diabetesed.net)



# PRESCRIPTION

## VEGETABLES

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Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit					
Milk (low fat)					
Starch					
Meat (medium fat)					
Fat					





# PRESCRIPTION

## FRUIT

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		260	113.75	86.7	2275
Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit	4	60			240
Milk (low fat)					
Starch					
Meat (medium fat)					
Fat					



# PRESCRIPTION

## MILK

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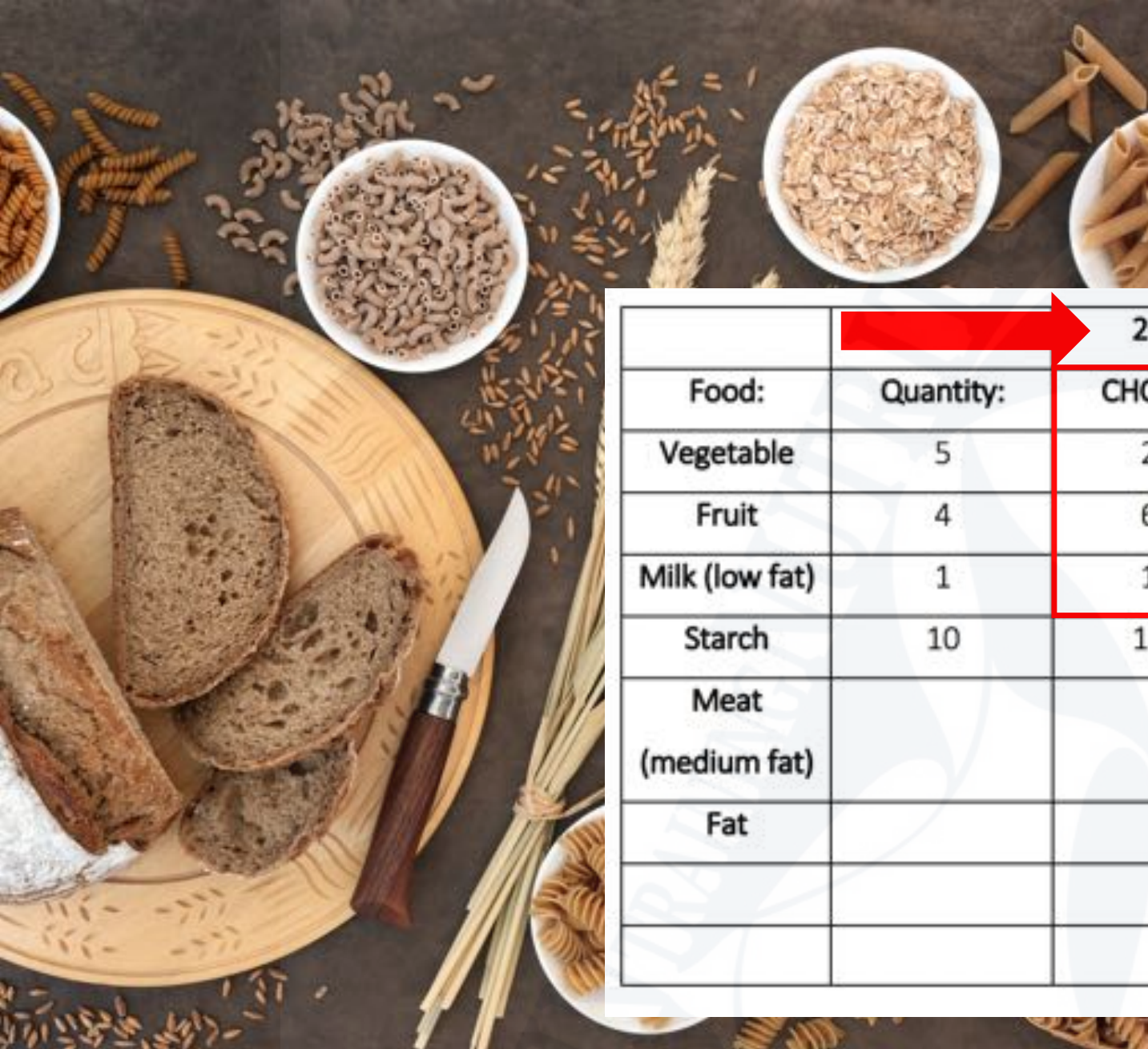


		260	113.75	86.7	2275
Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit	4	60			240
Milk (low fat)	1	12	8	5	120
Starch					
Meat (medium fat)					
Fat					

# PRESCRIPTION

## STARCHES

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		260	113.75	86.7	2275
Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit	4	60			240
Milk (low fat)	1	12	8	5	120
Starch	10	150	30		800
Meat (medium fat)					
Fat					



# PRESCRIPTION

## MEAT & MEAT ALT




		260	113.75	86.7	2275
Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	3	15	6		75
Fruit	2	30			120
Milk (low fat)	1	12	8	5	120
Starch	13	195	39		1040
Meat (medium fat)	9		63	45	675
Fat					



# PRESCRIPTION

## FATS



		260	113.75	86.7	2275
Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit	4	60			240
Milk (low fat)	1	12	8	5	120
Starch	10	150	30		800
Meat (medium fat)	9		63	45	675
Fat	7			35	315

# PRESCRIPTION

FINAL

Food:	Quantity:	CHO (g):	Protein (g):	Fat (g):	Calories:
Vegetable	5	25	10		125
Fruit	4	60			240
Milk (low fat)	1	12	8	5	120
Starch	10	150	30		800
Meat (medium fat)	9		63	45	675
Fat	7			35	315
		<b>247</b>	<b>111</b>	<b>85</b>	<b>2275</b>
		<b>95%</b>	<b>97.6%</b>	<b>98%</b>	<b>100%</b>





# SUMMARY

- Supplements are used by athlete's for a variety of reasons
- There are many different forms of supplements, athletes need to choose an appropriate form to suit their training & lifestyle
- Certain supplements can directly benefit athletic performance & support physique change
- NB for benefits to outweigh risks
- Practical application of recommendations using exchange lists



# SAMPLE MENU

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## Breakfast:

- 1/2 cup milk
- 1 cup cooked oats
- 1 small banana
- 2 tsp peanut butter

## Snack (am):

- 1 x seasonal fruit

## Lunch:

- ¾ cup tuna
- 1.5 cup sweet potato
- 2 cups salad
- ¼ avo

## Pre-exercise:

- 1 x seasonal fruit
- 1 x strong cup of coffee ~caffeine

## Post-exercise:

- Whey protein (20g protein) mixed with ½ cup milk & water (or meal replacement)
- Peanut butter sandwich
  - 2 slices whole-wheat bread +
  - 1 tsp peanut butter

## Dinner:

- 90g chicken breast
- 1 cup cooked barley
- 1 cups mixed roast vegetables
- 1 cup lightly steamed broccoli
- 2 tsp olive oil (to cook with)
- ½ cup tinned peaches (in juice) for dessert