# Sports Nutrition

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CHIROPRACTIC CLINIC

# Reputable Resources

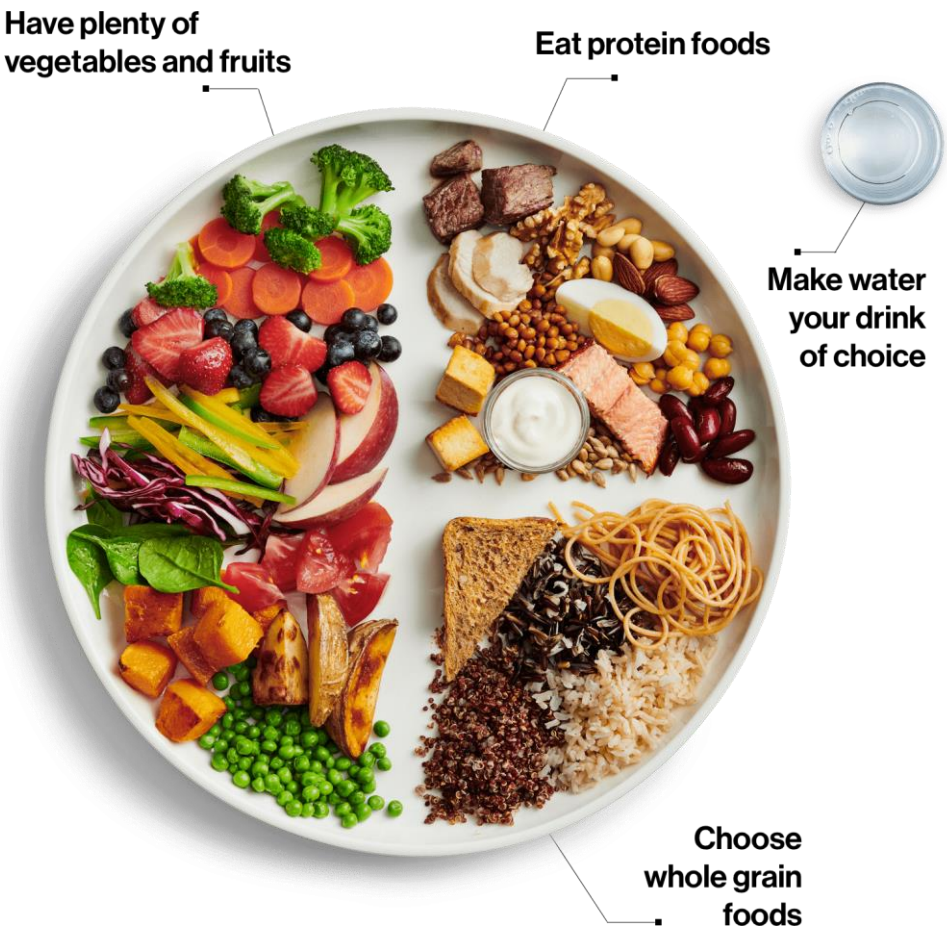
- Journal of the International Society of Sport Nutrition (JISSN)

- Yann Le Meur
  - Senior editor of the British Journal of Sports Medicine
  - YLMSportScience

- Asker Jeukendrup
  - Mysportscience.com

# Questions, Concerns & Interests

# Canada's Food Guide



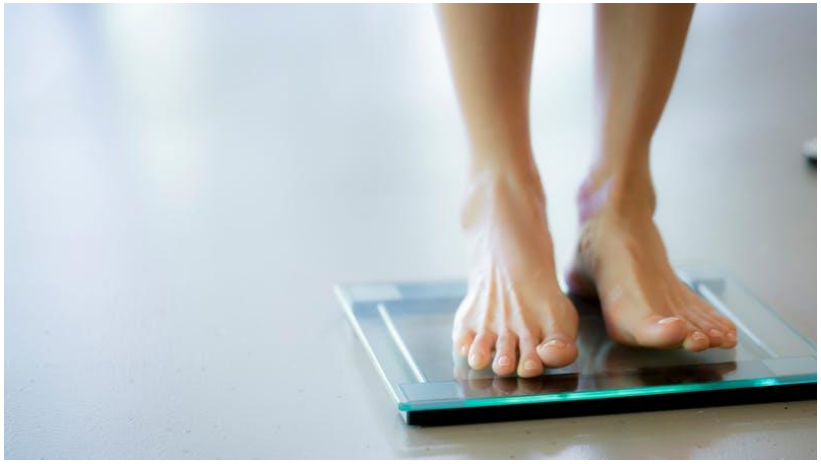

Limit foods high in sodium, sugars or saturated fats

# What is the right diet for you?

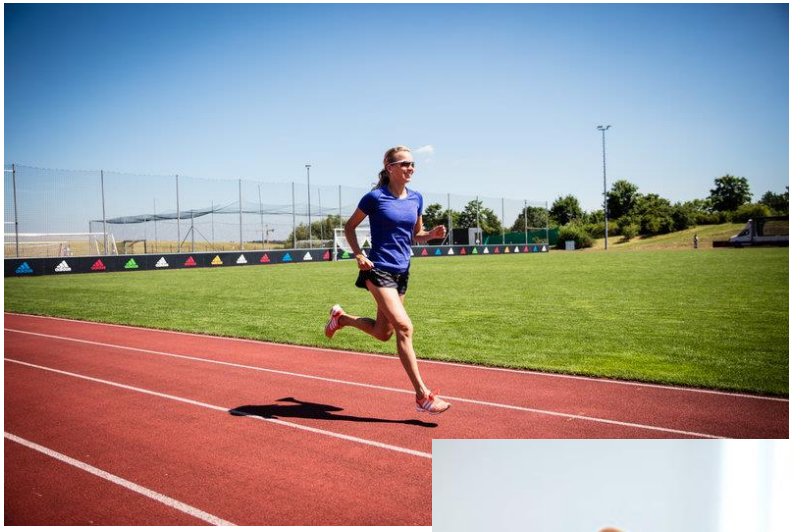
| How Named Diets Work for Weight Loss | | |
|---|---|---|
| **Diet Name** | **Short Description** | **How it Works** |
| **Low Carb** | Eat fewer carbs and more foods rich in protein and fats | |
| **Ketogenic** | Eat almost no carbs, some protein and mostly fats | |
| **Low Fat** | Avoid foods high in fats and eat mostly protein and carbs | |
| **Intermittent Fasting** | Restrict your eating period to only a few hours every day | |
| **Weight Watchers** | Points based system to help with portion control | |
| **Paleo** | Eat only minimally-processed "paleolithic" foods | |

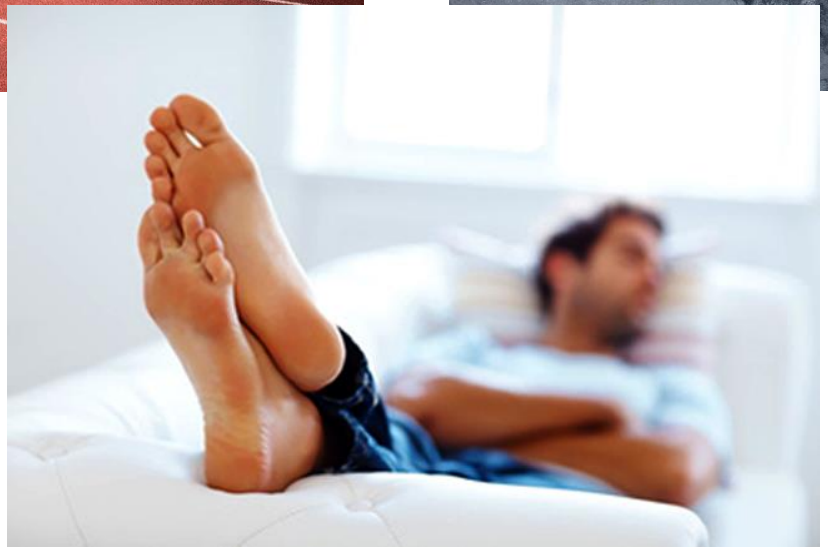
# Caloric Deficit

# There is a difference between eating for  performance & weight loss

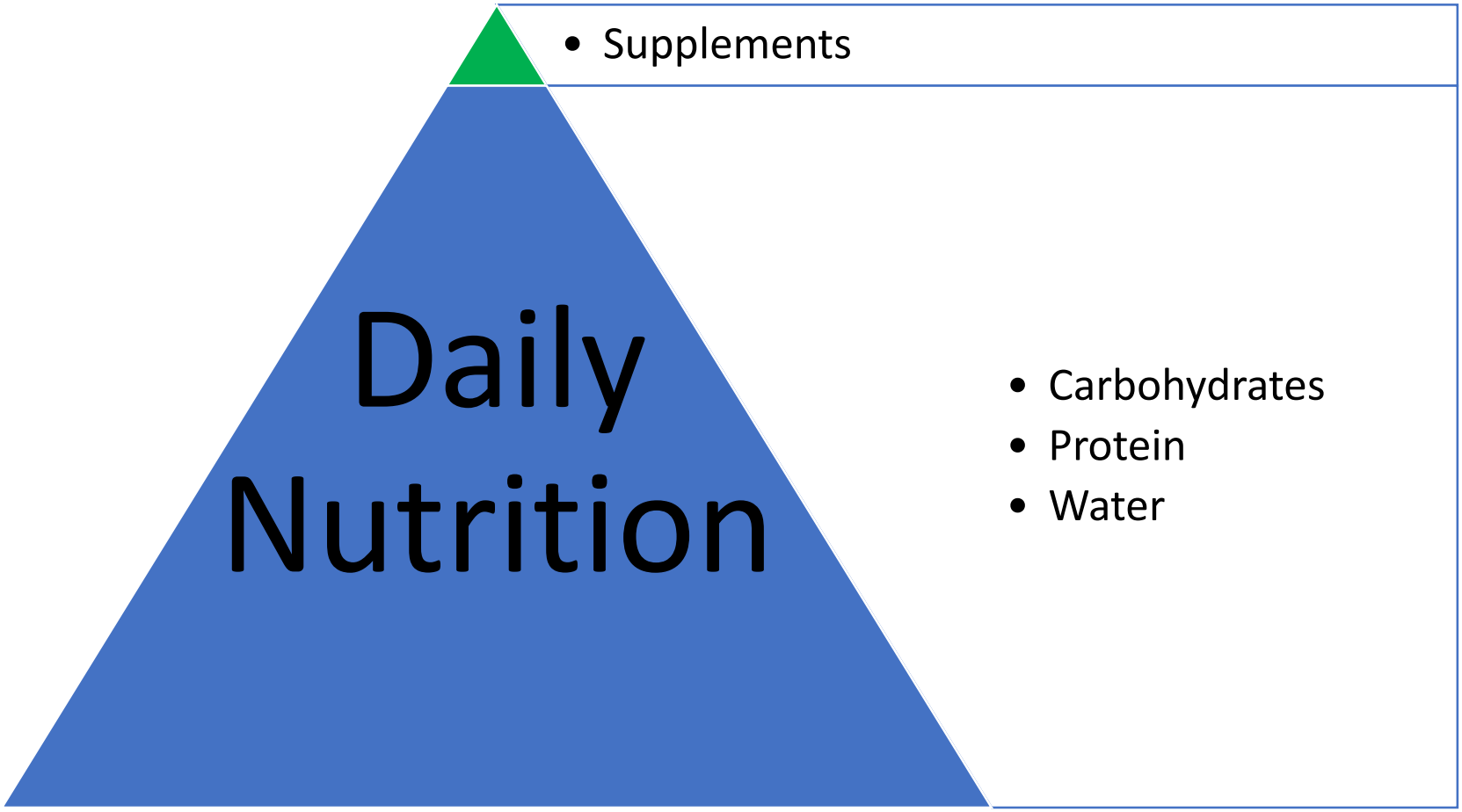



# Creating an Adaptation



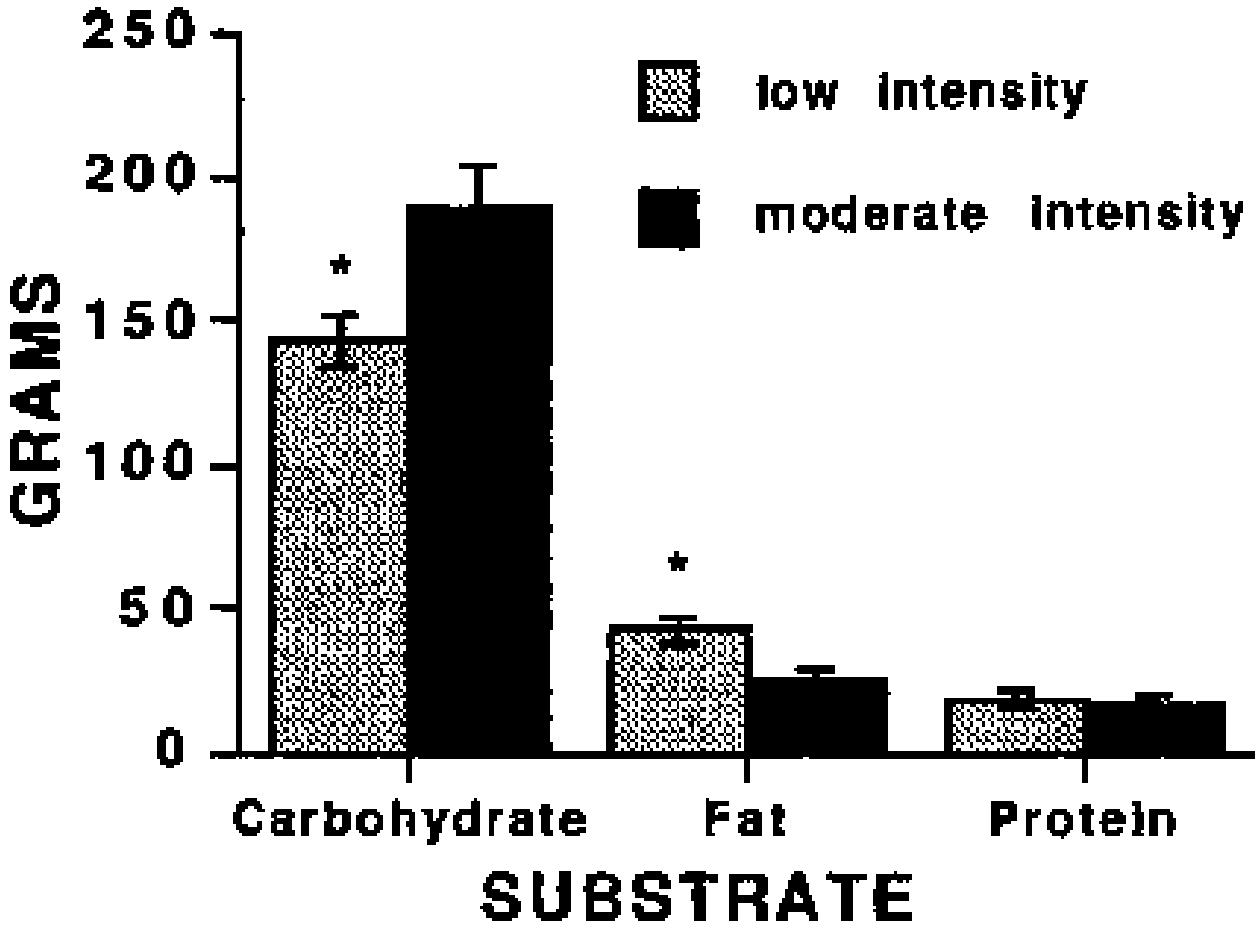


# Sports Nutrition Pyramid



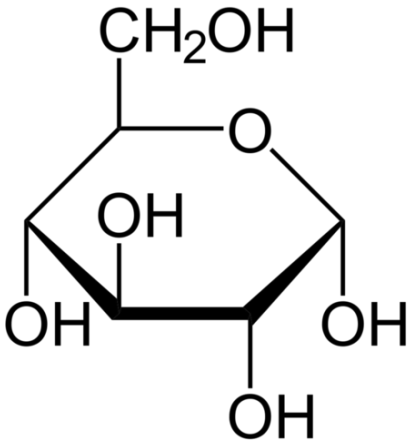
# Carbohydrates

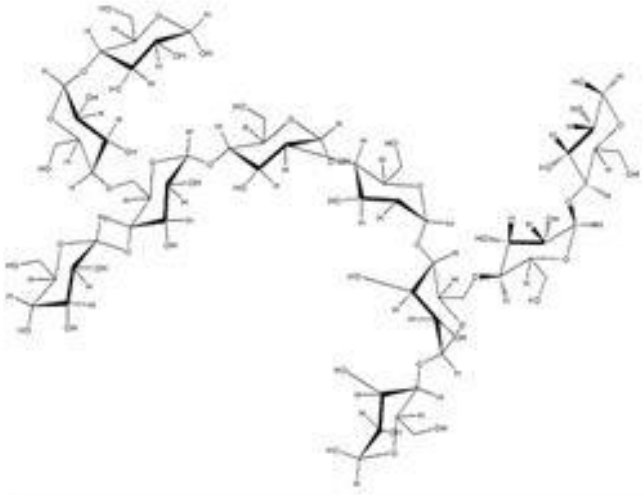
# Substrate Utilization



# Carbohydrates

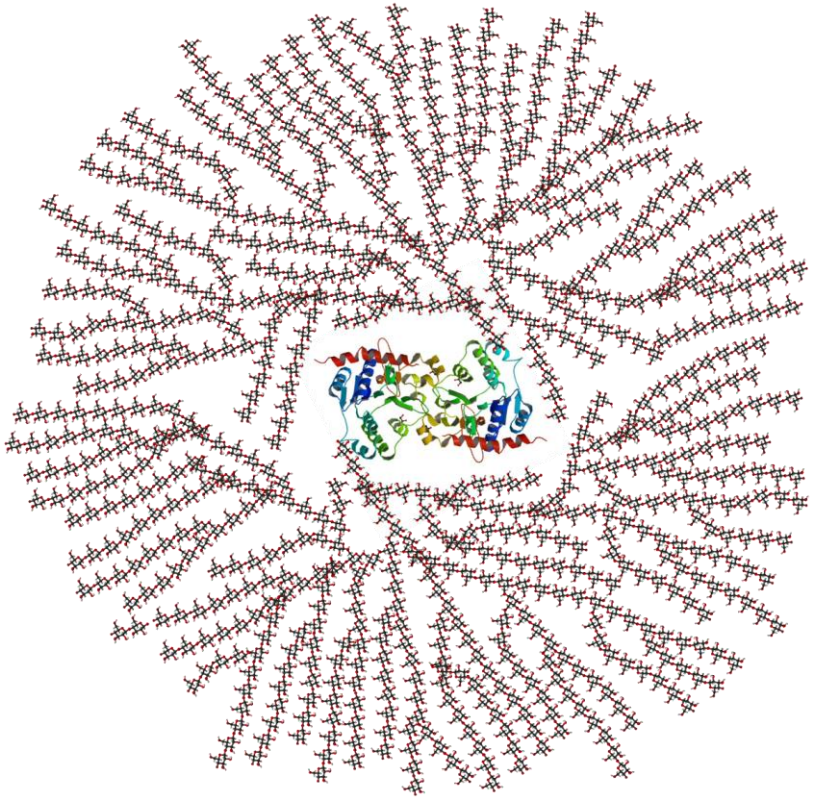
- Monosaccharides
  - Glucose, fructose
- Disaccharides
  - Sucrose, lactose
- Oligosaccharides
  - Maltodextrin
- Polysaccharides
  - Amylopection, glycogen



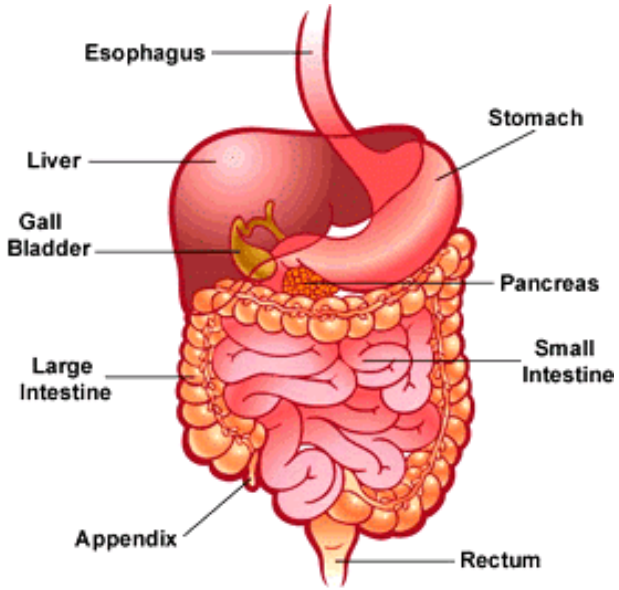
# Glycogen Stores

- Muscle Glycogen
  - 400g
- Liver Glycogen
  - 90-110g
- Blood Glucose
  - 2-3g



# Gastric Emptying

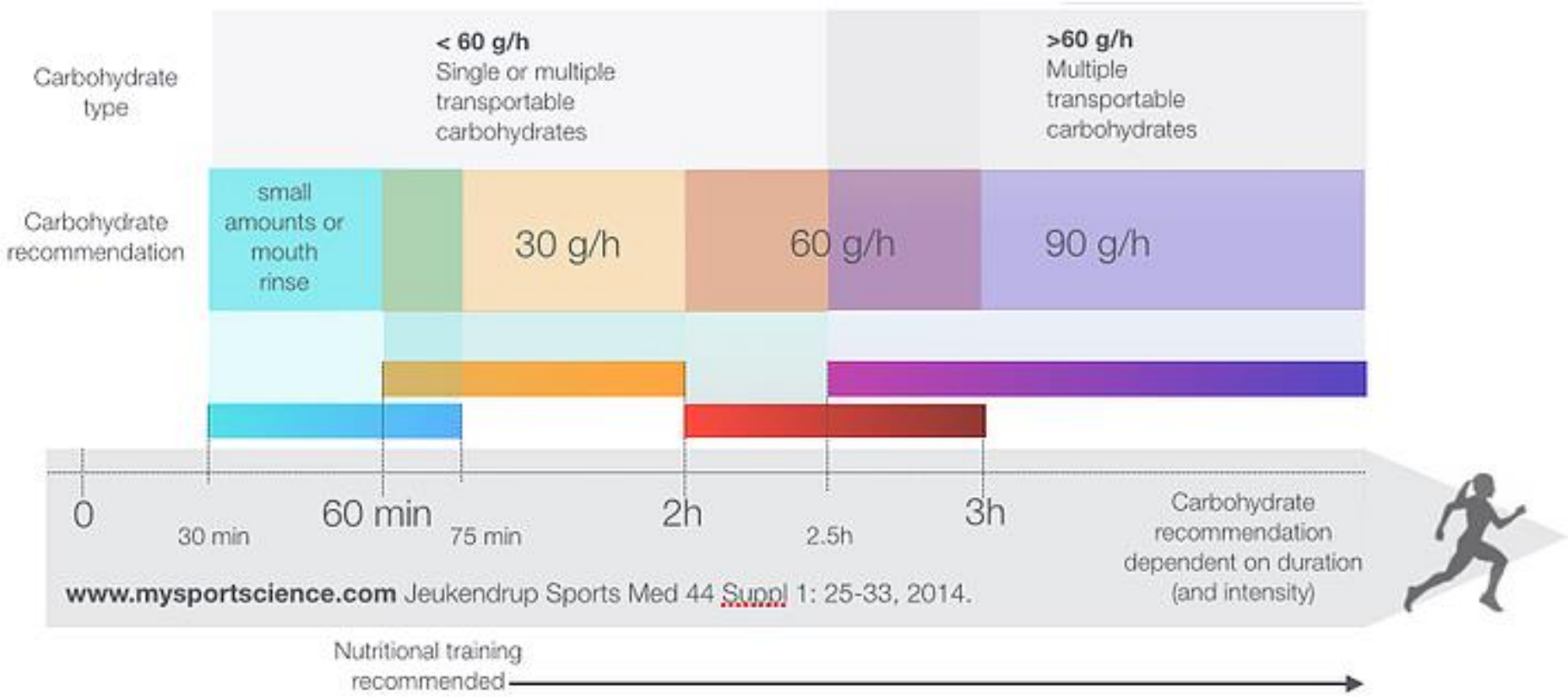
- ↑ exercise intensity = ↓ gastric emptying
- ↑ carbohydrate = ↓ gastric emptying



# Carbohydrate Supplements



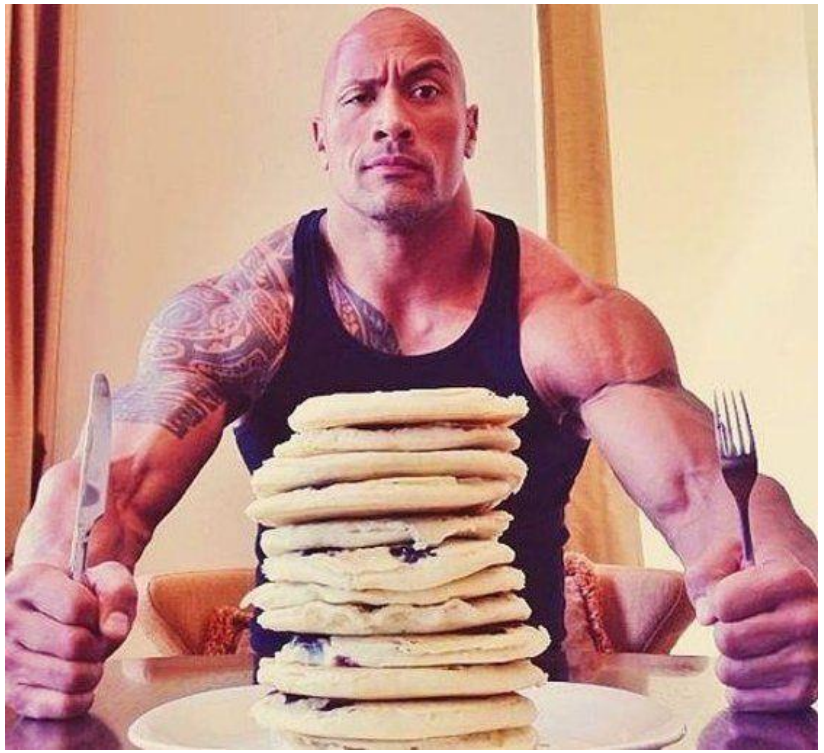
# Depending on Race Duration



# Questions???

# Post-Training Fueling

- Carbohydrates
- Protein



# Glycogen does not replenish rapidly to pre-exercise levels!

# It takes at least 24 hours to replenish muscle glycogen.

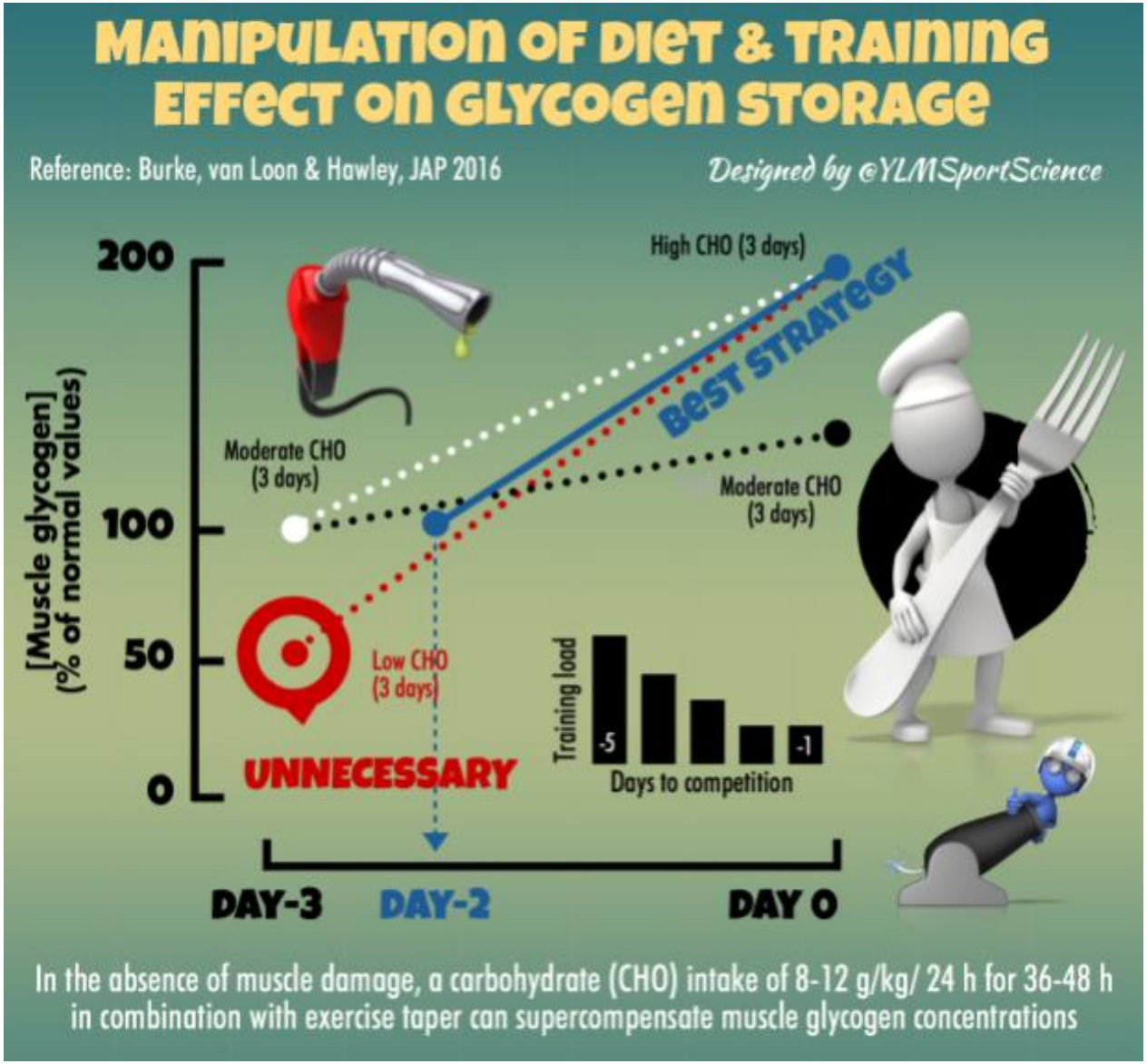
- Rapid Phase
  - 30-60 minutes post-exercise
  - Not insulin dependent

- Slow Phase
  - Insulin dependent

# Post-Exercise Protein Consumption

- Post-exercise ingestion of protein stimulates muscle protein synthesis (aka. building muscle)
- This appears to be less important in people who consume 20-40g of protein every 3-4 hours
- The general approach
  - Consume a post-exercise protein source

# Carbohydrate Loading


MANIPULATION OF DIET & TRAINING EFFECT ON GLYCOGEN STORAGE
Reference: Burke, van Loon & Hawley, JAP 2016
Designed by @YLMSportScience
[Muscle glycogen] (% of normal values)
200
100
50
0
High CHO (3 days)
BEST STRATEGY
Moderate CHO (3 days)
Moderate CHO (3 days)
Low CHO (3 days)
UNNECESSARY
Training load
-5
-1
Days to competition
DAY-3
DAY-2
DAY 0
In the absence of muscle damage, a carbohydrate (CHO) intake of 8-12 g/kg/ 24 h for 36-48 h in combination with exercise taper can supercompensate muscle glycogen concentrations

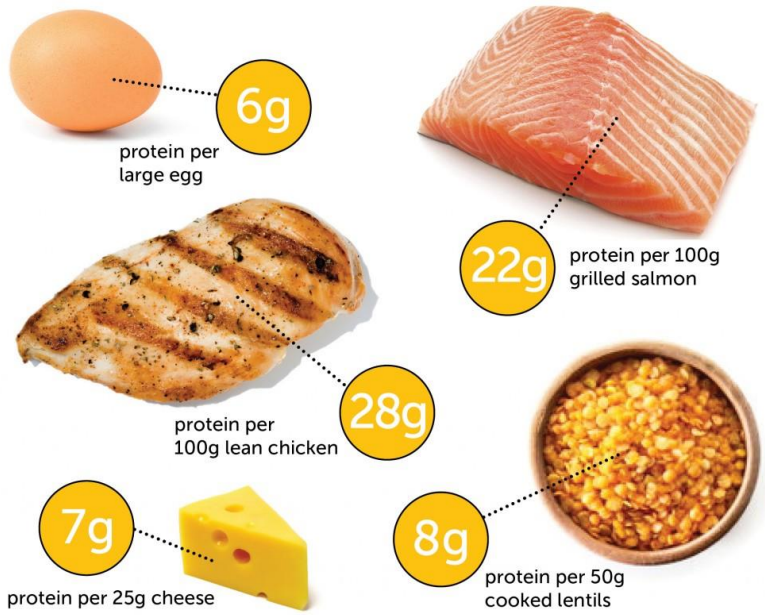

1
2x
TWICE PER DAY
Yeo et al. 2008
2
NO SPORTS DRINKS
Morton et al. 2009
3
FASTED
Van Proyen et al. 2011
Reference: James Morton
TRAINING LOW STRATEGIES
Deliberately training in conditions of reduced carbohydrate availability can promote training-induced adaptations
INCREASED MAXIMAL MITOCHONDRIAL ENZYME ACTIVITIES
INCREASED MITOCHONDRIAL CONTENT
INCREASED RATES OF LIPID OXIDATION
IMPROVED EXERCISE CAPACITY
in some instances
Designed by ©YLMSportScience
SLEEP LOW / TRAIN LOW
Bartlett et al. 2013
Lane et al. 2015
4
RECOVER LOW
Pilegaard et al. 2005
5
PROTEIN / CAFFEINE
Taylor et al. 2013
Lane et al. 2013
6

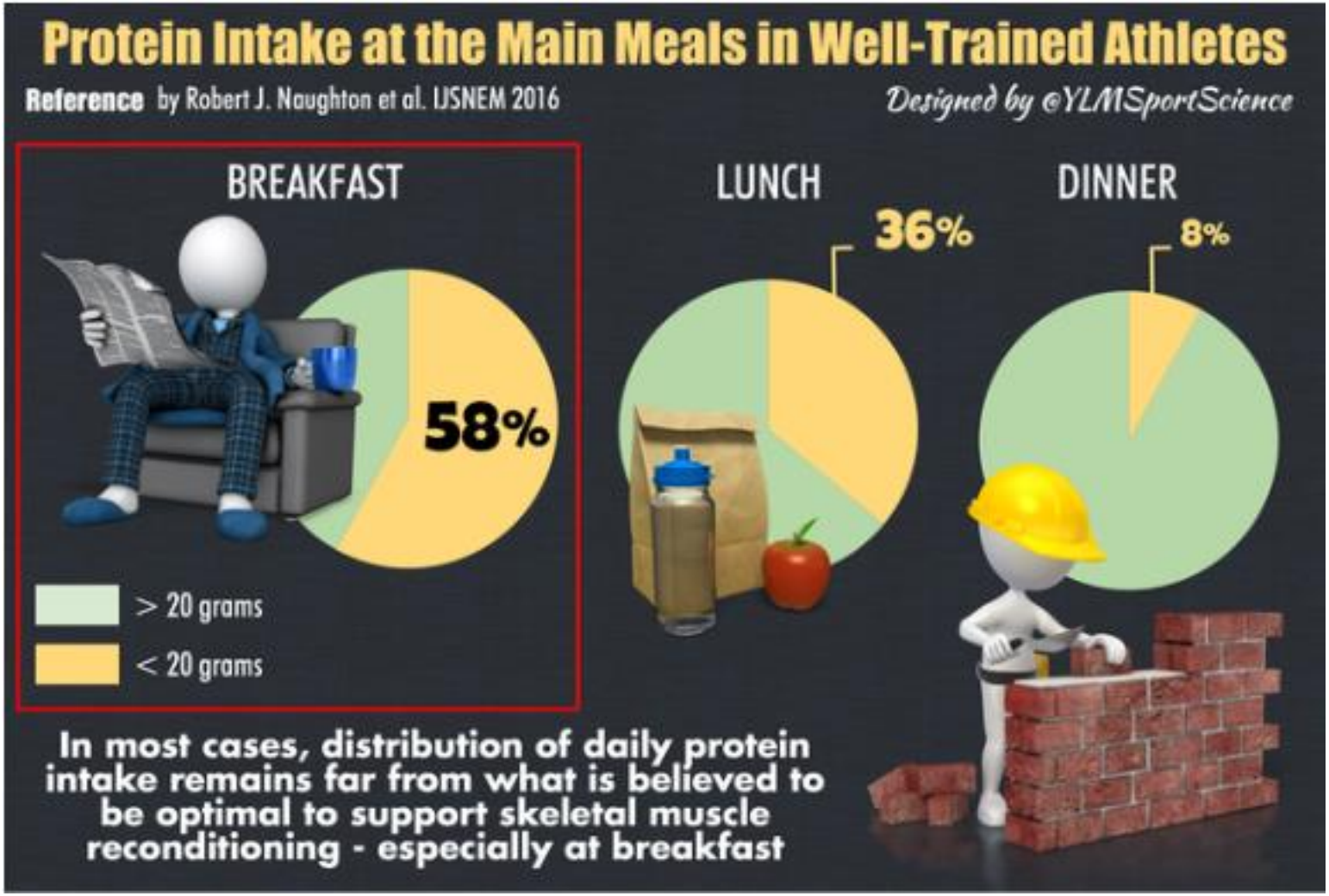
# Protein

- RDA = 0.8 g/kg/d
- Athletes = 1.4-2.0 g/kg/d
- 20-40 g/intake
- Ingest every 3-4 hours
- Leucine

# How Much Protein?

- 80kg male
- 0.8g/kg/day
  - 64g/day
- 2.0g/kg/day
  - 160g/day




Protein Intake at the Main Meals in Well-Trained Athletes
Reference by Robert J. Naughton et al. IJSNEM 2016
Designed by ©YLMSportScience
BREAKFAST
58%
LUNCH
36%
DINNER
8%
> 20 grams
< 20 grams
In most cases, distribution of daily protein intake remains far from what is believed to be optimal to support skeletal muscle reconditioning - especially at breakfast

# HIGHER PROTEIN DURING AN ENERGY DEFICIT

By Longland et al. AJCN, March 2016

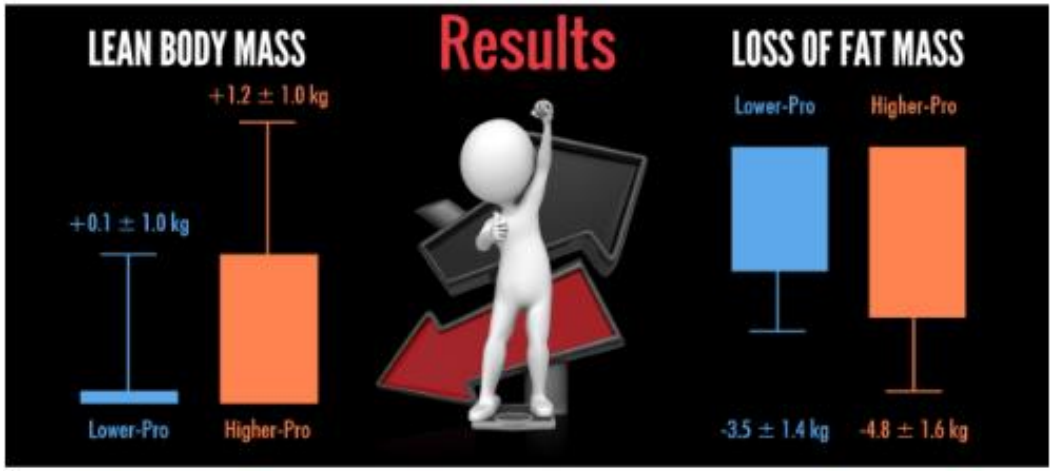
40 young men performed resistance exercise training combined with high-intensity interval training for 6 d/wk during a 4-wk severe caloric restriction diet

**HIGHER-PROTEIN DIET**
2.4 g/kg/day

VS

**LOWER-PROTEIN DIET**
1.2 g/kg/day

## Results




**HIGHER PROTEIN (2.4 G/KG/D) DURING SEVERE CALORIC RESTRICTION PROMOTES LEAN MASS GAIN AND FAT MASS LOSS**


TIME FOR A BREAK

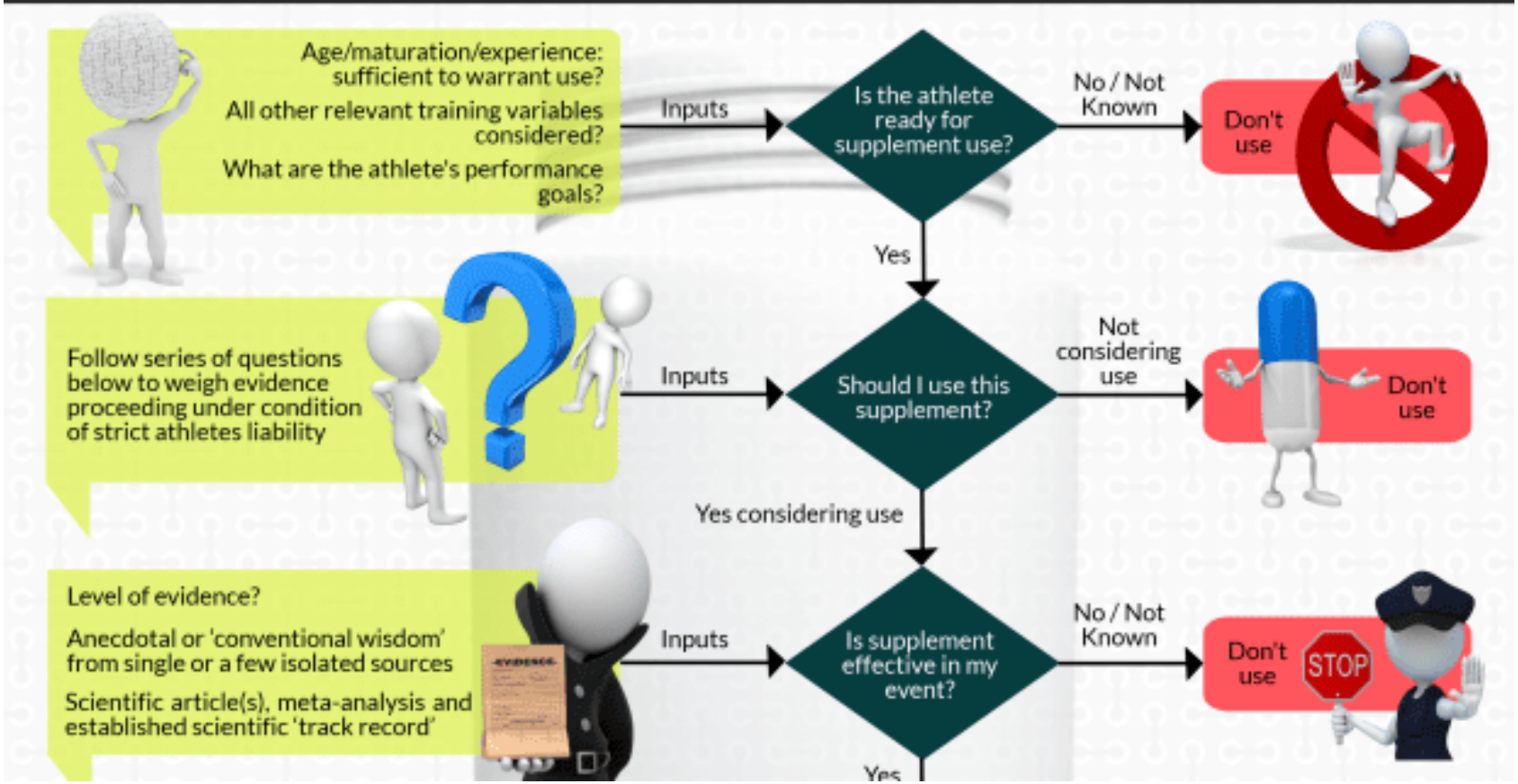
# Supplementation

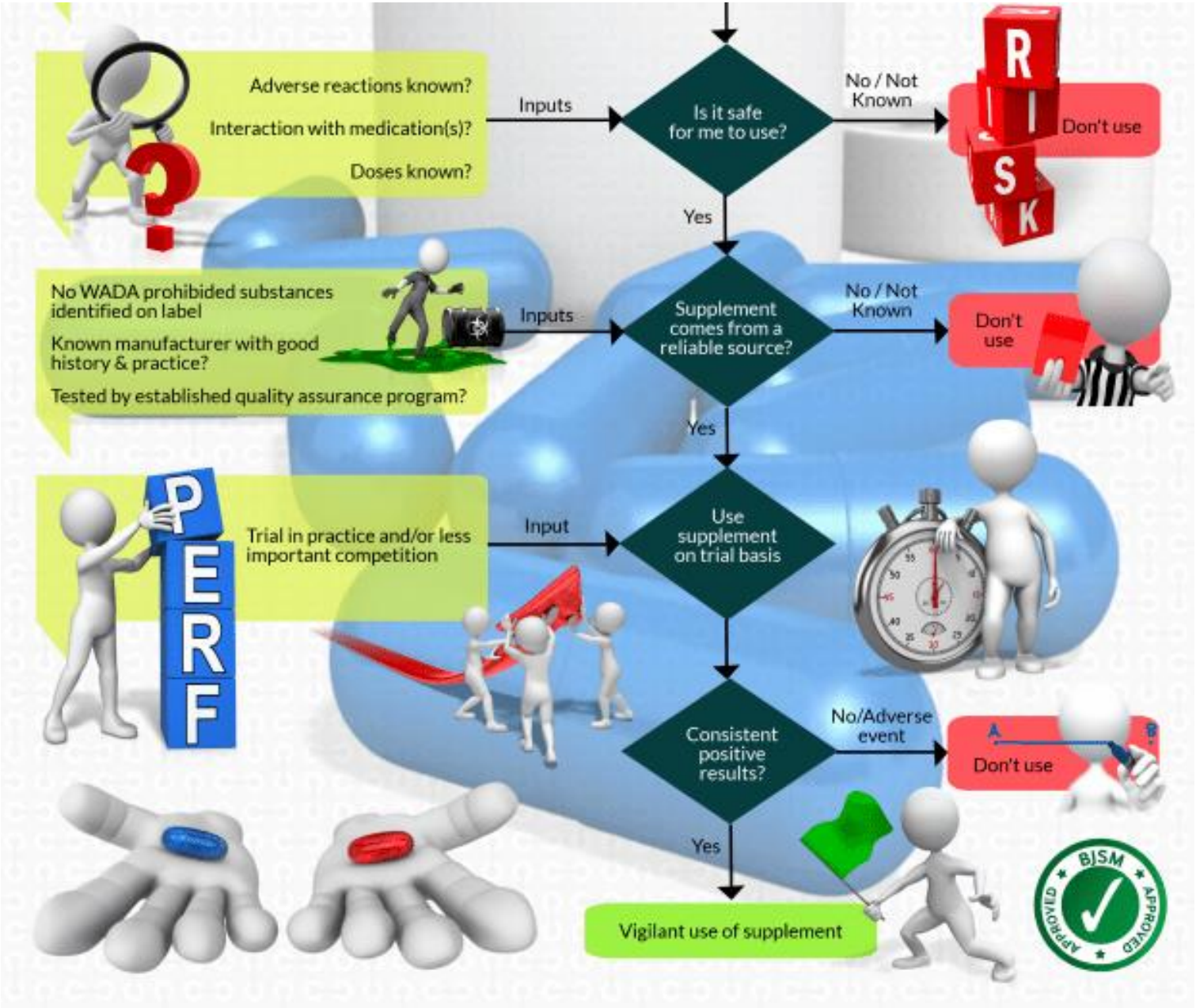
# Dietary supplements and the high-performance athlete

# IOC consensus statement

Reference: by Maughan et al. BJSM 2018

*Designed by ©YLMSportScience*



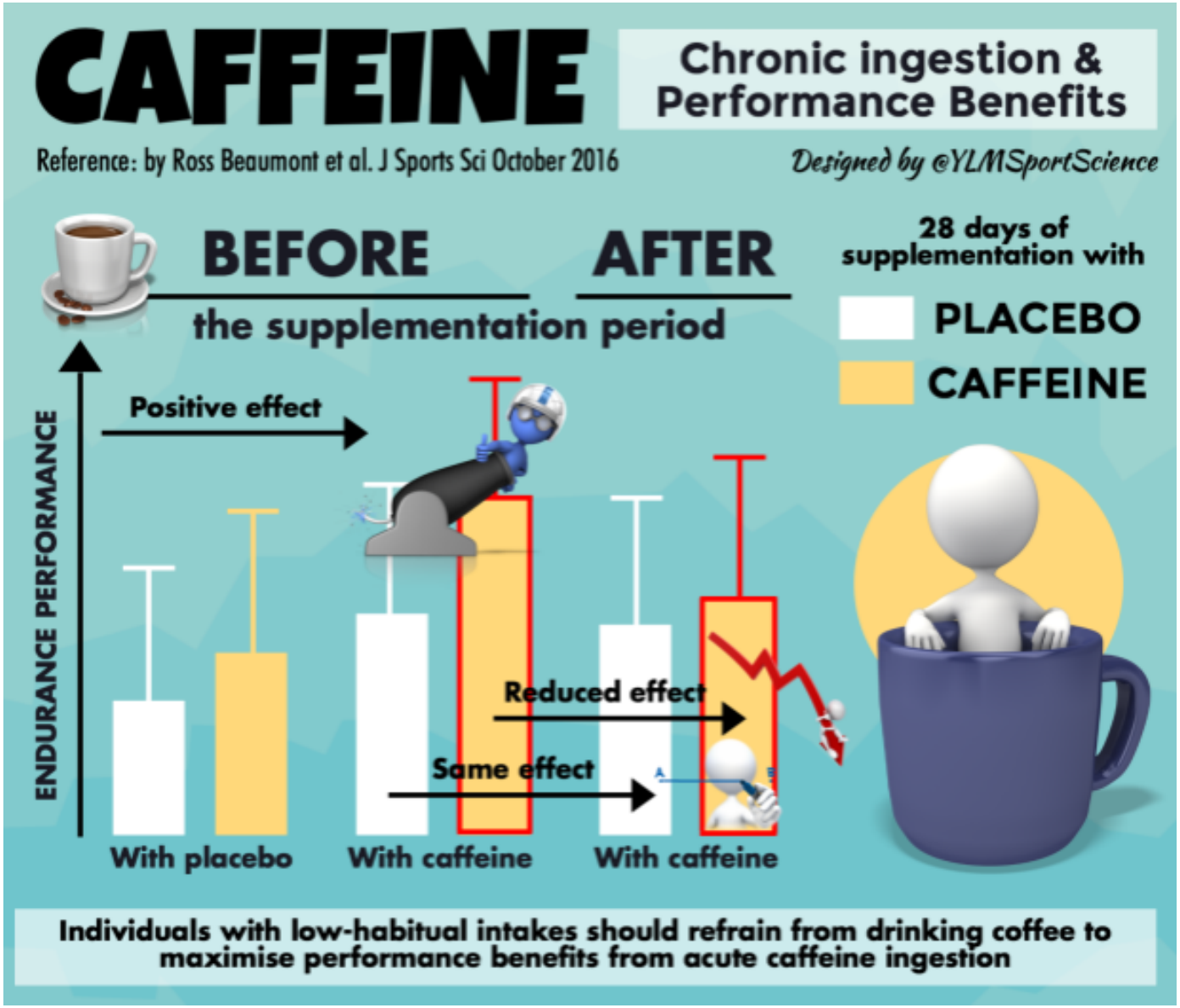

Adverse reactions known?
Interaction with medication(s)?
Doses known?
Inputs
Is it safe for me to use?
No / Not Known
Don't use
Yes
No WADA prohibited substances identified on label
Known manufacturer with good history & practice?
Tested by established quality assurance program?
Inputs
Supplement comes from a reliable source?
No / Not Known
Don't use
Yes
Trial in practice and/or less important competition
Input
Use supplement on trial basis
Consistent positive results?
No/Adverse event
Don't use
Yes
Vigilant use of supplement
RISK
PERF
BJSM
APPROVED

# Caffeine

- Mechanism
  - ↑ endorphin release
  - ↑ neuromuscular function
  - ↑ alertness
  - ↓ RPE during exercise

# Caffeine

- Improved performance in endurance and high-intensity exercise
- 3-6mg/kg, consumed 60 minutes before competition
- 240-480mg of caffeine
  - 2-5 cups of coffee
  - 1-2 caffeine pills


CAFFEINE
Chronic ingestion & Performance Benefits
Reference: by Ross Beaumont et al. J Sports Sci October 2016
Designed by @YLMSportScience
BEFORE
AFTER
the supplementation period
28 days of supplementation with
PLACEBO
CAFFEINE
ENDURANCE PERFORMANCE
Positive effect
Reduced effect
Same effect
With placebo
With caffeine
With caffeine
Individuals with low-habitual intakes should refrain from drinking coffee to maximise performance benefits from acute caffeine ingestion

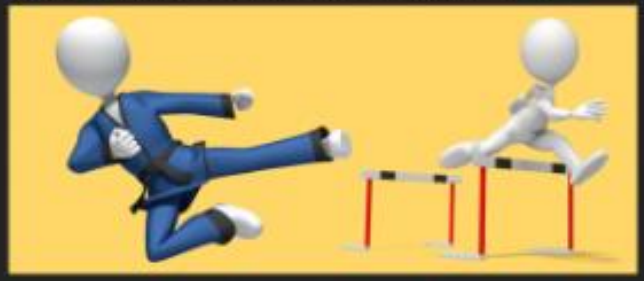
# Creatine

- Safe & effective
- Naturally occurring
  - Phospho-creatine pathway
- Supplementing increases creatine stores by 30%

# PERFORMANCE

## HIGH-INTENSITY SPORTS

Performance benefits in single (+1–5%) and repeated bouts (+5–15%) of high-intensity exercise of <150 s. Most pronounced effects during tasks of <30 s



## RESISTANCE TRAINING

Improves the chronic outcomes of resistance training programs with greater gains in lean mass and muscular strength and power

Less benefits are reported for endurance sport athletes because supplementation is frequently reported to result in a 1–2 kg increase to body mass after the "loading-phase" due to water retention

# PROTOCOL

## LOADING PHASE

4x 5-g doses per day for 5–7 days

## MAINTENANCE PHASE

3–5-g per day

No negative health effects of the long-term use of creatine monohydrate (up to 4 years) when appropriate loading protocols are followed

# Beta-Alanine

## HOW DOES IT WORK?

Beta-alanine augments intracellular buffering capacity, having potential beneficial effects on sustained high-intensity exercise performance

- Daily supplementation of beta-alanine increases skeletal muscle carnosine content
- ... the immediate defense against proton accumulation in the contracting musculature

## PERFORMANCE

Small but potentially meaningful performance benefits (~0.2–3%) during both continuous and intermittent exercise tasks of 30 s to 10 min in duration

## PROTOCOL

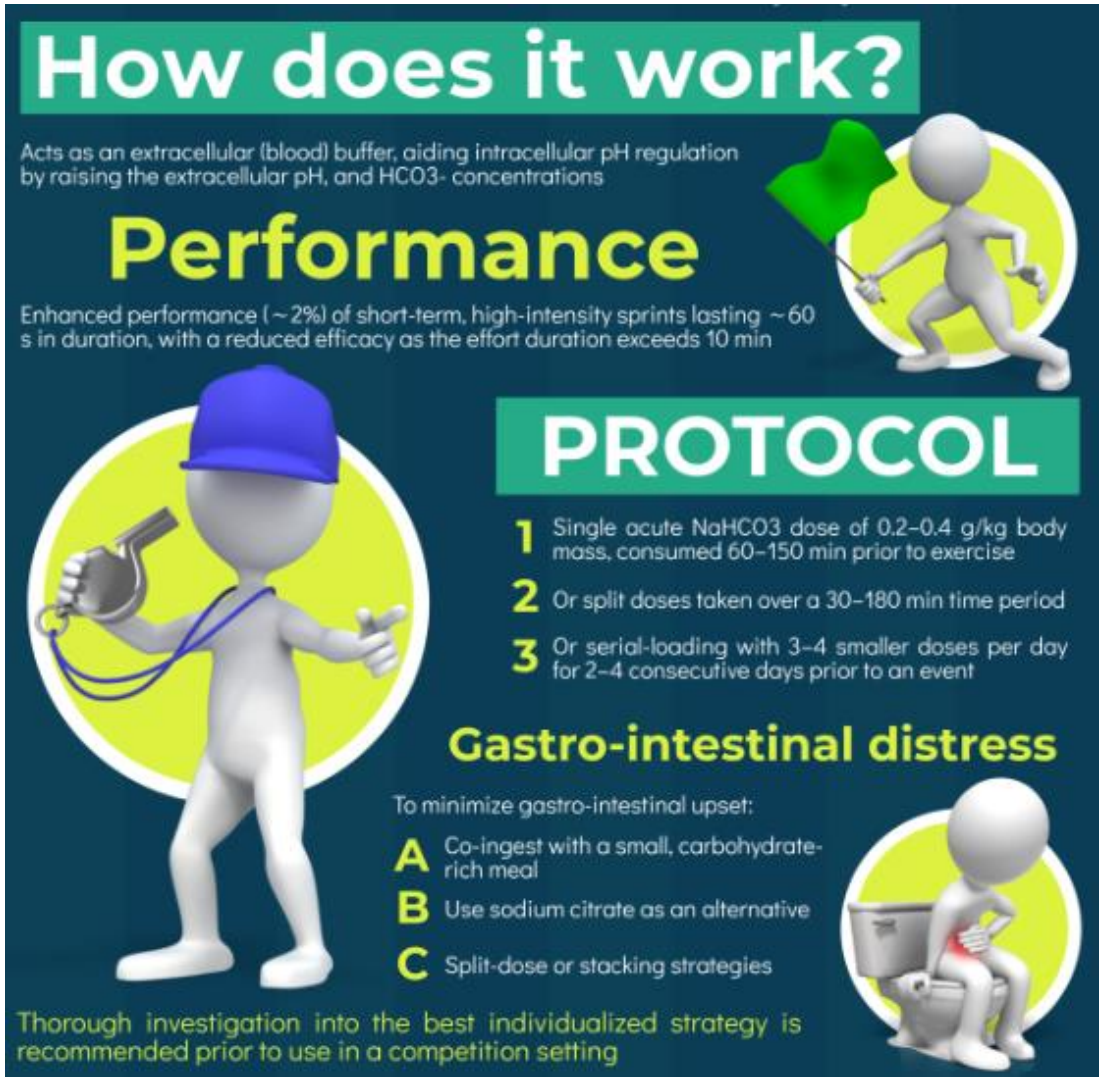
~65 mg/kg body mass / day
(i.e., 0.8–1.6 g every 3–4 hr)

**10–12 weeks**

Less effective in well-trained athletes

Possible negative side effects include skin rashes and/or transient paresthesia

# Sodium Bicarbonate



# Nitrates

- Proposed benefits
  - Enhanced efficiency of mitochondria
  - Enhanced function of fast-twitch muscle fibers
  - Increased blood flow to the muscle

- Improvements
  - 1-3% in events < 40 minutes
  - 3-5% in high-intensity exercise; 12-40 minutes

- High nitrate-containing foods
  - Spinach, arugula, celery, beetroot

# Vitamin D

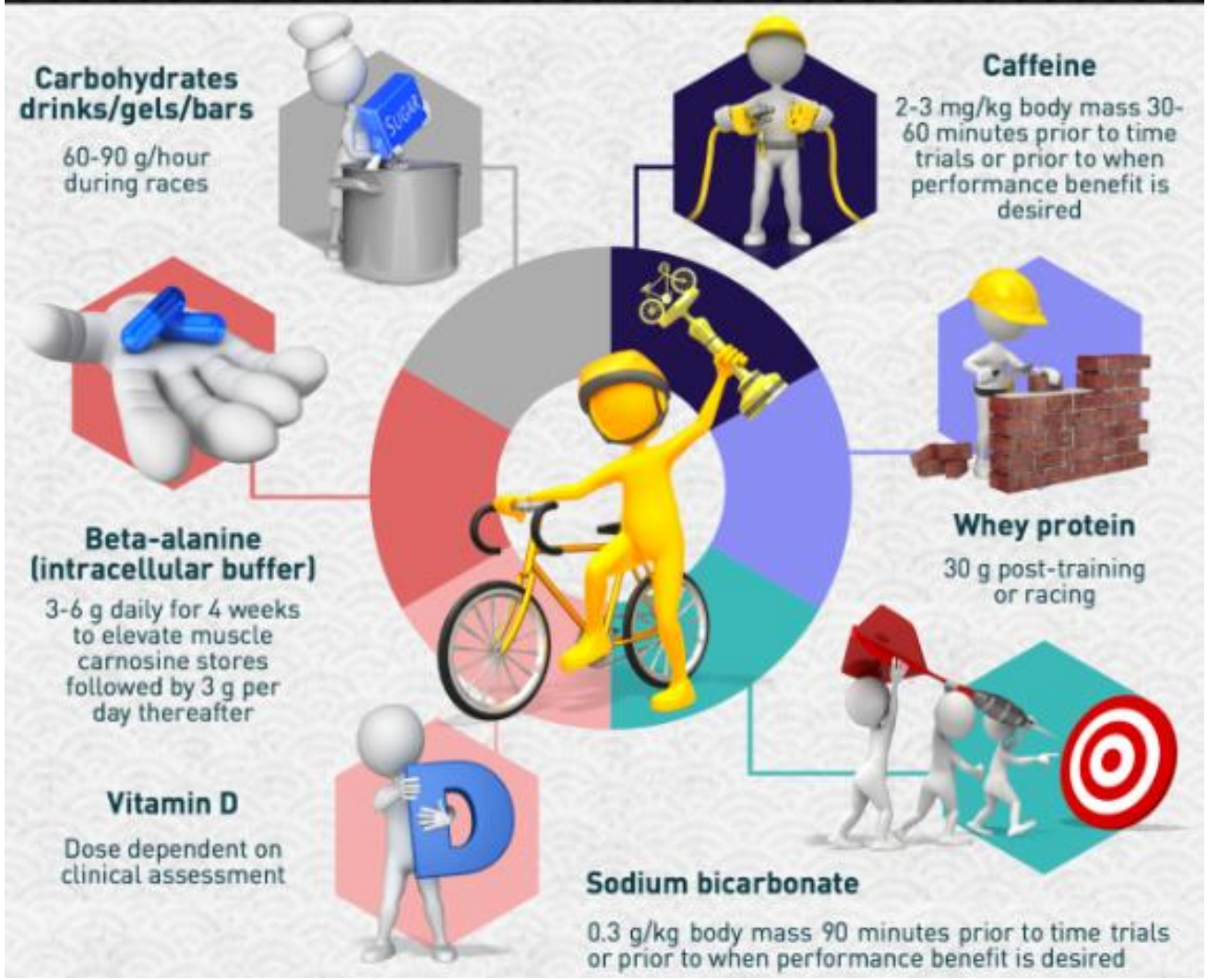
- RDA = 600 IU/d
- ↑ response to exercise
- ↓ stress fractures
- ↓ upper respiratory tract infections
- Consult with a physician, dietician or nutritionist

# Probiotics

- Improvement in athletes prone to GI tract problems
- Travelling to regions in which GI disturbances are more likely
- Supplementation needs to begin well ahead of competition

# Potential Research-Proven and Ergogenic Supplements for Road Cycling

Reference: by JP Morton & JM Fell, Aspire Sport Medicine Journal, 2016



# Questions About Supplements

# Vegan Athletes

- Energy/Calories
- Protein
- B12
- Iron
- Zinc
- Calcium
- Iodine
- Vitamin D
- Omega-3 Fatty Acids

# Energy

- Vegans generally consume less energy than omnivores
- Decreased protein intake
- Decreased fat intake
- Increased fiber intake

# Protein

- Athletes require more protein than the average person
- Incomplete proteins
- Contain less BCAAs

**Table 2** High Protein Foods

| Food | Protein per 100 g[a] |
|---|---|
| Pumpkin seeds (dried, uncooked) | 30.2 |
| Lentils (red, split, uncooked) | 24.6 |
| Black beans (uncooked) | 21.6 |
| Almonds (raw) | 21.2 |
| Tempeh | 20.3 |
| Tofu (calcium set) | 17.3 |
| Oats (rolled) | 16.9 |
| Quinoa (uncooked) | 14.1 |

[a]Data from USDA food composition database SR28

# Omega-3 Fatty Acids

- No marine-based fats
- Increase nitric oxide production
- Improve heart rate variability
- Vegan-Friendly Omega-3 Sources
  - Flax seed
  - Walnuts
  - Chia
  - Microalgae-oil supplement

# Vitamin B12

- Absence of animal and dairy products
- No other naturally-occurring, B-12 rich foods
- B12 supplement or fortified foods (i.e. plant-based milks)

# Iron

- Vegans consume the same amount of iron as omnivores
- Less bioavailability from plant-based sources
- Female are susceptible to iron-deficiency anemia

- Vegan-Friendly Iron Sources
  - Legumes
  - Grains
  - Nuts
  - Seeds
  - Green vegetables

# Zinc

- Zinc is widely available in plant-based foods
- Poor absorption into the body
- Low zinc availability is rarely a concern for vegans

- Vegan-Friendly Sources of Zinc
  - Beans
  - Nuts
  - Seeds
  - Oats
  - Wheat Germ
  - Nutritional Yeast

# Calcium

- Vegans consume less calcium than vegetarians and omnivores
- Increased risk of fracture
- Important during childhood
- Oxalate impede calcium absorption

- Vegan-Friendly Calcium Sources
  - Tofu (calcium set)
  - Fortified milks and juices
  - Kale
  - Broccoli
  - Sprouts
  - Cauliflower
  - Bok Choy

# Iodine

- Vegans can have low iodine levels
- Vegans that eat a lot of seaweed can actually be at an increased risk of elevated iodine levels

- Vegan-Friendly Iodine Sources
  - Seaweed
  - Cranberries
  - Potatoes
  - Prunes
  - Navy Beans
  - Iodized Salt

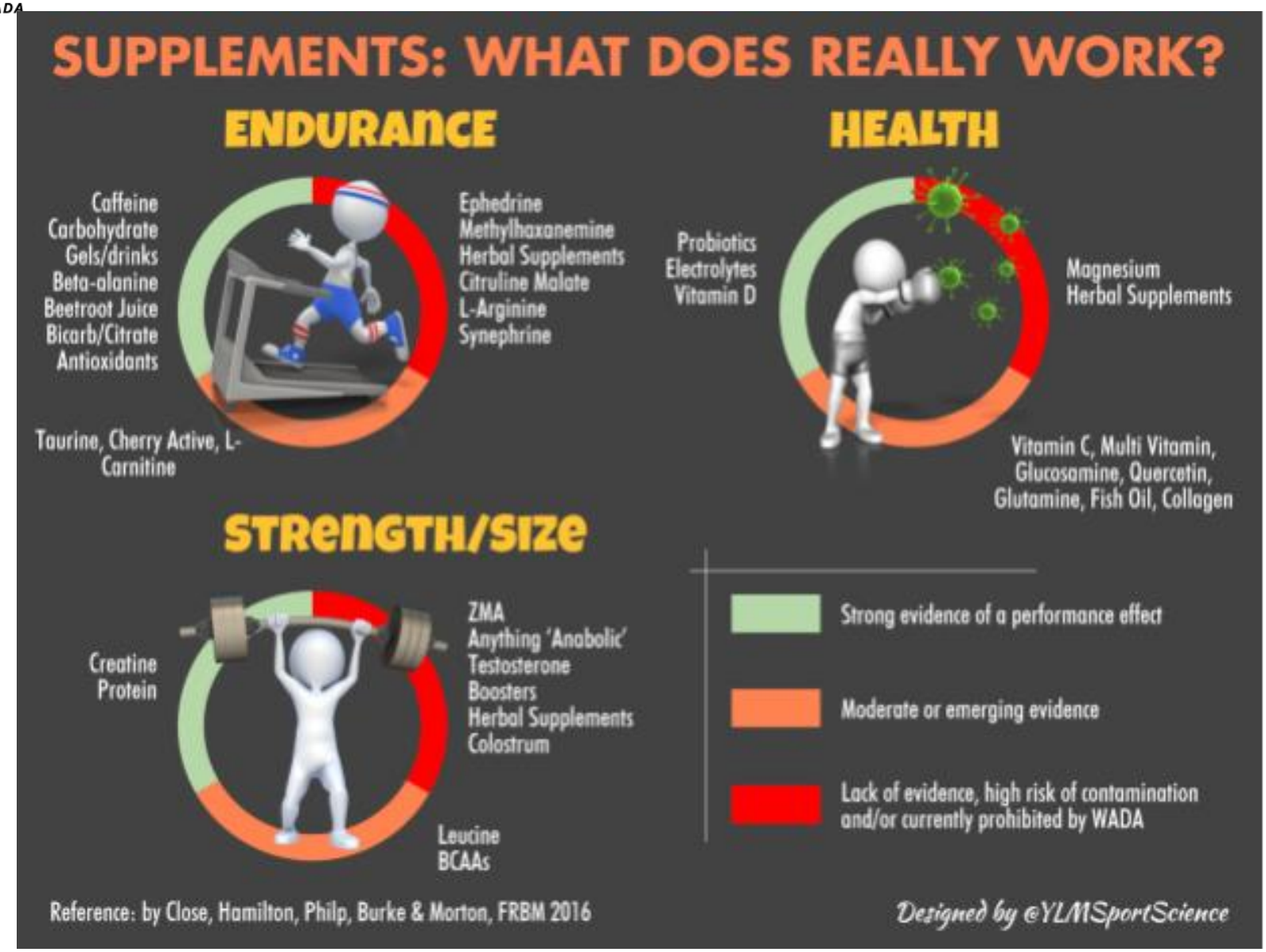
# Vitamin D

- Exposure to the sun
- Fortified-Food (i.e. milk)
- Vitamin D3 (cholecalciferol)
- Fungal-algae D3

# Pam Rocca

# Questions

- Website: drchrisgrant.com
- Instagram: @drchrisgrant
- Facebook: Dr. Chris Grant


SUPPLEMENTS: WHAT DOES REALLY WORK?
ENDURANCE
Caffeine
Carbohydrate Gels/drinks
Beta-alanine
Beetroot Juice
Bicarb/Citrate
Antioxidants
Taurine, Cherry Active, L-Carnitine
Ephedrine
Methylhaxanemine
Herbal Supplements
Citruline Malate
L-Arginine
Synephrine
HEALTH
Probiotics
Electrolytes
Vitamin D
Magnesium
Herbal Supplements
Vitamin C, Multi Vitamin, Glucosamine, Quercetin, Glutamine, Fish Oil, Collagen
STRENGTH/SIZE
Creatine
Protein
ZMA
Anything 'Anabolic'
Testosterone Boosters
Herbal Supplements
Colostrum
Leucine
BCAAs
Strong evidence of a performance effect
Moderate or emerging evidence
Lack of evidence, high risk of contamination and/or currently prohibited by WADA
Reference: by Close, Hamilton, Philp, Burke & Morton, FRBM 2016
Designed by @YLMSportScience


# Beta-hydroxy Betamethyl-butyrate (HMB)

3 g/d

- Enhanced lean mass, strength, and adaptation to exercise via decreased muscle protein breakdown,
- Reduced DOMS

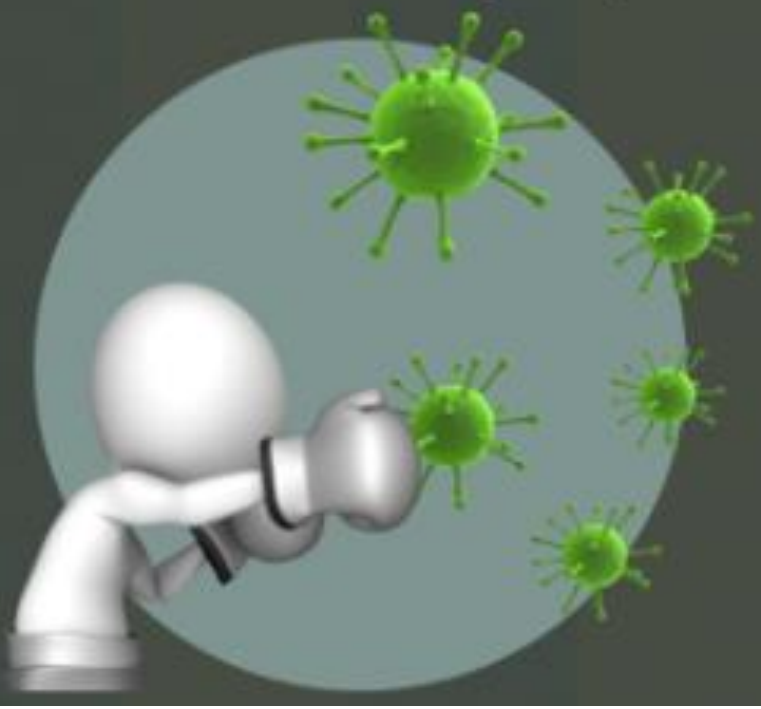
Cannot be confidently recommended to athletes. Effects may be no more effective than adhering to the current protein intake recommendations

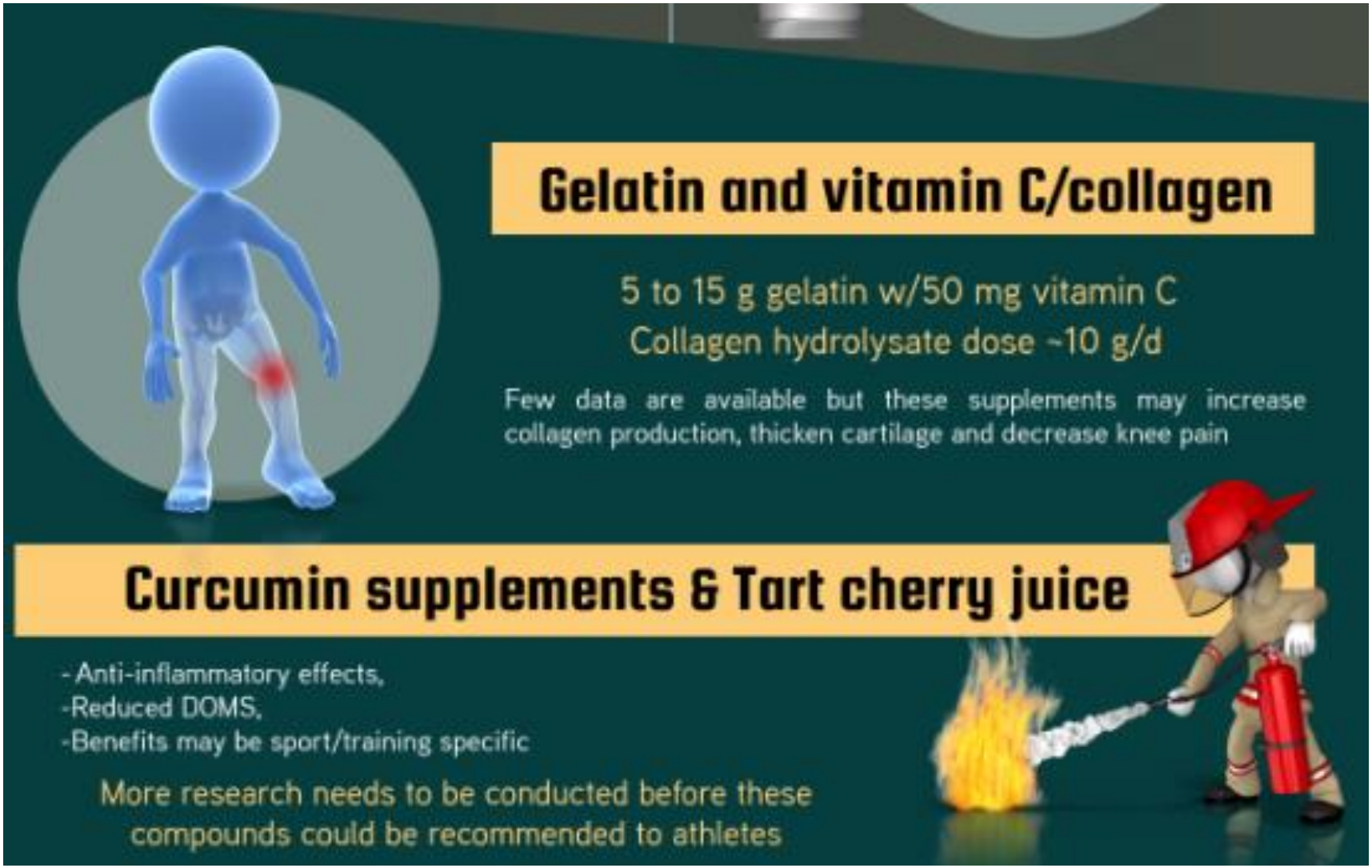
# Omega 3-Fatty Acids

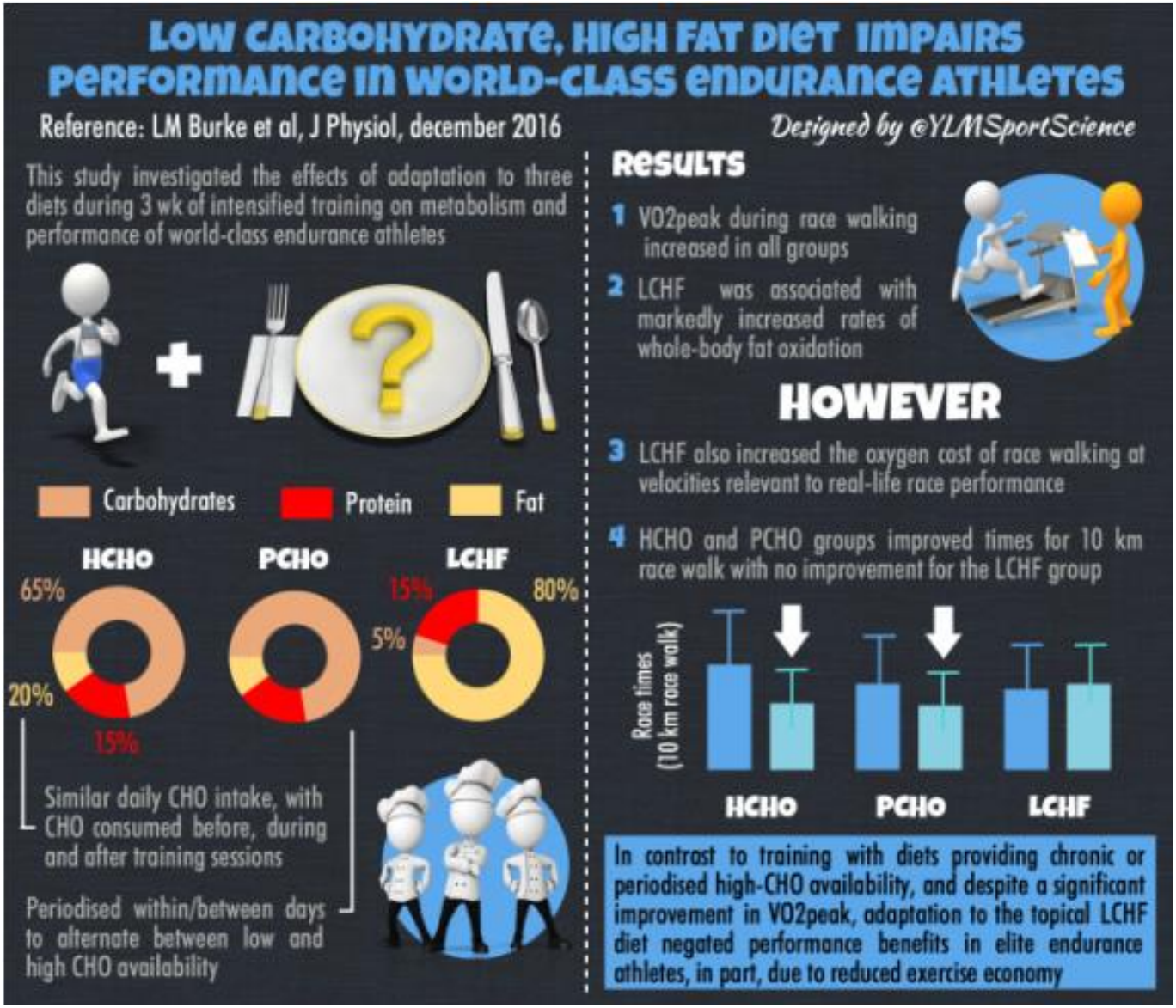
2 g/d

- Improved cognitive processing.
- Decreased risk/enhanced recovery from mild traumatic brain injury.
- Reduced DOMS

Low risk but unclear if supplementation should be pursued by athletes, in lieu of including fatty fish in the diet as a source of omega-3 fatty acids




Gelatin and vitamin C/collagen
5 to 15 g gelatin w/50 mg vitamin C
Collagen hydrolysate dose ~10 g/d
Few data are available but these supplements may increase collagen production, thicken cartilage and decrease knee pain
Curcumin supplements & Tart cherry juice
- Anti-inflammatory effects,
-Reduced DOMS,
-Benefits may be sport/training specific
More research needs to be conducted before these compounds could be recommended to athletes


LOW CARBOHYDRATE, HIGH FAT DIET IMPAIRS PERFORMANCE IN WORLD-CLASS ENDURANCE ATHLETES
Reference: LM Burke et al, J Physiol, december 2016
Designed by @YLMSportScience
This study investigated the effects of adaptation to three diets during 3 wk of intensified training on metabolism and performance of world-class endurance athletes
Carbohydrates
Protein
Fat
HCHO
PCHO
LCHF
65%
20%
15%
15%
5%
80%
Similar daily CHO intake, with CHO consumed before, during and after training sessions
Periodised within/between days to alternate between low and high CHO availability
RESULTS
1 VO2peak during race walking increased in all groups
2 LCHF was associated with markedly increased rates of whole-body fat oxidation
HOWEVER
3 LCHF also increased the oxygen cost of race walking at velocities relevant to real-life race performance
4 HCHO and PCHO groups improved times for 10 km race walk with no improvement for the LCHF group
Race times (10 km race walk)
HCHO
PCHO
LCHF
In contrast to training with diets providing chronic or periodised high-CHO availability, and despite a significant improvement in VO2peak, adaptation to the topical LCHF diet negated performance benefits in elite endurance athletes, in part, due to reduced exercise economy

# Dietary Meal Plans Provided to a Premier League Soccer Player During Rehabilitation From ACL Injury

| | Immobilization Phase | Rehabilitation Phase |
|---|---|---|
| Breakfast | 3 egg omelet (ham + tomato + cheese) + 400 ml semiskimmed milk + 1 multivitamin + 500 mg vitamin C + 1 g fish oil + 1.5 g HMB | 1 × bowl muesli + 250 ml semiskimmed milk) + 2 × slices wholemeal toast + 3 poached eggs + 350 ml apple juice + 1 multivitamin + 1 g fish oil + 1.5 g HMB |
| 10 am | 30 g whey / casein protein supplement + 5 g creatine monohydrate | 25 g whey / casein protein supplement + 5 g creatine monohydrate |
| 1 pm | 2 × chicken fajita wraps (incl. salsa, peppers, onions, mushrooms, etc.) & mixed salad (e.g. lettuce, tomato, cucumber) + 1 g fish oil | Chicken filet + sweet potatoes + mixed vegetables (e.g. roasted carrots and parsnips) + 350 ml apple juice + natural yogurt + mixed berries + 1 g fish oil |
| 4 pm | 30 g whey / casein protein supplement + 5 g creatine monohydrate | 25 g whey protein + 50 g CHO recovery shake + 50 g CHO energy bar |
| 7 pm | Salmon filet + basmati rice + broccoli + 1 g fish oil | Filet steak + mixed salad (e.g. tomato, mushrooms, spinach) + potato wedges + 350 ml apple juice + 1 g fish oil |
| Approx 30–60 min before sleep | 30 g whey/casein protein supplement + 1.5 g HMB | 30 g whey / casein protein supplement + 1.5 g HMB |
| | **1970 kcal: 140 g carbs, 195 g protein, 70 g Fat** | **3170 kcal: 400 g carbs; 190 g protein, 90 g Fat** |

Reference: by Jordan Milsom et al. IJSNEM 2014

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# Carbohydrate Intake

- General fueling (< 90 min. of exercise)
  - 7-12 g/kg/day
- Carbohydrate Loading
  - 36-72 hours before
  - 10-12 g/kg/d
- Speedy Refueling (< 8 hours between sessions)
  - 1-1.2 g/kg/h for the first 4 hours
  - Small, regular snacks
- Pre-event fueling (> 60 minutes)
  - 1-4 g/kg consumed 1-4 hours before exercise
  - Avoid high fat, protein and fiber