



MICRONUTRIENTS



Common questions...

How do I know if I'm **getting enough** vitamins and minerals?

What **foods** pack the most punch?

Should I take a **supplement?**

(Burke & Deakin, 2010)

DID YOU KNOW



Micronutrients are
essential nutrients...

This means that they are **not produced in the body** and you **have to take them in through your diet.**

OBJECTIVES

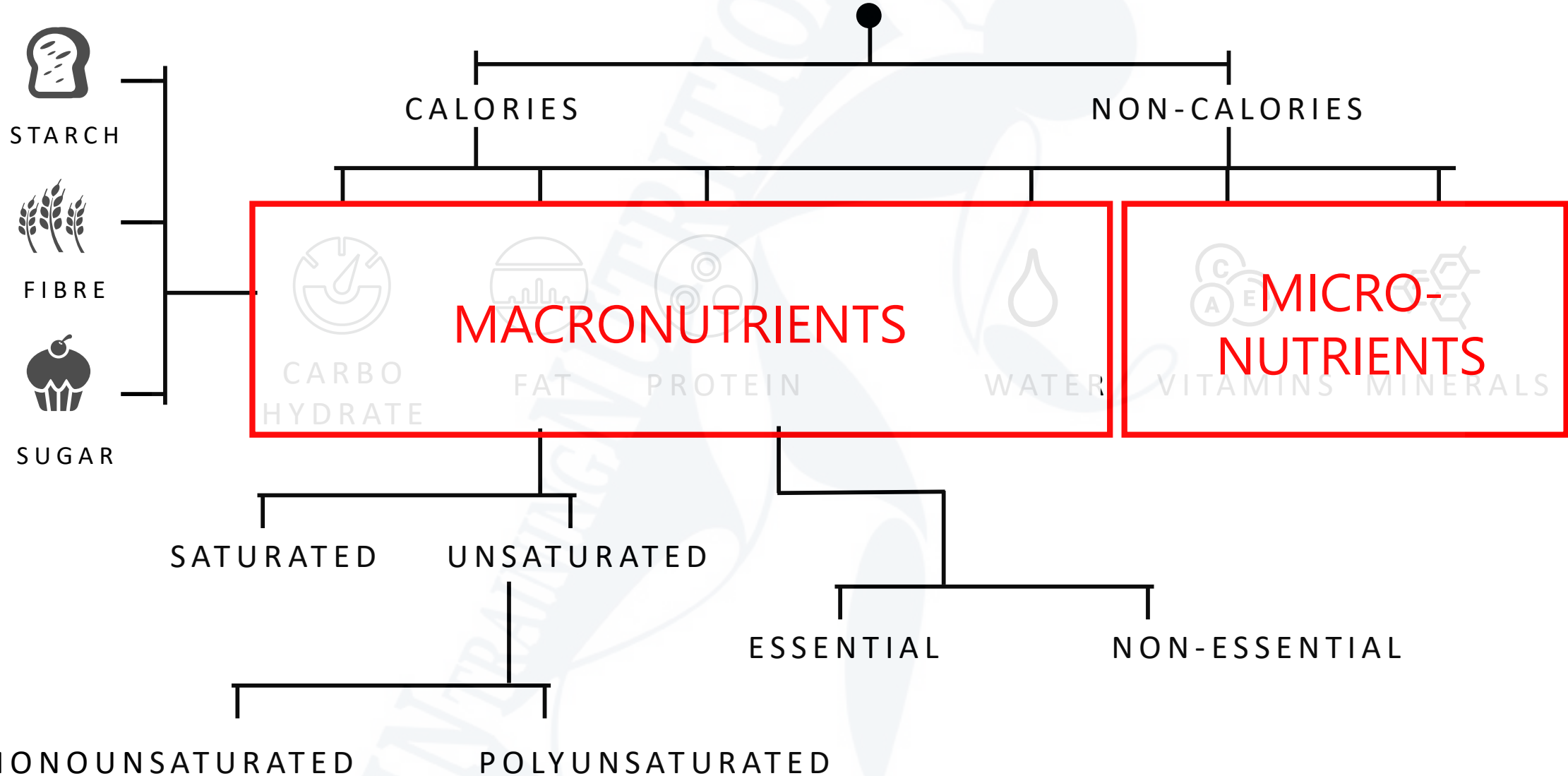
- Understand **what micronutrients are**
- Why they are an **important component** of the diet
- Athletes **requirements** vs sedentary individuals
- What causes **deficiencies**
- What **foods** pack the biggest micronutrient punch
- Micronutrients often needing **supplementation** in the athletic population





What are micronutrients?

NUTRITION



VITAMINS

alive/ living!



- **Vitamins:** Organic compounds
- Needed in very small amounts
- **Water soluble:** Vitamin C & B vitamins
- **Fat soluble:** A, D, E, K



(Burke & Deakin, 2010)

MINERALS & TRACE ELEMENTS

- **Minerals:** Inorganic substances found naturally on the earth
- **Macro-minerals:**
 - > 100mg/ day
 - Sodium, potassium, calcium, phosphorus & magnesium
- **Trace elements:**
 - < 20mg/ day
 - Iron, zinc, copper, chromium & selenium



(Burke & Deakin, 2010)

What is an essential nutrient?



A:

**A nutrient our
body cannot
make on its own**

B:

**A nutrient your
body can make
on its own**

C:

**A nutrient your
body does not
need**

FUNCTIONS of MN

Help to turn food into energy

Haemoglobin synthesis

Anti-oxidant function

Nervous function & muscle contraction

Immune function

Bone metabolism



(Burke & Deakin, 2010)

FUNCTIONS of MN

Help to turn food into energy

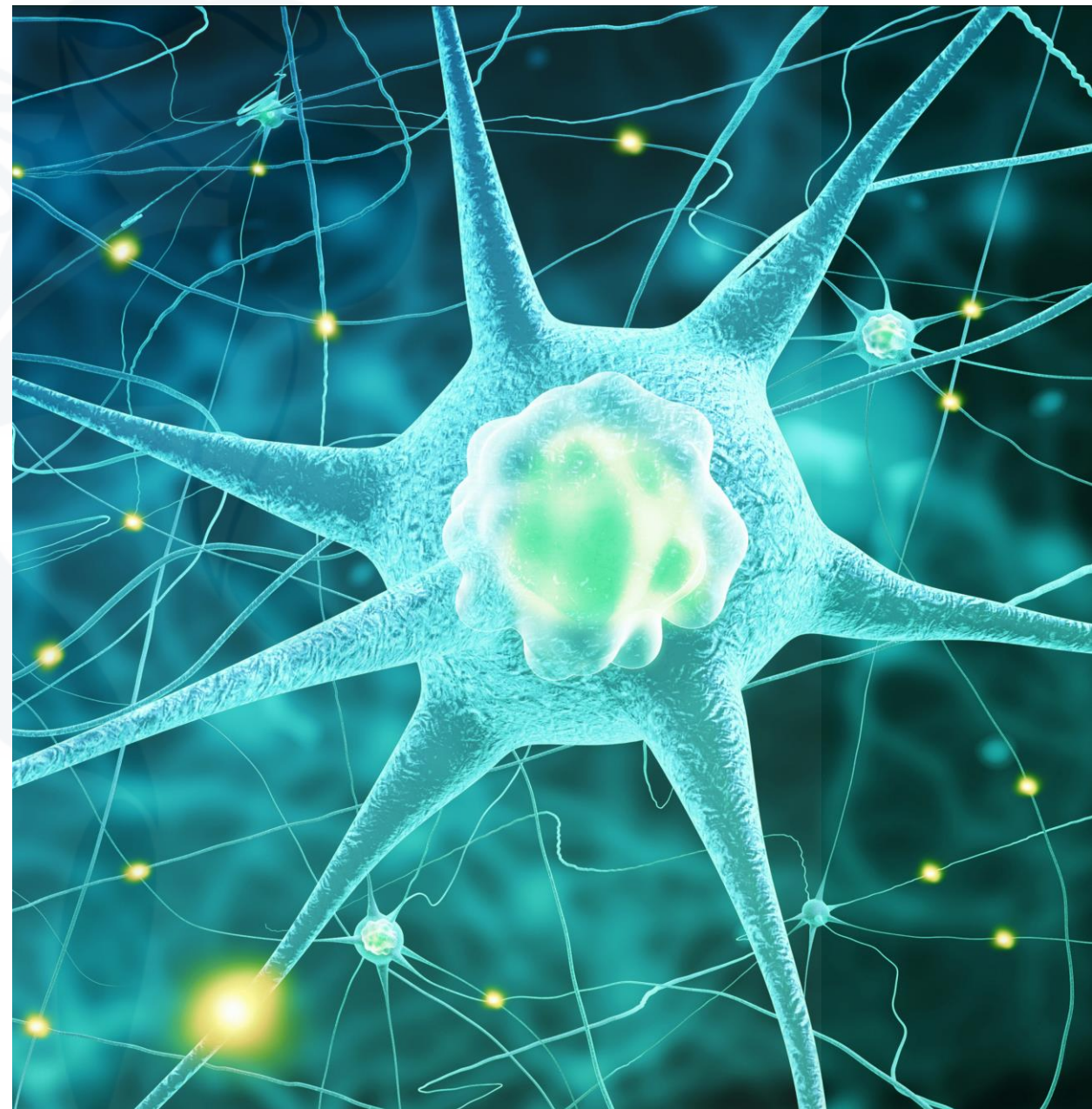
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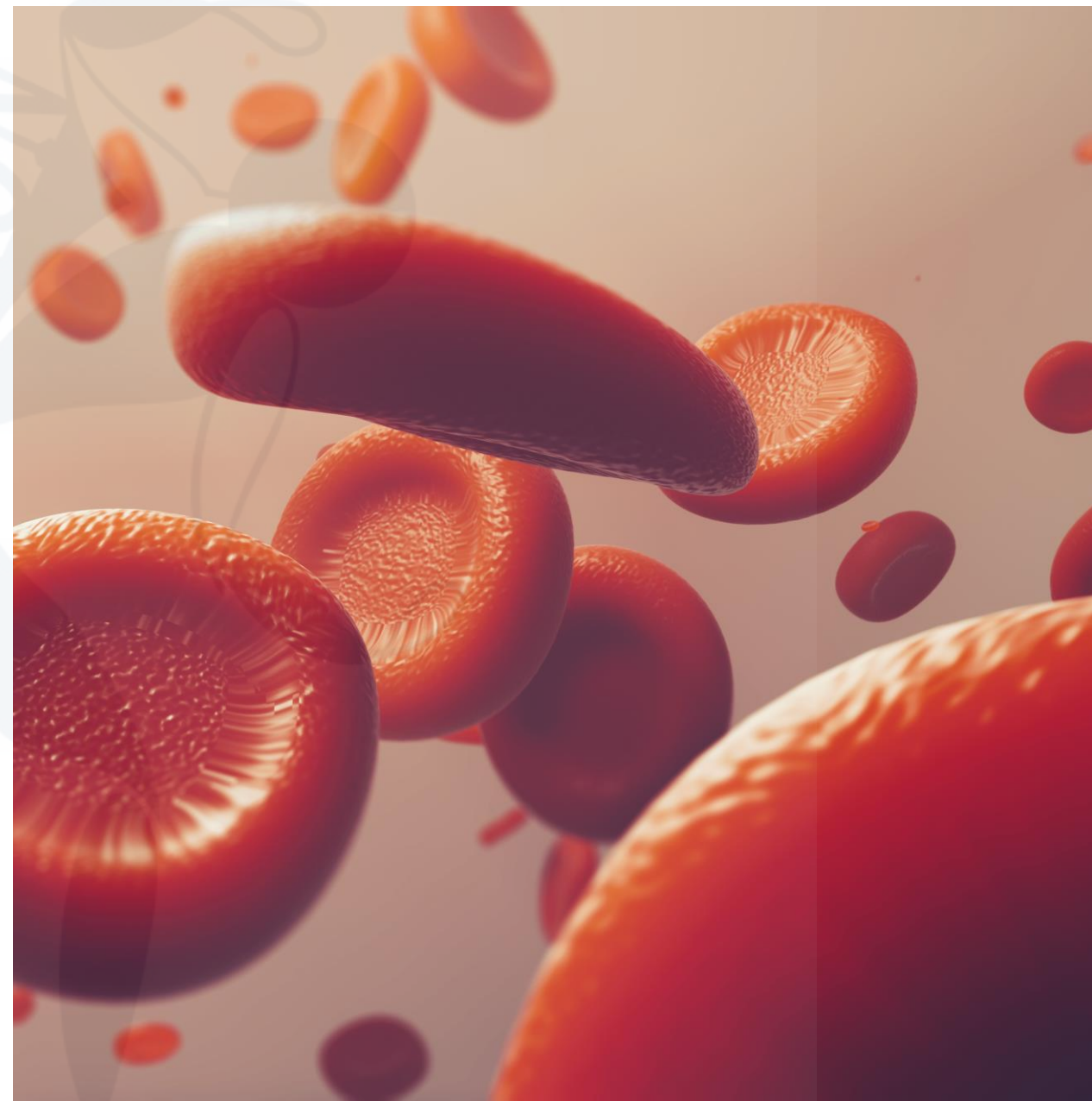
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(Burke & Deakin, 2010)

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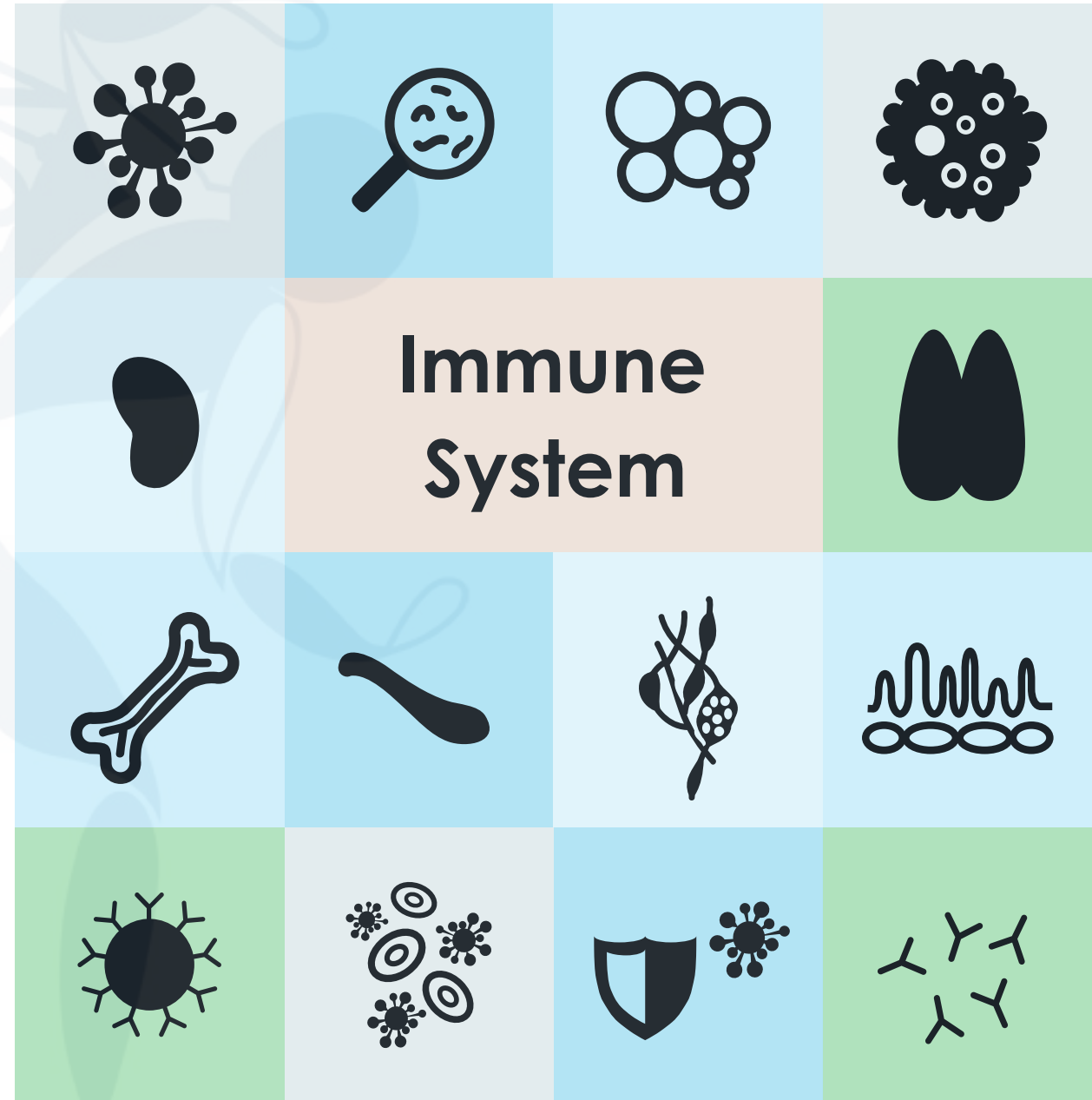
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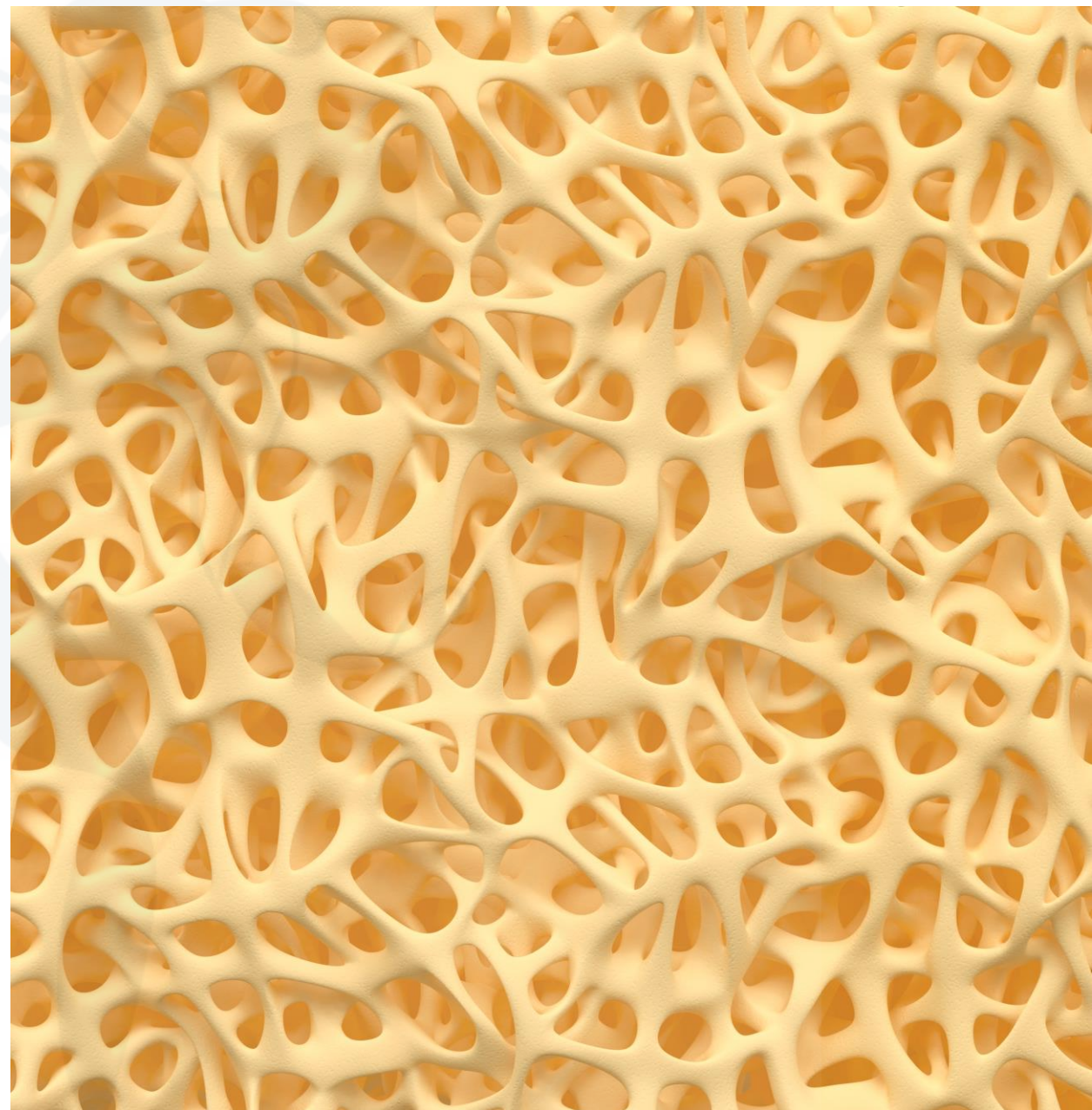
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(Burke & Deakin, 2010)

DEFICIENCIES IN PHYSICALLY ACTIVE

01.

Reduced intake



DEFICIENCY

(Burke & Deakin, 2010)

01. BARRIERS TO ADEQUATE INTAKE

↗ bad diet

A:

Missed meals
Eating on the run
Eating too little

B:

Fussy eaters
Limited food knowledge
& imagination

C:

Unable to translate
nutrient needs into
food choices

Do you feel like
you do any of
these things?
Tell me!



(Burke & Deakin, 2010)

DEFICIENCY

DEFICIENCIES IN PHYSICALLY ACTIVE

Reduced intake

01.

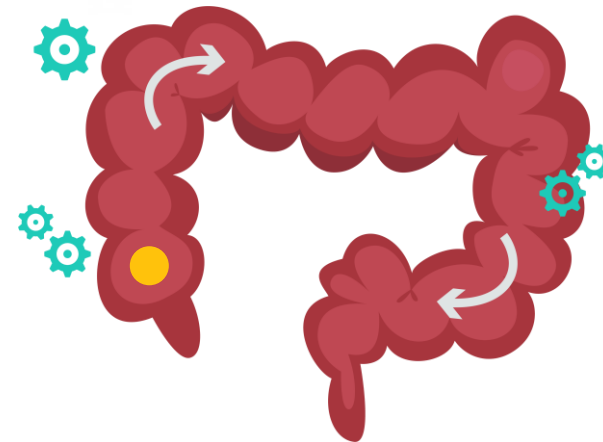
⋮

02.

Increased GIT
transit time



Reduced absorption



GIT = Gastrointestinal tract

(Burke & Deakin, 2010)

DEFICIENCIES IN PHYSICALLY ACTIVE



DEFICIENCY

Reduced intake

01.

⋮

02.

Reduced absorption

⋮

Increased losses

03.



Sweat, urine &
faeces

(Burke & Deakin, 2010)



DEFICIENCY

DEFICIENCIES IN PHYSICALLY ACTIVE

Reduced intake

01.

⋮

02.

Reduced absorption

⋮

Increased losses

03.

⋮

04.

Increased needs



Increased
energy
expenditure

(Burke & Deakin, 2010)



DEFICIENCIES IN PHYSICALLY ACTIVE

- Body composition
 - Not micronutrient status
 - Energy balance
- Micronutrient deficiency
 - Hidden hunger
- Rare
 - Not more common than untrained people
- Blood tests not always reliable
 - Check with your doctor

(Burke & Deakin, 2010)

WHICH FOODS PACK A BIG PUNCH?

- Nutrient density
 - Amount of beneficial nutrients in proportion to other properties (e.g. energy content/ weight)
 - Nutrient rich/ micronutrient dense
- Energy dense
 - Energy/ calories per gram of food
 - Lower energy density can help maintain your weight



**'Every time you eat, make it an opportunity to
nourish your body!' ~ Abby the Dietitian**

(nutrition.org.uk, n.d.)

FRUITS & VEG

RECOMMENDATIONS

- 5-a-day
 - ½ cup fruit (or 1 small whole fruit)
 - 1 cup raw/ ½ cup cooked vegetables
- Up to 10-a-day (600-800g)
 - Reduce CVD, cancer & all cause mortality
- Choose different colours
 - Different colours = different nutrients



(Mahan & Raymond, 2017, Aune et al, 2017)

| FRUITS | | | | | | | | | | VEGGIES | | | | | | | | | | | | | |
|-------------|---|---|---|---|---|-------------|---|---|---|---------|---|-----------------|---|---|---|---|---|---------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 |
| Apple | | | | | | Pawpaw | | | | | | Artichoke | | | | | | Onions | | | | | |
| Apricot | | | | | | Peach | | | | | | Asparagus | | | | | | Patty pans | | | | | |
| Banana | | | | | | Pear | | | | | | Baby marrow | | | | | | Peas | | | | | |
| Blueberries | | | | | | Pineapple | | | | | | Beetroot | | | | | | Pepperdew | | | | | |
| Cherries | | | | | | Plum | | | | | | Brinjal | | | | | | Pumpkin | | | | | |
| Cranberries | | | | | | Pomegranate | | | | | | Broccoli | | | | | | Radish | | | | | |
| Dates | | | | | | Prune | | | | | | Brussel sprouts | | | | | | Red pepper | | | | | |
| Dried fruit | | | | | | Raisins | | | | | | Butternut | | | | | | Rocket | | | | | |
| Figs | | | | | | Raspberry | | | | | | Cabbage | | | | | | Spinach | | | | | |
| Fruit salad | | | | | | Strawberry | | | | | | Carrots | | | | | | Snow peas | | | | | |
| Grapes | | | | | | Watermelon | | | | | | Cauliflower | | | | | | Spring onion | | | | | |
| Grapefruit | | | | | | | | | | | | Celery | | | | | | Sweet potato | | | | | |
| Guava | | | | | | | | | | | | Cucumber | | | | | | Tomato | | | | | |
| Kiwifruit | | | | | | | | | | | | Fennel | | | | | | Yellow pepper | | | | | |
| Litchi's | | | | | | | | | | | | Gem squash | | | | | | | | | | | |
| Melon | | | | | | | | | | | | Green beans | | | | | | | | | | | |
| Mango | | | | | | | | | | | | Green pepper | | | | | | | | | | | |
| Naartjies | | | | | | | | | | | | Leeks | | | | | | | | | | | |
| Nectarine | | | | | | | | | | | | Lettuce | | | | | | | | | | | |
| Orange | | | | | | | | | | | | Mushrooms | | | | | | | | | | | |

QUALITY & SAFETY

FRESH*

Vine ripened/post
harvest ripened

FROZEN*

Vine ripened &
blanched

CANNED*

Blanched & stored in
syrup/juice or brine

*Wash before use

HOW MANY PORTIONS OF FRUIT & VEG SHOULD YOU EAT PER DAY (MINIMUM)

A:

1-2 portions per day

B:

5-a-day

B:
5-a-day

C:

10-a-day



(Burke & Deakin, 2010)

FOOD FIRST approach:



**Create a plan
that covers
your bases**

2 Fruit, 3 Veg
Wholegrain
Lean proteins
Healthy fats



**Select suitable
snacks**



**Be a smart
shopper**

(Mahan & Raymond, 2017)

FOOD FIRST approach:



**Create a plan
that covers
your bases**



**Select suitable
snacks**

Choose 1-2 food
groups/ snack
Think about what you
like...



**Be a smart
shopper**

(Mahan & Raymond, 2017)

FOOD FIRST approach:



**Create a plan
that covers
your bases**



**Select suitable
snacks**



**Be a smart
shopper**

How much time do
you have &
What are your skills

(Mahan & Raymond, 2017)

| | | |
|-------------------------------------|---------------------------------|-----------------------------|
| FRUIT | HIGH FIBRE STARCHES | Canned: |
| Fresh | Rye/ Low GI bread | Tomato and onion |
| Pre-cut | Corncakes | Ratatouille |
| Frozen (berries etc) | Low fat wholegrain crackers | |
| | | |
| VEG | Oats- rolled/ steelcut | DRINKS |
| Fresh | Oat bran | Herbal tea |
| Frozen | Bran flakes | Regular tea |
| Microwave | | Coffee (regular/ decaf) |
| Pre-cut (stir fry and soup) | | Cocoa |
| | Brown/ wild rice | Low calorie cordial |
| | Quinoa (red/ white) | |
| PROTEINS | Pearled barley | FLAVOURING |
| White fish | Pearled wheat | Soy sauce (gluten)/ Tamari |
| Salmon (smoked/ fresh) | Bulgur wheat | Vinegar (balsamic/ regular) |
| Trout (smoked/ fresh) | Baby potato/ sweet potato | Hot sauce |
| Mackerel (smoked/ tinned) | | Mustard |
| Canned: | Canned: | Pickles |
| Tuna/ salmon | Corn (tinned/ frozen/ fresh) | Jalapeno |
| Sardines | Chickpeas (tinned/ dried) | |
| Pilchards | Lentils (tinned/ dried) | HERBS & SPICES |
| Chicken breast (skinless)/ stir fry | Beans (any) | Salt |
| | | Pepper |
| Extra lean mince (beef/ lamb) | HEALTHY FATS | Garlic |
| Fillet/ rump/ stir fry | Olive/ Avo oil | Ginger |
| Lean chops (lamb/ pork) | Olives | Chilli |
| Ostrich (fillet/ burger) | Avo | Cinnamon |
| | Pesto | Vanilla |
| Eggs | Tapenade | Fresh/ dried herbs |
| | Hummus (reduced fat) | |
| DAIRY | Salad dressing (any) | OTHER |
| Milk (low fat/ fat free/ other) | Mayo, lite or regular | Bicarbonate of soda |
| Yogurt (plain) | Nut butter (peanut/ almond etc) | Baking powder |
| Low fat cottage cheese | Seeds (sunflower/ pumpkin etc) | |
| Reduced fat feta | | |

- Wholegrains & high fibre starches
- Variety of fruits and vegetables
- Lean proteins
- Minimally processed fats

FOOD FIRST approach:



Create a plan
that covers
your bases



Select suitable
snacks



Be a smart
shopper

What are **YOUR**
barriers to the
food first
approach?



(Mahan & Raymond, 2017)

ARE
**FROZEN FRUIT &
VEGETABLES**
**AS NUTRITIOUS AS
FRESH?**

A

Yes

B

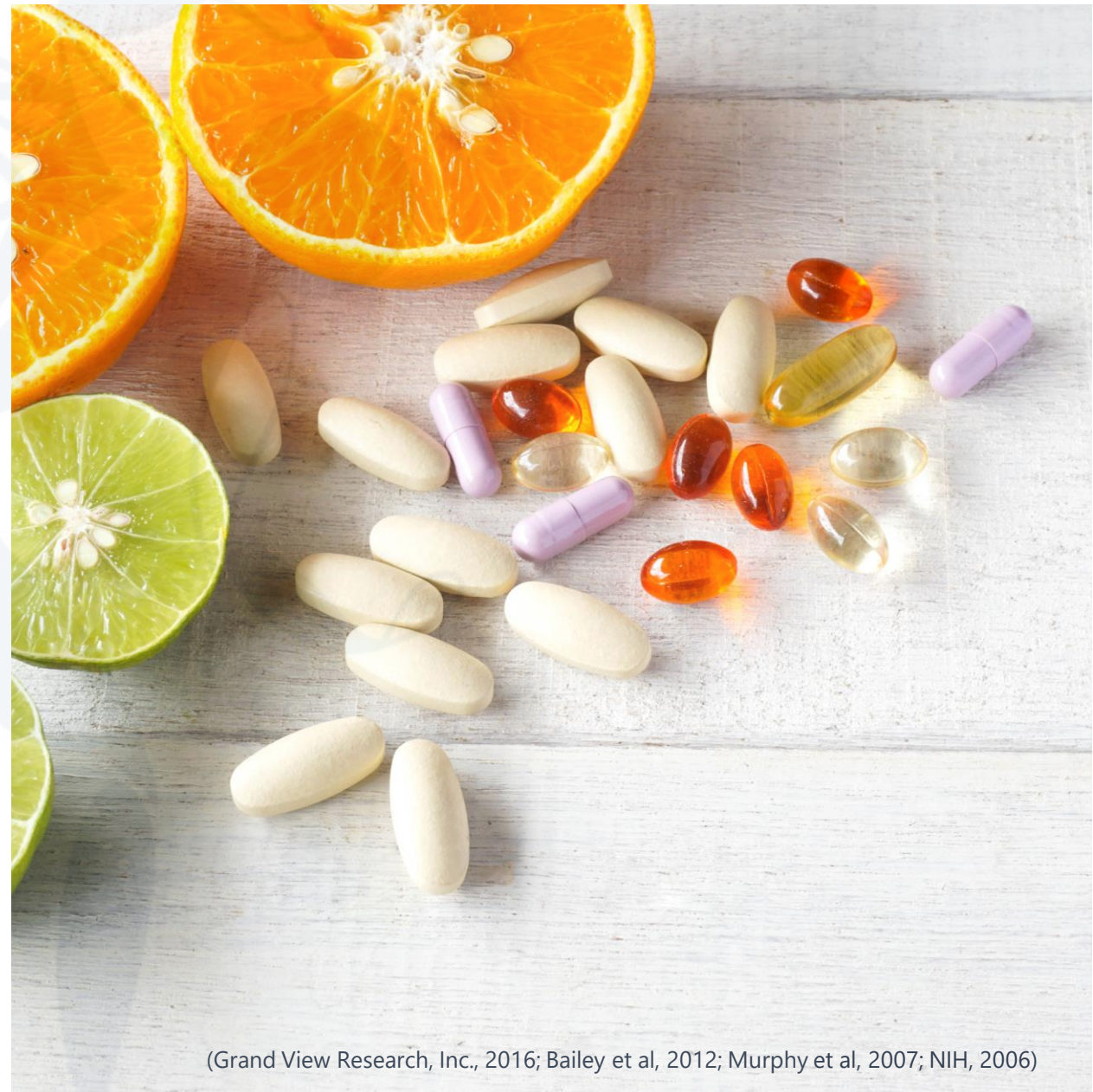
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Q&A

CLOSE

THE MN GAP

- Multivitamin (MVT)
 - < 2-3 x RDA (low dose)
 - Improves MN status
 - Not translated into reduction of disease
- Food matrix > benefits
- Single nutrient
 - Short term
 - Higher dosage for rapid recovery



(Grand View Research, Inc., 2016; Bailey et al, 2012; Murphy et al, 2007; NIH, 2006)

FORTIFIED FOODS

- Replaced nutrients lost in processing
 - Usually in larger amounts
- Artificial nutrition
 - 'Added' to the food
- Sports foods & supplements
 - 50 - 100% of MN RDA



MN = Micronutrient RDA = Recommended Daily Allowance

(Erdman et al, 2007; Tsitsimpikou et al, 2009)

DISADVANTAGES OF SUPPLEMENT USE



Cost



Safety



Poor quality control



Risk of the containing a
banned substance



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**Risk of the containing
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DANGERS OF SUPPLEMENTS

- You may be tempted to mega-dose on vitamins & minerals
 - Thinking it will give you a performance boost
- **Will not help your performance**
- Can cause harm:
 - Increasing risk for toxicity (especially with fat soluble vitamins)
 - Interfering with absorption & function of other micronutrients/ medications

(Burke & Deakin, 2010)

SUPPLEMENTS

COMMONLY USED

- Vitamin C, B-vitamins, vitamin E & iron
- **Rationale:** Enhance recovery & improve sports performance & reduce exercise induced tissue damage
- **MN actually needed:** Iron, calcium & vitamin D



(Burke & Deakin, 2010)

VITAMIN D

- RDA: 600IU/ d
- Technically not a vitamin- is a hormone
- Essential fat-soluble vitamin
- Deficiency affects many body systems
- No consensus on adequate levels
- Supplementation dose
 - Depends on UVB exposure & skin type

(Maughan et al., 2018, He et al., 2016; Heaney, 2008)



IRON

- Most common nutrient deficiency in athletes
- RDA: 8 – 18mg/ d
 - Limited iron intake, poor bioavailability, inadequate energy intake
 - Additional iron needs: Rapid growth, high altitude training, foot –strike hemolysis or excess losses
- Deficiency = debilitating effects
- Supplementation usually needed

(Maughan et al., 2018; Thomas et al., 2016; Haas & Brownlie, 2001; Celsing, 2989; Gardner et al, 19079; Bothwell et al, 1979)

CALCIUM

- RDA: 1000mg/ d
- Muscle & nerve conduction
- Causes of deficiency:
 - Avoidance of dairy products &
 - Restricted energy intake
 - Disordered eating
- No appropriate intake of calcium status

(Maughan et al., 2018; Thomas et al, 2016)



CA SUPPLEMENT

- Citrate & carbonate
- To take carbonate with food
 - Without increases risk for heartburn
- Limit to approx. 500mg/ dose

(Burke & Deakin, 2010)



ZINC

& colds/ flu

- Zinc is an important immune regulating MN
 - May have anti-viral effects
 - May correct a subclinical deficiency
- Zinc lozenges (taken as you start feeling sick)
 - May decrease the severity & duration of your illness

(Pennutrition, 2019)



S

'Can't out train or out supplement a bad diet...' ~ Abby the Dietitian

SUMMARY

- Micronutrients are nutrients needed in small quantities for optimal health
- They perform multiple functions in the body and although they are non-caloric help turn food into energy
- An athletes requirement are not vastly different from the general population
- Quantity and variety of fresh fruits & vegetables is important
- Certain supplements may be needed in active people (like vitamin D, iron & calcium) but only when necessary (not in excess)