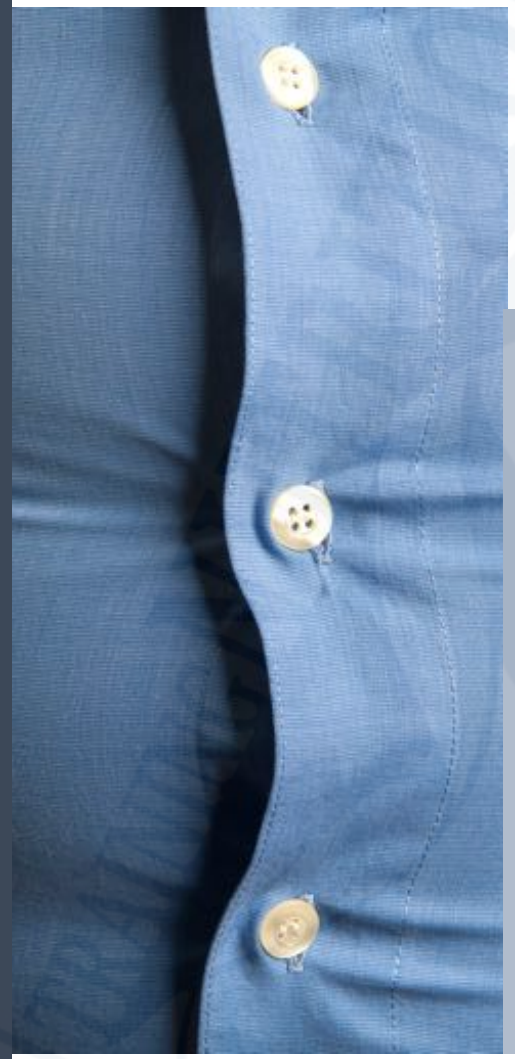
FATS

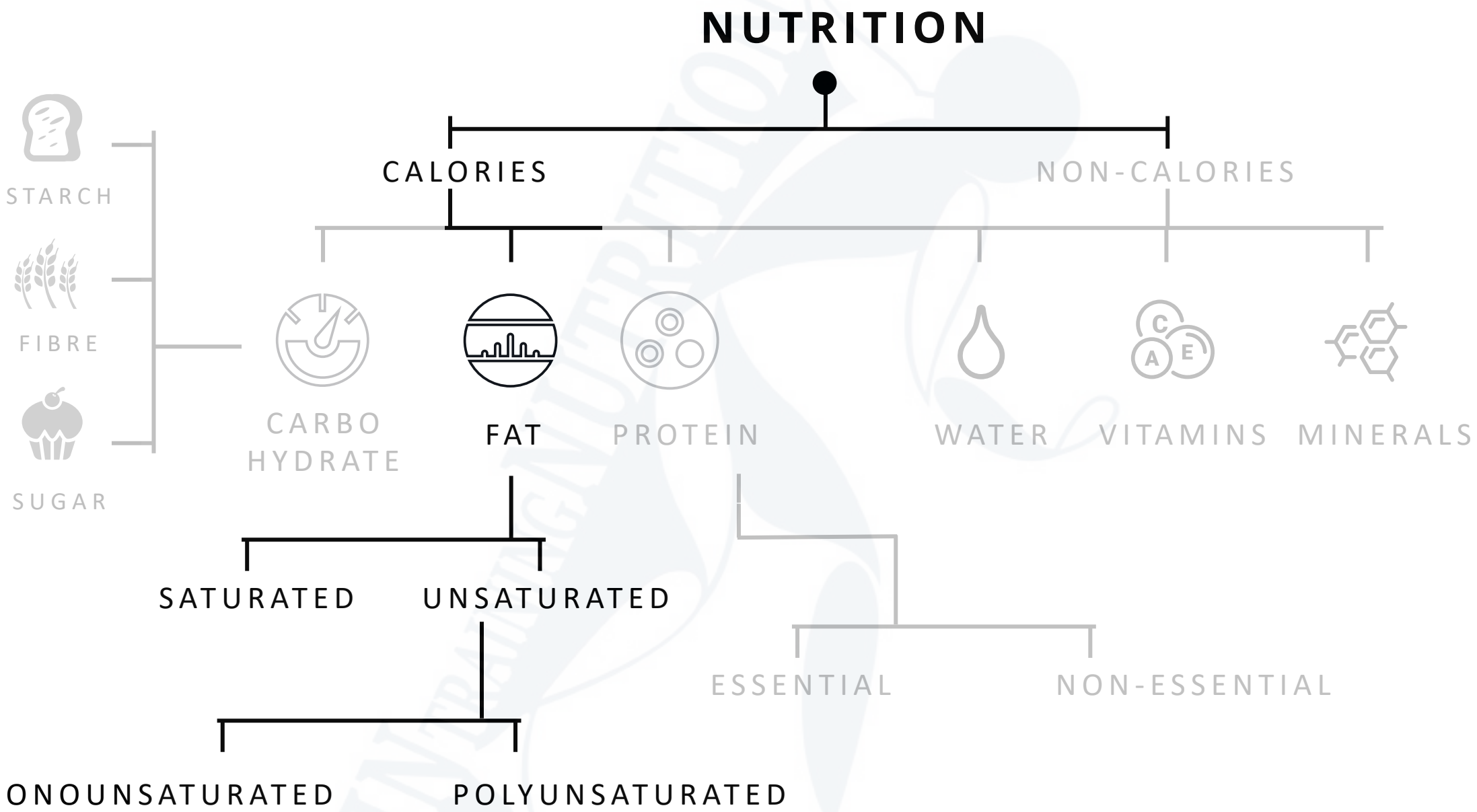
Secret slow fuel

DID YOU KNOW

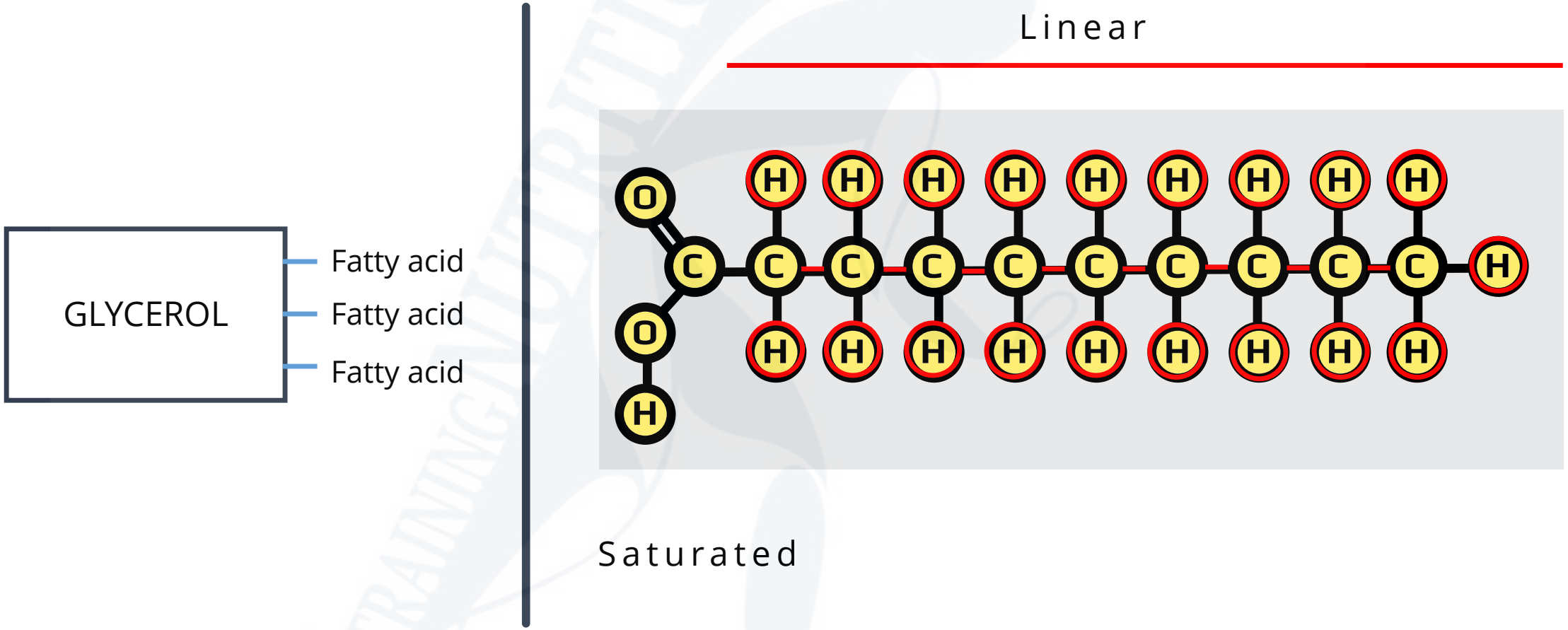


When you ‘burn’ fat it leaves your body through your sweat, urine and as carbon-dioxide (when you breathe out)!

(health.clevelandclinic.org)



STRUCTURE OF SATURATED FATS



(Mahan & Raymond, 2017)

SATURATED

FATS

- Physical features:
  - Solid at room temperature
  - High melting point
- Mostly animal fats
  - Butter, poultry skin, fat on the meat
- Some plant fats
  - Coconut & palm oil

(Mahan & Raymond, 2017)

HEALTH

& SATURATED FATS

Certain saturated fats raise

LDL* cholesterol:

*Low density lipoprotein

- Long term effects:
  - Currently unknown
  - Rather consume moderately (<10%)
  - Replace saturated fats with unsaturated fats

(Mahan & Raymond, 2017)

COCONUT

OIL

- Not all coconut oil created equal
  - Virgin vs refined
- Health benefits stem from **MCT** studies

(Mahan & Raymond, 2017)

COCONUT

OIL

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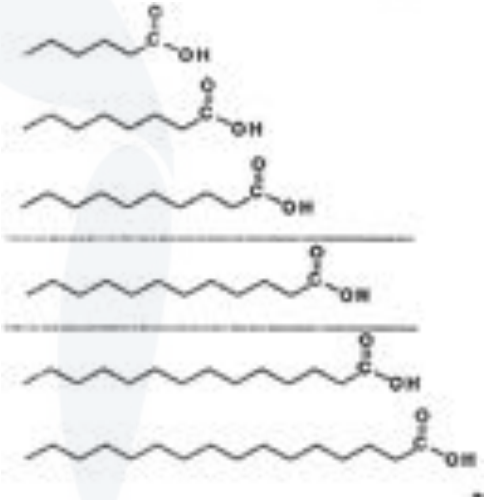


- Short chain fatty acids (SCFA)
- Medium chain fatty acids (MCT)
- Long chain fatty acids (LCT)

(Mahan & Raymond, 2017)

COCONUT

OIL

- Not all coconut oil created equal
  - Virgin vs refined
- Health benefits stem from **MCT** studies
- Increases LDL cholesterol
  - More than monounsaturated fats
  - Less than other saturated fats (like butter)
- Coconut oil & decrease in waist circumference

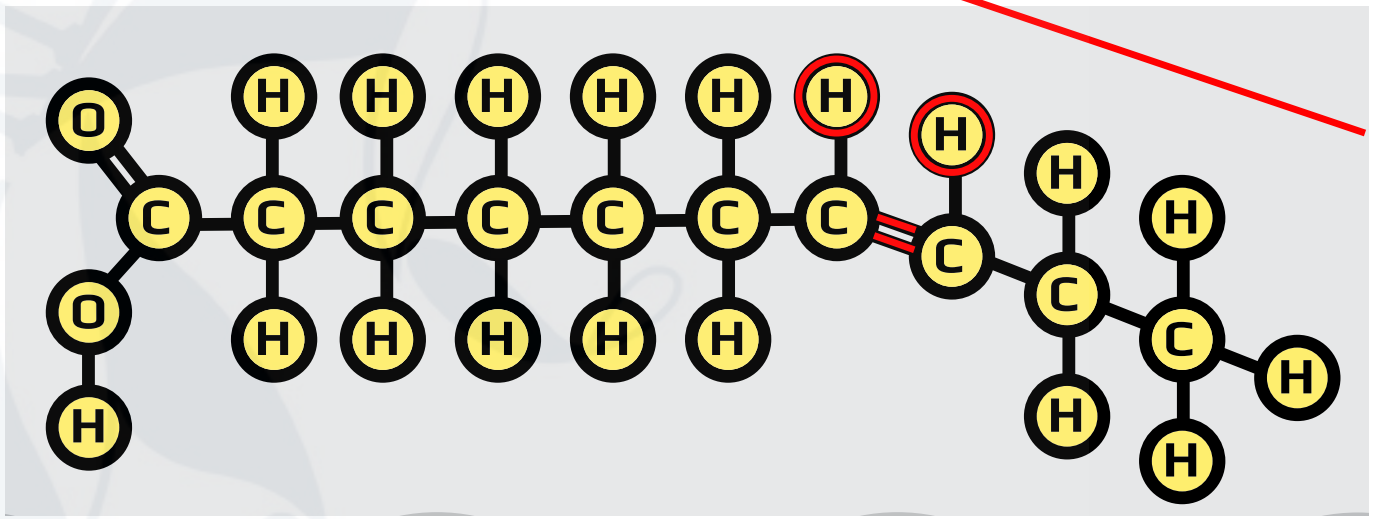
(Mahan & Raymond, 2017)

STRUCTURE OF UNSATURATED FATS

GLYCEROL

- Fatty acid
- Fatty acid
- Fatty acid

Kinked



Unsaturated
- Mono-unsaturated (one)
- Poly-unsaturated (many)

(Mahan & Raymond, 2017)

POLY-UNSATURATED

FATS (PUFA)

- Mostly fish, nuts & seeds
- Decrease heart disease risk
  - Anti-inflammatory
- Source of essential fatty acids (EFAs)

(Mahan & Raymond, 2017)

ESSENTIAL

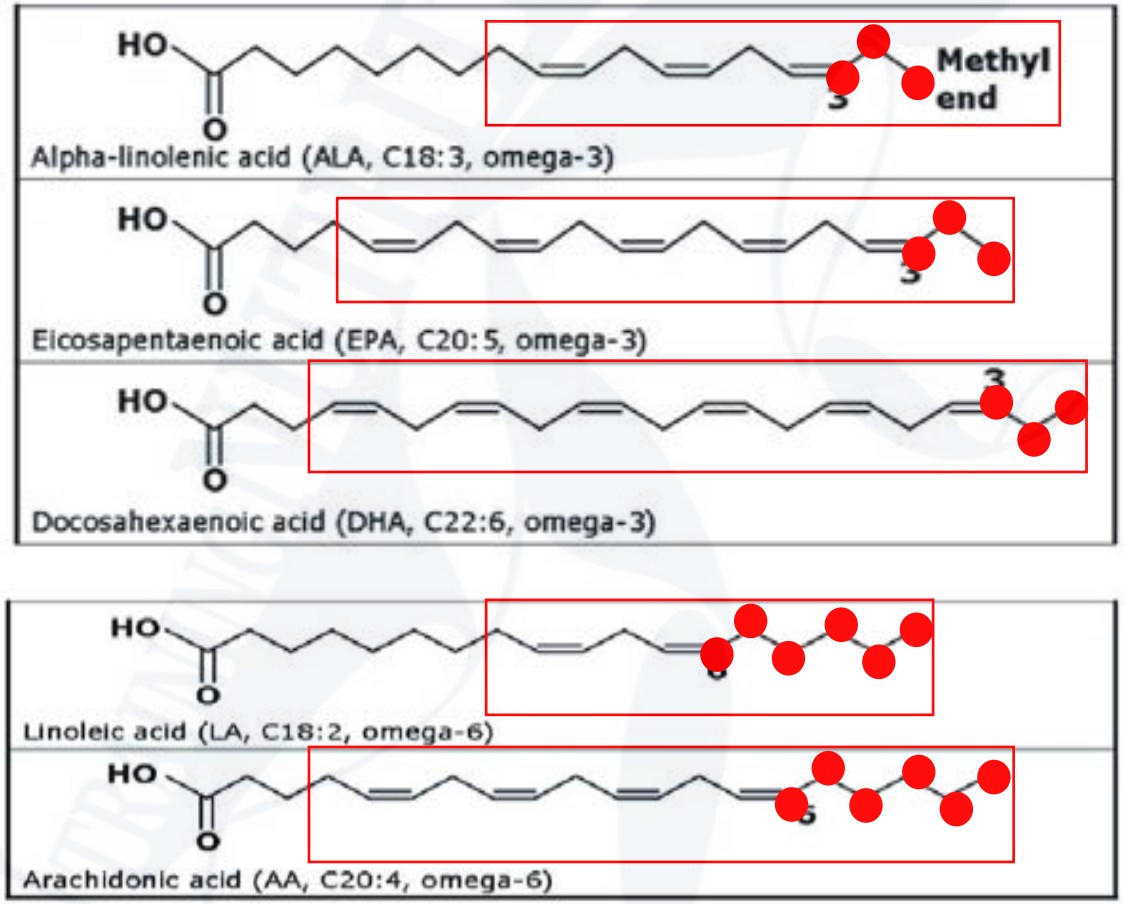
FATTY ACIDS

- Cannot make these intrinsically
  - Must consume in the diet
- Omega 3
  - Eicosapentaenoic acid (EPA)
  - Docosahexaenoic acid (DHA)
  - Alpha-linolenic acid (ALA)
- Omega 6

(Mahan & Raymond, 2017

STRUCTURE OF UNSATURATED FATS

- Unsaturated
- Poly-unsaturated



- Omega 3
- Omega 6

(Mahan & Raymond, 2017)

ESSENTIAL

FATTY ACIDS EXAMPLES

- EPA & DHA
  - Cold water fish & algae
    - Choose low mercury options
  - Caviar & brains
- ALA
  - Seeds & nuts & tofu
    - Flaxseed/ linseed, chia seed
    - Walnuts, almond

(Mahan & Raymond, 2017

Omega 3 status

- Anti-inflammatory
- Decrease cholesterol (particularly triglycerides)
- Neuro and heart protective
- Accelerated recovery from traumatic brain injury (TBI) & concussion
- Supplemental omega 3
  - Inflammatory stage after injury
  - Especially when diet is deficient

(Mahan & Raymond, 2017

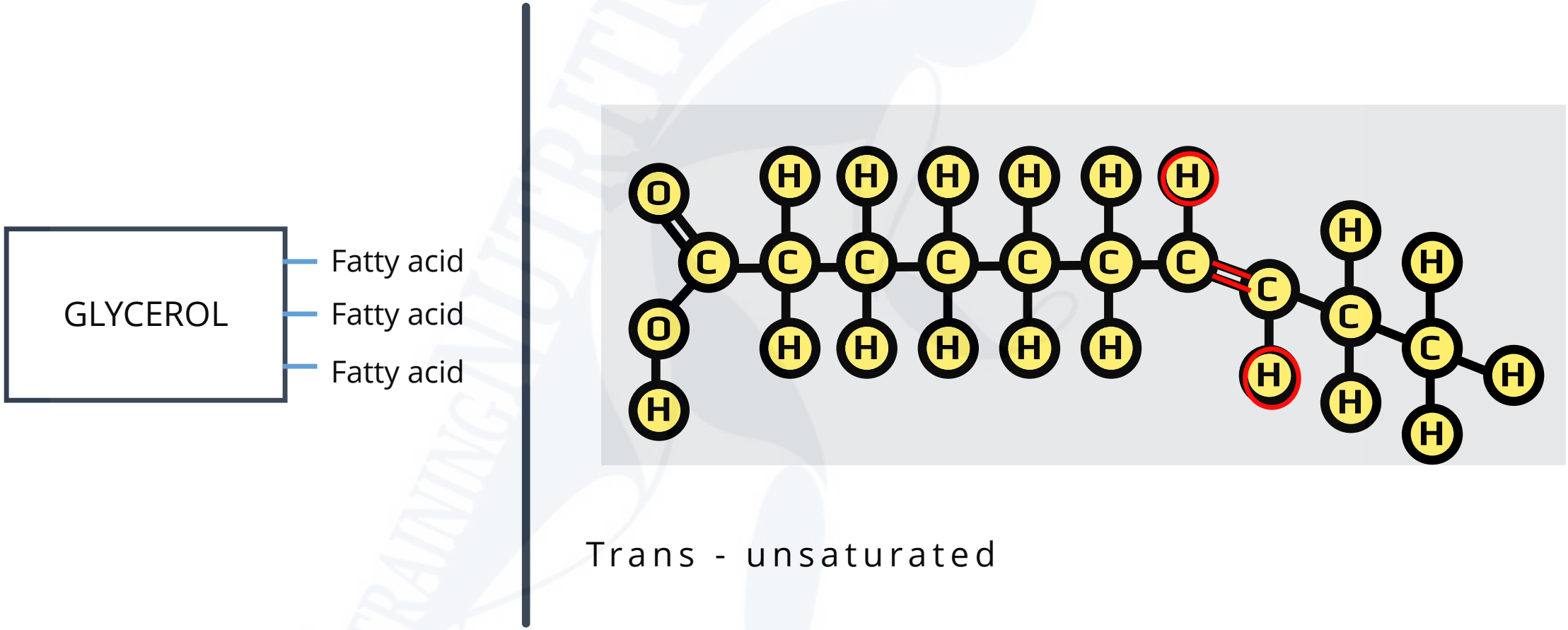
MONO-UNSATURATED

FATS (MUFA)

- Mostly plant fats
  - Avocado, olives, canola, nuts & seeds
- Heart health
  - Less than with PUFA, but still beneficial
  - Lower total cholesterol, LDL & lower triglycerides

(Mahan & Raymond, 2017)

STRUCTURE OF TRANS FATS



(Mahan & Raymond, 2017)

TRANS

FATS (UNSATURATED)

- Physical features:
  - Solid at room temperature
  - Higher melting point
- Natural:
  - Beef, lamb & dairy
- Artificial/ man-made:
  - Hydrogenated

(Mahan & Raymond, 2017)

HEALTH

EFFECTS & EXERCISE

- Stress to muscle leads to inflammation, bruising & tissue breakdown
- Inflammation = scar tissue, poor mobility & delayed recovery time

Trans fat, saturated fat & omega 6 vegetable oils: Pro-inflammatory

MUFA & omega 3 PUFA

- Reduce inflammation & promote healing
- Reduce post-exercise delayed onset muscle soreness

(Mahan & Raymond, 2017)

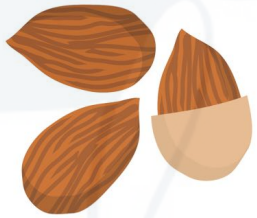
Additional info…

- Be aware of the smoke point of fats and oils when cooking
  - If it smokes, it is too hot and has degraded
- Choose minimally processed fats & oils
  - Mostly plant based
  - Avoid man-made trans fats
  - Replace saturated with unsaturated fats

(Mahan & Raymond, 2017)

FAT SUBSTITUTIONS

+



= **Healthier!**

+

= **Not healthy**

(Mahan & Raymond, 2017)

FAT SUBSTITUTIONS

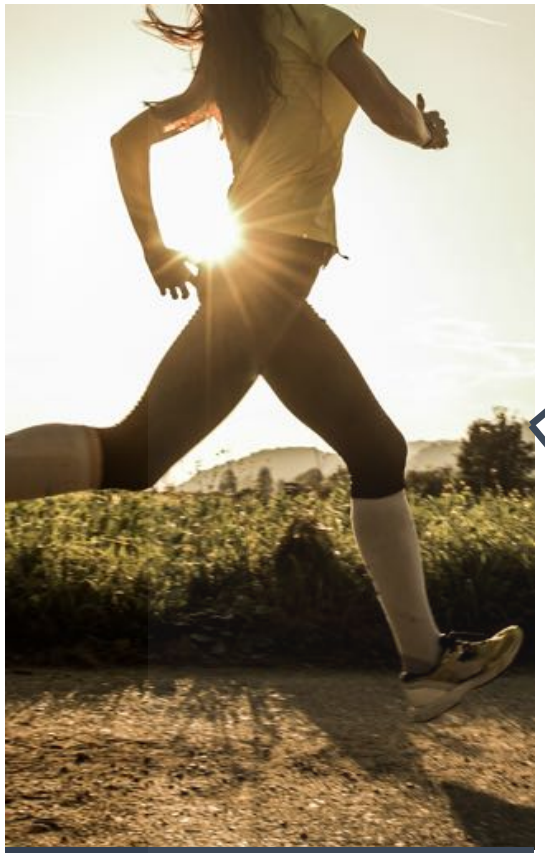

+


+


+

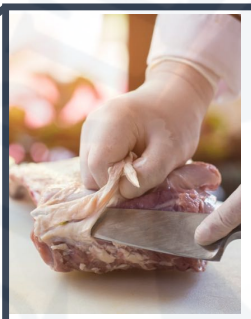

(Sun.ac.za, 2019; Mahan and Raymond, 2017)

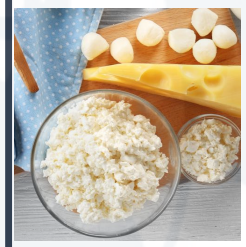
FUNCTIONS OF FATS



ENERGY

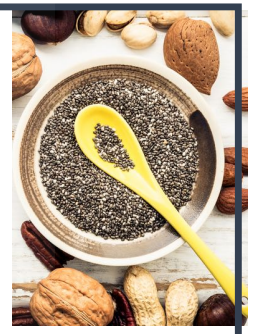
9kCal/g

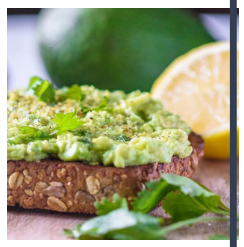




SATURATED

9kCal/g

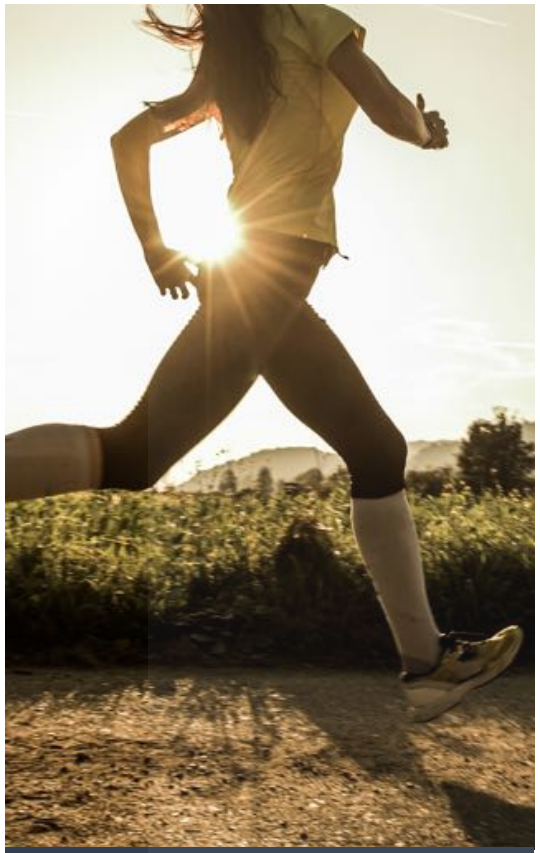




UNSATURATED

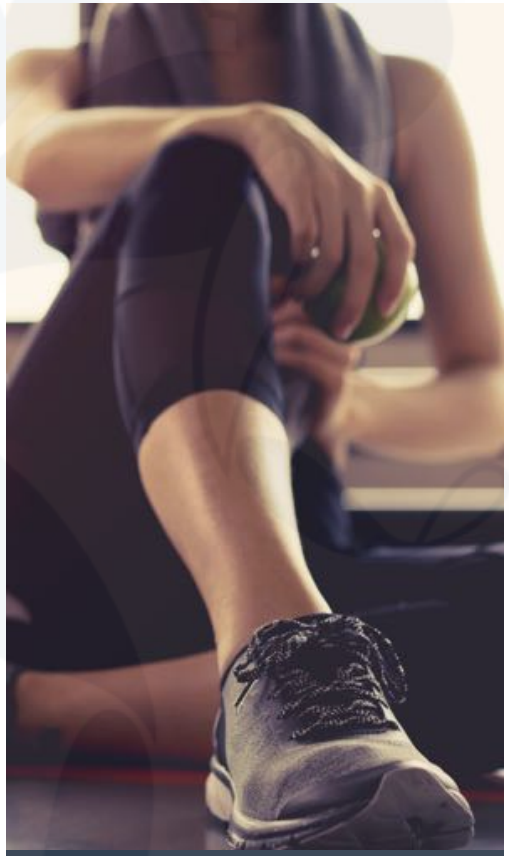
(Mahan & Raymond, 2017)

FUNCTIONS OF FATS



ENERGY

TRANSPORT OF VITAMINS



HORMONE & CELL MEMBRANE

NERVOUS SYSTEM & EFA*

*Essential Fatty Acids

(Mahan & Raymond, 2017)

Dietary fat

RECOMMENDATIONS

- Intake by athletes and exercisers
  - **Same as public health guidelines**
  - Individualised based on training level & body composition goals

- BOTTOM LINE:
  - **20 – 35% of total energy**
  - **0.5 – 1.5g/kg/d**

(Mahan & Raymond, 2017; Thomas, 2016; Coach.ca, 2019)

EXAMPLE

EXERCISER

- **Weight:** 65kg (BMI: 21.7kg.m2)

- **Energy:** 25 - 35 x 65 = 1625 - 2275kCal/ d
- **CHO:** 3 – 5 x 65 = 195– 325g/d
- **Fat: 20 – 35%**

EXAMPLE

EXERCISER

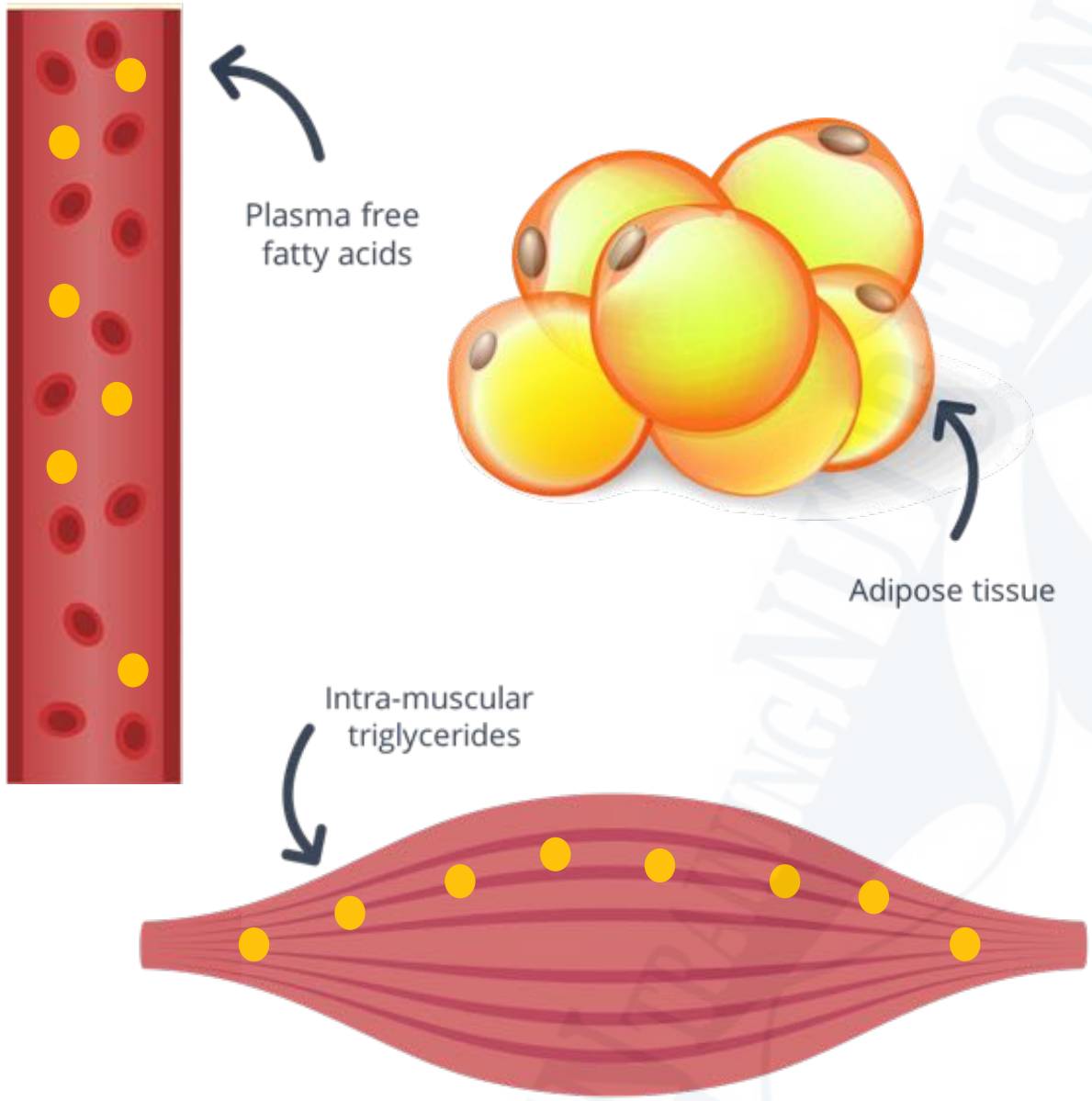
- **Fat: 20 – 35%**

= (**20** x **1625**)/ 100
= 325kCal
= **36.1g**

= (**20** x **2275**)/100
= 455kCal
= **50.5g**

= (**35** x **1625**)/ 100
= 568.75kCal
= **63.2g**

= (**35** x **2275**)/100
= 796.25kCal
= **88.5g**



STORAGE

OF FAT (adipose tissue)

Food = Energy (ATP)

- Can't have a continual source of food
- We must store it

1. Carbohydrates – Glycogen – Liver & muscle
2. Proteins – Muscle tissue
3. **Fats – Adipose tissue & a little in the muscle**

(Mahan & Raymond, 2017)

GLUCONEOGENESIS

An excess intake of any nutrient will be converted into fat

- Glucose (CHO), amino acids (protein) and fatty acids (fats)
  - Converted to triglycerides = stored as adipose

Weight loss through exercise:

- If muscle & liver stores run low
- Fat stores are used to replenish them
  - Direct access in endurance activity

INTEREST

IN FAT FOR EXERCISE

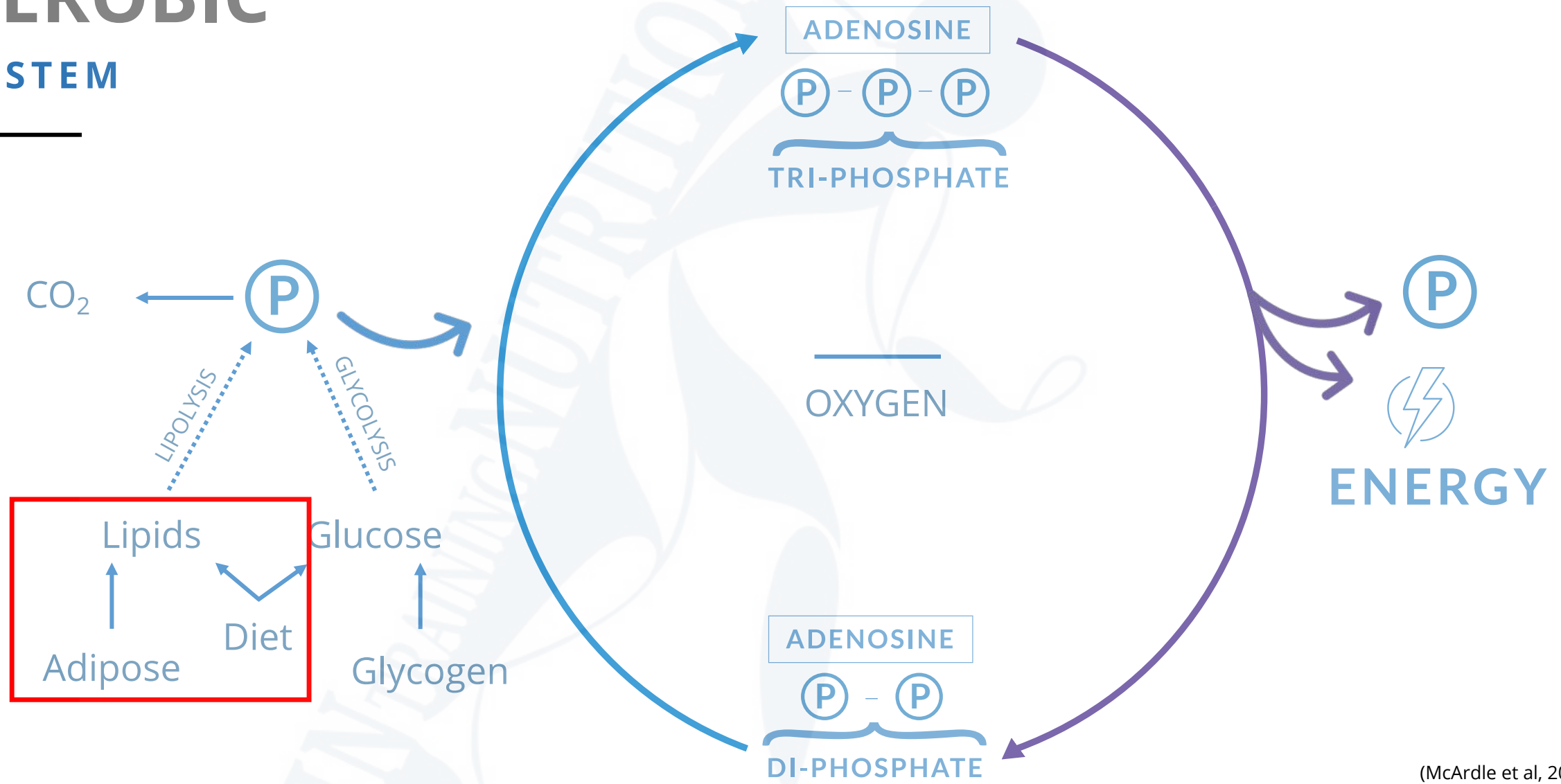
- Total glycogen stores
  - 2600kCal
- Fat stores are exponentially more
  - 1lb (2.2kg) body fat = 3500kCal
  - e.g. 163lb (74kg) with 10% body fat

  = 16.3lb (7.4kg) fat = 57 000kCal
- Huge interest on how to tap into fat stores
  - Especially for endurance exercise

(Mahan & Raymond, 2017, Burke & Deakin, 2011)

AEROBIC

SYSTEM



(McArdle et al, 2013)

LIMITATIONS

FOR FATS AS EXERCISE FUEL

- Exercise duration & intensity determine rate of fat oxidation
  - Fat oxidation rates decline when intensity is high
- CHO more energy efficient
  - Provides more ATP
  - For the same amount of oxygen

(Volek et al, 2014; Yeo et al, 2011)

HIGH FAT

DIET & EXERCISE

- May consume fewer calories from CHO:
  - Detrimental to short term performance
    - May impair high intensity workouts
  - Even when followed by CHO loading
    - Reduced CHO availability & capacity to use CHO as an exercise substrate
- HFLC diet unwise for most athletes
  - Endurance athlete's?
- HFLC = HC diet at moderate intensities

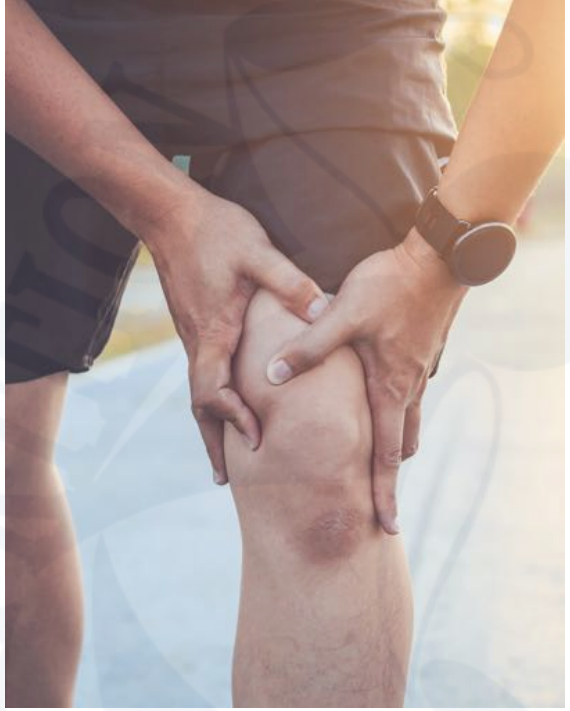
*HFLC = High fat, low carb; HC = High carb

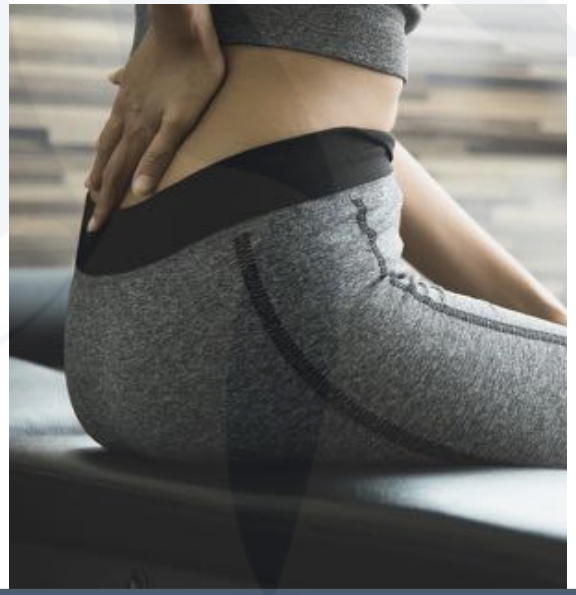
(Stellingwerff, 2006; Thomas et al, 2016)

HIGH FAT

DIET & EXERCISE

- High fat diets have frequently been associated with:
  - Lethargy
  - Fatigue
  - Increased rating of perceived exertion
  - Lower exercise tolerance





(Pennutrition, 2017)

LOW FAT

DIET & EXERCISE

- Effort to lose body weight/ improve body composition
  - < 20% is not advised
  - Reduced dietary variety
  - Especially fat soluble vitamins & essential fatty acids (especially omega 3)
- Low fat for short periods of time for specific reasons
  - Pre-event meal
  - Carbo-loading
  - GIT comfort

(IOM, 2005; Thomas et al, 2016)

HOW TO INCREASE FAT BURNING:

FASTING

> 6 hours before workout

PRE-WORKOUT FAT INTAKE

High carb before = more glycogen

High fat before = more fat oxidised

DURATION & INTENSITY

High intensity = Less fat oxidation

Running vs cycling

(Spriet, 2014; Mahan & Raymond, 2017, Stellingwerff et al)

RANGES OF NORMAL BODY FAT %

Body fat standard	Males	Females
Lowest reference body fat for **ADULTS**	5%	12%
Lowest reference body fat for **ADOLESCENTS**	7%	14%
Healthy body fat ranges	10 – 22%	20 – 32%

(Mahan & Raymond, 2017)

SUMMARY

- The structure of fat determines its classification
- Different structures have different physical and health properties
- The right fats can decrease inflammation
- Fat recommendations are same as the general population
- High fat diets are not encouraged as it may reduce capacity to train at higher intensities
- Very low fat diet are also not recommended
- There are various ways to increase fat burning
- Healthy body fat depends on age & gender