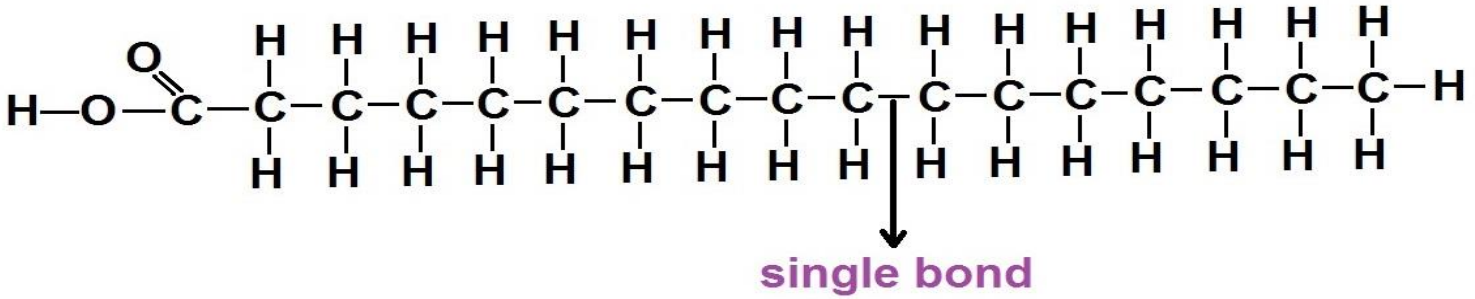
Lecture 91:

Omega Fatty Acids

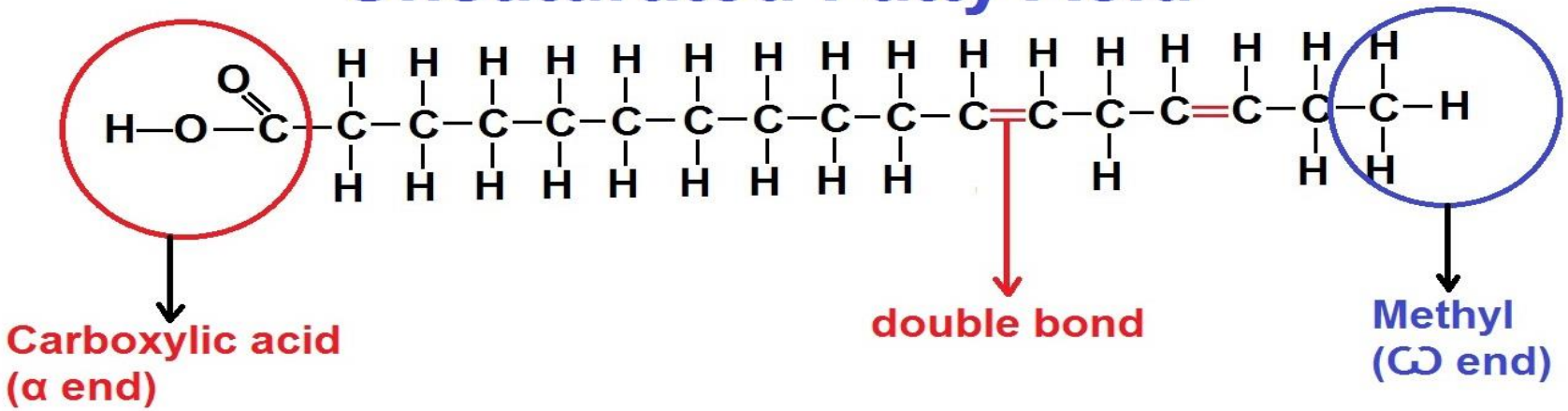
Copyright Protection:

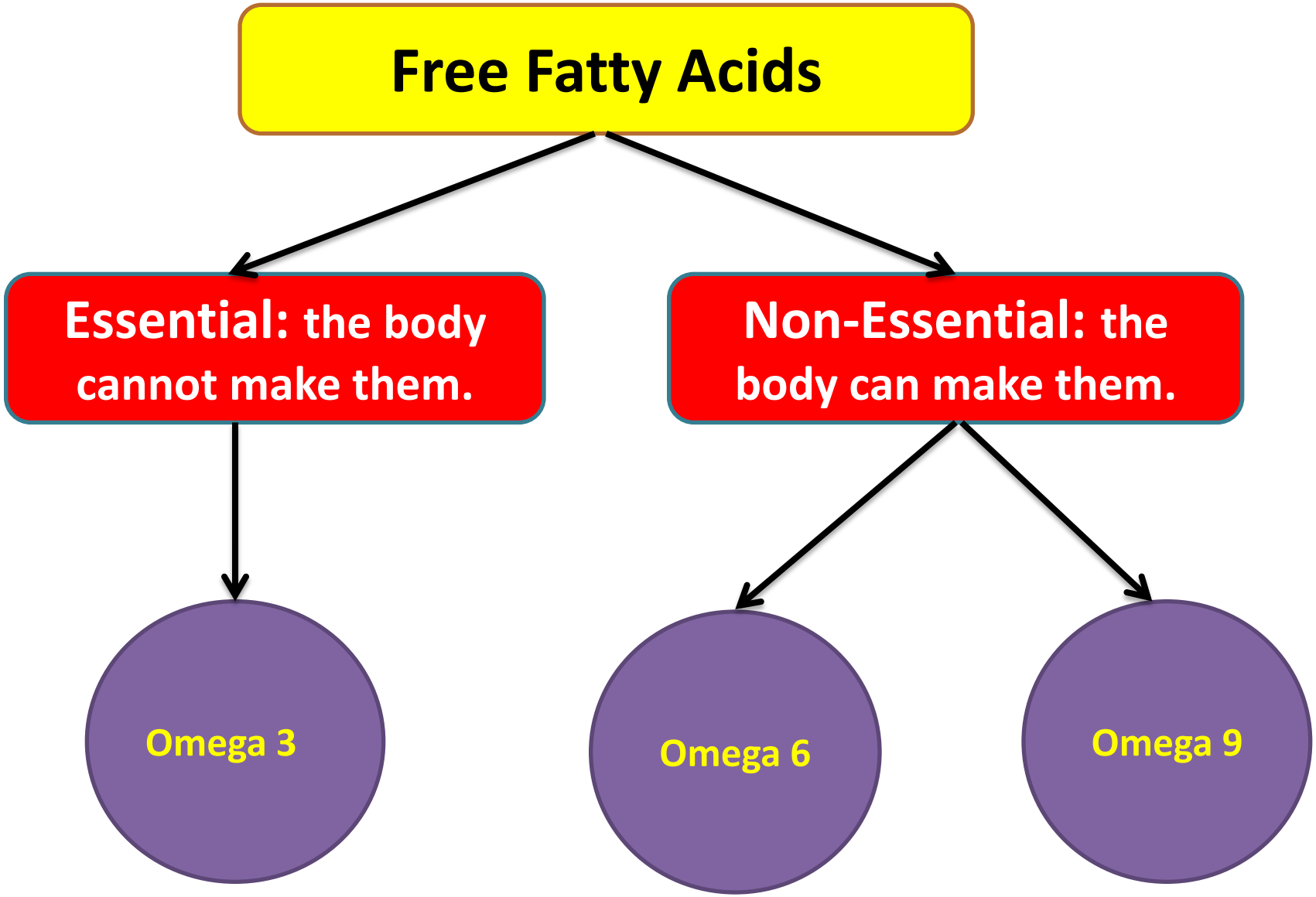
Fatty Acid Structures:

Saturated Fatty Acid



Unsaturated Fatty Acid




Free Fatty Acids
Essential: the body cannot make them.
Non-Essential: the body can make them.
Omega 3
Omega 6
Omega 9

Free Fatty Acids:

Omega-3	Omega - 6	Omega - 9
- Alpha-linolenicAcid (ALA) - Eicosapentaenoic Acid (EPA) - Docosahexaenoic Acid (DHA)	- Linoleic Acid (LA) - Dihomo Gamma Linolenic Acid (DGLA) - Arachidonic Acid (AA) - Gamma Linolenic Acid (GLA) - Adrenic Acid	- Oleic Acid - Erucic Acid - Elaidic Acid - Nervonic Acid

Free fatty acids have:

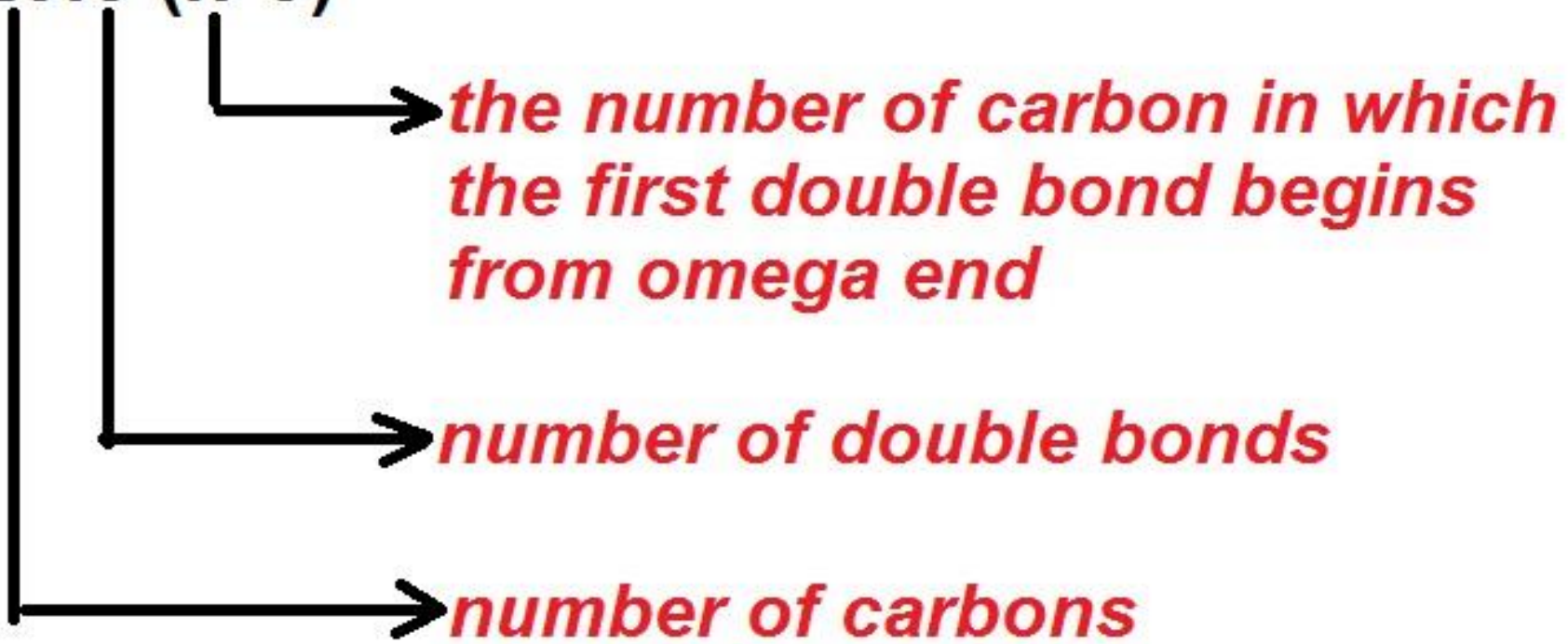
- **Common names**
- **Lipid names.**
- **Chemical names.**

Common name	Lipid name	Chemical name
Eicosapentaenoic acid (EPA)	20: 5 (*n*-3)	*all-cis*-5,8,11,14,17-eicosapentaenoic acid

Eicosapentaenoic acid (EPA)

***all-cis*-5,8,11,14,17-eicosapentaenoic acid**

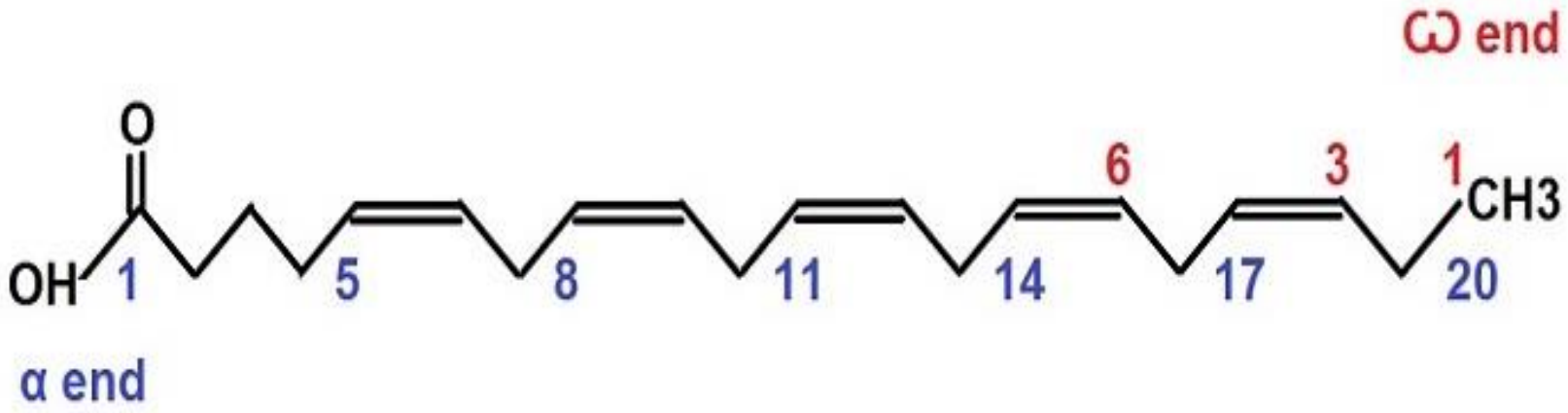
20:5 (*n*-3)



Eicosapentaenoic acid (EPA)

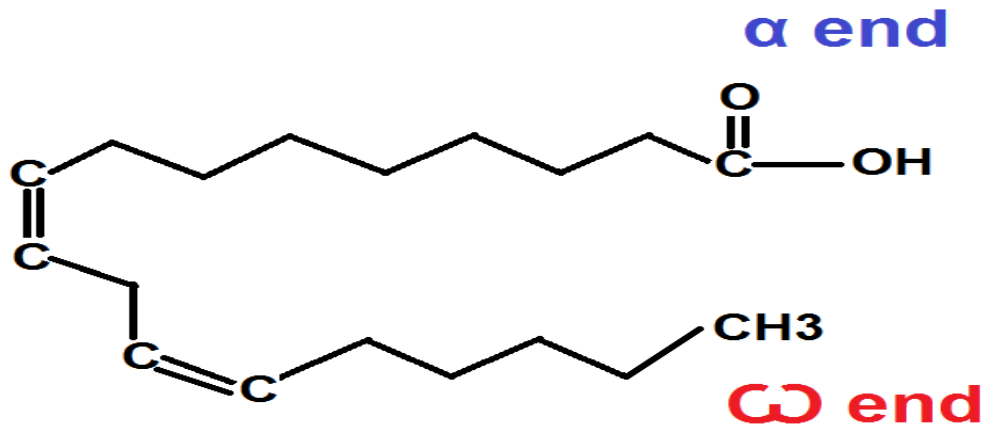
all-cis-5,8,11,14,17-eicosapentaenoic acid

20:5 (*n*-3)



18:2 (*n*–6)

Linoleic acid (LA)



Linoleic Acid (LA)

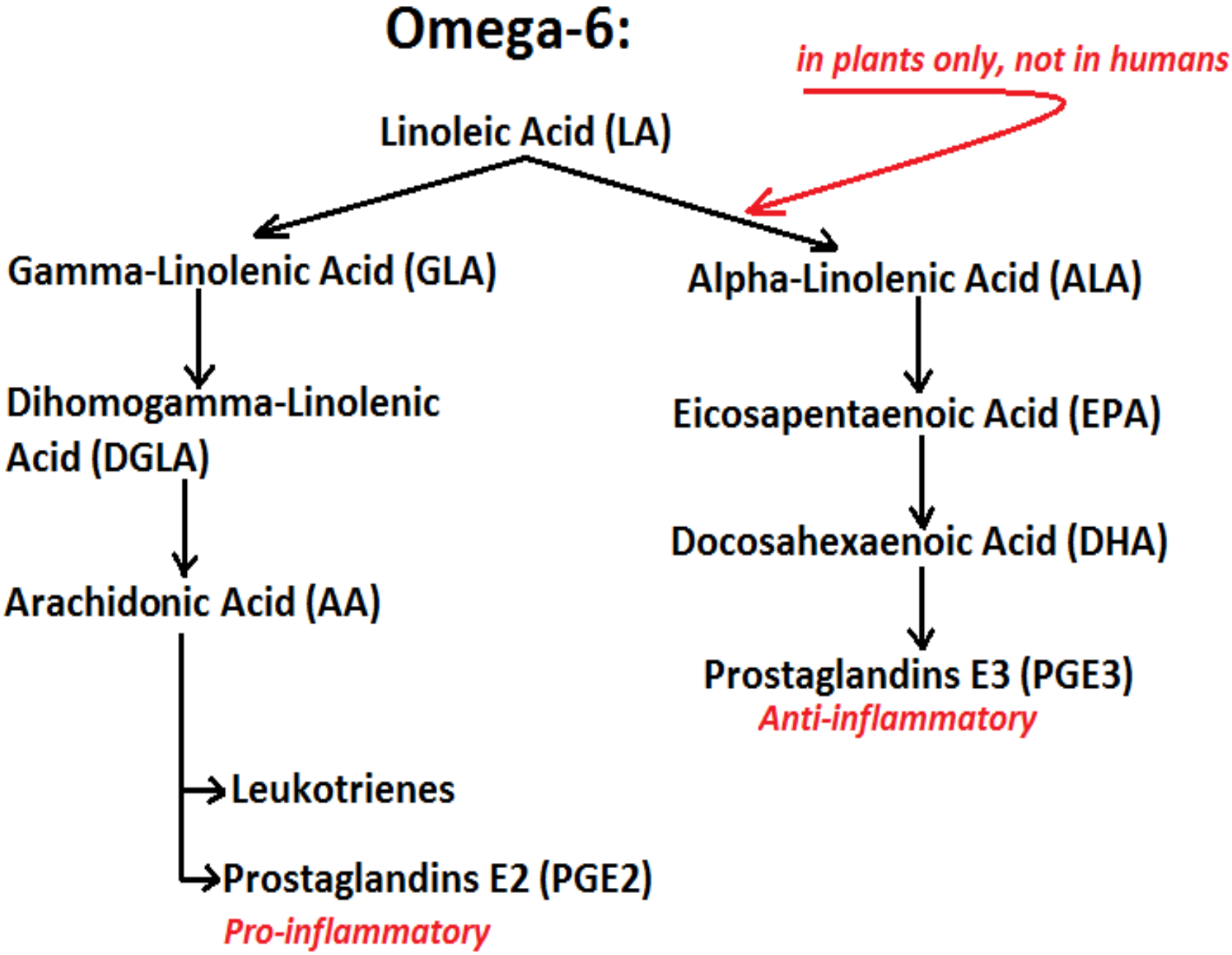
Omega- 9 Fatty Acids:

The two common Omega-9 fatty acids are:

- **Oleic acid: from olive oil and macadamia oil.**
- **Erucic acid: from rapeseed and mustard seeds.**

Omega- 6 Fatty Acids:

Linoleic Acid	Gamma – Linolenic Acid	Arachidonic Acid
Safflower oil Sunflower oil Sesame oil Grapeseed oil	Borage oil Evening primrose oil Black currant oil Human milk	Egg yolk Beef fat


Omega-6:
in plants only, not in humans
Linoleic Acid (LA)
Gamma-Linolenic Acid (GLA)
Alpha-Linolenic Acid (ALA)
Dihomogamma-Linolenic Acid (DGLA)
Eicosapentaenoic Acid (EPA)
Arachidonic Acid (AA)
Docosahexaenoic Acid (DHA)
Prostaglandins E3 (PGE3)
Anti-inflammatory
Leukotrienes
Prostaglandins E2 (PGE2)
Pro-inflammatory

Omega- 3 Fatty Acids:

As a sports nutrition advisor, you should be able to answer the following questions:

1) **What are Omega – 3 fatty acids?**
2) **How many types of Omega -3 are there?**
3) **What are the foods sources of Omega – 3?**
4) **Athletic benefits of Omega – 3?**
5) **Non – Athletic benefits of Omega-3?**
6) **How much Omega – 3 do we need a day?**
7) **What are the possible side effects of Omega-3?**
8) **Contraindications of Omega -3?**
9) **Interactions of Omega – 3?**

1) What are Omega – 3 fatty acids?

Omega – 3 fatty acids are polyunsaturated fatty acids with more than two double bonds in their structures.

They are essential fatty acids, which means the body cannot make them.

2) How many types of Omega -3 are there?

There are many types of Omega - 3, and the most common types are:

1) **EPA (eicosapentaenoic acid)**
2) **DHA (docosahexaenoic acid)**
3) **ALA (alpha- linolenic acid)**

3) What are the food sources of Omega – 3?

Animal Sources: Fish oils (per 100 grams of Total Fat)

- Tuna 25 mg
- Halibut 25 mg
- Salmon 20 mg
- Sardines 20 mg
- Mackerel 20 mg
- Trout 20 mg
- Eel 20 mg
- Cod 19.2 mg

Plant Sources: Seed oils (per 100 grams of Total Fat)

- Flax (Linseed) 55 mg
- Chia 30 mg
- Hemp 20 mg
- Butternuts 15.2 mg
- Walnut, Persian 10.9 mg
- Walnut 10.4 mg
- Rapeseed (Canola) 9 mg
- Pumpkin 7.5 mg
- Wheat germ 6.9 mg
- Soybean 6.8 mg
- Tomato seed 2.3 mg
- Rice bran 1.6 mg

Fish

Flaxseeds

Chia seeds

Walnuts

Hemp seeds

Hemp seeds

Fish Higher in EPA and/or DHA		
Bluefish	Herring	Salmon
Bonita fish	Kippers	Sardines
Butterfish	Mackerel	Trout
Eel	Pompano	

Food Items	Omega-3 in grams per 3 oz
Flaxseed	11.5
Hemp seeds	11
Walnuts	7.5
Herring	1.7
Sardines	1.7
Mackerel	1.5
Salmon	1.5
Halibut	0.9

- **For the contents of Omega – 3 and Omega – 6 fatty acids in fruits and vegetables, please refer to our website at www.caasn.com**

Omega – 3 Softgels. *Image: Copyright©Depositphotos.com/Verena Matthew*

4) Athletic Benefits of Omega – 3 Fatty Acids:

Omega – 3 fatty acids may benefit athletes in many ways:

- **1) They stimulate the release of growth hormone, which increases lean muscle mass and decreases body fat.**

- **2) They help athletes recuperate quickly from intense training sessions or competitions.**

- **3) They may enhance oxygenation to the working muscles.**
- **4) They may improve athletic endurance.**
- **5) They help athletes recover faster from sports injuries, such as bursitis, tendinitis, strains, and sprains.**
- **6) They may reduce blood levels of catabolic hormone.**
- **7) They have a protective effect against overtraining syndrome.**

5) Non - Athletic Benefits of Omega – 3 Fatty Acids:

The following conditions may benefit from Omega – 3 fatty acids:

- **High levels of LDL cholesterol and triglyceride.**
- **Heart diseases.**
- **Depression.**
- **High blood pressure.**
- **Asthma.**
- **Atherosclerosis.**

- **Osteoarthritis (OA).**
- **Rheumatoid arthritis (RA).**
- **Multiple sclerosis (MS).**
- **ADHD (attend – deficit hyperactivity disorder).**
- **Crohn`s disease.**
- **Diabetes.**
- **Ulcerative colitis.**
- **Bipolar disorder.**
- **Anxiety.**
- **Schizophrenia.**

- **Alzheimer's disease.**
- **Skin disorders: psoriasis, dermatitis, burns, and dry skin.**
- **Eye problems: glaucoma, cataracts, age- related macular degeneration, and dry eyes.**
- **Cystic fibrosis.**
- **Systemic lupus erythematosus (SLE).**
- **Cancer prevention: breast, prostate, and colon.**
- **Dysmenorrhea (painful menstruation).**

- **COPD (chronic obstructive pulmonary disease).**
- **Sickle cell anemia.**
- **Compromised immune system: AIDS, post – surgery, and irradiation therapy.**

Omega – 3 Pills.

6) How much Omega – 3 do we need a day?

Acceptable intake (AI):

Men: 1.6 gr/day

Women: 1.1 gr/day

According to FDA, adults could consume safely up to 3 gr/day, with maximum 2 gr a day from dietary supplements.

Larger doses of Omega – 3 fatty acids may be required in the following conditions (over 10 grams a day):

- **Multiple sclerosis.**
- **ADHD.**
- **Endurance athletes.**

American Heart Association:

After heart attack: 1gram a day of EPA and DHA.

To lower triglyceride level: 2-4 grams a day of EPA and DHA.

Children:

No specific amount has been yet established.

7) What are the possible side effects of Omega -3?

The usual dosage of Omega -3 has usually no side effects, but higher doses (more than 3 grams a day) might lead to:

1) **Belching.**
2) **Stomach upset.**
3) **Nausea .**
4) **Diarrhea.**
5) **Soft stool.**
6) **Fish breath or fishy aftertaste.**

7) Heavy metals (mercury, arsenic, cadmium, lead) accumulation in the body in higher doses in the long term. In reality, this is highly unlikely. As heavy metals bind with protein in the fish flesh rather than accumulate in the oil.

8) Elevated blood sugar (adding vitamin E may prevent this).

9) Increased bad cholesterol (garlic supplement may prevent this).

10) Increased risk of bleeding.

8) Contraindications of Omega-3 Fatty Acids:

- **People who take medications to prevent from blood clotting (blood thinners, e.g. Warfarin).**
- **Along with anti – platelet medications, such as clopidogrel, prasugrel, ticlopidine, abciximab, eptifibatide, and dipyridamole.**
- **During pregnancy.**
- **During breastfeeding.**
- **Allergy to ingredients.**
- **Liver problems (with elevated liver enzymes)**

9) Interactions of Omega-3 Fatty Acids:

Omega – 3 fatty acids should be used with caution in the following conditions. In other words, the following conditions require lower doses of Omega – 3 fatty acids (maximum 1 gram a day):

- **Along with Advil, Aspirin, and Ginkgo Biloba.**
- **Bipolar disorder.**
- **Diabetes type II.**

- **AIDS and advanced cancers (avoid higher doses).**
- **Implanted cardiac defibrillator.**
- **People with cardiac pacemaker**.

Ratio of Omega- 6 to Omega - 3:

The ratio of Omega−6 to Omega−3 is very important in maintaining cardiovascular health.

Healthy ratios of Omeg−6 to Omega −3 range from 1:1 to 1:4 (an individual needs more Omega−3 than Omega−6).

Typical Western diets provide ratios of between 10:1 and 30:1 (average 15:1).

Flaxseeds and Flaxseed Oil:

- **Flaxseed oil, also called linseed oil, is the best natural source for Omega-3 fatty acids.**

- **Flaxseed is also the richest source of lignans, which have anti-cancer properties.**

- **When you eat lignans, bacteria in the digestive system convert them to entrodiol and enterolactone, which are thought to have anti-cancer effects.**

- **Flaxseed oil contains linoleic acid and alpha linolenic acid—the two essential fatty acids that by acting like aspirin may reduce the production of inflammatory mediators such as prostaglandins and leukotrienes in damaged joints.**

- **Studies show that flaxseed can reduce the risk of heart diseases, and may prevent prostate cancer in men and breast cancer in women.**

- **Several population studies have linked a high intake of flaxseed oil or primrose oil, 1 to 3 tbsp., with reduced urinary symptoms of benign prostate enlargement.**

- **It has not been well understood whether it is lignans that help, or some other elements in the flaxseeds. And not all studies have yielded positive results.**

Homework:

- **1) Describe the athletic benefits of Omega-3 fatty acids.**

- **2) Describe contraindications of Omega-3 fatty acids.**