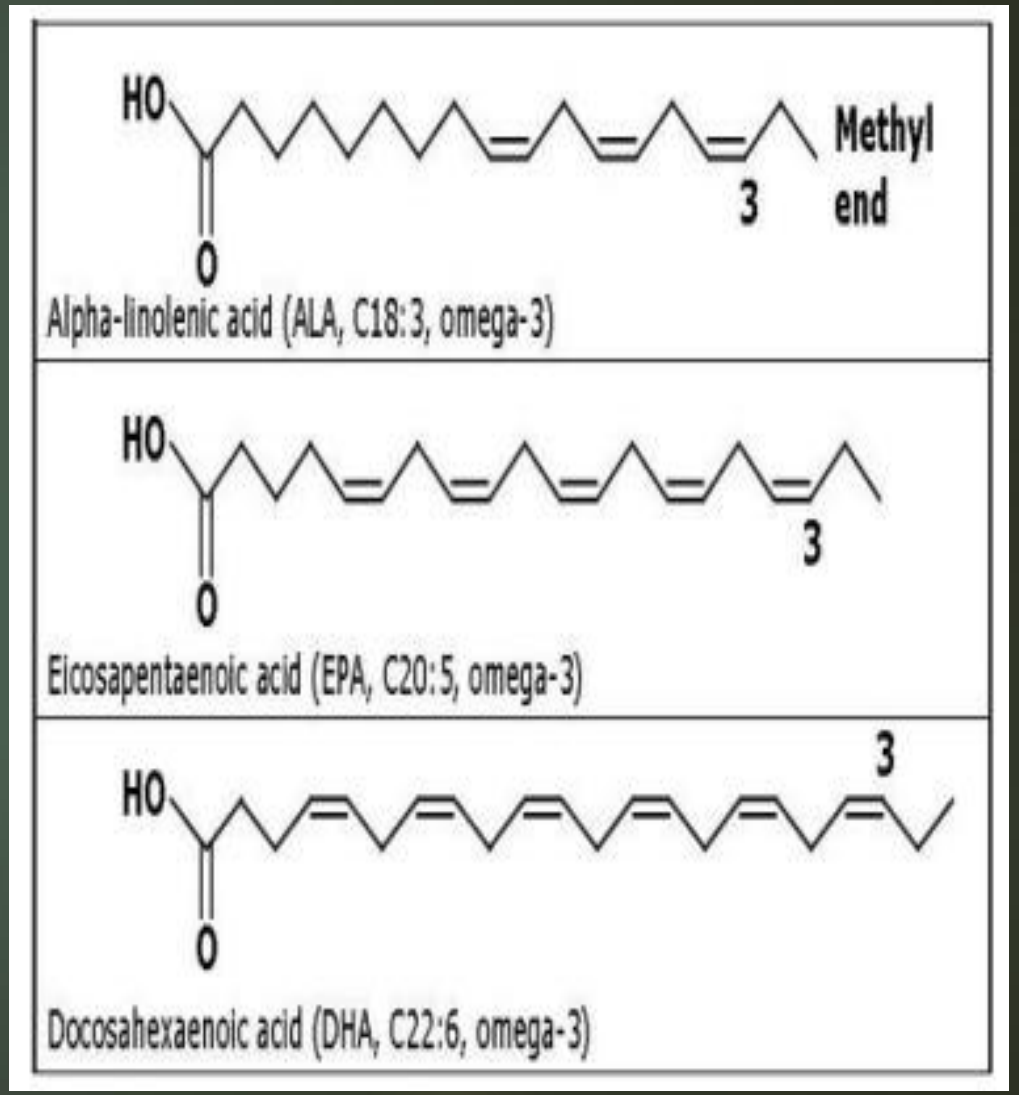
Omega-3 Fatty acids

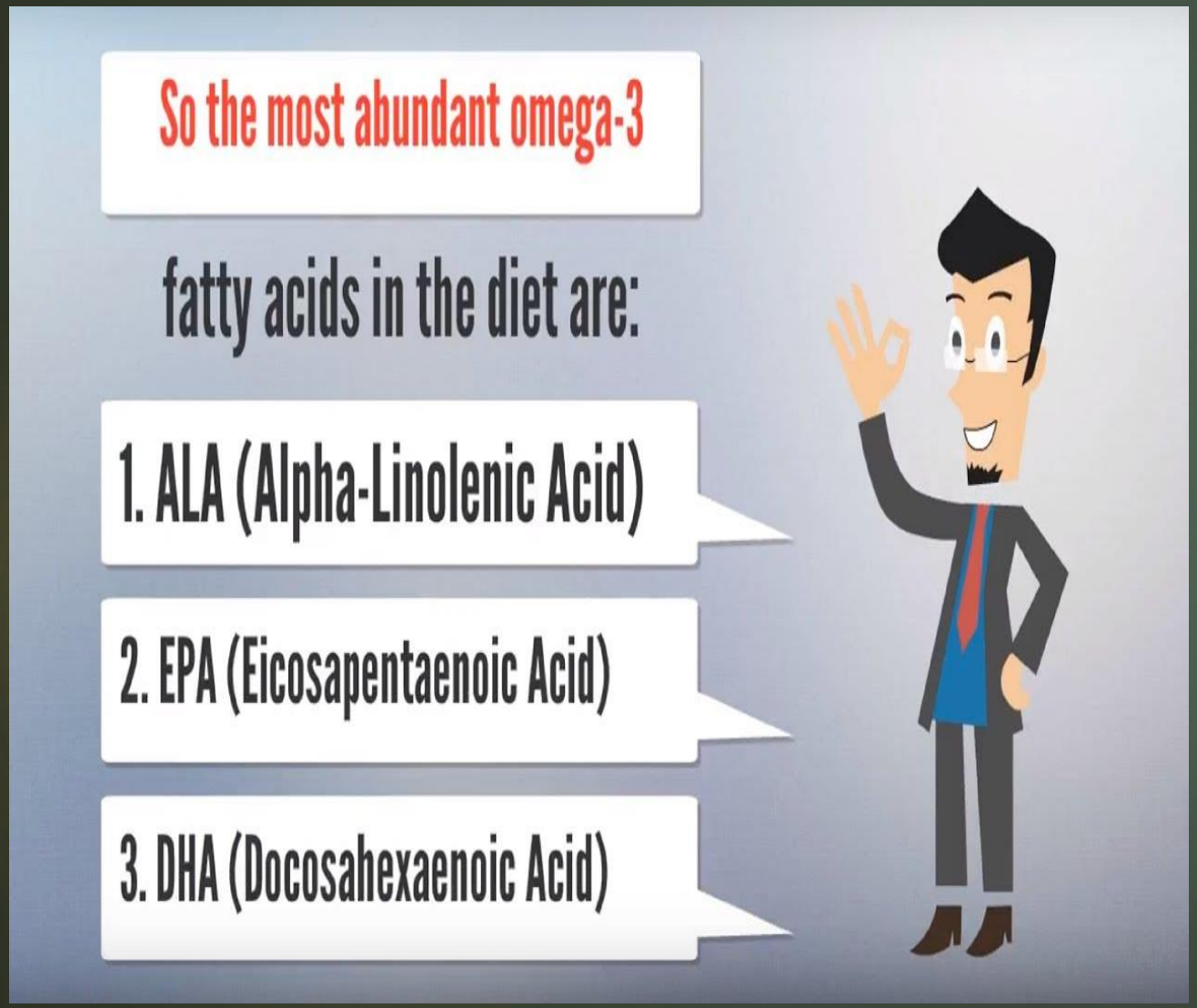
Introduction

Omega-3 fatty acids are polyunsaturated, meaning they contain more than one double bond

They are called omega-3 because the first double bond counting from the methyl end of the fatty acid is located at the third carbon atom



Types

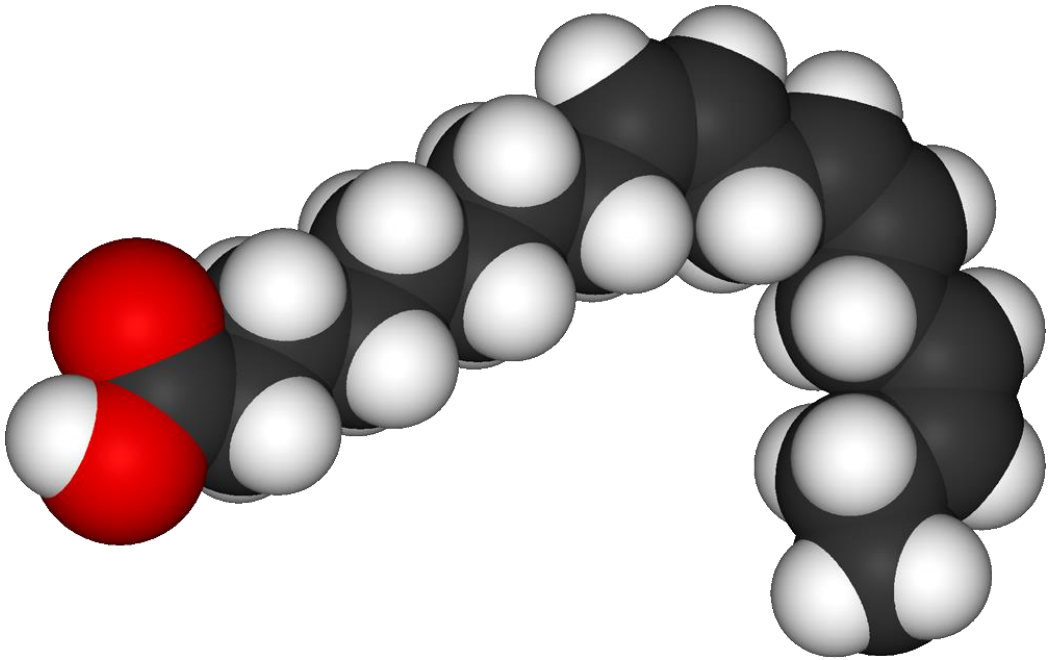


Omega 3 fatty acids are a group of polyunsaturated fatty acids, mainly 3 types which include:

- Alpha-linolenic acid (ALA)
- Eicosapentaenoic acid (EPA)
- Docosahexaenoic acid (DHA)

Alpha-linolenic acid (ALA)

- Scientific abbreviation is 18:3n-3
- The first part (18:3) suggests that ALA is an 18-carbon fatty acid with 3 double bonds
- The second part (n-3) tells you that ALA is an omega-3 fatty acid
- ALA is considered a plant-derived omega-3 fatty acid like flaxseed, soybean, and canola oils



EPA & DHA

- Scientific abbreviations:

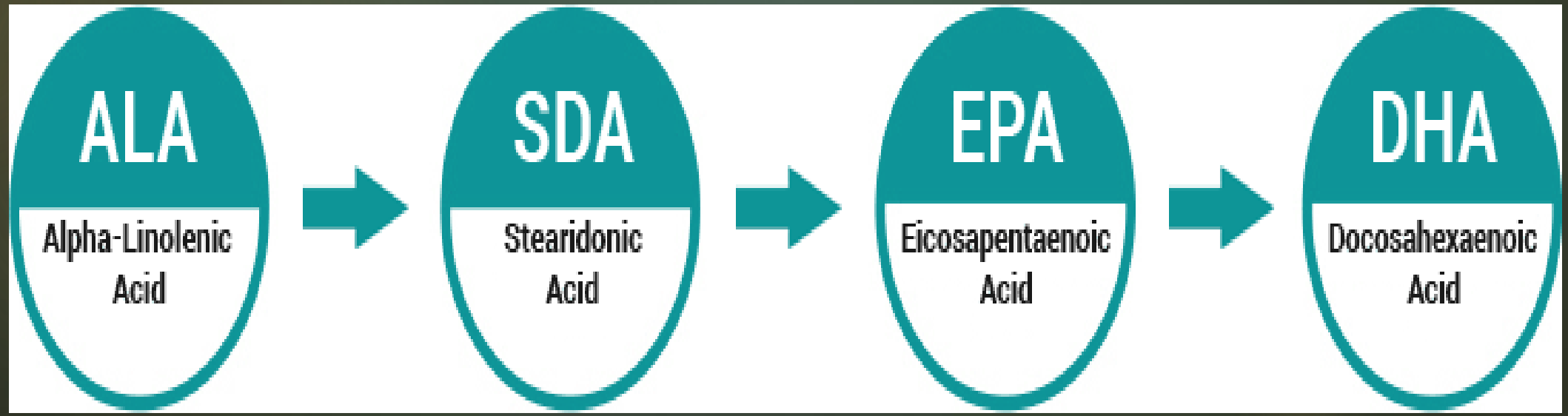
- Eicosapentaenoic acid (EPA): 20:5n-3
- Docosahexaenoic acid (DHA): 22:6n-3

- These two are usually referred to as marine-derived omega-3 fatty acids because they are abundant in certain species of fish and other seafoods.

Process of Conversion

The human body can only form carbon–carbon double bonds after the 9th carbon from the methyl end of a fatty acid .

- Therefore, ALA and linoleic acid are considered essential fatty acids, meaning that they must be obtained from the diet.
- ALA can be converted into EPA and then to DHA, but the conversion (which occurs primarily in the liver) is very limited, with reported rates of less than 15%.
- Therefore, consuming EPA and DHA directly from foods and/or dietary supplements is the only practical way to increase levels of these fatty acids in the body.



Sources of Omega-3

Food	Grams per serving		
	ALA	DHA	EPA
Flaxseed oil, 1 tbsp	7.26		
Chia seeds, 1 ounce	5.06		
English walnuts, 1 ounce	2.57		
Flaxseed, whole, 1 tbsp	2.35		
Salmon, Atlantic, farmed cooked, 3 ounces		1.24	0.59
Salmon, Atlantic, wild, cooked, 3 ounces		1.22	0.35
Herring, Atlantic, cooked, 3 ounces*		0.94	0.77
Canola oil, 1 tbsp	1.28		
Sardines, canned in tomato sauce, drained, 3 ounces*		0.74	0.45
Mackerel, Atlantic, cooked, 3 ounces*		0.59	0.43
Salmon, pink, canned, drained, 3 ounces*	0.04	0.63	0.28
Soybean oil, 1 tbsp	0.92		
Trout, rainbow, wild, cooked, 3 ounces		0.44	0.40
Black walnuts, 1 ounce	0.76		
Mayonnaise, 1 tbsp	0.74		
Oysters, eastern, wild, cooked, 3 ounces	0.14	0.23	0.30
Sea bass, cooked, 3 ounces*		0.47	0.18
Edamame, frozen, prepared, ½ cup	0.28		
Shrimp, cooked, 3 ounces*		0.12	0.12
Refried beans, canned, vegetarian, ½ cup	0.21		
Lobster, cooked, 3 ounces*	0.04	0.07	0.10
Tuna, light, canned in water, drained, 3 ounces*		0.17	0.02
Tilapia, cooked, 3 ounces*	0.04	0.11	
Scallops, cooked, 3 ounces*		0.09	0.06
Cod, Pacific, cooked, 3 ounces*		0.10	0.04
Tuna, yellowfin, cooked 3 ounces*		0.09	0.01
Kidney beans, canned ½ cup	0.10		
Baked beans, canned, vegetarian, ½ cup	0.07		
Ground beef, 85% lean, cooked, 3 ounces**	0.04		
Bread, whole wheat, 1 slice	0.04		
Egg, cooked, 1 egg		0.03	
Chicken, breast, roasted, 3 ounces		0.02	0.01
Milk, low-fat (1%), 1 cup	0.01		

Amount of fatty acids in grams per serving

*https://ods.od.nih.gov/factsheets/Omega3FattyAcids-HealthProfessional/

Adequate Intakes for Omega 3's

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months*	0.5 g	0.5 g		
7–12 months*	0.5 g	0.5 g		
1–3 years**	0.7 g	0.7 g		
4–8 years**	0.9 g	0.9 g		
9–13 years**	1.2 g	1.0 g		
14–18 years**	1.6 g	1.1 g	1.4 g	1.3 g
19-50 years**	1.6 g	1.1 g	1.4 g	1.3 g
51+ years**	1.6 g	1.1 g		

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Common Problems associated with low intake of omega-3's

- Some of the problems that can occur with low intake of Omega- 3 fatty acids include: dry, itchy skin, as well as coarse, bumpy patches on the skin, soft broken nails, dry, dull hair, and allergies.
- Cardiovascular disorders
- Other problems can cause poor brain function and brain development in children

Clinical Applications

Cardiovascular disease

- Omega 3 fatty acids helps in lowering the risks of CVD and heart failures and helps in lowering LDLs & increasing HDL levels.
- Getting more EPA or DHA from foods lowers triglyceride levels, for example. Omega-3 dietary supplements can also help lower triglyceride levels

Rheumatoid arthritis (RA)

- RA causes chronic pain, swelling, stiffness, and loss of function in the joints. Some clinical trials have shown that taking omega-3 supplements with their anti inflammatory effect may help manage RA when taken together with standard RA medications and other treatments.

Infant health and development

- some studies show that taking these supplements may slightly increase a baby's weight at birth and the length of time the baby is in the womb, both of which may be beneficial. Breast milk contains DHA. Most commercial infant formulas also contain DHA

Clinical applications

- **Alzheimer's disease, dementia, and cognitive function**
  - It has been found that omega- 3 fatty acids are known to have membrane enhancing capabilities in brain cells.
  - They cause more production of two neurotransmitters, serotonin and dopamine.
  - This allows patients to focus better on tasks that are at hand without as many distractions. The effects of Serotonin have been shown to help individuals better deal with stress and other activities.
  - Some—but not all—research shows that people who consume more omega-3s from food such as fish may have a lower risk of developing Alzheimer's disease, dementia, and other problems with cognitive function. More study of the effects of omega-3s on the brain is needed.

Clinical applications

Diabetes Mellitus	• Omega 3's help improves the ability of muscle cells to take up glucose in the presence of insulin. • This proves to be beneficial to those with type II diabetes.
Cancer	• Omega- 3 Fish oil may stop the alteration of a normal cell to a cancerous mass, they may inhibit unwanted cellular growth, and cause apoptosis of cancer cells.
Visual Impairment	• DHA is found in high concentration in cells of retina. Lower levels of intake may lead to visual impairment. Intake of Omega-3 fatty acids helps.

Thank you