

Sanford Medical Center



Aunt Cathy

Aunt Cathy's Guide To:

The Unsaturated Fat Families: Mono & Poly

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	Omega 3 family	Omega 6 family	Omega 9 family
	“The Fisher Family ”	“The Cornelius Family ”	“The Olivetti Family ”
Plant forms	Polyunsaturated (more than one double bond)	Polyunsaturated (more than one double bond)	Monounsaturated (only one double bond)
18 carbons	Alpha linolenic (18:3)  Essential	Linoleic (18:2) Gamma Linolenic (18:3)  Essential	Oleic, etc. (18:1) 
	↓	↓	
Critter forms	Polyunsaturated (more than one double bond)	Polyunsaturated (more than one double bond)	
20 carbons	EPA (EicosaPentaenoic Acid) (20:5)  (May be essential too)	ARA (20:4) (Arachidonic Acid)  (May be essential too)	
	↓		Important New Discovery:
22 carbons	DHA (DocosaHexaenoic Acid) (22:6)  (May be essential too)		Many people are now known to be <u>much</u> less able to do the conversions (↓) than we thought, so EPA, DHA and ARA are also “essential fats” for them in addition to linoleic and linolenic acid.

What does “omega” mean when talking about fatty acid carbon chains?

It sounds very scientific, but it just means that you start counting the carbons in the chain from the very end of the fatty acid chain.



“A to Z” = alpha to omega in the Greek alphabet = “beginning and end”

α alpha end

ω omega end

18-carbons-in-a-chain fats:

9 8 7 6 5 4 3 2 1



18 carbons, 1 double bond (monounsaturated) fatty acid starting after 9 carbons from the “omega” (z) end of the chain, so it is in the “omega 9” family) 18:1 = (18 carbons, one double bond)

Linoleic

6 5 4 3 2 1



18 carbons, 2 double bond (monounsaturated) fatty acid starting after 6 carbons from the “omega” (z) end of the chain, so it is in the “omega 6” family) 18:2 = (18 carbons, two double bonds)

Linolenic

3 2 1



18 carbons, 3 double bond (monounsaturated) fatty acid starting after 6 carbons from the “omega” (z) end of the chain, so it is in the “omega 6” family) 18:3 (18 carbons, three double bonds)

“Essential Fatty Acids” Linoleic and alpha-Linolenic How to keep them sorted out:

Linoleic

Linoleic

Alpha-Linolenic

Linolenic

The only difference is the second **n** ... write it in script and turn it on its side and it is a 3!

Linolemic

$\omega = 3$

(It’s the omega 3 one. The other one isn’t.)

We can add two more carbons and stick in another double bond to make 20 carbon fatty acids, and then do it again to make 22 carbon fatty acids. These are “critter-level” fatty acids, not plant fatty acids like linolenic and linoleic acid. [This process is called “enlongation and desaturation”]

20-carbons-in-a-chain fats:

Omega-3 = EPA Eicosapentaenoic Acid

(Eicosa = 20 carbons Penta = 5 enoic = double bonds)



Omega-6 = Arachidonic Acid

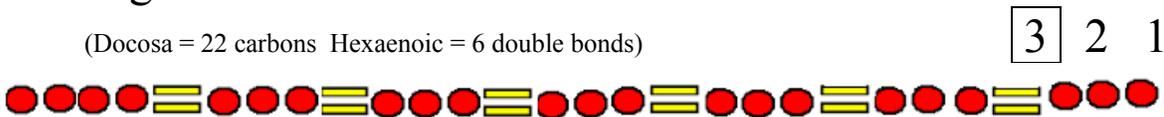
(the name is from an old system and so it is not very helpful. If it were named today it would be ETA Eicosatetraenoic Acid (Eicosa = 20 carbons Tetra= 4 enoic = double bonds)



22-carbons-in-a-chain fats:

Omega-3 = DHA Docosahexaenoic Acid

(Docosa = 22 carbons Hexaenoic = 6 double bonds)



Why is this important:

**Although these fats can be burned as fuel like any fat,
the big deal with these is that
we make several important things out of them**

Prostaglandins

The 20-carbon fats are the material from which one makes prostaglandins ... inflammatory messengers. If one makes a prostaglandin out of ARA (the **omega 6** one) the response is **REALLY INFLAMMATORY!** But if one makes a prostaglandin out of EPA (the **omega 3** one) instead, **the inflammatory response is MUCH LESS!**

Thromboxanes

The 20-carbon fats are the material from which one makes thromboxanes ... messengers that tell your blood to clot. If one makes a thromboxane out of ARA (the **omega 6** one) the **coagulation response is REALLY CLOTTY!** But if one makes a thromboxane out of EPA (the **omega 3** one) instead, **MUCH LESS BLOOD CLOTTING** results.

Excessive tendencies to clot blood and inflame the arterial walls increase risk of cardiovascular disease. Both are increased a lot by making these substances from ARA instead of EPA. Both are also increased by making them from EPA (because that's what prostaglandins/thromboxanes do) but the ones made out of EPA cause a much milder response than the ones made from ARA do.

DHA is a critical fat of the brain and retina, and it has roles in development, maintenance of cognition as we age, mood and attention, and decreasing risk of macular degeneration. As we now know that many people are not as able to make these very long chain fats, it is a very good idea to obtain some "ready made."

Most Americans get adequate ARA (the omega 6 fat) from meat, but the source of ready made EPA and DHA (the omega 3 fats) is fatty fish like salmon or mackerel, and many Americans eat very little of these foods. That is why the **American Heart Association recommends that people eat fatty fish twice weekly or take 1000 mg fish oil capsule daily**. For certain health situations, such as having "high triglycerides," they suggest that 2-4 capsules daily can be helpful with a physician's supervision.

This is why I always say you should **think of EPA** as "Environmental Protection Agency" since it protects your internal environment from excessive inflammation and blood clotting ... both of which are very important in cardiovascular disease and other serious health concerns. And it comes pre-packaged with DHA in ready made form.

The typical "**American Diet**" (whatever THAT is) is described as having
10-20 omega 6 fattyacids for every one omega 3 fatty acid.
That is, a **10:1 ratio up to a 20:1 ratio**.

The "**Mediterranean Diet**" is a heart-healthy eating pattern also associated with decreased risk of cancer, and one feature of this diet is a ratio of only
4 omega 6 fatty acids for every omega 3 fatty acid.
That is, a **4:1 ratio**.

How to remember this stuff: "6 is always bigger than 3"

Omega **6** fats make **more clotty** ("aggregatory") thromboxanes than Omega 3 fats do.

Omega **6** fats make **more inflammatory** prostaglandins than Omega 3 fats do.

In all the ratios described above, the **larger number** of the two is ALWAYS the omega **6**