Omega-3 Docosapentaenoic Acid (DPA): What is known?

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Did EPA and DHA overshadow the health benefits of DPA?

What is omega-3 DPA?
Docosapentaenoic acid (DPA) is a dietary omega-3 fatty acid mainly found in fish, fish oil, seal oil and red meat. Its biological properties have not been thoroughly studied. Unlike, the other popular omega-3 fatty acids (EPA and DHA), DPA has not been extensively subjected to research due to the limited availability of the pure compound. However, the available scientific literature suggests that DPA also have beneficial health effects.
There is another form (isomer) of DPA known as omega-6 DPA. Omega-6 DPA content is low in most mammalian tissues, except testes tissue. The omega-3 isomer of DPA is substantially higher in fish & fish oils, than the omega-6 isomer.

Metabolism of omega-3 DPA
The laboratory studies conducted using liver cells have shown that omega-3 DPA and EPA are inter-convertible in the liver cells; however, there was little evidence of conversion of EPA and omega-3 DPA into DHA. This means omega-3 DPA can act as a source of EPA. Similarly, in animals, omega-3 DPA can also form EPA. However it does not appear to be readily metabolised to DHA, except in liver tissue. In addition to EPA production (retro-conversion to EPA), omega-3 DPA is found in a number of different tissues. Its specifically higher accumulation in heart and skeletal muscle and in kidneys compared with EPA suggests that omega-3 DPA might have beneficial effects in these tissues.

Beneficial effects of omega-3 DPA
Inhibition of thrombosis/aggregation in platelets: Platelet aggregation is an early event in the development of thrombosis and is initiated by thromboxin A_2 (TXA_2). The results from a study conducted in rabbit platelets showed that omega-3 DPA was the most potent inhibitor of COX-1 activity *(the enzyme involved in synthesis of TXA_2)*, thus inhibiting platelet aggregation most effectively. In a human whole blood study, omega-3 DPA was equally effective as EPA and DHA in inhibiting platelet aggregation in female subjects, however, in male subjects only EPA inhibited platelet aggregation.
Greater wound-healing/ability: Endothelial cell migration and proliferation are important processes in the control of wound-healing response of blood vessels. Direct pretreatment of *endothelial cell*s with omega-3 DPA resulted in a dose-dependent increase in migration. Moreover, maximum stimulation of endothelial cell migration by omega-3 DPA pretreatment was achieved at a concentration one-tenth of that required for maximal stimulation by EPA pretreatment. Also, omega-3 DPA may have a positive role in preventing angiogenesis *(new blood vessel formation)* as omega-3 DPA pretreatment suppresses the bovine aortic endothelial cell tube-forming activity induced by vascular endothelial growth factor.
Alters expression of various genes: Very few studies have looked at the effects of pure DPA on expression of genes. However, in liver cells, omega-3 DPA has been shown to induce PPARα, which is involved in fat oxidation, but EPA and DHA had a stronger and more consistent effects. Omega-3 DPA reduces the expression of lipogenic genes in mice and liver cells. These genes are involved in synthesis of fat in the body. The mice fed with omega-3 DPA have also shown a reduction in liver triglyceride levels. Omega-3 DPA is involved in the reduction of the expression of inflammatory genes such as tumor necrosis factor (TNF-α) in cell culture models. Inflammation in walls of blood vessels is thought to play a role in the development of atherosclerotic plaques and thus lead to cardiovascular disease (CVD). The action of omega-3 DPA in reducing the expression of inflammatory genes suggests its beneficial role in CVD and many other inflammation associated complications conditions including nervous system disease.

What amount of DPA is considered to be beneficial?
Recommended dietary intakes (RDI) are most commonly expressed for total long chain omega-3 fatty acids of which omega-3 DPA is a member. There is no recommendation for DPA alone. We need more scientific investigations to decide the exact amounts of omega-3 DPA that we need to eat through our or to take as supplements.

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