4 powerful nutrients for growing children

(1) **Omega-3** with EPA and DHA - DHA as building block of the brain's gray matter, EPA as supportive aid for brain function
(2) **Phosphatidylserine (PS)** from sunflowers supports brain functioning
(3) **Evening primrose** oil with gamma-linolenic acid (GLA) supports a healthy skin
(4) **Vitamin D_3**, vitamin D's most physiologically active from, supports bone development and increases natural resistance

Applications and recommended use

Supports concentration, increases natural resistance, helps bone development and contributes to a healthy skin.

Typical indications for EPA-rich fish oil with phosphatidylserine and vitamin D:

- ADHD-like symptoms
- Supporting cognitive functions (concentration, memory)
- Increasing stress resistance
- Supporting mood (counteracts depressive feelings)

Typical indications for evening primrose oil:

- Eczema, atopic dermatitis

Typical indications for vitamin D

- Immune system support (e.g. flu prevention)
- Supporting bone development, bone strength

Interactions and precautions

No side effects are known when is used correctly.

Scientific information

Improved brain functioning

The omega-3 fatty acid **docosahexaenoic acid (DHA)** is a building block of the grey matter in the brain, and accumulates in brain regions taking part in learning and memory (e.g. brain cortex and hippocampus).[1,2] DHA provides a certain suppleness to the cell membranes of nerve cells, which in turn supports membrane proteins to function better, and neurotransmission to run more smoothly.
Moreover, DHA improves cerebral blood flow and is the precursor for neuroprotectins and resolvins that protect nerve tissue against inflammation and oxidative stress.
Brain tissue contains 250 to 300 times less of the omega-3 fatty acid **eicosapentaenoic acid (EPA)** than DHA, however EPA does also play an

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essential role. EPA likewise contributes to improved cerebral blood flow and is the precursor of powerful anti-inflammatory eicosanoids.[1,2]

EPA seems to be the most important omega-3 fatty acid to reduce attention problems in a subgroup of ADHD patients.3 Meanwhile, an increased AA (omega-6)/EPA (omega-3) ratio in blood is considered a biomarker for ADHD.[4] In children increased omega-3 intake is associated with better functional activity of the prefrontal cortex of the brain.[5] Omega-3 supplementation positively influences concentration and short-term-memory in both ADHD children and children with a normal development, especially in cases of omega-3 deficiency.[6,7]

Phosphatidylserine (PS) contributes to healthy nerve cell membranes and is an important building block of myelin. Oral PS crosses the blood-brain barrier with the help of the "flippase" enzyme, and beneficially influences numerous neurotransmitter systems such as acetylcholine, dopamine, serotonin and noradrenaline. [8,9] Mostly cognitive functions are supported: memory, concentration, ability to learn and reason, and language skills.[8] A placebo-controlled study in 4-14 year old ADHD children (n=36) showed that PS supplementation (200 mg/day) for 2 months resulted in significant improvements in ADHD symptoms (DSM IV-TR) and short-term memory.[9] The 200 ADHD children (6-13 years old) participating in a placebo-controlled research with a PS-omega-3 combination (300 mg PS + 250 mg EPA/DHA for 30 weeks) experienced improvements in restlessness, emotional well-being and oppositional behaviour.[10]

Vitamin D also supports brain function. In research with the best study designs, vitamin D supplementation improved depressive symptoms.[11] Vitamin D activates the enzyme responsible for the conversion of tryptophan to serotonin (the neurotransmitter that influences memory, mood, self-confidence, appetite). In order to increase serotonin levels vitamin D cooperates well with EPA and DHA. EPA is expected to increase presynaptic serotonin release through inhibiting the synthesis of E2 series prostaglandins, while DHA improves postsynaptic serotonin receptor action by increasing cell membrane fluidity.[12]

Supporting natural resistance

On top of its well-known benefits for bone development and strength, vitamin D also allows the immune system to work properly[13]. For example, there is evidence that vitamin D helps protect against the occurrence of upper respiratory tract infections caused by the influenza virus by suppressing the production of pro-inflammatory substances.[14,15]

Condition of the skin

Oral use of **evening primrose oil** is promising as treatment for atopic dermatitis, to reduce symptoms such as skin rash, dry skin, itching, redness and swelling. The positive effect seems to be dose-dependent, and is largely based on its gamma-linolenic acid (GLA) content.[16] In skin cells GLA functions as the precursor of the anti-inflammatory prostaglandin E1 (PGE1), i.e. through its prior conversion to dihomogamma-linolenic acid (DGLA).

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