Proper early nutrition is important for optimal brain development

Sub-optimal nutrition through infancy may disrupt brain development and impair cognitive outcomes.

"Several epidemiological studies have shown that individuals (not infants) with learning disorders, including attention deficit hyperactivity disorder (ADHD), dyslexia, and autism have signs of essential fatty acid (EFA) deficiency or have lower than normal blood levels of DHA and ARA."[1]

"The most active period of neurological development occurs in the first 1000 days of life, the period beginning at conception and ending at the start of the third postnatal year."[2]

– American Academy of Pediatrics

Proper nutrition from key macro- and micronutrients helps support brain scaffolding, which support the structures and processes responsible for cognitive, behavioral, and social-emotional functions. These structures and processes include:[2]

Neurotransmitter systems that impact reward centers

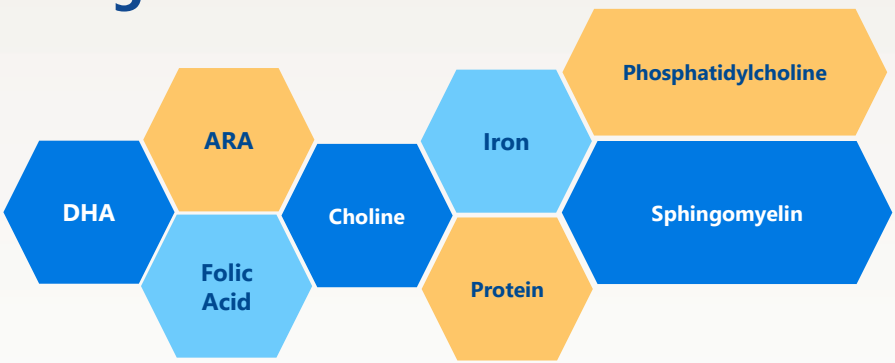
Prefrontal cortex functions like planning, attention, and inhibitions

Hippocampus functions, such as memory and learning

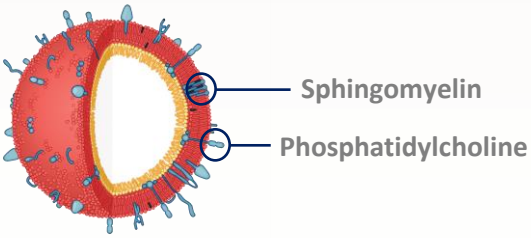
Sensory systems, especially auditory and visual

Certain components are important for brain and neural growth

Key components shown to support neurodevelopment[2,3]



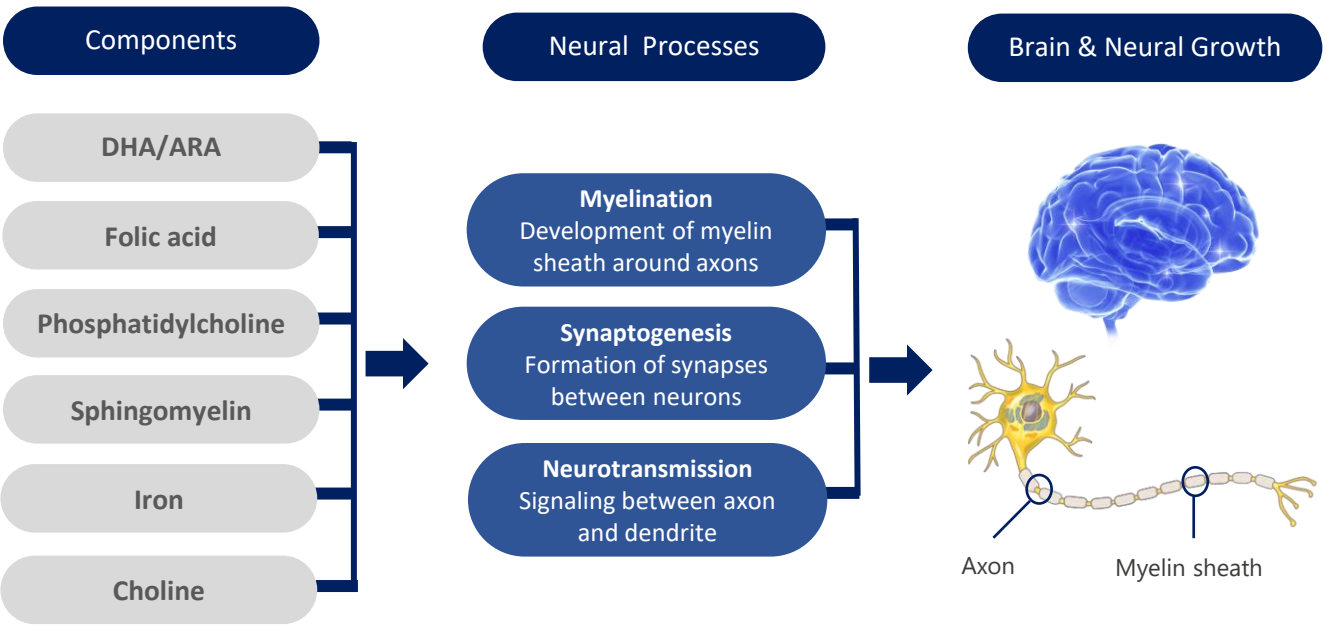
Milk Fat Globule Membrane



Sphingomyelin and phosphatidylcholine are located in the outer membrane of the Milk Fat Globule Membrane, which is a naturally occurring fat and protein layer that is important in development and immune health.[4,5]

Early development of essential neural processes

Nutrition enables essential neural processes, which allow for proper brain and neural growth.[3,6,7]



Development of the brain structure

As shown by MRI, key nutrients are significantly correlated* with the development of different regions of the brain.[3]

FRONTAL LOBE
Executive functions
DHA, ARA, phosphatidylcholine, sphingomyelin, choline

PARIETAL LOBE
DHA, ARA, folic acid, phosphatidylcholine, sphingomyelin

OCCIPITAL LOBE
DHA, ARA, folic acid phosphatidylcholine, sphingomyelin, iron

CORPUS CALLOSUM
ARA, phosphatidylcholine, sphingomyelin

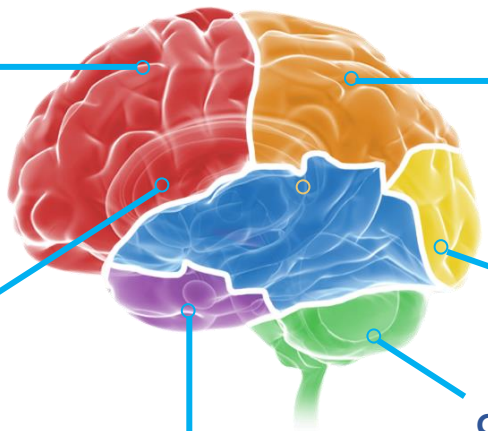
CEREBELLUM
DHA, ARA, phosphatidylcholine, sphingomyelin, iron

TEMPORAL LOBE
phosphatidylcholine, sphingomyelin

* Significant difference at p< 0.006 level. To obtain longitudinal measures of development, children were scanned and cognitive assessed at 6-month increments from time of recruitment until 2 years of age, and yearly thereafter until 5 years of age.

The structure-function link

Optimal nutrition supports essential neural processes, enables the growth of the brain structure, and provides the basis for the development of more complex functions.



FRONTAL LOBE
Executive functions
Higher cognitive thinking, executive and motor function, sensory processing

PARIETAL LOBE
Touch and spatial understanding, motor control, procedural learning, cognitive and emotional functions

OCCIPITAL LOBE
Vision

CORPUS CALLOSUM
Coordination and complex problem solving

CEREBELLUM
Critical functions and survival

TEMPORAL LOBE
Hearing and language, memory formation

Infant formula composition can affect neural and cognitive development

Different compositions of infant nutrition appear to result in different patterns of myelin development, with some being closer to the myelin trajectories associated with breastfed infants than others.[3]

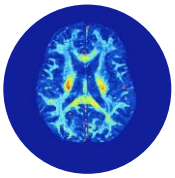
"Formula compositions associated with the highest myelin levels and cognitive scores also had the highest concentration of long-chain PUFAs (DHA and ARA), choline, folic acid, sphingolipids (sphingomyelin), and phosphatides (phosphatidylcholine)."[3]

Assessment of 3 different nutrient profiles

By comparing 3 different formulations, a recent paper evaluated the impact of varying amounts of key nutrients on myelination and cognitive function.[3]

	Units	1	2	3	% Difference (Min – Max)
ARA	mg/L	173	238	255	32
DHA	mg/L	62.2	117	120.6	48
Folic Acid	mcg/L	304	232	146.2	52
Phosphatidylcholine	mg/L	85	58	60	29
Sphingomyelin	mg/L	28.1	62	28.1	55
Iron	mg/100 g	10.6	8.42	11.65	28
Choline	mg/100 g	170	92.5	144	46

Myelination – *based on MRI*



"Children who received formula compositions with higher levels of **DHA, ARA, choline**, and **sphingolipids** (formulas #2 and #3) showed increased levels of myelin development."[3]

Cognitive function – *based on Mullen Scales*

"Formula #2, which had the closest myelination trend to breastfeeding also exhibits **cognitive trends that are most consistent with breastfeeding**."[3]

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