Five Nutrients that Neurodivergent Children May be Missing

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Key Goals

- Understand common nutrient gaps that can impact people with ASD, ADHD, and other Neurodevelopmental differences
  - Understand what they do and why they matter
  - Review the strength of evidence
  - Identify food sources and supplement limitations

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Why it Matters

- Nutrients are the key building blocks and cofactors for every biological process
- You can not out-medicate or out-supplement nutrient deficiencies but…
- Greatest benefit often occurs when deficiency or insufficiency is present
- All the pathways that research shows are often abnormal in people with ND (gut, mitochondria, methylation, neurologic etc., require nutritional cofactors
- They can meaningfully influence attention, sleep, irritability, sensory reactivity, hyperactivity, learning, and overall regulation—

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What can Improve when Nutrients Improve?

- Attention
- Sleep
- Emotional reactivity
- Fatigue
- Sensory tolerance
- Appetite
- Resilience

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Why Nutrient Gaps Are Common

- Selective or restrictive eating
- GI dysfunction or malabsorption
- Higher metabolic and oxidative demand
- Chronic inflammation/infection
- Medication effects

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Do you know about these?

- Iron
- Vitamin D
- Zinc
- Folate (active form, NOT folic acid)
- B12
- Magnesium
- Omega-3 fatty acids (EPA/DHA)

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Iron (Low Ferritin)

- Required for dopamine synthesis, attention, learning, sleep
- Low ferritin is common in picky eaters and can worsen fatigue, restless sleep, attention
- Research shows best benefit when ferritin is low
- Red meat, dark poultry, lentils/beans, blackstrap molasses + vitamin C pairing; cast-iron cooking
- Supplement when indicated with clinician support. Manage constipation/nausea; **iron toxicity risk**—store safely

McWilliams 2022

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Vitamin D

- Neuroimmune regulation, brain development pathways, sleep/behavior modulation, immune support
- Deficiency common in many children- 25(OH)D;
- Meta-analyses show modest ASD behavior improvements
- fatty fish, fortified dairy/alternatives (if used), egg yolk; sunlight hygiene.
- Avoid high-dose chronic use without monitoring; pair with adequate magnesium and K2 through food patterns as appropriate

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Zinc

- Neurotransmitter modulation, immune function, taste/appetite, gut barrier; selective eaters can be low.
- Studies show zinc supplementation can reduce overall ADHD symptom scores, may alleviate clinical symptoms in children with zinc deficiency and ASD, and increase cognitive ability.
- Beef, lamb, oysters (if appropriate), pumpkin seeds, legumes
- Supplement: short trials; avoid chronic high-dose zinc (copper depletion risk); consider zinc with meals if nausea.

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FOLATE

- Methylation, neurotransmitter synthesis, detoxification pathways, neural connectivity
- Some children may have functional folate transport/metabolism issues
- folinic acid (leucovorin/folinic acid) may improve some outcomes (often language/communication)
- Methyl folate, another active form, can have similar benefits
- Leafy greens, legumes, liver, broccoli, Brussels
- Supplement as indicated based on labs
- May increase activation/irritability in some children

PK PANDA 2024

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B12

- Myelination, neurotransmitter synthesis
- Methylation & mitochondrial energy) often with folate and magnesium)
- Improvements in communication/adaptive behavior
- Who may benefit
  - GI issues, regression, fatigue, poor methylation tolerance
- Higher risk with selective eating, GI dysfunction, PPI use, low animal foods
- Only found in animal protein

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Magnesium

- Improves sleep, irritability, hyperactivity, sensory sensitivity, bowel function in some children
  - NMDA receptor regulation (prevents excitotoxicity)
  - GABAergic tone and nervous system calming
  - Sleep initiation, muscle relaxation, stress resilience,
- Neurodivergent children often have:
  - low intake (processed diets)
  - higher urinary magnesium loss with stress
  - medication-related depletion (e.g., stimulants)
- Labs often normal despite functional insufficiency

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Magnesium

- Leafy greens, pumpkin seeds, almonds, legumes, whole grains (if tolerated)
- Supplement forms commonly used in kids:
  - magnesium glycinate (calming, well tolerated)
  - magnesium citrate (constipation present)
  - magnesium threonate (emerging cognitive interest)
- Who may benefit most:
  - sleep difficulty
  - anxiety or sensory overload
  - muscle tension, headaches, constipation
- Safety: loose stools at high doses

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Omega-3 Fatty Acids

- Support membrane fluidity, synapse function, neuroinflammation, and neurotransmitter signaling
- Anti-inflammatory
- Brain is predominantly fat
- Many kids eat little fatty fish; omega-3 status can be low in these populations
- Studies show small–moderate ADHD symptom improvement
- Salmon/sardines, mackerel, trout, herring 2x/week; DHA eggs (if tolerated).
- Supplement options: fish oil (EPA+DHA), algal DHA (esp. for fish avoidance).

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How about these 5?

- Carnitine
- Choline
- Vitamin A
- Riboflavin (B2)
- Iodine

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Carnitine

- Carnitine supports transport of fatty acids into mitochondria for energy production
  - evidence of mitochondrial dysfunction signals in a subset of ASD
  - reports of altered acylcarnitine profiles in some autistic children
  - Research trials show improvement in autism rating scales in subsets
  - Consider when fatigue, low tone, constipation or restricted animal protein intake
  - red meat, poultry, fish (most carnitine comes from animal foods).

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Choline

- Supports acetylcholine and methylation pathways
  - acetylcholine (attention/learning, memory)
  - methylation via betaine pathway
  - cell membranes (phosphatidylcholine) and brain development
- Many children (and pregnant people) do not meet choline intake targets;
- In selective eaters, eggs/meat/fish, soybeans, legumes may be limited.
- Prenatal trials show improved attention outcomes
- Limited direct ASD treatment trials

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CHOLINE

- Who might benefit most: restricted intake + signs of low methyl-donor intake, higher needs (rapid growth), pregnancy/lactation contexts, neurocognitive attention concerns (adjunctive).
- Supplement options: choline bitartrate, phosphatidylcholine, alpha-GPC (different tolerability profiles).
- Safety notes: excessive choline can cause GI upset and fishy body odor; stay within reasonable age-appropriate dosing.

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Riboflavin (B2)

- Necessary cofactor for:
  - Mitochondrial energy production (FAD/FMN)
  - Methylation cycling (supports MTHFR enzyme efficiency, especially with MTHFR mutations
  - Glutathione recycling and oxidative stress defense
- Neurodivergent children may be at higher risk due to:
  - low intake of dairy, eggs, meat
  - higher oxidative stress burden
  - increased metabolic demand in neurodevelopment

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Riboflavin

- Often included in mitochondrial support protocols and B-complex interventions
- Improvements in fatigue, irritability, and tolerance to stress have been reported.
- Who May Benefit
  - fatigue, low stamina
  - suspected methylation inefficiency
  - restricted intake of animal foods
- dairy (if tolerated), eggs, liver, almonds, mushrooms, spinach

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Iodine

- Essential for thyroid hormone and brain development, myelination, language, and attention regulation
- Neurodivergent kids may be at risk if they have
  - heavy reliance on non-iodized "gourmet" salts
  - no iodized salt at home
  - limited dairy/seafood/eggs
  - selective eating, multiple food exclusions
- A small case-control study found lower urinary iodine and differences in thyroid markers in boys with ASD vs controls, with iodine status correlating (in some analyses) with clinician ratings.
- ASD-specific supplementation evidence limited
- both deficiency *and excess* can disrupt thyroid function.

Blazewicz 2016

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Vitamin A

- Retinoic acid regulates synapses and plasticity. Disruption could theoretically affect learning, memory, and social behavior.
- Supports gut barrier integrity and mucosal immunity.
- Potent antiviral
- Some studies suggest it may influence oxytocin signaling, relevant to social behavior in ASD (experimental)
- Foods
  - Retinol sources: liver (pasture-fed, small amounts), egg yolk, dairy (if tolerated)
  - Adequate dietary fat is required for absorption
- Safety
  - Fat-soluble vitamin- excess can lead to serious consequences

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Clinical Approach

- Assess diet and symptom patterns
- Add appropriate whole food when possible
- Use targeted labs when appropriate
- Trial supplements one at a time
- Reassess and taper when possible

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Key Take-Home Message

- Neurodivergent children benefit from nutritional sufficiency
  - Targeted, evidence-based repletion can meaningfully support function
  - Food first when possible

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Thanks for listening

Questions?

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Holcarenutrition.com and Healthy Baby Roadmap

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