The Docosahexaenoic Acid (DHA) Oxford Learning and Behavior (DOLAB) Trial

New Study Demonstrates that Algal DHA Improves Reading and Behavior in Underperforming School Children

A new study in PLoS-ONE (in press) reported that supplementation with 600 mg algal DHA for 16 weeks improves reading and behavior in healthy, school-aged children with low reading scores[1]. This study comes at a time when many school-aged children lack sufficient reading skills. According to the most recent report card by the National Assessment of Educational Progress (NAEP), many school-aged children struggle with reading, the most fundamental educational skill. Because early reading skills provide the foundation for children's academic success, and because poor readers are not only at risk of developing academic problems, but also social and behavioral problems, identifying strategies to improve reading is imperative[2].

Why DHA?

As the brain continues to grow and develop throughout childhood and adolescence, maintaining brain health through good nutrition is critical. DHA is a major structural fat in the brain, accounting for up to 97 percent of the omega-3 fatty acids in the brain[3]. Furthermore, DHA is a nutrient critical for optimal brain development and cognitive function throughout life. DHA is therefore important for children and their developing brains. Accumulating evidence from epidemiological and intervention studies suggests that low dietary intakes of long chain omega-3 fatty acids, and DHA in particular, may have a detrimental effect on children's behavior and cognitive development[4,5]. Additionally, dietary supplementation with long-chain omega-3 fatty acids, including DHA, may have benefits for child behavior and learning, including reading and spelling[6-8]. Unfortunately, the potential benefits of DHA for learning and behavior are often not realized because DHA intake by children is low. The limited availability of DHA in foods customarily consumed by children has resulted in a shortfall in DHA consumption. Because average daily intake falls well below amounts recommended by national and international authorities, a DHA dietary supplement and foods fortified with DHA represent viable alternatives to increase DHA consumption.

- **Objective** — To evaluate the effects of DHA supplementation on reading, working memory and behavior in healthy school children who are underperforming in reading (≤ 33rd percentile)

STUDY DESIGN

- **Design** — Randomized, double-blind, placebo-controlled, parallel group
- **Setting** — 74 primary schools in Oxfordshire, UK
- **Participants** — 362 healthy children, aged 7-9 years, who were underperforming in reading (<33rd percentile)
- **Intervention** — 600 mg/day algal DHA or matching placebo (corn/soy)
- **Duration** — 16 weeks
- **Primary Outcomes Measures** — Reading, working memory and behavior

To determine the effects of algal DHA supplementation on reading, memory and behavior in healthy children in mainstream classes, Drs. Alexandra Richardson and Paul Montgomery initiated and conducted the **Docosahexaenoic Acid (DHA) Oxford Learning and Behavior (DOLAB) Trial** (DSM Nutritional Products, formerly Martek Biosciences, provided product and funding). This randomized, double-blind, placebo-controlled trial investigated the effects of algal DHA supplementation on reading, working memory and behavior in healthy school children. A total of 362 healthy children who were underperforming in reading (below the 33rd percentile) were enrolled in the study. Reading performance was evaluated using

a standardized reading test, The British Ability Scales (BAS II). Children were randomly given either algal DHA, at a dose of 600 mg/day, or a matching placebo for 16 weeks. The primary outcome measures were change from baseline in reading, working memory and behavior. Reading and working memory were assessed using the BAS II, and behavior was assessed by both parents and teachers using the Conners' Ratings Scales (CPRS and CTRS respectively). CPRS and CTRS are highly valid and reliable scales of child behavior over several domains.

Reading Results

Results from the DOLAB Trial found that after 16 weeks of supplementation, performance on the reading test did not differ by treatment group; children supplemented with algal DHA performed similarly to children given placebo. However, in a pre-planned analysis of the 224 children with baseline reading scores <20th percentile, algal DHA supplementation significantly improved reading. Reading was also significantly improved in the subgroup of 105 children with baseline reading scores <10th percentile (**Figure 1**).

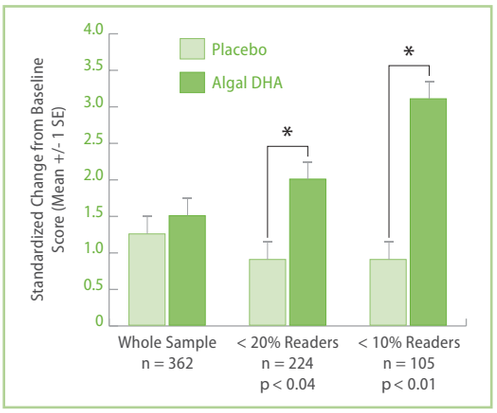

Figure 1 — Reading Results (Standardized Scores)

Standardized scores on the BAS II reading test correspond to a reading age (reported here in months). In general, children's reading ages typically increase by four months over a 16-week period. When comparing reading ages, results from the DOLAB Trial found that supplementation with 600 mg algal DHA for 16 weeks led to an additional **0.8 month gain** in reading age (approximately 20% greater than expected) in children with baseline reading scores <20th percentile. In children with baseline reading scores <10th percentile, algal DHA supplementation led to an additional **1.9 month gain** in reading age (approximately 50% greater than expected) (**Figure 2**).

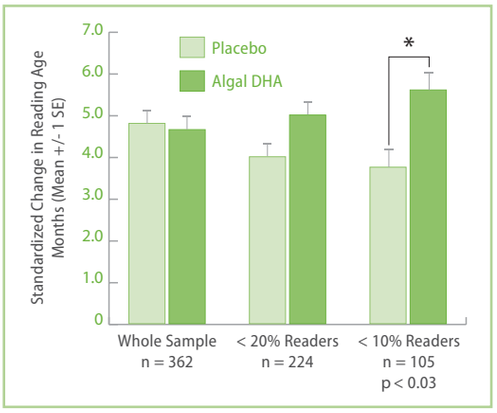

Figure 2 — Reading Results (Reading Age)

Behavior Results

After 16 weeks of supplementation, algal DHA significantly improved behavior as rated by parents. Compared to children given placebo, children given algal DHA experienced significant improvements in eight of fourteen scales of the CPRS (**Figure 3**). Algal DHA supplementation had no effect on teacher-rated behavior. Disparities between teacher and parent ratings of child behavior are common. Parents might be more sensitive than teachers or other professionals to any changes in their children's behavior over a short intervention period[9].

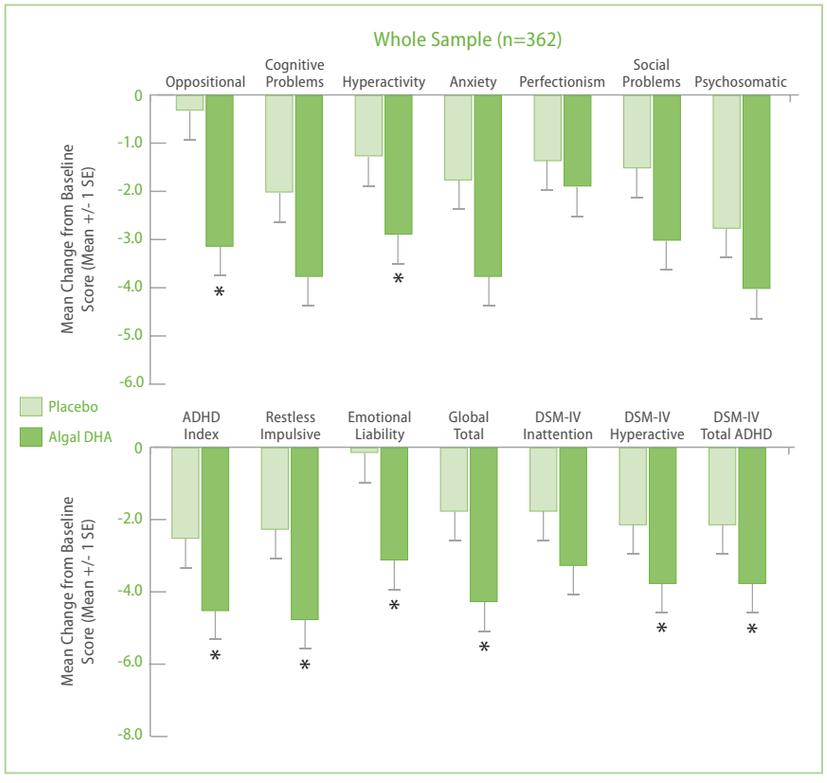

Figure 3 — Parent-Rated Behavior

Working Memory Results

There were no significant effects of algal DHA supplementation on working memory, although a trend toward better scores was observed (**Figure 4**).

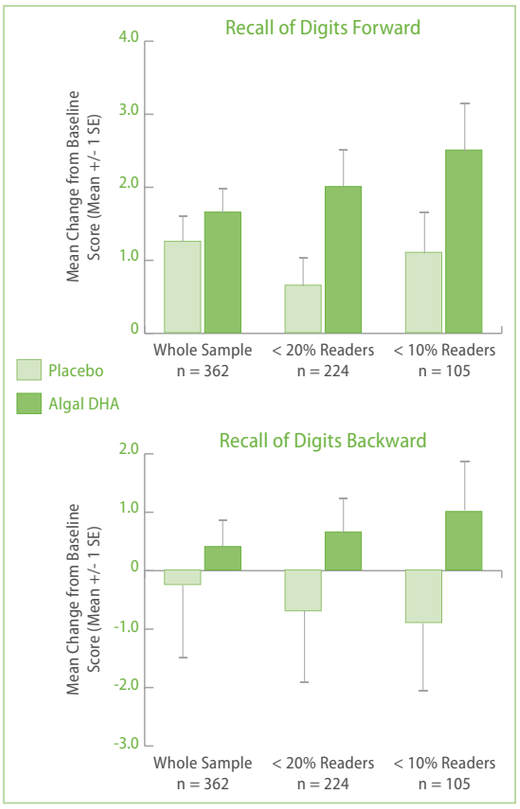

Figure 4 — Working Memory

Conclusions

For children with baseline reading scores <33rd percentile:

- Supplementation with 600 mg algal DHA for 16 weeks had no effect on reading
- Supplementation with 600 mg algal DHA for 16 weeks significantly improved parent-rated child behavior

For children with baseline reading scores <20th percentile:

- Supplementation with 600 mg algal DHA for 16 weeks significantly improved reading
- Supplementation with 600 mg algal DHA for 16 weeks led to an additional 0.8 month gain in reading age

For children with baseline reading scores <10th percentile:

- Supplementation with 600 mg algal DHA for 16 weeks significantly improved reading
- Supplementation with 600 mg algal DHA for 16 weeks led to a significant, 1.9 month gain in reading age

The full study can be found at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0043909.

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