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J. GORDON MILLICHAP, M.D., F.R.C.P., EDITOR

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LEARNING AND BEHAVIOR DISORDERS

FATTY ACID DIETARY SUPPLEMENTS IN TREATMENT OF DEVELOPMENTAL COORDINATION DISORDER AND ADHD

The effects of dietary supplementation with fish oil and evening primrose oil (in a ratio of 80% to 20%) compared to placebo were assessed in a randomized, controlled trial in 117 children with developmental coordination disorder (DCD), aged 5-12 years, at the University of Oxford, UK. Thirty-two of 102 children with Conners' Teacher Rating Scale-L (CTRS-L) scores at baseline had findings compatible with ADHD. Six capsules of the supplement daily provided omega-3 fatty acids (558 mg of eichosapentaenoic acid and 174 mg of docosahexaenoic acid), w-6 fatty acid g-linoleic acid (60 mg), and 9.6 mg of vitamin E (natural form, a-tocopherol). Placebo capsules contained olive oil. Significant improvements ($p<0.001$) in reading, spelling, and behavior occurred over a 3-month treatment period, and after a crossover, similar improvements were also noted in the placebo-active group. Motor skills were not benefited; a Movement Assessment Battery showed at baseline, mean percentile scores below the 6th percentile, and after 3 months treatment, scores at the 12th percentile were not different from the placebo group. Comparing the CTRS-L/ADHD scores, a reduction and improvement of >0.5 SD occurred during the 3 month treatment phase, whereas no change was seen in the placebo group ($p<0.0001$). During the 3–6 month follow-up phase, children continuing active treatment showed improvements in mean reading age of 13.5 months, a mean spelling gain of 5.3 months, and a decrease of the mean CTRS/ADHD score from a baseline of 74.7 to 52.6. No adverse effects were reported. On active treatment, the gain in reading age was 3 times that expected and spelling advanced twice the normal expected, reaching values above normal for age at follow-up. (Richardson AJ, Montgomery P. The Oxford-Durham study: a randomized, controlled trial of dietary supplementation with fatty acids in children with developmental coordination disorder. **Pediatrics** May

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2005;115:1360-1366). (Respond: Alexandra J Richardson DPhil, Oxford University Laboratory of Physiology, Parks Road, Oxford OX1 3PT, UK).

COMMENT. Developmental coordination disorder (DCD) is a motor skills disorder, not due to cerebral palsy or muscular dystrophy, that impairs a child's performance in sports or handwriting and interferes with academic achievement or activities of daily living (DSM-IV-R, 2000). In neurological terms, DCD is equivalent to an ideokinetic (adextrous) dyspraxia (Denny-Brown D. 1957), or clumsiness, in writing, dressing, using scissors and other ADL, despite normal muscle power (a dominant parietal lobe dysfunction), and it overlaps with the syndromes of ADHD and DAMP (deficit in attention, motor control and perception) (Landgren M et al, 1996). Treatment involves occupational therapy, special education, and, when indicated, medication. The above authors demonstrate a beneficial effect of fatty acid supplements in the diet in children with reading, spelling, attention and behavior disorders, but without improvement in coordination. These findings confirm earlier reports of the benefits of docosahexaenoic acid supplements in dark adaptation (scotopic vision) and improvements in reading ability in some dyslexics (Stordy BJ, 1995; **Ped Neur Briefs** Nov 1995). They also corroborate the report of a significant decrease in serum essential fatty acids (docosahexaenoic acid etc) found in 44 hyperactive children compared to 45 age- and sex-matched controls (Mitchell EA et al, 1987; **Ped Neur Briefs** Sept 1987). The hyperactive children had a greater incidence of learning disabilities and dyslexia than controls, but a double-blind, placebo-controlled, crossover study of evening primrose oil in 31 patients showed only modest improvements in behavior.

The present authors cite more recent references to successful trials of w-3/w-6 fatty acid supplements in children with dyslexia or ADHD, but a lack of response to w-3 fatty acid (docosahexaenoic acid) alone. The combination of omega-3 and omega-6 (linoleic) fatty acids appears to be essential, and also the dosage is probably important, in the duplication of the authors' encouraging results. Other research has claimed that deficiencies in omega-3 fatty acids and increased intake of omega-6 linoleic acid may explain increases in crime and aggressive behavior in young adults (Hibbeln JR et al. **Lipids** 2004;39:1207-13). Dietary modifications or supplements in the treatment of learning and behavior disorders of children have frequently fallen short of initial expectations after closer and more prolonged study. These have included the additive-salicylate-free, hypoallergenic, sugar-restricted, megavitamin, and mineral and trace element diets (Millichap JG, Attention Deficit Hyperactivity and Learning Disabilities. Chicago, PNB Publishers, 1998). Despite the excellent experimental design of the Oxford-Durham study, further controlled trials are indicated before advocating fish, with its attendant mercury exposure, or fatty acids as a general substitute for medication. However, the introduction of a relatively safe, and well tolerated, dietary treatment could, if successful, serve as a complementary or substitute treatment, and offset the increase in concern regarding side effects of drug therapies.

CHANGES IN CEREBRAL BLOOD FLOW WITH AGE IN ADHD

Changes in regional cerebral blood flow (rCBF) with age were studied by SPECT in 29 drug-naïve patients with attention deficit hyperactivity disorder (ADHD) (24 boys, 5 girls; age 7-13) and 12 with complex partial epilepsy as controls, at NIMH International Mental