
Evidence Based Dietary Advice for Children's Mood, Behaviour and Learning,

In The Context of Healthy Eating Guidelines and Typical Eating Habits

by David Rex, Dietitian, Health & Social Care – Children's Services, Highland Council, Inverness

This presentation will assess the degree to which the current "Levels of evidence" approach to diet and children's mood, behaviour and learning, is fit for purpose.

A progressive alternative is suggested, based on many years of experience of a dietitian balancing parental interest in nutrition "therapy" and the promotion of a healthy food culture at the population level.

Key points:

- The current preferred way of assessing the value of interventions for children with ASD and ADHD is too reductionist to allow diet to be taken seriously.
- The current interpretation of this "Levels of evidence" approach gives practitioners and families the idea that drugs are essential and a nourishing diet is unimportant.
- Our assumption that the health professional is the "expert", means that parents interest in the link between mood and food is seen as a threat, instead of an opportunity for engagement.
- A more holistic and progressive form of decision making, using the full range of available evidence on nutrients, foods and diets, is proposed.
- This approach allows us to restore the natural hierarchy with diet at the top, supplements as second best, and drugs only when necessary.

About David Rex

David Rex is a Dietitian for Highland Council, working in "Health & Social Care – Children's Services". He has a lead public health role for Food & Health in schools, nurseries and Children's Residential Units; and provides specialist Dietetic advice for children with Autistic Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD). He advises on diet and children's mood, behaviour and learning; and on how to deal with the selective eating patterns that are so common in children with ASD. He has been heavily involved in the development of the "High 5" Health & Wellbeing programme for Highland primary schools, and is a member of the Highland School Meals Stakeholder group. David has a first degree in Chemistry and Food Science, a post graduate Diploma in Nutrition and Dietetics, and a Masters in Food Policy. He has over 25 years experience of the food system, starting as a "Teenage burger flipper" for a well known fast food chain, and going on to look at food and health from a range of different perspectives, in posts as diverse as: food chemist and technical advisor in the food industry; community and hospital dietitian; and food policy advisor for a Health Authority. He is an advocate for sustainable and socially just food systems, and is passionate about cooking and eating well.

Background to the DOLAB Studies: Omega-3 and Child Behaviour and Learning

by Dr Alex Richardson, Senior Research Fellow at the Centre for Evidence Based Intervention, University of Oxford; and Founder Director of the UK charity, Food and Behaviour Research

In the UK and US, at least one in five school-aged children are now affected by Attention-Deficit Hyperactivity Disorder (ADHD) or related developmental conditions - including dyslexia or reading disability (RD), developmental coordination disorder (DCD) and Autistic Spectrum Disorders (ASD). These diagnoses remain purely descriptive, as there are no objective markers. The overlap between these conditions is substantial, and they also show no clear-cut boundaries with normal functioning. These kinds of behaviour and learning difficulties place a heavy burden not only on affected individuals and families, but on society as whole, owing to their negative lifelong impact on educational, occupational and social outcomes. Effective strategies for their prevention and management are therefore urgently needed.

The causes of childhood behaviour and learning difficulties are complex and multi-factorial, but increasing evidence points to diet as an important but under-researched factor. Nutrition plays a fundamental role in brain development and functioning, and omega-3 fatty acids have received particular attention in recent years in relation to mental as well as physical health, wellbeing and performance. Omega-3 are dietary essentials, but intakes are very low by historical standards in most modern developed countries. The longer-chain omega-3 found in fish, seafood and some algae – known as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) – are the most biologically important forms, not only for cardiovascular and immune system health, but also for normal development and functioning of the brain and nervous system. DHA is the most abundant omega-3 in the brain, as it is a structural building block of brain and nerve cell membranes; and both DHA and EPA are substrates for a huge array of regulatory substances that influence brain function on a moment-by-moment basis.

Accumulating evidence from epidemiological, biochemical and intervention studies indicates that low dietary intakes of these long-chain omega-3 can have negative effects on children's behavioural and cognitive development. Controlled treatment trials show significant benefits from supplementation with EPA/DHA in children with ADHD and related conditions such as dyslexia and developmental coordination disorder (DCD). Reductions in ADHD-type symptoms (inattention, hyperactivity and impulsivity) have been the most commonly reported finding, but significant benefits were also found for both reading and spelling progress in the 'Oxford-Durham study' of children with DCD. These findings have raised the important question of whether any such benefits might apply to children from the wider school population. The DHA Oxford Learning and Behaviour (DOLAB) studies were designed to address this question.

Summary of key points

- Childhood behaviour and learning difficulties are an increasing problem in the UK and other developed countries. ADHD, dyslexia and related conditions affect at least one in five children of school age in the UK, and many more children have milder forms of the same kinds of difficulties.
- The causes of child behaviour and learning difficulties are many and varied, but theory and increasing evidence indicate the importance of nutrition in general, and omega-3 fatty acids in particular, for brain development and functioning.
- Controlled trials show that an increased intake of long-chain omega-3 fatty acids (EPA and DHA), can be beneficial in ADHD and related conditions such as dyslexia and DCD.
- The DOLAB studies were designed to find out whether supplementation with omega-3 DHA can improve learning and/or behaviour in children from the general school population.

About Alex Richardson

Dr Alex Richardson is a Founder/Trustee of FAB Research and a Senior Research Fellow at the Centre for Evidence Based Intervention, University of Oxford, having previously been based at Oxford's Dept of Physiology, Anatomy and Genetics from 1987-2007. She is internationally known for her work on the role of nutrition in behaviour, learning and mood, and is one of the world's leading researchers on the influence of omega-3 and other dietary fats on mental health and performance, particularly in relation to developmental conditions such as ADHD, dyslexia, depression and schizophrenia. Her research has always been multi-disciplinary, and currently involves both experimental studies and nutritional treatment trials. Alex is much sought after as a speaker for public, professional and academic audiences both nationally and internationally. She has over 80 research publications to date, and is also author of 'They Are What You Feed Them'.

**Children's Blood Omega-3 Status, and its Links with Behaviour and Cognition:
Evidence from the DOLAB Study Screening Population**

**by Dr Alex Richardson, Senior Research Fellow at the Centre for Evidence Based Intervention,
University of Oxford; and Founder Director of the UK charity, Food and Behaviour Research**

Background

Omega-3 long-chain polyunsaturated fatty acids (LC-PUFA), especially DHA (docosahexaenoic acid) are essential for brain development and physical health. Low blood Omega-3 LC-PUFA have been reported in children with ADHD and related behaviour and learning difficulties, as have benefits from dietary supplementation. Very little is known, however, about blood fatty acid status in the general child population. We therefore investigated this in relation to age-standardized measures of behaviour and cognition in a representative sample of children from mainstream schools.

Methods

Participants were 493 schoolchildren aged 7-9 years from 74 mainstream Oxfordshire schools, selected for below average reading performance in national assessments (Key Stage 1) carried out on all UK children at age seven. (These children were part of the screening sample for the subsequent DOLAB intervention trial).

Whole blood fatty acids were obtained via fingerstick samples, and parents provided information on the children's typical intake of fish and seafood and any supplement use. The children's reading and working memory was assessed using the British Ability Scales (II). Their behaviour (ADHD-type symptoms) was rated using the revised Conners' rating scales (long parent and teacher versions). Associations were examined and adjusted for relevant demographic variables.

Results

Only two thirds of the children were reading below the average for their age when tested. Reading scores were normally distributed, and their mean (90.6, sd 10.6) fell within the normal range (100, sd 15). DHA and EPA (eicosapentaenoic acid), made up only 1.9% and 0.55% respectively of total blood fatty acids, with DHA showing more individual variation. EPA+DHA together totalled 2.46%. Almost 9/10 children (88.2%) were reported to eat less than two portions of fish or seafood per week, and blood omega-3 LC-PUFA correlated very strongly with reported intakes.

Controlling for sex and socio-economic status, lower blood DHA concentrations were associated with poorer reading (std. OLS coeff. = 0.09, $p < .05$) and working memory performance (0.14, $p < .001$). Lower DHA was also associated with higher parent-rated oppositional behaviour (-0.175, $p < .0001$), emotional lability (-0.178, $p < .0001$), anxiety (-0.123, $p < .02$), psychosomatic symptoms (-0.116, $p < 0.02$) and Conners' Global Index scores (-0.122, $p < 0.013$).

Conclusions

In these healthy UK children, blood concentrations of omega-3 LC-PUFA (EPA+DHA) were low relative to adult general health recommendations (EPA+DHA < 4% indicates high cardiovascular risk in adults). Children's blood DHA concentrations were also directly related to measures of their cognition (reading and working memory) and a wide range of parent-rated behaviour problems (ADHD-type symptoms).

These findings require confirmation, and simple associations do not provide evidence of a causal links. However, they support the proposal that the benefits from dietary supplementation with Omega-3 LC-PUFA shown for ADHD, DCD, Dyslexia, and related conditions might extend to the general school population. This proposal was also supported by the results of the subsequent DOLAB intervention trial.

Summary of key points

- In UK schoolchildren, average blood concentrations of long-chain omega-3 (EPA+DHA) were found to be very low with respect to adult general health recommendations, at 2.46%. (In adults, EPA+DHA < 4% is indicative of high cardiovascular risk).
- Consistent with this, almost 9 out of 10 children failed to meet current dietary guidelines for fish and seafood consumption (and blood omega-3 LC-PUFA reflected reported intakes)
- Lower blood DHA concentrations in these children were associated with poorer reading and working memory, and with more parent-rated behaviour problems (ADHD-type symptoms). These associations were independent of age, sex and socio-economic status.
- While this study was purely observational and therefore cannot address causality, the findings support other evidence that an increased DHA intake can improve behaviour and learning in children from the general school population.

Further Information

For full details of the results reported here, see the open-access publication:

Montgomery P, Burton JR, Sewell RP, Spreckelsen TF, Richardson AJ. Low Blood Long Chain Omega-3 Fatty Acids in UK Children Are Associated with Poor Cognitive Performance and Behaviour: A Cross-Sectional Analysis from the DOLAB Study. PLoS One. 2013;8(6):e 66697. June 24.

Acknowledgements

The DOLAB studies are primarily supported by a research grant to the University of Oxford from DSM Nutritional Products, who also carried out the blood fatty analyses reported here. Additional support for Dr Richardson's contribution to this work was provided by the Waterloo Foundation.

About Alex Richardson

Dr Alex Richardson is a Founder/Trustee of FAB Research and a Senior Research Fellow at the Centre for Evidence Based Intervention, University of Oxford, having previously been based at Oxford's Dept of Physiology, Anatomy and Genetics from 1987-2007. She is internationally known for her work on the role of nutrition in behaviour, learning and mood, and is one of the world's leading researchers on the influence of omega-3 and other dietary fats on mental health and performance, particularly in relation to developmental conditions such as ADHD, dyslexia, depression and schizophrenia. Her research has always been multi-disciplinary, and currently involves both experimental studies and nutritional treatment trials. Alex is much sought after as a speaker for public, professional and academic audiences both nationally and internationally. She has over 80 research publications to date, and is also author of 'They Are What You Feed Them'.



**Effects of DHA supplementation on Children's Reading, Working Memory and
Behaviour: Key findings from the DOLAB Randomised Controlled Trial**

**by Dr Alex Richardson and Professor Paul Montgomery, Centre for Evidence Based Intervention,
University of Oxford**

Background

Omega-3 fatty acids are dietary essentials, and the current low intakes in most modern developed countries are believed to contribute to a wide variety of physical and mental health problems. Evidence from clinical trials indicates that dietary supplementation with the long-chain omega-3 (EPA and DHA, found in algae, fish and seafood) may improve child behaviour and learning. However, most previous trials have involved children with specific developmental disorders of behaviour and learning such as attention-deficit/hyperactivity disorder (ADHD), dyslexia or developmental coordination disorder (DCD).

Here we investigated whether such benefits might extend to the general child population. Our aim was to determine the effects of dietary supplementation with the long-chain omega-3 DHA (docosahexaenoic acid), the main omega-3 found in the brain, on the reading, working memory and behaviour of healthy schoolchildren.

Methods

This was a parallel group, fixed-dose, randomized, double-blind, placebo-controlled trial (RCT). The participants were 362 healthy children aged 7-9 years from 74 mainstream Oxfordshire primary schools. Eligibility criteria included: initially underperforming in reading (original study design, $\leq 20^{\text{th}}$ centile, but owing to recruitment problems, this increased to $\leq 33^{\text{rd}}$ centile before randomisation); English as a first language; no major medical conditions or learning difficulties, fish intake ≤ 2 portions/week, and not taking omega-3 supplements or medications expected to affect behaviour or learning. Of 1376 children invited, 362 met full study criteria and were randomised to receive either 600 mg/day DHA (from algal oil, provided by DSM Nutritional Products), or a taste/colour matched corn/soybean oil placebo. The primary outcomes were age-standardized measures of reading and working memory (British Ability Scales II), and parent- and teacher-rated behaviour (Conners' Rating Scales, long versions).

Results

Intent-to-treat (ITT) analyses showed no effect of DHA on reading in the full sample, but significant effects in the pre-planned subgroup of 224 children whose initial reading performance was $\leq 20^{\text{th}}$ centile (the target population in our original study design). In these children, DHA supplementation increased reading progress by 20% relative to placebo treatment. For children initially reading $\leq 10^{\text{th}}$ centile, the gain from DHA treatment over placebo was 50%. Parent-rated behaviour problems (ADHD-type symptoms) were significantly reduced by the DHA treatment in the full sample, but little or no effects were seen for either teacher-rated behaviour or working memory.

Conclusions

DHA supplementation appears to offer a safe and effective way to improve reading and behaviour in healthy but underperforming children from mainstream schools. Replication studies are clearly warranted, as such children are known to be at risk of low educational and occupational outcomes in later life. A second DOLAB study is already underway, involving mainstream schools in several other UK regions in addition to Oxfordshire, and focusing on children with an initial reading performance $\leq 20^{\text{th}}$ centile.

Summary of key points

- Previous studies have shown that an increased intake of omega-3 long-chain polyunsaturated acids (LC-PUFA) can improve behaviour and learning in children with ADHD, dyslexia, DCD or related conditions. Evidence for similar benefits for children from the general school population has been lacking, so the DHA Oxford Learning and Behaviour (DOLAB) Study was designed to investigate this issue.
- In a randomised controlled trial, 362 healthy UK schoolchildren who were initially underperforming in reading (lowest third of the normal range), were supplemented with DHA (600mg/day) or placebo for 16 weeks. Their reading, working memory and behaviour (parent and teacher ratings of ADHD-type symptoms) were assessed before and after this intervention.
- No effects of DHA on reading were found for the sample as whole. However, significant benefits were found for the poorest readers (lowest fifth of the normal range), who were the original target population. In these children, DHA boosted reading progress by 20% over placebo, and in the lowest 10% of readers, the relative reading gain was 50%. DHA also led to significant improvements in parent-behaviour problems (ADHD symptoms), but no effects were found for teacher ratings of behaviour, nor for the working memory measures.
- These findings require confirmation, but they show that an increased intake of omega-3 DHA can improve behaviour and learning in underperforming children from the general school population.

Further Information

For full details of the results reported here, see the open-access publication:

Richardson AJ, Burton JR, Sewell RP, Spreckelsen TF, Montgomery P. Docosahexaenoic Acid for Reading, Cognition and Behaviour in Children Aged 7-9 Years: A Randomized, Controlled Trial (The DOLAB Study). PLoS One. 2012;7(9):e43909. Sep 6.

Acknowledgements

The DOLAB studies are primarily supported by a research grant to the University of Oxford from DSM Nutritional Products, who also provided the DHA and placebo supplements used in this trial. Additional support for Dr Richardson's contribution to this work was provided by the Waterloo Foundation.

About Alex Richardson

Dr Alex Richardson is a Founder/Trustee of FAB Research and a Senior Research Fellow at the Centre for Evidence Based Intervention, University of Oxford, having previously been based at Oxford's Dept of Physiology, Anatomy and Genetics from 1987-2007. She is internationally known for her work on the role of nutrition in behaviour, learning and mood, and is one of the world's leading researchers on the influence of omega-3 and other dietary fats on mental health and performance, particularly in relation to developmental conditions such as ADHD, dyslexia, depression and schizophrenia.

About Professor Paul Montgomery

Professor Paul Montgomery is Co-Director of the University of Oxford's Centre for Evidence-Based Intervention, and internationally known for his work on finding effective interventions for complex psycho-social problems. This integrates the best of a wide range of different methodologies (e.g. systematic reviews, and randomised controlled trials, as well as the reporting and implementation of interventions). With Alex Richardson, he is co-Principal Investigator of the DOLAB studies and co-author of the Oxford-Durham study and a systematic review of omega-3 for bipolar disorder. He has also published on nutritional interventions for autism and schizophrenia.



Omega-3 DHA and Children's Sleep: New findings from the DOLAB Studies

**by Professor Paul Montgomery – Co-Director, Centre for Evidence-Based Intervention,
University of Oxford**

Sleep problems in children are associated with poor general health, and with behavioural and cognitive problems. Similarly, a large body of evidence now links deficiencies of omega-3 long-chain fatty acids such as DHA (docosahexaenoic acid) with childhood behaviour and learning difficulties. Theory and some evidence support a role for fatty acids in sleep regulation, but this issue has received little formal investigation to date.

We therefore included some simple assessments of children's sleep as secondary measures in the DOLAB study, both at the screening stage and in the subsequent randomised controlled trial of DHA supplementation. This allowed us to examine associations between blood fatty acid concentrations (from fingerstick samples of whole blood) and subjective sleep (using an age-standardised parent questionnaire) in a large epidemiological sample of healthy children aged 7-9 years from mainstream UK schools. Both blood fatty acid profiles and parent ratings of sleep were obtained from 395 of the children who took part in the screening stage of the DOLAB study.

In the subsequent randomised controlled trial, we then explored whether 16 weeks of supplementation with 600mg/day of DHA vs placebo might improve sleep in a subset of those children (n=362) who were underperforming in reading. In a further random subset (n=43), the children's sleep was also assessed objectively via actigraphy pre- and post-intervention.

In 40% of the epidemiological sample, we found that Child Sleep Health Questionnaire scores indicated clinical-level sleep problems. Furthermore, cross-sectional analyses at this stage revealed some significant associations between blood DHA concentrations and these parent ratings of children's sleep problems. These preliminary results will be presented and discussed, together with findings from the treatment trial investigating the effects of DHA supplementation on both subjective and objective sleep measures.

These new findings have not yet been subjected to peer review, and therefore must be regarded as purely exploratory at this stage. We appear to have found some links between blood omega-3 status and children's sleep, as well as preliminary indications that DHA supplementation may improve children's sleep, but further investigations are warranted.

Summary of key points

- Both sleep problems in children and dietary deficiencies of long-chain omega-3 fatty acids such as DHA are associated with poorer physical and mental health, wellbeing and performance.
- Fatty acids are known to play some role in the regulation of sleep, and there is some evidence that dietary supplementation might help with some forms of sleep problems, but there has been little or no investigation of possible links between sleep and fatty acids in children.
- Both subjective and objective measures of sleep were therefore included as secondary measures in the DOLAB study.
- Parent ratings indicated that 40% of the children screened for the DOLAB study had clinical-level sleep problems.

- Preliminary findings indicate some significant associations between blood omega-3 status and sleep problems in children, as well as possible treatment effects from DHA, but full details of these results must await peer review and publication.

About Professor Paul Montgomery

Professor Paul Montgomery is Co-Director of the University of Oxford's Centre for Evidence-Based Intervention, and internationally known for his work on finding effective interventions for complex psycho-social problems. This integrates the best of a wide range of different methodologies (e.g. systematic reviews, and randomised controlled trials, as well as the reporting and implementation of interventions). With Alex Richardson, he is co-Principal Investigator of the DOLAB studies and co-author of the Oxford-Durham study and a systematic review of omega-3 for bipolar disorder. He has also published on nutritional interventions for autism and schizophrenia.

What's so special about Omega-3 DHA?

by Professor Michael A Crawford – Imperial College London

Omega-3 DHA (docosahexaenoic acid) is a long-chain polyunsaturated fatty acid found in algae, fish and other seafood. DHA is an essential structural component of all cell membranes in the brain and nervous system, where it helps to maintain the fluidity needed for proper cell signalling. Substances made from DHA play key roles in almost all biochemical signalling systems in the brain and body, including gene transcription, regulation and expression. Some derivatives of DHA are needed to form synapses – the connections between brain and nerve cells – while others help to protect brain and nerve cells from damage. Deficiencies of DHA also interfere with the functioning of almost all classical neurotransmitters (chemical messengers) including dopamine, serotonin and many others – as well as impairing both cardiovascular and immune function.

DHA is particularly critical for vision. This unique molecule makes up 30-50% of the retina, where photo-receptor cells require DHA to convert light into an electrical signal. In fact, it is this property of DHA that laid the foundation for the evolution of vision, the nervous system and the brain. During the 600 million years since air-breathing life forms first evolved on earth, DHA has always been the fatty acid uniquely used in the photo-receptors, neurons and synapses of any species with any kind of vision and/or a nervous system. This astonishing conservation of the basic structure of brain and nerve cell membranes over 600 million years of evolution shows the absolute essentiality of omega-3 DHA for brain development and function, and its fundamental importance to human nutrition to this day.

Unfortunately, however, the diets now consumed in the UK and other developed countries are seriously lacking in omega-3 fatty acids, and the long-chain omega-3 like DHA in particular. In theory, some DHA can be synthesised from shorter-chain omega-3 derived from plant sources, but in humans this process is not reliable, making pre-formed DHA a dietary essential. Changes to our food system since industrialisation have taken little account of the importance of nutrition to health in general, and almost no attention has been paid to the special nutritional requirements of the human brain, which simply must have adequate supplies of omega-3 DHA if it is to develop and function normally.

These dietary changes help to explain the dramatic increase in 'brain disorders' in all developed countries over recent years. In the European Union the costs of mental disorders have now overtaken all other burdens of ill health. In 2010 these were calculated at €789 billion (£105 billion in the UK alone) - a cost greater than that of heart disease and cancer combined. Reduced intakes of sea foods, and the excessive use of other dietary fats which compete with DHA, would be expected to lead to brain disorders and mental ill health. To reverse these trends and meet the needs of growing populations worldwide will require an increase in current dietary intakes of long-chain omega-3 that cannot be met from either fishing or aquaculture using current technologies. Sustainable sources of DHA derived directly from algae offer one potential solution that is already available, and further sources may be forthcoming from genetic modification of plants to produce long-chain omega-3, or sustainable farming of the oceans.

Summary of key points

- DHA is the most abundant omega-3 fatty acid in the brain. It is critical for both the structure of brain and nerve cells, and their functioning.
- DHA is particularly important for vision, as the unique properties of the DHA molecule allow the conversion of light into electricity. In over 600 million years of evolution, DHA has been conserved in brain and nerve cell membranes in every species with a nervous system, and this fact illustrates its fundamental importance in human nutrition to this day.

- Modern western-type diets are seriously lacking in DHA, however, as the main dietary sources are algae, fish and seafood. Shorter-chain omega-3 from plant sources cannot reliably be converted into DHA in humans, and so pre-formed DHA is a dietary essential.
- This relative lack of DHA in modern diets helps to explain the dramatic rise in 'brain disorders', which have now overtaken all other burdens of ill-health in the UK and other developed countries.
- Increased supplies of DHA are needed to meet the needs of the growing world population, as the quantities needed to support human brain health cannot be met from fish stocks or conventional aquaculture. Some forms of algae already provide a sustainable, scalable source of DHA, and other approaches in development include genetic modification of plants and sustainable farming of the oceans.

About Professor Michael A Crawford

Professor Michael Crawford has been the Director of the Institute of Brain Chemistry and Human Nutrition since 1990. Having worked in the East-end of London on maternal nutrition and health with Newham, the Homerton and Queen Elizabeth Hospital for Children, he is now at Reproductive Physiology at the Chelsea and Westminster Hospital Campus of Imperial College, London. His special interest lies in the role that lipids and essential fatty acids play in interacting with the cellular signalling systems, i.e. the key interaction between nutrition affecting membrane lipids and gene expression. He has published over 300 peer reviewed papers and 3 books. Amongst his several honours and prizes, he was elected by his peers to the Hall of Fame at the Royal Society of Medicine in 2010. He collaborates in research internationally and is much in demand as a lecturer worldwide.

About FAB Research

Food and Behaviour Research (**FAB Research**), established in 2003, is a charitable organisation dedicated both to advancing scientific research into the links between nutrition and human behaviour and to making the findings from such research available to the widest possible audience. **FAB Research** aspires to be a local and international leader of scientific research into how nutrition affects the human brain and mind, and an intellectual and strategic force for improving public education and professional practice in this domain.

We aim to support and promote world-class scientific research into nutritional influences on brain and behaviour, which often spans the current boundaries between many different academic and professional disciplines. We aim to provide accessible, evidence-based information to other researchers, the public, practitioners and policymakers on the importance of nutrition and diet to brain development and function.

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