OCL 2016, 23(1) D101

DOI: 10.1051/ocl/2015067

OCL Oilseeds & fats Crops and Lipids

Available online at:
www.ocl-journal.org

INTRODUCTION – DOSSIER OPEN ACCESS

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LIPIDS AND BRAIN
LIPIDES ET CERVEAU

Introduction

Since 2007, the French Society for the Study of Lipids (SFEL) has organized the Lipids and Brain Conference every 4 years which, over a period of 3 days, examines the latest findings in this field of research within a framework of human health and nutrition. These conferences have provided an opportunity to extend our knowledge in these fields of research and on the relationship between nutrition, fatty acids, lipids and central nervous system function during development and ageing. They have also successively honoured Dr Stanley I. Rapoport (Bethesda, USA) and Pr. Nicolas G. Bazan (New Orleans, USA) with the French Chevreul Medal for their pioneering research.

The Lipids and Brain III 2015 conference followed on from the success of the previous conferences of 2007 and 2011 held in Paris, from which reports have been published in *OCL* journal in 2007 (Lipids and Brain I *OCL* Vol. 14, N° 3 and 4) and 2011 (Lipids and Brain II : *OCL* Vol. 18, N° 4 and 5). The SFEL is pleased to present you with the *OCL* report of the Journées Chevreul Lipids and Brain III 2015 conference which has been held in Paris on 16–18 March, 2015. This Conference report presents the original and latest findings from leading researchers into both fundamental and applied research on the metabolism and the biological effects of polyunsaturated fatty acids (PUFAs) within the brain and the retina, but also others specific fatty acids and structured lipids. Recent advances on the metabolism and bioactivity of long-chain PUFAs in the central nervous system, particularly that of docosahexaenoic acid (DHA), are examined during both development and ageing. The action of PUFAs on infant development, as well as that of long-chain monounsaturated fatty acids and lipid micronutrients, are also addressed, as well as the latest insights into brain (ischemia and Alzheimer's Disease) neuropsychiatric disorders and eye diseases. The report ends with emerging areas of research and recommendations for brain and eye nutrition, and also with the Chevreul Medal of Professor Michael Angus Crawford from Imperial College (London, UK) honoured for his research on DHA metabolism, neurosignaling and human brain evolution. Professor Crawford is one of the pioneer researchers who was actively involved in the discovery of the essentiality of omega 3 fatty acids, and the presence and the functions of DHA in brain cell membranes.

Many thanks again to all those who participated and particularly those that wrote up their presentations for publication in the *OCL Journal*. Further presentations, which we did not receive in time to publish in this special isssue, will be published in future issues of *OCL*. We hope to see you in the next Lipids and Brain Conference.

Philippe Guesnet (SFEL), Bernadette Delplanque (SFEL), Rob Winwood (SCI)

Journées chevreul 2015/Lipids and Brain 3
Scientific program

Metabolism and mechanisms of action of polyunsatured fatty acids in the brain

(Chairs: P. Guesnet, R. Bazinet)

- Metabolic fate of AceDoPC, a stable form of LysoPC-DHA to target the brain (Michel Lagarde, France).
- Molecular principles for docosahexaenoic acid retention and for its cell survival bioactivity in the nervous system (Nicolas G. Bazan, USA).
- Maintaining brain PUFA concentrations: A focus on uptake and rapid metabolism (Richard P. Bazinet, Canada).
- Nutritional n-3 PUFAs deficiency during perinatal period alters brain immune system and neuro-nal plasticity (Sophie Laye, France).
- Resolvins promote resolution of brain inflammation via microglia polarization (Corinne Joffre, France).

Chevreul medal: Pr. Michael A. Crawford, UK

Past, present and future: the extreme conservation of neurosignaling and the cost of mental ill-health (video on OCL website, www.ocl-journal.org).

Lipids and infant development (Chairs: B. Gibson, C. Bourlieu)

- Differential effects of prenatal DHA supplementation by maternal socio-demographic characteristics (Maria Makrides, Australia).
- Long-chain saturated and monounsaturated fatty acids are correlated to early development in premature infants (Birgitta Strandvik, Sweden).
- Early nutritionnal determinants of cognitive development in children of the EDEN mother-child cohort – Role of polyunsaturated fatty acid (Barbara Heude, Jonathan Bernard, France).
- Parenteral nutrition and brain development after preterm birth (Randal K. Buddington, USA).
- Why lutein is important for the eye and the brain (Maria Ramirez, Spain).

Dietary lipids, ageing and brain pathologies (Chairs: L. Belayev, B. Delplanque)

- Lipid signaling: connecting inflammation and lipid metabolism (Mojgan Masoodi, Switzerland).

Brain ischemia

- Palmitic and stearic acid methyl esters as potential vasodilators and neurotransmitters (Hung W. (Kevin) Lin, USA).
- A novel therapeutic strategy for experimental stroke using docosahexaenoic acid complexed to human albumin (Ludmila Belayev, USA).
- A parenteral lipid emulsion protects from mitochondrial dysfunction in a MCAO mouse model of ischemic stroke (Gunter P. Eckert, Germany).
- Role of HDL in brain ischemia/stroke (Olivier Meilhac, France).
- Dairy fatty acids intake is protective against the occurrence of vasospasm after subarachnoid haemorrhage, while omega6 fatty acids exert an opposite role (Jean-Charles Martin, France).

Alzheimer disease (Chairs: P. Barberger-Gateau, S. Cunnane)

- Deteriorating brain uptake of glucose but not ketones in Alzheimer's disease: Could medium chain triglycerides be of therapeutic benefit? (Stephen C. Cunnane, Canada).
- Long-chain n-3 PUFA and cognition in older people: interaction with Apolipoprotein E genotype (Pascale Barberger-Gateau, France).
- A unique brain lipidome and metabolome biosignature in Alzheimer's Disease? (Giuseppe Astarita, USA).
- The rationale and efficacy of Souvenaid, a medical food targeting synaptic dysfunction in early Alzheimer's disease (John W.C. Sijben, the Netherlands).

Psychiatric disorders and neurological pathologies (Chairs: H. Bengtsen, B. Delplanque)

- Modern Fats and the Modern Mind: Aggression and Depression (Joseph R. Hibbeln, USA) (video on SFEL website, www.sfel.asso.fr).
- Omega-3 for child behaviour and learning: clinical trials in ADHD and the general population (Alexandra J. Richardson, United Kingdom).
- Phospholipids, Arachidonic Acid, and Eicosanoids Signaling in Schizophrenia (Jeffrey K. Yao, USA).

Lipids and eye diseases (Chairs: P. Barberger-Gateau, N. Bazan)

- Fatty acids and the prevention of ocular pathologies: where do we stand? (Lionel Bretillon, France).
- A novel role for very long chain fatty acids in brain function (Blake R. Hopiavuori, USA).
- Lipids and eye diseases: an epidemiological perspective (Cécile Delcourt, France).
- Phospholipase A2, the neurotrophin pigment epithelial derived factor and lipid mediators regulate corneal nerve regeneration (Haydee Bazan, USA).
- Age-related macular degeneration, drug targets, and DNA sequence variation in genes encoding lipid-associated signaling pathway constituents (John Paul SANGIOVANI, USA).

Recommendations for brain nutrition (Chairs: P. Legrand, B. Delplanque, P. Guesnet)

- Alterations in dietary n-3 and n-6 fatty acids for treating chronic headaches (Christopher Ramsden, USA).
- Choosing foods to balance competing n-3 and n-6 HUFA and their actions (Bill Lands, USA).
- LCPUFA Requirement for brain development (Robert A. Gibson, Australia).

Emerging areas of research (Chairs: M. Linder, R. Winwood)

- Has the key role of Arachidonic Acid in the development of neural systems in infants been forgotten? – a topical review (Rob Winwood, United kingdom).
- Impact of the gut microbiota on brain development and function (Sylvie Rabot, France).
- The preterm pig as a translational model to study the role of lipids in growth and development (Randal K. Buddington, USA).
- Lecithin Extracted from a Marine Source in the Form of Nanoliposomes Promotes Neural Network Arborization and Formation in Primary Neuronal Cultures (Elmira Arab-Tehrani, France).
- Tracing neural development and rhythms in a benchtop perfusion platform for combined long-term microelectrode in vitro electrophysiology and time-lapse imaging (Axel Blau, Italy).
- Dietary triglycerides act on mesolimbic structures to regulate the rewarding and motivational aspects of feeding (Serge Luquet, France).
- Non-enzymatic metabolism of PUFAs: friend or foe? (Thierry Durand, France).