

THE ROLE OF MARINE LIPIDS AS A DETERMINANTS OF EVOLUTION AND HOMINID BRAIN DEVELOPMENT

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Lipids played a major, as yet unrecognised, role as determinants in evolution. Life originated 2.5 billion years ago during which time there was ample opportunity for DNA modification. Yet little change of life form is visible in the fossil record for the first 2.5 billion years of life. It was not until about 600 million years ago when the oxygen tension rose to a point where air breathing life forms became thermodynamically possible, that a major change is seen in the fossil record. The sudden appearance of the 32 phyla in the Cambrian fossil record was also associated with the appearance of intracellular detail. That detail was provided by cell membranes in which the lipids were structural essentials. The intracellular compartmentalisation of the nucleus, mitochondria, reticulo-endothelial system and plasma membrane led to cellular specialisation and then speciation. Thus not just oxygen but also the lipids were drivers in the Cambrian explosion. Docosahexaenoic acid (DHA) from the marine food web, provided the basic membrane backbone of the new photoreceptors that converted photons into electricity laying the foundation for the evolution of the nervous system and the brain. Hence the omega 3 DHA associated with the anti-oxidants and trace elements so rich in fish and sea foods, would have played a critical role in the evolution of vision and the brain. That same process was essential to and finally led to the cerebral expansion in human evolution. There is now clear evidence from molecular biology, comparative data and contemporary epidemiology of that continued dependence. The paucity of that marine nutrient cluster on land meant that land based mammals lost relative brain capacity as they evolved larger and larger bodies, For example all small mammals have a high relative capacity of over 2% of the body weight as brain. The chimpanzee has about 0.4%, humans 2%. A zebra with 350g brain compares unfavourably with the dolphin of similar body weight but 1.8 Kg of brain. Lipids are still modifying the present evolutionary phase of our species with their contribution to a changing panorama of non communicable disease. The present concern is with the sustainability of the marine food web and the sustainability of human kind. A new paradigm is required for human nutrition and food production to meet the present challenge of human sustainability.

Key words: evolution, genomics, lipids, docosahexaenoic, arachidonic, omega 6, omega 3, brain, vascular development, cerebral expansion, Darwin, fish, sea food, oceans.