The University of Hong Kong
School of Biological Sciences

Guest Seminar

Lipid mediators and disease

by **Professor John Harwood**, School of Biosciences, Cardiff University

Date: Mon, 19 Feb 2024

Time: 4:00 pm - 5:00 pm

Join Zoom seminar:

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Meeting ID: 965 3924 2571

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About the speaker

Professor John Harwood from the School of Biosciences, Cardiff University, has a long career at the forefront of research into lipid biochemistry. His contributions are many and varied, and his research has covered all levels of lipid biochemistry, from agricultural solutions to medical products. His many research achievements have contributed to the development of an artificial lung surfactant that is widely administered to premature babies to assist their breathing; the production of transgenic plants to increase the yield of oil seed rape; and the addition of omega-3 fatty acids supplements and functional pet foods to protect against arthritis in animals. He has over 640 scientific publications including 5 books and 14 edited volumes. The books include "*Lipids: biochemistry, biotechnology and health*" (Gurr, M.I. et al., sixth edition, 2016, Wiley-Blackwell) which is the definitive advanced student text on lipids. He edited "*Handbook of Olive Oil*" (R. Aparicio and J. Harwood, second edition, 2013, Springer) which has had two editions and a translation into Spanish. It is the main authoritative reference volume on olive oil. He has also been joint editor of all three editions of "*The Lipid Handbook*", the main reference work on lipids (Gunstone, F.D., Harwood, J.L. and Dijkstra, A.J., eds., third edition, 2007, CRC Press). He was also joint Editor in Chief of the "*AOCS Lipid Library*" (2011-2016), the main on-line source of information on lipids. He has received many awards of which the latest is the Morton Lecture Award in recognition for his outstanding contribution to lipid biochemistry.

Abstract

Originally, dietary lipids were merely thought to be a good source of calories. But, in the 1930's, feeding experiments revealed that certain lipids were essential for our good health. These were the polyunsaturated fatty acids, linoleic (n6-18:2) and alpha-linolenic (n3-18:3) acids. These can be converted to other n6 (omega-6) and n3 (omega-3) acids. Although linoleic and alpha-linolenic acids are the core 'essential fatty acids', most of their important effects are due to the conversion of their 20 and 22C metabolites into lipid mediators. The main acids which are converted to mediators are arachidonic (ARA, n6-20:4), eicosapentaenoic (EPA, n3-20:5) and docosahexaenoic (DHA, n3-22:6) acids.

Metabolism of ARA, EPA and DHA proceeds by oxidation using one of three oxidation systems---cyclooxygenases, lipoxygenases or cytochrome P450 oxidases. These give rise to a host of lipid mediators which act as 'local hormones' at very low concentrations e.g. pmolar. One such mediator is a prostaglandin which gives rise to headache pain and whose production is prevented by aspirin.

In general, omega-6 polyunsaturated fatty acids, such as ARA, give rise to inflammatory lipid mediators while omega-3 PUFAs, such as EPA and DHA, form non- or anti-inflammatory mediators. The various lipid mediators have important effects for common diseases such as cardiovascular, arthritis and cancers, as well as having a host of actions on intermediate metabolism and physiology.

Useful references

Essays in Biochemistry (2020) vol.64, issue 3, pages 397-606, see https://doi.org/10.1042/EBC20190082. The volume is entitled 'Lipid mediators' and contains a number of relevant articles.

In addition, the general advanced student book---**Lipids; biochemistry, biotechnology and health**, 6th edition, Gurr, M.I. et al. 2016, Blackwell/Wiley gives details of lipids, their metabolism and function.