

Proceedings of the AOCS  
Short Course on  
**Polyunsaturated Fatty Acids  
and Eicosanoids**

Edited by  
W.E.M. Lands



American Oil Chemists' Society

# **Proceedings of the AOCS Short Course on Polyunsaturated Fatty Acids and Eicosanoids**

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**American Oil Chemists' Society**  
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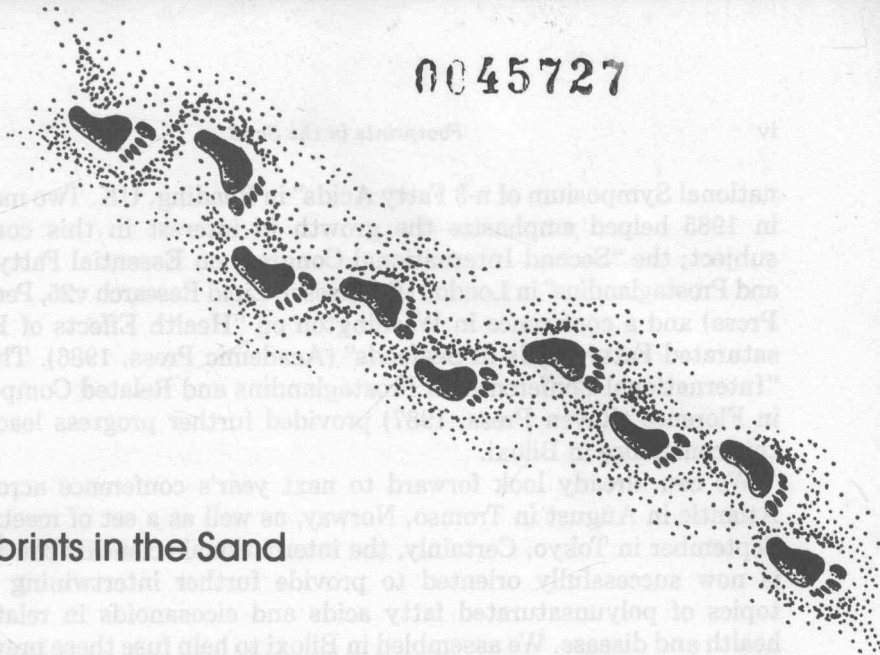
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## Footprints in the Sand

**L**ooking back can sometimes be a good way to prepare to look forward. The intertwining of knowledge on polyunsaturated fatty acids and eicosanoids lay neglected for decades after the separate, but nearly simultaneous, discoveries of essential fatty acids and prostaglandins over fifty years ago. The separate study of these two phenomena continued even after the revolutionary recognition in 1965 that the n-6 fatty acid, arachidonate, was converted to prostaglandins. As the fiftieth anniversary of the discovery of essential fatty acids approached, there was an explosive advance within a few years in recognizing the structure and biogenesis of thromboxane, prostacyclin and leukotriene. Then the nutritional sources of these powerful mediators of so many pathophysiological events could no longer be ignored.

In 1979, plans were initiated for international meetings to bring together biochemists, physiologists, pharmacologists and nutritionists to examine the intertwining of information on dietary fats and the eicosanoids (which include prostaglandins, thromboxanes, leukotrienes, and other related twenty-carbon derivatives). In 1980, there was the 13th Miles International Symposium in Baltimore, which examined "Nutritional Factors: Modulating Effects on Metabolic Processes" (Raven Press; 1981), and the Golden Jubilee International Congress on Essential Fatty Acids and Prostaglandins in Minneapolis (Progress in Lipid Research v20, Pergamon Press; 1982). Then an alternating trans-Atlantic tradition began to evolve with a meeting in 1981 in London examining the "Nutritional Evaluation of Long-Chain Fatty Acids in Fish Oil" (Academic Press; 1982). The topic was then developed at the "Winter Prostaglandin Conference" in Keystone in 1983 and in the 1984 "Inter-

national Symposium of n-3 Fatty Acids" in Reading, UK. Two meetings in 1985 helped emphasize the growth in interest in this combined subject; the "Second International Congress on Essential Fatty Acids and Prostaglandins" in London (Progress in Lipid Research v25, Pergamon Press) and a conference in Washington on "Health Effects of Polyunsaturated Fatty Acids in Seafoods" (Academic Press, 1986). The 1986 "International Conference on Prostaglandins and Related Compounds" in Florence (Raven Press, 1987) provided further progress leading to this conference in Biloxi.

We can already look forward to next year's conference across the Atlantic in August in Tromsø, Norway, as well as a set of meetings in September in Tokyo. Certainly, the international scientific community is now successfully oriented to provide further intertwining of the topics of polyunsaturated fatty acids and eicosanoids in relation to health and disease. We assembled in Biloxi to help fuse these previously separate areas of knowledge into a deeper understanding of the impact that our daily foods have upon our lives. In this lovely resort by the shore of the Gulf, we reviewed our progress and left behind a record—like footprints in the sand.



## An Overview

The table of contents indicates clearly where certain types of information is located so that readers may quickly find the material of interest to them. The purpose of this overview is to indicate some of the hopes that were in the minds of the organizers in assembling the impressive array of presentations at this meeting and my perception of the progress attained.

The six major divisions of the proceedings have evolved steadily over the past few years with cardiovascular events leading the way. From earlier meetings and recent papers, we knew that a lot of new data were being developed on the dose and duration of n-3 supplementation that could decrease some risk factors. The strong response from planners and participants on this and other topics forced us to restrict all plenary speakers to twenty minutes and have many outstanding contributions as poster sessions. Participants will recognize that the several plenary talks on new clinical aspects that "spilled over" into Sunday morning are now placed under the appropriate section.

The two major features of cardiovascular pathophysiology in which the n-3/n-6 polyunsaturated fats have demonstrable roles are platelet function and plasma lipid levels. They were examined in Sessions I and II, respectively. The speakers reaffirmed the ability of dietary HUFA (highly unsaturated fatty acids; 20- and 22-carbon polyunsaturated fatty acids) to diminish some of the parameters associated with cardiovascular pathology. Dr. Nordoy reintroduced the possibility of benefits of dietary n-3 PUFA (18-carbon polyunsaturated fatty acids), and Dr. Weiner reminded the participants of the cellular processes in the vascular wall that underlie the progressive onset of atherosclerosis. Collectively,

the speakers provided a balanced review of the limits of our current knowledge on the possible alteration of risk factors by altering the dietary ratios and abundances of the n-3 and n-6 fats.

Session III brought a deeper focus upon the cellular events associated with inflammatory processes so that participants could evaluate the impact of dietary fats upon these eicosanoid-mediated events. This area of research has shown a dramatic increase in results available for review and of investigators committed to developing further information. The complicated interplay of eicosanoid and cytokine mediators that sustain immune-inflammatory processes makes it certain that this field will provide a large amount of new insight into the impact of dietary fats upon a wide range of hyperreactive responses. The collective information from plenary and poster sessions gave less clear evidence that immediate direct benefits might be obtained from increasing the n-3/n-6 ratio in the diet, and much more research will be needed before a consensus can be reached. In fact, the diversity of cells and mediators in immune-inflammatory processes may give us many apparently contradictory clues until a better understanding of the rate-limiting reactions evolves. The results don't tell us exactly what effect may come from altered n-3/n-6 ratios, but they do suggest that effects surely can occur.

The features of membrane turnover that were discussed in Session IV helped illustrate the limits in our knowledge of the elongation/desaturation reactions as well as the reactions that synthesize and hydrolyze the membrane glycerolipids. The present knowledge of these steps does not let us predict clearly the consequence of ingesting PUFA and HUFA of varied n-3/n-6 ratios. This area is now showing signs of a renaissance after more than of a decade of near neglect in which a few lonely pioneers pushed on with little company. More research on these aspects should certainly be important to the organizations interested in the ways that our foods affect our health.

Cancer was discussed in Session V that was chaired by two distinguished pioneers in the study of the relative impact of dietary n-3 fats. Drs. Carroll and Karmali have been the mainstay of many previous conferences, presenting data that led many other investigators to go further. The speakers gave ample evidence that this aspect of nutritional modification of disease processes was now firmly established, and that future symposia can be expected to include more results of the modification of tumor development and metastasis by altered ratios of n-3 and n-6 fats in the diet.

Session VI discussed development and the possible special role of n-3 HUFA in neural events. The effect of n-3/n-6 ratios upon the duration of

pregnancy helped emphasize perinatal concerns. Those concerns, in turn, brought attention to the requirements of rapidly developing neural tissue. The high content of 22:6n-3 in brain lipids and retina raises a serious question of its "essentiality" for proper functioning of conductive tissues (and perhaps others). Some very creative approaches were described that are certain to be followed by other researchers in the near future. Because the topic has been neglected for decades, the session could not reach final answers, but rather it pointed the ways in which investigators might go to discover new insights into the roles of PUFA and HUFA. The n-3 HUFA may have some role that does not involve eicosanoids (and may even be met partially by n-6 HUFA). Future meetings are certain to examine this question in more detail.

Finally, this overview of the conference would be incomplete without recognition of the people and organizations who ensured the success of the meeting. I greatly appreciate the compassionate clerical and typing assistance provided by Mike Mayo and Donna Latyik in Chicago and Mary Burke and the AOCS staff in Champaign. The pleasant arrangements for participants were made possible by generous contributions from the following organizations:

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We all wish you pleasure in reviewing the proceedings of our meeting in Biloxi, May 14-17, 1987.

A handwritten signature in dark ink, reading "William E. Lands". The signature is written in a cursive, flowing style with a large, prominent "L" and "S".



# Contents

Foreword . . . . .	iii
Overview . . . . .	v
Chapter 1 <b>Mortality From Ischaemic Heart Disease and Cerebrovascular Disease in Greenland</b> . . . . .	2
<i>J. Dyerberg and P. Bjerregaard</i>	
Chapter 2 <b>Clinical and Epidemiological Studies of Eicosapentaenoic Acid in Japan</b> . . . . .	9
<i>A. Hirai, T. Terano, H. Saito, Y. Tamura and S. Yoshida</i>	
Chapter 3 <b>Dietary n-3 Fatty Acids, Experimental Thrombosis and Coronary Heart Disease in Man</b> . . . . .	25
<i>A. Nordoy and T. Simonsen</i>	
Chapter 4 <b>The Effect of Cod Liver Oil on the Development of Atherosclerosis in an Animal Model</b> . . . . .	35
<i>B.H. Weiner, I.S. Ockene, P.H. Levine, H.F. Cuenoud, M. Fisher, B.F. Johnson, A. Natale, C. Vaudreuil and J.J. Hogasian</i>	
Chapter 5 <b>Dietary Polyunsaturates and Human Vascular Function</b> . . . . .	41
<i>H.R. Knapp, K.L. Whittemore and G.A. FitzGerald</i>	
Chapter 6 <b>Long-term Effects of Dietary Linoleic and Linolenic Acids on Platelet Functions and Lipemia in Man and Woman</b> . . . . .	56
<i>S. Renaud, J.L. Martin and C. Thevenon</i>	
Chapter 7 <b>Diet and Cardiac Arrhythmia: Involvement of Eicosanoids</b> . . . . .	62
<i>M.Y. Abeywardena, P.L. McLennan and J.S. Charnock</i>	
Chapter 8 <b>A Preliminary Report of Acute and Chronic Studies of Atherogenic Related Effects of Eicosapentaenoic Acid-rich Rations in Rhesus Monkeys</b> . . . . .	66
<i>R.W. Wissler, H.R. David, D. Vesselinovitch, F.J. Podbielski and R.T. Bridenstine</i>	

Chapter 9	<b>Influence of Moderate Intakes of Fish Oil on Blood Lipids</b> . . . . .	70
	<i>T.A.B. Sanders</i>	
Chapter 10	<b>Relationship of Fish Oil Consumption to Platelet Phospholipids and to the Phosphatidylcholine: Cholesterol Acyltransferase Reaction in Human Plasma</b> . . . . .	87
	<i>B.J. Holub</i>	
Chapter 11	<b>Effects of Polyenoic Fatty Acids (n-3) on Lipid and Lipoprotein Metabolism</b> . . . . .	94
	<i>P.J. Nestel, D. Topping, J. Marsh, S. Wong, H. Barrett, P. Roach and B. Kambouris</i>	
Chapter 12	<b>Effects of Dietary Fish Oil on Plasma and Macrophage Amyloid P Component Acute Phase Responses in Mice</b> . . . . .	104
	<i>E.S. Cathcart, R.F. Mortensen, W.A. Gonnerman, J.A. Conte, L.M. Greene and C.A. Leslie</i>	
Chapter 13	<b>Fish Oil Protects from Cyclosporine A Induced Nephrotoxicity</b> . . . . .	109
	<i>V.E. Kelley, T.S. Rogers, L. Elzinga and W.N. Bennett</i>	
Chapter 14	<b>Effects of Omega-3 Polyunsaturated Fatty Acids on Human Leukocyte 5-Lipoxygenation and Function</b> . . . . .	115
	<i>R.I. Sperling and K.F. Austen</i>	
Chapter 15	<b>Effect of Dietary Fish Oil on Renal Function in Immune Mediated Glomerular Injury</b> . . . . .	123
	<i>F. Thaiss and R.A.K. Stahl</i>	
Chapter 16	<b>Natural Killer Cells and Eicosapentaenoic Acid</b> . . . . .	127
	<i>T. Hamazaki, N. Yamashita, A. Yokoyama, E. Sugiyama, M. Urakaze and S. Yano</i>	
Chapter 17	<b>Effect of Oral Administration of Highly Purified Eicosapentaenoic Acid and Docosahexaenoic Acid on Eicosanoid Formation and Neutrophil Function in Healthy Subjects</b> . . . . .	133
	<i>T. Terano, A. Seya, A. Harai, H. Saito, Y. Tamura and S. Yoshida</i>	
Chapter 18	<b>The Effect of Dietary Marine Lipids on Autoimmune Disease</b> . . . . .	139
	<i>D.R. Robinson, S. Tateno, B. Patel and A. Hirai</i>	
Chapter 19	<b>Fish Oil Supplementation in Active Rheumatoid Arthritis: A Double-Blinded, Controlled, Crossover Study</b> . . . . .	148
	<i>J.M. Kremer and W. Jubiz</i>	
Chapter 20	<b>Interrelationships between Polyunsaturated Fatty Acid and Membrane Lipid Synthesis</b> . . . . .	154
	<i>H. Sprecher, A.C. Voss, M. Careaga and C. Hadjiagapiou</i>	

Chapter 21	<b>Analysis and Remodeling of Phospholipid Molecular Species Containing Esterified Arachidonic Acid</b> . . . . .	169
	<i>R.C. Murphy, F.H. Chilton and P.E. Haraldsen</i>	
Chapter 22	<b>Effects of Fish Oils and Alcohol on Polyunsaturated Lipids in Membranes</b> . . . . .	185
	<i>N. Salem Jr., A. Yoffe, H-Y. Kim, J.W. Karanian and T.F. Taraschi</i>	
Chapter 23	<b>Efficacy of Linolenic Acid Compared with Longer Chain n-3 Fatty Acids to Inhibit Arachidonic Acid Metabolism in Rats</b> . . . . .	192
	<i>D.H. Hwang, M. Boudreau and P. Chanmugam</i>	
Chapter 24	<b>Polyenoic Fatty Acid Metabolism and Effects on Prostaglandin Biosynthesis in Adults and Aged Persons</b> . . . . .	215
	<i>O. Adam</i>	
Chapter 25	<b>Omega-3 Fatty Acids and Cancer: A Review</b> . . . . .	222
	<i>R.A. Karmali</i>	
Chapter 26	<b>Dietary Fat and Colon Cancer: Effect of Fish Oil</b> . . . . .	233
	<i>B.S. Reddy</i>	
Chapter 27	<b>Effect of Varying Dietary Omega-3:Omega-6 Fatty Acid Ratio on L-azaserine Induced Preneoplastic Development in Rat Pancreas</b> . . . . .	238
	<i>T.P. O'Conner, B.D. Roebuck and T. C. Campbell</i>	
Chapter 28	<b>Differing Effects of High-Fat Diets Rich in Polyunsaturated, Monounsaturated or Medium Chain Saturated Fatty Acids on Rat Mammary Tumor Promotion</b> . . . . .	241
	<i>L.A. Cohen</i>	
Chapter 29	<b>Intake of Cholesterol, Fish and Specific Types of Fat in Relation to Risk of Breast Cancer</b> . . . . .	248
	<i>M.J. Stampfer, W.C. Willett, G.A. Colditz and F.E. Speizer</i>	
Chapter 30	<b>Response of Mammary Carcinogenesis to Dietary Linoleate and Fat Levels and Its Modulation by Prostaglandin Synthesis Inhibitors</b> . . . . .	253
	<i>C.A. Carter, M.M. Ip and C. Ip</i>	
Chapter 31	<b>Comparative Effects of Omega-3 and Omega-6 Dietary Lipids on Rat Mammary Tumor Development</b> . . . . .	261
	<i>W.T. Cave Jr. and J.J. Jurkowski</i>	
Chapter 32	<b>Duration of Pregnancy and Intake of Marine Fat in Two Populations, One with Low and One with High Consumption of Marine Fat</b> . . . . .	268
	<i>S.F. Olsen, H.S. Hansen, B. Jensen, S. Sommer, T.I.A. Soerensen, N.J. Secher and P. Zachariassen</i>	

Chapter 33	<b>The Requirements of Long Chain n-6 and n-3 Fatty Acids for the Brain</b> . . . . .	270
	<i>M.A. Crawford</i>	
Chapter 34	<b>Re-evaluation of the Essentiality of Alpha-Linolenic Acid in Rats</b> . . . . .	296
	<i>H.U. Okuyama, M. Saitoh, Y. Naito, T. Hori, A. Hashimoto, A. Moriuchi and N. Yamamoto</i>	
Chapter 35	<b>The Importance of Dietary n-3 Fatty Acids in the Development of Retina and Nervous System</b> . . . . .	301
	<i>M. Neuringer and W.E. Connor</i>	
Poster Session A:		
	<b>Maintenance of Plasma Triglyceride-Lowering Through Use of Low-Dose Fish Oil in the Diet</b> . . . . .	314
	<i>S. Balasubramaniam and L.A. Simons</i>	
	<b>Serum Lipid and Lipoprotein Changes in Fish Oil Supplemented Pregnant WHHL Rabbits</b> . . . . .	318
	<i>J.E. Bauer and C.H. Beauchamp</i>	
	<b>Is the High Prevalence of Combined Hypertension and Hypercholesterolemia in Western Industrialized Countries Caused by Dietary Unfavorable n-6/n-3 Ratio?</b> . . . . .	325
	<i>K. Bonna and D. Thelle</i>	
	<b>Lipid Compositional Changes in Hypertensive (DOCA-Salt Loaded) Rats Fed Fish Oil, Safflower Oil, or Soluble Fiber Supplemented Diets</b> . . . . .	329
	<i>P. Webb, V. Bond, T. Kotchen and G. Bruckner</i>	
	<b>Comparative Lipemias in Hamsters and Three Monkey Species Fed Fish Oil</b> . . . . .	334
	<i>K.C. Hayes, A. Pronczuk, Z.F. Stephan and S. Lanzkron</i>	
	<b>Eicosapentaenoic Acid In Vivo and In Vitro: Platelets and Endothelial Cells</b> . . . . .	340
	<i>M. Lagarde, M. Croset, J.C. Bordet, M. Guichardant and E. Vericel</i>	
	<b>Cummulative Experience with Eicosapentaenoic Acid and Other Platelet Inhibitors for the Prevention of Intimal Hyperplasia in Autologous Vein Grafts</b> . . . . .	342
	<i>R.W. Landymore, M. MacAulay, W. Sheridan and C. Cameron</i>	
	<b>Dietary n-6 and n-3 Fatty Acids and Salt-Induced Hypertension in the Borderline Hypertensive Rat</b> . . . . .	346
	<i>D.E. Mills and R.P. Ward</i>	

<b>Effects of Four Weeks' Intake of Eicosapentaenoic Acid-Rich Fish Oil on Composition of Lipids and Fatty Acids, and Platelet Aggregability: A Double Blind, Controlled Trial in Healthy Volunteers</b> . . . . .	349
<i>C. Naito, M. Kawamura, Y. Hashimoto, H. Ito, H. Hayashi and S. Miyazaki</i>	
<b>Pinnipeds: Animal Models for Studying the Effects of Dietary Fats on Lipoproteins and Platelets</b> . . . . .	352
<i>D.L. Puppione, L. Corash, D.T. Kunitake, D.L. Smith and D.P. Costa</i>	
<b>Dietary Fatty Acids and Signal Transduction in Platelets</b> . . . . .	358
<i>N.W. Schoene and J.P. Church</i>	
<b>The Significance of Arachidonic Acid in the Human Diet</b> . . . . .	361
<i>A.J. Sinclair and Kerin O'Dea</i>	
<b>Effect of Fish Oil Concentrate on Parameters of Cardiovascular Complications in Renal Transplantation</b> . . . . .	365
<i>M. Urakaze, T. Hamazaki, S. Yano, H. Kashiwabara, S. Fischer and P.C. Weber</i>	
<b>Habitual Fish Consumption, Serum Lipids and Platelet Function</b> . . . . .	368
<i>A. van Houwelingen, G. Hornstra, J. Stegen, M. Katan and D. Kromhout</i>	
<b>Rapid Changes in Hemostasis and Fatty Acid Profiles After Intravenous Infusion of a Marine Oil Lipid Emulsion to Various Animal Species</b> . . . . .	372
<i>M. Ward, T. Pavlina, R. Butchin, R. Johnson and R. Cotter</i>	
<b>Alterations in n-6 and n-3 Polyunsaturated Fatty Acids of Phospholipids in Tissues of Rats Under a Fat-free Diet, and the Asymmetric Distribution in the Liver Microsomal Membranes</b> . . . . .	378
<i>N. Iritani, H. Mizoguchi and R. Narita</i>	
<b>Comparison of the Incorporation of Free Eicosapentaenoic Acid and Arachidonic Acid into Phospholipids and Eicosanoids in Gel-filtered Platelets</b> . . . . .	384
<i>B. Nordvi and H. Holmsen</i>	

Poster Session B:

<b>Dietary n-3 Fatty Acids Suppress Dienoic Eicosanoid Production in Aging Rats</b> . . . . .	388
<i>U.O. Barcelli, D. Beach, A. Mejia and V.E. Pollak</i>	

<b>n-3 Fatty Acid Deficiency in Man: Effect of Supplementing with Ethyl Linolenate and Long-Chain n-3 Fatty Acids</b> . . . . .	392
<i>K.S. Bjerve, L. Thoresen and S. Fischer</i>	
<b>Inability of Murine Peritoneal Macrophages to Convert Linoleic Acid into Arachidonic Acid: Evidence of Chain Elongation</b> . . . . .	395
<i>R.S. Chapkin, S.D. Somers and K.L. Erickson</i>	
<b>Dietary EPA Alone or With Vitamin E Supplementation: Differential Effects on Platelet and Leukocyte Fatty Acids, Eicosanoid Production and Functional Parameters</b> . . . . .	399
<i>C. Galli, C. Mosconi, S. Colli, E. Stragliotto, L. Medini and E. Tremoli</i>	
<b>Fatty Acid Specificity of Acyl-CoA Synthetase in Endothelial Cells</b> . . . . .	404
<i>C.E. Manner and E.R. Hall</i>	
<b>Influence of Dietary Lipid Content and Composition on Prostaglandin Turnover In Vitro and In Vivo</b> . . . . .	408
<i>G. Hornstra</i>	
<b>Genetically Low Arachidonic Acid and High Dihomogammalinolenic Acid Levels in Eskimos May Contribute to Low Incidences of Coronary Heart Disease, Psoriasis, Arthritis and Asthma</b> . . . . .	413
<i>D.F. Horrobin and M.S. Manku</i>	
<b>Eicosanoid Synthesis and Membrane Enzymes are Affected by Dietary Fat Level and Ratios of n-6 to n-3 Polyunsaturated Fatty Acids</b> . . . . .	416
<i>J.E. Kinsella, B. Lokesh, B. German, J. Swanson and M. Zuniga</i>	
<b>The Effect of a Fish Oil Diet on the Fatty Acid Composition and Prostaglandin Profile of Macrophages from Amyloid Susceptible and Arthritis Susceptible Mice</b> . . . . .	422
<i>C.A. Leslie, L.M. Greene, E.S. Cathcart and W.A. Gonnerman</i>	
<b>Chemoattractants Produced from Mouse Macrophages are Decreased by a Diet Rich in Omega 3 Fatty Acids</b> . . . . .	428
<i>C.A. Leslie, A.C. Theodore and E.S. Cathcart</i>	
<b>Susceptibility of Mitochondrial Membranes to Calcium and Oxygen Free Radical Damage: Potential Modulation of Injury by Dietary n-3 Fatty Acids</b> . . . . .	430
<i>C.D. Malis and J.V. Bonventre</i>	
<b>Enhanced Survival to Endotoxin in Guinea Pigs Fed I.V. Fish Oil Emulsion</b> . . . . .	435
<i>E. Mascioli, L. Leader, E. Flores, S. Trimbo, B. Bistran and G.L. Blackburn</i>	



<b>The Effect of Fish Oil on Natural Killer Cell Activity and Prostaglandin E2 Synthesis in Young and Old Mice</b> . . . . .	438
<i>S.N. Meydani and G. Yogeewaran</i>	
<b>Metabolism of Eicosapentaenoic and Dihomogammalinolenic Acids by the Cultured Rat Glomerular Mesangial Cell</b> . . . . .	442
<i>L.A. Scharschmidt, N.B. Gibbons and R. Neuwirth</i>	
<b>The Effects of Omega-3 Polyunsaturated Fatty Acids on Megakaryocyte Arachidonic Acid Metabolism</b> . . . . .	447
<i>P.K. Schick and P. Webster</i>	
<b>Essential Fatty Acid Levels in Plasma and Red Blood Cells of Japanese with Atopic Eczema</b> . . . . .	450
<i>H. Shimasaki, N. Ueta and T. Shino</i>	
<b>Omega-3 Polyunsaturated Fatty Acids Reduce Prostacyclin Formation by Endothelial Cells</b> . . . . .	453
<i>A.A. Spector, C. Hadjiagapiou and T.L. Kaduce</i>	
<b>n-3 and n-6 Polyunsaturated Fatty Acids and Their Metabolism in Marine and Freshwater Fish Cells</b> . . . . .	458
<i>D.R. Tocher and J.R. Sargent</i>	
<b>Injection of Tridocosahexaenoyl-Glycerol Emulsion and Fatty Acid Composition of Blood Cells</b> . . . . .	462
<i>M. Urakaze, T. Hamazaki, S. Sawazaki, K. Yamazaki, M. Fujikawa and S. Yano</i>	
<b>The Effect of Cod Liver Oil on Measures of Monocyte Function</b> . . . . .	465
<i>B.H. Weiner, M. Fisher, P.H. Levine, C.H. Vaudreuil, A. Natale, T.M. Grammel, M.H. Johnson and J.J. Hoogasian</i>	
<b>Non-Regiospecificity of the Purified Lipoxygenase from Potato Tubers in the Oxygenation of Omega-3 and Omega-6 Fatty Acids</b> . . . . .	468
<i>J. Whelan, P. Reddanna, G. Prasad and C.C. Reddy</i>	
<b>Lipoxygenase Products of Eicosapentaenoic Acid in Porcine Leukocytes</b> . . . . .	474
<i>B.K. Lam and P.Y-K. Wong</i>	
<b>Polyunsaturated Fatty Acid Metabolism and Effect on Membrane Transport in Human Y79 Retinoblastoma Cells</b> . . . . .	478
<i>M.A. Yorek</i>	

<b>Effect on Dietary Marine on Human Colon Muscoa Lipid Fatty Acids and Prostaglandin Synthesis in Patients with Inflammatory Bowel Disorder</b> . . . . .	481
<i>K. Hillier, L. Dowell, R. Jewell and C.L. Smith</i>	

Poster Session C:

<b>Effects of Polyunsaturated Fish and Vegetable Oils on Mammary Tumors and Hyperplastic Lesions in Rats</b> . . . . .	488
<i>L.M. Braden, L.J. Faulkin, and K.K. Carroll</i>	
<b>Docosahexaenoic Acid Status in Infants: Effects of Diet and Supplementation</b> . . . . .	491
<i>S.E. Carlson and P.G. Rhodes</i>	
<b>Effects of n-3 Polyunsaturated Fatty Acid Deficiency During Development in the Rat: Functional Effects</b> . . . . .	495
<i>M. Enslen, A. Nouvelot and H. Milon</i>	
<b>Effects of n-3 Polyunsaturated Fatty Acid Deficiency During Development in the Rat: Biochemical Effects</b> . . . . .	498
<i>H. Milon, A. Malnoe and M. Enslen</i>	
<b>Enhancement of Adriamycin Toxicity and Lipid Peroxidation by Dietary Fish Oils</b> . . . . .	501
<i>M.B. Baird and J.L. Hough</i>	
<b>Fish Oil Supplementation and Adrenoceptor Function</b> . . . . .	504
<i>K.E. Laustiola, M.K. Salo and T. Metsa-Ketela</i>	
<b>Oral Administration of Menhaden Oil Alters Gestation in Rats</b> . . . . .	508
<i>M.M. Mathias, A. Tsai, M. Harris and J. McGregor</i>	
<b>The Effect of Dietary Fat Type and Tocopherol Supplementation on Tocopherol Status and Eicosanoid Synthesis in the Lung</b> . . . . .	513
<i>S.N. Meydani, A.C. Shapiro, M. Meydani and J.B. Blumberg</i>	
<b>A Comparison of Dietary Fish Body Oil and Corn Oil in Experimental Colorectal Carcinogenesis</b> . . . . .	518
<i>R.L. Nelson, J.C. Tanure, G. Andrianopoulos, G. Souza and W.E.M. Lands</i>	
<b>Eicosanoids in Human Milk</b> . . . . .	523
<i>J. Neu and C-Y. Wu-Wang</i>	
<b>Effects of Dietary Fish Oil on the Growth of a Human Mammary Carcinoma in the Athymic Nude Mouse and on the Activity of the Carnitine Acyltransferase and the Delta-9 Acyl Co-A Desaturase</b> . . . . .	529
<i>R.C. Reitz, C.E. Borgeson, L. Pardini and R.S. Pardini</i>	

<b>Polyunsaturated Fatty Acids in Retinal Development</b> . . . . .	534
<i>B.L. Scott and N.G. Bazan</i>	
<b>Omega-3 Fatty Acid Content of Commercial Fish Oil Capsules</b> . . . .	540
<i>B. Tucker, N.E. Heck and G.M. Pigott</i>	
<b>Phospholipids and Enzyme Activities in Aged Rats</b> . . . . .	542
<i>S. Wada, H. Suzuki and S. Hayakawa</i>	
<b>Influence of Dietary Omega-3 and Omega-6 Fatty Acids on Drug and Carcinogen Metabolism and on the Promotion of DMBA-Induced Mammary Tumors</b> . . . . .	544
<i>A.E. Wade and O.R. Bunce</i>	
<b>Why is Linoleic Acid Essential? Further Studies of Fatty Acid Specificity in Correction of Transepidermal Water Loss</b> . . . . .	549
<i>H.S. Hansen and B. Jensen</i>	
<b>Dietary Induced Increase in Omega-3 and Omega-6 Polyunsaturated Fatty Acids (PUFA) in Liver Lipids Influence on Starvation and Sepsis-Induced Changes in PUFA and Lipid Metabolism</b> . . . . .	555
<i>C. Larsson-Backstrom, E. Arrhenius, K. Sagge, J. Paprocki, L. Lindmark and L. Svensson</i>	
<b>Lipoproteins and n-3 Fatty Acids</b> . . . . .	560
<i>H.M. Sinclair</i>	
<b>Proliferation of Spontaneous Mouse Mammary Tumor Cells in Primary Cultures in Response to n-3, n-6 and n-9 Fatty Acids</b> . . . .	565
<i>K.E. McKenzie, G.K. Bandyopadhyay, W. Imagawa and S. Nandi</i>	
<b>Appendix</b> . . . . .	569