

Food Industry Briefing Series

OILS AND FATS IN THE FOOD INDUSTRY

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Series Editor's Foreword

It was with some excitement that I received Professor Frank Gunstone's manuscript of this book, *Oils and Fats for the Food Industry*, which makes a very worthy addition to the *Food Industry Briefing Series*. I had already read two other books by Professor Gunstone and I felt that not only would I enjoy reading the manuscript for this book, but also that Professor Gunstone would add further to my knowledge of the subject and teach me something new. I was right on all counts.

With *Oils and Fats for the Food Industry* Professor Gunstone has proven once again his mastery of a subject matter of great importance to the food industry. It is written in a style that makes the concepts and information contained easily accessible. Importantly, the structure of the book is very logical, presenting the reader with a journey through the subject matter that will inevitably lead to increased knowledge and understanding. Significantly, this is a concise book. It does not attempt to answer all questions about oils and fats, and it does not attempt to stand in the place of weightier tomes. It fits precisely with the concept of the *Food Industry Briefing Series* as a food technology series that provides books which offer great utility to food industry professionals who wish to increase their knowledge of a given subject, but who have little time to devote to the task. With this book, those who wish quickly to gain insight to the topic of oils and fats used in the food industry can do just that. If they then wish to go on to read heavier volumes they will find that *Oils and Fats for the Food Industry* has provided the foundation on which to build their expertise.

The *Food Industry Briefing Series* was devised to provide the food industry with a resource that can be used by managers and executives to broaden their knowledge and gain expertise without devoting inordinate amounts of time to study. It was also conceived that the series would provide a resource for the personal development

of staff whose career development is predicated on increasing their expertise. In addition to satisfying the needs of food industry professionals for quickly accessible texts on food technology topics, the *Food Industry Briefing Series* should also provide benefits to both lecturers in the fields of food science and technology and their students. Recognising also that food industry professionals, lecturers, their students, and university libraries are all subject to budgetary controls, the *Food Industry Briefing Series* has been conceived as a source of high-quality food technology texts that fall well below the price threshold of typical technical and academic texts.

Ralph Early
Series Editor, *Food Industry Briefing Series*
Harper Adams University College



Preface

The human diet contains three macronutrients and several micronutrients (vitamins, minerals, antioxidants, etc.). The macronutrients are sources of different kinds of proteins, carbohydrates, and fats (lipids) and the food industry is concerned to supply these as primary products or as constituents of a wide range of foods. A healthy supply of macronutrients will generally contain the necessary micronutrients.

Despite the impression given by many uniformed sources that fat is an undesirable part of the diet, it remains an essential requirement. However, we are increasingly aware that both the quantity and the quality of the fat consumed are important elements of a healthy diet.

This book is an attempt to describe the nature of fat for those working in the food industry and for those in the media seeking to guide the public about what they should consume. It is impossible to do this without some reference to the chemical structure of fatty acids and lipids but structural features have been kept to the minimum. I have been generous in producing up-to-date numbers for production levels to give a better indication of the relative importance of both the starting materials and the products.

All the fats used by the food industry and consumed on a daily basis are products of the agricultural industry. Today they are mainly of plant origin and are grown on plantations or in fields in tropical and temperate regions. About one-sixth of the supply is still of animal origin but this underestimates human consumption because the fat eaten in meats and in dairy products (other than butter) is not monitored by commodity analysts. Some oilseeds and oily fruits are grown for their lipid content (palm, olive, rapeseed), others are co-products grown for oil and meal (soybean), and yet others are by-products of another industry (cottonseed oil and meat fats such as lard and tallow). Each oil has its own mixture of fatty acids and its own fingerprint of minor components. Where these are not optimum

for human food use they may be subject to modification by biological procedures before planting or by technological procedures after extraction. These have been described.

While used mainly for human food fats have always found minor uses for animal feed and for a range of oleochemical industries using oils and fats as starting materials. Biodiesel falls into this last group. Because of concerns over several aspects of our traditional use of mineral oil there is a growing interest in biofuels. At present these consist mainly of bioethanol from appropriate carbohydrates and biodiesel from appropriate oils and fats. There is concern that these materials are being made from staple foods and the question is asked: will there be enough for both purpose? This matter is discussed, mainly in terms of the last 5 years and the next 5 years. Forecasts beyond that short-time frame are likely to be in error.

The lipids have important physical, chemical, and nutritional properties and these have to be brought into appropriate balance. This is not always an easy task. Nutritionists may indicate a recommended quantity and quality of fat and seed producers, farmers, and those in the agricultural and food businesses may strive to produce material to meet these targets. It remains only for the consumer to follow the advice. This is often a major difficulty. There are concerns at the present time with consumption levels of *trans* acids which need to be reduced and of omega-3 acids which need to be raised, and with the growing problem of obesity. This book is offered to those who wrestle with these problems in the hope that it might be of assistance.

To keep this volume short the number of references has been limited. Most of those cited are to reviews and books where further information may be obtained.

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St Andrews*

Abbreviations and Acronyms

AA	Arachidonic acid
ACP	Acyl carrier protein
ALA	Alpha-linolenic acid
AMF	Anhydrous milk fat
CBE	Cocoa butter equivalent
CLA	Conjugated linoleic acid
DHA	Docosahexaenoic acid
EDTA	Ethylenediamine tetra-acetic acid
EPA	Eicosapentaenoic acid
ESR	Electron spin resonance
FTIR	Fourier transform infrared
GLA	Gamma-linolenic acid
HDL	High-density lipoprotein
IP	Identity preserved
L	Linoleic acid or ester
La	Lauric acid or ester
LCPUFA	Long-chain polyunsaturated fatty acids
LDL	Low-density lipoprotein
Ln	Linolenic acid or ester
Mt	Million tonnes
MUFA	Monounsaturated fatty acids
NIR	Near infrared
NMR	Nuclear magnetic resonance
O	Oleic acid or ester
PC	Phosphatidylcholine
PE	Phosphatidylethanolamine
PFAD	Palm fatty acid distillate
PI	Phosphatidylinositol

PMF	Palm mid-fraction
PS	Phosphatidylserine
PUFA	Polyunsaturated fatty acids
RBD	Refined, bleached, and deodorised
S	Stearic acid or ester
St	Saturated acids or esters
UV	Ultraviolet

Triacylglycerols are frequently represented by three letters such as POL. This symbol stands for all six of the triacylglycerols having palmitic, oleic, and linoleic acids attached to glycerol. Other three letter groupings are to be interpreted similarly.