

Contents

<i>Preface to Technical Series</i>	xii
<i>Preface</i>	xiii
<i>Dedication</i>	xiv
<i>Contributors</i>	xv
1 Milk Lipids – Composition, Origin and Properties	1
T. HUPPERTZ, A.L. KELLY AND P.F. FOX	
1.1 Introduction	1
1.2 Composition of milk lipids	1
1.2.1 Fatty acids	3
1.2.2 Triacylglycerols	4
1.2.3 Mono- and diacylglycerols and free fatty acids	6
1.2.4 Phospholipids	6
1.2.5 Minor constituents	8
1.3 Origin of milk lipids	9
1.3.1 Biosynthesis and origin of the fatty acids in milk lipids	9
1.3.2 De novo synthesis of fatty acids	10
1.3.3 Uptake of fatty acids from the blood	11
1.3.4 Desaturation of fatty acids	11
1.3.5 Synthesis of triacylglycerols	11
1.4 Factors affecting the composition of milk lipids	11
1.5 Intracellular origin of milk lipid globules and the milk lipid globule membrane	13
1.5.1 Secretion of milk lipid globules	13
1.5.2 The milk lipid globule membrane	14
1.5.3 Lipids of the milk lipid globule membrane	15
1.5.4 Proteins of the milk lipid globule membrane	15
1.5.5 Enzymes of the milk lipid globule membrane	16
1.6 Physicochemical stability of milk lipid globules	17
1.6.1 Size distribution of milk lipid globules	17
1.6.2 Colloidal stability of milk lipid globules	18
1.6.3 Creaming of milk lipid globules	19
1.6.4 Coalescence of milk lipid globules	20
1.6.5 Homogenisation and properties of homogenised milk lipid globules	20

1.6.6	Temperature-induced changes in milk lipid globules	22
1.7	Crystallisation and melting of milk triacylglycerols	23
1.8	Conclusions	25
	References	25
2	Milk Fat Nutrition	28
	P.W. PARODI	
2.1	Introduction	28
2.2	Conjugated linoleic acid	28
2.2.1	Origin of ruminic acid	28
2.2.2	CLA nutrition	29
2.2.3	CLA as an anticancer agent	29
2.2.4	Ruminic acid and mammary tumour prevention	30
2.2.5	CLA, RA and colon tumour prevention	32
2.2.6	Ruminic acid and the prevention of atherosclerosis	32
2.2.7	Trans fatty acids and coronary heart disease	33
2.2.8	Ruminic acid and immunomodulation	34
2.2.9	Ruminic acid and type 2 diabetes mellitus	34
2.2.10	Ruminic acid as a growth factor	35
2.3	Sphingolipids	36
2.3.1	Sphingolipids in colon cancer prevention	36
2.3.2	Sphingomyelin and cholesterol absorption	37
2.3.3	Sphingomyelin and the immune system	38
2.3.4	Sphingolipids and intestinal diseases	38
2.4	Butyric acid	39
2.5	Branched chain fatty acids	39
2.6	Fat-soluble components	40
2.6.1	The vitamins	40
2.6.2	Cholesterol	41
2.6.3	Other interesting components	41
2.7	Further nutritional benefits	41
2.8	Perceived nutritional negatives for milk	42
2.8.1	Milk fat and coronary artery disease	42
2.8.2	Saturated fatty acids	43
2.8.3	Fat intake and cancer	44
2.8.4	Dietary fat and obesity	45
2.9	Conclusions	45
	References	46
3	Separation and Standardisation of the Fat Content	52
	M. GUNSING, H.C. VAN DER HORST, D. ALLERSMA AND P. DE JONG	
3.1	Introduction	52
3.2	Overview of the history of milk fat separation	53

3.3	Physical models	55
3.4	Standardisation of the fat content of milk	57
3.5	Conclusion	60
	References	60
4	Cream and Related Products	61
	M.A. SMIDDY, A.L. KELLY AND T. HUPPERTZ	
4.1	Introduction	61
4.2	Cream processing	62
	4.2.1 Separation	62
	4.2.2 Standardisation	63
	4.2.3 Heat treatment	64
	4.2.4 Homogenisation	65
	4.2.5 Quality of cream	65
4.3	Whipping cream	66
	4.3.1 Production of whipping cream	66
	4.3.2 Whipping of the cream	67
	4.3.3 Characterisation of whipped cream	67
	4.3.4 Influence of processing conditions on whipping characteristics of cream	68
	4.3.5 Compositional factors affecting whipped cream characteristics	68
	4.3.6 Influence of stabilisers and emulsifiers on whipping characteristics of cream	70
4.4	Aerosol-whipped cream	70
	4.4.1 Production of aerosol-whipped cream	70
	4.4.2 Properties of aerosol-whipped cream	71
4.5	Cream liqueur	72
	4.5.1 Composition of cream liqueur	73
	4.5.2 Processing of cream liqueur	74
	4.5.3 Shelf-life of cream liqueur	75
4.6	Cultured, fermented or sour cream	76
	4.6.1 Background	76
	4.6.2 Production of cultured, fermented or sour cream	76
4.7	Coffee cream	78
	4.7.1 Processing of coffee cream	78
	4.7.2 Properties of coffee cream	78
4.8	Other cream products	81
	4.8.1 Frozen cream	81
	4.8.2 Dried cream	82
4.9	Conclusion	82
	References	82

5	Butter	86
	R.A. WILBEY	
5.1	Introduction	86
5.2	Cream preparation	86
	5.2.1 Sweet cream	87
	5.2.2 Ripened/fermented/cultured cream	88
	5.2.3 Modifications of cream ageing	88
5.3	Batch churning	90
5.4	Continuous butter manufacture	91
	5.4.1 Cream feed to buttermaker	91
	5.4.2 Conversion to butter-grains	91
	5.4.3 Working	93
	5.4.4 Salting	94
5.5	Alternative processes for cultured butters	94
5.6	Alternative technologies for continuous buttermaking	95
	5.6.1 Low-fat route	95
	5.6.2 Shearing high-fat cream	96
5.7	Recombined butter	99
5.8	Reduced-fat butters	99
5.9	Spreadable butters	101
5.10	Packaging	102
5.11	Flavoured butters	103
5.12	Quality issues	104
5.13	Concluding comments	106
	References	106
6	Anhydrous Milk Fat Manufacture and Fractionation	108
	D. ILLINGWORTH, G.R. PATIL AND A.Y. TAMIME	
6.1	Introduction	108
6.2	Definitions and properties	108
6.3	Production statistics	109
6.4	Anhydrous milk fat/butteroil manufacture processes	109
	6.4.1 Principles	109
	6.4.2 Manufacturing options	111
	6.4.3 Quality of milk fat during and post manufacture	114
6.5	Milk fat fraction	115
	6.5.1 Process options	116
	6.5.2 Fraction properties	120
6.6	Ghee	126
	6.6.1 Introduction	126
	6.6.2 Methods of manufacture	128
	6.6.3 Packaging	136
	6.6.4 Chemical composition	136

6.6.5	Flavour	141
6.6.6	Physicochemical properties	146
6.6.7	Texture	147
6.6.8	Thermal oxidation	147
6.6.9	Shelf-life of the product	148
6.6.10	Nutritional aspects	153
6.6.11	Ghee as a medicine	155
6.7	Conclusion	156
6.8	Acknowledgements	157
	References	157
7	Production of Yellow Fats and Spreads	167
	B.K. MORTENSEN	
7.1	Introduction	167
7.2	Legislations	167
7.3	Dairy fat spreads	169
7.3.1	Introduction	169
7.3.2	Production technologies	170
7.3.3	Quality aspects	176
7.4	Blends and blended spreads	177
7.4.1	Introduction	177
7.4.2	Production technologies	178
7.4.3	Quality aspects	181
7.5	Products with modified functionality	182
7.5.1	Introduction	182
7.5.2	Production technologies	182
7.5.3	Applications	185
7.6	Nutritionally modified products	188
7.6.1	Introduction	188
7.6.2	Production technologies	188
7.7	Conclusions	190
	References	191
8	Cream Cheese and Related Products	195
	T.P. GUINEE AND M. HICKEY	
8.1	Introduction	195
8.2	Background and development	196
8.3	Definitions and standards of identity	199
8.3.1	Background and evolution	199
8.3.2	European legislation	200
8.3.3	UK legislation	208
8.3.4	Irish legislation	212
8.3.5	US legislation and standards	213
8.3.6	Canadian legislation and standards	218

8.3.7	German cheese legislation with particular reference to cream cheese-type products	219
8.3.8	Danish cheese legislation with particular reference to cream cheese-type products	220
8.3.9	French cheese legislation with reference to some cream cheese-type products	220
8.3.10	Italian standard on Mascarpone	222
8.3.11	Cheese legislation in Australia	223
8.3.12	Codex Alimentarius – international standards for cheese and cream cheese	225
8.4	Cream cheese	230
8.4.1	Principles of manufacture	230
8.4.2	Manufacture stages	232
8.4.3	Recombination technology	237
8.5	Basic characterisation of the structure and rheology of cream cheese	238
8.6	Factors affecting the properties of cream cheese	239
8.6.1	Homogenisation of cheese milk	239
8.6.2	Holding of hot curd at high temperature while shearing	240
8.6.3	Homogenisation of the heated cream cheese	240
8.6.4	Cooling rate	240
8.6.5	Addition of whey protein	240
8.6.6	Hydrocolloids	241
8.6.7	Composition	242
8.7	Related cheese varieties	242
8.7.1	Mascarpone	242
8.7.2	Neufchâtel and Petit-Suisse	243
8.7.3	Kajmak	243
8.8	Conclusion	244
	References	245
9	Microbial Production of Bioactive Metabolites	257
	S. MILLS, R.P. ROSS, G. FITZGERALD AND C. STANTON	
9.1	Introduction	257
9.2	Short-chain fatty acids	258
9.2.1	Background	258
9.2.2	Production of short-chain fatty acids in the colon	260
9.2.3	Role of short-chain fatty acids in health and disease	261
9.3	Gamma amino butyric acid	270
9.3.1	Introduction	270
9.3.2	Gamma amino butyric acid effects	271
9.4	Overall conclusion	273
9.5	Acknowledgements	273
	References	273

10	Trouble Shooting	286
	B.B.C. WEDDING AND H.C. DEETH	
10.1	Introduction	286
10.2	Milk	286
10.2.1	Transmitted flavours	286
10.2.2	Chemical flavours	287
10.2.3	Flavours associated with oxidation	287
10.2.4	Flavours associated with heat treatment	289
10.2.5	Bacterial flavours	289
10.2.6	Lipolysed flavour	290
10.2.7	Proteolysis	292
10.2.8	Antibiotics	292
10.3	Cream	292
10.3.1	Transmitted flavours	293
10.3.2	Microbiological defects	293
10.3.3	Defects associated with oxidation	294
10.3.4	Physical defects and stability	294
10.3.5	Lipolysis	296
10.3.6	Defects associated with whipped cream	296
10.3.7	Defects associated with coffee cream	297
10.3.8	Defects associated with UHT cream	297
10.3.9	Defects associated with sterilised cream	298
10.4	Butter	298
10.4.1	Microbiological defects	299
10.4.2	Cultured butter	300
10.4.3	Butter churning defects	301
10.4.4	Oxidative defects	301
10.4.5	Physical defects	302
10.5	Dairy spreads	304
10.5.1	Fat phase structure	304
10.5.2	Microbiological defects	305
10.5.3	Oxidative defects	306
10.6	Cream cheese	306
10.6.1	Microbiological defects	307
10.6.2	Emulsion stability	308
10.6.3	Flavour defects	308
10.6.4	Texture defects	309
10.6.5	Oxidative defects	309
10.7	Conclusion	310
	References	311
	<i>Index</i>	317