

Contents

Part I Composition and Extraction of Egg Components

MARK ANTON

Subpart Ia Egg Yolk Compounds

1	Composition and Structure of Hen Egg Yolk	
	MARC ANTON	1
1	Introduction.....	1
2	Composition.....	1
3	Macrostructure.....	4
	References.....	5
2	Low-density Lipoproteins (LDL) or Lipovitellenin Fraction	
	MARC ANTON	7
1	Introduction.....	7
2	LDL Structure and Composition	7
3	LDL Apoproteins	9
4	LDL Extraction.....	11
	References.....	12
3	High-density Lipoproteins (HDL) or Lipovitellin Fraction	
	MARC ANTON	13
1	Introduction.....	13
2	HDL Structure and Composition	13
3	HDL Extraction	15
	References.....	16
4	Phosvitin	
	MARC ANTON, OSCAR CASTELLANI AND CATHERINE GUÉRIN-DUBIARD	17
1	Introduction.....	17
2	Phosvitin Composition and Structure	17
3	Metal Chelating Properties	18
4	Phosvitin Extraction and Purification	21
	References.....	23

5	Livetin Fractions (IgY)	
	RÜDIGER SCHADE AND PABLO ANIBAL CHACANA	25
1	Introduction	25
2	Alpha-Livetin	25
3	Beta-Livetin	26
4	Gamma-Livetin	26
4.1	Molecular Structure of Chicken IgY	26
4.2	Biological Function of IgY	27
4.2.1	<i>Transfer from Maternal Blood to Egg Yolk</i>	28
4.2.2	<i>Transfer from Yolk Sac to Embryonic Circulation</i>	29
4.3	IgY Extraction	30
	References	31
 Subpart Ib Egg White Compounds		
6	Lysozyme	
	GRZEGORZ LESNIEWSKI AND JACEK KIJOWSKI	33
1	Introduction	33
2	Characteristics of Lysozyme	33
3	Antimicrobial Activity of Lysozyme	35
4	Methods of Lysozyme Isolation	37
5	Lysozyme Polymeric Forms	38
	References	40
7	Ovotransferrin	
	FABIANA SUPERTI, MARIA GRAZIA AMMENDOLIA, FRANCESCA BERLUTTI AND PIERA VALENTI	43
1	Introduction	43
2	Composition	43
3	Purification and Structure	44
4	Antimicrobial and Antiviral Activity	46
	References	48
8	Ovalbumin and Gene-Related Proteins	
	VALÉRIE LECHEVALIER, THOMAS CROGUENNEC, FRANÇOISE NAU AND CATHERINE GUÉRIN-DUBIARD	51
1	Introduction	51
2	Ovalbumin	51
2.1	Amino Acid Sequence and Structure	51
2.2	Ovalbumin Function	54
3	S-Ovalbumin	55
4	Ovalbumin Gene Y	56
5	Ovalbumin-Related Y Protein	56
	References	57

9	Ovomucin	
	JAAKKO HIIDENHOVI	61
1	Ovomucin—a Gelling Agent of Egg White	61
2	Chemical and Physical Properties of Ovomucin.....	62
3	Isolation and Purification of Ovomucin	63
3.1	Isoelectric Precipitation Method	63
3.2	Chromatographic Methods	64
3.3	Other Methods	65
4	Future Trends—Biological Roles of Ovomucin	65
	References.....	66
10	Riboflavin-Binding Protein (Flavoprotein)	
	THOMAS CROGUENNEC, CATHERINE GUÉRIN-DUBIARD	
	AND FRANÇOISE NAU	69
1	Introduction.....	69
2	Composition and Structure.....	69
3	Synthesis.....	72
	References.....	73
11	Avidin	
	FRANÇOISE NAU, CATHERINE GUÉRIN-DUBIARD	
	AND THOMAS CROGUENNEC	75
1	Introduction.....	75
2	Physiochemical Characteristics	75
3	Structure and Interactions	76
4	Extraction and Purification.....	77
	References.....	78
12	Proteases	
	SOPHIE RÉHAULT	81
1	Introduction.....	81
2	Glutamyl Aminopeptidase (EAP).....	82
3	Methionine-Preferring Broad Specificity Aminopeptidase (MAP).....	82
4	Others	83
	References.....	83
13	Antiproteases	
	SOPHIE RÉHAULT	85
1	Introduction.....	85
2	Ovostatin	86
3	Ovomucoid.....	87
4	Ovoinhibitor.....	88
5	Chicken Cystatin	89
	References.....	89

14 Minor Proteins

CATHERINE GUÉRIN-DUBIARD AND FRANÇOISE NAU	93
1 Introduction	93
2 Lipocalins	93
2.1 Extracellular Fatty Acid Binding Protein (Ex-FABP)	94
2.2 Chondrogenesis Associated Lipocalin Gamma (CAL gamma)	94
2.3 Ovoglycoprotein	95
3 Clusterin	95
4 HEP21	95
5 Tenp	96
6 Vitelline Membrane Outer Protein 1 (VMO1)	96
7 Conclusion	97
References	97

Subpart Ic Egg Shell Compounds**15 Structure and Formation of the Eggshell**

YVES NYS AND JOËL GAUTRON	99
1 Introduction	99
2 Structure of the Eggshell	99
3 Eggshell Formation	101
References	102

16 Eggshell Matrix Proteins

JOËL GAUTRON AND YVES NYS	103
1 Introduction	103
2 Egg White Proteins	104
3 Ubiquitous Proteins	104
4 Proteins Unique to the Eggshell	105
References	106

17 Function of Eggshell Matrix Proteins

JOËL GAUTRON AND YVES NYS	109
1 Introduction	109
2 Eggshell Matrix Proteins and Calcification Process	109
2.1 Calcium Binding Proteins	110
2.2 In vitro Interaction with Mineral Phase	110
2.3 In vivo Relationships Between Eggshell Matrix and Eggshell Quality	111
2.4 Genomic Approach	112
3 Antibacterial Activities of Eggshell Matrix Proteins	112
References	113

Part II Use of Egg Compounds for Human Nutrition

ROSINA LOPÉZ-FANDIÑO

18 Nutritional Evaluation of Egg Compounds	
INGRID SEUSS-BAUM	117
1 The Problem with the Egg	117
2 Nutritional Value of Eggs	117
2.1 Nutrient Content per 100 g or per Portion	117
2.2 Nutrient Content Expressed as Percentage of RDI	125
2.3 Nutrient Profile	129
3 Importance of Nutrients in Eggs for Human Nutrition	129
3.1 Macronutrients	129
3.1.1 Protein	129
3.1.2 Fat	132
3.1.3 Carbohydrates	134
3.2 Micronutrients	134
3.2.1 Vitamins	134
3.2.2 Minerals	135
4 Bioavailability of Nutrients from Eggs	136
5 Enrichment and Fortification of Nutrients in Eggs	137
6 Conclusions	140
References	140
19 Concepts of Hypoallergenicity	
YOSHINORI MINE AND MARIE YANG	145
1 Introduction	145
2 Food Allergy Overview	146
2.1 Molecular Aspects of Food Allergy	146
2.2 Molecular Properties of the Major Egg Allergens	146
2.3 Role of Glycosylation in Protein Allergenicity	148
3 Concept of Hypoallergenicity	148
3.1 Development of Hypoallergenic Products via Food Processing	148
3.1.1 Thermal Processing	149
3.1.2 Enzymatic Fragmentation	150
3.1.3 Other Food Processing Methods	150
3.2 Development of Hypoallergenic Products for Immunotherapeutic Purposes	151
3.2.1 Full Recombinant Allergens	151
3.2.2 Site-Directed Mutagenesis	152
3.2.3 Peptide-Based Immunotherapy	152
3.2.4 Production of Tolerance-Inducing Peptides	153
3.2.5 Blocking IgG-Inducing Peptides [Mimotope (Mimotopes, Clayton, Australia) Immunotherapy]	153
3.2.6 Chemically Modified Allergens (Allergoids)	154
References	155

20	Egg Enrichment in Omega-3 Fatty Acids	
	A.L. YANNAKOPOULOS	159
1	Introduction	159
2	Fatty Acid Requirements in Humans	159
2.1	Fatty Acid Metabolism in the Human Body	160
2.2	Effects of PUFA on Human Health	160
3	Lipid Metabolism in Avians and Lipid Composition of Eggs	161
4	Omega-3 Enriched Eggs as a Means to Improve Human Health	162
4.1	Enriched ω 3 Eggs in Practice	163
4.2	Health Benefits of ω -3 Enriched Eggs	164
4.3	Organoleptic Characteristics	165
4.4	The ω -3 Egg in the Market	165
5	Combined Enrichment with Omega-3 and Natural Antioxidants	167
	References	168
21	Enrichment in Vitamins	
	FEDERICO SIRRI AND ANA BARROETA	171
1	Introduction	171
2	Vitamin E Enrichment	172
3	Vitamin A Enrichment	175
4	Vitamin D Enrichment	177
5	Enrichment of Other Vitamins	178
5.1	Vitamin K	178
5.2	Folacin (Folic Acid)	178
5.3	Other Water Soluble Vitamins	179
6	Contribution by the Consumption of Enriched Eggs to the Recommended Daily Vitamin Intake	179
	References	181
22	Enrichment in Selenium and Other Trace Elements	
	PETER F. SURAI, TIGRAN T. PAPAZYAN, BRIAN K. SPEAKE AND NICK H.C. SPARKS	183
1	Introduction	183
2	Selenium-Enriched Products	185
3	Selenium-Enriched Eggs as a Route Toward Improving Human Selenium Status	186
4	Conclusions	188
	References	190

Part III Use of Eggs for Human/Animal Health and Biotechnology

RÜDIGER SCHADE

Subpart IIIa Egg Compounds and Human/Animal Health

23 Compounds with Antibacterial Activity	
FLORENCE BARON AND SOPHIE RÉHAULT	191
1 Introduction	191
2 Lysozyme	191
3 Ovotransferrin	193
4 Proteinase Inhibitors	194
5 Other Proteins	195
6 Conclusions	196
References	196
24 Egg-Protein-Derived Peptides with Antihypertensive Activity	
ROSINA LÓPEZ-FANDIÑO, ISIDRA RECIO AND MERCEDES RAMOS	199
1 Introduction	199
2 Food Peptides with ACE-Inhibitory and Antihypertensive Effects	199
3 Antihypertensive Hydrolysates Obtained from Egg Proteins	201
4 Antihypertensive Egg Peptides: Bioavailability and Mechanism of Action	203
5 Conclusions and Future Prospects	208
References	209
25 Use of IgY Antibodies in Human and Veterinary Medicine	
RÜDIGER SCHADE, XIAO-YING ZHANG AND HORACIO RAÚL TERZOLO	213
1 Introduction	213
2 Advantages of IgY Technology	213
3 Applications of IgY in Biomedical Research and in Human and Veterinary Medicine	214
3.1 General Applications	214
3.2 IgY for Therapeutic or Prophylactic use in Veterinary Medicine	214
3.2.1 <i>Treatment of Intestinal Infections</i>	214
3.2.2 <i>IgY Application in Aquafarming</i>	215
3.3 IgY for Therapeutical or Prophylactic use in Human Medicine	215
3.3.1 <i>Treatment of Intestinal Infections in Children</i>	215
3.3.2 <i>Treatment of Helicobacter Pylori</i>	216
3.3.3 <i>Use of IgY for Treatment of Colitis and Celiac Disease</i>	216
3.3.4 <i>Treatment of Cystic Fibrosis</i>	216

3.3.5	<i>Prophylactic use of IgY in Dental Caries</i>	217
3.3.6	<i>Use of IgY for Treatment of Poisonings</i>	217
3.3.7	<i>Use of IgY as a Tool in the Context of Bioterrorism</i>	218
3.3.8	<i>IgY as a Tool in Proteomics</i>	219
4	Conclusions and Future Prospects	219
	References	219
26	Egg Compounds with Antioxidant and Mineral Binding Properties	
	CATHERINE GUÉRIN-DUBIARD, OSCAR CASTELLANI AND MARC ANTON	223
1	Introduction	223
2	Ovotransferrin	223
2.1	Ion-Binding Capacity	223
2.2	Metal-Binding Capacity and Biological Activities	224
3	Phosvitin	224
3.1	Ion-Binding Capacity	224
3.2	Nutraceutical Applications	225
3.3	Antibacterial and Emulsifying Properties	225
3.4	Antioxidant Activity	225
3.4.1	<i>Medical Domain</i>	226
3.4.2	<i>Food Industry</i>	226
	References	227
27	Use of Lecithin and Lecithin Fractions	
	MARGHERITA ROSSI	229
1	Definition and Composition	229
2	Processes for Isolation, Purification and Modification	231
2.1	Extraction and Purification	231
2.2	Modification	232
3	Applications	234
3.1	Nutritional Field	234
3.2	Pharmaceutical Field	236
3.3	Cosmetic and Other Fields	237
	References	238
Subpart IIIb Egg Compounds and Biotechnology		
28	Extraction of Several Egg Compounds at a Pilot Scale	
	HEIKKI ARO	241
1	Introduction: Hen Egg is an Endless Reserve for Fractionation Processes	241
2	Supercritical Fluids - Sustainable Separation Technology	241
3	Solubility of Egg Compounds in SC-CO ₂	243
4	SCF Applications and Egg Yolk	243
4.1	The Pilot Scale Method for the Production of TAGs, Pure Phospholipids, and Lipid-Free Fractions From Egg Yolk Using Supercritical Fluids	244
4.2	Supercritical Fluid Extraction Steps	244

4.3	Supercritical Antisolvent (SAS) Process	245
4.4	Analysis of the Egg Yolk Fractions Produced in the Process	245
5	Utilization of the Resulting Fractions	246
6	Conclusions	246
	References	246
29	Use of Egg Compounds for Cosmetics and Pharmaceuticals	
	MAUD CANSELL	249
1	Introduction	249
2	Emulsions Based on Egg Phospholipids Used in Pharmaceuticals and Cosmetics	250
3	Liposomes Based on Egg Phospholipids Used in Pharmaceuticals and Cosmetics	251
4	Conclusion	254
	References	255
30	Use of Egg Compounds for Cryoprotection of Spermatozoa	
	LAMIA BRIAND-AMIRAT, DANIEL TAINURIER AND MARC ANTON	259
1	Introduction	259
2	Low Density Fraction of Hen Egg Yolk	260
3	Proposed Mechanisms of LDL Cryoprotection Capacities	261
	References	262
31	Egg-Protein-Based Films and Coatings	
	CATHERINE GUÉRIN-DUBIARD AND JEAN-LUC AUDIC	265
1	Introduction	265
2	Protein-Based Films and Coatings	266
3	Formulation of Films and Coatings	267
4	Optimization of Egg Protein Films by Incorporation of Additives	269
4.1	Plasticizers	269
4.2	Protein Chemical Modification: Crosslinking	270
4.3	Other Additives	271
5	Conclusion	271
	References	272
32	Magnetic Particles for Egg Research	
	IVO SAFARIK AND MIRKA SAFARIKOVA	275
1	Introduction	275
2	Immobilization of Egg-Related Biologically Active Compounds	275
3	Isolation of Egg-Related Biologically Active Compounds	276
4	Magnetic Bioassays of Egg Related Biologically Active Compounds	278
5	Immunomagnetic Separation of Egg-Related Microbial Pathogens	280
6	Magnetoliposomes	281
7	Other Applications of Magnetic Particles	282
8	Future Trends	282
	References	283

33 Avidin-Biotin Technology

FRANÇOISE NAU, CATHERINE GUÉRIN-DUBIARD AND THOMAS CROGUENNEC	287
1 The Avidin-Biotin System	287
2 Biochemical Applications	287
3 Biomedical Applications	288
4 How to Get Around the Nonspecific Binding of Avidin.	289
References.	290

Index	293
------------------------	------------

Bioactive Egg Compounds

Huopalahti, R.; López-Fandiño, R.; Anton, M.; Schade, R.
(Eds.)

2007, XX, 298 p. 30 illus., Hardcover

ISBN: 978-3-540-37883-9