## **Contents**

List	of Co	ntributors	XV
1	Historical and Current Perspectives on Organic Meat Production Ellen J. Van Loo, Steven C. Ricke, Corliss A. O'Bryan, and Michael G. Johnson		1
	1.1 1.2 1.3 1.4	What is organic – definition History and development of the modern organic food industry Organic food labels Organic meat and objectives of this book	1 1 3
	Ackr	nowledgment rences	8
SEC	CTIO	N I: ECONOMICS, MARKET, AND REGULATORY ISSUES	11
2	Organic Meat Operations in the United States Corliss A. O'Bryan, Ellen J. Van Loo, Steven C. Ricke, and Philip G. Crandall		13
	2.1	Introduction	13
	2.2 2.3	The market for organic meat in the United States Production and supply of organic meat in the United States	14 14
	2.4	Future of the US organic meat industry	20
	Refe	rences	20
3		llatory Issues in Domestically Raised and Imported Organic Meats	
		e United States son M. Pittman, Kerri C. Boling, and Shannon J. Mirus	23
	3.1	Introduction	23
	3.2 3.3	The national organic program Future directions and conclusions	24 50
		rences	51
4	Organic Meat Production in Europe: Market and Regulation Simona Naspetti and Raffaele Zanoli		53
	4.1	Introduction	53
	4.2	The regulatory framework	53
	4.3 4.4	Organic animal production: salient features of the new EU regulation Characteristics of the organic meat industry	55 56

viii	Contents		
	4.5 Consult 4.6 Conclu References	mer issues sions	61 65 66
5		t Marketing oo, Vincenzina Caputo, Rodolfo M. Nayga, Jr., avari, and Steven C. Ricke	67
	5.3 Econor	mers' purchasing drivers and deterrents mics and price premium lysis across organic buyer types and sociodemographic tions	67 67 75 78
	Acknowledgm References	ent	81 81
	D PROCESSE Health and V	ANAGEMENT ISSUES FOR ORGANICALLY RAISED D MEAT ANIMALS Velfare of Organic Livestock and Its Challenges	87 89
	<ul><li>6.3 Implied</li><li>6.4 Hetero</li><li>6.5 Status</li><li>6.6 Differe</li><li>6.7 Incons</li><li>6.8 Challet</li></ul>	action teristics of organic livestock farming ations of living conditions on animal health and welfare geneity of living conditions between organic farms of animal health and welfare in organic farming ant perspectives istencies and cognitive dissonances	89 90 91 96 97 98 102 105 107
7	Production as	al Impacts and Life Cycle Analysis of Organic Meat and Processing lini, Antonio Boggia, Luisa Paolotti, Greg J. Thoma, and	113
	7.2 The lift 7.3 Case st	c meat and environmental impacts e cycle assessment method endy-environmental impact evaluation of poultry production s, by means of LCA: comparison among conventional, organic,	113 114
	and org	ganic-plus udy-national scan-level carbon footprint for US swine	119 128
	produc 7.5 Conclu References		128 134 134

			Contents	ix
8		etics of Poultry Meat Production in Organic Systems Sørensen		137
	8.1	Introduction		137
	8.2	The growth		139
	8.3	Adaptation to outdoor facilities		140
	8.4	Concentration and/or quality of nutrients fed to the organically		
		grown chicken		141
	8.5	The parent stock should be organically kept – perhaps?		142
	8.6	Where to buy genetic material, or is it necessary to breed for		
		organically grown chickens?		142
	8.7	Dual purpose or specialised breeds		143
	8.8	Conclusion		143
	Refer	rences		144
9	-	inic Meat By-Products for Affiliated Food Industries dia S. Dunkley, Dave Carter, and Kingsley Dunkley		147
	9.1	Introduction		147
	9.2	Meat by-products		148
	9.3	Marketing organic by-products		150
	9.4	Current regulations regarding the pet-food industry		151
	9.5	Organic product and by-product use in the pet-food industry		152
	9.6	Where do we go from here?		154
	9.7	Other uses of organic by-products		154
	9.8	Conclusions		155
	Refei	rences		155
10	_	nic Animal Nutrition and Feed Supplementations		157
	Vesel	a I. Chalova and Steven C. Ricke		
	10.1	Introduction		157
	10.2	Organic animal nutrition: general considerations		158
	10.3	Proteins		160
	10.4	Mineral and vitamin supplementations		167
	10.5	Conclusions and perspectives		169
		owledgment		169
	Refe	rences		169
11		uction of Forage Crops Suitable for Feeding Organically		
		ed Meat Animals		177
	Ivan I	Manolov and Christina Yancheva		
	11.1	Introduction		177
	11.2	Crop rotations		178
	11.3	Intercropping		180
	11.4	Green manure and cover crops		180
	11.5	•		181
	11.6	Weed management		182

x	Content	S		
	11.7	Soil fertility	183	
	11.8	Cereal crops	185	
	11.9	Fodder crops	186	
	11.10	Pastures	190	
	11.11	Conclusion	192	
	Refere	nces	192	
		III: PROCESSING, SENSORY, AND HUMAN HEALTH		
AS.	PECTS	OF ORGANIC MEATS	199	
12	Corliss	nter Options for Organic Meat Producers in the United States A. O'Bryan, Kristen E. Gibson, Philip G. Crandall, even C. Ricke	201	
	12.1	Introduction	201	
	12.2	Fixed facilities	201	
	12.3	Mobile slaughter units	203	
	12.4	On-farm poultry processing	205	
	12.5	Waste management	206	
	12.6	Conclusions	208	
		wledgment	208	
	Refere	nces	208	
	List of	resources	208	
13	Alternatives to Traditional Antimicrobials for Organically Processed			
		and Poultry	211	
		thew Taylor, Rolf Joerger, Enrique Palou, Aurelio López-Malo, wila-Sosa, and Thelma Calix-Lara		
	13.1	Introduction	211	
	13.2	Weak organic acids and associated salts	214	
	13.3	Chlorine and the oxidizing antimicrobials	221	
	13.4	Antimicrobial polypeptides and biopreservation	225	
	13.5	Concluding remarks	229	
	Refere	nces	230	
14	Nutrit	ional Value of Organic Meat and Potential Human		
		Response	239	
	Ewa R	embiałkowska and Maciej Badowski		
	14.1	Introduction	239	
	14.2	Beef	242	
	14.3	Mutton and lamb	243	
	14.4	Pork	244	
	14.5	Poultry	247	
	14.6	Rabbit meat	247	
	14.7	Summary	249	
	Refere	nces	252	

		Contents	xi
15	Sensory Assessment of Organic Meats		257
	Lydia J. Rice and Jean-François Meullenet		
	15.1 Introduction		257
	15.2 Types of sensory testing		258
	15.3 Sensory research on organic meat		263
	15.4 Conclusions		269
	References		270
	Appendix B Minimum number of assessment in a triangle test  Appendix B Critical number of correct response in a triangle test		273
	(entries are $x_{a,n}$ )		274
16	Chemical Residues in Organic Meats Compared to		
	Conventional Meats		275
	Sergio Ghidini, Emanuela Zanardi, Mauro Conter, and Adriana Ianieri		
	16.1 Introduction		275
	16.2 Inorganic residues and contaminants		276
	16.3 Organic residues and contaminants		279
	16.4 Pesticides		280
	<ul><li>16.5 Polycyclic aromatic hydrocarbons (PAHs)</li><li>16.6 Veterinary drugs</li></ul>		280 281
	<ul><li>16.6 Veterinary drugs</li><li>16.7 Conclusions</li></ul>		282
	References		283
	CTION IV: THE CURRENT FOOD SAFETY STATUS OF GANIC MEATS		285
17	Prevalence of Food-Borne Pathogens in Organic Beef Megan E. Jacob, J. Trent Fox, and T. G. Nagaraja		287
			287
	17.1 Introduction 17.2 E. coli O157 and non-O157 STEC		290
	17.3 Salmonella		292
	17.4 Campylobacter		293
	17.5 Listeria monocytogenes		294
	17.6 Conclusions		294
	References		296
18	Incidence of Food-Borne Pathogens in Organic Swine		301
	Marcos H. Rostagno and Paul D. Ebner		
	18.1 Introduction		301
	18.2 Incidence of bacterial food-borne pathogens		303
	18.3 Antimicrobial resistance in conventional versus organic		205
	pork production		305 308
	<ul><li>18.4 Incidence of parasites</li><li>18.5 Conclusions</li></ul>		308
	18.5 Conclusions References		310
	12010101100.7		

xii	Contents	
XII	Contents	

19	Food-borne Pathogen Occurrence in Organically and Naturally Raised Poultry Ellen J. Van Loo, Sherry N. Melendez, Irene B. Hanning, and Steven C. Ricke		
	<ul> <li>19.1 Introduction</li> <li>19.2 Broiler production in the United States</li> <li>19.3 Prevalence of food-borne pathogens in pasture and organically</li> </ul>	315 316	
	raised poultry 19.4 Antibiotic resistance	318 321	
	19.4 Antibiotic resistance 19.5 Conclusions	324	
	Acknowledgment	324	
	References	324	
	CTION V: PREHARVEST CONTROL MEASURES FOR ASSURING E SAFETY OF ORGANIC MEATS	329	
20	Probiotics as Pathogen Control Agents for Organic Meat Production Gregory R. Siragusa and Steven C. Ricke		
	20.1 Introduction	331	
	20.2 Antibiotics in food animal production	332	
	20.3 Development of probiotics	333	
	20.4 Probiotics and the GI tract	334	
	20.5 Probiotics and mechanisms of protection	336	
	20.6 Company-specific inoculant	340	
	20.7 Conclusions	341 342	
	Acknowledgment References	343	
21	Gut Health and Organic Acids, Antimicrobial Peptides, and Botanicals		
	as Natural Feed Additives Jacqueline Jacob and Anthony Pescatore	351	
	21.1 Introduction	35	
	21.2 Gut health and microbial population	353	
	21.3 , Organic acids	355	
	21.4 Antimicrobial peptides	359	
	21.5 Phytogenic compounds/botanicals	362	
	21.6 Conclusions	369	
	References	370	
22	Prebiotics		
	Jacqueline Jacob and Anthony Pescatore		
	22.1 Introduction	379	
	22.2 Fructo-oligosaccharides	383	
	22.3 Mannanoligosaccharides (MOS)	384	
	22.4 Other oligosaccharides	389	

			Contents	xiii
	22.5	Inulin		390
	22.6	Combinations of feed additives		392
	22.7	Conclusions		399
	Refer	ences		399
23	Bacte	eriophages for Potential Food Safety Applications		
	in Or	ganic Meat Production		407
	Steve	n C. Ricke, Paul Hererra, and Debabrata Biswas		
	23.1	Introduction		407
	23.2	Bacteriophage biology		408
	23.3	Postharvest application of bacteriophage in meat processing		409
	23.4	Preharvest phage therapy		411
	23.5	Bacteriophage and animal host response		412
	23.6	Overcoming barriers to bacteriophage GI tract therapy		414
	23.7	Optimizing phage sources for therapeutic application		417
	23.8	Conclusions		418
	Ackn	owledgment		419
	Refer	rences		419
24	The l	Future of Organic Meats		425
		J. Van Loo, Steven C. Ricke, Corliss A. O'Bryan, Aichael G. Johnson		
	24.1	Synopsis of the different sections		425
	24.2	Future of the organic meat industry		427
	Ackn	owledgment		429
	Refer	rences		429
Ind	ex			431