

Improving the safety and quality of eggs and egg products: Egg chemistry, production and consumption (Volume 1)

Edited by Y Nys, INRA, France, M Bain, University of Glasgow, UK and F Van Immerseel, Ghent University, Belgium

Woodhead Publishing Series in Food Science, Technology and Nutrition No. 213

- focuses on egg chemistry, production and consumption with reference to the factors that can impact egg quality
- reviews recent research in the areas of disease, egg quality and the development of new technologies to assure egg safety
- comprehensively covers organic, free-range and processed egg production
- an essential reference for managers in the egg industry, food industry professionals using eggs and those with a research interest in the subject

Eggs are economical and of high nutritional value, yet can also be a source of foodborne disease. Understanding of the factors influencing egg quality has increased in recent years and new technologies to assure egg safety have been developed. *Improving the safety and quality of eggs and egg products* reviews recent research in these areas.

Volume 1 focuses on egg chemistry, production and consumption. Part one sets the scene with information on egg production and consumption in certain countries. Part two then provides essential information on egg formation and chemistry. Factors that impact egg quality are the focus of part three. Chapters cover the role of poultry breeding, hen nutrition and laying environment, among other significant topics. Part four addresses organic and free range egg production, the impact of egg production on the environment and non-poultry eggs. A chapter on processed egg products completes the volume.

With its distinguished editors and international team of contributors, Volume 1 of *Improving the safety and quality of eggs and egg products* is an essential reference for managers in the egg industry, professionals in the food industry using eggs as ingredients and all those with a research interest in the subject.

ISBN 1 84569 754 5

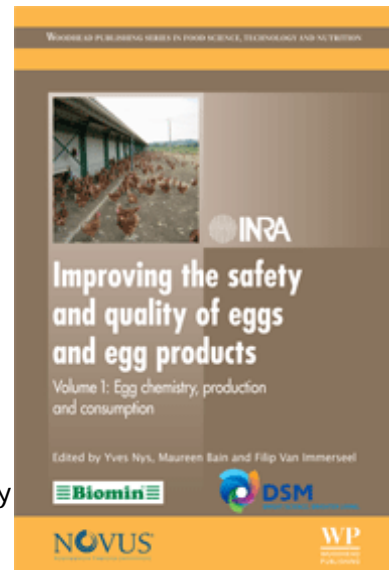
ISBN-13: 978 1 84569 754 9

August 2011

632 pages 234 x 156mm hardback

£160.00 / US\$270.00 / €190.00

<http://www.woodheadpublishing.com/en/book.aspx?bookID=1974>



About the editors

Dr Yves Nys is a Research Leader in the Poultry Research Unit at the Institut National de la Recherche Agronomique, France.

Dr Maureen Bain is Senior Lecturer in the Faculty of Veterinary Medicine, University of Glasgow, UK.

Prof. Filip Van Immerseel leads a research group in the Department of Pathology, Bacteriology and Poultry Diseases at the Ghent University, Belgium.

Titles which may also be of interest:

[Improving the safety and quality of eggs and egg products](#)

[Food safety control in the poultry industry](#)

[Microbiological analysis of red meat, poultry and eggs](#)

[Foodborne pathogens](#)

Contents

[PART 1 EGG PRODUCTION AND CONSUMPTION](#)

[PART 2 EGG FORMATION, CHEMISTRY AND QUALITY PARAMETERS](#)

[PART 3 EGG PRODUCTION AND QUALITY](#)

[PART 4 ALTERNATIVE EGG PRODUCTION SYSTEMS AND PROCESSED EGGS](#)

PART 1 EGG PRODUCTION AND CONSUMPTION

Egg and egg product production and consumption in Europe and the rest of the world

P Magdelaine, ITAVI, France

- Introduction
- Worldwide overview
- European overview
- Conclusion and future trends
- References and further reading

Social economic aspects of egg production in China

N Yang, China Agricultural University, China

- Introduction
- Historical development of egg production in China
- Current status of the Chinese egg industry
- Future trends
- References and further reading

Egg production in Africa

H M Tukur, Usmanu Danfodiyo University, Nigeria

- Introduction
- Egg production
- Egg consumption, marketing and trade
- The production system
- Conclusion
- References

Profiling the egg consumer: attitudes, perceptions and behaviours

F Hansstein, University of Bologna, Italy

- Introduction
- Egg consumption: evidence from the literature
- Europe legislation between consumers and eggs
- Evidence from the trust pilot survey
- Conclusion
- References

Egg quality assurance schemes and egg traceability

F C Schwägele, Max Rubner-Institut, Germany

- The role of eggs in human nutrition
- Egg quality
- Egg traceability
- Conclusions
- References and further reading

PART 2 EGG FORMATION, CHEMISTRY AND QUALITY PARAMETERS

Egg formation and chemistry

Y Nys and N Guyot, Institut National de la Recherche Agronomique, France

- Introduction
- Structure of the egg
- Composition of the egg
- Formation of the egg: an overview
- Formation of the egg yolk in the ovary
- Formation of the egg white and the shell in the oviduct
- Oviposition
- References

Use of high-throughput technology to identify new egg components

J Gautron, S Réhault-Godbert and Y Nys, Institut National de la Recherche Agronomique, France, K Mann, Max-Planck-Institut für Biochemie, Germany and P G Righetti, Politecnico di Milano, Italy

- Introduction
- Functional genomics generated new insights for the characterisation of egg proteins
- Newly identified egg proteins
- Conclusion
- Acknowledgements
- References

The eggshell: structure and protective function

M Hincke, University of Ottawa, Canada, J Gautron and Y Nys, Institut National de la Recherche Agronomique, France, A B Rodriguez-Navarro, University of Granada, Spain and M D McKee, McGill University, Canada

- Introduction
- Structure of eggshell 1: composition and characterization
- Structure of eggshell 2: biosynthesis and constituents
- Applications: eggshell as an industrial raw material
- Conclusions
- References

Molecules involved in chemical defence of the chicken egg

S Réhault-Godbert, V Hervé-Grépinet, J Gautron, C Cabau and Y Nys, Institut National de la Recherche Agronomique, France and M Hincke, University of Ottawa, Canada

- Introduction

- Molecules degrading microbial components
- Molecules decreasing bioavailability of iron and vitamins
- Molecules inhibiting the activity of microbial proteases
- Immunoglobulin superfamily
- Cytokines and other mediators of immune response
- Molecules involved in protection against stress and oxidative injury
- References

Advances in egg defect detection, quality assessment and automated sorting and grading

K Mertens, B Kemps, C Perianu, J De Baerdemaeker, E Decuypere and B De Ketelaere, Katholieke Universiteit Leuven, Belgium and M. Bain, University of Glasgow Veterinary School, UK

- Introduction
- Assessment of the egg shell quality
- Assessment of the internal egg quality
- Automated industrial egg sorting and grading
- Conclusions and future trends
- References

PART 3 EGG PRODUCTION AND QUALITY

Poultry breeding for egg quality: traditional and modern genetic approaches

I Dunn, University of Edinburgh, UK

- Introduction
- Selection for egg quality
- The structure of the egg, its formation and the potential for genetic improvement
- New genetic selection methodologies and their potential impact
- Conflicts in selection goals
- References

Hen nutrition for sustained egg quality

I Bouvarel, ITAVI, Y Nys and P Lescoat, Institut National de la Recherche Agronomique, France

- Introduction
- Variations in egg weight
- Variations in the proportions of albumen and yolk
- Variations in fatty acid composition
- Variations in mineral and vitamin composition
- Variations in yolk colour and carotenoid content
- Variations in shell quality
- Conclusion
- References

Effect of hen age, moult, laying environment and egg storage on egg quality

A Travel, ITAVI, Y Nys, Institut National de la Recherche Agronomique, France and M Bain, University of Glasgow Veterinary School, UK

- Introduction
- Egg quality and the effect of increasing bird age
- Induced moulting
- The laying environment
- Effects of egg handling and storage on egg quality
- Conclusions
- References

Egg and egg product microbiology

F Baron and S Jan, Institut National de la Recherche Agronomique, France

- Introduction
- Egg microbiology
- Egg product microbiology
- References and further reading

Alternative hen housing systems and egg quality

M Rossi, Università degli Studi di Milano, Italy and K De Reu, Institute for Agricultural and Fisheries Research (ILVO), Belgium

- Introduction
- External egg quality
- Interior egg quality
- Hygienic quality
- Conclusion
- References

Avian diseases which affect egg production and quality

J R Roberts, University of New England, Australia R Souillard, Agence Française de Sécurité Sanitaire des Aliments (AFSSA) and J. Bertin, Coopérative Le Gouessant, France

- Introduction
- Effects of bacteria on egg production and quality
- Effects of viruses on egg production and quality
- Effects of syndromes on egg production and quality
- Effects of toxic agents on production and egg quality
- Clinical perspectives
- References and further reading

Parasitism in egg production systems: the role of the red mite (*Dermanyssus gallinae*)

O A E Sparagano, Northumbria University, UK; and A. Giangaspero, University of Foggia, Italy

- Major parasites in poultry production
- *Dermanyssus gallinae*: biology and behaviour
- Pathologies associated with *Dermanyssus gallinae*
- Acaricide treatments and consequences
- New methods to control dermanyssosis
- Conclusion
- References and further reading

Health risks for workers in egg production systems and methods of control

S Le Bouquin and A Huneau-Salaün, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses) and B Eniafe-Eveillard, CHU A. Morvan, France

- Introduction
- Professional exposures in egg farming
- Health effects and epidemiological features in poultry worker populations
- Prevention and control of health risks
- Future trends
- Sources of further information and advice
- References

PART 4 ALTERNATIVE EGG PRODUCTION SYSTEMS AND PROCESSED EGGS

Environmental sustainability of egg production and processing

M G MacLeod, University of Edinburgh, UK

- Introduction
- The ecology of sustainability
- Life cycle analysis: a mathematical framework for integrating inputs and outputs
- Organic and less intensive production
- The role of feed and nutrition
- Indirect ways of improving productivity: maintenance ratio
- Other sustainability issues
- Conclusions
- References

Organic and free-range egg production

M Hammershøj, Aarhus University, Denmark

- Introduction
- Market development of organic and free-range eggs
- Regulations on organic and free-range egg production
- Productivity of organic and free range hens
- Quality of organic and free range eggs
- Future trends
- References

Production, composition, and quality of duck eggs

J F Huang and C C Lin, Council of Agriculture, Taiwan

- Introduction
- Breeds of laying ducks
- Productive styles of laying ducks
- Duck egg composition and characteristics
- Duck egg products
- Factors affecting quality of duck eggs
- Conclusion
- References

Production and quality of quail, pheasant, geese and turkey eggs for uses other than human consumption

A Tserveni-Goussi and P Fortomaris, Aristotle University of Thessaloniki, Greece

- Introduction
- Uses of non table eggs
- Non table egg production, composition and quality
- Other quality characteristics
- Conclusion
- References

Processed egg products

V Lechevalier, T Croguennec, M Anton and F Nau, Institut National de la Recherche Agronomique, France

- Introduction: industrial egg products
- Industrial production of liquid egg products
- Egg product dehydration
- Alternative technologies for egg product stabilization
- Egg product functionality and use as an ingredient
- Speciality egg products
- References

Improving the safety and quality of eggs and egg products (SERIES): Egg safety and nutritional quality (Volume 2)

Edited by F Van Immerseel, Ghent University, Belgium, Y Nys, INRA, France and M Bain, University of Glasgow, UK

Woodhead Publishing Series in Food Science, Technology and Nutrition No. 214

- focuses on egg safety and nutritional quality with reference to egg contaminants such as Salmonella Enteritidis
- chapters discuss essential topics such as monitoring and control procedures in laying flocks and egg decontamination methods

- presents a comprehensive overview of the role of eggs in nutrition and other health applications including dietary cholesterol, egg allergy, egg enrichment and bioactive fractions of eggs

- an essential reference for managers in the egg industry, food industry professionals using eggs and those with a research interest in the subject

Eggs are economical and of high nutritional value, yet can also be a source of foodborne disease. Understanding of the factors influencing egg quality has increased in recent years and new technologies to assure egg safety have been developed. *Improving the safety and quality of eggs and egg products* reviews recent research in these areas

Volume 2 focuses on egg safety and nutritional quality. Part one provides an overview of egg contaminants, covering both microbial pathogens and chemical residues. Salmonella control in laying hens is the focus of part two. Chapters cover essential topics such as monitoring and control procedures in laying flocks and egg decontamination methods. Finally, part three looks at the role of eggs in nutrition and other health applications. Chapters cover dietary cholesterol, egg allergy, egg enrichment and bioactive fractions of eggs, among other topics.

With its distinguished editors and international team of contributors, Volume 2 of *Improving the safety and quality of eggs and egg products* is an essential reference for managers in the egg industry, professionals in the food industry using eggs as ingredients and all those with a research interest in the subject.

ISBN 0 85709 072 0

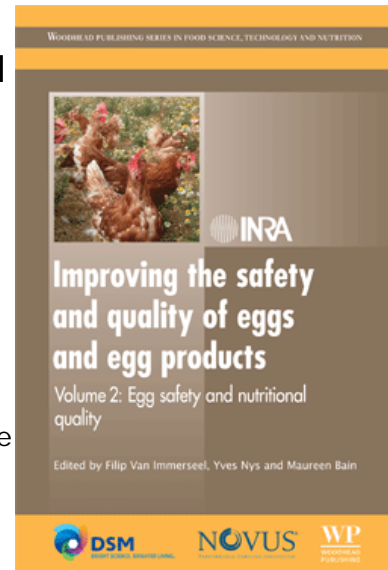
ISBN-13: 978 0 85709 072 0

August 2011

448 pages 234 x 156mm hardback

£155.00 / US\$265.00 / €185.00

<http://www.woodheadpublishing.com/en/book.aspx?bookID=2354>



About the editors

Prof. Filip Van Immerseel leads a research group in the Department of Pathology, Bacteriology and Poultry Diseases at the Ghent University, Belgium.

Dr Yves Nys is a Research Leader in the Poultry Research Unit at the Institut National de la Recherche Agronomique, France.

Dr Maureen Bain is Senior Lecturer in the Faculty of Veterinary Medicine, University of Glasgow, UK.

Titles which may also be of interest:

[Improving the safety and quality of eggs and egg products](#)

[Food safety control in the poultry industry](#)

[Microbiological analysis of red meat, poultry and eggs](#)

[Foodborne pathogens](#)

Contents

PART 1 MICROBIAL AND CHEMICAL CONTAMINATION OF EGGS

PART 2 SALMONELLA CONTROL IN LAYING HENS

PART 3 EGGS IN NUTRITION AND OTHER APPLICATIONS

PART 1 MICROBIAL AND CHEMICAL CONTAMINATION OF EGGS

Microbiology and safety of table eggs

M T Musgrove, United States Department of Agriculture, USA

- Introduction
- Washing table eggs
- Table egg facility sanitation
- Regulations
- Microbiology of table eggs
- Bringing eggs and foodborne disease into perspective
- Acknowledgements
- References and further reading

Foodborne disease associated with eggs: microbial hazards and Salmonella enteritidis risk assessment

M Chemaly and G Salvat, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses), France

- Introduction
- Hazard identification
- Quantitative risk assessment: Salmonella enteritidis in eggshells
- Conclusion
- References and further reading

Internal contamination of eggs by Salmonella enteritidis

R Raspoet, I Gantois, R Devloo, F Pasmans, F Haesebrouck, R Ducatelle and F Van Immerseel, Ghent University, Belgium

- Salmonella enteritidis and eggs: a close connection
- Eggshell surface contamination
- Eggshell penetration
- Contamination of the egg during development in the reproductive tract
- Salmonella enteritidis virulence factors involved in chicken reproductive tract colonization
- References

Chemical residues and contaminants in eggs

C Jondreville, A Fournier and C Feidt, Institut National de la Recherche Agronomique (INRA), Nancy Université, A Travel, Institut Technique de l'Aviculture (ITAVI) and B Roudaut, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses), France.

- Introduction
- Chemical contaminants in animal-derived foodstuffs: origins and regulatory context
- Modes of transfer into the egg
- Monitoring strategies
- Origin of non-conformities and preventing risk during rearing
- Conclusion
- References

PART 2 SALMONELLA CONTROL IN LAYING HENS

Detection and monitoring of Salmonella in laying hen flocks

R Davies and J J Carrique-Mas, Veterinary Laboratories Agency, UK

- Introduction
- What to sample
- Recommended sampling regime of laying houses
- Serology
- Methods used for the 2004/2005 baseline survey and Salmonella control programmes in flocks of laying hens in the European Union
- Factors affecting the detection of Salmonella infection
- Significance of under-detection
- References

Epidemiology of Salmonella infections in laying hens with special emphasis on the influence of the housing system

J Dewulf, S Van Hoorebeke and F Van Immerseel, Ghent University, Belgium

- Introduction
- Effect of the housing system on Salmonella prevalence
- Factors related to housing systems and Salmonella prevalence
- Presence of Salmonella serotypes other than S. enteritidis in outdoor production systems
- Conclusions
- Acknowledgements
- References

Pre-harvest measures to control Salmonella in laying hens

R Gast, United States Department of Agriculture, Agricultural Research Service, USA

- Introduction
- Vaccination
- Genetic selection for naturally occurring resistance
- Gastrointestinal colonization control

- Future trends
- Sources of further information and advice
- References

Management and sanitation procedures to control Salmonella in laying hen flocks

R Ducatelle and F Van Immerseel, Ghent University, Belgium

- Introduction
- Management procedures to prevent introduction of Salmonella on the farm or to suppress the infection pressure from the environment
- Sanitation and decontamination
- Future trends: management and sanitation procedures for a Salmonella-free production chain
- Sources of further information and advice
- References

Egg decontamination by washing

W Messens, Institute for Agricultural and Fisheries Research (ILVO), Belgium, J Gittins, ADAS, UK, S Leleu, ILVO, Belgium and N Sparks, SAC, UK

- Introduction
- Historical and commercial perspective
- The egg washing process
- Factors that influence the microbiological quality of washed eggs
- Post washing treatments
- Benefits and problems associated with egg washing
- Conclusions
- References

Alternative egg decontamination techniques to washing

A Berardinelli, C Cevoli, A Fabbri, M E Guerzoni, G Manfreda, F Pasquali, L Ragni and L Vannini, University of Bologna, Italy

- Introduction
- Washing methods currently used in industry
- Hot air pasteurisation
- Microwave pasteurisation
- Gas plasma
- Pulsed light
- Conclusions and future trends
- References

PART 3 EGGS IN NUTRITION AND OTHER APPLICATIONS

The nutritional quality of eggs

I Seuss-Baum, Fulda University of Applied Sciences, Germany and F Nau and C Guérin-Dubiard, AGROCAMPUS Ovest, France

- Reputation of the egg
- Nutritional evaluation of eggs: composition
- Nutritional evaluation of eggs: macronutrients
- Nutritional evaluation of eggs: micronutrients
- Improving the nutritional quality of eggs
- Conclusions
- Sources of further information and advice [Food tables]
- References

Eggs, dietary cholesterol and disease: facts and folklore

B A Griffin, University of Surrey, UK

- Egg nutrition: facts and folklore
- Serum cholesterol and dietary cholesterol as risk factors for coronary heart disease
- Impact of cholesterol perception on egg consumption
- Evidence from egg-feeding studies in humans
- The relative effects of dietary saturated fat and dietary cholesterol on serum cholesterol
- Current consensus and recommendations
- Conclusion
- References

Egg allergy

Y Mine and M Yang, University of Guelph, Canada

- Introduction
- Egg allergy: an overview
- Egg proteins
- Egg yolk allergenicity
- Effects of processing on the allergenicity of egg proteins
- Conclusion and future trends
- References

Modifying egg lipids for human health

F Sirri and A Meluzzi, University of Bologna, Italy

- Introduction
- Egg lipid fractions
- Fatty acids metabolism in laying hens
- Effects of hen's diet on lipid components
- Sensory characteristics of enriched eggs
- Conclusion
- References

Egg enrichment with vitamins and trace minerals

A Schiavone, University of Torino, Italy and A C Barroeta, Autonomous University of Barcelona, Spain

- Introduction
- Egg enrichment with vitamins
- Water soluble vitamins enrichment
- Egg enrichment in trace minerals
- References

Bioactive fractions of eggs for human and animal health

M Anton, Institut National de la Recherche Agronomique (INRA), F Nau and C Guérin-Dubiard, AGROCAMPUS Ouest, France

- Introduction
- Egg fractions
- Antibody applications
- Bioactive properties of eggs
- Cryoprotective activity
- Conclusions
- References

Using egg IgY antibodies for health, diagnostic and other industrial applications

J Kovacs-Nolan and Y Mine, University of Guelph, Canada

- Introduction
- Overview of the avian immune system and IgY biosynthesis
- Production and purification of IgY
- Advantages of eggs as an alternative antibody source
- Applications of IgY
- Immunotherapeutic applications of IgY
- Conclusion and future trends
- References

Strategic planning for the development of the egg nutraceutical industry

V Guyonnet, Burnbrae Farms Ltd., Canada

- Introduction
- Egg nutraceutical business (SWOT) analysis
- Strategic goals for the egg nutraceutical business
- Action plan for the egg nutraceutical business
- Conclusion
- References