

# Case studies in food safety and authenticity

Lessons from real-life situations

Edited by J. Hoorfar

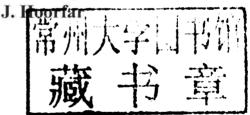




# Case studies in food safety and authenticity

Lessons from real-life situations





Oxford Cambridge Philadelphia New Delhi

Published by Woodhead Publishing Limited, 80 High Street, Sawston, Cambridge CB22 3HJ, UK www.woodheadpublishing.com www.woodheadpublishingonline.com

Woodhead Publishing, 1518 Walnut Street, Suite 1100, Philadelphia, PA 19102-3406, USA

Woodhead Publishing India Private Limited, G-2, Vardaan House, 7/28 Ansari Road, Daryaganj, New Delhi – 110002, India www.woodheadpublishingindia.com

First published 2012, Woodhead Publishing Limited

© Woodhead Publishing Limited, 2012; except Chapter 2 © A. G. Stewart, R. Vivancos, A. Keenan and C. Theodore, 2012, and Chapter 3 © A. G. Stewart and S. Ghebrehewet. Chapters 4 and 27 were prepared by US Government employees; they are therefore in the public domain and cannot be copyrighted.

The authors have asserted their moral rights.

This book contains information obtained from authentic and highly regarded sources. Reprinted material is quoted with permission, and sources are indicated. Reasonable efforts have been made to publish reliable data and information, but the authors and the publisher cannot assume responsibility for the validity of all materials. Neither the authors nor the publisher, nor anyone else associated with this publication, shall be liable for any loss, damage or liability directly or indirectly caused or alleged to be caused by this book.

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming and recording, or by any information storage or retrieval system, without permission in writing from Woodhead Publishing Limited.

The consent of Woodhead Publishing Limited does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific permission must be obtained in writing from Woodhead Publishing Limited for such copying.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation, without intent to infringe.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library.

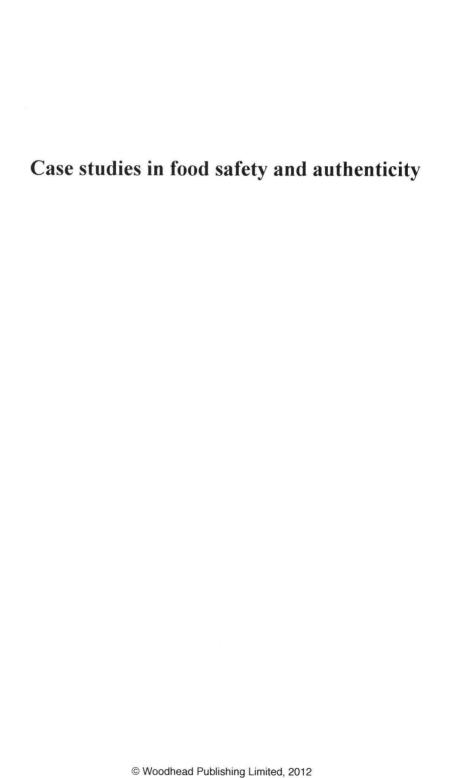
Library of Congress Control Number: 2012936397

ISBN 978-0-85709-412-4 (print) ISBN 978-0-85709-693-7 (online)

ISSN 2042-8049 Woodhead Publishing Series in Food Science, Technology and Nutrition (print) ISSN 2042-8057 Woodhead Publishing Series in Food Science, Technology and Nutrition (online)

The publisher's policy is to use permanent paper from mills that operate a sustainable forestry policy, and which has been manufactured from pulp which is processed using acid-free and elemental chlorine-free practices. Furthermore, the publisher ensures that the text paper and cover board used have met acceptable environmental accreditation standards.

Typeset by RefineCatch Limited, Bungay, Suffolk Printed by TJ International Ltd, Padstow, Cornwall, UK



### Related titles:

Foodborne pathogens: hazards, risk analysis and control (Second edition) (ISBN 978-1-84569-362-6)

Effective control of pathogens continues to be of great importance to the food industry. The first edition of Foodborne pathogens quickly established itself as an essential guide for all those involved in the management of microbiological hazards at any stage in the food production chain. This major new edition strengthens that reputation, with extensively revised and expanded coverage, including more than ten new chapters. Part I focuses on risk assessment and management in the food chain. Chapters in this section cover pathogen detection, microbial modelling, the risk assessment procedure, pathogen control in primary production, hygienic design and sanitation, among other topics. Parts II and III then review the management of key bacterial and non-bacterial foodborne pathogens.

Mycotoxins in food: detection and control (ISBN 978-1-85573-733-4)

Mycotoxins are toxic compounds produced by fungi. They are produced in foods of plant origin and pose a significant contamination risk in cereal and other foods. With its distinguished editors and international team of contributors, Mycotoxins in food summarises the wealth of recent research on how to assess the risks from mycotoxins, detect particular mycotoxins and control them at differing stages in the supply chain.

Food chain integrity: a holistic approach to food traceability, safety, quality and authenticity

(ISBN 978-0-85709-068-3)

Issues related to food integrity are becoming increasingly important. Guaranteeing the authenticity, geographical origin, traceability and safety of foods requires new diagnostic tools and implementation of new information systems. This book outlines recent research and practice in this fast-moving field. It will increase the reader's ability to predict and implement actions to prevent a breach in the integrity of food production. Different sections of the book are devoted to the key areas of food tracing and tracking, food authenticity and origin, and food safety and quality.

Details of these books and a complete list of titles from Woodhead Publishing can be obtained by:

- visiting our web site at www.woodheadpublishing.com
- contacting Customer Services (e-mail: sales@woodheadpublishing.com; fax: +44 (0) 1223 832819; tel.: +44 (0) 1223 499140 ext. 130; address: Woodhead Publishing Limited, 80 High Street, Sawston, Cambridge CB22 3HJ, UK)
- in North America, contacting our US office (e-mail: usmarketing@woodhead publishing.com; tel.: (215) 928 9112; address: Woodhead Publishing, 1518 Walnut Street, Suite 1100, Philadelphia, PA 19102-3406, USA)

If you would like e-versions of our content, please visit our online platform: www. woodheadpublishingonline.com. Please recommend it to your librarian so that everyone in your institution can benefit from the wealth of content on the site.

## **Obituary for Niels Skovgaard**

This book contains the last scientific publication of Professor Niels Skovgaard (Chapter 23), who died recently at the age of 87.

Niels Skovgaard had a remarkable career which spanned 60 years. Everybody engaged in food safety either knew him personally or knew of him. Niels and I used to travel to



numerous meetings together and I always appreciated his sharp remarks and deep insight into the interaction of microbes with our food and animals.

After graduation as a veterinarian from the Royal Veterinary and Agricultural University (KVL) in Copenhagen in 1951 and a spell working as a veterinary practitioner, he joined the veterinary public health service in Denmark, dealing with meat inspection, food control and the administration of food safety. His teaching career started in 1965 as a lecturer in food microbiology and food hygiene at KVL. He was appointed professor in 1973, a position he held until his official retirement at the age of 70 in 1994.

During his time as professor and also after his retirement Niels Skovgaard contributed actively to several international organizations including the World Health Organization (WHO), Food and Agriculture Organization (FAO), EU, World Association of Veterinary Food Hygienists (WAVFH), International Organization for Standardization (ISO), International Union of Microbiological Societies (IUMS) and International Commission of Food Microbiology and Hygiene (ICFMH) in the roles of advisor and teacher. These organizations benefited from his profound knowledge. In addition, he frequently acted as a scientific consultant to the Danish Government and the Danish food industry.

Niels Skovgaard was also devoted to Nordic cooperation within the field of food microbiology and the development of analytical methods. For this cause he

served terms as Secretary as well as President of the Nordic Committee on Food Analyses (NMKL). In the Nordic microbiology group he will be remembered for bringing forward proposals for new areas of study, such as emerging microbes of global interest. In this respect he acted as a true lecturer with deep insight in the subject. We will all miss him as a source of profound knowledge, and – it must not be forgotten – his ability to convey his messages and keep his audiences alert using his own unique brand of humor!

Niels Skovgaard was co-founder of the *International Journal of Food Microbiology* published by ICFMH, and was President of this organization from 1989 to 1996, followed by an appointment as Honorary President. He contributed more than 300 scientific articles in Danish, Nordic and international magazines, and also published several instructive text books for students. In particular during his retirement he spent considerable time reviewing scientific books and acting as referee for articles on food microbiology and hygiene. Niels Skovgaard was an honoury member of international organizations and universities, and in Denmark was made a Knight 1st Class of the Royal Order of Dannebrog.

However, his true legacy is neither his books nor his many publications; it is the many students that have taken over and are continuing his remarkable work in many different organizations, journals, panels, and committees.

> Sven Qvist Denmark

### Contributor contact details

# Editor and Chapters 4, 20, 24, 29 and 38

J. Hoorfar National Food Institute Technical University of Denmark National Food Institute Mørkhøj Bygade 28 2860 Søborg Denmark

E-mail: jhoo@food.dtu.dk

### Chapter 1

Austria

D. Schoder
Institute of Milk Hygiene and Food
Science
Vienna. Austria

M. Wagner\*
Bi-National Advisory Laboratory for
Listeriosis
Austrian Agency for Health and Food
Safety
Spargelfeldstrasse 171
1220
Vienna

E-mail: Martin.Wagner@vetmeduni. ac.at

F. Allerberger Christian-Doppler Laboratory for Molecular Food Analytics Vienna, Austria

### Chapter 2

A. G. Stewart\* and R. Vivancos
Consultants in Communicable Disease
Control
Cheshire & Merseyside Health
Protection Unit
5th Floor, Rail House
Lord Nelson Street
Liverpool L1 1JF
UK

E-mail: alex.stewart@hpa.org.uk

A. Keenan
Epidemiology & Surveillance Analyst
Cheshire & Merseyside Health
Protection Unit
Liverpool
UK

C. Theodore Environmental Health Officer Liverpool City Council Liverpool UK

### Chapter 3

A. G. Stewart\* and S. Ghebrehewet
Consultants in Communicable Disease
Control
Cheshire & Merseyside Health
Protection Unit
5th Floor, Rail House
Lord Nelson Street
Liverpool L1 1JF
UK

E-mail: alex.stewart@hpa.org.uk

### Chapter 4

M. A. Smith
Food and Drug Administration
Center for Food Safety and Allied
Nutrition
Office of Food Safety (HFS-317)
5100 Paint Branch Parkway
College Park
MD 20740
USA

E-mail: michelle.smith@fda.hhs.gov

### Chapter 5

L. D. Goodridge\*
 Center for Red Meat Safety and Quality
 Department of Animal Sciences
 Colorado State University
 Fort Collins
 CO 80523
 USA

E-mail: Lawrence.Goodridge@ Colostate.edu J. T. LeJeune
Ohio Agricultural Research and
Development Center
The Ohio State University
1680 Madison Ave
Wooster
OH 44691
USA

E-mail: Lejeune.3@osu.edu

L. Beutin
Nationales Referenzlabor für
Escherichia coli (NRL-E.coli)
Bundesinstitut für Risikobewertung
(BfR)
Diedersdorfer Weg 1
D-12277 Berlin
Germany

E-mail: Lothar.Beutin@bfr.bund.de

### Chapter 6

Marja-Liisa Hänninen\*
Department of Food Hygiene and
Environmental Health
Helsinki University
P.O. Box 66
00014 Helsinki University
Finland

E-mail: marja-liisa.hanninen@ helsinki.fi

Ari Hörman The Finnish Defense Forces P.O. Box 919 00131 Helsinki Finland

### Chapter 7

Prof. Dr Monika Ehling-Schulz\*
Institute of Functional Microbiology
Department of Pathobiology
University of Veterinary Medicine
Veterinaerplatz 1
1210 Vienna
Austria

E-mail: monika.ehling-schulz@ vetmeduni.ac.at

U. Messelhäusser Bavarian Health and Food Safety Authority Veterinaerstr. 2 85764 Oberschleissheim Germany

E-mail: ute.messelhaeusser@lgl. bayern.de

### Chapter 8

M. F. Dutton Mycotoxin Research Group University of KwaZulu Natal Durban South Africa

E-mail: mdutton@uj.ac.za

### Chapter 9

Dr Brent Dixon\*
Bureau of Microbial Hazards
Food Directorate
Health Canada
251 Sir Frederick Banting Driveway
P.L. 2204E
Ottawa
Ontario
Canada
K1A 0K9

E-mail: Brent.Dixon@hc-sc.gc.ca

L. Landry

Centre for Food-borne Environmental and Zoonotic Infectious

Diseases

Public Health Agency of Canada

Guelph Ontario Canada

F. Milord

Direction de la Santé Publique de la

Montérégie Longueuil Ouebec

Canada

### Chapter 10

Kieran N. Jordan\*, Karen Hunt and Edward M. Fox Teagasc Food Research Centre Moorepark Fermoy Co. Cork Ireland

E-mail: Kieran.Jordan@teagasc.ie

### Chapter 11

V. Biguzzi

Responsible for Quality Control Unit in Food Industry (retired)

E-mail: valeriano.biguzzi@libero.it

G. Pezzotti

Istituto Zooprofilattico Sperimentale dell'Umbria e le Marche Via Gaetano Salvemini. I

Perugia Italy

E-mail: g.pezzotti@izsum.it

M. V. Gianfranceschi and D. De Medici\* Department of Veterinary Public Health and Food Safety – Microbiological Foodborne Hazard Unit Istituto Superiore di Sanità Viale Regina Elena 299 00161 Rome Italy

E-mail: dario.demedici@iss.it; monica.gianfranceschi@iss.it

### Chapter 12

Erik Nordkvist National Veterinary Institute Uppsala Sweden

E-mail: erik.nordkvist@sva.se

### Chapter 13

N. C. Elviss\* and F. Jørgensen Health Protection Agency (HPA) Food, Water and Environmental Microbiology Laboratories Sutton Coldfield Birmingham B75 7RR UK

E-mail: Nicola. Elviss@hpa.org.uk

### Chapter 14

Suresh D. Pillai
National Center for Electron Beam
Research
Food Safety & Environmental
Microbiology Program
Texas A&M University
College Station
Texas
USA

E-mail: s-pillai@tamu.edu

### Chapter 15

Knut Rudi\* Hedmark University College Hamar Norway

and

The Norwegian University for Life Sciences Ås Norway

E-mail: knut.rudi@umb.no

Petr Ricanek Department of Gastroenterology Akershus University Hospital Lørenskog Norway

and

EpiGen Institute Research Centre Akershus University Hospital Lørenskog Norway

Tone Tannæs and Stephan Brackmann University of Oslo EpiGen-Institute Akershus University Hospital University of Oslo Oslo Norway

Gøri Perminow Pediatric Department Oslo University Hospital Ullevål Oslo Norway Morten H. Vatn University of Oslo EpiGen-Institute Akershus University Hospital University of Oslo Oslo Norway

and

Medical Clinic Oslo University Hospital Rikshospitalet Norway

### Chapter 16

A. Wingstrand\* National Food Institute Technical University of Denmark 19 Mørkhøj Bygade DK-2860 Søborg Denmark

E-mail: awin@food.dtu.dk

T. Jensen
Danish Veterinary and Food
Administration
19 Mørkhøj Bygade
DK-2860 Søborg
Denmark

E-mail: teje@fvst.dk

G. Sørensen National Food Institute Technical University of Denmark 19 Mørkhøj Bygade DK-2860 Søborg Denmark

E-mail: gits@food.dtu.dk

S. Gubbels Statens Serum Institut 5 Artillerivej DK-2300 Copenhagen S Denmark

E-mail: gub@ssi.dk

and

European Programme for Intervention Epidemiology Training (EPIET) European Centre for Disease Prevention and Control SE-171 83 Stockholm Sweden

L. J. Porsbo National Food Institute Technical University of Denmark 19 Mørkhøj Bygade DK-2860 Søborg Denmark

E-mail: ljpo@food.dtu.dk

S. Ethelberg Statens Serum Institut 5 Artillerivej DK-2300 Copenhagen S Denmark

E-mail: set@ssi.dk

G. O. BjeragerDanish Veterinary and Food Administration19 Mørkhøj BygadeDK-2860 SøborgDenmark

E-mail: gorb@fvst.dk

M. K. Kjeldsen Statens Serum Institut 5 Artillerivej DK-2300 Copenhagen S Denmark

E-mail: kjd@ssi.dk

M. Torpdahl Statens Serum Institut 5 Artillerivej DK-2300 Copenhagen S Denmark

E-mail: mtd@ssi.dk

K. G. Kuhn Statens Serum Institut 5 Artillerivej DK-2300 Copenhagen S Denmark

E-mail: kuh@ssi.dk

### Chapter 17

R. Knutsson\*, V. Båverud, M. Elvander and E. Olsson Engvall National Veterinary Institute (SVA) SE-751 89 Uppsala Sweden

E-mail: rickard.knutsson@sva.se

K. Eliasson National Board of Agriculture (SJV) Jönköping Sweden

S. Sternberg Lewerin Swedish University of Agricultural Sciences (SLU) Uppsala Sweden

### Chapter 18

 D. Orlando, Dennis and F. M. C. Sigit Setyabudi\*
 Department of Food and Agricultural Product Technology
 Faculty of Agricultural Technology
 Universitas Gadjah Mada
 Jalan Flora No.1, Bulaksumur, Yogyakarta
 Indonesia – 55281

E-mail: francis.setyabudi@ugm.ac.id

M. Suci Hardianti
Division of Hematology Medical
Oncology
Department of Internal Medicine
Faculty of Medicine
Universitas Gadjah Mada
Bulaksumur
Yogyakarta
Indonesia

### Chapter 19

Anca Ioana Nicolau
Faculty of Food Science and
Engineering
Dunarea de Jos University
Galati
Romania

E-mail: Anca. Nicolau@ugal.ro

### Chapter 21

L. S. Christensen Islands Organic Ltd Horsekær Sejerøvej 28 DK-4592 Sejerø Denmark

E-mail: siig@horsekaer.dk

### xxvii

### Chapter 22

Per Häggblom National Veterinary Institute Uppsala Sweden

E-mail: per.haggblom@sva.se

### Chapter 24

K. N. Jordan\* and K. Hunt Teagasc Food Research Centre Moorepark Fermoy Co. Cork Ireland

E-mail: Kieran.Jordan@teagasc.ie

### Chapter 25

 E. H. Drosinos\* and P. N. Skandamis
 Department of Food Science and Technology
 Laboratory of Food Quality Control and Hygiene
 Agricultural University of Athens
 Food Street, Votanicos
 GR-118 55 Athens
 Greece

E-mail address: ehd@aua.gr; pskan@aua.gr

S. G. Charalambidou
Food Science Technologist –
Agriculturist
14, Falirou Street, Ayios Pavlos
2362, Nicosia
Cyprus

E-mail: charalambidou.s@gmail.com

### Chapter 26

D. W. Eddy\* and I. N. Haynes Dairy Food Safety Victoria Level 1, 313 Burwood Road Hawthorn Victoria Australia

Email: deddy@dairysafe.vic.gov.au

### Chapter 27

Dr Peter Feng Division of Microbiology HFS-711, FDA 5100 Paint Branch Parkway College Park MD 20740-3835 USA

E-mail: peter.feng@fda.hhs.gov

### Chapter 28

Dr Jeffrey L. Kornacki Kornacki Microbiology Solutions, Inc. 9 Woodglen Court Madison WI 53716-2465 USA www.kornackifoodsafety.com

E-mail: jlkorn731@gmail.com

### Chapter 29

C. Löfström\*, M. H. Josefsen and J. Hoorfar National Food Institute Technical University of Denmark Mørkhøj Bygade 19 2860 Søborg Denmark

E-mail: chalo@food.dtu.dk

F. Hansen
Danish Technological Institute
DMRI
Maglegårdsvej 2
4000 Roskilde
Denmark

### Chapter 30

J. Sumner

Tasmanian Institute of Agriculture School of Agricultural Science University of Tasmania Hobart Tasmania Australia

E-mail: john\_sumner2@bigpond.com

I. Jenson Meat and Livestock Australia North Sydney Australia

E-mail: ijenson@mla.com.au

T. Ross\*
Tasmanian Institute of Agriculture
School of Agricultural Science
University of Tasmania
Hobart
Australia

E-mail: tom.ross@utas.edu.au

### Chapter 31

M. J. Walker LGC Ltd Queens Road Teddington UK

E-mail: michael.walker@lgcgroup.com

### Chapter 32

J. Zentek\* and F. Knorr Institute of Animal Nutrition Freie Universität Berlin Department of Veterinary Medicine Königin-Luise-Str. 49 14195 Berlin Germany

E-mail: zentek.juergen@vetmed. fu-berlin.de

A. Mader Institute of Animal Nutrition Freie Universität Berlin Department of Veterinary Medicine Königin-Luise-Str. 49 14195 Berlin Germany

and

Federal Institute for Risk Assessment Diedersdorfer Weg 1 12277 Berlin Germany

H. Schafft
Federal Institute for Risk Assessment
Diedersdorfer Weg 1
12277 Berlin
Germany

### Chapter 33

Claudio F. Cardoso, Adriano G. Cruz\* and José A. F. Faria Universidade Estadual de Campinas (UNICAMP) Faculdade de Engenharia de Alimentos (FEA) Cidade Universitária 'Zeferino Vaz' CEP 13083-862 Campinas SP Brazil

E-mail: food@globo.com

Uelinton M. Pinto Universidade Federal de Ouro Preto Departamento de Alimentos Morro do Cruzeiro Ouro Preto MG CEP 35400-000 Brazil

### Chapter 34

D. Schoder Veterinarians Without Borders Austria

and

Institute of Milk Hygiene University of Veterinary Medicine Vienna Veterinärplatz 1 1210 Vienna Austria

E-mail: dagmar.schoder@vetmeduni. ac at

### Chapter 35

N. Z. Ballin Department of Food Chemistry Regional Veterinary and Food Control Authority Danish Veterinary and Food Administration Søndervang 4 DK-4100 Ringsted Denmark

E-mail: nixb@fvst.dk

### Chapter 36

E. E. Nielsen\*, J. Hemmer-Hansen and D. Bekkevold National Institute of Aquatic Resources (DTU Aqua) Technical University of Denmark Vejlsøvej 39 8600 Silkeborg Denmark

E-mail: een@aqua.dtu.dk

### Chapter 37

A. Holst-Jensen\*, A. R. Ali, L. Emanuelsen, T. M. Grønbeck, S. B. Harbo, C. Skjæret and B. Spilsberg Norwegian Veterinary Institute P.O. Box 750 Sentrum 0106 Oslo Norway

E-mail: arne.holst-jensen@vetinst.no

H.-U. Waiblinger State Institute of Chemical and Veterinary Analysis of Food Freiburg Freiburg Germany

### Chapter 38

L. S. Christensen\* and J. Hoorfar National Food Institute Technical University of Denmark Mørkhøj Bygade 19 DK-2860 Søborg Denmark

E-mail: siig@horsekaer.dk

### xxx Contributor contact details

J. Sørensen

Øhavet Aps Korsvejen 2

Strynø

DK-5900 Rudkøbing

Denmark

E-mail: john@ohavet.dk

S. Bisgaard

Danish Veterinary and Food

Administration Mørkhøj Bygade 19 DK-2860 Søborg

Denmark

E-mail: sorb@fvst.dk