Climate change and the health impact of aflatoxins exposure in Portugal - an overview

Climate change has been indicated as a driver for food safety issues worldwide, mainly due to the impact on the occurrence of food safety hazards at various stages of the food chain. Mycotoxins, natural contaminants produced by fungi, are among the most important of such hazards. Aflatoxins, which have the highest acute and chronic toxicity of all mycotoxins, assume particular importance. A recent study predicted aflatoxin contamination in maize and wheat crops in Europe within the next 100 years and aflatoxin B1 is predicted to become a food safety issue in Europe, especially in the most probable scenario of climate change (+2 °C). This review discusses the potential influence of climate change on the health risk associated with aflatoxins dietary exposure of the Portuguese population. We estimated the burden of disease associated with the current aflatoxin exposure for the Portuguese population in terms of Disability Adjusted Life Years (DALYs). It is expected that in the future the number of DALYs and the associated cases of hepatocellular carcinoma due to aflatoxins exposure will increase due to climate change. The topics highlighted through this review, including the potential impact on health of the Portuguese population through the dietary exposure to aflatoxins, should represent an alert for the potential consequences of an incompletely explored perspective of climate change. Politics and decision-makers should be involved and committed to implement effective measures to deal with climate change issues and to reduce its possible consequences. This review constitutes a contribution for the prioritisation of strategies to face the unequal burden of effects of weather-related hazards in Portugal and across Europe.
Probabilistic approach for assessing cancer risk due to benzo[a]pyrene in barbecued meat: Informing advice for population groups

Consumption of meat prepared by barbecuing is associated with risk of cancer due to formation of carcinogenic compounds including benzo[a]pyrene (BaP). Assessment of a population's risk of disease and people's individual probability of disease given specific consumer attributes may direct food safety strategies to where impact on public health is largest. The aim of this study was to propose a model that estimates the risk of cancer caused by exposure to BaP from barbecued meat in Denmark, and to estimate the probability of developing cancer in subgroups of the population given different barbecuing frequencies. We developed probabilistic models applying two dimensional Monte Carlo simulation to take into account the variation in exposure given age and sex and in the individuals' sensitivity to develop cancer after exposure to BaP, and the uncertainty in the dose response model. We used the Danish dietary consumption survey, monitoring data of chemical concentrations, data on consumer behavior of frequency of barbecuing, and animal dose response data. We estimated an average extra lifetime risk of cancer due to BaP from barbecued meat of $6.8 \times 10^{-5}$ (95% uncertainty interval $2.6 \times 10^{-7}$ - $7.0 \times 10^{-4}$) in the Danish population. This corresponds to approximately one to 4,074 extra cancer cases over a lifetime, reflecting wide uncertainty. The impact per barbecuing event on the risk of cancer for men and women of low body weight was higher compared to higher bodyweight. However, the difference due to sex and bodyweight between subgroups are dwarfed by the uncertainty. This study proposes a model that can be applied to other substances and routes of exposure, and allows for deriving the change in risk following a specific change in behaviour. The presented methodology can serve as a valuable tool for risk management, allowing for the formulation of behaviour advice targeted to specific sub-groups in the population.

General information

State: Published
Modelling Dietary Exposure to Chemical Components in Heat-Processed Meats

Several chemical compounds that potentially increase the risk of developing cancer in humans are formed during heat processing of meat. Estimating the overall health impact of these compounds in the population requires accurate estimation of the exposure to the chemicals, as well as the probability that different levels of exposure result in disease. The overall goal of this study was to evaluate the impact of variability of exposure patterns and uncertainty of exposure data in burden of disease estimates. We focus on the first phase of burden of disease modelling, i.e. the estimation of exposure to selected compounds in the Danish population, based on concentration and consumption data. One of the challenges that arises in the probabilistic modelling of exposure is the presence of “artificial” zero counts in concentration data due to the detection level of the applied tests. Zero-inflated models, e.g. the Poisson-Lognormal approach, are promising tools to address this obstacle. The exposure estimates can then be applied to dose-response models to quantify the cancer risk.

General information

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Organisations: Department of Applied Mathematics and Computer Science, Statistics and Data Analysis, National Food Institute, Research Group for Risk-Benefit, Research Group for Genomic Epidemiology, Research Group for Analytical Food Chemistry
Number of pages: 1
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Keywords: Burden of disease, Exposure modelling, Model fitting
Electronic versions:

"Recycled paper for food packaging: burden of disease methodology to link sustainability and safety"

General information

State: Published
Organisations: National Food Institute, Research Group for Genomic Epidemiology, Research Group for Analytical Food Chemistry, Research Group for Risk-Benefit, Research Group for Molecular and Reproductive Toxicology
Contributors: Boriani, E., Pieke, E. N., Hald, T., Pires, S. M., Boberg, J., Jakobsen, L. S.
Number of pages: 1
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Article number: U-5
Electronic versions:

Burden of disease of dietary exposure to acrylamide in Denmark

Acrylamide (AA) is a process-contaminant that potentially increases the risk of developing cancer in humans. AA is formed during heat treatment of starchy foods and detected in a wide range of commonly consumed products. Increased focus on risk ranking and prioritization of major causes of disease makes it relevant to estimate the impact that exposure to chemical contaminants and other hazards in food have on health. In this study, we estimated the burden of disease (BoD) caused by dietary exposure to AA, using disability adjusted life years (DALY) as health metric. We applied an exposure-
based approach and proposed a model of three components: an exposure, health-outcome, and DALY-module. We estimated BoD using two approaches for estimating cancer risk based on toxicological data and two approaches for estimating DALY. In Denmark, 1.8 healthy life years per 100,000 inhabitants are lost each year due to exposure to AA through foods, as estimated by the most conservative approach. This result should be used to inform risk management decisions and for comparison with BoD of other food-borne hazards for prioritizing policies. However, our study shows that careful evaluation of methodological choices and assumptions used in BoD studies is necessary before use in policy making.

**General information**

*State:* Published  
*Organisations:* National Food Institute, Research Group for Risk-Benefit, Research Group for Food Production Engineering  
*Contributors:* Jakobsen, L. S., Granby, K., Knudsen, V. K., Nauta, M., Pires, S. M., Poulsen, M.  
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*BFI (2016):* BFI-level 1  
*Scopus rating (2016):* CiteScore 3.96 SJR 1.351 SNIP 1.58  
*Web of Science (2016):* Impact factor 3.778  
*BFI (2015):* BFI-level 1  
*Scopus rating (2015):* CiteScore 3.44 SJR 1.202 SNIP 1.415  
*Web of Science (2015):* Impact factor 3.584  
*Web of Science (2015):* Indexed yes  
*BFI (2014):* BFI-level 1  
*Scopus rating (2014):* CiteScore 3.12 SJR 1.038 SNIP 1.369  
*Web of Science (2014):* Impact factor 2.895  
*Web of Science (2014):* Indexed yes  
*BFI (2013):* BFI-level 1  
*Scopus rating (2013):* CiteScore 3.26 SJR 1.02 SNIP 1.506  
*Web of Science (2013):* Impact factor 2.61  
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*Web of Science (2013):* Indexed yes  
*BFI (2012):* BFI-level 1  
*Scopus rating (2012):* CiteScore 3.52 SJR 1.126 SNIP 1.748  
*Web of Science (2012):* Impact factor 3.01  
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*Web of Science (2012):* Indexed yes  
*BFI (2011):* BFI-level 1  
*Scopus rating (2011):* CiteScore 3.36 SJR 1.124 SNIP 1.58  
*Web of Science (2011):* Impact factor 2.999  
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*Web of Science (2011):* Indexed yes  
*BFI (2010):* BFI-level 1  
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Burden of disease estimates of cancer caused by dietary exposure to acrylamide: How methodological choices affect the outcome

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Organisations: National Food Institute, Research Group for Risk-Benefit
Contributors: Jakobsen, L. S., Nauta, M., Knudsen, V. K., Pires, S. M., Poulsen, M.
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Issue number: 2
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Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 3.83 SJR 1.302 SNIP 1.201
Web of Science (2016): Impact factor 3.858
Helhedssyn på nødder: en risk-benefit vurdering

General information
State: Published
Organisations: National Food Institute, Division of Risk Assessment and Nutrition, Research Group for Risk-Benefit, Research Group for Analytical Food Chemistry
Contributors: Mejborn, H., Jakobsen, L. S., Olesen, P. T., Jørgensen, K., Christensen, T., Nauta, M., Poulsen, M.
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Nødderapporten.pdf
Source: PublicationPreSubmission
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Research output: Research › Report – Annual report year: 2015

Nødder kan være en del af en sund kost

General information
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Research output: Research - peer-review › Journal article – Annual report year: 2015

Projects:

Metriv
Jakobsen, L. S., Project Participant, Research Group for Risk-Benefit, National Food Institute
20/08/2017 → 20/08/2019
Collaborators: Fødevarestyrelsen
Project: Research

RBÆEU: Risk Benefit 4 EU
Jakobsen, L. S., Project Participant, National Food Institute, Research Group for Risk-Benefit
17/01/2018 → 17/10/2019
Project: Research

Development of models for assessing the disease burden from chemical compounds and nutritional factors in the Danish population
Development of models for assessing the disease burden for chemical compounds and nutritional factors in the Danish population

The overall aim of the project is to estimate the burden of foodborne disease in Denmark due to chemicals and suboptimal diets. Specifically it is investigated how existing toxicological and epidemiological data on chemicals and nutritional factors can be utilized in the quantitative estimation of burden of disease. Exposure to acrylamide through foods and low consumption of fruits and vegetables will be used as case-studies.

Jakobsen, L. S., PhD Student, National Food Institute, Division of Toxicology and Risk Assessment
Poulsen, M., Main Supervisor, National Food Institute, Division of Toxicology and Risk Assessment
01/01/2013 → 01/10/2016
Keywords: Burden of Disease, Toxicology, Nutrition
Project: Research

Activities:

Burden of disease of peanut allergy in Denmark
Period: 20 Oct 2018
Lea Sletting Jakobsen (Speaker)
Katrine Lindholm Bøgh (Other)
Kirsten Pilegaard (Other)
Sara Monteiro Pires (Guest lecturer)
Research Group for Risk-Benefit
National Food Institute
Degree of recognition: International

Related event
Food Allergy and Anaphylaxis Meeting 2018
18/10/2018 → 20/10/2018
Copenhagen, Denmark
Activity: Talks and presentations » Conference presentations

Introduction to Risk Benefit Assessment of Foods
Period: 23 May 2018
Lea Sletting Jakobsen (Invited speaker)
Sofie Theresa Thomsen (Invited speaker)
Research Group for Risk-Benefit
National Food Institute
Degree of recognition: International

Related event
International Workshop on Risk-Benefit Assessment
23/05/2018 → 25/05/2018
Lisbon, Portugal
Activity: Talks and presentations › Talks and presentations in private or public companies and organisations

**Vejledning af Master's Thesis**
Period: 1 Jan 2018 → 5 Jul 2018
Lea Sletting Jakobsen (Supervisor)
National Food Institute
Degree of recognition: National
Activity: Examinations and supervision › Supervisor activities

**Vejledning af Master's Thesis**
Period: 1 Jan 2018 → 9 Jul 2018
Lea Sletting Jakobsen (Supervisor)
National Food Institute
Degree of recognition: National
Activity: Examinations and supervision › Supervisor activities

**Journal of Food Composition and Analysis (Journal)**
Period: 2018 → …
Lea Sletting Jakobsen (Peer reviewer)
National Food Institute
Related journal

**Burden of disease of barbecued meat - who's at risk?**
Period: 31 Mar 2017
Lea Sletting Jakobsen (Guest lecturer)
Stylianos Georgiadis (Guest lecturer)
Bo Friis Nielsen (Guest lecturer)
Anders Stockmarr (Guest lecturer)
Elena Boriani (Guest lecturer)
Lene Duedahl-Olesen (Guest lecturer)
Tine Hald (Guest lecturer)
Sara Monteiro Pires (Guest lecturer)
National Food Institute
Research Group for Risk-Benefit
Department of Applied Mathematics and Computer Science
Statistics and Data Analysis
Research Group for Genomic Epidemiology
Research Group for Analytical Food Chemistry
Degree of recognition: International

**Related external organisation**
Environmental Pollution (Journal)
Period: 2017 → …
Lea Sletting Jakobsen (Peer reviewer)
Research Group for Risk-Benefit
National Food Institute
Related journal
Environmental Pollution
0269-7491
Central database
Activity: Research › Peer review of manuscripts

Food Research International (Journal)
Period: 2017 → …
Lea Sletting Jakobsen (Peer reviewer)
Research Group for Risk-Benefit
National Food Institute
Related journal
Food Research International
0963-9969
Central database
Activity: Research › Peer review of manuscripts