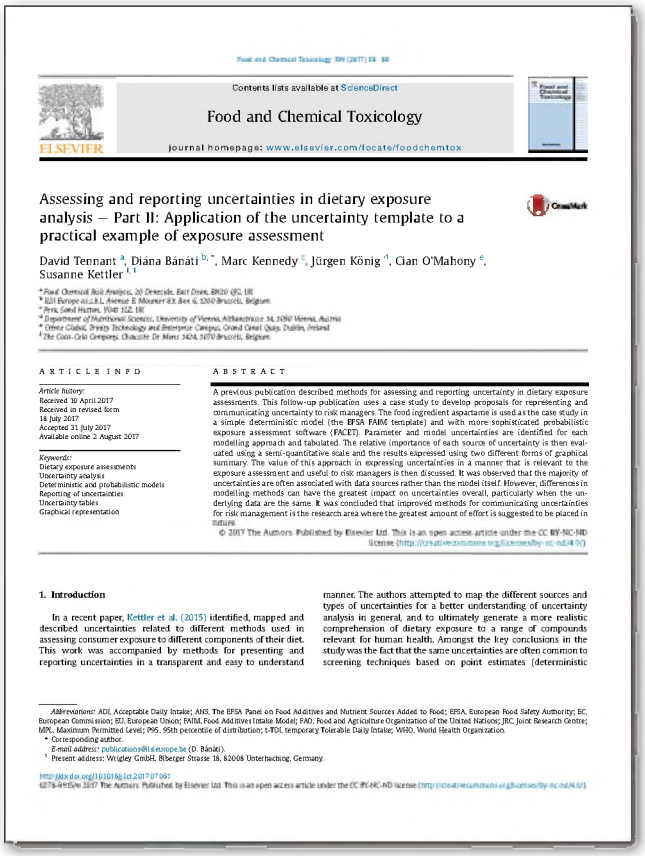

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Assessing and reporting uncertainties in dietary exposure analysis – Part II: Application of the uncertainty template to a practical example of exposure assessment

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ABSTRACT

A previous publication described methods for assessing and reporting uncertainty in dietary exposure assessments. This follow-up publication uses a case study to develop proposals for representing and communicating uncertainty to risk managers. The food ingredient aspartame is used as the case study in a simple deterministic model (the EFSA FAIM template) and with more sophisticated probabilistic exposure assessment software (FACET). Parameter and model uncertainties are identified for each modelling approach and tabulated. The relative importance of each source of uncertainty is then evaluated using a semi-quantitative scale and the results expressed using two different forms of graphical summary. The value of this approach in expressing uncertainties in a manner that is relevant to the exposure assessment and useful to risk managers is then discussed. It was observed that the majority of uncertainties are often associated with data sources rather than the model itself. However, differences in modelling methods can have the greatest impact on uncertainties overall, particularly when the underlying data are the same. It was concluded that improved methods for communicating uncertainties for risk management is the research area where the greatest amount of effort is suggested to be placed in future.

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1. Introduction

In a recent paper, Kettler et al. (2015) identified, mapped and described uncertainties related to different methods used in assessing consumer exposure to different components of their diet. This work was accompanied by methods for presenting and reporting uncertainties in a transparent and easy to understand manner. The authors attempted to map the different sources and types of uncertainties for a better understanding of uncertainty analysis in general, and to ultimately generate a more realistic comprehension of dietary exposure to a range of compounds relevant for human health. Amongst the key conclusions in the study was the fact that the same uncertainties are often common to screening techniques based on point estimates (deterministic

Abbreviations: ADI, Acceptable Daily Intake; ANS, The EFSA Panel on Food Additives and Nutrient Sources Added to Food; EFSA, European Food Safety Authority; EC, European Commission; EU, European Union; FAIM, Food Additives Intake Model; FAO, Food and Agriculture Organization of the United Nations; JRC, Joint Research Centre; MPL, Maximum Permitted Level; P95, 95th percentile of distribution; t-TDI, temporary Tolerable Daily Intake; WHO, World Health Organization.

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Az étrendi expozíció-vizsgálatok bizonytalanságának megállapítása és jelentése - II. rész: A bizonytalansági sablon alkalmazása az expozíció megállapításának egy gyakorlati példája esetén

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Összefoglalás

Egy korábbi publikáció ismertette a módszereket az étrendi expozíció-vizsgálatok bizonytalanságának megállapítására és jelentésére. Ez a következő publikáció egy esettanulmányt alkalmaz a bizonytalanság kockázatkezelők felé történő bemutatására és kommunikálására vonatkozó javaslatok kidolgozására.

Az esettanulmányban az aszpartám nevű élelmiszer-összetevőre alkalmazunk egy egyszerű determinisztikus modellt (az EFSA FAIM - Food Additives Intake Model - sablont) és egy kifinomultabb, probabilisztikus expozíció-értékelő szoftvert (FACET - Flavourings, Additives, and food Contact Materials Exposure Tool). Mindkét modellezési megközelítés esetén azonosítjuk és táblázatosan megadjuk a paraméterek és a modellek bizonytalanságait. Az egyes bizonytalansági források relatív fontosságát ezután egy félkvantitatív skála segítségével értékeljük, és az eredményeket két különböző grafikai módon fejezzük ki.

Ezt követően tárgyaljuk ennek a megközelítésnek az értékét a bizonytalanságok olyan módon történő kifejezésében, amely releváns az expozíció megállapítása során és hasznos a kockázatkezelők számára. Megfigyelhető volt, hogy a bizonytalanságok többsége gyakran nem magához a modellhez, hanem az adatok forrásához köthető. Összességében azonban a modellezési módszerek különbségei gyakorolhatják a legnagyobb hatást a bizonytalanságokra, különösen akkor, ha az alapul szolgáló adatok megegyeznek. Arra a következtetésre jutottunk, hogy a jövőben a legnagyobb erőfeszítést megkövetelő kutatási területnek a bizonytalanságoknak a kockázatkezelők felé történő kommunikálására szolgáló módszerek fejlesztése tekinthető.

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Abstract

A previous publication described methods for assessing and reporting uncertainty in dietary exposure assessments. This follow-up publication uses a case study to develop proposals for representing and communicating uncertainty to risk managers.

The food ingredient aspartame is used as the case study in a simple deterministic model (the EFSA FAIM - Food Additives Intake Model - template) and with more sophisticated probabilistic exposure assessment software (FACET - Flavourings, Additives, and food Contact Materials Exposure Tool). Parameter and model uncertainties are identified for each modelling approach and tabulated. The relative importance of each source of uncertainty is then evaluated using a semi-quantitative scale and the results expressed using two different forms of graphical summary.

The value of this approach in expressing uncertainties in a manner that is relevant to the exposure assessment and useful to risk managers is then discussed. It was observed that the majority of uncertainties are often associated with data sources rather than the model itself. However, differences in modelling methods can have the greatest impact on uncertainties overall, particularly when the underlying data are the same. It was concluded that improved methods for communicating uncertainties for risk management is the research area where the greatest amount of effort is suggested to be placed in future.

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Outlook and Challenges of Nanotechnologies for Food Packaging

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Nanotechnology has been considered to have high potential for food packaging applications very early on. The ability to provide additional consumer benefits through the improvement of key properties of packaging materials and the creation of new functionalities means that the increased use of nanomaterials and nanotechnologies is highly likely. It has however up to now failed to reach the widespread use that was initially expected, mainly because of remaining uncertainties on the safety of these materials during the various stages of their life-cycle, which limit legal and consumer acceptance.

This paper aims at presenting the latest developments in the field of nanotechnologies for food packaging applications, describing the legal framework linked to their usage and attempts to clarify the current knowledge of the safety of these materials both for the consumer and the environment.

It is shown that particulate migration into foodstuff is absent in many applications, which drastically reduces the potential risk during the use phase of packaging materials, i.e. the exposure of the consumer to nanoparticles. Other release routes are also evaluated, showing that, although safe in normal use conditions, prudence should still be used, especially with regard to release after disposal of the materials. Copyright © 2016 The Authors Packaging Technology and Science Published by John Wiley & Sons Ltd

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INTRODUCTION

The concept of nanotechnology refers to the manipulation of materials at a nanometric scale to benefit from the specific physico-chemical properties occurring in this size range. The concept was first mentioned in a speech by Richard Feynman given in December 1959 at the annual meeting of the American Physical Society.[1] Theoretical knowledge and analytical tools were developed over the next two decades leading to the discovery of fullerenes in 1985 (resulting in a Nobel prize in 1996)[2] and carbon nanotubes a few years later.[3]

From the early days nanotechnology was identified by the packaging industry as a potential enabler of increased functionality in packaging materials. This was initially in the domain of barrier and

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PRESS REVIEW

A nanotechnológiák kilátásai és kihívásai az élelmiszer-csomagolásban

By Yves Wyser[1], Michael Adams[2], Maurizio Avella[3], David Carlander[4], Leonor Garcia[5], Gabriele Pieper[6], Monique Rennen[7], Jeroen Schuermans[8*], and Jochen Weiss[9]

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