

# Estimation of consumer exposure to selected packaging ingredients - Part I : Collection and generation of input data for a mathematical prediction tool

Anita Gruner<sup>1</sup>, Annika Seiler<sup>1</sup>, Anja Zülch<sup>2</sup>, Monika Rüter<sup>2</sup>, Peter Mercea<sup>2</sup>

<sup>1</sup> Fraunhofer Institute for Process Engineering and Packaging (IVV), Giggenhauser Straße 35, 85354 Freising, Germany, email: anita.gruner@ivv.fraunhofer.de, phone: ++49 8161 491 743

<sup>2</sup> Fabes Forschungs-GmbH, Schragenhofstraße 35, 80992 Munich, Germany

## Introduction

A national Research Program on "Consumer exposure to packaging ingredients of packed cheese and sausage" was carried out between 2009 and 2011 by ten German SME's and two research institutes. The aim was to develop a pragmatic science based concept to estimate consumer exposure to packaging ingredients. The estimation model was developed on the basis of Bavarian market and consumer habit studies and on analytically determined parameters. Using input data from surveys and studies and analytical data of two main components that were identified in the packaging materials mathematical algorithms were developed to consider complex multilayer and food structures and to estimate the specific migration of any potential migrant into any food type. In combination with the consumer data differentiated exposition scenarios for any given section of the population can be created. Due to the flexibility of the mathematical algorithms any given exposure scenarios can be calculated. This poster part I is focused on the generation of the input data and the analytical validation. For details on the mathematical algorithms and the calculation of exposure scenarios see poster Part II.

## Input data from surveys and market studies

All packaged cheese and sausage products (3775 products) from ten local supermarkets were screened to determine relevant package data (Table 1). The products were categorised in twelve main package types. A consumer questionnaire delivered data as to purchase and consumption behaviour (Table 2). A consumption study (BVS II)<sup>[3]</sup> delivered information on eating habits of the Bavarian population according to age and gender. Food categories were sausage, ham bacon, creamy cheese and hard cheese. Information on body weight of the German population derived from the Mikrozensus 2009<sup>[4]</sup>.

**Table 1: Example of survey parameters of local market study of packaged cheese and sausage products**

Parameter	Example
Storage temperature	Refrigerator
Packaging material	Top cover: plastic material, Lid: aluminium with sealing laquer, Tray: PS
Colour of packaging material	Top cover: see-through, Tray: white
Print on packaging material in [%] of surface	Top cover: 0%, Lid: 10%, Tray: 30%
Label on packaging material in [%] of surface	Top cover: 40%, Lid: 0%, Tray: 50%
Closure of package	Sealed lid and top cover
Product and texture	Cream cheese, creamy
Fat content [%]	24.5% abs. / 70% in dry matter
Net weight	200 g
Purchase date (best before date)	14.05.2009 (09.07.2009)

**Table 3: Physical parameters**

	Parameter
Packaging material	Type of polymer or multilayer
	Thickness of whole package
	Thickness of each layer
	Area of package
Filling product	Type of product
	Texture of product
	Weight and density of product
	Filling volume / weight
Contact product / package	Food contact area
	Contact temperature
	Contact time (shelf life)
	Product geometry (slices, bloc or pasty)

**Table 2: Information collected from consumer questionnaire**

Parameter	Consumer data
Preference of purchase	Local farmer's market
	Service area (unpacked goods)
	Self service area (packaged goods)
Personal data	Gender
	Age group
	Number of persons in household
	Place of residence (big or small town, country)
	Frequency of purchase per week

## Analytical input data

Physical parameters of 562 packages were determined (Table 3). The concentration and identity of migratable components were analytically determined for 174 packages. Migration tests into simulants were carried out for a representative choice of materials. Migration of the main components into the real food was determined for a small number of materials. Two components (a laminating adhesive and the PA monomer Caprolactam) were found to be the most frequently occurring migrants and were selected as examples for the calculation of exposure scenarios.

## Calculation of exposure scenarios

These calculations are a very complex combination of several stochastic models. All input data are a distribution of values which have to be combined with each other. The mathematical procedure allows to calculate exposure risks for any chosen scenario if all relevant input data are available. One calculated scenario was for example that the exposure risk of a male middle-aged Bavarian consumer towards Caprolactam from packed sausage and cheese is with a probability of 99% significantly below the European SML of 15 mg Caprolactam per 1 kg food.

Details of the exposure calculation model are described in poster Part II.

## References

<sup>[1]</sup> EU-Projekt, 2001 – 2003, Certified reference materials for specific migration testing of plastics for food packaging needed by industry and enforcement laboratories (support to the development of), Acronym: SPECIFIC MIGRATION; G6RD-CT-2000-00411.

<sup>[2]</sup> EU-Projekt, 2003 – 2006, Modelling migration from plastics into foodstuffs as a novel and cost efficient tool for estimation of consumer exposure from food contact materials, Acronym: FOODMIGROSURE; QLK1-CT-2002-02390.

<sup>[3]</sup> Himmerich, Gedrich, Karg, Bayerische Verzehrsstudie (BVS) II 2002/2003.

<sup>[4]</sup> Statistische Ämter des Bundes und der Länder, Mikrozensus 2009.

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