



# The DRESS project: DeRmal Exposure aSsessment Strategies

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## Introduction

Estimating realistic dermal consumer exposure is a challenging task: on the one hand, dermal exposure is often difficult to assess by direct measurements because of the complexity of dermal exposure processes and lack of standardized methods; on the other hand, there is for some products/articles a lack of appropriate models featuring realistic exposure estimates from the use of consumer products and articles. The available Tier 1 models for estimating exposure from the use of consumer products are conservative in nature, and do not account for differences in dermal exposure mechanism between article and product types. Notwithstanding that higher models offer great improvements compared to Tier 1 models, the databases of input parameters for the higher Tier models are still rather weak in several aspects: 1) the databases on dermal transfer factors of substances in various articles/products are very scattered, and in general poorly populated; 2) use patterns and data on product use are largely missing; and 3) the existing models do not account for parameter variability and uncertainty. Additionally, the available Tier 2 modeling tools, do not cover several relevant consumer products and articles.

## Project objectives and outline

The DRESS project aims to develop a refined dermal exposure modeling strategy. The main steps to perform in the DRESS project are:

1. Identification of the key consumer products and articles to focus on in the project
2. Inventory and analysis of existing information on dermal exposure determinants, and identification of data gaps
3. Data generation to fill these gaps: consumer surveys and experiments on transfer factors
4. Integrate this information into refined exposure tools
5. Testing in three case studies

## Selection of Article and Product Categories

Focusing to a limited number of products and articles is needed because there is an enormous variety of individual substances, chemical mixtures, articles and products to which consumers might be exposed via the dermal pathway. Data types needed to model dermal exposure, and methods to generate these data, might differ largely between groups and even subgroup of articles and products, due to the variety of exposure mechanisms involved in exposure to several articles and product groups.

### Approach

Consumer exposure relevant Article and Product categories (AC & PC) considered in REACH (REACH guidance R.12 (ECHA, 2010)), and its subcategories as defined in ECETOC TRAv3 were considered. In a first stage, several AC & PC (PC8: biocidal products, PC 27: plant protection products, PC28: perfumes, fragrances and PC35: washing and cleaning products) were excluded because these are covered under specific regulations in the EU (Dir. 98/8/EC, Regulation EC 1107/2009 and Dir. 76/768/EEC) or because higher Tier models do exist (AISE 1.5 Tier model for washing and cleaning products).

The remaining AC/PC (sub)categories were scored (scores 0, 1, 2) for 7 criteria:

- Criterion 1: widespread use
- Criterion 2: high amounts of product/article used per event
- Criterion 3: high use frequency
- Criterion 4: high contact duration
- Criterion 5: high potential contact area between product/article and skin
- Criterion 6: likely discrepancy between Tier 1 model predictions and true exposure, and
- Criterion 7: significance of post-application exposure.

Criteria 1-5 reflect exposure determinants leading to high dermal exposure due to the nature of contact and use. Criteria 6 and 7 were introduced to focus the work on those articles and products for which the current tools are less appropriate. The scoring of the criteria was based on defaults of existing models, and on expert judgment. The PC/AC (sub)categories were ranked according to the sum of the 7 criteria (Table 1).

## Outcome

The ranking (Table 1) of the sum of the scores was used as a starting point to select products and article subcategories to focus the DRESS project on. Additional considerations such as feasibility of performing experiments and surveys, analogies in types, uses and exposure mechanism across categories were taken into account to select AC/PC categories to focus the DRESS project on. Within each of the selected AC/PC categories, one subcategory was selected for further research. It was preferred to select maximum one subcategories per category given the (partially) transferability of data between subcategories within the same category. As a result, the selected subcategories are scattered over several AC/PC categories, covering various dermal exposure mechanism, which strengthens the applicability range of the DRESS outcomes.



In conclusion, next steps of the DRESS project (inventories of existing information and generation of new data) will focus on the following articles and products: AC 5 fabrics, textiles and apparel (clothing), AC 6 leather articles (footwear: shoes and boots), AC 8 paper articles (printed paper) and PC 31 polishes and wax blends (floor polish).

Table 1: scoring and ranking of the AC & PC subcategories according to the 7 prioritization DRESS criteria

REACH AC/PC category	REACH AC/PC subcategory	crit 1 score	crit 2 score	crit 3 score	crit 4 score	crit 5 score	crit 6 score	crit 7 score	SUM SCORE criteria 1-7
AC5: Fabrics, textiles and apparel	Clothing (all kind of materials), towel	2	2	2	2	2	2	0	12
AC5: Fabrics, textiles and apparel	Bedding, mattress	2	2	2	2	2	1	0	11
AC5: Fabrics, textiles and apparel	Car seat, chair, flooring	2	2	2	2	2	1	0	11
AC13: Plastic articles	Plastic, larger articles (plastic chair, PVC-flooring, lawn-mower, PC)	2	2	2	2	2	1	0	11
AC6: Leather articles	Furniture (sofa)	1	2	2	2	2	1	0	10
AC6: Leather articles	Footwear (shoes, boots)	2	1	2	2	2	1	0	10
AC11: Wood articles	Furniture (chair)	2	2	2	2	2	0	0	10
AC11: Wood articles	Walls and flooring (also applicable to non-wood materials)	2	2	2	2	1	1	0	10
AC10: Rubber articles	Footwear (shoes, boots)	2	1	2	2	2	1	0	10
PC12: Fertilisers	Lawn and garden preparations	1	2	1	1	1	1	2	9
AC10: Rubber articles	Flooring	1	2	2	2	1	1	0	9
AC11: Wood articles	Toys, outdoor equipment	1	2	2	2	1	1	0	9
AC5: Fabrics, textiles and apparel	Toys (daddy toy)	1	1	2	2	1	2	0	9
AC8: Paper articles	Printed paper (papers, magazines, books)	2	1	2	1	1	2	0	9
AC6: Leather articles	Purse, wallet, covering steering wheel (car)	2	1	2	1	1	2	0	9
AC10: Rubber articles	Rubber handles, tyres	2	2	2	0	1	2	0	9
PC31: Polishes and wax blends	Polishes, wax/cream (floor, furniture, shoes)	1	1	1	1	1	1	2	8
PC31: Polishes and wax blends	Polishes, spray (furniture, shoes)	1	1	1	1	1	1	2	8
PC31: Fuels	Liquids	2	2	2	0	1	1	0	8
PC3A: air care products	continuous actions (solids and liquids)	1	0	2	2	0	1	2	8
AC8: Paper articles	Sanitary towels	2	0	2	2	0	2	0	8
AC10: Rubber articles	Rubber toys	1	1	2	1	1	2	0	8
AC8: Paper articles	Diapers	1	0	2	2	1	2	0	8
PC3A: Coatings, paints, thinners, removers	Waterborne latex wall paint	1	2	0	2	1	0	1	7
PC3A: Coatings, paints, thinners, removers	Solvent rich, high solid, water borne paint	1	2	0	2	1	0	1	7
PC3A: Coatings, paints, thinners, removers	Aerosol spray can	1	1	0	1	2	1	1	7
AC11: Wood articles	Small toys (car, train)	1	0	2	1	1	2	0	7
AC13: Plastic articles	Toys (doll, car, animals, teething rings)	1	0	2	1	1	2	0	7
AC8: Paper articles	Tissues, paper towels, wet tissues, toilet paper	2	0	2	0	1	2	0	7
AC13: Plastic articles	Plastic, small articles (ball pen, mobile phone)	2	0	2	1	0	2	0	7
PC3A: air care products	Instant actions (aerosol spray)	1	0	2	0	0	1	2	6
PC1: Adhesives, sealants	Glues (DIY use: carpenter glue, tile glue, wood parquet glue)	1	2	0	2	1	0	0	6
PC24: Lubricants, greases, and release products	Pastes	1	1	1	0	1	1	1	6
PC3A: Coatings, paints, thinners, removers	Removers (paints, glue, wall paper, sealant-removers)	1	2	0	1	1	0	0	5
PC3B: Fillers, putties, plasters, modelling clay	Plasters and floor equalizers	0	2	0	2	1	0	0	5
PC1: Adhesives, sealants	Glue from spray	1	1	1	1	0	1	0	5
PC24: Lubricants, greases, and release products	Liquids	1	1	1	0	1	1	0	5
PC24: Lubricants, greases, and release products	Sprays	1	1	1	0	1	1	0	5
PC3B: Fillers, putties, plasters, modelling clay	Fillers and putty	1	1	0	2	0	0	0	4
PC1: Adhesives, sealants	Sealants	1	1	1	1	0	0	0	4
PC1: Adhesives, sealants	Glues, hobby use	1	0	1	1	0	1	0	4
PC3B: Fillers, putties, plasters, modelling clay	Modelling clay	0	1	1	1	1	0	0	4
PC8: Finger paints	Finger paints	0	0	1	1	1	0	0	3