

DEVELOPING A NEW OPERATOR EXPOSURE MODEL FOR PLANT PROTECTION PRODUCTS WITHIN THE EU BROWSE PROJECT

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INTRODUCTION

BROWSE (Bystanders, Residents, Operators and WorkerS Exposure models for plant protection products) is a European 7th Framework Program 3-year project which started on 1st January 2011. Work Package 1 of this project is the development of a single, new and improved modelling framework for operator exposure, integrating all available exposure data in order to replace the diversity of different models (e.g. UK POEM, German BBA model, etc.) currently used in the regulatory framework for Plant Protection Products (PPPs). The operator is considered as a person carrying out tasks such as mixing and loading, application, cleaning etc. These tasks may all be done by the same or different individuals, depending on the type of farm enterprise.

OPERATOR EXPOSURE MODEL

The development of the operator model will take explicit account of key factors and mechanisms influencing exposure during a range of PPP application scenarios across EU Member States (MS). Advances compared to existing models will include consideration of more exposure routes, more exposure influencing factors and the use of probabilistic approaches to quantify variability and uncertainty. In order to do this a conceptual model (shown in Figure 1) was developed in 2011 (based on the conceptual models by Cherrie et al., 2006, Schneider et al., 1999 and Tielemans et al., 2008) taking into account the important routes of exposure for the operator, namely via the dermal, respiratory, and oral route. The dermal exposure route is further subdivided into three main routes in which dermal exposure can occur, i.e. through bulk (i.e. splashes during mixing/ loading), via deposition (i.e. from spray drift) and via surfaces (i.e. transfer from contaminated surfaces such as crops or equipment). The relative importance of the respiratory and dermal routes during mixing/loading and application are shown in Figures 2 and 3 respectively.

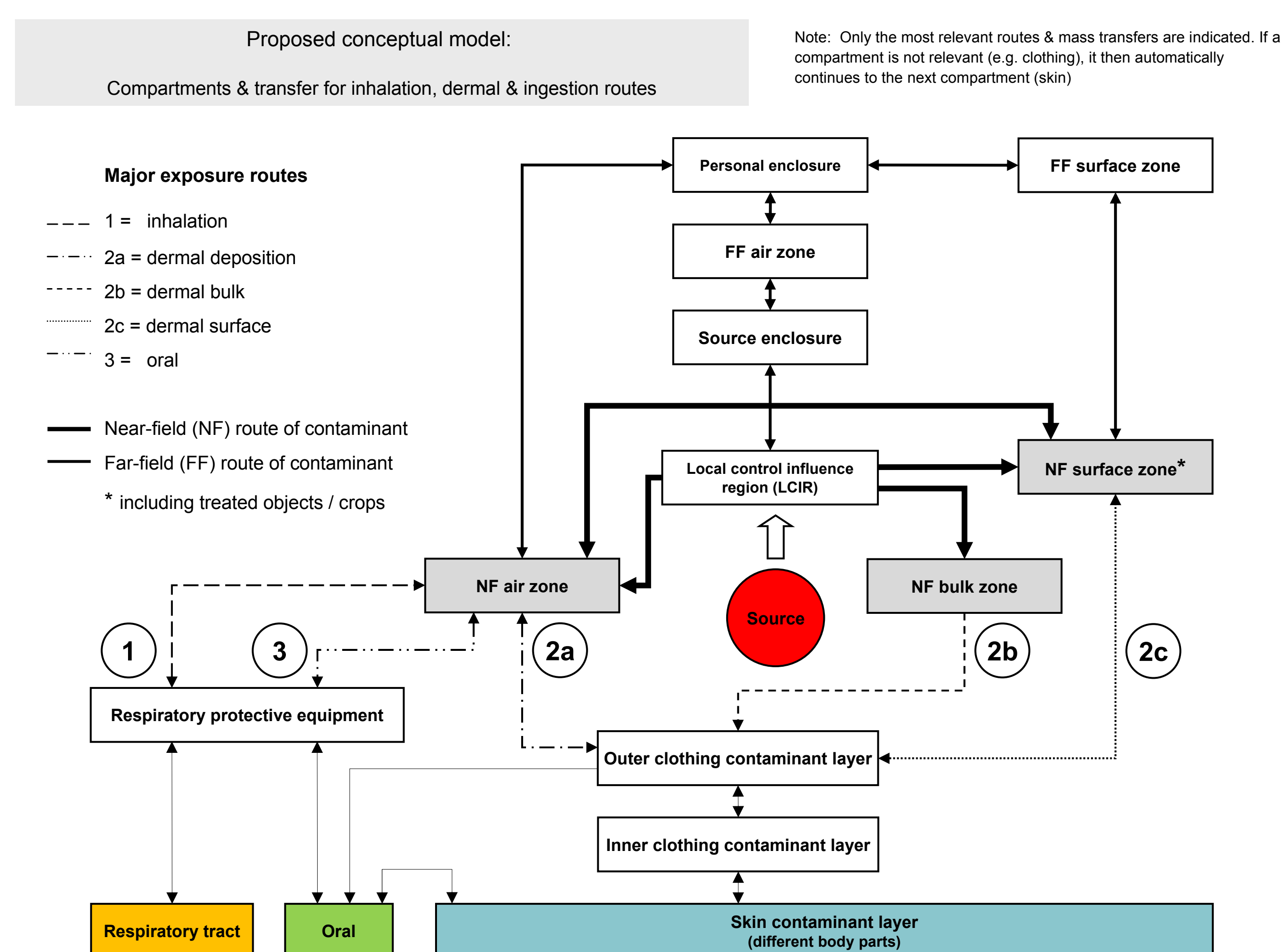


Figure 1

CONCEPTUAL MODEL APPROACH

The conceptual model applies a source-to-receptor based approach and consists of several compartments with principle modifying factors and underlying determinants of exposure. An example of a compartment in the conceptual model is the source. One of the principle modifying factors of the

source is the 'substance emission potential' with underlying determinants such as the volatility of a substance. The conceptual model differentiates between exposure in the near field and the far field of the operator.

APPLICATION SCENARIOS

During 2012 and 2013 this conceptual model approach will be implemented in probabilistic models for the key PPP application scenarios, starting with downward hydraulic boom spraying and the mixing/loading of liquid PPP formulations. For each scenario the most important exposure determinants will be identified and exposure profiles will be determined based on available exposure data and information on key exposure determinants like application equipment used, application rate, duration, risk management measures (like cabins) and personal protective equipment.



Figure 2

Figure 3

SURVEY TO GATHER INFORMATION

New information on the key PPP application scenarios and the behavior of operators will be collected in surveys due to be carried out in the UK, Italy and Greece. This information is required as currently farm survey data across EU MS are very limited, and do not provide detailed information on for example how PPPs are used, length of working days and use of PPE (personal protective equipment).

MORE INFORMATION



For more information and progress of the BROWSE project please visit our website www.browseproject.eu

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REFERENCES

- Cherrie JW, Semple S, Christopher Y, Saleem A, Hughson GW, Philips A. How important is inadvertent ingestion of hazardous substances at work? *Ann. Occup. Hyg.*, 2006; 50(7): 693-704.
- Schneider T, Vermeulen R, Brouwer DH, Cherrie JW, Kromhout H, Fogh CL. Conceptual model for assessment of dermal exposure. *Occup. Environ. Med.* 1999; 56(11): 765-773.
- Tielemans E, Schneider T, Goede H, Tischer M, Warren N, Kromhout H, Van TM, van HJ, Cherrie JW. Conceptual model for assessment of inhalation exposure: defining modifying factors. *Ann. Occup. Hyg.* 2008b; 52(7): 577-586.