



## Consumer Exposure Profile for 2-Butoxyethanol (CAS#: 111-76-2) - Combining the Results from Emission Chamber Studies and Modelling

Final Report  
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### 1.0 Executive Summary

Environment and Health Canada released the Final Risk Assessment Report on 2-Butoxyethanol (2-BE) in August 2002. The assessment proposed that 2-BE is not toxic for the environment. However, it is considered toxic based on health hazard potential and because of a concern that it may be entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health. On August 9, 2003, the federal Ministers of the Environment and Health published the final decision concerning the assessment of 2-BE in the *Canada Gazette*, Part I and recommended that this substance be added to the **List of Toxic Substances** (Schedule 1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). Further, on October 25, 2003, a proposal to add 2-BE and 2-ME to Schedule 1 of CEPA 1999 was published in *Canada Gazette*, Part I. In the event that 2-BE is added to the List of Toxic Substances (Schedule 1) of CEPA 1999 options for managing this substance will have to be developed and implemented by Environment and Health Canada.

2-BE is a component in many consumer products, resulting in human exposure upon use of these products. The CEPA PSL assessment report identifies an exposure concentration below which adverse human effects are not expected. In this regard, a Tolerable Concentration of 11 mg/m<sup>3</sup> for 2-BE has been established (Environment and Health Canada, 2002: CEPA PSL assessment) based on chronic exposure. Although the potential for dermal absorption of airborne 2-BE was not explicitly accounted for in the determination of the TC this chronic exposure limit is considered sufficiently conservative to account for the fact that airborne or direct exposure by the cutaneous route contributes to overall exposure<sup>1</sup>. The conclusion of the CEPA assessment states that although this exposure limit was based on chronic exposure, the health effects of concern have also been noted in shorter-term studies. Implementation of this TC in risk management requires assessment of which products would be expected to exceed the TC under normal use patterns and whether this TC can be used to develop product-specific limits.

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<sup>1</sup> For example, conservative elements in the risk assessment include the fact that extrapolation from rodent studies may have overestimated the risk to humans due to the potential for preening/grooming to contribute to overall exposure via ingestion (see page 49 of 2-BE CEPA Assessment 2002 for further details)

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The primary questions that needed to be addressed at this stage therefore were:

- When consumers use products containing 2-BE what air concentrations of 2-BE are they exposed to during typical contact times?
- Can product-specific limits for 2-BE be developed that ensure compliance with the TC?

To answer these questions a number of approaches were used. Headspace testing and emission chamber studies were undertaken to confirm product 2-BE content and to determine emission factors for a variety of products containing 2-BE that are currently on the market (AirZone One, March 2004; products chosen from inventory in ToxEcology, 2001 and 2003). In addition, exposure modelling was used to estimate consumer exposure to 2-BE for a variety of product types under realistic product use scenarios exposure. The exposure modelling approach was also used to develop recommended product-specific limits for 2-BE for consumer products.

At this point, it is important to link the results of the two approaches. This study is concerned with the following central questions;

1. To what extent do the results of the emission chamber studies and the exposure modelling agree with each other?
2. Does concurrent analyses of the results from the two approaches indicate that changes to the currently recommended product-specific limits (from ToxEcology, 2004) would be appropriate?

Headspace testing and chamber emission data were generated for a number of product types containing variable levels of 2-BE (AirZone One, 2004). The resultant emission factors were used to reconstruct concentration-time profiles for 2-BE based on a standard room size and room conditions and typical contact times for the products. These exposure profiles were compared to the results obtained through the previous exposure modelling study, and the assumptions and conclusions of the modelling study were re-examined in the light of the emission chamber data. The results are summarised in the table below. Overall, the chamber emission data confirmed the product-specific limits developed via the modelling study. Two important conclusions were made on the basis of combining the results of the two studies:

1. In the case of window cleaners an adjustment to the product-specific limit was made based on the fact that emission factors for this product type were not appreciably different from other general purpose cleaners, whereas the modelling study was based on the assumption that window/glass cleaning products would evaporate significantly faster than other general purpose cleaners
2. The modelling study recommended that 2-BE limits for coating products should be zero (spray paints) or <0.5% (non-spray paints) and these stringent limits were confirmed by the chamber emission data. However, overall, it appears that the modelling study may have underestimated consumer exposure to 2-BE released from paints/coatings.

To assist in implementation, and to take into account that consumers may use cleaning products intended for one purpose for various cleaning activities and may put non-spray products into spray bottles, two main limits are recommended: (1) a single limit for consumer cleaning products of a maximum of 5%<sup>2</sup> (w/w) 2-BE and, (2) a single limit for consumer paints and coatings<sup>3</sup> of <0.5% (w/w) 2-BE (see Table 1).

**Table 1: Summary of Recommended Product-Specific Limits**

Consumer Product Category	Original Proposed Limit (%)	Updated Limit (%)	Change
All Purpose Cleaners	5	5	No change
Window/Glass Cleaners	4	5	Increased

Paint and Coatings	0.40	<0.5%	No change
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Note: Representative products from the major product categories that contain 2-BE were subjected to headspace testing and emission chamber analyses. There are no chamber emission data to allow comparison for some minor categories including personal care products.

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<sup>2</sup> Ready-to-use (RTU) concentration, concentrated products could contain higher levels if product labelling provides clear instructions for appropriate dilution

<sup>3</sup> Including related products such as paint/coating/lacquer thinners, and paint/coating removers