Dilution bridging principle example using acute toxicity data

While this specific example uses acute toxicity data, the reader is reminded that the dilution bridging principle can be applied to other hazard classes as prescribed in the purple book.

Dilution

If a tested mixture is diluted with a diluent that has an equivalent or lower toxicity classification than the least toxic original ingredient, and which is not expected to affect the toxicity of other ingredients, then the new diluted mixture may be classified as equivalent to the original tested mixture. Alternatively, the formula explained in 3.1.3.6.1 could be applied.

Tested mixture information:

Acute toxicity classification and test data		
Oral	**Dermal**	**Inhalation vapours**
Category 4 (LD_{50}: 310 mg/kg)	**Category 4** (LD_{50}: 1250 mg/kg)	**Category 2** (LC_{50}: 1.97 mg/l)

Information on ingredients in the tested mixture:

Ingredient	Wt%	Acute toxicity Classification and Test Data		
		Oral	**Dermal**	**Inhalation vapours**
Ingredient 1	26	**Category 5** (LD_{50}: 2737 mg/kg)	**Category 4** (LD_{50}: 1500 mg/kg)	**Category 4** (LC_{50}: 11 mg/l)
Ingredient 2	40	**Category 3** (LD_{50}: 118 mg/kg)	**Category 4** (LD_{50}: 1250 mg/kg)	**Category 3** (LC_{50}: 4 mg/l)
Ingredient 3	34	**Category 4** (LD_{50}: 1950 mg/kg)	**Category 4** (LD_{50}: 1100 mg/kg)	**Category 2** (LC_{50}: 1.5 mg/l)

Information on diluent:

Ingredient	Acute toxicity test data		
	Oral	**Dermal**	**Inhalation vapours**
Diluent	**Category 5** (LD_{50}: 2500 mg/kg)	**Category 3** (LD_{50}: 950 mg/kg)	**Category 5** (LC_{50}: 19 mg/l)

Information on an untested mixture:

The tested mixture is diluted 50% with an ingredient that is not expected to affect the toxicity of the other ingredients resulting in the following untested mixture:

Ingredient	Wt%
Ingredient 1	13
Ingredient 2	20
Ingredient 3	17
Diluent	50

Answer:

(a)   Oral route – Classification: acute oral toxicity; Category 4

(b)   Dermal route – The dilution bridging principle cannot be applied.

(c)   Inhalation route – Classification: Acute inhalation toxicity; Category 2

Rationale:

(a)   Since acute toxicity test data was not provided for the untested mixture classification via application of substance criteria is not possible;

(b)   Classification via the application of bridging principles can be considered since there are sufficient data on both the individual ingredients and a similar tested mixture;

(c)   Classification of the mixture based on ingredient information should be considered if the classifier chooses not to apply the bridging principle or sufficient data had not been available to apply the bridging principle;

Oral route

(d)   The dilution bridging principle can be applied because the diluent's classification (i.e., Category 5) is an equivalent toxicity classification category as the least toxic original ingredients (i.e., ingredient 1 which is also classified in Category 5);

Dermal route

(e)   The dilution bridging principle can not be applied because the diluent's classification (i.e., Category 3) is in a higher toxicity classification category than the least toxic original ingredients (i.e., ingredients 1, 2, and 3 are all classified in Category 4);

(f)   Classification of the mixture based on ingredient data should be considered;

Inhalation route

(g)   The dilution bridging principle can be applied because the diluent's classification (i.e., Category 5) is in a lower toxicity classification category as the least toxic original ingredients (i.e., ingredient 1 is classified in Category 4).

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(Ref. Doc: ST/SG/AC.10/C.4/2010/15, Annex 1, example 1)