
COLLECTIVE EXPERT APPRAISAL: SUMMARY AND CONCLUSIONS

Relating to the Expert appraisal for establishing occupational exposure limit values for chemicals"

On the assessment of health effects and the occupational exposure level measurement methods for toluene [CAS No: 108-88-3]

This document summarises and presents the work of the Committee of Specialised Experts (OEL Committee).

Presentation of the question

On 12 June 2007, AFSSET received a formal request from the French Directorate General for Labour to conduct the scientific expert appraisal work required to set Occupational Exposure Limits Values for toluene.

SCOEL, the scientific committee of European experts in charge of assessing the Occupational Exposure Limits for chemicals, issued an opinion on the health effects of toluene in March 2001 (See SCOEL/SUM/18 of March 2001). This committee of experts recommends the following limit values, based on an analysis of the health effects: a time weighted average (TWA) over 8 hours of 50 ppm and a Short-Term Exposure Limit (15 minutes STEL) of 100 ppm.

The committee also recommends a "skin" notation to indicate that the dermal absorption of liquid toluene can substantially contribute to the body burden.

These values were used to develop European Directive 2006/15/EC, which sets European indicative limit values.

A brief review of the literature published between 2001 and 2006 resulted in the Directorate General of Labour requesting AFSSET to update this European expert appraisal work.

Organisation of the expert appraisal

AFSSET entrusted the Committee of Specialised Experts "Expert appraisal for establishing the limit values for chemicals in the occupational environment" (OEL committee) to conduct this study. This committee appointed two rapporteurs from among the OEL committee experts to carry out the reviews.

The work of the rapporteurs was regularly submitted to the OEL committee. The reviews took into account the observations and additional comments of the other members of the OEL committee.

This expert appraisal was therefore conducted by a group of experts with complementary skills. It was carried out in accordance with the French NF X 50-110 Standard "Quality in Expertise Activities" to ensure compliance with the following points: competence, independence, transparency and traceability.

Description of the method

1 - For the assessment of health effects:

The summary report relating to the health effects of toluene is essentially based on an update of available data in the literature and relating to the health effect of toluene over the period of 2000-2007. Bibliographic research was carried out using the following databases: MedLine, ToxNet (CCRIS, GENE-TOX, IRIS), ScienceDirect. It was carried out directly by the rapporteur appointed from among the experts of the OEL committee.

2 - For the assessment of measurement methods for exposure levels in the workplace:

The summary report lists and classifies the existing measurement methods, until August 2007, that appear in the list of the main sources indicated in paragraph 3.2 of the corresponding report. The research was carried out directly by the rapporteur appointed from among the experts of the OEL committee.

The OEL committee adopted:

- the summary report for the assessment of health effects at its meeting on 13 December 2007,
- the summary report on the occupational exposure level measurement methods at its meeting of 30 October 2007.

The summary report and conclusions of the collective expert appraisal were adopted by the OEL committee on 25 April 2008.

Conclusions of the collective expert appraisal

The OEL committee recommends setting an **8-hour Occupational Exposure Limit** for toluene of **20 ppm (or 75.4 mg/m³)**.

This recommendation aims at preventing potential effects in the workplace leading to visual impairment such as color discrimination. This value is set based on the results of two studies (Cavalleri *et al.* 2000; Campagna *et al.* 2001) which indicate that the Lowest Observed Adverse Effect Level (LOAEL) could be observed in humans from an exposure of 40 ppm or 150.8 mg;m⁻³.

Furthermore, the OEL committee recommends setting a **STEL of 100 ppm (or 377 mg/m³)** in order to limit peaks in exposure and thus to prevent potential short-term neurobehavioural effects. This value is identical to the value of 100 ppm recommended by SCOEL in 2001. The relevance of this European value was furthermore reaffirmed by the publication, in 2005, of an experimental study on humans (Lammers *et al.* 2005).

The OEL committee recommends retaining the "**skin**" notation for toluene as some occupational scenarios could lead to skin exposure to liquid toluene, during which skin penetration is likely to substantially contribute to an increase in body burden.

The OEL committee indicates that validated methods are available for the assessment of occupational exposure. These methods allow not only the 8-hour limit value of 20 ppm (or 75 mg.m⁻³) to be measured, but equally that of the STEL of 100 ppm (or 377 mg.m⁻³).

Moreover, the OEL committee recommends the use of methods based on active or passive sampling over activated charcoal, then solvent desorption and analysis of the eluate by gas phase chromatography (GPC) in so far as they have withstood the test of time and that they are sensitive methods which remain the benchmark.

It specifies that other methods can be equally implemented, in particular methods of thermal desorption following active or passive sampling. Thermal desorption requires the availability of specific equipment. As it is highly sensitive, it is often better adapted to the analysis of trace levels in the environment than to higher concentrations found in workplaces. In addition this technique of desorption is more sensitive to calibration than the classical solvent desorption method.

The OEL committee recommends retaining a "skin notation" for toluene. However it draws the attention of the AFSSET Directorate General to the need to supplement this expert appraisal by identifying biological reference values that can be used in biological monitoring with a view to supplementing the current French regulatory system for assessing occupational exposure of chemicals.

Maisons-Alfort, France, 19 May 2008

On behalf of the experts of the OEL committee,
"François Paquet",
Chairman of the OEL committee