

## COMMENT TO MAC-VALUE FOR TOLUENE

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### ABSTRACT

The author gives a critical consideration of the MAC-value for toluene on the basis of an extensive investigation into the state of health of gravure printers exposed to toluene for many years. Pointing out that workers exposed to toluene in concentrations of 200 to 300 ppm for many years did not show any health impairment, he suggests that there is no need to change the current MAC-value for toluene.

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In many countries the maximum permitted levels for workplace concentrations of solvents are now being changed. The primary reason for this is not new scientific knowledge, but the fact that the determination of these levels has been drawn into the sphere of socio-political disputes. Naturally, any worker protection authority can fix the workplace concentrations for particular workstuffs specifying at the same time either occupational, medical and toxicological points of view or technical feasibility aspects, or both. To be distinguished from these are those levels, which have been shown by the work of independent medical commissions as not leading to a health risk on the basis of long-term medical experience and exact scientific experimental results. Hence in any discussion about the permitted workplace concentrations of dangerous workstuffs a definition appears imperative. Unfortunately, up to now there has been no satisfactory international agreement in this respect.

In the Federal Republic of Germany, the Commission for testing workstuffs detrimental to health has the task of compiling a list of maximum workplace concentrations. By this are understood those workstuff concentrations in the workplace air which, according to present knowledge, do not present a health risk to employees exposed for 8 hours daily during a 45-hour working week. In the evaluation, toxicological and occupational-medical experience at the workplace take precedence over animal experiments.

In the Federal Republic of Germany the maximum workplace concentration for toluene is 200 ppm (750 mg/m<sup>3</sup>). The study, supported by the investigations of the Institute for Practical Occupational Health in Freiburg was designed to

establish whether this concentration involved a health risk to employees or diminished performance. A plant regarded suitable for this study was a gravure printing plant working in 3 shifts. Since 1957 pure toluene with a benzene content of less than 0.3% has been used. Continuous measurement of the toluene content in the air showed levels between 200 ppm and 300 ppm in all 3 shifts. Some details of the study have already been published<sup>1,2</sup>.

One hundred gravure printers took part in the investigation, one third from each shift, all of whom had worked in gravure at least for 10 years. The average time in gravure lay between 15–20 years. A control group in the same age range was formed from persons in the same firm and with the same social background, who had no contact with toluene. The investigation comprised a questionnaire, clinical and neurological examinations including liver tests and sphygmograph tests. Toxic effects on the central nervous system such as muscle co-ordination disturbances, particularly damping of the fine motor regulation can be detected with a sphygmograph. Both the blood alcohol level, and the blood toluene level were measured in order to establish the workers' drinking habits before and during work.

The blood toluene content varied between 1 and 10 mg/ml for the printers. The control group drank more alcohol before and during the shift than did the printers, but the alcohol consumption was generally within limits. The state of health of both groups could be described as good. Individual illnesses and complaints occurred just as frequently in the control group as among the printers. Subjective complaints such as loss of appetite, nausea, vomiting, giddiness, headache, fast tiredness, anxiety, lack of sleep and sensitivity to alcohol which are often attributed to a chronic effect of toluene, were not quoted more frequently by the printers than by the control group. These general complaints can have many causes, both within the plant and outside it which, unfortunately, is often neglected to consider.

A thorough clinical investigation produced no evidence for damage due to toluene, in particular, there were no significant changes in the blood nor were there any indications of a toxic effect on the liver. The regular surveillance examinations meant that a record had been kept of the blood and general health condition of the employees for at least 10 years, i.e. throughout their term of employment in the company.

The neurological examination covered the reflexes, sensitivity and motor actions. There were no noticeable deviations which could be referred to a chronic effect of toluene.

No psychological disturbances were observed. The very sensitive sphygmographic measurements showed no co-ordination disturbances resulting from toxic damage to the central nervous system.

Within the framework of another investigation designed to establish driving fitness after exposure to solvents and alcohol, action and reaction tests were carried out on printers from the same plant using the Wiener Determination Equipment. No significant lowering of reaction time and performance compared with those of the control group could be established.

As shown by the results of the examinations and long-term observations, a regular inhalative exposure of gravure printers to toluene at 200 to 300 ppm at the workplace over many years had not caused any damage to health or impairment of performance.

Occupational medical experience and toxicological examinations of printers thus do not justify demands for altering the currently permitted maximum workplace concentration of 200 ppm for toluene.

#### REFERENCES

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