CODE OF PRACTICE
CONTROL OF WORKER EXPOSURE TO MERCURY IN THE CHLOR-ALKALI INDUSTRY

Health 2

6th edition

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EURO CHLOR PUBLICATION

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Euro Chlor

Euro Chlor is the European federation which represents the producers of chlorine and its primary derivatives.

Euro Chlor is working to:

- improve awareness and understanding of the contribution that chlorine chemistry has made to the thousands of products which have improved our health, nutrition, standard of living and quality of life;
- maintain open and timely dialogue with regulators, politicians, scientists, the media and other interested stakeholders in the debate on chlorine;
- ensure our industry contributes actively to any public, regulatory or scientific debate and provides balanced and objective science-based information to help answer questions about chlorine and its derivatives;
- promote the best safety, health and environmental practices in the manufacture, handling and use of chlor-alkali products in order to assist our members in achieving continuous improvements (*Responsible Care).*

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Prior to 1990, Euro Chlor's technical activities took place under the name BITC (Bureau International Technique du Chlore). References to BITC documents may be assumed to be to Euro Chlor documents.

RESPONSIBLE CARE IN ACTION

Chlorine is essential in the chemical industry and consequently there is a need for chlorine to be produced, stored, transported and used. The chlorine industry has co-operated over many years to ensure the well-being of its employees, local communities and the wider environment. This document is one in a series which the European producers, acting through Euro Chlor, have drawn up to promote continuous improvement in the general standards of health, safety and the environment associated with chlorine manufacture in the spirit of *Responsible Care.*

The voluntary recommendations, techniques and standards presented in these documents are based on the experiences and best practices adopted by member companies of Euro Chlor at their date of issue. They can be taken into account in full or partly, whenever companies decide it individually, in the operation of existing processes and in the design of new installations. They are in no way intended as a substitute for the relevant national or international regulations which should be fully complied with.

It has been assumed in the preparation of these publications that the users will ensure that the contents are relevant to the application selected and are correctly applied by appropriately qualified and experienced people for whose guidance they have been prepared. The contents are based on the most authoritative information available at the time of writing and on good engineering, medical or technical practice but it is essential to take account of appropriate subsequent developments or legislation. As a result, the text may be modified in the future to incorporate evolution of these and other factors.

This edition of the document has been drawn up by the Health Working Group to whom all suggestions concerning possible revision should be addressed through the offices of Euro Chlor.

MAIN MODIFICATIONS IN THIS VERSION

Section	Nature
4.6	Introduction of validity limits according to the creatinine concentration value
5.2.1	Update of OELs values

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ANNEXES

EXECUTIVE SUMMARY

This Code of Practice for Control of Worker Exposure to Mercury in the Chlor-Alkali Industry has been written for managers, plant engineers and local occupational health professionals to enable them to protect the health of workers against harmful effects of exposure to mercury.

Approximately 90% of all metallic mercury in inhaled air is absorbed in the body. In the case of chronic overexposure, mercury will accumulate in several organs because of its long half life in the body which varies between 50 and 90 days in most organs, and may possibly be for a period of years in the brain. Mercury is mainly excreted via urine and faeces.

The nervous system appears to be the most sensitive target for mercury toxicity. Although there is a lack of consistency across a large number of the published studies, several subclinical neurological effects have been reported. Mercury is also toxic to the kidney, and it is well recognised that high levels of exposure can lead to “nephrotic syndrome”. Proteinuria and enzymuria, not associated with clinical disease or loss of function, have been reported at mercury in urine (HgU) levels of more than 30 µg/g creatinine[1]. Mortality studies have not shown an excess of death due to chronic renal disease.

It is known that mercury can easily cross the placenta and the foetal blood-brain barrier. Mercury could therefore conceivably affect the development of the unborn child and as a consequence will be classified in the EU for its developmental toxic effects (category 2 R61 - May cause harm to unborn child). Women of reproductive age, working with mercury, should be made aware of this potential hazard and if willing to become pregnant, should be advised to consult an occupational physician to discuss potential measures to be taken in her work situation to exclude possible damage to the unborn child. For women who are pregnant, have recently given birth, or are breastfeeding, EC Directive 92/85 is applicable. Mercury is not classified as a carcinogen.

It is of great importance to understand that a combination of plant design, good housekeeping and personal hygiene is essential to prevent the uptake of mercury into the human body. Mercury contaminated clothes in particular can be a significant source of exposure. This document contains advice on how to deal with these problems. Where significant exposure is anticipated, effective personal protective equipment should be used.

To minimize workers’ exposure to mercury, Euro Chlor proposes a system for health management of mercury-related processes which is based on continuous improvement. This approach is supported by a written health policy and management system which is communicated to all potentially exposed employees, in which the work processes related to the management of exposure

[1] The results of urinary mercury measurement are expressed in µg/g of creatinine in order to refer to a “constant” excretion parameter.

to mercury are described, and responsibilities and tasks are delegated to responsible functions within the organisation. Items which should be covered in the health management system are at least the following:

- A short but adequate description of the health hazards of mercury.
- Personnel hygiene standards, such as personal protective equipment (PPE) use, clothing rules, smoking and eating in the workplace, etc.
- Processes for monitoring mercury in urine.
- Processes for monitoring mercury in air.
- Risk assessment and control processes.
- Health surveillance programmes.
- Actions to be taken if accidental exposure occurs.
- Information and training for employees.
- Record keeping.
- Internal audit processes.

All of these steps are described in this document.

The recommended monitoring programme is a key point which should comprise both personal air sampling and measurement of mercury in urine (biological monitoring - HgU). Biological measurement in urine compared to blood measurement is non invasive and reflects average exposure during the previous 3-4 months,

The aim of the urinary monitoring programme is to ensure that all individual HgU samples contain less than 50 µg Hg/g creatinine. As a consequence of this, the annual mean HgU of homogeneous groups is expected to be lower than 30 µg Hg/g creatinine, assuming a normal distribution in the data.

In general, testing should be more frequent in employees with higher potential exposure.

In order to be able to achieve the aim of individual HgU levels being less than 50 µg Hg/g creatinine, a testing frequency of at least 3-4 times a year is suggested for individuals with HgU levels above 20 µg Hg/g creatinine depending of the pattern of exposure. Stability of exposure can be assessed by frequent air analysis, preferably using personal monitoring techniques. When HgU levels are below 20 µg Hg/g creatinine, the frequency of urine sampling should be at least twice a year. This monitoring programme can be amended to meet national or local requirements.

The recommended work related action levels for individuals are:

Urinary mercury µg/g creatinine	Frequency of Sampling per year	Management Action
< 20	2	No action
20-30	≥ 4	No action
30-50	≥ 4	Review individual employee work practices
> 50	≥ 4	Remove from exposure to mercury, until below 30 µg/g creatinine