La Medicina del Lavoro

Med Lav 2002; *93*, 1: 26-33

Intossicazione acuta da anidride carbonica: descrizione di due casi mortali

L. Romeo, P. Prigioni, S. Marcheselli, L. Marchiori*, M. Cerpelloni, C. Fiorini*, F. Brugnone

Medicina del Lavoro, Dipartimento di Medicina e Sanità Pubblica, Università degli Studi di Verona

* Servizio Prevenzione Igiene e Sicurezza Ambienti di Lavoro, USL 20 Verona

Key words

Carbon dioxide; intoxication; confined space hypoxic syndrome; fermentation

Summary

«Acute carbon dioxide intoxication during work in a confined space: report of two fatal accidents». Background: *Carbon dioxide (CO_2), a very high density gas, tends to stratify at the lowest levels of the atmosphere. It can be produced by neutral geothermal emissions, fermentative processes or by human and industrial activity. When carbon dioxide concentrations rise to a very high level in a confined and poorly ventilated space, the anoxic hazard is a very important cause of severe accidents that can involve workers and rescuers. At CO_2 levels higher than 20% there is a very high risk of a fatal accident, also considering the odourless feature of this gas.* Object: *Two fatal accidents in workers are described which occurred during inspection of a concrete well, built as a part of sewerage network in a rural area. In the weeks after the accident, composition and concentration of gases inside the well were analysed. We also considered the influence of an organic fertilizer called "pollina" which was found on the ground around the concrete well, in order to ascertain whether fermentation could alter the gas composition inside the well.* Methods: *Samples of air and water were collected in the well and samples of the organic fertilizer (pollina) on the ground surrounding the concrete well were also taken. Different quantities of organic fertilizer (pollina) with or without water were incubated in airtight glass bottles and placed in a dark room at 20°C temperature; analysis of air inside the glass bottles was performed after 7 and 18 days of incubation. All the samples of air and water were analysed by gas-chromatographic-mass-spectrometry.* Results: *Analysis of the air samples collected inside the well after 2, 16 and 18 weeks after the accident showed a low concentration of O_2 (range 4.2-9%), a high concentration of CO_2 (range 5.9-12.3%), a normal level of N_2 (range 78-85%) and a concentration of N_2O between 0.03 and 0.19%. In water collected 2 weeks after the accident at the bottom of the concrete well, CO_2 and N_2O concentrations of respectively 222 mg/L and 2 mg/L were measured. In the bottles with "pollina" we found, at different times of incubation, high concentrations of CO_2 (highest value 25.2%), low levels of O_2 (lowest value 0.5%) and negligible concentrations of N_2O (<0.015%).* Conclusions: *All these findings suggest that the atmosphere inside the concrete well was altered by the fermentative processes of pollina. The death of the two workers, caused by a poorly oxygenated atmosphere with a high concentration of carbon dioxide, can be classified under the confined space hypoxic syndrome (CSHS).*

Pervenuto il 15.9.2001 - Accettato il 26.10.2001

Corrispondenza: Medicina del Lavoro, Dipartimento di Medicina e Sanità Pubblica, Università degli Studi di Verona, Ospedale Policlinico "G.B. Rossi" P.le A. L. Scuro, 10, 37134 Verona - Tel. 045-8074295/8204828 - Fax 045-8074974/8204828