SHORT REPORT

Saved by a material safety data sheet

Ching-Hua Lin1, Chung-Li Du1,2, Chang-Chuan Chan1 and Jung-Der Wang1,2

Background We present the case of a young female laboratory worker who developed acute hepatic encephalopathy.

Objective To show that knowledge of occupational exposures to causative agents can alter therapeutic management.

Methods Although the patient was in a deep coma, her family members examined the workplace material safety data sheet, revealing exposure to chloroform. Since most chemical-induced hepatitis is self-limiting, a scheduled liver transplantation was postponed.

Results The patient recovered. Subsequent air sampling suggested that the patient had been exposed to chloroform at a concentration of more than 15 ppm for 2 weeks.

Conclusion Our case report demonstrates the importance of obtaining an occupational history and how the patient’s family can be important in this process.

Key words Chloroform; hepatic failure; material safety data sheet.

Introduction

Although the prevalence of viral hepatitis is high in Taiwan [1], cases of chemically induced hepatitis do occur but may be difficult to diagnose, especially when hazard communication guidelines are not carefully followed. We report a case involving a young woman who suffered from acute hepatic encephalopathy after being exposed to chemicals for 2 weeks in a laboratory where the chemical extraction hood was out of service.

Case report

In June 2003, a recently employed 24-year-old female laboratory worker in a meat processing plant was transferred in a coma from a local hospital to the National Taiwan University Hospital (NTUH) with a diagnosis of acute hepatitis complicated by encephalopathy. Because the patient’s condition and state of consciousness was deteriorating rapidly, her local physician had suggested liver transplantation. The laboratory tests at NTUH found her blood samples to be serum negative for hepatitis A, B or C virus. Her autoimmune profile results were not remarkable. Alanine aminotransferase and aspartate aminotransferase, which showed spiking elevation on admission, dropped after hospitalization (Table 1). The patient had no previous history of alcohol or drug abuse, though she had taken some weight control medication for several weeks in January 2003. Finally, with the help of the patient’s family we took a further history and reviewed her workplace’s chemical inventory and material safety data sheets (MSDS) [2]. Together, we concluded that the patient’s acute hepatitis was caused by exposure to chloroform in the laboratory. Because most chemically induced hepatic failures are self-limiting in nature and often subside if exposure is discontinued, we postponed liver transplantation and instituted plasmapheresis. After several treatments, her condition improved.

On 17 July 2003 we visited the patient’s laboratory at the meat processing plant, where she had worked for 2 weeks. A walkthrough revealed that chloroform was used to extract residual antibiotics in the meats. Usually, 25 ml of 90% chloroform solution was used in each of the three to five tests performed per day. The chloroform was first mixed with the homogenized chicken meat, which was connected to a condenser and bathed with 42°C water in an attempt to recycle the chloroform. Due to a leak in the suction machine, none was reclaimed. The whole procedure was usually performed in a relatively enclosed chemical extraction hood where the chloroform vapour would be collected and expelled. However, the hood had malfunctioned and was not in service for 2 weeks while our patient, a new employee, continued performing the tests without effective protection. The windows of the laboratory were always kept closed and the air was refiltered.
conditioned air. We did a series of routine tests to simulate our patient’s working environment, but with the windows fully opened. An air sample was collected in a stainless steel canister for 15 min. Using Method TO-14A [3] and Method NIEA A715.11B approved by the Environmental Protection Agency, Executive Yuan, Taiwan [4], we measured the concentration of volatile organic compounds (VOCs) in the air sample. We also performed three area samples using Method 1105 of Council of Labor Affairs, Executive Yuan, Taiwan [5] which are derived from National Institute of Occupational Safety and Health (NIOSH) 1003 [6].

The workplace layout can be seen in Figure 1. Gas chromatography showed ambient air VOC consisting mostly of chloroform at a concentration of 14.9 ppm during the 15 min that the recycling procedure was being conducted. Other organic compounds with possible hepatotoxicity, e.g. ethanol, were found in the ambient air, but at very low concentrations. The three area samples showed air chloroform to be 10.5, 6.1 and 2.5 ppm, indicating the lower concentration of actual exposures as the windows were open when these samples were taken. Basing our estimates on the law of conservation of mass, the average chloroform concentration would have been about 17.7 ppm in that environment, as most of the 25-ml solution containing 90% chloroform was being vapourized into the ambient air during the recycling process. It is also reasonable to assume that both the peak and average concentrations would be much higher, because three to five tests were performed consecutively each day with the windows closed.

Discussion

Our patient developed acute hepatitis after being exposed to chloroform at high concentrations for 2 weeks. Other possible hepatotoxic agents, including viral hepatitis, alcohol, and hepatotoxic medications were all ruled out and we concluded that our patient’s hepatitis was work related. Unnecessary intervention was avoided when a history of occupational exposure to hepatotoxic chemicals was obtained from the patient’s family.

When confronted with acute hepatitis, a physician should keep in mind the possibility that the disease might be chemically induced. This can be clarified by taking a careful and complete history and reviewing an employer’s chemical processes and MSDS. In some instances, however, the MSDS may not always be kept up to date and the agents listed on MSDS should be double checked against large databases, such as those posted on the websites of NIOSH, World Health Organization, and International Agency for Research of Cancer.

The patient in this case report was transferred from a local hospital to NTUH for a liver transplant. Had we and the patient’s family not taken a careful employment history and reviewed the chemical inventory and MSDS, the chemical cause of her disease may not have been discovered and she may very well have received a transplant with its risk of complications and the consequent need to take immunosuppressive medications for the rest of her life. Our case report demonstrates the importance of an occupational history and how this can be obtained from the patient’s family if necessary.

Acknowledgements

The procedures of air sampling and the further analysis mentioned above were performed by staff members of the
Center for Environmental Safety and Health Technology, the Industrial Technology Research Institute, regularly monitored and certified by the Council of Labor Affairs, Executive Yuan, Taiwan. The work was supported by a grant for the Center of Management of Occupational Injuries and Diseases from the Council of Labor Affairs and a grant from the National Health Research Institutes (NHRI-EX93-9204PP).

Conflicts of interest

None declared.

References


