

INTOXICATION BY CHLORPICRIN AND ETHYLENE DIBROMIDE IN A GREENHOUSE

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ABSTRACT

Pesticides chlorpicrin and ethylene dibromide are widely used for soil treatment in greenhouses. Rare cases of poisoning occur sporadically. An episode in which 38 out of 41 workers engaged in the application of these pesticides were poisoned is described. Six workers were seriously poisoned and taken to hospital. However, the recovery was fast and complete. Standard laboratory tests did not reveal obvious abnormalities.

It is concluded that the new technology of work should be closely followed by adequate precautionary measures which should be strictly observed.

New technology, in addition to good features, sometimes implies new risks to the health of workers. Thanks to greenhouses cultivation of flowers, vegetables and fruit does not depend on the season or climate. In greenhouses work is carried out in a limited and closed space, with increased temperature and humidity and insufficient air flow. Under such conditions, application of pesticides is remarkably more dangerous than in an open space.

Chlorpicrin (trichloronitromethane, CCl_3-NO_2) and ethylene dibromide (dibrommethane, $\text{BrCH}_2-\text{CH}_2\text{Br}$) are known as pesticides for the extermination of pests in soil that attack the plant root, though they can be used for disinfection and extermination of rodents in general.

By their chemical characteristics these substances are rather similar: they are poorly soluble in water and to be used they should be dissolved in some solvent (alcohol, ether, etc.). However, they are easily volatile at room temperature and the vapours are heavier than the air. They are applied either individually or in combination for better pesticidal activity. The toxicity of these poisons is similar, though ethylene dibromide is somewhat more toxic. Both poisons might cause acute and chronic intoxication. Acute forms of intoxication are manifested by irritation of the skin and mucosa, particularly of the airways and by general intoxication. After long-term exposure to these poisons, neurotoxic, hepatotoxic and nephrotoxic effects develop.

The scope of our work was to find out health impairments which might be encountered in workers applying these pesticides in greenhouses. An episode of acute poisoning with the two pesticides is described.

DESCRIPTION OF THE EPISODE

Forty-one women were taken as subjects in this study. Chlorpicrin and ethylene bromide were applied into the loose soil in some greenhouses by a group of skilled workers wearing protective clothing and masks. The soil was covered by plastic sheets in order to keep the toxic vapours in the soil as long as possible. Seven days after the application and five days after the opening of the greenhouse for aeration, the women entered the greenhouse to remove the covers. Usually they did not wear any protective clothing or masks and this time they also entered the greenhouse without them because aeration had already taken place.

After working 35 to 40 minutes in the greenhouse the first symptoms of intoxication appeared and all but three workers became ill. In 21 workers the symptoms were mild and they recovered soon after coming in fresh air. The remaining 17 sought medical aid. Six patients were taken to hospital, were treated for three days and recovered completely.

RESULTS

The data were collected from the interviews and medical records. The signs and symptoms developed by the workers are shown in Table 1.

TABLE 1
Signs and symptoms of intoxication by chlorpicrin and ethylene dibromide among 38 workers.

Headache	19
Nausea	13
Vomiting	13
Eye aching	12
Cough	8
Throat aching	8
Pain in the back of the head	8
Burning in the mouth	6
Vertigo	4
Sharp pain in the region of the heart	4
Retching	4
Lacrimation	3
Laboured breathing	2
Numbness and pain in the arms	2
Fever	2
Pains under the left rib cage	1
Discomfort inside the chest	1
Hoarseness	1

Standard laboratory tests performed in the hospital in six patients revealed no marked abnormalities. Liver and kidney function tests were within normal range.

Therapeutic measures were nonspecific and the treatment was mainly supportive and symptomatic. Patients were given an infusion of physiological saline, vitamins, corticosteroids and one patient was treated with cardiacs.

DISCUSSION AND CONCLUSION

Chlorpicrin and ethylene dibromide were known to the workers and managers as strong poisons and therefore when applied they were handled with great care by specially trained personnel and under strict safety measures. These poisons had been applied before both in the open space and in greenhouses. In spite of the safety measures sporadic cases of intoxication occurred particularly when the greenhouses opened for aeration. At the time of the episode the weather was calm, windless and with increased air pressure. Warm weather increased evaporation, but toxic vapours remained in the greenhouse. After lifting the plastic covers, designed to keep toxic vapours in the top soil layer as long as possible, chlorpicrin and ethylene dibromide vapours were suddenly released and workers inhaled them in considerable amounts. Inhalation was facilitated by the bent position of workers during the lifting of the plastic covers from the soil.

This incident warns that the new technology of work in greenhouses introduced for increasing food production may imply new risks for workers' health. The risks may be overcome by adequate precautionary measures which should be introduced to keep pace with the new technology.