

Fatal Inhalational Methomyl Poisoning: A Case Report

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ABSTRACT

The insecticide methomyl (S-methyl N-(methylcarbamoyloxy)thioacetimidate - (Lannatae®) is carbamate insecticide available in powder and solid form. Accidental inhalation and transdermal absorption though rare is not uncommon as farmers don't take protective measures during pesticide spray. Deceased 28 year old male, was spraying Lannatae® (Methomyl) insecticide in field since early morning. By afternoon he felt breathlessness, tiredness and weakness for which he was immediately consulted local doctor. Local doctor gave first aid treatment and referred to higher medical center. Deceased was died on the way to higher medical center. Deceased body was buried next day without intimating to police. 4 days later deceased body was exhumed and autopsy was done. Methomyl –carbamate insecticide was found in both lungs, stomach, liver, spleen and kidney. Cause of death was opined as accidental inhalational methomyl poisoning.

Keywords: inhalation; methomyl; pesticide; autopsy; exhumation

INTRODUCTION

Methomyl a carbamate pesticide, marketed as an aqueous solution and in solid form with brand names like Lannate, Nudrin, Metomex, and Terlate.¹ Suicidal and accidental poisoning is common due to its easy availability in domestic premises. Inhalational and transdermal poisoning by insecticide is rare but not uncommon due to lack of protective measures during spraying of these insecticides in fields. The insecticide methomyl (S-methyl N-(methylcarbamoyloxy)thioacetimidate was first introduced by *E.I. du Pont de Nemours* in 1968.² Methomyl controls a broad spectrum of arthropods such as spiders, ticks, moths, flies, beetles, aphids, leafhoppers, and spider mites often found on various field crops, ranging from fruits to tobacco. Methomyl is formulated as a soluble concentrate, a wettable powder or a water-soluble powder.³ Methomyl toxicity depend on route of exposure: I, oral exposure (highly toxic); II, inhalation (moderately toxic); and III, dermal exposure.² Methomyl inhibits acetylcholinesterase (AChE), which is contained within synaptic junctions between neurons. When AChE is inhibited, the hydrolytic deactivation of acetylcholine (ACh) is reduced, so that it continues to

stimulate the postsynaptic receptors to eventually cause nerve and/or tissue failure.⁴ In general, carbamates are rapidly metabolized and excreted. However, precise kinetics of methomyl metabolism in humans are unknown.^{5,6} According to the World Health Organization (1983), methomyl is non-cumulative and rapidly metabolized in plants and animals to substances of lower toxicity.⁷

Clinical Manifestations:

- Skin: Irritation with discomfort or pain, redness or rash, itching or swelling.
- Eyes : May cause: Irritation with discomfort, pain, redness, or visual impairment.
- Systemic toxicity: Inhalation or ingestion may cause acute acetyl cholinesterase depression. symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., nausea, abdominal pain, abnormal tearing, abnormal salivation, constriction of pupils, blurred vision, muscle twitching, convulsions, respiratory effects⁸.

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CASE-REPORT

A 28 year old male, was spraying Lannate (methomyl) insecticide in field since early morning. By afternoon he felt breathlessness, tiredness and weakness for which he was immediately consulted local doctor. Local doctor gave first aid treatment and referred to higher medical center. Deceased was died on the way to higher medical center. Deceased body was buried next day without intimating to police. 4 days later deceased body was exhumed and autopsy done. Deceased body showed signs of early decomposition. No injuries were found on body. Viscera and both lungs were preserved separately in saturated salt solution. Chemical analysis found Methomyl (carbamate) insecticide in both lungs, stomach, liver, spleen and kidney. Cause of death was opined as Accidental Inhalational Methomyl Poisoning.

DISCUSSION

Poisoning by Methomyl is rarely reported and not widely studied. Tsatsakis et al.⁹ reported a methomyl inhalation poisoning in 60 year old man while spraying methomyl in his green house.

Driskell et al.¹⁰ reported the crash of a crop dusting plane as it sprayed methomyl onto grape seed fields. The methomyl level in the pilot's blood was 570 ± 9 ng/mL; the effects of methomyl on the pilot's nervous system were regarded to have resulted in the loss of control and crash.

Miyazaki et al.¹¹ reported a double suicide attempt, in which both spouses ingested methomyl powder; only one succumbed. The insecticide was measured in both the deceased spouse's serum (44 mg/g) and blood (0.2 mg/g), and an autopsy revealed multiple miliary hemorrhages in the brain suspected to be as the result of induced asphyxiation. In clinical and post mortem situations the inhibition of (acetyl) cholinesterase activity is used as a biomarker in methomyl intoxications and methomyl is analyzed in biological samples.¹² In our case colour tests, thin layer chromatography (TLC) and High Performance Thin Layer Chromatography methods have responded to Methomyl (Carbamate) insecticide in right lung, left lung, stomach, liver and kidney.

Farmers must take preventive measures such as use of mask, respirator, special clothes and gloves during spraying of pesticides in field. Apart from skin washing,

basic treatment includes gastric lavage, activated charcoal and administration of atropine. Administer atropine sulphate as an antidote until complete atropinisation (1.2 to 2.0 mg i.v. every 10-30 minutes). Artificial respiration and/or oxygen may be necessary. Probable mucosal damage may contraindicate the use of gastric lavage. Morphine, 2-PAM and oxime therapy are contraindicated.⁸ Personal Protective Equipment (Respiratory protection and skin and body protection) should be used during spraying of insecticide. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with pesticides. Do not reuse them.

CONCLUSION

Dissemination of awareness of protective measures during use of pesticide is need of hour especially in rural areas. Forensic experts should elicit proper history and examine medical records while conducting autopsy.

CONFLICTS OF INTEREST

Declared none.

REFERENCES

1. Tsatsakis AM, Tsakalof AK, Michalodimitrakis EN. The analysis of methomyl, a carbamate pesticide, in post-mortem samples. *Science & Justice* 1996 Jan-March;36(1):41-5.
2. US EPA (1998b) Reregistration Eligibility Decision (RED) Facts: Methomyl. (Cited 2015 Dec 8) Available from: <http://www.epa.gov/oppsrrd1/REDs/factsheets/0028fact.pdf>.
3. Kidd H, James DR. *The agrochemicals handbook*. 3rd ed. Royal Society of Chemistry Information Services, Cambridge, England; 1991.
4. Ekins BR, Geller RJ. Methomyl-induced carbamate poisoning treated with pralidoxime chloride. *West J Med* 1994 JUL; 161(1):68-70.
5. Liddle JA, Kimbrough RD, Needham LL, Cline RE, Smrek AL, Yert LW, Bayse DD, Ellington AC, Dennis PA. Fatal episode of accidental methomyl poisoning. *Clin Toxicol* 1979;15(2):159-67.
6. Tsatsakis AM, Tsakalof AK, Siatitsas Y, Michalodimitrakis EN. Acute poisoning with carbamate pesticides: The cretan experience. *Science & Justice* 1996 JAN-MAR;36(1):35-9.
7. Kelly Bergs , Ed Pennings , Remco Clinical and Postmortem aspects of Methomyl intoxication. Review. (Cited 2016 Apr 20). Available from http://www.dspace.library.uu.nl/bitstream/handle/1874/.../3050254_Thesis.pdf?...1.
8. Safety Data Sheet, Dupont TM, Lannate(R) SP. Insecticide 2013.(Cited 2016 Apr 20). Available from http://www.www2.dupont.com/Crop.../2013-01-29_Lannate_MSDS_English.pdf.

9. Tsatsakis AM, Bertsiak GK, Mammias IN, Stiakakis I, Georgopoulos DB (2001) Acute fatal poisoning by methomyl caused by inhalation and transdermal absorption. *Bull Environ Contam Toxicol* 66:415–420.
10. Driskell WJ, Groce DF, Hill RH (1991) Methomyl in the blood of a pilot who crashed during aerial spraying. *J Anal Toxicol* 15:339–340.
11. Miyazaki T, Yashikia M, Kojimaa T, Chikasuea F, Ochiaib A, Hidani Y (1989) Fatal and non-fatal methomyl intoxication in an attempted double suicide. *Forensic Sci Int* 42(3):263–270
12. Martines-Cheucos J, Moliner-Somolinos F, Sole-Violan J, Rubio Sanz R. Management of methomyl poisoning, *Hum Exp Toxicol*, 1999;9:251-254.