

Hypoglycemia and revisable ST-elevation induced by Movento

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ABSTRACT

Spirotetramat (STM), an active ingredient of insecticide Movento 100 suspension concentrate (M100), is an inhibitor of acetyl-CoA carboxylase (ACC). The ACC is catalyst of acetyl-CoA to malonyl-CoA (MCA) reaction. MCA is the rate limiting steps of fatty acid biosynthesis. An 18-years-old man, who was referred to our ward from a local hospital, ingested 100 ml of M100, 18 h before. When we visited him, he was confused with stable vital signs and complained of vomiting and epigastric discomfort. He experienced hypoglycemia (blood sugar = 31 mg/dl) that was treated by hypertonic 20% dextrose serum and continued by maintenance DW10% (100 ml/h) up to 3 h. The first electrocardiogram showed ST-elevation. The results of urgent bedside echocardiography findings were normal. His first troponin I value was 0.01 ng/ml and at 1 and 6 h later were zero. The elevated ST segment gradually returned to baseline through next 6 h. STM ingestion can cause hypoglycemia and ST changes.

Key words: Hypoglycemia, intoxication, Movento 100 suspension concentrate, spirotetramat

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INTRODUCTION

Movento 100 suspension concentrate (M100) is a new insecticide containing 100 g/l of the active ingredient spirotetramat (STM). It belongs to insecticide group that inhibits acetyl-CoA carboxylase (ACC).^[1] It is a popular product widely used against biting and sucking insects on stone fruit, ornamentals plants, and greenhouses vegetables. STM penetrates from plant leaves and distributes through xylem and phloem in all parts of plants and leading to insect death within 2–5 days.^[1]

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There has been a dramatic increase in the use of pesticides since 2000 in Iran. Pesticides are some of the most important agents detected for poisoning and death in Iran through past decades.^[2] Although M100 has been approved by agricultural institute of Iran for application in filed since 2012, we could not find any case report of M100 or STM poisoning in literature. We reported a case of M100 poisoning with hypoglycemia and revisable ST-elevation.

CASE REPORT

A young 18-year-old man with past history of suicidal attempt was admitted 18 h after ingestion of 100 ml M100. He was visited by local physician, and gastric lavage was performed and

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referred to local hospital. Due to negative atropine challenged test. He was referred to toxicology ward of Imam Reza Hospital, Mashhad, Mashhad University of Medical Science, Iran. When we visited him, he was confused with stable vital signs (blood pressure = 115/75 mmHg, respiratory rate = 15 cycle/min, pulse rate = 101–94 beat/min, and temperature = 36.9°C). He complains of vomiting and epigastric discomfort. He had mid-sized reactive pupils. The other physical and neurological examinations were normal. He experienced hypoglycemic based on 2 times bedside glucometry (blood sugar (BS) = 30 and 28 mg/dl) that was confirmed by laboratory BS test (BS = 31 mg/dl) [Table 1]. He received 50 ml hypertonic 20% dextrose serum, and his BS level rose to 159 mg/dl. Dextrose water 10% (100 ml/h) was administrated through 3 h until the BS was stable and then he received maintenance fluid therapy. Electrocardiogram showed ST-elevation at admission time [Figure 1]. Given the examination findings, urgent bedside echocardiography was performed and revealed normal ejection fraction, wall motion, and no valvular heart disease. His first troponin I value was 0.01 ng/ml and at 1 and 6 h later was 0 ng/ml. The elevated ST of his EKG gradually returned to baseline through next 6 h. He has been discharged in good condition. Unfortunately, the patient was lost to follow-up after discharge.

DISCUSSION

Animal studies showed that STM is fast and near completely absorbed from gastrointestinal tract and reaches maximum level in plasma within 0.09–2.03 h after administration, with the highest concentration in kidney and liver. However, the species differences in metabolism of STM should be considered.^[3]

Based on literature reviews, the mammalian acute toxicity of STM is low. The oral LD₅₀ in rat is >2000 mg/kg. Norwegian

Scientific Committee for Food safety also concluded that STM has low acute oral or inhalation toxicity. According to animal studies, STM can irritate upper airways transiently; however, this case did not show any sign of irritation.^[1]

It has been also revealed that acute administration of a single dose (>200 mg/kg) STM in dogs can induce clinical manifestations of neurotoxicity such as seizures, ataxia, decrease in activity and neural swelling.^[3] Our case has not suffered any motor and neurological abnormality.

Falcón-Etchechury *et al.* evaluated the behavior, biochemical markers, and histological changes of rat liver cells after oral administration of STM at doses lower than LD₅₀. The most common reported symptoms were diarrhea, salivation, ataxia, rhinitis, convulsions, and bleeding.^[4] In our case, the STM-intoxicated patient has suffered from salivation and diarrhea.

STM, the main active ingredient of M100, bonds to carboxyl transfers site of the ACC. Carboxylation of acetyl-CoA to malonyl-CoA (MCA) is catalyzed by ACC. MCA is the rate limiting steps of fatty acid biosynthesis.^[5] There are two isoforms of ACC in human, Type 1 and 2. Type 1 is a cytosolic ACC in lipogenic tissues and ACC2 is a mitochondrial enzyme in heart and liver tissues. The animal short term toxicological studies of STM showed no significant changes in plasma lipid parameters. Although high lipid levels have been reported in some animal studies.^[4] Furthermore, GeDaQing found that the lipid profile of *Bemisia tabaci* biotype B nymphs fed by STM soaked leaves reduced after the 2nd day.^[6] Unfortunately, we did not check the lipid profile of the patient.

Table 1: Laboratory tests results of patients intoxicated by Movento 100SC pesticide

Lab test (unit)	Results
Blood sugar (mg/dl)	31
Urea (mg/dl)	26
Creatinine (mg/dl)	1.1
Creatinine phosphokinase (U/L)	319
Creatinine phosphokinase-MB (U/L)	34
Sodium (mEq/L)	140
Potassium (mEq/L)	5.1
Total calcium (m/dl)	8.9
Phosphor (mg/dl)	4.4
INR of prothrombin time (-)	1.15
partial thromboplastin time (s)	28
White blood cell ($\times 10^3/\mu\text{l}$)	14.8
Hemoglobin (g/dl)	13.6
Hematocrit (%)	42.4
Platelet count ($\times 10^3/\mu\text{l}$)	206

INR: International normalized ratio

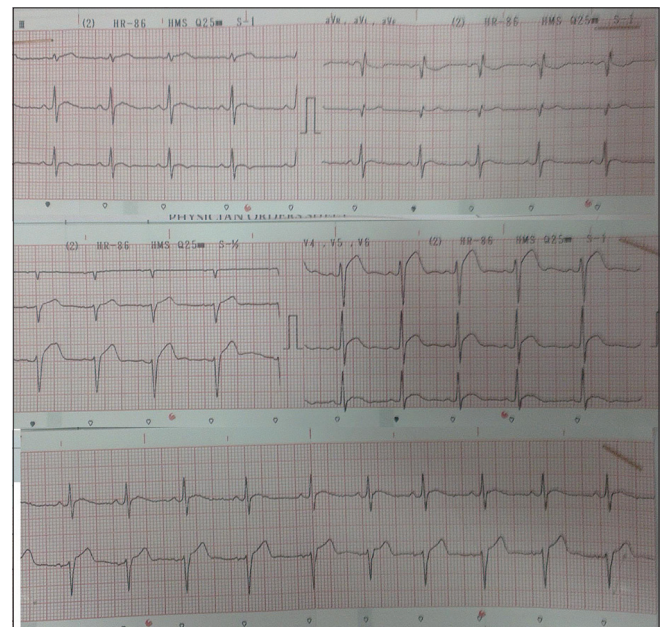


Figure 1: Electrocardiogram of patients intoxicated by Movento 100SC pesticide

It has been revealed that STM dropped leaves feeding can reduce the BS level of nymphs on the 2nd day.^[6] Oh, *et al.* evaluated BS of ACC2 knockout mice and also reported a reduction in BS and tissue glycogen.^[7] However, Furler *et al.* did not report any decrease in glucose clearance resulted in acute administration of the ACC inhibitor, CP-640186, in the rat. Abu-Elheiga *et al.* showed the ACC2 knockout mice had lower cardiac and skeletal muscle MCA that resulted in reducing total body fat, BS, and free fatty acid.^[8] Administration of ESP-55016; potent allosteric inhibitors of ACC activity; and Acyl sulfonamides and related analogs; another ACC activity inhibitors; can also decrease BS level. Our patient also suffered from hypoglycemia that may be related to STM-induced ACC inhibition. We could not find similar cases in the literature.

Shukry *et al.* reported 54 case series of fenoxaprop-P-ethyl poisoning (FPPE). FPPE is another pesticide that inhibits ACC. The most common manifestations of patients were a high rate of vomiting and burning epigastric pain that also observed in our patient. Shukry *et al.* did not report any cardiovascular, respiratory, or neurological problems. They did not provide any laboratory test results, and we assumed that they were normal.^[9]

MCA is the center regulator of fatty acid oxidation in the heart and is a potent inhibitor of mitochondrial fatty acid uptake. The level of MCA is regulated by activity of two enzymes, ACC and MCA decarboxylase. The heart and skeletal muscles have a limited capacity of fatty acid oxidation. Fatty acid oxidation is major source of the heart energy through ischemia and is mainly regulated by levels of MCA controlling mitochondrial fatty acid uptake. The agents that inhibit fatty acid oxidation apply for protection of ischemic heart damages.^[10] Decrease level of MCA is an etiology of high fatty acid oxidation rates during ischemic reperfusion. ACC inhibition can potentially affect the development of ischemia/reperfusion injury.^[11] Our patient's EKG showed reversible ischemic pattern that may be related to M100 (STM) ingestion. We could not find any similar record in human and animal studies.

In conclusion M100, STM, ingestion can cause hypoglycemia and ischemic heart problems and should be considered in the

treatment of acute poisoning. Further studies are needed to clarify the mechanisms of these finding.

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Conflicts of interest

There are no conflicts of interest.

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