

Short Communication

Flubendiamide – Entry of a New Insecticide into the Field of Clinical Toxicology

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ABSTRACT

Flubendiamide is a new lepidopteron insecticide developed for the use against pests of a wide array of annual and perennial crops. It is the first commercial representative of a new chemical class, the phthalic acid diamides.

Flubendiamide is said to have a low order of acute toxicity in humans via the oral, dermal and inhalation routes. There are hardly any reports of poisoning due to flubendiamide in humans.

In this paper, a case of attempted suicide by consumption of flubendiamide-containing insecticide by a farmer is being reported.

Key Words: Flubendiamide; Lepidopteron insecticide

Introduction

As insects develop resistance to the commonly used insecticides, more and more new insecticides are being produced and released for use by various pesticide manufacturers. One such new insecticide is flubendiamide. It is a new lepidopteron insecticide developed for use against pests of a wide variety of annual and perennial crops. Flubendiamide is the first member of a new chemical class, the phthalic acid diamides (1,2-benzenedicarboxamide). It is a ryanodine receptor agonist, which activates ryanodine-sensitive intracellular calcium release channels in the neurons of insects.¹

According to the Pesticide Fact Sheet of flubendiamide from the Environmental Protection Agency, United States,

issued on 01-08-2008, this compound has a low order of acute toxicity in humans via all routes of exposure (oral, dermal and inhalation). As per the mammalian toxicology database, chronic exposure can affect liver, thyroid, kidneys and eyes.² The Material Safety Data Sheet of flubendiamide released on 26th November 2009 by Bayer Crop Science, Australia, indicates that there have been no reports of poisoning due to flubendiamide in humans.³

We report here a non-fatal case of suicidal flubendiamide poisoning in a farmer.

The Case

A 40-year-old male, farmer by occupation, was brought to the Emergency Department of our hospital in a state of drowsiness. As per the history, the patient had consumed about 30 ml of Fame-480C, a flubendiamide insecticide, after diluting it in about 150 ml of water at about 2.30 pm at his home. Half an hour later, his wife found him in a drowsy state, and rushed him to the hospital. There was no history of vomiting, loose stools or any other gastrointestinal symptoms, except for burning pain in the abdomen.

On examination, the patient appeared drowsy, and the pupils were sluggishly reactive, without dilatation or constriction. The rest of the systemic examination was normal. Routine blood parameters were within normal limits. Plasma pseudocholinesterase level was 21,290 U/L.

The patient was given stomach wash, intravenous fluids, H₂ blockers and antibiotics. Stomach wash sample was

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sent to the Poison Detection Centre of our hospital for analysis. It was qualitatively analysed by colour tests, thin layer chromatography and UV-Vis spectrophotometry. The sample tested negative for alcohols, phenols, barbiturates, and also for the most commonly used pesticides in North Karnataka. Since pure or commercial standard of flubendiamide was not available, the sample could not be tested for the presence of flubendiamide.

Symptomatic treatment was continued, as there is no specific antidote for flubendiamide. Seven hours after admission the patient recovered completely, and was discharged after two more days of observation.

Discussion

Flubendiamide is the first commercial representative of the chemical class benzene dicarboxamides or phthalic acid diamides. New chemistry combined with its special mode of action helps to overcome the increasing problem of insecticide resistance.⁴ Flubendiamide has potent insecticidal activity against lepidopterous insects like butterfly, moth, etc. It is a ryanodine receptor agonist, which activates ryanodine-sensitive intracellular calcium release channels in the neurons of insects. In a study done to ascertain the mode of action of flubendiamide on insects, it was observed that the compound possessed insecticidal activity through a specific effect on the intracellular Ca^{2+} kinetics, which was signified by pronounced Ca^{2+} pump stimulation. Further study clarified that flubendiamide intrinsically activates ryanodine-sensitive calcium release channels. The result of this study indicated that ryanodine receptor of insects is a promising target molecule for flubendiamide, with high selectivity and low toxicity to mammals.¹ The action of flubendiamide is restricted to insect ryanodine receptors, and has almost no effect on all the three ryanodine receptor subtypes of vertebrates.⁴

Unfortunately, information regarding the toxic effects of flubendiamide in humans is scanty. Even some WHO-recognized Data Bases of Poisons do not contain information about this compound. The only available information regarding human toxicity is the Material Safety Data Sheet of flubendiamide, which was released on 26 November 2009 by Bayer Crop Science, Australia. It states that there are no reports of poisoning in humans, and the treatment is³:

- If inhaled, the patient has to be removed from the source of exposure.
- In case of skin contact, contaminated clothing is to be removed, and the exposed parts should be washed with plenty of water and soap.
- If eyes are contaminated, they have to be irrigated with clean water for at least 15 minutes.
- If ingested, mouth has to be washed with water; gastric lavage is usually not required due to low toxicity. However, administration of activated charcoal and sodium sulphate is advisable with significant amount of consumption.
- As there is no specific antidote, treatment has to be symptomatic and supportive.

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