ABSTRACT

Avermectin pesticides may not be as safe as you think

Background

Pesticide poisoning is an important global health issue. As highly hazardous pesticides had gradually been prohibited, some novel pesticides with lower toxicity have increased their popularity. Avermectins, a group of naturally occurred drugs from fermenting *Streptomyces avermitilis*, are used as antiparasitics, pesticides and acaricides. Avermectins interact with invertebrate g-aminobutyric acid (GABA) receptor which leads to paralysis and death in the target organism.

Information of acute avamectin pesticide poisoning in human is quite limited. Previous case reports and small case series revealed that clinical symptoms following avermectin exposure are generally mild and self-limited. However, high dosage poisoning could lead to consciousness alternation, hypotension, respiratory failure and even death.

Materials and Methods

We retrospectively collected cases who visited the emergency department due to acute avermectin pesticide (including emamectin and abamectin) ingestion in six teaching hospitals between January 1, 2012 and May 31, 2020. Patients who reported ingestion of any other pesticides, drugs, or substances were excluded.

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Result

In total, 64 patients were enrolled; 60 ingested emamectin pesticide, and the other four ingested pesticide containing abamectin. Their mean age was 68.98 ± 14.77 years and 41 (64.06 %) were male. Nearly all patients were exposed as a result of suicide attempt. Approximately 60% of the patients had underlying medical diseases, while 22 patients (34.38%) had psychiatric disorders.

The most common presentation was drowsiness (43.75%), followed by short of breath (SOB)/dyspnea (32.81%) and nausea/vomiting (21.7%). 42 patients (65.63%) had either pneumonia patches or an increased infiltration on CXR. Leukocytosis, abnormal creatinine and elevated lactate level were common laboratory findings. Concurrent methanol exposure (from the pesticide solvent) were confirmed or suspected in five patients. The majority of patients (71.88%) underwent gastric lavage, and approximately half (48.44%) were treated with activated charcoal. 20 patients developed respiratory failure; 17 of them were intubated and three were not because of a “Do Not Resuscitate (DNR)” order. 49 patients (76.56%) were admitted, of whom 26 (40.63%) were admitted to an ICU. Four patients eventually died from the poisoning.

Severe poisoned cases (defined as patients who were intubated or died) had a worse initial GCS score, lower body temperature, higher rate of having SOB/dyspnea, and more likely to have abnormal creatinine, significant acidemia (pH < 7.3) and hyperlactatemia (lactate > 4 mmol/L). A GCS score < 13 was found to have the best predictive value (sensitivity 95 %; specificity 77.3%). Multivariate logistic regression model showed a GCS score < 13 (Odds ratio 87.19, 95% CI 5.9–>999) and the presence of SOB/dyspnea (Odds ratio 25.59, 95% CI 2.67–245.1) were significantly associated with severe poisoning.

Conclusions

In Taiwan, the majority of patients who intentionally ingest avermectin pesticide require inpatient treatment, and as high as 40% of patients need ICU care. More than 30% of patients develop respiratory failure following avermectin pesticide ingestion. Fatality is not uncommon.

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阿維菌素 (avermectin) 一群天然化合物，由鏈黴菌（*Streptomyces avermitilis*）發酵產生，被用來當作驅蟲藥或殺蟲劑。這類農藥可作用在脊髓內之g-aminobutyric acid (GABA) 受器，進一步導致目標生物癱瘓而死亡。人類阿維菌素中毒的相關文獻報告並不多，大多僅限於單一個案報告或小規模的個案系列報告。雖然有少數死亡案例，但大多數阿維菌素中毒的個案為無症狀或僅出現輕微中毒症狀。本研究自全台六家教學醫院，蒐集了64例單純為avermectin類農藥中毒的個案來做分析，結果發現在台灣avermectin類農藥中毒有很高的機率引發呼吸衰竭。Avermectin類農藥似乎不若想像中的安全。