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## Highlights

# Pralidoxime and pesticide poisoning: A question of severity?



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## ABSTRACT

### Keywords:

Organophosphate poisoning  
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In this issue of the *Biomedical Journal*, we highlight new data supporting the use of pralidoxime in the treatment of cases of organophosphate poisoning, which also suggest that WHO treatment guidelines should be updated. We also learn about a modified surgical technique to repair severe spinal injuries, as well as new insight into the structure of human adenovirus that could inform vaccine development.

## Spotlight on original articles

### *Pralidoxime and Pesticide Poisoning: a Question of Severity?*

Accidental or self-inflicted poisoning with organophosphate (OP) pesticides continues to be a major clinical problem, especially in developing countries with an estimated 3 million cases occurring each year [1]. Treatment guidelines have been established by the World Health Organization (WHO) [2]; however, new data presented by Lin et al. [3] in this issue of the *Biomedical Journal*, suggest that these guidelines may need updating.

OP compounds work by irreversibly inhibiting the enzyme acetylcholinesterase (AChE), leading to a build-up of the neurotransmitter acetylcholine and hence uncontrolled stimulation of cholinergic nerves. The effects include vasodilation of blood vessels, slower heart rate, constriction of bronchioles and in severe cases, death by respiratory failure [4]. OPs have been used to devastating effects in chemical attacks such as that which occurred when sarin gas was released in the Tokyo subway system in 1995. Despite being toxic to humans, OPs continue to be the most widely used

pesticides in the world [5] and are the cause of substantial unintentional poisoning to agricultural workers [6].

Following OP pesticide poisoning, the WHO recommends the use of the antidotes pralidoxime (PAM) and atropine [2]. PAM regenerates functional AChE after it has been inactivated by OP, whereas atropine blocks the build-up of excess acetylcholine. However, the added benefit of using PAM in addition to atropine remains unclear [7]. Lin et al. reason that this may be because current WHO guidelines fail to take into account the severity of OP poisoning; thus, they report here a clinical trial designed to test whether the use of PAM should be guided by patient severity.

Lin et al. conducted a randomized open-label controlled trial including a total of 46 patients presenting with acute OP poisoning at two Taiwanese centers. Patients were randomly divided into a control group and an experimental group, with each group receiving gastric lavage, activated charcoal and atropine. The control group (n = 24) were treated according to the WHO's recommended regimen of 500 mg/h PAM for 48 h. The experimental group (n = 22) however received PAM according to the severity of OP poisoning as measured by their acute physiology and chronic health evaluation (APACHE II)

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score and change in butyrylcholinesterase (BuChE) activity. BuChE is a circulating enzyme that detoxifies OP by making a covalent bond with the OP, while becoming inactive in the process [8]. Lin et al. reasoned that if a patient's APACHE II score was  $\geq 26$  and their BuChE activity had not increased 12 hours after admission, then such patients should be classified as "severe" cases and receive twice the recommended WHO dose of PAM (i.e. 1 g/h).

There was no difference in poisoning severity between the two groups as measured by APACHE II and changes in BuChE activity; yet, the rate of mortality was significantly higher in the control group (29.2%) than in the experimental group (4.6%), with a hazard death ratio of 111.2 in the control group versus the experimental group. Additionally, AChE activity (as measured in red blood cells) increased during treatment in the experimental group but actually decreased in the control group.

These findings thus challenge previous studies that question the value of PAM in the treatment of OP poisoning [9]. Moreover, they suggest WHO guidelines for the use of PAM should be updated to take into account a flexible dosing strategy based on severity of poisoning, although any such changes to recommendations must first be validated in a larger sample size.

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## Also in this issue:

### Original articles

#### *Common herb relieves diarrhea*

The herb *apium leptophyllum* is widely used in India to relieve many ailments [10], including diarrhea, which is the second largest cause of infant death worldwide [11]. However, its therapeutic properties have rarely been investigated with any scientific rigor. Now, Sahoo et al. [12] provide scientific support for the use of the herb in a study showing that the flavonoid-rich fraction of *A. leptophyllum* relieves diarrhea in rats by decreasing gastrointestinal transit and increasing sodium-potassium ATPase activity, which regulates intestinal fluid absorption.

#### *Structural analysis could inform vaccine development against human adenovirus*

Patwary et al. [13] use bioinformatics tools to model the structure of an important protein of human adenovirus E, which causes respiratory infections, especially among the elderly [14]. Based on this structure, the authors predict several conserved B and T cell epitopes, which could prove useful in developing effective vaccines against this virus.

#### *Counteracting the "heat sink" effect improves outcome after radiofrequency ablation*

Radiofrequency ablation (RFA) is the treatment of choice for unresectable hepatocellular carcinoma (HCC) [15]. With this technique, tumor tissue is destroyed using the heat generated from a medium frequency alternating current. Blood flowing around the tumor brings about a cooling effect (called the "heat sink" effect), such that thermal ablation is limited against tumors near large blood vessels. In this retrospective

analysis of 52 patients with small (<3 cm) HCC, Cheng et al. [16] find that thermal ablation of the feeding artery before RFA against the target tumor significantly reduces local tumor progression.

#### *Modified surgical technique to repair severe spinal injuries*

A "burst fracture" describes a severe type of spinal cord injury in which vertebra break as a result of high-energy trauma. These fractures are often treated surgically, although disagreement exists surrounding the choice of surgical approach [17]. Lin et al. [18] test whether the addition of two augmenting screws improves outcome in patients with thoracolumbar burst fracture treated by short-segment instrumentation. They conclude that this modified "all screws" technique is easier and requires less operative time than the transpedicular grafting technique, while giving rise to similar clinical results.

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## Brief communication

### *Unusual ligament in the peritoneum*

Deshmukh et al. [19] describe the discovery of an unusual peritoneal ligament between the gallbladder, duodenum, and transverse colon, discovered during a routine dissection class for undergraduate students. Knowledge of this variant is important for intestinal surgeries.

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## Conflicts of interest

The author declares that there are no conflicts of interest.

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