Serum phospholipase A2 as a biomarker for snake envenomation

Source: Diagnosis of snake envenomation using a simple phospholipase A2 assay. Maduwage K, O'Leary MA, Isbister GK. Scientific Reports. 2014 Apr 29;4:4827. Summary prepared by Dr. Anand R, Department of Biochemistry, CMC Vellore

Research question: Phospholipase A2 is a known component of snake venoms; can activity of the enzyme be used as a biomarker for snake envenomation.

Main finding: Serum phospholipase A2 activity is non-specifically elevated in cases of snake envenomation and can be a potential biomarker to diagnose systemic envenomation.

Background
Mortality and morbidity associated with snakes bites are a major problem in tropical nations, especially the rural areas.1 There are no accurate laboratory tests that help in the diagnosis of systemic envenomation. A 20-min whole blood clotting test is commonly used for the diagnosis of coagulopathy in these patients.2 However, the unreliability of the test in diagnosis of early envenomation and in snake bites not associated with coagulopathy are major concerns.3–5 The enzyme phospholipase A2 (PLA2) is a common component of most snake venoms and is widely used to study activity of venoms, but whether assaying its activity would aid the diagnosis of snake envenomation is not known.

Methods
The authors estimated activity of PLA2 in pre-antivenom samples of 77 patients diagnosed with systemic snake envenomation based on data from clinical and coagulation studies. This group mainly comprised of envenomation due to Russell’s viper (Daboia russelii; N=32) and hump-nosed pit viper (Hypnale hypnale; N=35) envenomation; there were also 3 patients with Indian cobra (Naja naja) envenomation, 2 with Indian krait (Bungarus caeruleus) envenomation, 5 with red-bellied black snake (Pseudechis porphyriacus) envenomation. Comparison was made against 31 patients with history of snake bite but no evidence of systemic envenomation.

Results
It was seen that serum PLA2 activity was significantly higher in patients with snake envenomation; highest activity was noted specifically in Russell’s viper envenomation. The activity of PLA2 showed good correlation to the concentrations of venom in these patients. Interestingly, PLA2 activity showed good correlation to free venom concentrations. Following antivenom administration, there was a decrease in the activity of PLA2 while patients with venom recurrence had an increase in PLA2 activity after a brief fall.

Discussion
Considering that PLA2 activity was elevated non-specifically in most cases of envenomation irrespective of the cause, the test cannot help identify the species of the snake. However, PLA2 activity closely followed venom concentrations; higher activity of the enzyme was seen with large venom doses and this activity decreased following antivenom administration. Hence, PLA2 activity can help in assessing the degree of envenomation, effectiveness of antivenom treatment and thus shows potential as a good index of systemic envenomation. Since PLA2 activity is non-specifically elevated, it could also be useful in cases of snake bites not associated with coagulopathy, especially the neurotoxic species. Some limitations of the study are that the time that elapsed between snake bite and sampling is not known. The kinetics of PLA2 appearance in blood is also not studied, hence the earliest time point at which the test could be performed is not clear.

References
Expert comments: Dr. Victoria Job, Professor & head, Department of Clinical Biochemistry, CMC Vellore

PLA2 is a family of enzymes grouped as secretory PLA2 (PLA2s), Cytosolic PLA2 (PLA2c) and LP-PLA2 which has the Platelet activating factor and is an artherogenic marker. The secretory enzyme PLA2s is found in many mammalian tissues mainly pancreas and kidney and in insect and snake venom. The study clearly shows a good correlation of its serum levels with different types of snake envenomation and levels regressing with anti venom administration. It definitely could be used as a diagnostic test to confirm snake bites, to assess the extent of envenomation, to guide therapeutic decisions and also to monitor the victim. Spectrophotometric assays can be made available in mid level laboratories to aid in the management of snake bite patients. It would be a good test to be made available in a tertiary care centers where many such patients are medically managed.

PLA2s is increased in many inflammatory conditions but has not come into regular use since other good markers which have established measurement techniques are available. Many studies have been conducted of its usefulness in pancreatic diseases. In acute pancreatitis high levels were seen, in chronic and pancreatic cancer abnormal levels were seen and with severe exocrine insufficiency the levels were very low. It did not seem to add any additional information than Serum Amylase and Lipase so is not used as a routine test of pancreatic function. PLA2s has been shown to be increased in cardiovascular diseases too but the Lipoprotein associated PLA2 has a better correlation.

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UPCOMING EVENTS IN CMC VELLORE

11th Conference of Indian Society for Bone and Mineral Research (ISBMR)

- Date: 27th & 28th November 2015
- Pre-conference CME on Metabolic Bone Disorders on 26th November 2015
- Venue: Scudder Auditorium, CMC, Vellore.
- Who can attend: This is a conference for General Physicians, Endocrinologist, Nutritionists, Nephrologists, Paediatricians, Nuclear Physicians, Rheumatologist, Endocrine and Orthopaedic Surgeon.
- For more details kindly visit the website: www.isbmr2015vellore.in

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