Analysis of Spider Venoms by Capillary Electrophoresis

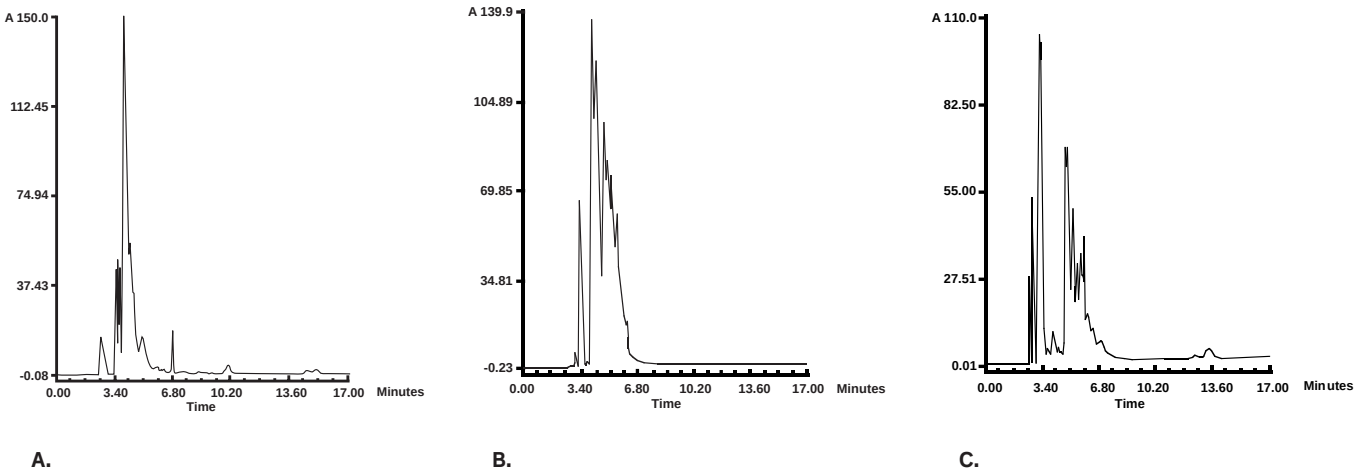

Fig. 1. Separation of (A) beautiful tarantula venom, (B) goliath spider venom, and (C) zebra tarantula venom at pH 2.5.

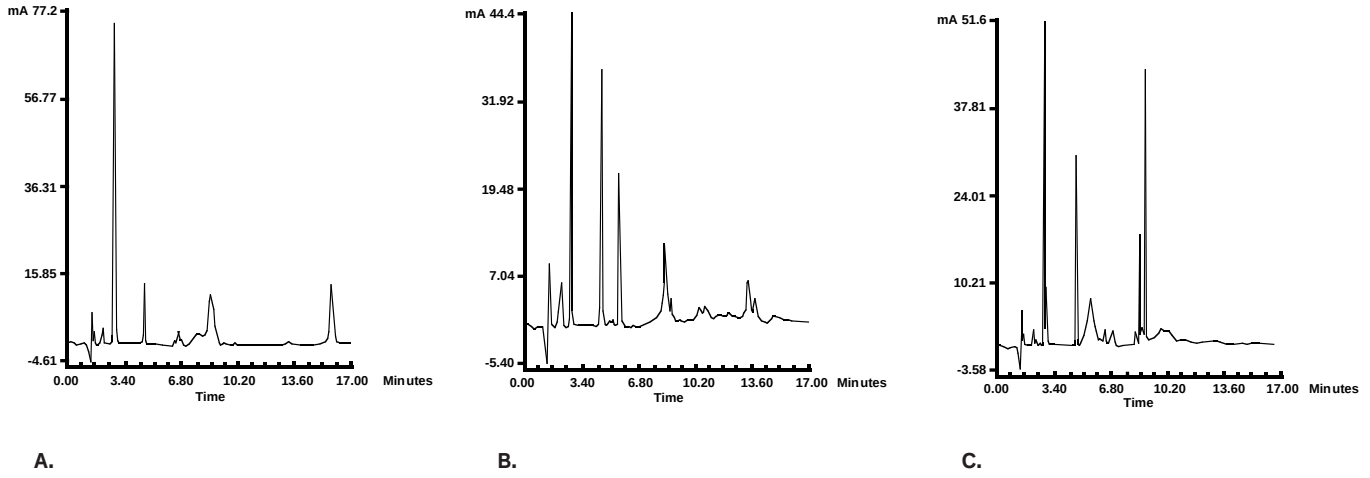

Fig. 2. Separation of (a) beautiful tarantula venom, (b) goliath spider venom, and (c) zebra tarantula venom at pH 8.3.

Introduction

Spider venoms are of commercial interest because of their potential use as environmentally safe insecticides. They are also a potential source of new clinical drugs which can reduce brain cell necrosis in diseases such as Alzheimers, and are important tools for identifying invertebrate receptors and ion channels[1]. The venoms are composed of a complex mixture of proteins, peptides, nucleotides, arylamines, and other small biomolecules.

Analysis Conditions

Instrument	BioFocus® 3000 system
Polarity	positive to negative
Capillary	24 cm x 25 µm, coated (catalog number 148-3031)
Run buffer	0.1 M sodium phosphate, pH 2.5 (catalog number 148-5010) or Basic Protein Analysis Buffer, pH 8.3 (catalog number 148-5023)
Injection	20 psi * sec
Run voltage	10 kV
Detection	200 nm
Cartridge temperature	20 °C
Autosampler temperature	20 °C

Chromatographic and electrophoretic techniques are used in the analytical separation and purification of spider venoms. In this study, capillary zone electrophoresis (CZE) was investigated as a new high resolution tool for the analysis of spider venoms from three species of spider. The goliath bird-eating spider (*Theraphosidae leblondi*) is the world's largest arachnid, reaching diameters of 8 in. It is found in Venezuela and Brazil near the Amazon region of the Orinoco river. The zebra tarantula (*Aphonopelna seemanni*) is common in Central America, particularly in Costa Rica. The beautiful tarantula (*Grammastola cala*) is a rare (but not endangered) species found in Chile.

Results

CE analysis of the spider venoms was performed with a pH 2.5 phosphate buffer and a pH 8.5 borate buffer. In both cases, electro-osmotic flow (EOF) was suppressed using Bio-Rad's coated capillaries. Separation at low pH (Figure 1) and high pH (Figure 2) yielded different profiles. At low pH, most of the major components migrated within 4-8 minutes and were incompletely resolved; improved resolution was obtained at high pH. Distinctly different profiles were obtained for each toxin sample at each pH. It is known that tarantula toxins, which contain hyaluronidase, lethal peptide toxins, paralytic polyamines, and nucleotides, exhibit differences in chemical composition among species.

Under the conditions used in this study without EOF, information about cationic components in the venoms was selectively obtained using detection at the cathodic end of the capillary.

References

1 Jackson, H. and Usherwood, P. N. R., *Trends Neurosci*, **11**, 278-283 (1988).

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