

## Monash Venom Group

### Group Head

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### Specific interests



#### General overview

Australia is home to some of the most venomous creatures in the world. To date little, if any, work has been undertaken on many of these venoms. The focus of our group is on the pharmacological and biochemical examination of venoms from Australasian animals. We are particularly interested in: examining whether the currently available antivenoms can be utilised for envenomation by other species (some closely related while others are not). We are also interested in identifying the primary mode of action of these venoms and isolating and characterising components. This research will help in the identification of new, or improved, treatment strategies, the identification of new highly potent research tools and the identification of lead compounds for pharmaceuticals.

#### Snake venoms

##### Sea-snakes

We are characterising the neurotoxic and myotoxic components of a range of sea-snake venoms, many of which have not been previously examined. We are also examining the efficacy antivenoms against the *in vitro* neurotoxicity. Future work will involve isolation of individual components.

##### Death adders, black snakes and taipans

We are undertaking similar studies to those as outlined above. In addition we have isolated, and are currently characterising, a number of components from these venoms. We have access to a large range of venoms from these genus.

##### Colubrids

Serious envenomation by colubrids is rare. Neurotoxicity rarely features in clinical reports of colubrid envenomings but has been documented *in vitro* in a number of species. Only two colubrid species, *Boiga irregularis* (Colubrinae) and *Malpolon monspessulanus* (Psammophiinae), have been reported in the literature as causing clinically significant neurotoxicity, while there are less clear-cut reports for others, such as the colubrines *Boiga blandingii*, *Coluber rhodorachis* and *Coluber viridiflavus* and the xenodontine *Hydrodynastes gigas*. The activity of many other colubrid venoms remains to be elucidated. We are examining the venoms from a range of colubrids including those from the Colubrinae, Homalopsinae, Natricinae, Psammophiinae and Pseudoxyrhophiinae snake families. These results will greatly increase the pharmacological knowledge of colubrid venoms while lending some insight into potential clinical effects and the evolution of venom components.



## Marine venoms

### Fish

We have examined the pharmacological and biochemical properties of three fish venoms: stonefish (*Synanceia trachynis*), soldierfish (*Gymnapistes marmoratus*) and lionfish (*Pterois volitans*). We are currently trying to isolate the lethal toxins.

### Jellyfish

Box jellyfish are responsible for significant morbidity and occasionally mortality in northern Australia. The class cubozoa (box jellyfish) is divided into two orders: Chirodropidae, which includes the Indo-Pacific box jellyfish (*Chironex fleckeri*), and Carybdea, typified by *Carukia barnesi*. The clinical effects of these jellyfish appear to be mainly cardiovascular and autonomic. However, the mechanism(s) of the effects are not understood. Severe *C. fleckeri* envenoming results in cardiovascular collapse in humans and recent work in our laboratory has suggested that this is principally a cardiac effect. In contrast, the Irukandji syndrome due to *C. barnesi* is characterised by generalised pain, hypertension, nausea, vomiting and anxiety that has been purported to result from a hypercatecholaminergic state.

Despite the regularity and severity of jellyfish envenomings our understanding of the action of jellyfish venoms and toxins remains in its infancy. Recent data from our laboratory suggests that *C. fleckeri* antivenom is not as effective as previously thought. Therefore, research needs to focus on characterising the effects of jellyfish venoms so that treatment strategies based on a clear understanding of the mechanism of action of these venoms can be developed. In addition, the effects of the venom appear to be novel and fractionation of the venom may lead to the discovery of novel toxins that affect the cardiovascular system.

## Spider venoms

We are examining the venoms from a range of Australian spiders including the Eastern mouse spider (*Missulena bradleyi*), white-tailed spider (*Lampona sp.*) and wolf spider (*Lycosa sp.*). We have recently commenced examination of Australian orb-weaving spiders.



### Personnel

A/Professor Wayne Hodgson

Dr Geoff Isbister (Honorary Senior Lecturer)

Dr Lachlan Rash (currently INSERM/NH&MRC Postdoctoral Fellow, Institut de Pharmacologie Moléculaire et Cellulaire, Valbonne, France)

Sharmaine Ramasamy (PhD student)

Natalie Lumsden (PhD student)

Sanjaya Kuruppu (PhD student)

Andrew Hart (Honours student)

Ross Fernando (Honours student)

### Past PhD students

Dr Maria Matuszek (Lecturer, University of New South Wales)

Dr Bennett Hopkins (Product Manager, Merck Sharp & Dohme, Australia)

Dr Jarrod Church (Postdoctoral Fellow, Vascular Biology Center, Augusta, Georgia, USA)

Dr Janith Wickramaratna (Regulatory Scientist, National Industrial Chemicals Notification and Assessment Scheme)

### Collaborators

Dr Eddie Rowan (University of Strathclyde, Glasgow, Scotland)

A/Professor Graham Nicholson (University of Technology, Sydney)

A/Professor Mibel Aguilar (Department of Biochemistry & Molecular Biology, Monash University)

Professor Ian Smith (Department of Biochemistry & Molecular Biology, Monash University)

Dr Pierre Escoubas (Nice, France)

Dr Jamie Seymour (James Cook University, Queensland)

Dr Bryan Grieg Fry (University of Singapore)



*Left-Right*

Wayne, Sanjaya, Lachlan, Janith, Natalie



*Left-Right*

Lachlan, Jarrod, Wayne, Janith, Sharmaine



*Left-Right*

Sanjaya, Sharmaine, Evert Karlsson, Natalie  
(IST, Brazil 2004)

### Recent selected publications

1. Chetty, N., Du, A., Hodgson, W.C., Winkel, K. & Fry, B.G. The *in vitro* neuromuscular activity of Indo-Pacific sea-snake venoms: efficacy of two commercially available antivenoms. *Toxicon*, 44, 193-200, 2004.
2. Wickramaratna, J.C., Fry, B.G., Loiacono, R.E., Aguilar, M.I., Alewood, P.F. & Hodgson, W.C. Isolation and pharmacological characterisation of a neurotoxin from the venom of the *Acanthophis* sp. Seram death adder. *Biochem. Pharmacol.*, 68, 383-394, 2004.
3. Lumsden, N.G., Fry, B.G., Kini, R.M. & Hodgson, W.C. *In vitro* neuromuscular activity of 'colubrid' venoms: clinical and evolutionary implications *Toxicon*, 43, 819-827, 2004.
4. Ramasamy, S., Isbister, G.K., Seymour, J.E. & Hodgson, W.C. The *in vivo* cardiovascular effects of box jellyfish *Chironex fleckeri* venom in rats: efficacy of pre-treatment with antivenom, verapamil and magnesium sulphate. *Toxicon*, 43, 685-690, 2004.
5. Fry, B.G., Lumsden, N.G., Wüster, W., Wickramaratna, J.C., Hodgson, W.C. & Kini, R.M. Isolation of a neurotoxin ( -colubritoxin) from a 'non-venomous' colubrid: evidence for early origin of venom in snakes. *J. Mol. Evol.*, 57, 446-452, 2003.
6. Ramasamy, S., Isbister, G.K., Seymour, J.E. & Hodgson, W.C. The *in vitro* effects of two chirodropid (*Chironex fleckeri* and *Chiropsalmus* sp.) venoms: efficacy of box jellyfish antivenom. *Toxicon*, 41, 703-711, 2003.
7. Church, J.E., Moldrich, R.X., Beart, P.M. & Hodgson, W.C. Modulation of intracellular Ca<sup>2+</sup> levels by Scorpaenidae venoms. *Toxicon*, 41, 679-689, 2003.
8. Church, J.E. & Hodgson, W.C. (Review) The pharmacological activity of fish venoms. *Toxicon*, 40, 1083-1093, 2002.
9. Rash, L.D. & Hodgson, W.C. (Review) Pharmacology and biochemistry of spider venoms. *Toxicon*, 40, 225-254, 2002.