Who’s Afraid of the Bush Today?

Lessons for Research Translation from Studies of Bee and Wasp Sting Mortality and Severe Morbidity in Australia

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Department of Pharmacology & Therapeutics, University of Melbourne
Identified Barriers to Optimal Research Translation

- Morbidity – Hospital Separations
- Bee and Wasp Mortality studies
- Discussions and Conclusions
Identified Barriers to Optimal Research Translation – What do we know?

**Research:** Lack of (i) detailed epidemiological studies to best define high risk groups, places and times for ‘best buy’ interventions, (ii) lack of understanding of knowledge, attitudes and beliefs impacting uptake of immunotherapy

**Currently identified high risk groups -**

• 40-70 yr old rural males with prior venom allergy history

• Lack of immunotherapy Rx/Epipen

• 2° Lack of specialist and some allergens
Ant sting mortality in Australia

Forbes McGain, Kenneth D. Winkel

*Australian Venom Research Unit, Department of Pharmacology, University of Melbourne, Melbourne 3010 Vic., Australia

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Abstract

We investigated ant sting related fatalities in Australia over the period 1980–1999. Data was obtained from the Australian Bureau of Statistics and state coronial authorities. Six ant sting-related fatalities were identified, five in Tasmania and one in New South Wales. All were males aged between 40 and 80-years-of-age and most (5/6) had prior histories of jumper or bull ant (*Myrmecia* spp.) venom allergy. However, none of the deceased carried injectable adrenaline and most died within 20 min of a single sting. Significant cardiopulmonary co-morbidities were identified in all cases and, in addition, moderate–severe laryngeal oedema and coronary atherosclerosis was observed in most (4/6) cases at autopsy. Where ascertained, *Myrmecia* ant venom specific immunoglobulin E antibodies levels were always elevated and fell into two distinct patterns of immunoreactivity. Adult Tasmanian males with a prior history of ant venom allergy and cardiopulmonary co-morbidities are therefore at highest risk of a fatal outcome from ant stings. Deaths may be avoided by the early recognition of anaphylaxis and self-treatment with adrenaline as well as by the development of purified *Myrmecia* ant venom immunotherapy. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Hymenoptera allergy; Ant venom; *Myrmecia pilosula*; *Myrmecia pyriformis*; Anaphylaxis; Venom allergy; Immunotherapy; Tryptase; Australia

Notable Cases

Wasp sting mortality in Australia

Forbes McGain, James Harrison and Kenneth D Winkel

Wasp sting fatalities have rarely been reported in Australia. We used data from the Australian Bureau of Statistics and State coronial authorities to investigate deaths from wasp stings in Australia from 1979 through 1998. Seven cases were identified, all involving men in rural settings. Five of the seven victims had prior histories of wasp or bee venom allergy, or both, but none carried injectable adrenalin. All patients with a history of systemic Hymenoptera sting allergy should undergo assessment for immunotherapy and carry adrenalin.
A venomous Australian tick.
Table 2: Type of bite and sting (first external cause) for hospitalised cases, Australia 2002–05

<table>
<thead>
<tr>
<th>External cause</th>
<th>Cases</th>
<th>Per cent</th>
<th>M:F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact with venomous snakes and lizards (X20)</td>
<td>1,751</td>
<td>15.1%</td>
<td>2.1</td>
</tr>
<tr>
<td>Contact with spiders (X21)</td>
<td>3,887</td>
<td>33.5%</td>
<td>1.2</td>
</tr>
<tr>
<td>Contact with scorpions (X22)</td>
<td>24</td>
<td>0.2%</td>
<td>0.8</td>
</tr>
<tr>
<td>Contact with hornets, wasps and bees (X23)</td>
<td>3,557</td>
<td>30.7%</td>
<td>2.4</td>
</tr>
<tr>
<td>Contact with centipedes and venomous millipedes (tropical) (X24)</td>
<td>31</td>
<td>0.3%</td>
<td>0.9</td>
</tr>
<tr>
<td>Contact with other specified venomous arthropods (X25)</td>
<td>1,127</td>
<td>9.7%</td>
<td>1.3</td>
</tr>
<tr>
<td>Contact with venomous marine animals and plants (X26)</td>
<td>1,041</td>
<td>9.0%</td>
<td>2.6</td>
</tr>
<tr>
<td>Contact with other specified venomous animals (X27)</td>
<td>14</td>
<td>0.1%</td>
<td>3.7</td>
</tr>
<tr>
<td>Contact with other specified venomous plants (X28)</td>
<td>23</td>
<td>0.2%</td>
<td>1.3</td>
</tr>
<tr>
<td>Contact with unspecified venomous animal or plant (X29)</td>
<td>147</td>
<td>1.3%</td>
<td>1.7</td>
</tr>
<tr>
<td>Total (X20–X29)</td>
<td>11,602</td>
<td></td>
<td>1.7</td>
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Figure 37: Age-specific rates (± 95% CI) for hospitalised bee sting cases (X23.3): males and females, Australia 2002–05
Figure 43: Age-standardised rates (± 95% CI) over time for cases with a first external cause of X23.3 (bees) by region of usual residence, Australia 2000–05
Table 20: Age-standardised rates (± 95% CI) of hospitalised wasp and bee sting cases by state of usual residence, Australia 2000–05

<table>
<thead>
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<tr>
<td><strong>Wasps</strong></td>
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<td></td>
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</tr>
<tr>
<td>NSW</td>
<td>0.8</td>
<td>1.1</td>
<td>0.5</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Vic</td>
<td>0.7</td>
<td>0.6</td>
<td>0.3</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Qld</td>
<td>5.2</td>
<td>3.8</td>
<td>3.2</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>WA</td>
<td>0.4</td>
<td>0.6</td>
<td>0.9</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>SA</td>
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<td>0.5</td>
<td>0.4</td>
<td>1.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Tas</td>
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<td>0.4</td>
<td>0.6</td>
<td>0.4</td>
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<tr>
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<td>0.0</td>
</tr>
<tr>
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<td>0.0</td>
<td>0.4</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Bees</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>4.4</td>
<td>4.4</td>
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<tr>
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<td>14.4</td>
<td>13.1</td>
<td>12.2</td>
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<tr>
<td>ACT</td>
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<td>4.4</td>
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<td>0.4</td>
<td>0.8</td>
<td>0.4</td>
<td>0.4</td>
</tr>
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</table>

Note: Shading indicates the state which had the highest rates of hospitalised wasp or bee stings over the study period.
BEE AND WASP STING FATALITIES:

- A leading cause of bite and sting fatalities internationally
- But poorly documented in Australia – Only two reports of bee sting fatalities (1913 and 1984)
- A complete absence of comprehensive coronial data in the literature
- Internationally most deaths occur quickly after few stings in adult males
BEE AND WASP STING FATALITIES

Search of the Australian Bureau of Statistics Mortality Dataset 1/1979-12/12: Ongoing study
ICD-9/10 E-code 905/X23 Hornets, Bees and Wasps
Territory Registrars of Births, Deaths and Marriages
State and Territory Coroners

Compare bee versus wasp:
- Circumstances of sting: locality; occupation; time to death,
- Autopsy findings: number of stings, species of wasp; underlying disease
- Hymenoptera allergy history/management

University of Melbourne Health Sciences Human Ethics Sub-Committee approved
BEE AND WASP STING FATALITIES: 
Results: **Seven** Wasp Fatalities

**Summary:**

- All adult males in Queensland and northern NSW 39-73-years of age: mean 54 years
- All stings in rural areas
- At least 4/7 were farmers
- Death within 30 mins in 6/7 cases
- Moderate-severe atherosclerosis in 2/6
- 5/7 cases had **definite prior histories** of wasp and/or bee venom allergy
- **None** carried adrenaline
BEE AND WASP STING FATALITIES:
Results: **Thirty-eight** Bee Fatalities

Summary:

♀ Predominantly adult males in Victoria and NSW:
   33 males, 5 females, 1 x 3-year-old & 1 x 26-year-old
♀ But deaths occurred in all states and territories
♀ Predominantly in rural settings: [34/38 non-metropolitan]
♀ 9/38 were apiarists or relatives thereof
♀ Death within 60 mins in 22/26 cases
♀ Mostly 1-2 stings. In 2 cases >50 stings
BEE AND WASP STING FATALITIES:
Results: Bees

Hymenoptera Allergy:

♀ 14/38 cases had definite prior histories of bee venom allergy
♀ 3/14 carried [insufficient or not Epipen] adrenaline
♀ 1/14 was receiving bee venom immunotherapy (sub-therapeutic dosing)
BEE AND WASP STING FATALITIES: Results: Bees

Case Report:

- Case 1: A 56 year-old male with ~80 stings, an apiarist with significant heart disease, stung whilst moving bees, collapsed and died within an hour

- Elevated serum tryptase (50mg/L)
- *Apis mellifera* specific IgE strongly positive
BEE AND WASP STING FATALITIES: Discussion: Bees and wasps

- We recommend that all patients with a history of systemic reactions should be assessed for immunotherapy and be educated in the use of injectable adrenaline.

- Improve CPR knowledge in high risk patients, families, and workplaces.

- Immunotherapy induced risk reduction requires maintenance dose be attained.
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- Clinical collaborators (SA Forensic Science Centre, Ray Mullins, ASCIA)
- Australian Government Department of Health and Ageing and the NH&MRC for funding support
IF YOU FIND A COLONY LEAVE IT BEE
Any Questions !?