MOULDY HOMES, DOES IT MATTER?

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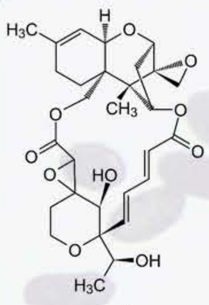
In early 2015 a coroner's report was released stating that the cold, damp living conditions in a state home contributed to the death of a two year old girl.[1] This sort of environment provides the perfect conditions for growth of moulds.

Picture of a neighbouring state home to the one in which the young girl lived
Image courtesy of RNZ

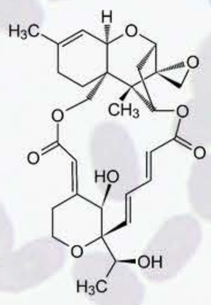
Stachybotrys chartarum is a black mould that produces some of the most potent toxins in the world. This research investigated the hypothesis that toxins from moulds are the causative agent of respiratory disorders and other diseases associated with living in low quality housing. Findings from this project could have implications on best practices for the treatment and remediation of toxic moulds present in the environment.



Satratoxin G

Two *Stachybotrys* toxins, Satratoxin G and Satratoxin H, were analysed for the first stage of the project.

These are part of a deadly class of toxins known as macrocyclic tricothecenes; Satratoxin G has a lethal dose (LD_{50}) of only 1 mg/kg.[2] For context potassium cyanide is considered toxic at 6 mg/kg.[3] This means that Satratoxin G is 6x more toxic than cyanide.

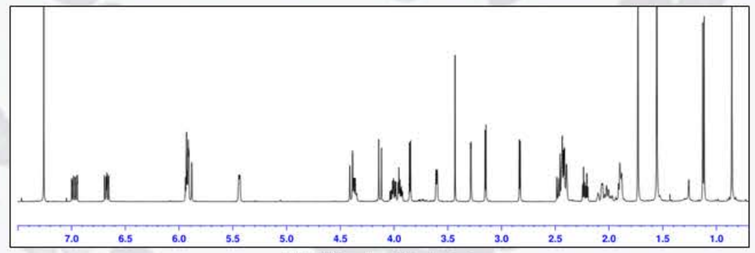


Satratoxin H

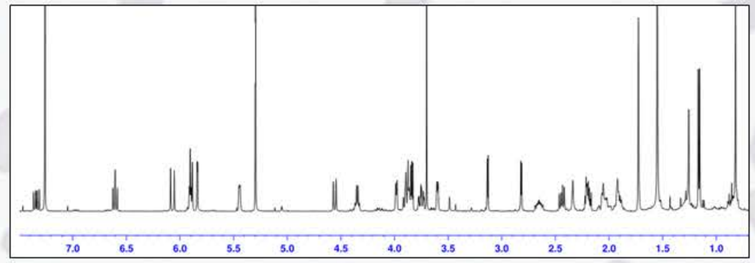
The toxins were isolated from a crude extract using separation columns. Once isolated the toxins were characterised using a variety of analytical chemistry techniques. The most important of these was a technique called LCMS, this allowed detection at nanogram levels.

Full characterisation of the toxins means that it becomes possible to detect them in the environment.

NMR was used for rapid identification and a guideline to sample purity.



^{1}H NMR Spectra of Satratoxin G



^{1}H NMR Spectra of Satratoxin H

The follow on from this project will be to test samples from the environment for the presence of these toxins. Environmental samples from homes and offices infected with moulds are being provided by the University of Otago. If the toxins are present then there are several avenues of research to consider:

- A full epidemiological study to determine if there is a significant correlation between *Stachybotrys* infection and health issues.
- Development of a rapid detection test to quickly determine whether or not a mouldy building is dangerous.
- Investigation of the environmental stimuli that cause moulds to release toxins and the relevant cellular machinery for their production

Acknowledgements:

Simon Hinkley
Kevin Mitchell
Bradley Williams
Colin Hayman

[1] Ministry of Justice. (2015). In the matter of Emma-Lita Pepe Quintanella BOURNE (Cor Ref: CSU-2014-AUK-000963).
[2] Hinkley, S. F., & Jarvis, B. B. (2001). Chromatographic method for stachybotrys toxins. *Methods in Molecular Biology (Clifton, N.J.)*, 157, 173-194.
[3] Abdel-Zaher, A. O., Abdel-Hady, R. H., Abdel Moneim, W. M., & Salim, S. Y. (2011). Alpha-lipoic acid protects against potassium cyanide-induced seizures and mortality. *Experimental and Toxicologic Pathology, 63*(1-2), 161-165.

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