Venomous bytes

Could something lethal help make us stronger? **CASEY HAMILTON** reports.

Venomous creatures have somewhat of a PR problem. Staring down at a scorpion, pincers raised and tail poised for attack, would strike fear in the hearts of many. But what if the venomous telson at the end of its tail held the cure to crippling diseases?

Deep in the corridors of the Research School of Biology, sandwiched between experimental laboratories, Professor Shin-Ho Chung and his team are using terabytes rather than test tubes to figure out the ins and outs of cell biology, including whether venom can be used for good.

The group is using the National Computer Infrastructure's new supercomputer to understand biological ion channels – intelligent molecular gate-keepers that confine some molecules inside cells while allowing others to flow out.

"It is only in the past several years that we are beginning to understand how the gate opens and closes and the way atoms navigate across when the gate is open," explains Chung.

When these channels malfunction, they give rise to neurological, muscular and autoimmune diseases. In a case of foe becoming friend, the team is looking to venomous animals for answers. Scorpions, spiders, snakes and worm-hunting cone snails produce a vast array of toxins in their venom which target certain types of channels to quickly paralyse prey.

Dr Rong Chen, who joined Chung's group last year, has been investigating the way these toxins interact with channels and plans to modify the toxins' structure to block a specific channel type.

"There is a genuine possibility we will find compounds, specifically targeted for certain ion channels, that can cure several debilitating disorders," says Chung.

Another group member, Dr Tamsyn Hilder, is focusing on designing nanotubes – tiny synthetic tubes that have the ability to mimic some functions of ion chanels. These exquisitely designed hollow pores have broad potential application, from ultra-sensitive biosensors to the treatment of bacterial infections.

"One such prototype nanotube that only lets through positively charged ions, such as potassium and sodium, mimics the function of antibiotic compounds produced by a type of bacteria," explains Chung.

The team have also succeeded in designing nanotubes that collect the salt from seawater.

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"These nanotubes may form part of a desalination membrane to more efficiently remove salt from seawater," says Chung.

"Not all research needs to be experimental. In fact, sometimes using a computational method is the best way – some experiments just aren't practical. Computational research can be more cost effective, faster and can reduce animal testing. We are solving real world problems virtually."

The drugs and technology created by the team may one day take the sting out of the scorpion's reputation. ■