New insights into pain relief drugs

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Photo by Jonathan Lindberg for Coast Guard

(Medical Xpress)—Scientists from the Research School of Biology have opened the door to a new world of pain treatments with their discovery of the exact way that pain relief drugs, such as anaesthetics, work on the body.

Dr Ben Corry and Lewis Martin developed a detailed computer model that revealed for the first time how benzocaine, a local anaesthetic, and phenytoin, an anti-epilepsy drug, enter into nerve cells and prevent the

pain signals being transmitted to the brain.

"By understanding how the current range of drugs work we can best design the next generation, to better treat conditions such as chronic pain , epilepsy and cardiac arrhythmia," said Dr Corry.

The precise knowledge of how the drug molecules attach to proteins in the nerve cell give a springboard for redesigning drugs without the side-effects that current drugs bring with them.

Their work, from the Research School of Biology at ANU is published in the latest edition of *PLOS Computational Biology*.

Local anaesthetics were first inspired by cocaine and have been in use for more than 100 years, but the exact mechanism has not been understood until now.

The pair used more than three million CPU hours on the National Computational Infrastructure's supercomputer to simulate the drug's route into the nerve cell.

Pain signals are transmitted to the brain when proteins that act as tiny gateways in nerve cell walls open, allowing sodium and potassium ions to pass through. The simulation shows that the drug's final binding site is inside the sodium gateway protein, which blocks it and prevents the signal from being transmitted.

Drugs that block sodium channels are also used to treat nerve-signal disorders such as epilepsy or heart arrhythmia. However, the current drugs target sodium channels indiscriminately throughout the body, which can lead to side effects.

Dr Corry says pharmaceutical companies are especially interested

developing new drugs designed to selectively target the subtly-differing proteins in specific locations of the body, such as the heart or brain.

"Knowledge of the fine molecular detail of the drug opens up possibilities to conceive new drugs," says Dr Corry. "Chronic pain is a big market, and an avenue I'd also like to pursue is developing antibiotics based on this approach."

Provided by Australian National University