

How the echidna lost its venom

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University of Sydney research has identified the function of the echidna's spur.
Credit: Tony Britt-Lewis

(Phys.org) —The function of a spur on the hind leg of echidnas has been revealed by research at the University of Sydney.

Male platypuses and echidnas both secrete from a spur in their hind leg. In platypuses the spur injects venom into competitors causing pain and swelling but the purpose of the echidna spur and secreted substance has been unclear.

"A waxy secretion is produced around the base on the echidna spur, and we have shown that it is not venomous but is used for communicating during [breeding](#)," said Professor Kathy Belov, lead author of the study published in *PLOS One* last week.

Professor Belov is from the University's Faculty of Veterinary Science.

Monotremes are egg-laying mammals and Australia and New Guinea are the only places in the world that have living species. Australia is home to the platypus and short- beaked echidna.

One of monotremes' unique characteristics is spurs on the males' hind legs. In platypuses the gland attached to the spur increases in size during the [breeding season](#) and produces a venom injected into competing males during the breeding season.

In male echidnas, spurs are in the same position and the glands also get bigger during the breeding season. But the spur cannot be erected and there have never been reports of envenomations by echidnas.

"There is physiological, molecular and fossil evidence to suggest the ancestors of both platypuses and echidnas were venomous," said Professor Belov.

In a collaboration with the University of Queensland, University of Tasmania, and Washington University School of Medicine, researchers from the University of Sydney compared the genes switched on in platypuses' and short-beaked echidnas' venom glands during the breeding season.

The study analysed the RNA (ribonucleic acid) molecules in the two glands, looking for similarities and differences in order to determine the function of the secretions in [echidnas](#) and to understand the evolutionary

history of the venom gland.

"We expected to see high levels of similarity between the two species but were fascinated to discover that the echidna 'venom' gland secretion was markedly different to that from a platypus," Professor Belov said.

"There was no correlation between the top 50 most highly expressed genes in the echidna and [platypus](#) secretions. They produce completely different secretions.

"Overall the echidna gland looks more like a scent gland. Instead of its aggressive spurring role the echidna's spur secretion is probably linked with either communicating its reproductive status with females or with competing males.

"Historically the monotreme gland contained venom. The loss of the echidna's ability to erect its spur and other unknown evolutionary forces have acted over millions of years," said Professor Belov.

"This evolution has resulted in the gradual disappearance of the [venom](#) in the spur secretion and the evolution of a new role for the gland."

More information: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0079092

Provided by University of Sydney

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