Tammar wallaby's clever immune tricks revealed

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A Tammar wallaby. Credit: AGRF/Vicci Crowley-Clough

(PhysOrg.com) -- Until now, it was a mystery why many marsupials have two thymuses—key organs in the immune system—instead of the one typical of other mammals. Now postdoctoral researcher Dr. Emily Wong from the University of Sydney and her colleagues have found that the two organs are identical, which suggests why they are there.

"The presence of two organs with identical function can allow the young to produce white blood cells rapidly, leading to faster development of

immune defences," Emily says. "This may be especially critical in marsupials, as they are born at an immature stage without immune tissues. They need to develop an immune system very quickly while growing in the pouch."

"It used to be believed that the marsupial immune system was more primitive than that of humans and other mammals," Emily says. "But, in fact, some aspects of the marsupial immune system appear more complex than our own—the two thymuses, for instance."

Humans and most other mammals have only one thymus, the immune organ which produces T cells, the white blood cells that act as sentries to protect us from infection. The presence of multiple thymuses was an evolutionary mystery.

A Tammar wallaby joey in the pouch. Credit: AGRF/Vicci Crowley-Clough

Using the latest DNA sequencing technology, Emily explored the genetic contents of the two organs in the Tammar wallaby. "The sequencing allowed us to compare the genetic material in the two thymuses quickly and thoroughly," she said. "And we found they were the same."

The researchers selected the Tammar wallaby because it was the first Australian marsupial to have its entire genome sequenced and published. “The availability of the genome has allowed for unprecedented insights into the marsupial immune system,” Emily says. The Tammar wallaby genome project is a joint collaboration between Australian and US scientists.

Emily’s research is part of a larger, ongoing project to understand how newborn marsupials survive in dirty pouches without an immune system.

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