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Marmosets viable in vivo models for developing immune-based therapies

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Due to close physiological replication of infectious disease pathology in humans and lower husbandry costs compared to traditional models of larger primates.

Singapore – Scientists from A*STAR's Singapore Immunology Network (SIgN) and Singapore Bioimaging Consortium (SBIC) have established marmosets as viable in vivo models for investigating human metabolic diseases, infections and immune responses, and developing immune-based therapies. They can serve as practical alternatives to larger primates that are traditionally used in biomedical research, due to significantly reduced husbandry costs and lower risks of cross-species disease transmission. In a study published in the peer-reviewed journal Nature - Scientific Reports, the research team tested the effect of the Zika virus on marmosets and found that their physiological response to the virus was similar to that of human and macaque models.

The similarity of an animal's immune response to a virus compared to a human's is the most important factor to consider when evaluating it as a model for immune-based therapies. This is because simpler cell culture models or mouse models lack the complexity of disease pathology and close replication of human physiology. In this study, SIgN researchers tested the blood, plasma, saliva and urine of marmosets that have been infected with the Zika virus and found that similar to humans, the virus could be detected in these mediums in roughly the same concentrations. Observation of the infected marmosets against a control group also seemed to show signs of a mild viral infection, some of which exhibited little or no symptoms, similar to that of human Zika patients.

However, to truly determine if the immune responses of the marmosets were similar to humans, more detailed diagnostic tests were necessary. Among them were magnetic resonance imaging (MRI) and ultrasound imaging, which helped to determine if the brain and testes of the marmosets had suffered damage, as Zika is known to infect these organs. SBIC researchers optimised the imaging methods to ensure the accuracy of the results. With these advanced imaging methods, scientists were able to determine that the brains and testes of the affected animals showed no significant difference from the control group.

Further tests of the marmoset's immune responses against the virus also showed that the antibodies produced by the

infected marmosets targeted a specific area of the Zika virus E protein. This area that the marmoset antibodies targeted on the protein was roughly the same as the one targeted when the human body mounts an immune response against Zika. This has important implications in the development of effective vaccines against Zika virus.

Aside from the most important criteria of having an immune response similar to humans being fulfilled, there are other factors that make marmosets ideal in vivo models. Due to their small size, the relative ease of handling and breeding, as well as the short gestation period and time before maturity, marmoset models offer cost effectiveness and speed. It is estimated that the cost of animal husbandry is up to 15 times lower compared to their larger counterparts, thereby permitting better utilization of limited research resources.