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Scientists discover origin of brain immune cells

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A team of international scientists led by Dr Florent Ginhoux of the Singapore Immunology Network (SIgN) of Singapore's Agency of Science, Technology and Research (A*STAR), have made a breakthrough that could lead to a better understanding of many neurodegenerative and inflammatory brain disorders. Their work, published in top scientific journal *Science*, uncovered the origins of microglia, which are white blood cells specific to the brain, and showed that, in mice, microglia had a completely different origin than other white blood cells. This understanding may lead to the development of new strategies to manipulate microglia for the treatment of various brain disorders.

Microglia have been implicated in many neurodegenerative and inflammatory brain disorders, underscoring the need to study and understand these cells. Dr Ginhoux's team is the first to show that microglia, unlike other white blood cells, are derived from a particular structure in the mouse embryo (the embryonic yolk-sac), implying that microglia may have specific functional properties not shared by other white blood cells.

In addition, Dr Ginhoux is the first to directly visualise how microglia develop in the brain. This will advance basic understanding of the mouse immune system, which is needed to understand how controlling the development of the precursors of microglia may one day be used to treat brain diseases in humans.

Prof Paola Castagnoli, Scientific Director of SIgN, commented, "Neurodegenerative diseases and inflammatory brain disorders are a major cause of suffering in the world. At SIgN, our focus and mission is to study human immunology and in particular, inflammatory reactions in human diseases. Inflammation occurs when the immune system overreacts to "danger" signals that can either be infectious or non-infectious, for instance, caused by cell or tissue damage. We know that the immune system does not work in isolation within the body, and that the interactions between immune and brain cells is occurring all the time. Therefore a better knowledge of the microglial cells' function and origin will open new avenues in the field of neuro-immunology."

Said Dr Ginhoux, "Several key experiments which were crucial to my work could only have been completed in SIgN. In particular, my work involved the use of a type of microscopy to directly visualise, in a living cell culture, how microglia colonise the brain. This is the first time this sort of work has been done, and it couldn't have been possible without the help of Dr. Lai Guan Ng, my colleague here at SIgN."

Dr Ginhoux plans to continue his investigation into how the unique origin of microglia, as compared to other white blood cell populations in the body, could give rise to the properties of microglia that makes them especially suitable for their role in the brain.

More information: The research findings described in the press release can be found in the 21 October, 2010 advance online issue of *Science* under the title "Fate Mapping Analysis Reveals That Adult Microglia Derive from Primitive Macrophages".

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