Cleaning the brain after ischemic stroke

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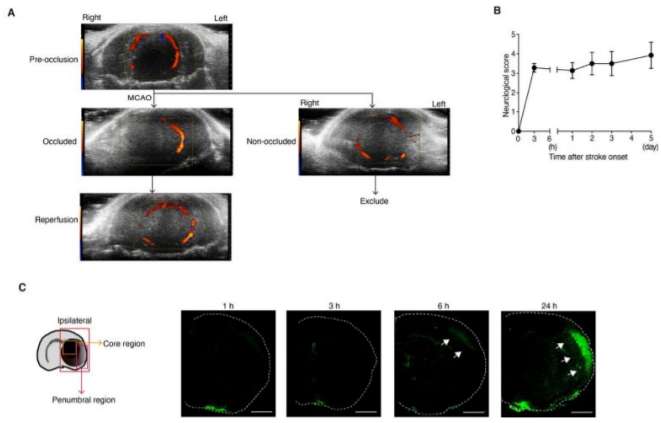

Fig. S1. Ischemic stroke model. (A) Representative doppler ultrasound imaging of arterial blood flow in brains of wild-type mice. Arterial blood flow was detected before (Pre-occlusion), just after middle cerebral artery occlusion (MCAO) (Occluded and Non-occluded) and after removing the indwelling catheter (Reperfusion). (B) Neurological scores of wild-type mice over time after MCAO (n = 14). (C) TUNEL staining of coronal brain sections of wild-type mice over time after stroke reperfusion. White arrows indicate TUNEL-positive cells. Scale bars, 1 mm. Data is presented as means ± SEM. Credit: DOI: 10.1126/sciimmunol.abe7915

It's clear that taking out the trash is an essential process in maintaining a clean and tidy home. But did you know that your body has a similar process for waste removal in which damaged cells are "thrown out"? A research team in Japan has recently shed new light on the dynamics of this process—termed efferocytosis—following ischemic stroke.

In a new study published this month in *Science Immunology*, researchers from the University of Tsukuba use a mouse model to identify the role of a key cell receptor, CD300a, in the process of efferocytosis after stroke.

During ischemic stroke, blockage of a blood vessel supplying the brain leads to disrupted blood flow, which can trigger cell death. Dying cells in turn trigger inflammatory responses that may worsen damage in the brain and lead to neurological impairment. Therefore, the elimination of dying cells through efferocytosis is a key part of minimizing the effects of ischemic stroke. However, the process of efferocytosis is not fully understood. The group led by researchers from the University of Tsukuba sought to further clarify the role of efferocytosis in ischemic stroke, particularly in the super-acute phase, which occurs within hours of the initial onset of stroke.

"We focused on cell receptor CD300a because it has been shown to be involved in efferocytosis, but its particular role in the process is not entirely clear," explains senior author Professor Akira Shibuya. "We thought that it might represent a potential target to reduce the damage caused by ischemic stroke."

To investigate the role of CD300a in efferocytosis following stroke, researchers induced ischemic stroke in a mouse model that was deficient in CD300a and found that CD300a-deficient mice showed less neurological deficits in the super-acute phase of stroke compared with stroke-induced mice that had normal CD300a expression. These effects appeared to be the result of enhanced efferocytosis in the CD300a-deficient mice, illustrating the role of CD300a in the inhibition of efferocytosis.

The researchers also found that treatment with an antibody that blocked the action of CD300a in mice with normal CD300a expression led to a reduction in brain inflammation after stroke, and that these mice even showed enhanced recovery following the blocking treatment.

"Our findings demonstrate the importance of efferocytosis during the super-acute phase of stroke and the impact of CD300a on the regulation of this process," says Professor Shibuya.

Because ischemic stroke may cause harmful neurological effects in the brain, strategies to

reduce cellular damage and inflammation following stroke are of great importance. Blocking the action of CD300a to promote the removal of damaged cells through efferocytosis may be a potential means to reduce damage after ischemic stroke.

More information: Chigusa Nakahashi-Oda et al, CD300a blockade enhances efferocytosis by infiltrating myeloid cells and ameliorates neuronal deficit after ischemic stroke, *Science Immunology* (2021). DOI: 10.1126/sciimmunol.abe7915

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