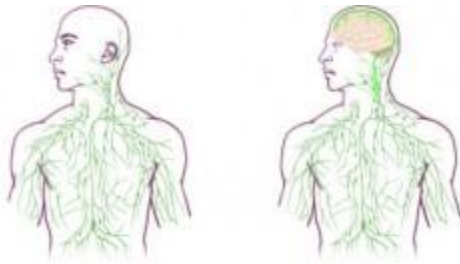


US researchers discover new structures linking the brain and the immune system

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Picture source: University of Virginia Health System

Researchers from the University of Virginia in the USA recently discovered a new structure linking the central nervous system and the immune system that had previously been unreported in the medical literature.

Published in the top medical journal [*Nature*](#), the researchers describe previously unknown lymph vessels located within the protective membrane surrounding the brain. While these are preliminary findings, they represent a tremendous step forward in our understanding of the interaction between the brain and immune system, with particular relevance for neurological disorders such as MS.

Lymph vessels are similar to blood vessels, but carry a clear fluid called lymph around the body. The lymph circulatory system runs in parallel to the blood circulatory system, and plays a vital role in providing cells with nutrients and removing toxins. Lymph fluid also transports lymphocytes – the cells of the immune system (including B cells and T cells).

Although the lymph system is connected to every other system in the body, it was previously thought not to be directly connected to the brain. The above image shows, on the left, an old map of the lymphatic system, showing the vessels stopping near the base of the skull, and on the right an updated map showing the locations of these new vessels.

The researchers suggest that these lymph vessels have gone unreported for so long in the literature because they are hidden alongside major blood vessels outside the brain, an area that is very difficult to study. They identified these vessels almost by accident, after they developed a new method to study the types of immune cells present in the brain's protective outer membrane (known as the meninges).

This presence of lymph vessels in the meninges provides a direct channel for immune cells to enter the central nervous system. With further research, this finding will help us understand exactly what role the lymph system plays in the movement of immune cells involved in MS. The meninges surrounding the brain are already known to be a key site of inflammation in MS.

The senior author of the study, Professor Jonathan Kipnis, said that '[This] changes entirely the way we perceive the neuro-immune interaction. We always perceived it before as something esoteric that can't be studied. But now we can ask mechanistic

questions. We believe that for every neurological disease that has an immune component to it, these vessels may play a major role.'

[MS Research Australia-supported](#) Associate Professor David Brown, from the University of NSW, is also working to understand the role of the lymph system in delivering immune cells into the brain. Last year he [published a study](#) demonstrating the pathways followed by a certain type of immune cell in the brain. Associate Professor Brown and his team mapped this cell pathway, and demonstrated that blocking this pathway enhanced MS-like disease in the mice. Of these recent findings, Associate Professor Brown said 'This is important work that complements the work we are doing here in Australia, and supports the importance of the lymph system not only for understanding the causes of MS but also for developing new treatment options. My earlier work in mice with MS-like disease has shown that these immune cell pathways in the brain are perturbed, and this may play an important role in the development of MS.'

These new findings raise many questions about the role of these vessels, not only for normal brain/immune interactions, but also for neurological diseases such as MS. Further research will help to disentangle these questions and provide important new avenues to accelerate treatments and cures for MS.