# Chronic stress builds highways for cancer to spread

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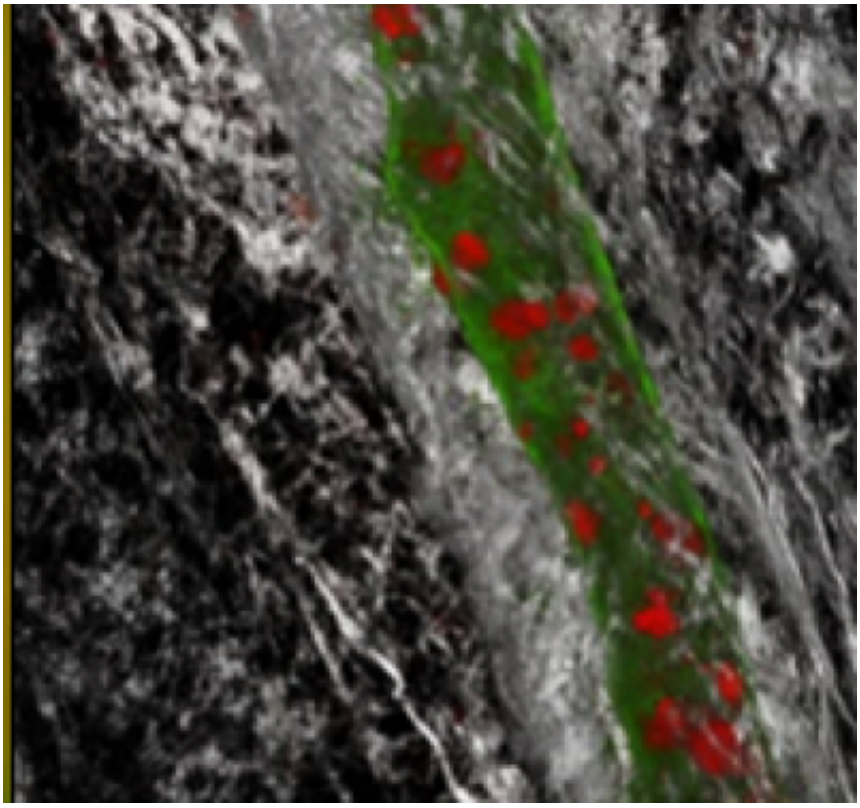

A 3D image of blood vessel (red) and lymph vessel with green fluorescent spheres (green), with tumour cells (orange). Credit: Le et al., Nature Communications.

Monash University researchers have revealed that chronic stress builds lymphatic "highways" that provide cancer cells with a faster and more efficient way to spread.

The lymphatic system helps carry immune cells throughout the body in order to fight illness, however it also plays a role in transporting cancer cells throughout the body. A study by Dr Caroline Le and Dr Erica Sloan from the Monash Institute of Pharmaceutical Sciences indicates that chronic stress can be extremely detrimental to cancer patients. High stress levels increase lymphatic activity, making the patient's own lymphatic system a more efficient and networked distributor of cancer cells.

Dr Le explained that "cancer highways" develop as a result of chronic stress, allowing cancer cells to travel more freely.

"We found that chronic stress signals the sympathetic nervous system (SNS) – better known as the 'fight-or-flight' response – to profoundly impact lymphatic function and the spread of cancer cells," Dr Le said, who undertook the work as part of her PhD research.

"These findings demonstrate an instrumental role for stress in controlling lymphatic function to impact health, and suggest that blocking the effects of stress to prevent cancer spread through lymphatic routes may provide a way to improve outcomes for patients with cancer."

To accurately monitor the movement of tumour cells, researchers tagged the cells with a fluorescent marker and used state-of-the-art imaging techniques to visualise tumour cells that had spread into lymphatic vessels. The imaging showed that stress increases the number and size of lymphatic vessels in and around tumours, while also increasing the rate of fluid flow through these vessels. Both of these combine to increase the capacity of lymphatic "highways" to carry and spread tumour cells throughout the body.

The research was a collaborative effort involving clinicians at the Peter MacCallum Cancer Centre in Melbourne and the European Institute of

Oncology in Milan. Importantly, the study shows that blocking neural signaling in patients, with drugs that are readily available and currently used to treat hypertension, regulates the function of lymphatic vessels to prevent the spread of cancer cells.

The remarkable findings have provided the groundwork for an ongoing clinical trial at the Peter MacCallum Cancer Centre and will provide clinicians and researchers with a valuable weapon in the battle against cancer, and ultimately, may provide a way to improve outcomes for patients with cancer.

Provided by Monash University