

Scientists identify novel protrusions in blood vessels of the brain

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Micrograph showing cortical pseudolaminar necrosis, a finding seen in strokes on medical imaging and at autopsy. H&E-LFB stain. Credit: Nephron/Wikipedia

Scientists from the University of Sheffield have discovered a novel behaviour of the blood vessels of the brain in zebrafish that may explain some forms of stroke in humans.

The previously undescribed [large structures](#) are spherical and so have

been termed "kugeln" (German for "sphere") by the Sheffield team, who discovered them in collaboration with scientists from the U.S. and Germany.

No cell has ever been shown to develop kugeln in the past, possibly because they are easily mistaken for normal blood vessels. Kugeln contain a molecule called nitric oxide which is essential for the health of blood vessels.

Stroke is a life-threatening condition affecting more than 100,000 people in the UK each year. Some forms of stroke are caused by mutations in genes which the Sheffield researchers have shown are required to form kugeln. Although the function of kugeln is not yet fully understood, this link to genetic forms of stroke could provide new insights into neurological and [cardiovascular research](#).

Elisabeth Kugler, a Ph.D. student from the University of Sheffield's Department of Infection, Infection and Cardiovascular Disease and the main author of the study, said: "The finding of kugeln highlights the need for [basic research](#) to understand the mechanisms of development and disease.

"This study would not have been possible without an extremely strong international scientific team, underlining the significance of working across [different countries](#)."

The pioneering research was made possible thanks to state-of-the-art imaging with a revolutionary light sheet microscope (funded by the British Heart Foundation), and the ability to study vascular development using zebrafish as a [model organism](#).

Elisabeth added: "We share 70 percent of our genes with zebrafish. Therefore, zebrafish are hugely important for understanding processes

that can lead to [human disease](#)."

The ground breaking research has been published in the journal *EMBO reports*.

Tim Chico, lead author of the study and Professor of Cardiovascular Medicine at the University of Sheffield, said: "Stroke is a devastating disease that affects millions of people and their families each year across the world.

"It is extremely exciting to discover an entirely new process that only happens in brain blood vessels, because this might explain why some mutations cause stroke but not diseases of other arteries.

"If we can discover the function of kugeln we may be able to manipulate them to reduce the effects of stroke."

The next step for researchers is to establish whether kugeln are present in human brains as well as gaining a deeper understanding of the mechanisms and functions of kugeln.

More information: Elisabeth C Kugler et al. Cerebrovascular endothelial cells form transient Notch-dependent cystic structures in zebrafish, *EMBO reports* (2019). [DOI: 10.15252/embr.201847047](https://doi.org/10.15252/embr.201847047)

Provided by University of Sheffield

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