Ion activity in mice offers insight into how to save stroke-stricken older brains

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Video Abstract

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Abstract

A critical cellular process that occurs in the wake of a stroke in mice could hint at how to salvage otherwise compromised brain tissue. Strokes happen when the flow of blood to the brain is blocked, most often by a blood clot in a vessel. This creates two zones of injury: a central core and a radiating penumbra. Deprived of oxygen and glucose, brain cells in the core can die within minutes. Those in the penumbra are not as severely damaged. But if blood flow isn't re-established within hours, those cells will succumb too. That's why fast responses to strokes are so important—especially among the elderly, who are less resilient than younger sufferers of stroke. New research shows that that disparity between aged and young brains could be due to differences in calcium ion activity brought on by stroke. After inducing stroke in old and young mice, researchers found that spontaneous calcium activity was reduced in the brains of young mice, whereas it was increased in the brains of old mice. Given that such activity is typically associated with normal, firing brain cells, the finding is surprising. But it could, at least to some extent, explain why outcomes for older stroke victims are worse than those for younger ones. Spontaneous calcium activity suggests that brain cells affected by stroke are "leaky", releasing toxic substances that are otherwise benign in normally functioning cells. Injecting older mice with drugs known to switch off signaling pathways linked to calcium activity was shown to decrease calcium release; in some cases, calcium activity was eliminated entirely. It isn't yet clear how this process plays out in the human brain. But these findings could point to new therapies that alleviate the damaging effects of stroke, possibly buying first responders to victims of stroke more time to act.