

POPULAR SCIENCE SUMMARY

The proposed research focuses on how inflammation and aging affect the structures of neurons in the brain, specifically the dendrites, which are essential for communication between nerve cells. Dendrites have a stable shape that changes when the brain is under stress or as we age, which can lead to cognitive decline. Common features for chronic stress and brain aging are increased inflammation and an imbalance in excitatory and inhibitory communication between neurons. We discovered that hundreds of genes change their expression under these conditions, leading us to identify key genes that help stabilize dendrites when excitatory signals decrease. However, we found that inflammation, particularly from interleukine-1 β , causes even more significant changes in genes expression, but the specific proteins responsible for the dendrite instability are still unknown. The project aims to understand the genes involved in these changes and to find ways to protect neurons from damage caused by inflammation. The project has two main parts. The first part will analyze how different brain cells respond to inflammation by looking at their gene activity. This will help identify key genes that make dendrites less stable. The second part will focus on discovering small molecules that can prevent these harmful changes in neurons. These potential treatments will be tested in both cells cultured in the lab and live mouse models to see if they can help protect brain function during aging and inflammation. Overall, the goal is to understand the mechanisms behind inflammation-related brain damage and to find new therapies to help prevent cognitive decline.