Answering Your Questions About

Brain Research

Q: WHAT ARE NEURODEGENERATIVE DISEASES?

In neurodegenerative diseases, neurons deteriorate, malfunction and die. The most common are Alzheimer's disease and Parkinson's disease, which afflict 5 million and 1 million Americans, respectively, according to the Harvard NeuroDiscovery Center, a research group that focuses on these disorders. Other neurodegenerative diseases include multiple sclerosis (400,000), Huntington's disease and ALS (30,000 each).

The occurrence of Alzheimer's and Parkinson's increases with age, although "early onset" variants occur as well.

The diseases start in different parts of the brain and cause different symptoms: Alzheimer's first hits the hippocampus and cortex and impairs memory and thinking; loss of dopamine-producing neurons in the basal ganglia makes movement problems predominate in Parkinson's. Symptoms worsen and broaden as neurons die throughout the brain.

Finding treatments to halt or reverse neurodegenerative diseases is the ultimate goal of much brain research. But before we can treat these diseases, we first need to understand them.

Most neurodegenerative diseases involve malformed or overproduced proteins that clump in the neuron: beta-amyloid in Alzheimer's, alpha-synuclein in Parkinson's and huntingtin in Huntington's. They are believed to play a role (as yet unclear) in cell malfunction and death.

Recent discoveries have highlighted another protein, tau, as a culprit common to neurodegenerative diseases (and TBI). Tau is essential for basic processes within the cell, so abnormalities can have profound consequences.

In their efforts to understand neurodegenerative diseases, researchers have broadened their investigations to include glia, the "other brain cells" that support and regulate neurons. They're looking beyond the brain, too, at body processes such as glucose metabolism, which appears to link Alzheimer's and diabetes. How exactly are these diseases related to aging? Why do some people live long lives and never develop them? Identifying "protective" genes or lifestyle factors may provide insights into prevention and cure.

BIOMARKERS

Neurodegenerative diseases start killing neurons long before symptoms appear. Their visible effects progress slowly. Researchers seek biomarkers, such as compounds in blood or the fluid surrounding the spinal cord, that will reveal disease activity earlier and more efficiently show whether experimental drugs work.

Extensive research campaigns such as the Alzheimer's Disease Neuroimaging Initiative (a public-private partnership) and the NIH-funded Parkinson's Disease Biomarker Program are spearheading these efforts.

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