# The Effects of Running-Induced Cathepsin B Secretion on Stroke Recovery

Despa, Ana (School: Paul Laurence Dunbar High School)

In the United States, a stroke occurs every 40 seconds. 60% of strokes will occur in females and 87% will be ischemic strokes. One modifiable risk factor for stroke severity, and subsequently stroke recovery, is exercise. Consistent exercise prior to stroke onset (i.e. exercise preconditioning), has been shown to reduce stroke severity; however, the mechanisms mediating this positive effect are largely unknown. Cathepsin B (CTSB) is a cysteine protease that increases in the blood with exercise and can cross the blood brain barrier. It plays a role in extracellular matrix remodeling and maintenance and derives the neuroprotective and pro-angiogenic protein Lg3 from its pro-peptide perlecan. This study uses brain samples from sedentary and exercise preconditioned ischemic stroke-induced female CTSB knockout mice (mice that cannot produce CTSB) to investigate if CTSB is necessary for exercise preconditioning to reduce stroke severity. Histology was performed to measure infarct volumes and capillary density. Capillary density data analysis is in progress, but no significant difference in infarct volumes was found between the sedentary and exercise CTSB knockout mouse cohorts, supporting the idea that CTSB mediates exercise preconditioning's neuroprotective role in stroke. This adds a positive dimension to this protein's role in disease, as prior research found CTSB to be harmful in epilepsy, increasing epileptic episode severity, and help mediate COVID-19 infection by cleaving the SARS-CoV-2 spike protein.

**Awards Won:**