

## **Neurogenesis in humans as a function of age, depression, and treatment"**

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UMMS Capstone for Impact

Branch: Systems Based, Hospital Based

### **Project Summary**

Throughout my time at the lab I participated on mostly the immunohistochemistry and tissue section analysis/stereology portion of the study - however these are the methods:

With IRB approval, brain tissue was obtained from the Macedonian/New York State Psychiatric Institute Brain Collection. At the time of autopsy 2 cm thick coronal blocks were frozen in dichlorodifluoromethane (-30 Celsius degrees) and stored at -80 Celsius degrees.

The hippocampal formation was dissected with a single edged blade from right hemisphere coronal blocks. The tissue was fixed in 4% PFA, at 4 Celsius degrees for 7 days, cryoprotected in increasing concentrations of sucrose (10% to 30%), sectioned coronally at 50 micrometers on a freezing microtome, and stored in 36 well boxes at -20 Celsius degrees in cryoprotectant. Consecutive 1 millimeter interval sections were immediately stained with Cresyl Violet and numbered for reference.

Immunohistochemistry was performed on 2 millimeter sections to identify immature, developing or newly generated neurons, or mature neurons.

Positional data was obtained by matching Cresyl Violet stained sections using a stereoscope low magnification (10x objective). Positive cells were selected from a random sample of sites. Sampling was performed at the 40x objective. The first slide where the DG appeared was anterior. Consecutive sections were analyzed towards the posterior until DG disappeared, with an average of 12 sections per subject.

We have used tissue samples from a large age group in individuals who were depressed and who were being treated at the time of their deaths.

### **Action Items/Outcome**

Neurogenesis, the birth and differentiation of new neurons, was originally thought to occur only during development. However, neurogenesis has been found to occur in

the hippocampus of adult rats, monkeys, and humans. Neurogenesis has been shown to increase in an enriched environment, decrease with increasing age, increase with exercise, and increase in response to learning.

Hippocampal neurogenesis has been theorized to be involved in depression and recovery with treatment. Chronic administration of antidepressants in rats has been shown to increase neurogenesis.

The data from our bank of human tissue is still in progress.

### **Conclusion/Reflection**

Depression has one of the highest disease burdens throughout the world. According to the Center for Disease Control, 5.4% Americans had current depression, with the highest rates occurring in adults ages 40-59. Additionally depression costs Americans over 50 million dollars in the workplace, likely due to the correlation between severity of depression and workplace performance. However the exact mechanism of pathology and treatment is still unclear. The hope is that the study neurogenic markers in human hippocampal tissue will help us better understand the relationship between neurogenesis and depression and may help provide new targets for drug development.