# Investigating the Effects of Human Serum Albumin and Mouse Serum on Proliferation of Neural Precursor Cells

## Executive Summary

Aging is directly correlated with reduced performance of various cell types in an organism. Our research investigated the response of cells to the age of the environment, as this could point to new methods of combating the negative consequences of aging. As part of a long-term investigation process, researchers plan to carry out a surgery in which a mouse will have half its blood replaced with "neutral" blood. As a necessary step towards this goal, we developed a cell culture (in-vitro) model to establish how two components of this neutral blood, human serum albumin (HSA) and blood serum, would affect cell proliferation at different dosages.

We sought to understand the brain stem cells' reaction to the age of the blood in the environment, so we used neural precursor cells (NPCs) in-vitro. In our first experiment, we added HSA and serum to cells' growth medium. We used young serum (YS) and old serum (OS) since we wanted to understand the nuances of how each age of serum affects proliferation. Our second experiment tested the response of cells to varying percentages of both types of serum, since previous surgeries have exchanged the blood of a young mouse with that of an old mouse. To quantify proliferation, we used a process of incorporation of a DNA base analog, bromo-deoxyuridine (BrdU), which was detected by immunostaining. Cells that divided would have BrdU (an indicator) present in their DNA, which was only the case for dividing cells. We used a fluorescent light microscope to visually analyze cells, and we collected data across the different conditions.

We found that albumin consistently benefited cell growth, suggesting that if an old mouse has its blood replaced with albumin-containing neutral blood, it will act healthier. However, we found that both YS and OS inhibit cell growth, with OS having more pronounced negative effects than YS. Although adding small quantities of serum (less than 1%) may benefit cell growth, serum has the potential to do more harm than good. These findings are significant since they suggest that albumin should be maximized in the neutral blood and the serum should be minimized, a nuanced result that wasn't known beforehand. Overall, researchers can develop refined proposals and surgical models by incorporating these findings, allowing for greater efficiency in the future of anti-aging investigation.