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Human neural stem cell derived exosomes for pre-clinical trials in porcine stroke models.

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Stroke is currently the second most fatal cause of death globally, and the leading cause of physical disability. Several potential stem cell therapies are in consideration to address the urgent need for stroke treatment, but only one therapeutic has received FDA approval for clinical trials.Standard small molecule pharmaceuticals can bypass the blood brain barrier to deliver treatment to damaged cerebral tissues, but these drugs are limited in their protective and regenerative properties. Although stem cells offer restorative abilities, whole cells cannot bypass the blood brain barrier. Recent studies suggest stem cell derived vesicles, termed exosomes, possess beneficial properties and deliver their contents directly to the site of injury. Exosomes are small lipid vesicles containing proteins and RNA that are actively secreted by several cell types and circulate in all body fluids to communicate with other cells. Via a simple intravenous injection, exosomes can deliver therapeutics in the form of proteins or RNA for the purpose of treating brain injury. The lipid bilayer capsule of the exosomes facilitates the movement of contents from the blood stream to damaged tissues. The objective was to collect neural stem cell (NSC) exosomes for evaluation in a porcine middle cerebral artery occlusion model. Gathering information on vesicle concentration and average exosome output by human NSCs in a controlled environment enables the scale up of production necessary for the sale of a biopharmaceutical. The success of exosome products demands optimization of more efficient purification methods. By examining shortcomings in conventional methods of cell culture, ArunA Biomedical can improve yield and minimize costs of NSC exosome production. The success of a production run supports the large-scale manufacturing processes of exosomes in quantities relevant for large animal studies. These processes will be critical as these new technologies are transferred to biomanufacturing under quality control systems required for human clinical trials of exosome therapeutics.