Effect of 2-octylcyanoacrylate on placenta derived mesenchymal stromal cells on extracellular matrix.

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Public Summary:
Mesenchymal stromal cells (MSCs) are stem cells that can be isolated from various sources such as bone marrow, adipose (or fat) tissue, amniotic fluid and placenta. These cells have a variety of potential therapeutic applications given their regenerative properties and immunomodulatory profile. Our lab focuses on studying placenta derived mesenchymal stromal cells (PMSCs) and translating their use in the fetal environment to treat various birth defects. One aspect of this work involves creating an optimal vehicle to both deliver and maintain the cells within a region of clinical interest. Previous work in our lab has characterized the process by which we grow PMSCs and seed them on extracellular matrix derived from porcine small intestine submucosa (SIS-ECM, Cook Biotech), our delivery vehicle of choice. This study investigates the effect of 2-octylcyanoacrylate, a commonly used medical glue, on PMSCs seeded onto SIS-ECM to determine if the glue can safely be used to secure our cell seeded matrix patch in place. We investigated the effect the glue had on cellular metabolic activity and the secretory profile of key growth factors. We found that exposure to 2-octylcyanoacrylate decreased metabolic activity and secretion of three key growth factors of PMSCs seeded on SIS-ECM. Thus, we advocate for caution in using 2-octylcyanoacrylate glue when working with cell engineered scaffolds as its inhibitory effects on cell growth and secretory function may limit the therapeutic potential of cell-based interventions.

Scientific Abstract:
PURPOSE: Determine the effect of 2-octylcyanoacrylate on placenta derived mesenchymal stromal cells (PMSCs) seeded onto extracellular matrix (ECM) in order to assess its biocompatibility as a potential adhesive for in-vivo fetal cell delivery. METHODS: PMSCs isolated from chorionic villus tissue were seeded onto ECM. A MTS proliferation assay assessed cellular metabolic activity at various time points in PMSC-ECM with direct, indirect, and no glue contact. Conditioned media collected prior to and 24 hours after glue exposure was analyzed for secretion of human brain-derived neurotrophic factor, hepatocyte growth factor, and vascular endothelial growth factor. RESULTS: Direct and indirect contact with 2-octylcyanoacrylate results in progressively decreased cellular metabolic activity over 24 hours compared to no glue controls. Cells with direct contact are less metabolically active than cells with indirect contact. 24 hours of glue exposure resulted in suppression of growth factor secretion that is near complete with direct contact. DISCUSSION: Exposure to 2-octylcyanoacrylate results in decreased metabolic activity and decreased measurable secretion of growth factors by PMSCs seeded onto ECM. Thus, the application of 2-octylcyanoacrylate glue should be limited when working with cell-engineered scaffolds as its inhibitory effects on cell growth and secretory function can limit the therapeutic potential of cell-based interventions.