Introduction
Cell sheet engineering has emerged as a versatile method for direct cell transplantation or creation of three-dimensional multilayered thick tissue structures without the need of biodegradable scaffolds. Viable cell sheets from different cell types were successfully harvested from temperature-responsive polymer surfaces and already used for clinical applications [1]. We demonstrate an alternative methodology for assembling and harvesting of stem cell sheets based on applying of electrical potential to conductive indium tin oxide surfaces (ITO) functionalized with polyelectrolyte multilayer (PEM) coatings [2].

Materials and Methods
We established critical parameters for isolation of placental derived mesenchymal stem cells (PD-MSCs) [3]. Following this we created PD-MSC sheets on ITO surfaces functionalized with PEM coatings assembled from 9 alternating layer pairs of cationic poly (allylamine hydrochloride) (PAH) and anionic poly (sodium-4-styrenesulfonate) (PSS). Resulting cell sheets were analyzed for morphology (light and confocal microscopy), viability (life/death stain), vitality (WST-1 assay), phenotypic profile (FACS), and plasticity (mesodermal differentiation). Live, undifferentiated PD-MSC sheets were then harvested from the conductive surface by applying of electrical potential.

Results
We showed that conductive ITO surfaces functionalized with [PAH-PSS] support adhesion and outgrowth of human mesenchymal stem cells and allow formation of live, dense stem cell sheets. The resulting cell sheets retained their phenotypical profile and could be differentiated towards mesodermal lineage in vitro (Figure 1). Moreover, we were able to recover undifferentiated PD-MSC sheets from these functionalized conductive surfaces (Figure 2).

Discussion and Conclusions
Conductive surfaces functionalized with PEM support formation differentiation and controlled recovering of intact stem cell sheets.

References

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Disclosures
No competing financial interests exist