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Abstract

Cell culture studies routinely seek to monitor cell migration in response to chemoattractant stimuli. Common assays of cell migration employ well inserts and vertical cell migration assessment. This approach does not allow real-time monitoring of cell behavior. To address this need, we sought to develop a horizontal culture platform conducive to time course cell assessment changes in migration, morphology, phenotype etc. Modification of a commercial chamber slide allowed us to quantify cell migration in response to a 20% serum gradient. Based upon this finding, we designed and fabricated a prototype chamber slide for high replicate, real time assessment of cell migration in the serum gradient. The novel chamber slide design was effective for quantifying not only cell migration differences but visualizing cell movement. Optimization of the fabricated design will provide a novel tool for cell biology research.

Methods

The human breast epithelial cell line, MDA-MB-231, from ATCC was grown in 10% serum containing DMEM/F12 media.

Nunc 8 well chamber slides were modified by using a heated 0.8mm needle to bore a channel between wells for horizontal migration assay.

A 3D printer was used to fabricate a novel chamber slide prototype capable of real-time imaging and quantitation of horizontal cell migration.

After 24 hr of migration into serum free or 20% serum containing media wells, cells were fixed with 4% paraformaldehyde, stained using hematoxylin, then counted using an inverted Leica microscope.

Differences in cell migration numbers were calculated using GraphPad software and a Student's t-test.

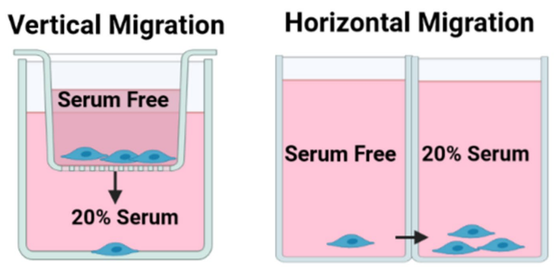

Figure 1. Comparison between vertical and horizontal cell migration assessments.

Results

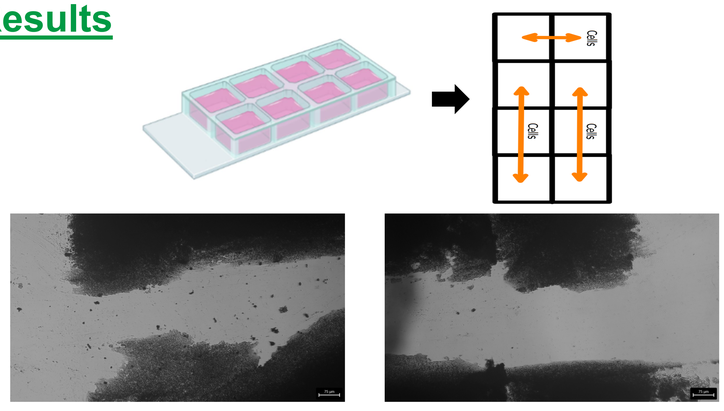

Figure 2. Cell migration in a serum gradient in modified commercial chamber slide. MDA-MB-231 cells were allowed to migrate towards either serum free or 20% serum containing media for 24 hr then cell numbers were counted.

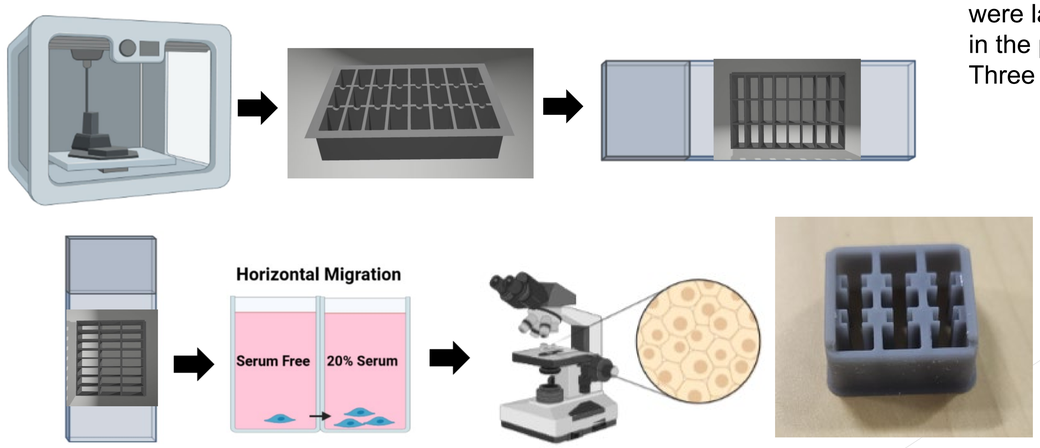

Figure 3. Design of a novel 24 well chamber slide prototype. A prototype chamber slide was fabricated to allow replicates of 8 horizontal migration assays per slide. **Current model prototype with slide advancements pictured far right.**

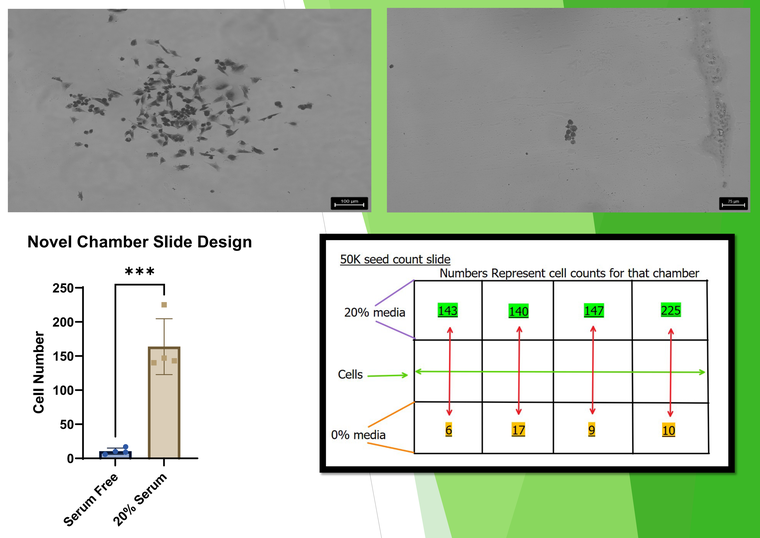

Figure 4. Cell migration in a serum gradient in prototype chamber slide. MDA-MB-231 cells were allowed to migrate towards either serum free or 20% serum containing media for 24 hr then cell numbers were counted.

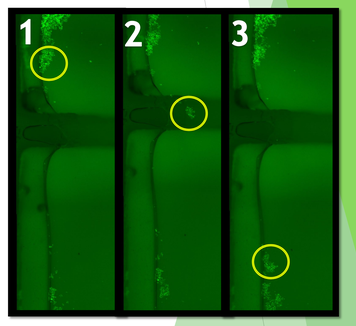

Figure 5. Time-lapse imaging of cell migration. MDA-MBA-231 cells were labeled with Cell Tracker Green CMFDA dye and allowed to migrate in the prototype chamber slide for 24 hr, taking pictures every 2 hours. Three consecutive representative images are shown.

Conclusions

- **A chamber slide format allows real-time monitoring of cell migration.**
- **The fabricated, novel chamber slide prototype provides a unique tool for future work focused on cell migration.**

Acknowledgments

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