

Effects of Low Glucose on Cell Motility and Invasiveness in Oral Squamous Cell Carcinoma (OSCC) In Vitro

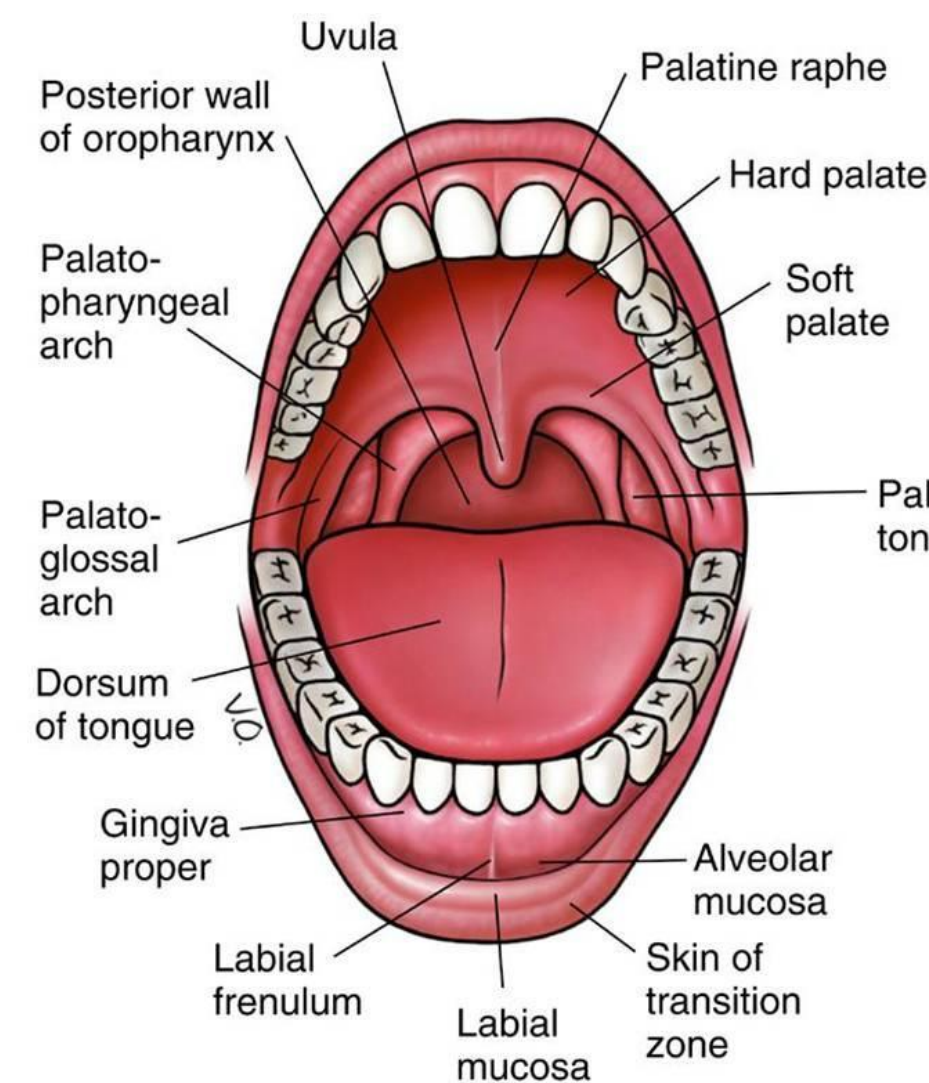
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Introduction

Oral Cancer

- Quick spreading malignant tumors associated with high mortality and a poor prognosis that have had an increase of occurrences since the mid 2000's
- Most common in those 40+ and in men
- Can appear as white spots, sores, thick patches, or swelling in or on the mouth.

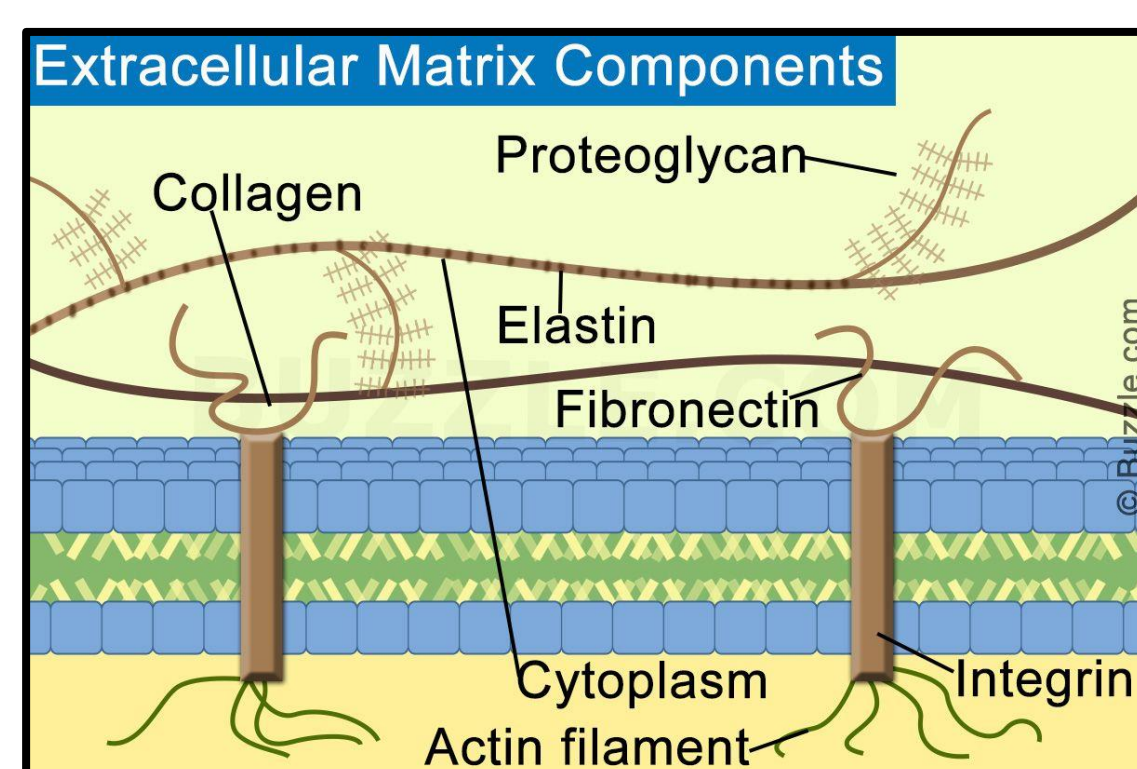


Human Papillomavirus (HPV)

- HPV is a very common sexually transmitted disease millions of Americans contract every year.
- Certain strands of HPV can be cancer-causing, making those who catch it at higher risk of oral cancer.
- Those with HPV+ oral cancer typically have a better prognosis.

Extracellular Matrix (ECM)

- Cells have different types of receptors that regulate signaling pathways, helping them navigate ECM stiffness and remodeling
- Cell movement and the remodeling of the ECM within the tumor microenvironment (TME) is regulated through cell communication and cytokines.

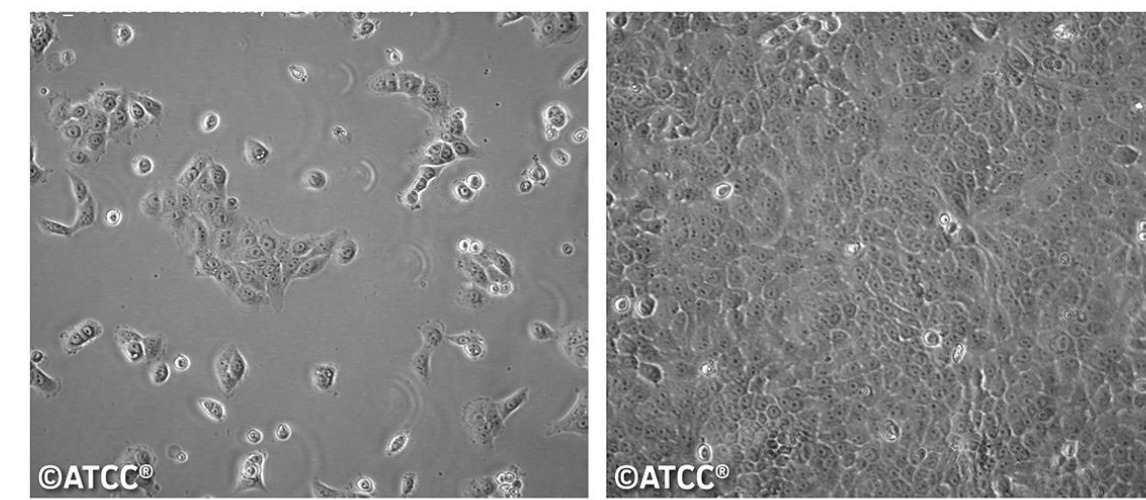


Glycolysis

- Some cancer cell types prefer to use glycolysis over oxidative phosphorylation, as described by the Warburg effect.
- Glycolysis produces adenosine triphosphate (ATP) at a lower rate than oxidative phosphorylation.
- Glucose is used to fuel glycolysis, supporting cellular mechanisms including proliferation, cell motility, and communication.

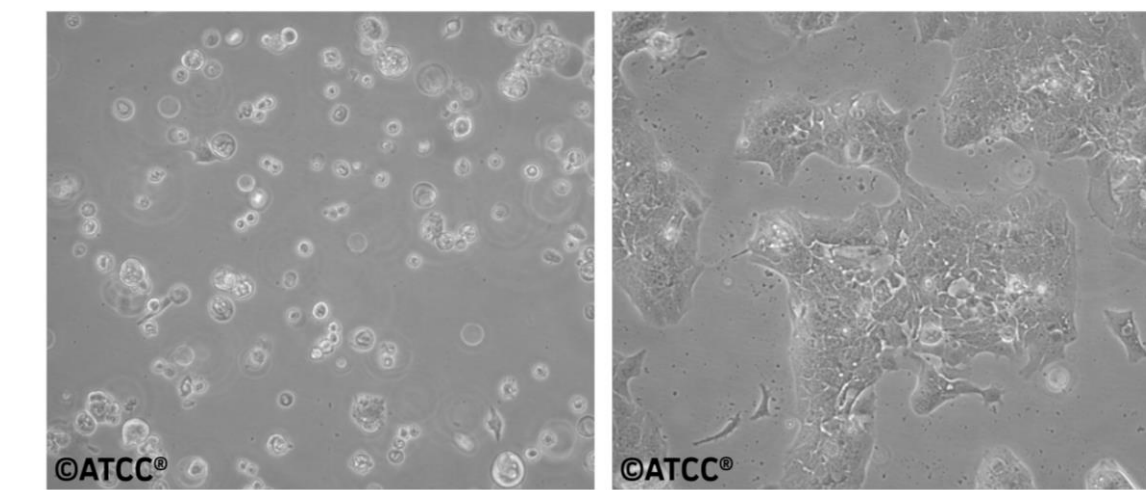
Cell lines

Cal 27 (HPV-)



- Homo sapiens
- Squamous cell carcinoma from mid tongue

SCC 090 (HPV+)

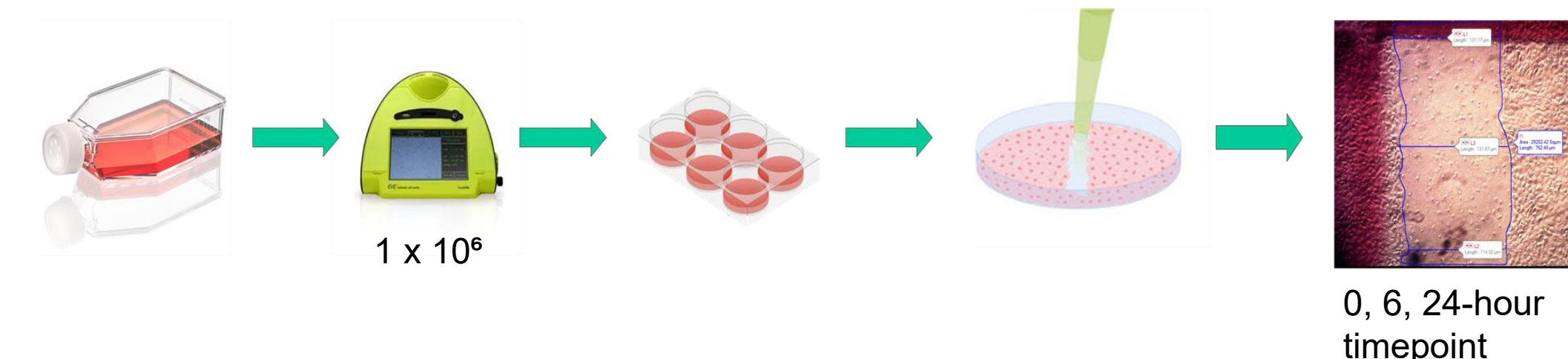


- Homo sapiens
- Squamous cell carcinoma from base of tongue

Experimental Design

Wound Healing Assay

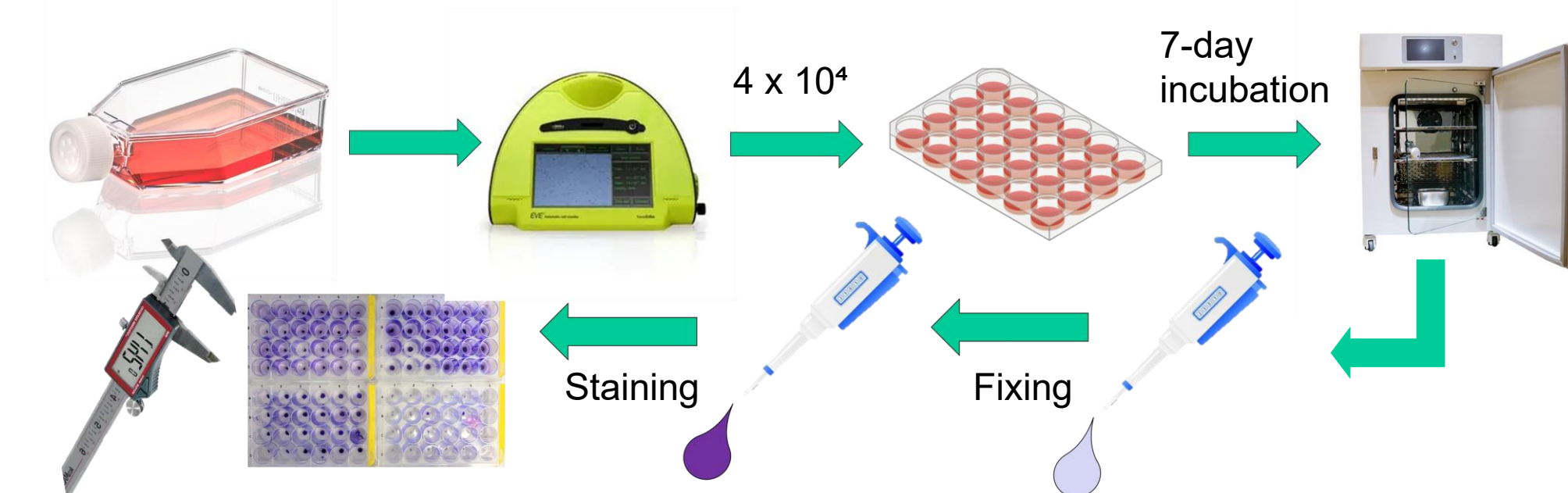
Rate of motility: $\frac{(\text{Initial width}) - (\text{Final width})}{(\text{Duration of migration})}$



- 6-well plates seeded at 1×10^6 cells per well
- Cells scratched and then medium changed to low glucose
- Images taken at 0, 6, and 24-hour time points then measured

Invasiveness assay

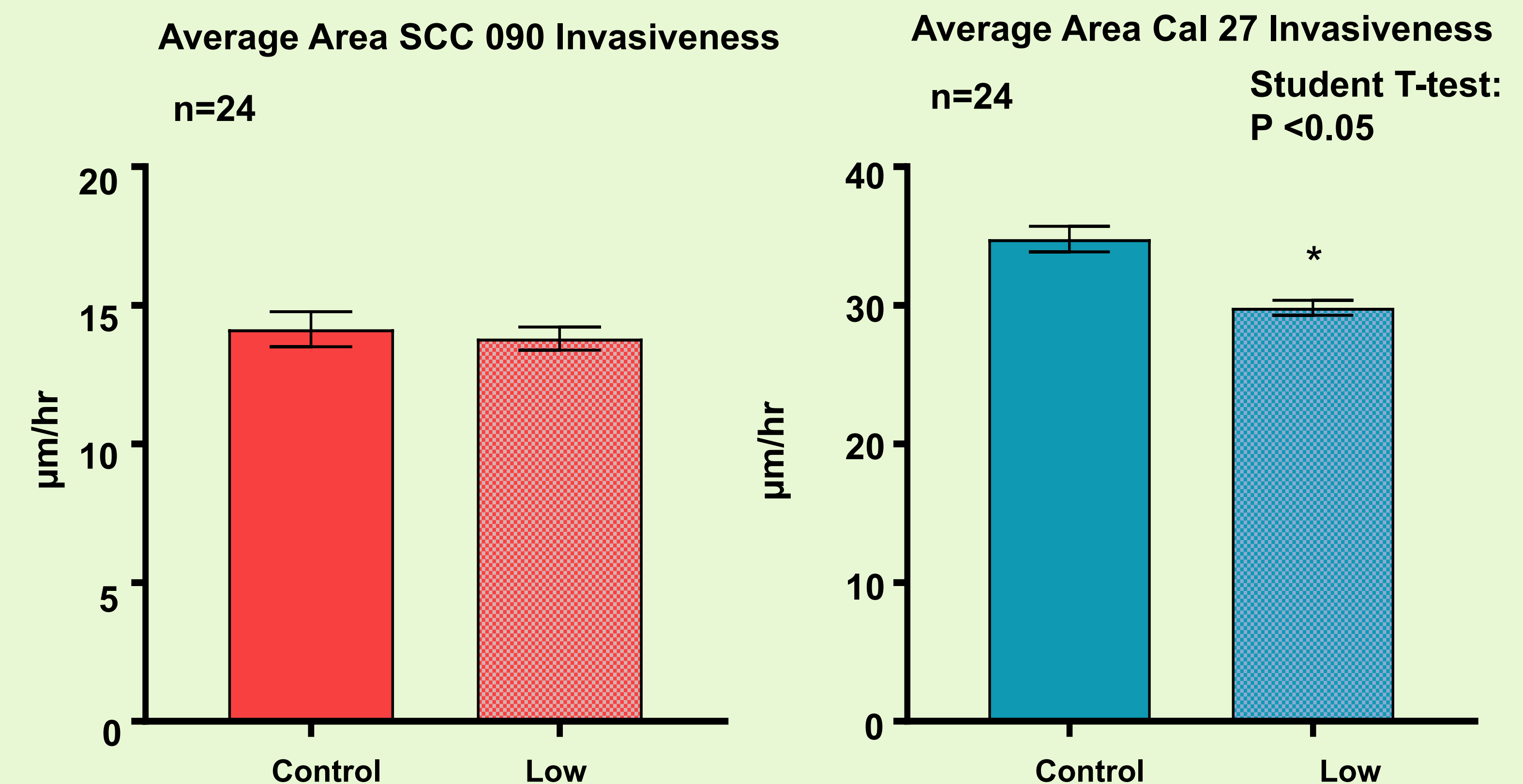
Area: $(\text{Diameter}_1/2) \times (\text{Diameter}_2/2) \times (\pi)$



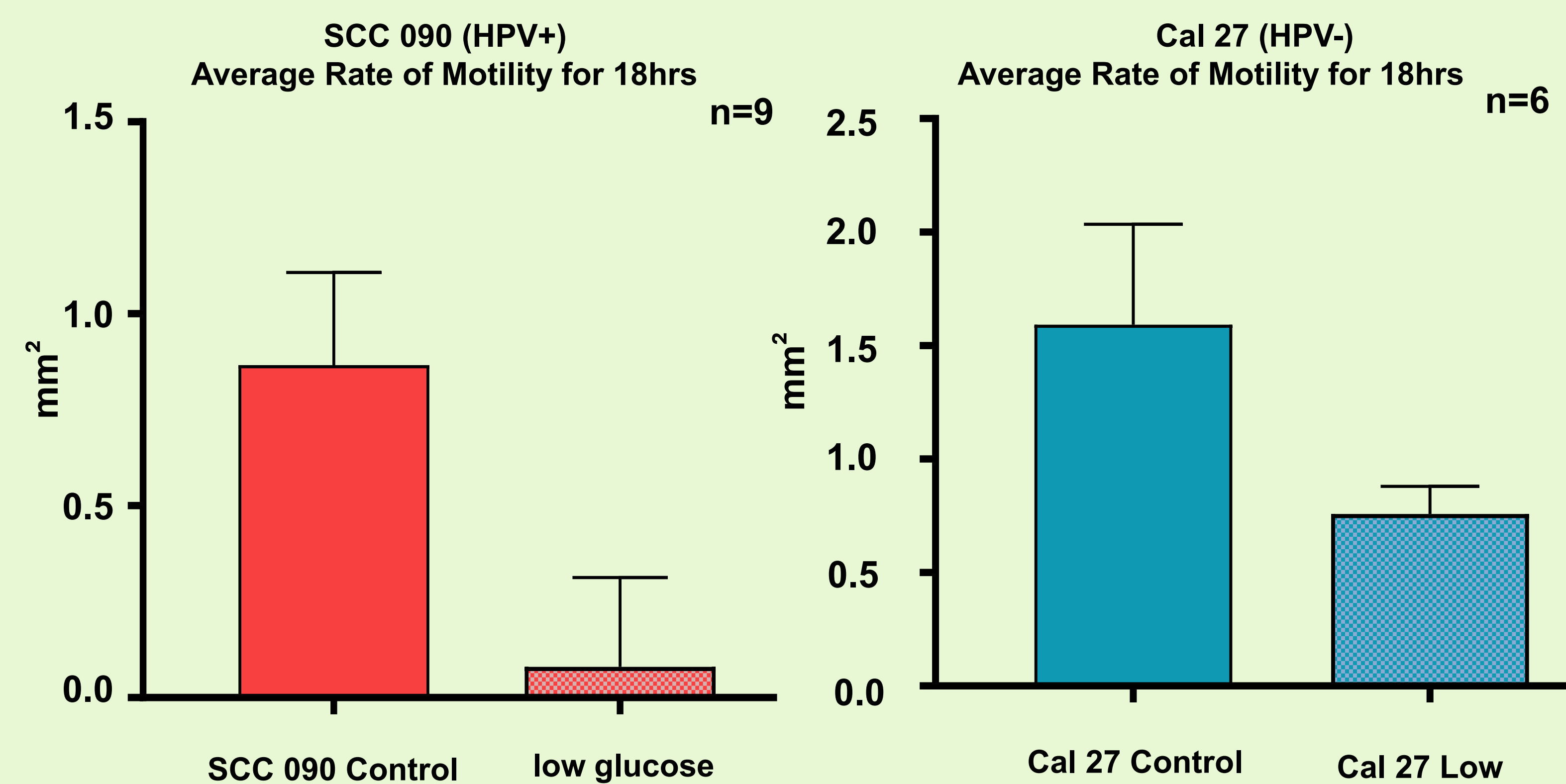
- Prepared matrix with 1% agarose and low glucose mix in 24-well plates
- Cells seeded at 4×10^4 cells per well
- Incubated for 7 days
- Fixed with 10% neutral buffered formalin and then stained with crystal violet
- Imaged and measured

Results

Invasiveness Assay



Motility/ Wound Closure Assay



Our invasiveness assays showed no significant difference between the invasiveness of SCC 090 (HPV+) cells in separate low and control glucose conditions over the 7-day incubation period; however, there was a significant difference for Cal 27 (HPV-) between low glucose to control.

There was no significant difference found in motility rate of the Cal 27 (HPV-) or SCC 090 (HPV+) cell lines when comparing low glucose to control during an 18-hour time period.

Future Directions

- Proliferation assay
- Molecular assays to elucidate mechanisms of regulation of motility and invasiveness