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India Barnett

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# The Establishment of 3D Human Colorectal Cancer Spheroids

India Barnett and Dr. Thu Annelise Nguyen

Diagnostic Medicine/Pathobiology

College of Veterinary Medicine

Kansas State University



## Abstract

Three-Dimensional (3D) cell culture plays an important role in cancer biology by providing a life-like microenvironment as a model for drug discovery and treatment. Hydrogels, like many other 3D scaffolds, demonstrate a unique property as matrices for 3D cell culture. The goal of this project is to establish a 3D cell culture for colorectal cancer and apply this 3D model to drug testing. Colorectal cancer is one of the most common cancers in the United States with an early detection rate of 39%. Previously, 2D cell culture of human colorectal cancer cells, SW480, was used to determine the efficacy of anticancer drug PQ1 through the gap junction enhancement. 200 nM PQ1 showed a 4-fold increase of gap junctional cell communication and subsequently decreased cancer cell growth. Thus, the current project is to use commercially available 3D matrix, PGMMatrix, to create colorectal cancer spheroids. The results showed a successful establishment of 3D spheroids of 4 colorectal cancer cell types: SW480, SW620, HT-29, and Caco-2. The following experiment is to determine viability rate influenced by doses of PQ1 in the established 3D spheroids. The significance of this research was not only to generate 3D tumor-like spheroids as model for in vivo model, but also to compare drug response between 2D and 3D cell cultures.

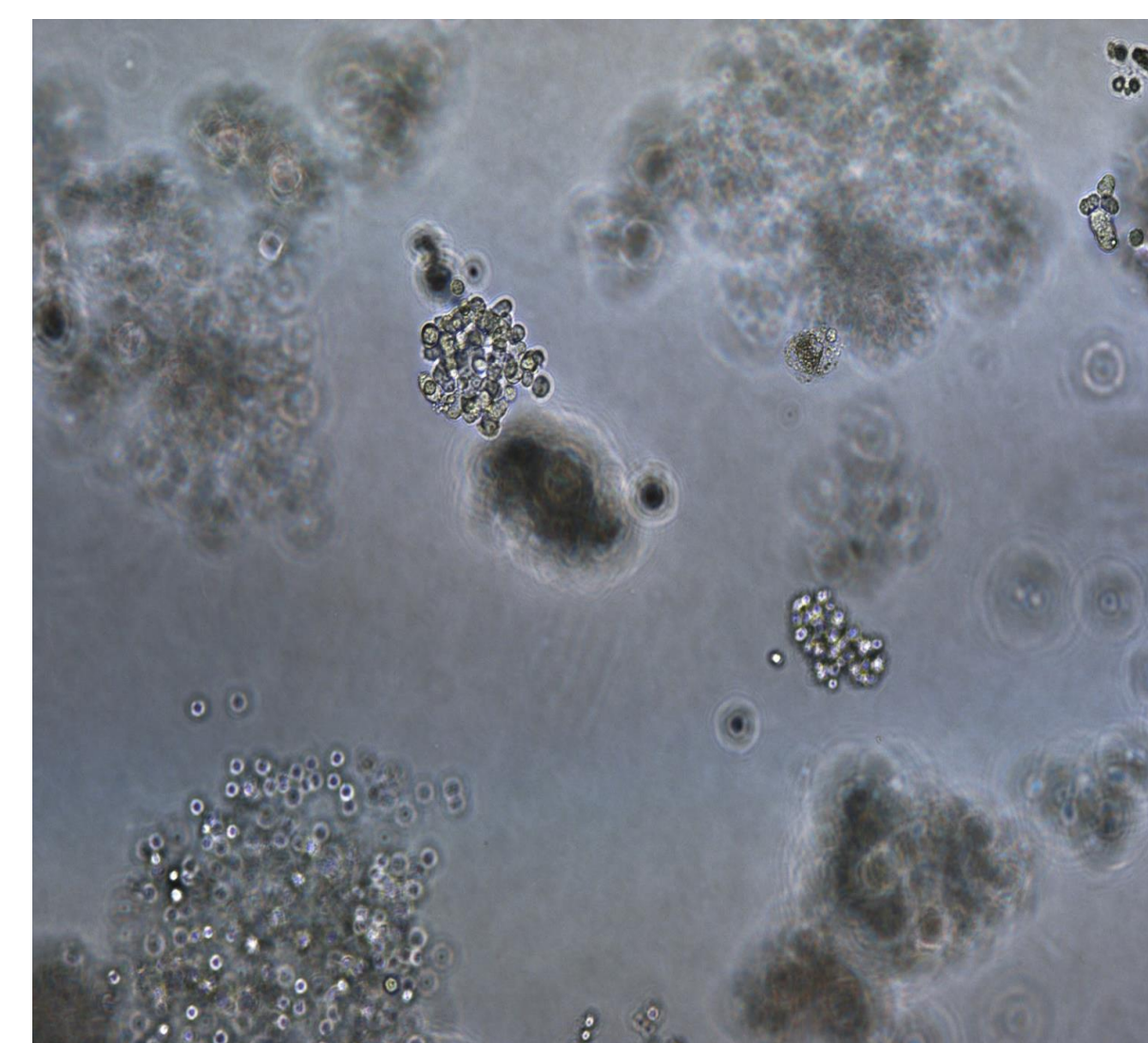
## Introduction

Biomedical industries are constantly seeking novel materials to advance biotechnologies for human health improvement. 3D cell culture technology has been recently recognized as a unique system enabling to understand in depth about life science in vivo, and then further investigate how to effectively regenerate human organs, therapeutic medicines, advanced diagnostic tools, etc. Thus, our laboratory has demonstrated that a new self-assembling peptide hydrogel for cell culture system presents many unique properties, overcame the drawbacks of current materials. The discovery of new hydrogel (the origin of PepGel technology) provides easy and safe for *in situ* cell encapsulation, injectable material, and effective and safe for cell recovery from hydrogel matrix. One of the applications of this technology is the use in generating 3D spheroids.

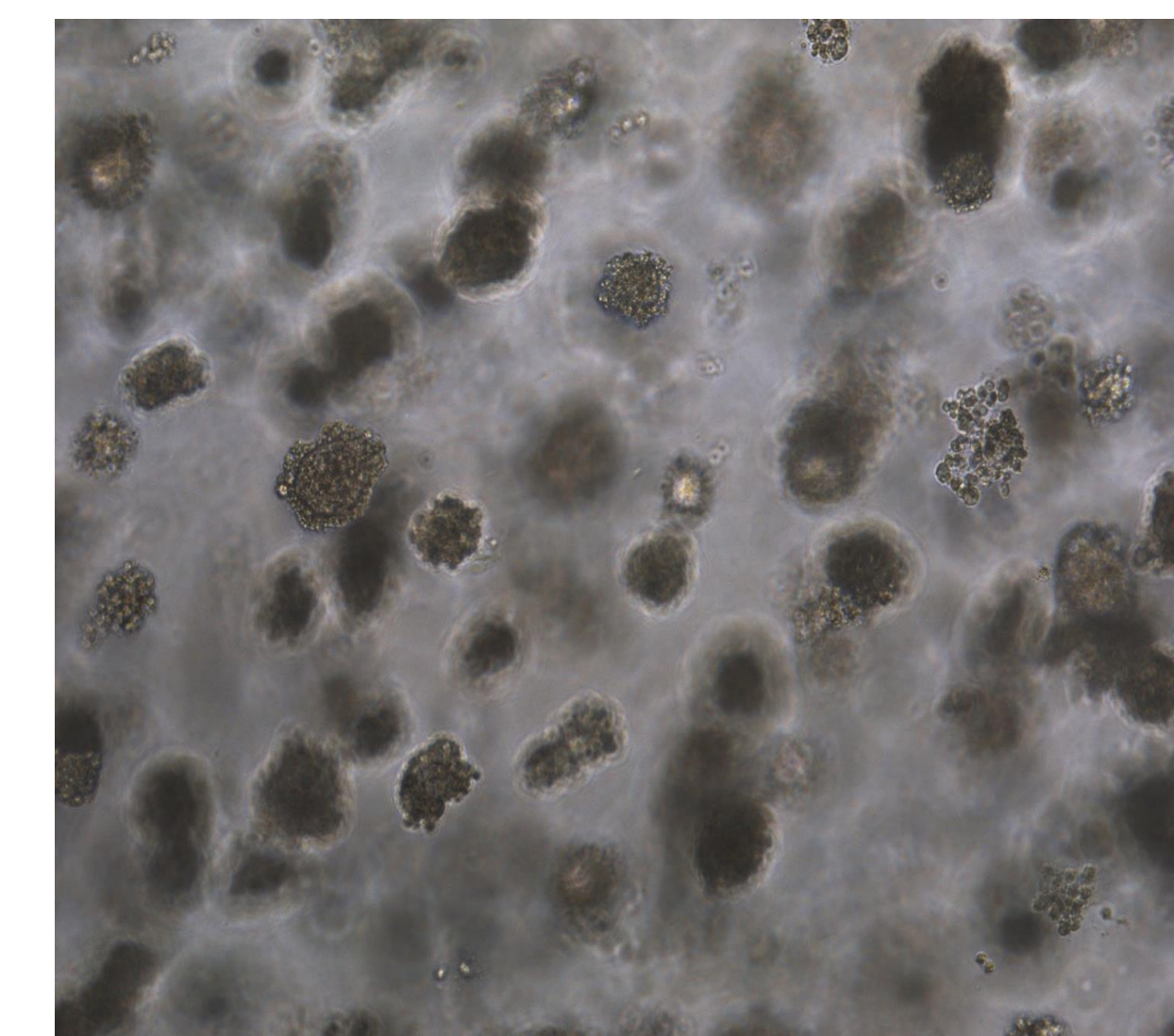
## Objective

The goal of this project is to establish a 3D cell culture for colorectal cancer and apply this 3D model to drug testing.

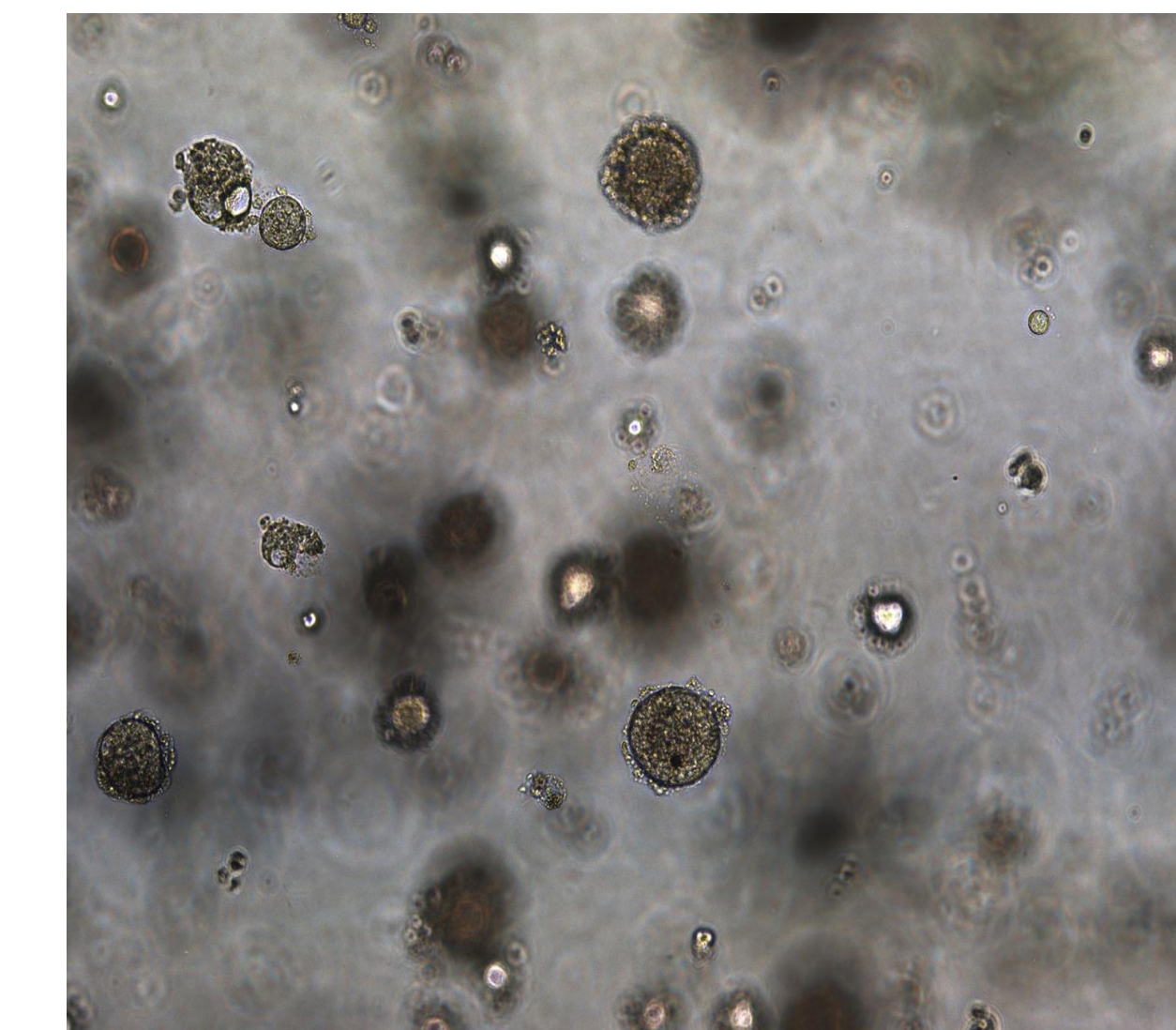
## Results



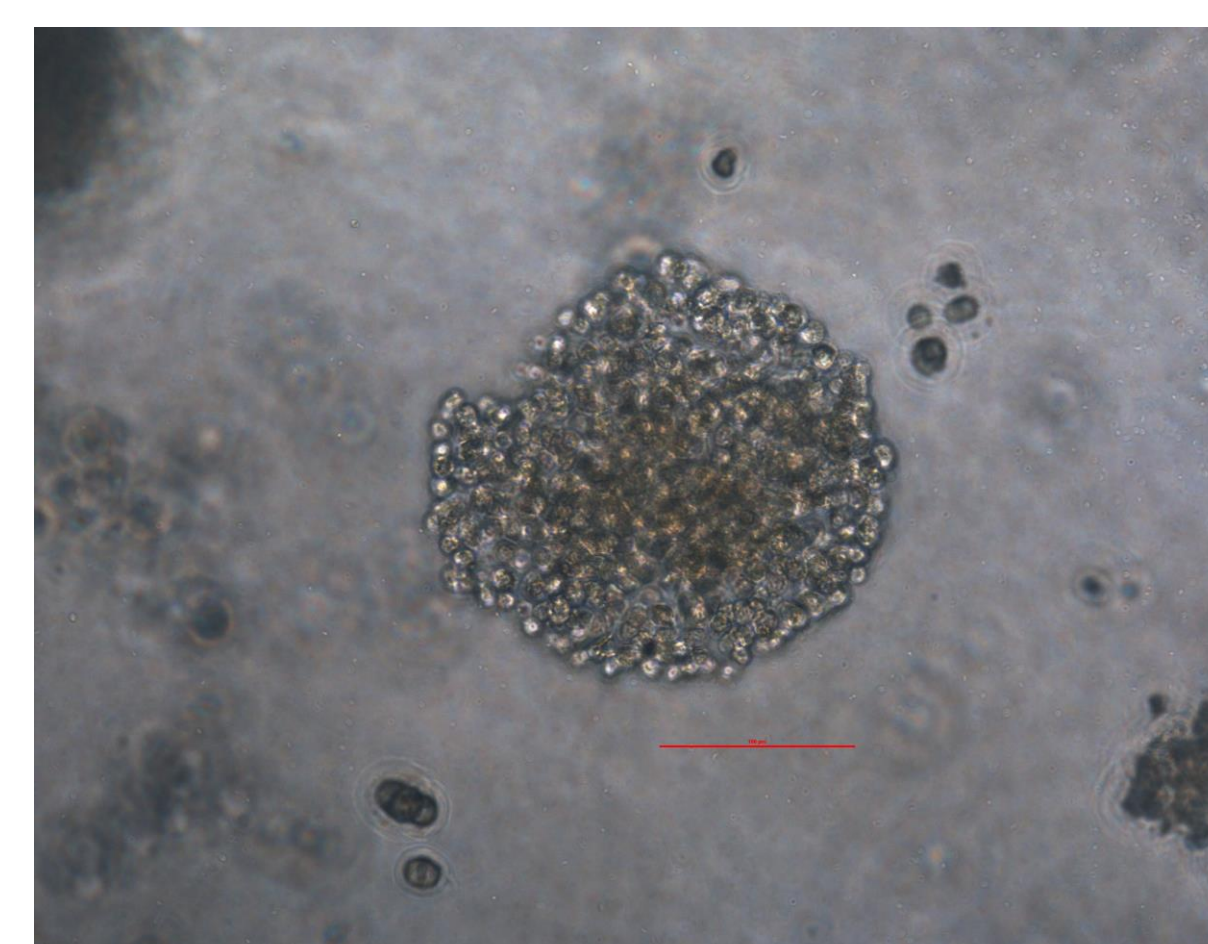
SW480 @ Day 11



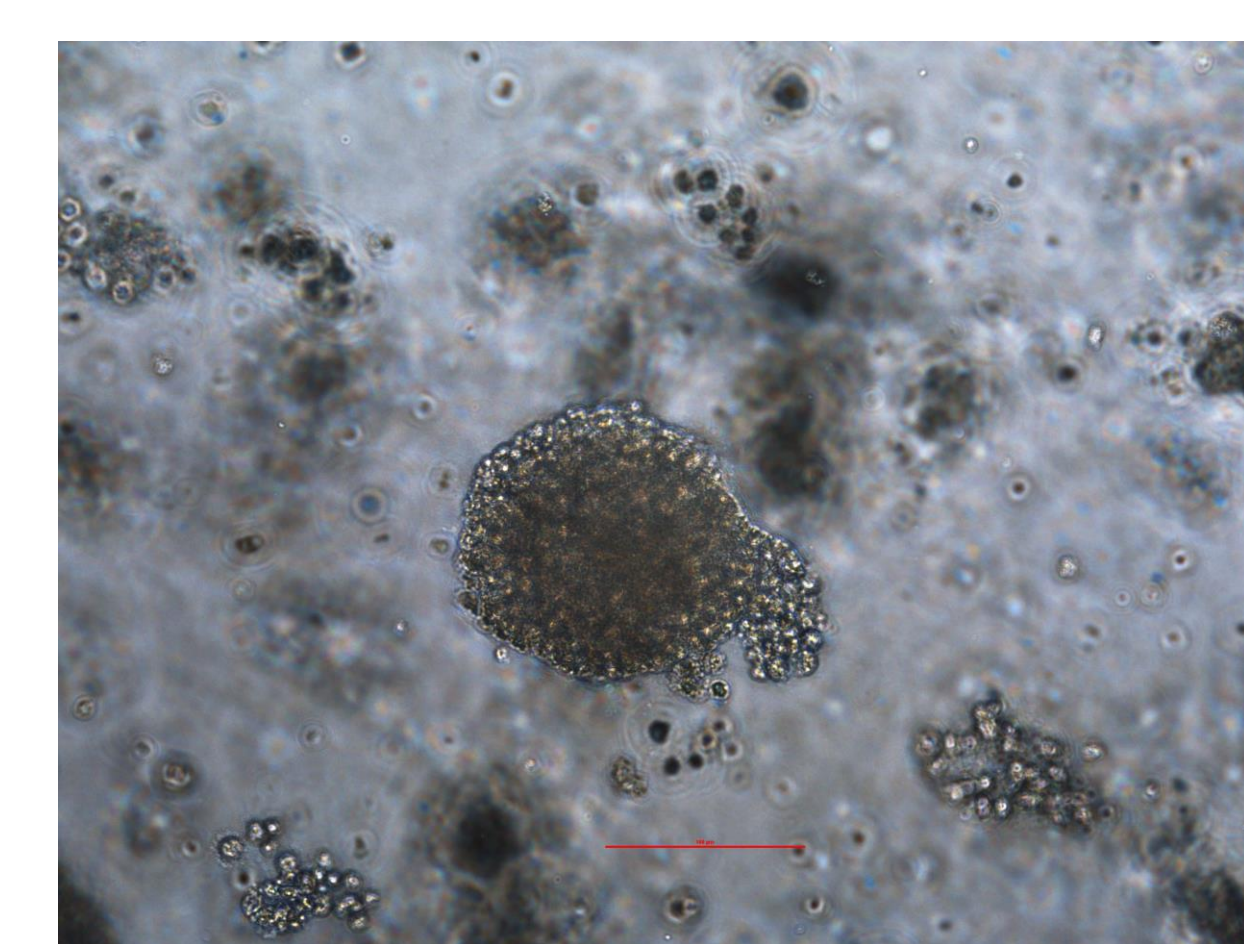
SW620 @ Day 13



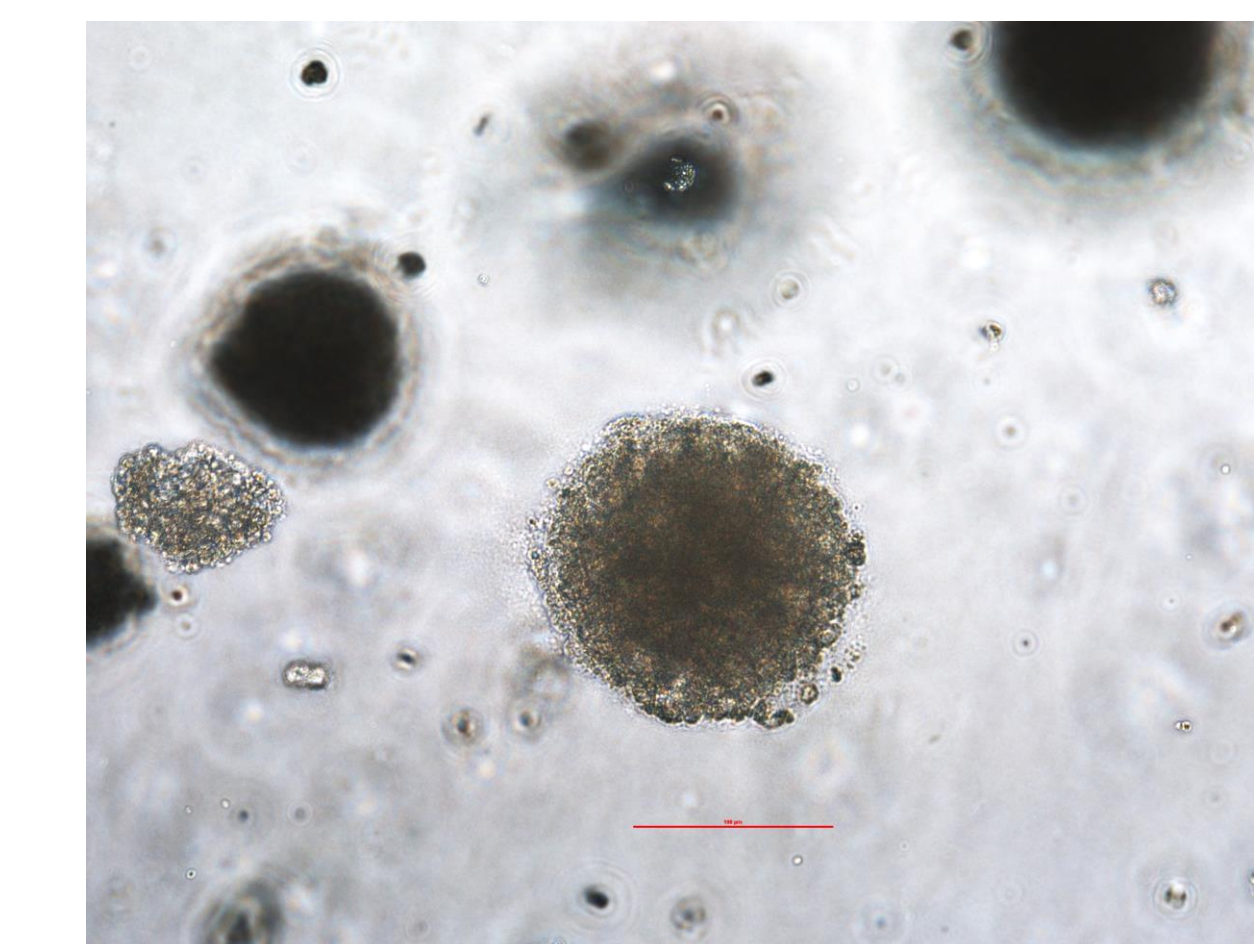
HT29 @ Day 18



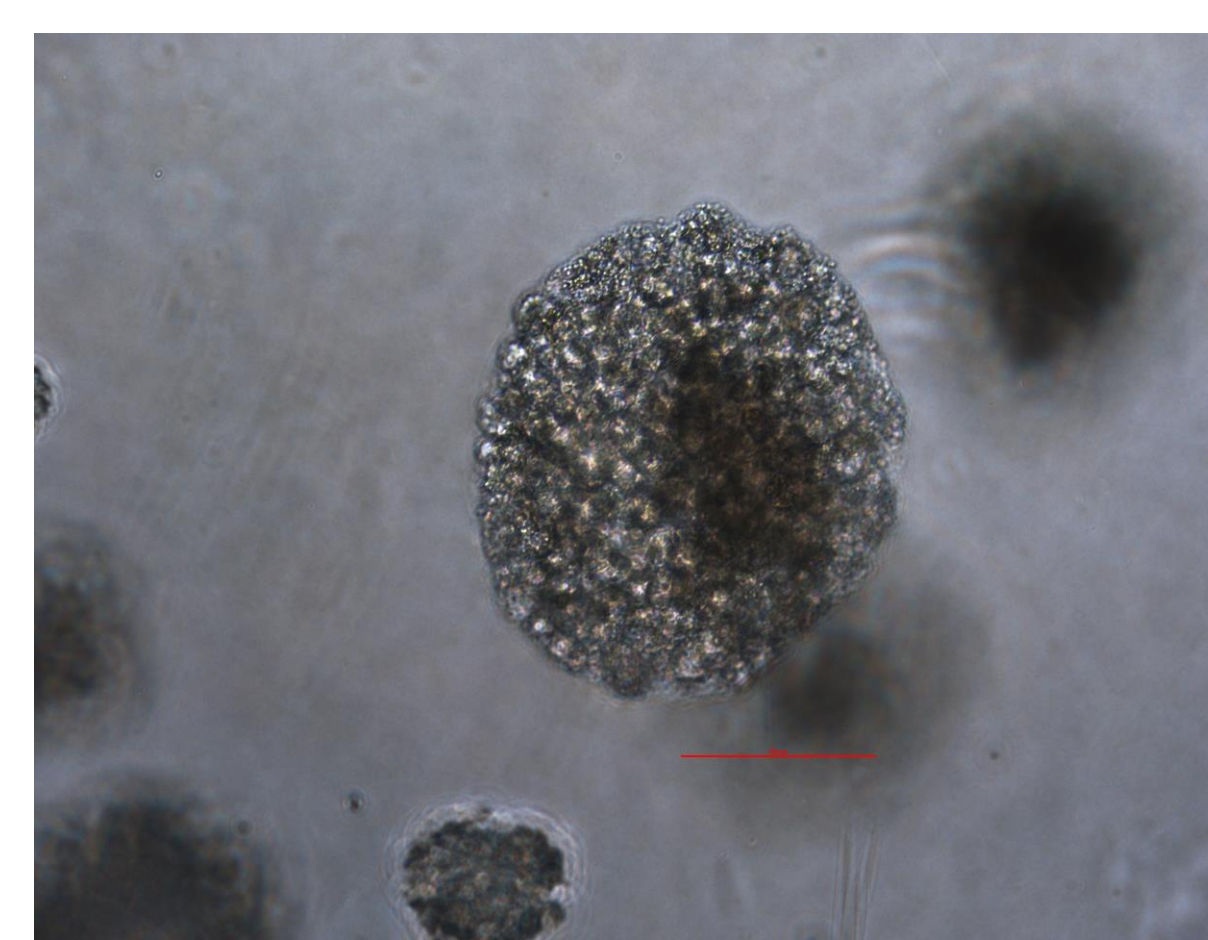
SW480 @ Week 6



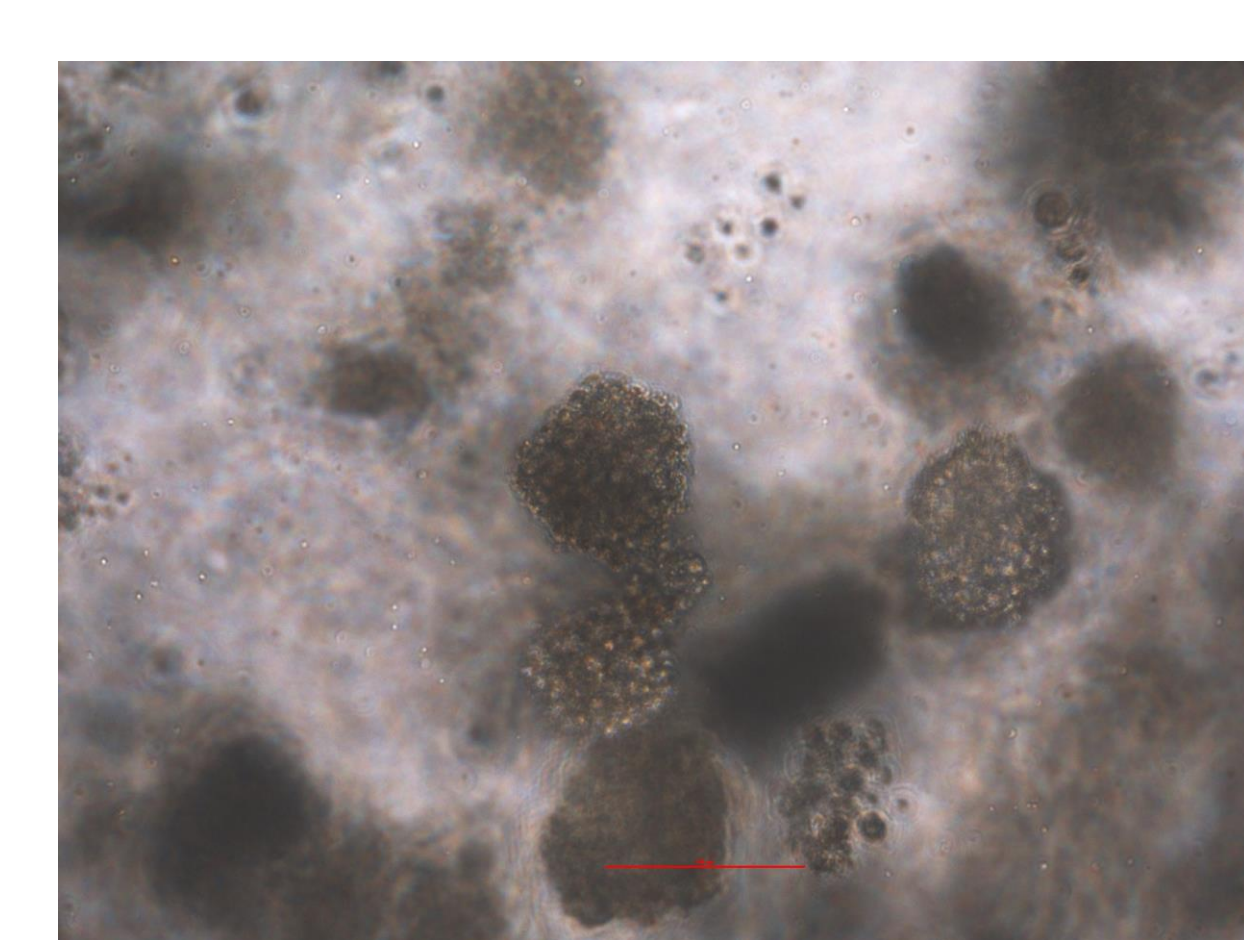
SW620 @ Week 6



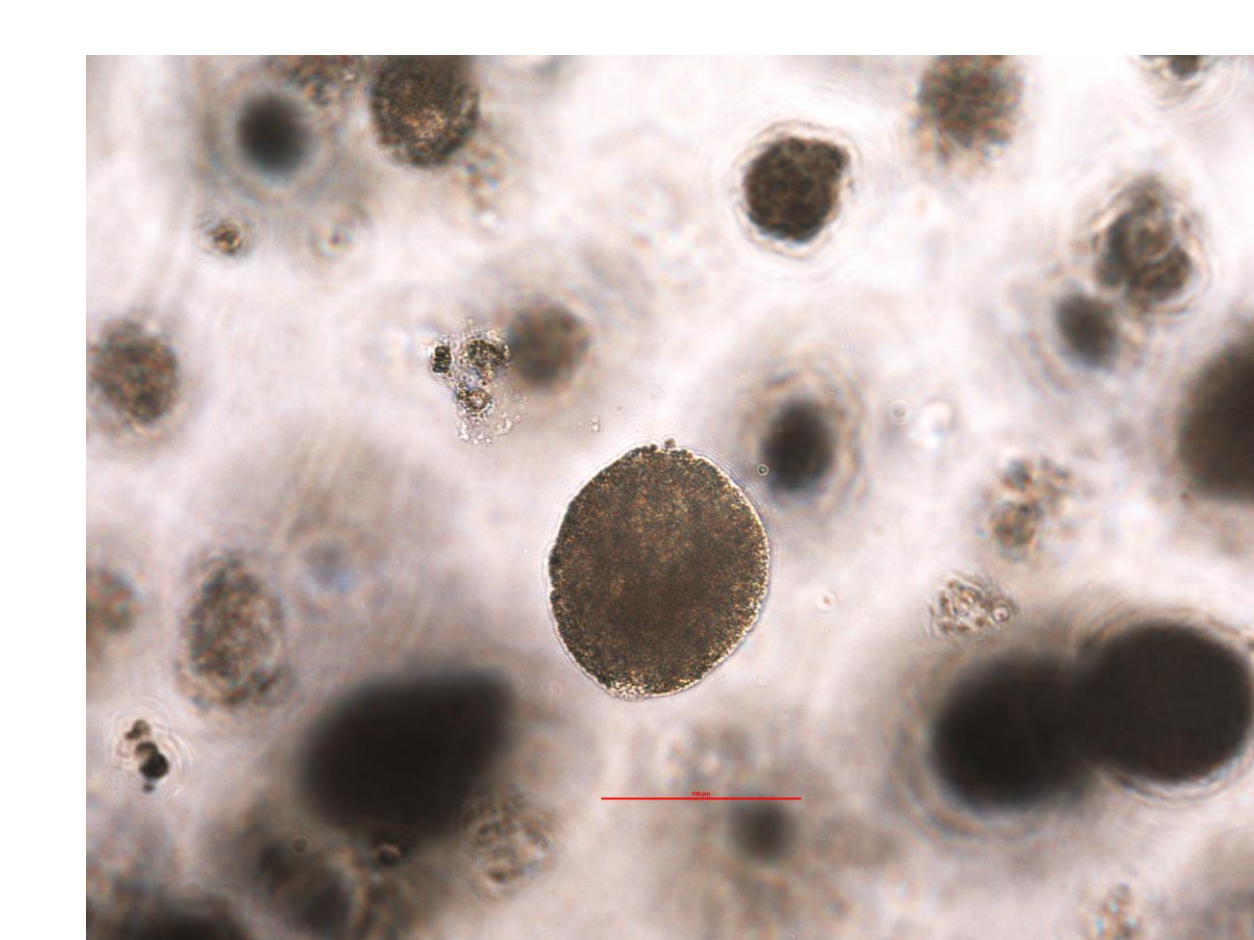
HT29 @ Week 6



SW480 @ Week 8



SW620 @ Week 8



HT29 @ Week 8

## Methods

- Human colorectal cancer cells (SW480, SW620, HT-29, and Caco-2) were grown in 10% RPMI media and used to generate 3D spheroids.
- Commercially available PG Matrix (PegGel) was used as the matrix for 3D cell culture.

## Acknowledgements

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1. Developing Scholars Program
2. Johnson Cancer Research Center
3. Kansas Louis Stokes Alliance for Minority Participation

## Summary

The results showed a successful establishment of 3D spheroids of 3 colorectal cancer cell types: SW480, SW620, and HT-2. While all were successfully able to develop spheroids, the Caco-2 cells were contaminated and not able to continue development beyond the 18 days.

## Future Research & Significance

The following experiment is to determine viability rate influenced by doses of PQ1 in the established 3D spheroids. With the accomplishment of developing 3D spheroids for these cells it is an important milestone in continuing this research later on and explore in, using this model. The significance of this research was not only to generate 3D tumor-like spheroids as model for in vivo model, but also to compare drug response between 2D and 3D cell cultures.