



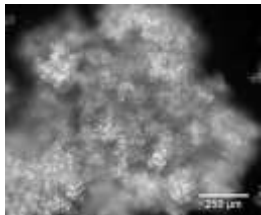
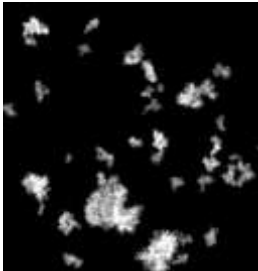
INSTITUTE FOR CELLULAR ENGINEERING

Optimizing Productivity in Plant Cell Cultures through Multiscale Process Characterization and Control of Cell Aggregation

IGERT Fellow Martin Kolewe

PI: Prof. Susan Roberts

Collaborators: Prof. Michael Henson (UMass Chemical Engineering)



Aggregates of *Taxus cuspidata*, which produce the anti-cancer drug paclitaxel

Plant cell culture technology is a production alternative for the large scale supply of natural product pharmaceuticals, which may be impossible to obtain through plant harvest or chemical synthesis. The major limitations of using undifferentiated plant cells *in vitro* are low and variable yields of the desired drug products. Plant cells grow as aggregates in suspension culture, with clusters ranging from few to hundreds of cells.

Microenvironments created within these aggregates affect the function of individual cells, and thus properties of the culture as a whole.

We study cell aggregates at several scales: 1) We developed a method to measure the size distribution of plant cell aggregates, and have determined that smaller aggregates are beneficial for 2° metabolite production 2) We have developed a model to predict how the size distribution changes based on breakage and growth phenomena 3) We utilize flow cytometry to understand the effect of aggregates on individual cells.