

Electron microscopy imaging of *S. mutans* biofilm profiles

Laura J. Waldman, Ph.D. laura.waldman@uky.edu

Martha E. Grady, Ph.D. m.grady@uky.edu

UK Department of Mechanical Engineering

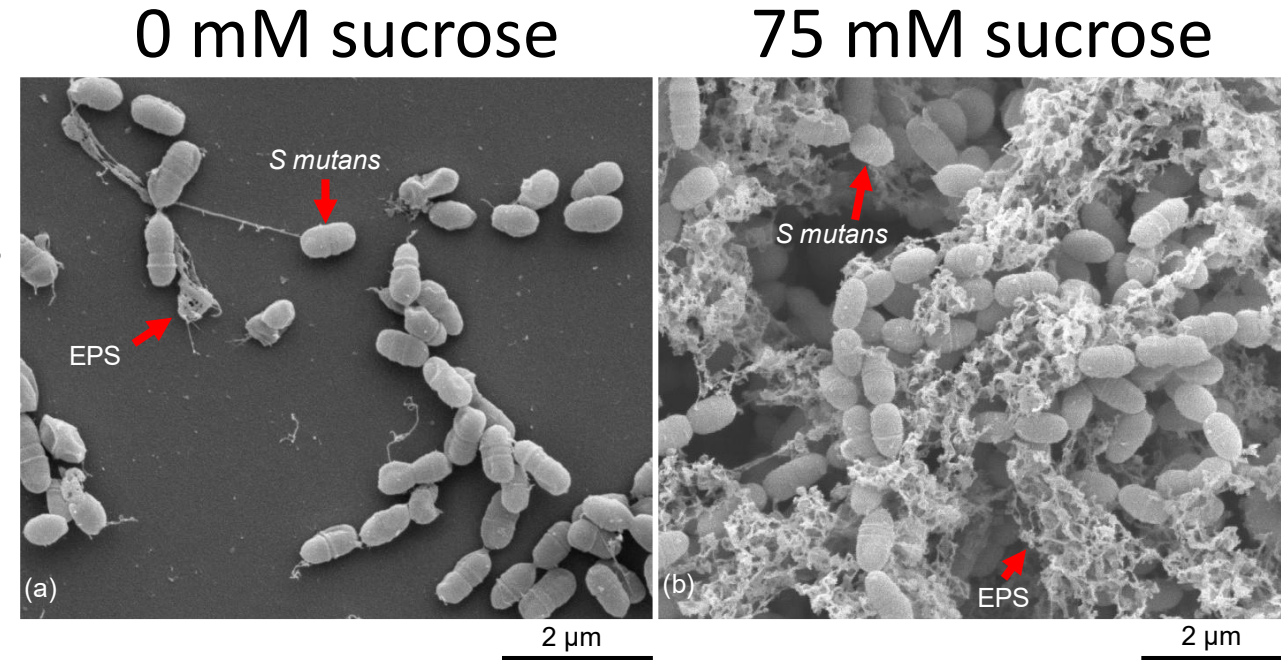
4 August 2022

Bacterial Biofilms

Bacteria biofilms are colonies of cells and protective EPS

Biofilm growth depends on conditions including nutrient concentrations

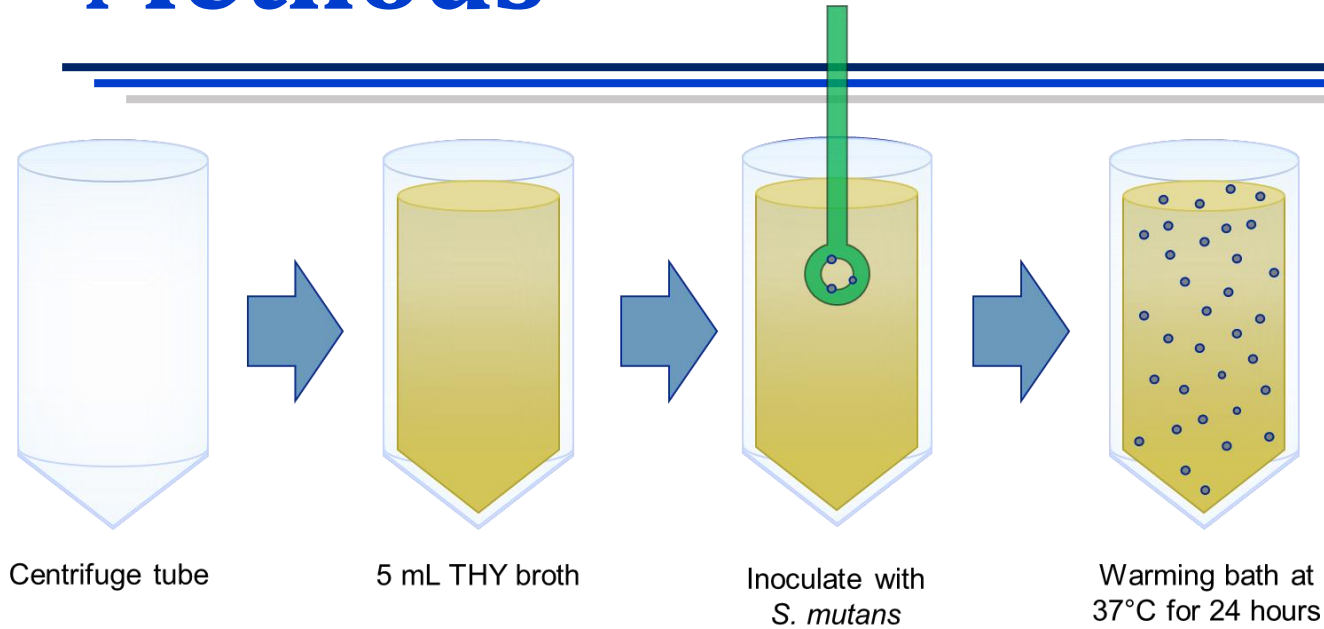
Top-down SEM imaging provides information about substrate coverage but not thickness or features



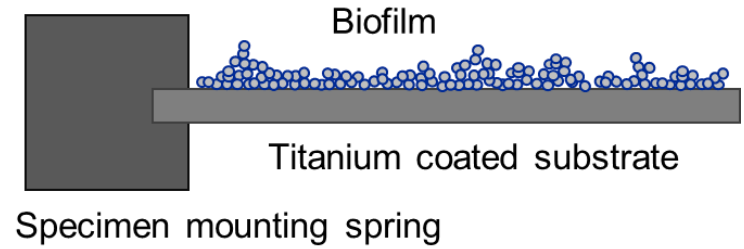
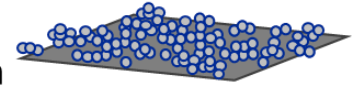
Can electron microscopy be used to obtain high resolution images of biofilm structure and formation?

Can electron microscopy be used to quantitatively determine the effect of sucrose concentration on biofilm formation and thickness?

Methods



Critical point dry and sputter coat the biofilm

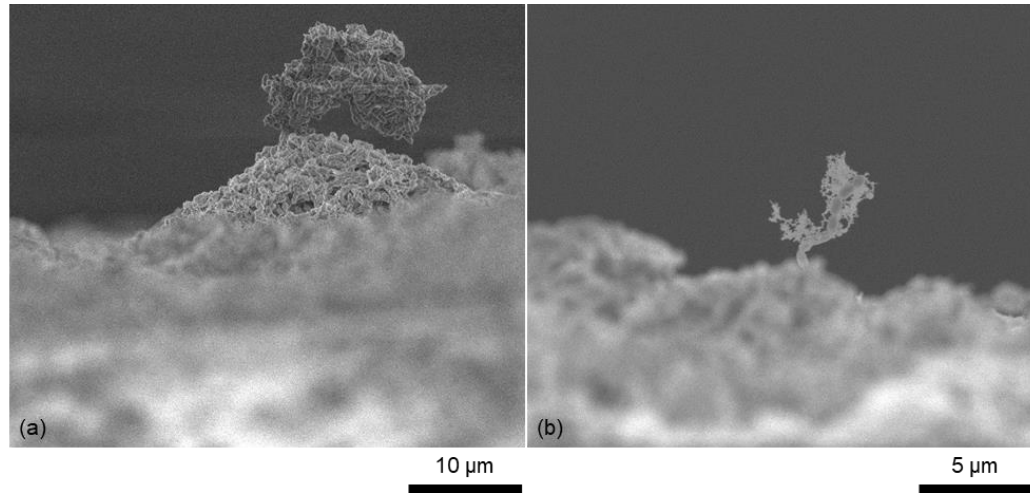


Specimens imaged with FEI Helios in UK EMC

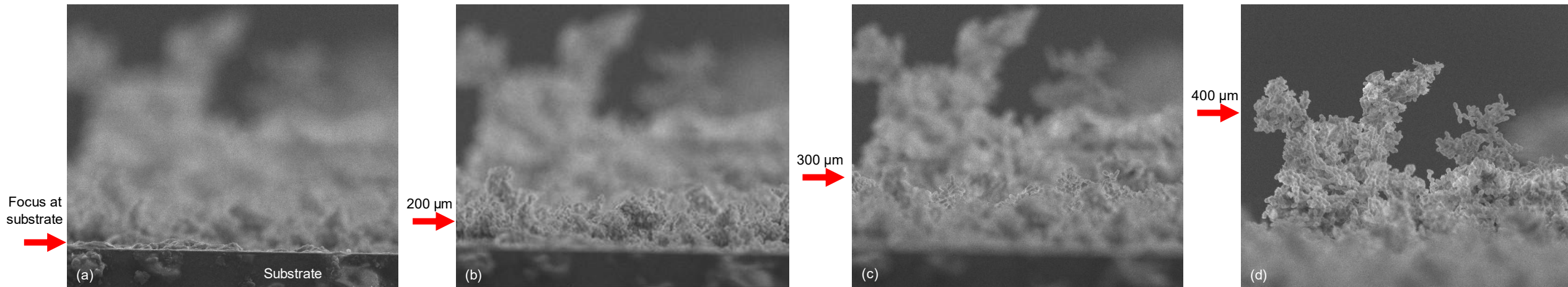
Specimen Imaging

Specimen Preparation

Profile images of *S. mutans* biofilms

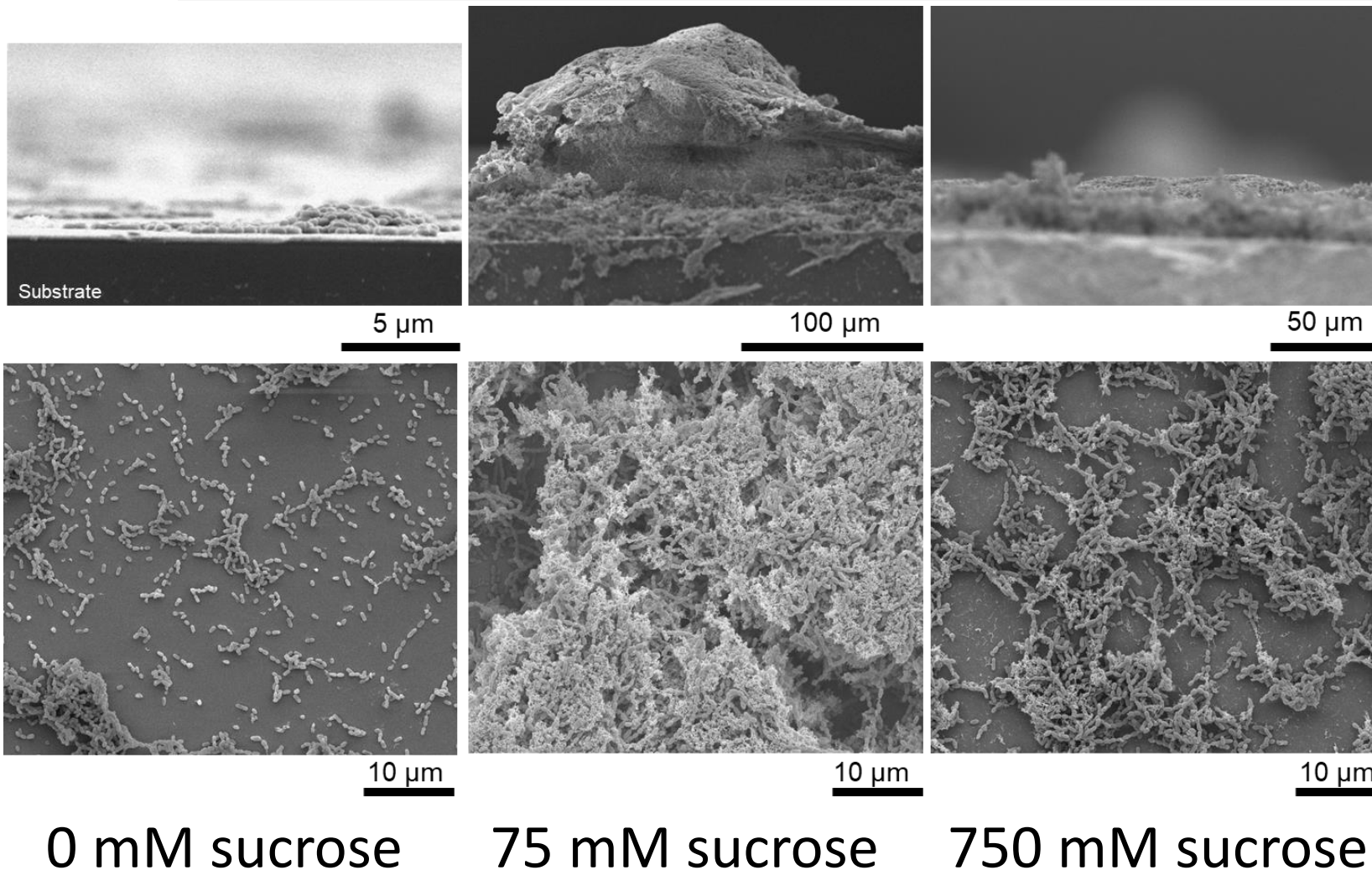


Fragile cell features and EPS structures can be imaged
Heights and formation of structures can be determined



Varying the focus point allows us to image features away from the specimen edge

Profile images of *S. mutans* biofilms

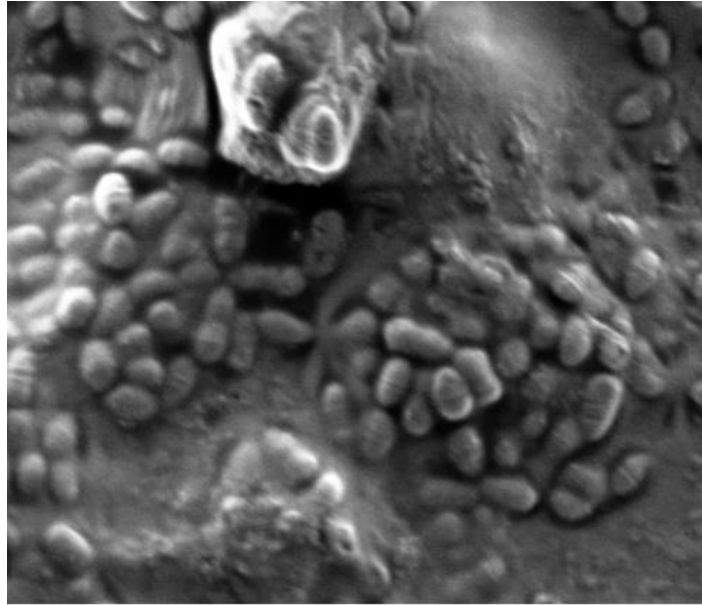


Heights of bacteria mounds depend on the concentration of sucrose

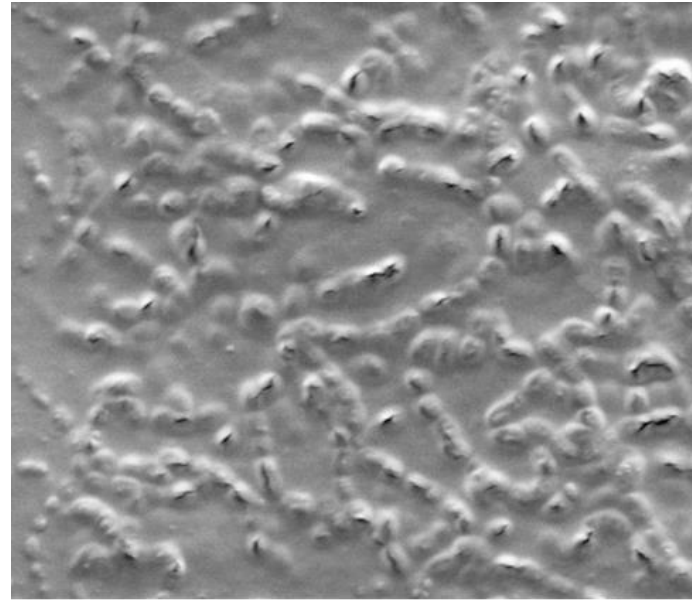
Heights of bacteria mounds agrees with substrate coverage in top-down imaging

Sucrose is necessary for biofilm growth, but too much sucrose hinders biofilm growth

Imaging Biological Specimens



Air drying can cause damage to biological specimens



High voltage and long dwell times can damage specimens

