



**CALIFORNIA STATE SCIENCE FAIR  
2012 PROJECT SUMMARY**

<b>Name(s)</b> <b>Kathleen R. Maguire</b>	<b>Project Number</b> <b>S1514</b>
<b>Project Title</b> <b>Bacterial Biofilms Are Influenced by Beta-Lactam Antibiotics</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this study was to analyze the effects of beta-lactam antibiotics on otitis media pathogens. <b>Methods/Materials</b> Non-typeable <i>Haemophilus influenzae</i> (NTHi) and <i>Streptococcus pneumoniae</i> (SP) bacterial strains were incubated for 24 and 96 hours in the presence of selected concentrations of amoxicillin, cefuroxime and ampicillin. At sub-lethal concentrations of the antibiotics NTHi exhibited increased biofilm formation (both 24 and 96 hour biofilms) as assessed using a crystal violet biofilm assay. Scanning Electron Microscopy (SEM) and confocal Laser Scanning Microscopy (cLSM) were used to confirm the results of the crystal violet assay. <b>Results</b> Although beta-lactam antibiotics are known to be bactericidal, it was hypothesized that sub-lethal concentrations may enhance biofilm growth. At sub-lethal concentrations of the antibiotics NTHi exhibited increased biofilm formation (both 24 and 96 hour biofilms). These antibiotic concentrations were deemed maximum stimulatory concentrations (MSCs). At these MSCs, biofilm formation increased while bacterial count decreased. SP biofilm formation was inhibited by all of the antibiotics at the concentrations tested. <b>Conclusions/Discussion</b> This research, while focusing on otitis media, is applicable to all biofilm infections. Many biofilm infections are chronic so it is possible that other biofilm bacteria will be influenced by sub-lethal concentrations of antibiotics. Results from testing other biofilm bacteria and antibiotic combinations using these methods may help explain the causes of chronic biofilm infections.	
<b>Summary Statement</b> Beta-lactam antibiotics can stimulate biofilm formation.	
<b>Help Received</b> Used lab equipment at House Research Institute under the supervision of Dr. Paul Webster	