CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Gregory S. Bernstein

Project Number

S1305

Project Title

Identification of a New Class of Antibiotics against MRSA

Abstract

Objectives/Goals

The bacteria Staphylococcus aureus has become a large problem because of its developed resistance to antimicrobial agents. Methicillin-resistant Staphylococcus aureus (MRSA) is currently the most dangerous and prevalent form. It is necessary that new treatments for MRSA be developed.

The compounds I tested were prepared in a synthetic combinational library and are based on the amino acid proline. Their four variable sites can be manipulated to vary their effect. For this experiment, the six most promising compounds from previous screens were tested alongside Vancomycin.

The purpose of this experiment was to determine the effectiveness of a new class of compounds against MRSA relative to the antibiotic Vancomycin by determining their minimum inhibitory concentration (MIC).

I hypothesize that the compounds that are most effective will have similar structure, which may indicate ways to develop them further.

Methods/Materials

Plates were prepared with a serial dilution of each compound and inoculated with MRSA. Controls with Vancomycin, DMF (the vehicle used in the compounds), and without MRSA were also prepared. The plates were incubated overnight and then scanned in a plate reader that measures light absorbance. This scan indicated bacteriostatic activity. MRSA was then incubated overnight in the absence of compounds and scanned to determine bactericidal activity. A set of agar plates was also prepared to provide confirmation with qualitative data.

Results

Compounds 29 and 31 had the lowest MIC, and therefore are the best candidates for further development. Some compounds were almost as effective as Vancomycin, with only a two-fold difference in concentration between their MICs.

Conclusions/Discussion

Compounds 29 and 31 had identical groups on 3 of their 4 variable sites. This indicates that the structure of these groups contributes to their effectiveness, confirming the hypothesis.

The data gathered in this experiment can be used to relate a compound#s effectiveness to its structure.

Further experiments will test the toxicity of the compounds on mammalian cells and determine their range of activity against other bacteria.

Summary Statement

I screened a compound library to select candidates for further development into new antibiotics against antibiotic-resistant Staphylococcus aureus.

Help Received

Materials provided by Nizet Lab at UCSD, supervision by Dr. Mary Hensler