

Restored Affinity

Vancomycin is a powerful antibiotic, which functions by binding to a pair of alanine residues and thereby disrupting the formation of bacterial cell walls. However, several strains of bacteria can evolve to resist vancomycin through replacement of the terminal alanine with lactate. This structural substitution of an O atom for an N-H group reduces vancomycin binding affinity by a factor of 1000.

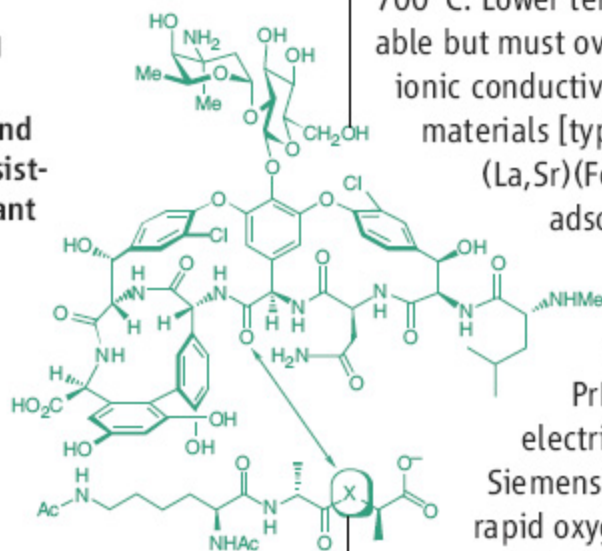
In a preliminary effort to combat this resistance pathway, Crowley and Boger have modified the vancomycin structure. Their prior modeling studies attributed the reduced affinity to lone pair repulsion between the lactate oxygen and a carbonyl oxygen in the vancomycin framework. They therefore prepared a synthetic derivative with a methylene group replacing the offending carbonyl. This backbone substitution was deemed too fundamental a change to attempt by modifying intact vancomycin. Instead, the authors were able to adapt their prior total synthesis of the native compound by introducing

Vancomycin structure and binding motif in nonresistant (X = NH) and resistant (X = O) bacteria.

the methylene group at the outset and protecting the adjacent nitrogen as a carbamate.

The resulting compound showed a 40-fold improvement in activity against cultures of resistant bacteria, with only a 37-fold loss in affinity toward the Ala-Ala motif present in nonresistant strains. — JSY

J. Am. Chem. Soc. 10.1021/ja0572912 (2006).



architectures. One dust, concentrated from the star, with abruptly at 109 AU disk extends out to narrowing, despite

On the basis of those observed in propose two limitingogy: narrow belts could arise from events that expel with nascent planets certain radii, perhaps of our own solar system features in the width that planet formation dust clouds. — JE

MATERIALS SCIENCE

Cooler Run

Current solid-oxide 700°C. Lower temperatures are possible but must overcome ionic conductivity materials [typical (La,Sr)(Fe,Mn)O₃ adsorb

PrB electric

Siemens process rapid oxygen to 500°C. Pro

cathodes has generated materials in porous achieve a more precise temperature, the authors created a thin film, with