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Journal Highlights

Endogenous Cephalosporinases in *P. aeruginosa* May Confer Carbapenem Resistance

(l-r) Nordmann, Rodriguez-Martinez, and Poirel

Pseudomonas aeruginosa, amostly nosocomial pathogen, is an important cause of pneumonia in intensive care units. This gram-negative species is increasingly multidrug resistant, including to broad spectrum ß-lactams such as cephalosporins and carbapenems (imipenem, meropenem). Resistance to imipenem has been associated mostly with structural changes in outer membrane proteins and rarely to acquired ß-lactamases. Patrice Nordmann, Jose-Manuel Rodriguez-Martinez, and Laurent Poirel of INSERM 914/University Paris Sud/hospital Bicêtre, Paris, France show that some endogenous cephalosporinases of *P. aeruginosa* may confer reduced susceptibility to imipenem. Those enzymes, when overexpressed, appear in vitro to contribute to selection of imipenem-resistant strains. "Further studies shall be performed to evaluate if imipenem-resistant strains are more easily selected in vivo with an imipenem-containing therapy when the *P. aeruginosa* isolate expresses one of those cephalosporinases," says Nordmann.

(J.-M. Rodriguez-Martinez, L. Poirel, and P. Nordmann. 2009. Extended-spectrum cephalosporinases in *Pseudomonas aeruginosa*. Antimicrob. Agents Chemother. 53:1766–1771.)

Resistant SHIV Found In Macaque Following Assay of Vaginal Microbicide

Vaginal microbicides have been proposed as a means for women to protect themselves against HIV-1 during sexual intercourse. PSC-RANTES was one of the first vaginal microbicides shown to protect against SHIV challenge. However, Dawn M. Dudley of Case Western Reserve University, Cleveland, Ohio, discovered a robust, drug-resistant SHIV

variant in an infected macaque that had been treated with this microbicide. That is discouraging for the development of anti-HIV microbicides, because the use of homogenous strains of virus in this model should make resistance less likely. Yet, during normal infection of women via sexual intercourse, the virus population is undoubtedly heterogenous, rendering the development of resistance all the more likely. Corresponding author Eric Arts, also of Case Western, says his group has now received funding from the National Institute of Allergy and Infectious Disease to develop a more heterogeneous population of SHIV to serve as challenge virus in these experiments.

(D. M. Dudley, J. L. Wentzel, M. S. Lalonde, R. S. Veazey, and E. J. Arts. 2009. Selection of a simian-human immunodeficiency virus strain resistant to a vaginal microbicide in macaques. J. Virol. 83:5067–5076.)

New Light on Bacterial Adhesion

Brown

Bacterial adhesion and biofilm formation are important in many fields, from biomedical engineering to food processing. Derick G. Brown and Yongsuk Hong of Lehigh University, Bethlehem, Pa., show that bacterial ATP levels can change upon adhesion to a solid surface as part of the adhesion process rather than due to nutrients or any characteristics of the solid surface. “We’ve demonstrated a link between a physiochemical process and a bioenergetic process,” says Brown. “One key benefit could be the development of surfaces that would either enhance or inhibit microbial colonization. For example, inhibition could be accomplished either through killing the bacteria by reducing ATP levels, or by removing a surface adhesion signal such as variation in cell surface pH or electrostatic potential. Our working hypothesis indicates that charge properties of the solid surface should have a significant impact on cellular bioenergetics, and we are currently validating this hypothesis with a wide range of materials. We are also looking at the implications of this effect for other processes, such as surface recognition, and survival under oligotrophic conditions.

(Y. Hong and D. G. Brown. 2009. Variation in bacterial ATP level and proton motive force due to adhesion to a solid surface. Appl. Environ. Microbiol. 75:2346–2353.)

Type II Secretion System Mapped in *Vibrio Cholerae*

Lybarger (l), and Sandkvist

Cholera toxin is actively secreted by the type II secretion system, promoting its delivery to the intestinal mucosa, where its action causes cholera's hallmark symptom of profuse, watery diarrhea. The secretion system is a large complex of proteins that spans the bacterium's entire cell envelope. Maria Sandkvist and colleagues of the University of Michigan Medical School, Ann Arbor, show that the type II secretion complex is distributed in a punctate fashion throughout the cell envelope, in stark contrast to their hypothesis that it would be localized to the cell poles. "Our study is a great reminder that we should reexamine old data in new ways, particularly as technologies improve," says Sandkvist. "In this case, a more sensitive microscope allowed us to view the fusion proteins at expression levels similar to those of native proteins in wild-type cells. We found that maintaining the natural stoichiometry of the individual components of the protein complex is a prerequisite for determining their location within the cell. In future studies, we will dissect the roles of individual components in localization and assembly of the T2S complex."

(S. R. Lybarger, T. L. Johnson, M. D. Gray, A. E. Sikora, and M. Sandkvist. 2009. Docking and assembly of the type II secretion complex of *Vibrio cholerae*. J. Bacteriol. 191:3149–3161.)