

Hiroshi Ogawara: Comparison of Antibiotic Resistance Mechanisms in Antibiotic-Producing and Pathogenic Bacteria. REVIEW ARTICLE

**Abstract:** Antibiotic resistance poses a tremendous threat to human health. To overcome this problem, it is essential to know the mechanism of antibiotic resistance in antibiotic-producing and pathogenic bacteria. This paper deals with this problem from four points of view. First, the antibiotic resistance genes in producers are discussed related to their biosynthesis. Most resistance genes are present within the biosynthetic gene clusters, but some genes such as paromomycin acetyltransferases are located far outside the gene cluster. Second, when the antibiotic resistance genes in pathogens are compared with those in the producers, resistance mechanisms have dependency on antibiotic classes, and, in addition, new types of resistance mechanisms such as Eis aminoglycoside acetyltransferase and self-sacrifice proteins in enediyne antibiotics emerge in pathogens. Third, the relationships of the resistance genes between producers and pathogens are reevaluated at their amino acid sequence as well as nucleotide sequence levels. Pathogenic bacteria possess other resistance mechanisms than those in antibiotic producers. In addition, resistance mechanisms are little different between early stage of antibiotic use and the present time, e.g.,  $\beta$ -lactam resistance in *Staphylococcus aureus*. Lastly, guanine + cytosine (GC) barrier in gene transfer to pathogenic bacteria is considered. Now, the resistance genes constitute resistome composed of complicated mixture from divergent environments.

**Keywords:** antibiotic resistance; self-resistance; bacterium; antibiotic producer; pathogenic bacteria

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