Hiroshi Ogawara: Penicillin-binding proteins in *Actinobacteria*, REVIEW ARTICLE
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Summary: Because some Actinobacteria, especially *Streptomyces* species, are ß-lactam-producing bacteria, they have to have some self-resistant mechanism. The ß-lactam biosynthetic gene clusters include genes for ß-lactamases and penicillin-binding proteins (PBPs), suggesting that these are involved in self-resistance. However, direct evidence for the involvement of β-lactamases does not exist at the present time. Instead, phylogenetic analysis revealed that PBPs in *Streptomyces* are distinct in that *Streptomyces* species have much more PBPs than other *Actinobacteria*, and that two to three pairs of similar PBPs are present in most *Streptomyces* species examined. Some of these PBPs bind benzylpenicillin with very low affinity and are highly similar in their amino acid sequences. Furthermore, other low-affinity PBPs such as SCLAV_4179 in *Streptomyces clavuligerus*, a ß-lactam-producing *Actinobacterium*, may strengthen further the self-resistance against ß-lactams. This review discusses the role of PBPs in resistance to benzylpenicillin in *Streptomyces* belonging to *Actinobacteria*.

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A whole manuscript is available in
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