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Bioactive Compound Produced from Actinomycetes-Streptomyces

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Abstract

The beginning of antibiotic-resistance among the bacteria is really unavoidable. Over the last 60 years, bacteria and, in particular, those pathogenic for humans have evolved toward anti-microbial drug resistance. For the treatment of infectious diseases antibiotics like penicillin and erythromycin are used but now these antibiotics become less effective because bacteria have become more resistant to such antibiotics. The development of new antimicrobial agents is an urgent medical need. Natural products are important sources of lead antimicrobial agents. Actinomycetes are soil dwelling and Gram positive bacteria and industrially wide range of bioactive secondary metabolites producers, including many antibiotics. More than75% of antibiotics are sourced from the genus *Streptomyces*. This review article focuses on microbial secondary metabolites from Streptomyces as new drugs to fight against antibiotic resistance.

Keywords: Antibiotics; Actinomycetes; Natural products; Streptomyces

Introduction

Natural products have been source of the world's important bioactive compounds and microorganisms are a primary resource of driving drug discovery [1,2]. Actinomycetes have ability to produce of bioactive substances, which have found application in combating a variety of human infections [3]. Particularly 80% of naturally occurring antibiotics have been isolated from different actinomycetes [4]. Streptomyces has largest genus known for the production of most secondary metabolites and there have different biological activities, such as antifungal, antibacterial, antitumor, anticancer and anti parasitic and immunosuppressive actions. Because of their useful biological activities, microbial secondary metabolites have received considerable attention especially in effects of human health [5].

Potential of secondary metabolites produced by *streptomyces*

Microbial secondary metabolites have been in the frontier in the discovery of novel anti microbial agents for pharmaceutical industry. Recently most of researcher suggests that novel and new compounds with potential therapeutic applications are waiting to be discovered from secondary metabolites produced by actinomycetes [6]. Some examples produced by Streptomyces and the related actinomycetes are represented as antimicrobial compound as below:

Streptomycin from *Streptomyces* grise us that are against tuberculosis, rifamycin produce from *Amycolatopsis mediterranei*, erythromycin from *Saccharopolyspor aerythraea, Oleandomycin* from *Streptomyces* antibioticus.

There are more bioactive compounds such as avermectin (*Streptomyces avermitilis*), bleomycin (*Streptomyces verticillus*) and daunomycin (*Streptomyces peuceticus*) as antitumor compounds, FK506 (*Streptomyces tsukubaensis*) as an immunosuppressant, and validamycin (*Stereptomyces hygroscopicus var. limoneus*) as a treatment of rice sheath blight disease [7].

Recently, Wu et al. [8] identified secondary metabolites like isocoumarins, undecylprodiginine, streptorubin B, pyrrole-2-carboxamide, acetyltryptamine and fervenulin that were produced in *Streptomyces* sp. MBT76.

Important classes of antibiotics produced by *Streptomyces*

About 2,500 papers dated 2014-2016 were recovered by searching in the PubMed database for *Streptomyces*, which are the richest known source of antibiotics [9]. The most important production of *Streptomyces* which source for various antibacterial pharmaceutical agents [10] are Chloramphenicol from *S. venezuelae* [11], Daptomycin from *S. roseosporus* [12], Fosfomycin from *S. fradiae* [13], Lincomycin from *S. lincolnensis* [14], Neomycin from *S. fradiae* [15], Puromycin from *S. alboniger* [16], Streptomycin from *S. griseus* [17], Tetracycline from *S. rimosus* and *S. aureofaciens* [18], Oleandomycin from

S. antibioticus [7,19,20], Tunicamycin from *S. torulosus* [21], Mycangimycin from Streptomyces sp. SPB74 and *S. antibioticus* [22,23], Boromycin from *S. antibioticus* [24], Bambermycin from *S. bambergiensis* and *S. ghanaensis* [25], Clavulanic acid from *S. clavuligerus*. Novel anti-infective currently being developed include Guadinomine from *Streptomyces* sp. K01-0509 [26].

Discussion

Microbial sources are a rich and diverse source of secondary metabolites with antibiotic activity. Secondary metabolites are mostly novel antibiotics in unlimited request with the increase in multi-drug resistant pathogens. *Streptomyces* has a great potential for new and improved generations of antibiotics and should be explored for more of the potentials in this respect.

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