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Prospects of Rare Actinomycetes for the Production of Newer Antibiotics

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Abstract

Rare actinomycetes are the genera of actinomycetes other than Streptomycetes found in less expored environment. Some of the actinomycetes genera such as Sinomonas, Nocardia, Micromonospora, Actiplanes, Pseudonocardia, Actinomadura, Micrbobispora are known as the novel species. Rare actinomycetes have been found to produce extremely useful secondary metabolites. They have the good antagonistic activity against the various human pathogens. Hence, it is believed to give a promising output of commercially important product for pharmaceutical industries.

Keywords: Rare actinomycetes; Novel species; Antagonistic activity; Secondary metabolites; Antibiotics

Introduction

Actinomycetes are widely spread in nature, which are recognized to produce novel secondary metabolites. Among the overall genera in nature, actinomycetes by itself produce 70-80% of the existing antibiotics. In that, Streptomycetes found to produce 74% of antibiotics, which possess altogether 7,600 compounds lead of therapeutic agents like streptomycin, chloramphenicol, tetracycline, macrolides respectively. Production of novel drugs faces many problems, due to the rediscovery of the known secondary metabolites. It has driven the industrial attention towards the rare actinomycetes. Actinomycetes from the unexplored habitats seem to possess the potential antimicrobial activities against the human pathogens. The critical situation faced by various pathogens from hospitals and industries have lead to the demand for new drugs and chemical compounds in pharmacology. Hence, poorly explored area to be explored much for the novelty in the screening of rare actinomycetes. Actinomycetes are capable to grow in extreme environments like hot and dry deserts, hyper salinity, hay, sea water/sea muds, mangrove sediments, caves etc. Researchers are now focusing on the isolation of rare actinomycetes which are non-streptomyces. Genera such as Sinomonas humi sp. [1], Salinispora sp., Micromonospora, Actinoplane, Nocardia caishiienris and Pseudonocardia Carboxydivorans [2], Thermomonospora sp., Saccaropolyspora sp., Corynebacterium sp. [3] respectively are isolated as the novel stains.

Habitats of Rare Actinomycetes

Diversity of actinomycetes depends on the environmental microflora. Takahashi et al. describes that the diverse actinomy cetes found taxonomically and physiologically at desert soil [4]. He could isolate various genus like Microbispora, Nocardia, Microtetraspora/ Actinomadura, Amycolatopsis respectively from the Moava desert, California. Hamedi et al. represented novel species like Nocardia arvandica isolated from the sandy soil [5]. Nocardiopsis strains are found to grow in alkaline soils with high salt concentration at moderate temperature (37 °C). Nakaew et al. described that the genus Micromonospora isolated from Thai cave soil with low nutrient and high humidity, encourages the production of novel antibiotics and hydrolytic enzymes [6]. Phatup cave Forest park and Phanangkhoi cave in north Thailand were studied for the development of new bioactive compounds from rare actinomycetes. Endophytic actinomycetes are studied from the medicinal plants of Tropical rain forest in Xishuangbanna, China. Qin et al. explored the entophytic environment with the novel species like Saccaropolyspora, Dietzia, Blastococcus, Dactylosporangium, Promicromonospora, Oerskovia, Actinocorallia and Jiangella respectively [7].

Several interesting unusual habitats like the sediments of lakes [8], fungal cultivar [9] and ant workers produces antimicrobial products with the symbiotic association of actinomycete bacteria [10], Mangrove sediments [11], deep sea biodiversity [12], Marine sedimentation [13] respectively has reported the novel species of actinomycetes, with the pharmaceutical potent.

Antimicrobial Activity

Marine actinomycetes are found to have very good potential for the production of novel bioactive metabolites [14]. Secondary metabolites produced by the rare actinomycetes have

potential antibacterial activity [15] has reported the Salinospora species from Fijian marine sponge, which showed the activity against the Methicillin-resistant Staphylococcus aureus stains. Qin et al. also reported that the species of rare actinomycetes like endophytic Pseudonocardia alni and Pseudonocardia zijingensis also showed significant antagonistic activity against the Methicillin-resistant Staphylococcus aureus stains [7]. Genus Micromonospora produces novel compounds like antraquinones and lupinacidins, which showed the anti-tumor activity. Tanvir et al. also found that the Pseudonocardia carboxydivorans exhibiting the anti-tumor activity [2].

Conclusion

Exploring the untapped area leads to the isolation of novel rare genera of actinomycetes with new bioactive compounds. Proliferation of new genera leads to the production of neobioactive compounds. Rare actinomycetes had increased the interest in tracking the microbial groups in the drug discovery process.

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