Sansinenea and Ortiz, Biochem Pharmacol (Los Angel) 2014, 4:1
DOI: 10.4172/2167-0501.1000e172

Biochemistry & Pharmacology: Open Access

Editorial Open Access

Tuberculosis and New Treatments

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Tuberculosis is a chronic infectious disease, one of the major enemies of the humanity from times immemorial. Tuberculosis (TB), mainly caused by *Mycobacterium tuberculosis*, is the leading killer among all infectious diseases worldwide and is responsible for more than two million deaths annually. Today it still remains one of the most serious medical and social problems. It is responsible for 3 million deaths per year and around 8 million cases of first-recorded disease [1].

This contagious disease is transmitted through the air and it is caused by the bacterium *Mycobacterium tuberculosis*, which can attack different organs of human body. It is spread primarily by inhalation or ingestion of expired or expelled infected droplets, drinking from contaminated glasses, or sharing of contaminated syringes and needles.

There are several major problems associated with the currently available TB treatment. First, the duration and complexity of treatment result in nonadherence to treatment. This leads to suboptimal response (failure and relapse), the emergence of resistance, and continuous spread of the disease [2]. Second, adverse events in response to anti-TB drugs are common and contribute to the problem of nonadherence [2]. Third, the increasing incidence of multidrug-resistant (MDR; resistance to at least rifampin and isoniazid) and extensively drug-resistant (XDR; MDR resistance plus resistance to a fluoroquinolone and an aminoglycoside) TB is a serious concern. The advances in the chemotherapy of tuberculosis in the mid-20th century have recently given way to anxiety over the evolution of drug resistance based on the genetically fixed mutations of *M. tuberculosis*. Moreover, nearly all drugs used for the treatment of tuberculosis and possessing different mechanisms of activity are able to cause adverse side effects on the human organism. Therefore it is extremely important to search for new, low-toxic substances superior to the available drugs in their activity and efficiency. Naturally occurring pure compounds as well as extracts from higher and lower forms of plants, microorganisms and marine organisms have indicated that inhibitory activity as antitubercular agent is widespread in nature. Natural products and some of their derivatives have been reported to exhibit remarkable growth inhibitory activity towards tuberculotic strains and some of them have been selected as prototype molecules for the development of new antitubercular agents [3-5].

There are three basic factors involved in the development of new tuberculosis drugs; to reduce the total duration of treatment, to improve treatment of MDRTB and to provide more effective treatment of latent tuberculosis infection [6]. However, unfortunately the development of new drugs for the treatment of tuberculosis has been slow. The rapid development of new anti-TB drugs has been hampered by several factors. First of all, the TB drug market is associated with insufficient profit opportunity or investment return to instigate pharmaceutical industries to develop new drugs. A second challenge in TB drug development is the difficulty to identify new compounds with activity against *M. tuberculosis.* A next challenge rises with the evaluation of new compounds, as there are currently no animal models available that predict with accuracy the required treatment duration with newly identified compounds. The phase of clinical testing of new anti-TB drugs is time consuming, as the current "gold standard" to assess efficacy of anti-TB regimens in phase III clinical trials is the relapse rate 2 years after completing treatment.

Naturally occurring pure compounds as well as extracts from higher and lower forms of plants, microorganisms and marine organisms have indicated that inhibitory activity against *M. tuberculosis* is widespread in nature. Antitubercular natural products have been grouped according to their source of origin and chemical type. Terpenoids represent an interesting group of bioactive natural metabolites with inhibitory activity towards *M. tuberculosis* and are grouped according to their chemical type as, monoditerpenoids, diterpenoids, sesquiterpenoids, sesterterpenoids and triterpenoids [7].

Some interesting reviews covering aspects of antimycobacterial natural products have been published until today [7-11]. The syntheses of some compounds have been reported; however the synthesis of many of them has not been reported.

References

1. WHO Report (2010) Global Tuberculosis Control, WHO Press.
2. Volmink J, Garner P (2007) Directly observed therapy for treating tuberculosis. Cochrane Database Syst Rev:CD003343.
3. Rogoza NL, Salakhutdinov NF, Tolstikov GA (2011) Anti-tubercular activity of natural products: Recent developments. In: Opportunity, Challenge and Scope of Natural Products in Medicinal Chemistry (Eds: Tiwari VK, Mishra BB) Research signpost, Kerala, India 103-120.
4. Bueno J, Coy ED, Stashenko E (2011) Antimycobacterial natural products--an opportunity for the Colombian biodiversity. Rev EspQuimioter 24: 175-183.
5. Mayer AMS, Rodriguez AD, Berlinck RG, Fusetani N (2011) Marine pharmacology in 2007–8: Marine compounds with antibacterial, anticoagulant, antifungal, anti-inflammatory, antimalarial, antiprotozoal, antituberculosis, and antiviral activities; affecting the immune and nervous system, and other miscellaneous mechanisms of action. Comp Biochem and Physiol C Toxicol Pharmacol 153: 191–222.
6. de Souza MV (2006) Promising drugs against tuberculosis. Recent Pat Antiinfect Drug Discov 1: 33-44.
7. Sansinenea E, Ortiz A (2014) Antitubercular natural terpenoids: Recent Developments and Syntheses. Curr Org Synth11: 545-591.
8. García A, Bocanegra-García V, Palma-Nicolás JP, Rivera G (2012) Recent advances in antitubercular natural products. Eur J Med Chem 49: 1-23.
9. Copp BR, Pearce AN (2007) Natural product growth inhibitors of *Mycobacterium tuberculosis*. Nat Prod Rep 24: 278-297.
10. Okunade AL, Elvin-Lewis MP, Lewis WH (2004) Natural antimycobacterial metabolites: current status. Phytochemistry 65: 1017-1032.
11. Pauli GF, Case RJ, Inui T, Wang Y, Cho S, et al. (2005) New perspectives on natural products in TB drug research. Life Sci 78: 485-494.

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Received: November 11, 2014; **Accepted:** November 12, 2014; **Published** November 17, 2014

Citation: Sansinenea E, Ortiz A (2014) *Tuberculosis and New Treatments.* Biochem Pharmacol (Los Angel) 4: e172. doi:10.4172/2167-0501.1000e172