May 20th, 12:30 PM

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Terpenes as ‘resistance-busting” anthelmintic drug

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There is an urgent need for new therapies for parasitic helminthic diseases affecting 1.5-2 billion people worldwide due to the threat of wide-spread resistance development to existing treatments and due to problems of incomplete efficacies.

Terpenes are plant secondary metabolites and major essential oil constituents. Historically, the terpene thymol was successfully used to cure hookworm infections in the 1900’s. Although effective, large doses were needed and thymol treatment had significant side effects. Because free terpenes are absorbed in the stomach, less than 10% of oral terpenes entered the site where the parasites live. To overcome these problems we have developed microparticle encapsulated terpenes and enteric coated terpene capsules.

We screened 20 terpenes for anthelmintic activity in vitro against adult stages of the hookworm and whipworm parasitic nematodes Ancylostoma ceylanicum and Trichuris muris. Here we will present results of this work, which shows the promising potential for some terpenes as pan-nematode anthelmintics. This work has allowed us to classify terpenes into at least two groups based on their in vitro killing kinetics. We have also shown that some terpenes are effective against an albendazole-resistant Caenorhabditis elegans strain suggesting that terpenes may play an important role in overcoming helminthic drug resistance. We will also present our work on optimizing lead terpene formulations in vitro and in vivo in animal models of parasitic nematode infection in order to overcome the challenges and realize the potential of “resistance-busting” terpene-based anthelmintic therapies.

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