Effect of Thymol on Telomerase Systems: A Potential "Catch-All" Cure for Cancer Therapy

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An effective “catch-all” cure for cancer remains elusive, but one promising target that could be used in such a cure is telomerase because it enables replicative immortality, has near ubiquitous expression in cancer cells, and has almost no expression in normal cells. Recently, thymol, an anti-fungal drug, has been found to have certain anti-cancer effects. In my project, I aimed to study if and how thymol affects telomerase, using S. cerevisiae as a model organism, and to better understand its potential in cancer therapeutics. Through the use of mutant yeast strains and growth assays, my data showed that telomerase pathways were sensitive to thymol treatment. In addition, by immunoblot and RT-qPCR analysis, it was found that thymol downregulated the main components of the telomerase complex, impacted its protein portions (Est1p, 2p, and 3p) and RNA portion (TLC1) independently, and affected TLC1 levels through RNA-binding proteins. Based on my experimental data, a model of thymol induced TLC1 downregulation was proposed. Moreover, additional evidence for the connection between thymol and telomerase was obtained through proteomics analysis. In conclusion, my results suggest that thymol interferes with telomerase’s activity through the telomerase complex and related biological pathways, such as those associated with RNA or protein-binding processes. This research sheds light on the mechanisms behind thymol’s effect on telomerase, and provides useful information for developing thymol or its analogs into potential broad spectrum medicines for cancer treatment.

Awards Won:
Fourth Award of $500