Prostate Cancer Prevention by δ-Tocotrienols

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There are eight forms of vitamin E - α-, β-, γ-, δ-tocopherols and α-, β-, γ-, δ-tocotrienols, each with differing antioxidant and cancer preventive activities. The molecules can trap free radicals through the donation of hydrogen atoms. Several human trials using α-tocopherol were unable to demonstrate cancer preventive potential, while experimental studies with γ- and δ-tocopherols have shown more promise. In the laboratory's studies using prostate cancer cell lines, it was established that δ-tocopherols are more effective than α- and γ-tocopherols in inducing cell cycle arrest and apoptosis, and δ-tocotrienols are also more effective than α- and γ-tocotrienols. Furthermore, it was found that the effects of tocotrienols were greater than those of tocopherols. We hypothesize that δ-tocotrienol is a potent cancer preventive agent in vivo. For this reason, the lab is currently investigating the efficacy of δ-tocotrienol in inhibiting prostate adenocarcinoma development in prostate-specific PTEN-/- mice. This study is comprised of four dietary condition groups: low fat; high fat; high fat with δ-tocotrienol; and low fat with δ-tocotrienol. The use of a high fat condition will allow us to determine whether tocotrienols also inhibit obesity-associated inflammation, which recent research has suggested. This anti-inflammatory activity may be specific to tocotrienols, as opposed to tocopherols. Since obesity-associated inflammation potentially promotes cancer development, the inhibition of inflammation by δ-tocotrienols could further substantiate its potential as a preventive agent in obesity-associated cancer. The mice were fed the experimental diets starting at 6 weeks of age and will be sacrificed at 40 weeks of age. Their prostates will then be examined for tumor development. The study is still ongoing and a majority of the mice have yet to be sacrificed. Histopathological and RNA expression analyses will later be performed. Overall, our research could provide important insights into the cancer preventive activities and potential therapeutic applications of δ-tocotrienol. Supported by NIH R25ES020721.