Treating Hypertension: Using Natural Compounds to Inhibit Angiotensin Converting Enzyme

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High blood pressure affects millions of people worldwide. In this illness, activity of angiotensin converting enzyme (ACE) leads to the narrowing of blood vessels. There are many drugs that reduce blood pressure by inhibiting ACE, but these synthetic compounds, including captopril, can cause negative side effects. To find alternatives, I studied structures of different natural compounds that might inhibit ACE. Through background research, I found betanin, a substance in beets. It shared a distinct structural feature with captopril and other ACE inhibitors. Therefore, it was hypothesized that betanin would significantly inhibit ACE activity. ACE activity was measured using two different spectrophotometric assays. In the first, hippuryl-L-histidyl-L-leucine (HHL) was used as the substrate. The product formed (hippuric acid) was separated from the substrate by solvent extraction and used to calculate ACE activity with and without betanin. Though this showed that betanin inhibited ACE, the assay was inefficient, so a second method was utilized. The degradation of Furanacroloyl-Phe-Gly-Gly (FAPGG), the substrate, was measured to calculate ACE activity with betanin or captopril at different concentrations. The IC50 for betanin was 640 μM and the IC50 for captopril was 0.0052 μM. The results of this experiment showed that betanin significantly inhibited ACE in a concentration-dependent manner. This information is novel and has potential to be developed into a cost-effective treatment for hypertension. In the future betanin’s inhibition efficiency could be improved by breaking it down. My study opens up the possibility of exploring the ACE inhibitory properties of other related plant products as well.

Awards Won:
Third Award of $1,000