Comparing the Anti-Alzheimer’s Activity of Different Types of Coffee

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Epidemiological data and recent scientific publications provide support for the neuroprotective effects of coffee against AD1,2. The proposed mechanisms of therapeutic benefits include inhibition of an enzyme known as alpha secretase which results in lower levels of Amyloid beta plaques and increase in a hematopoietic factor known as GCSF3,4. The aim of this study is to find the amount of coffee and type of coffee which ensures cell survival while reducing amyloid beta levels. NAPP are neuroblastoma cells from the APPsw mouse model with mutated genes for developing Alzheimer’s disease. NAPP can be treated with various drugs and the cytotoxicity of these drugs on their neurons can be measured using MTT assay. The survival rate of cells at various concentrations of coffee treatment can be quantified. 24 hours after drug treatment, the supernatant was collected, and amyloid beta levels were measured using ELISA. The data in this study is based on treatment of N2APP cells with instant coffee and common commercial coffee solutions.

Cell Culture: 10,000 NAPP cells were grown in 96 well plate in 200 μl RPMI 10% FBS medium
Coffee Treatment: NAPP cells in 96 well plate were treated with 5% and 2.5% coffee solution, performed in triplicate with controls.
ELISA: 100 µl of supernatant from 96 well plate was collected 24 hours after the drug treatment. The ELISA plates were used to measure amyloid beta levels 1-40 and 42.
MTT Assay: After 24 hours of drug treatment, 25 µl of MTT(5mg/mL) solution was added to all 96 well pate. After 4 hours, 96 well plate was emptied and 100 µl of MTT solvent was added to the wells. After 15 minutes, absorbance was measured at 590 nm to quantify cell survival.

Results

- The MTT data shows that the 5% concentration of coffee was toxic to the NAPP cells and decreased the viability of the cells significantly.
- The coffee treatment was significantly less toxic at a concentration of 2.5%.
- All coffees (except Dunkin’s and Panera commercial coffee) induced a very small amount of toxicity at the 2.5% concentration.
- In the future, the cells should be treated at various lower concentrations to find the optimal dosage of coffee at which cell viability is close to 100%.
- ELISA results also showed significant reduction in the amount of amyloid beta 1-42 after drug treatment compared to the control group.
- This reduction in toxic amyloid-beta shows the potential neuroprotective effects of coffee.
- Dunkin’s commercial coffee significantly reduced amyloid-beta levels from approximately 600 pg/ml to 400 pg/ml without being toxic to the NAPP cells.
- McDonald’s Commercial, Folgers Instant, Maxwell Instant, and Nestle Instant coffee showed a similar trend of reducing amyloid-beta levels with minimal toxicity to the neuronal cells.

Conclusion

This study found that coffee solutions treated at 5% are toxic to neurons. However, the toxicity reduced significantly at 2.5%. While the toxicity was significantly less allowing for more cells to survive at 2.5%, the levels of toxic amyloid beta 1-42 significantly reduced. This reduction in amyloid beta is associated with improvement in cognitive performance, as the presence of these toxic peptides is one of the characteristics of AD pathophysiology. The data is consistent with the claims from various epidemiological and scientific studies. In fact, coffee treatment significantly reduced the levels of beta amyloid protein in the cell culture supernatant.

References