ARIC Manuscript Proposal # 930

PC Reviewed: 03/27/03	**Status: __A__**	**Priority: __2__**
SC Reviewed: 03/31/03	**Status: __A__**	**Priority: __2__**

1.a. Full Title: Beverage consumption and the risk of type 2 diabetes mellitus

b. Abbreviated Title (Length 26 characters): beverages and diabetes

2. Writing Group (list individual with lead responsibility first):

Lead: **Linda Kao**
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3. Timeline: begin analysis upon approval, circulate first draft by September 2003

4. Rationale:

Coffee consumption has recently received attention for a possible inverse association with the risk of type 2 diabetes.[1] While the exact mechanism for this protective effect is unknown, three possibilities have been suggested. The first is the increase in magnesium, high levels of which have been shown to increase insulin sensitivity. However, the van Dam study was not able to adjust for total dietary or serum magnesium. The second is the increase in caffeine, which some studies have shown to also increase insulin sensitivity and to promote catecholamine release. The third proposed mechanism is through increased chlorogenic acid, high levels of which have also been shown to reduce glucose absorption and oxidative stress.

Tea consumption has been extensively studied for protective effects on cardiovascular outcomes, with mixed results.[2] Fewer studies have examined tea and diabetes in humans, though there have been several studies of the effect of tea and tea components in diabetic mice. Proposed mechanisms for the observed beneficial effects of tea have included: decreased lipid peroxidation due to green tea polyphenols[3] and the increase of lipid catabolism and subsequent reduction in weight gain due to tea catechins[4]. Black tea has also been studied, with similar results.[5] One study looking at tea catechins in humans found tea to have thermogenic properties, supporting the weight mediated pathway.[6]

Sweetened drinks, including regular soda, punch and fruit juice, have been postulated to increase weight leading to the possibility of increased diabetes risk, and soft drinks have been shown to be cross-sectionally associated with obesity in US adults.[7]

We proposal to study the associations between various beverage consumptions and the risk of type 2 diabetes in the ARIC study, which provides a unique opportunity to further explore these associations prospectively in a community-based setting.

5. Main Hypothesis/Study Questions:
We have three interrelated groups of study questions, paralleling the three beverage categories outlined above:

Coffee: Coffee consumption levels assessed at baseline will be inversely associated with incident type 2 diabetes over three follow-up visits even after adjustment for potential confounders. We will specifically examine the effect of including dietary magnesium and other sources of caffeine intakes on the association between coffee consumption and diabetes in multivariate analysis.

Tea: Tea consumption levels assessed at baseline will be inversely associated with incident type 2 diabetes over three follow-up visits even after adjustment for potential confounders. We will also examine the association between tea consumption and weight change (between baseline and the visit prior to diabetes development).

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Soft drinks, punch and fruit juices: Consumption levels at baseline will be positively associated with incident diabetes over three follow-up visits. We will also examine the association between soft drink consumption and weight change (between baseline and the visit prior to diabetes development).

6. Data (variables, time window, source, inclusions/exclusions):

Individuals with prevalent type 2 diabetes, missing diabetes status at baseline, and missing information on various beverage consumptions will be excluded from this analysis.

Exposure: Quantity of beverage consumption
Outcome: Incident type 2 after Visit 1
1. Fasting blood glucose > 126 mg/dL or
2. Uses insulin or oral hypoglycemic agents or
3. Reports physician diagnosed diabetes

Covariates: age, race, gender, education, physical activity indices, total energy intake, parental history of diabetes, smoking, body-mass-index, diuretic use, anthropometric measures, baseline and visit 4 fasting insulin, baseline cardiovascular risk factors, serum and dietary magnesium

Analysis: Time-to-event and/or person-years approach – Incidence rates by category of beverage consumption will be calculated. Adjusted relative risks will be calculated using Cox proportional hazards analysis. Generalized estimating equations will be used for time-dependent analysis.

7.a. Will the data be used for non-CVD analysis in this manuscript? _X__ Yes ____ No

b. If Yes, is the author aware that the file ICTDER02 must be used to exclude persons with a value RES_OTH = "CVD Research" for non-DNA analysis, and for DNA analysis RES_DNA = "CVD Research" would be used? _X__ Yes ____ No

(This file ICTDER02 has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ **Yes** __X__ **No**

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER02 must be used to exclude those with value RES_DNA = "No use/storage DNA"? ____ **Yes** ____ **No**

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: http://bios.unc.edu/units/cscc/ARIC/stdy/studymem.html

__X___ Yes _____ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)? None Found

11. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

Reference List

1. van Dam, R.M. and E.J. Feskens, *Coffee consumption and risk of type 2 diabetes mellitus.* Lancet, 2002. 360(9344): p. 1477-8.

2. Peters, U., C. Poole, and L. Arab, *Does tea affect cardiovascular disease? A meta-analysis.* Am J Epidemiol, 2001. 154(6): p. 495-503.

3. M, C.S., S. K, and R. Kuttan, *Anti-diabetic activity of green tea polyphenols and their role in reducing oxidative stress in experimental diabetes.* J Ethnopharmacol, 2002. 83(1-2): p. 109-16.

4. Murase, T., et al., *Beneficial effects of tea catechins on diet-induced obesity: stimulation of lipid catabolism in the liver.* Int J Obes Relat Metab Disord, 2002. 26(11): p. 1459-64.

5. Gomes, A., et al., *Anti-hyperglycemic effect of black tea (Camellia sinensis) in rat.* J Ethnopharmacol, 1995. 45(3): p. 223-6.

6. Dulloo, A.G., et al., *Efficacy of a green tea extract rich in catechin polyphenols and caffeine in increasing 24-h energy expenditure and fat oxidation in humans.* Am J Clin Nutr, 1999. 70(6): p. 1040-5.

7. Keast, D.R. and S.I. Hoerr. *Beverage choice related to U.S. Adult Obesity, NHANES III*. in *The Fourth International Conference on Dietary Assessment Methods*. 2000. Univeristy of Arizona, Tuscon, AZ.