

## ARIC Manuscript Proposal #724

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**Priority: 2**

**SC Reviewed: 05/04/00**

**Status: Approved**

**Priority: 2**

**1.a. Full Title:** Trait anger and carotid atherosclerosis: Examination of a possible mechanism in cardiovascular disease. The Atherosclerosis Risk in Communities (ARIC) Study

**1.b. Abbreviated title (Length 26 characters):** Trait anger - IMT

**2. Writing Group (List the individual with lead responsibility first):**

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**3. Timeline:** Complete data analysis – August 2000

Draft of manuscript to Publications Committee – December 2000

Journal submission – April 2001

**Hypothesis:**

1. Proneness to anger as a personality trait (trait anger) is positively associated with carotid atherosclerosis independent of the standard CVD risk factors.
2. Proneness to anger as a personality trait is positively associated with the progression of carotid atherosclerosis independent of the standard CVD risk factors.

**4. Rationale:**

Previous studies in ARIC and elsewhere have shown a positive association between anger and clinically manifest disease, e.g., CHD (1-4) and stroke (5, 6). However, the mechanism by which anger influences these disease states is unknown. The two most-often articulated explanatory hypotheses, relative to CHD at least, implicate anger either as a “trigger” of physiologic events that culminate in occlusive thrombosis (7) or as a factor in atherogenesis via the heightened sympathetic arousal and catecholamine secretion associated with the anger experience (8). The purpose of the proposed study is to examine the hypothesis that anger may be an important factor in the process of atherosclerosis. To do so, we will examine both the cross-sectional and prospective association between trait anger and intima-medial wall thickness (IMT), controlling for the established CVD risk factors. IMT is regarded as a proxy for diffuse or generalized atherosclerosis (9, 10), although this claim is not universally supported (11). Observational studies, including those from ARIC, have reported a positive association

between IMT and prevalent CVD among middle-aged adults (10), as well as between IMT and incident CHD (9) and stroke (12).

Three studies of the relationship between anger and atherosclerosis are found in the literature. In prospective analyses, Julkunen, Salonen, Kaplan et al. (13) found a near two-fold increase in the acceleration of carotid atherosclerosis (as measured by intima-medial wall thickness) among angry and cynically distrustful Finnish men. In cross-sectional analyses, Matsumoto, Uyama, Shimizu et al. (14) reported that ease of anger arousal was positively associated with the severity of carotid atherosclerosis (as measured by plaque scores) in Japanese men and women. In a more recent cohort study, higher levels of trait anger were correlated with higher levels of IMT among middle-aged women 10 years later, on average (15).

The results of the proposed study could contribute to a greater understanding of a mechanism by which stable personality attributes such as anger influence cardiovascular disease. ARIC provides the opportunity to investigate the anger-atherosclerosis hypothesis in a large population-based sample of both black and white men and women, a less restricted demographic representation than has been found in previous studies.

**6. Data(variables, time window, source, inclusions/exclusions):** Visit 1 - educational level, prevalent stroke, prevalent CHD; Visit 2 - age, gender, race/ethnicity, Spielberger Trait Anger Scale, LDL and HDL cholesterol levels, systolic BP, diastolic BP, fibrinogen, diabetes, waist-to-hip ratio, alcohol consumption, cigarette smoking, antihypertensive medication use, mean of the reader trend adjusted IMT variables (MNB45\_1); Visit 3 - mean of the reader trend adjusted IMT variables (MNC45\_1); Visit 4 – mean of the reader trend adjusted IMT variables (MND45\_1).

**Statistical analysis:** The study hypotheses will be tested using multiple linear regression analysis. The outcome variable in the cross-sectional analyses will be IMT values at Visit 2; for the prospective analyses it will be mean change in IMT from Visit 2 to Visit 4. The following hierarchical models will be fit for each hypothesis:

Model 1: Crude

Model 2: Adjusting for age, gender, race/ethnicity

Model 3: Adjusting for age, gender, race/ethnicity, level of educational attainment, systolic and diastolic blood pressure levels, LDL- and HDL-cholesterol levels, diabetes, waist-to-hip ratio, alcohol intake, antihypertensive medication use, cigarette smoking, and fibrinogen.

Interaction tests will be performed to verify no interaction before fitting models 2 and 3.

Linear regression analysis will also estimate least square mean (and mean change) values of IMT by level of anger to determine whether higher levels of anger are associated with higher levels/greater increases in IMT.

## Literature Cited

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