Investigated the effects of vitamin D repletion on endothelial function (EF; EndoPAT-RHI), and inflammation in 90 patients with coronary artery disease (CAD) and vitamin D deficiency (< 20 ng/ml), randomized to 50,000 IU of oral ergocalciferol, or placebo weekly for 12 weeks. RHI, circulating adhesion molecules, and pro-inflammatory cytokines were measured at baseline and 12 weeks.

**RESULTS:** Serum 25-vitamin D increased significantly from baseline in the active vs. placebo group (difference; p < 0.001). Within-group and between-group differences in intercellular adhesion molecule levels were greater with placebo (between-group difference, p = 0.048). There were no significant differences between groups in reduction of interleukin (IL)-12, in blood pressure, e-selectin, high-sensitivity C-reactive protein, IL-6, chemokine CXCL-10, RHI or in vascular cell adhesion molecule.

**CONCLUSION:** Repleting vitamin D levels in CAD failed to improve surrogate markers of cardiovascular health, thus questioning the role of vitamin D supplementation in modifying cardiovascular disease in CAD patients.


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**Assessment of EndoPAT Scores in men with vasculogenic and non-vasculogenic erectile dysfunction.**


Investigated whether EndoPAT-RHI could help identify men in whom endothelial dysfunction was the underlying cause of erectile dysfunction (ED), in 194 men with general ED and 98 men with postprostatectomy ED, but without preoperative ED, (based on patient chart review).

**RESULTS:** RHI scores were not significantly different between men with general vs. postprostatectomy ED (1.97 vs. 2.08, p=0.074), nor was there a relationship between RHI and The Sexual Health Inventory for Men (SHIM-5), scores in the general ED cohort. Hypertension, hyperlipidaemia and cardiovascular (CV) disease prevalences were similar between groups, but diabetes and hypogonadism were more prevalent in general ED (21% vs. 9%, and 28% vs. 7%, p<0.015).

**CONCLUSION:** RHI in postprostatectomy men with at least one risk factor was not significantly different compared with men with general ED with the same comorbidity load. The value of EndoPAT testing in the clinical evaluation of ED patients is questionable.


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**The LIFE child study: a life course approach to disease and health.**


The ‘Leipzig Research Centre for Civilization Diseases (LIFE) Child Study’ is a unique prospective longitudinal cohort study to assess how environmental, metabolic and genetic factors affect growth, development and health from fetal life to adulthood. It focuses on two main research objectives: (1) monitoring of normal growth, development and health; (2) non-communicable diseases such as childhood obesity and co-morbidities, atopy and mental health problems. Detailed assessments will be conducted, alongside long-term storage of biological samples in 2,000 pregnant women and more than 10,000 children and their families, including EndoPAT–RHI measurements in a subsample.

**CONCLUSION:** This paper addresses key elements in the design and implementation of the LIFE Child study. Data collection will provide unprecedented opportunities to examine complex interactions that govern the emergence of non-communicable diseases.


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**Air-Pollution and Cardiometabolic Diseases (AIRCMD): A prospective study investigating the impact of air pollution exposure and propensity for type II diabetes.**

Sun Z, Mukherjee B, Brook RD, Catts GA, Yang F, Fan Z, Brook JR, Sun Q, Rajagopalan S.


The objective of the AIRCMD study is to prospectively investigate the impact of personal level air pollution measures on propensity to type II diabetes in subjects with metabolic syndrome. Primary endpoints include independent associations between integrated 5-day mean exposure to PM(2.5) and insulin resistance (HOMA-IR) measures, 24-hour mean diastolic and mean arterial pressure and EndoPAT-RHI. Secondary endpoints will include arterial compliance, heart rate variability and plasma adipokines.

Novel aspects of the study include the launch of infrastructure for future translational investigations in highly polluted urbanized environments and the creation of novel methodologies for linking personalized exposure measurements with functional CM outcomes.

**CONCLUSION:** The AIRCMD study will allow for unprecedented new investigations into the association between environmental risk factors and CM disorders.

A Randomized Double Blind Cross-Over Study of Indoor Air Filtration and Acute Changes in Cardiorespiratory Health in a First Nations Community.


Examined the impact on cardiorespiratory health, lung function, blood pressure, and endothelial function (EndoPAT-RHI), of indoor air quality in First Nations communities on a reserve in Manitoba, Canada, in 37 residents in 20 homes using an electrostatic air filter (AF), and a placebo filter, for 1-week in random order. Measures were collected at the beginning and end of each week, and indoor air pollutants were monitored throughout the study.

RESULTS: Indoor particles decreased substantially during AF weeks vs. placebo but remained about 5-times greater than outdoor concentrations due to prevalent indoor smoking. On average, AF was associated with a 217 ml increase in forced expiratory volume in 1 second, and 7.9 and 4.5 mmHg decreases in systolic and diastolic blood pressures respectively. Inverse associations were observed between indoor particles and lung function.

CONCLUSION: Reducing indoor particles may contribute to improved lung function in First Nations communities.


Correlation between endothelial function measured by finger plethysmography in children and HDL-mediated eNOS activation—a preliminary study


Analyzed the correlation between endothelial functional (EndoPAT-RHI), and the capability of HDL to modify nitric oxide (NO) production by phosphorylation of endothelial nitric oxide synthase at the stimulatory site (Ser1177) and the inhibitory site (Thr495) and to stimulate eNOS phosphorylation assessed in cell culture, in 11 school children.

RESULTS: A close correlation between RH and the eNOS-Ser1177 phosphorylation (r = 0.66, p = 0.02) and the eNOS-Thr495 phosphorylation (r = -0.60, p = 0.04) was detected.

CONCLUSION: Supports the validity of EndoPAT-RHI measurement in children, but studies measuring FMD and RHI are needed for confirmation.


Polycystic ovary syndrome has no independent effect on vascular, inflammatory or thrombotic markers when matched for obesity.


Assessed if polycystic ovary syndrome (PCOS) increases CV risk independently in young obese women by examining carotid intima-media wall thickness (cIMT), platelet function (flow cytometry, clot structure and fibrinolysis), and endothelial function (ELISA and EndoPAT-RHI), in 21 women with PCOS and 19 age, weight matched controls.

RESULTS: PCOS had higher testosterone (P=0.01), HOMA-IR (P=0.08), impaired glucose regulation (P=0.02), and urinary isoprostane (P=0.04) compared to controls. Mean cIMT, basal platelet surface expression, fibrinogen binding , platelets sensitivity to stimulation or inhibition, ex vivo clot structure and fibrinolytic efficiency, RHI, inflammation (hsCRP) and adhesion markers (sE-selectin, sP-selectin, sVCAM-1 and sICAM-1) were not significantly different between groups.

CONCLUSION: PCOS appeared not to independently increase atherothrombotic risk when matched for obesity. Excess CV risk in young obese women with PCOS can likely either be attributed to obesity or is not yet apparent at early stages of the condition.


Hass avocado modulates postprandial vascular reactivity and postprandial inflammatory responses to a hamburger meal in healthy volunteers.


Investigated the effect of adding 68g of Hass avocado, on endothelial function (EndoPAT-RHI), and inflammatory marker changes 2h after eating a 250 g hamburger with or without added avocado, in 11 healthy subjects.

RESULTS: Two hour post hamburger RH declined significantly vs. baseline (2.19 ± 0.36 vs. 1.56 ± 0.21, p = 0.0007), but was unchanged from baseline with added avocado. Postprandial (3h) inflammatory marker Ikappa-B alpha concentration was significantly better preserved with added avocado (p = 0.03), consistent with reduced NF-kappa B activation, and IL-6 increased significantly 4h post hamburger only, but was unchanged with added avocado. Added avocado did not increase serum triglycerides beyond burger alone despite its added fat and calories.

CONCLUSION: These observations are suggestive of beneficial anti-inflammatory and vascular health benefits of added Hass avocado with a hamburger patty.

Assessed racial differences in endothelial function and augmentation index in 385 black and 470 white subjects (mean age, 48±11 years; 45% male), using EndoPAT-RHI, PAT-AIx and Central augmentation index (C-AIx) and pulse-wave velocity (PWV) using applanation tonometry (Sphygmocor).

**RESULTS:** Compared with whites, blacks had lower RHI (P<0.001), greater arterial wave reflections assessed as both PAT-AIx (P=0.01) and C-AIx (P=0.001), and greater PWV (P=0.001). After adjustment for traditional CVD risk factors, black race remained a significant predictor of lower RHI and higher PAT-AIx and C-AIx (all P<0.001), in all subjects, and of higher PWV in men (P=0.01). These associations persisted in a subgroup analysis of “healthy” individuals free of CVD risk factors.

**CONCLUSION:** Black race is associated with impaired microvascular vasodilatory function, and greater large arterial wave reflections and stiffness, which may represent underlying mechanisms for the increased CVD risk in blacks.


Evaluated the relationship between 24 hour blood glucose level fluctuations by continuous glucose monitoring (CCM) in 57 patients with type 2 diabetes mellitus and EndoPAT-logRHI.

**RESULTS:** Log RHI correlated with the SD of blood glucose levels (r=-0.504; P<0.001), mean amplitude of glycemic excursions (MAGE) (r=-0.571; P<0.001), mean postprandial glucose excursion (MPGGE) (r=-0.411; P=0.001) and percentage of time 200mg/dl (r=-0.292; P=0.028). In 12 patients with hypoglycemia, Log RHI also correlated with percentage of time at hypoglycemia (r=-0.589; P=0.044).

Log RHI did not correlate with HbA1c, fasting plasma glucose levels, LDL, HDL, and triglyceride levels or with systolic and diastolic blood pressures. Multivariate analysis identified MAGE as the only significant determinant of log RHI.

**CONCLUSION:** Fluctuations in blood glucose levels play a significant role in vascular endothelial dysfunction in type 2 diabetes.

Dietary calcium intake is associated with adiposity, metabolic profile, inflammatory state and blood pressure, but not with erythrocyte intracellular calcium and endothelial function in healthy pre-menopausal women.

Evaluated associations of dietary Ca with; adiposity, erythrocyte (Ca2+)i, metabolic profile, BP, inflammatory state, anthropometric parameters, body composition, biochemical variables and endothelial function (EF, by EndoPAT-RHI), and serum concentrations of adhesion molecules, in 76 healthy pre-menopausal women. Participants were allocated into low-Ca group (LCG; n 44; < 600 mg/d) and high-Ca group (HCG; n 44; > 600 mg/d).

**RESULTS:** Compared to HCG, LCG exhibited, higher values of BMI, waist circumference, waist:height ratio, percentage of body fat, insulin, homeostasis model assessment of insulin resistance, leptin, diastolic and mean BP; and lower levels of HDL-cholesterol, adiponectin and vascular cell adhesion molecule 1. EndoPAT-RHI and (Ca2+)i were similar in both groups. HCG had lower OR for prevalent overweight, obesity, abdomimal obesity, insulin resistance, HDL-cholesterol < 600 mg/l and systolic BP >120 mmHg.

**CONCLUSION:** Findings suggest that high Ca intake is inversely associated with some cardiovascular risk factors.
Dr. Quyyumi, Professor of Medicine in the Division of Cardiology at Emory University School of Medicine and Co-Director at Emory Clinical Cardiovascular Research Institute (ECCRI), Atlanta, GA, USA. His highly distinguished and prolific scientific and clinical career has been marked by amongst other achievements, seminal studies investigating mechanisms of myocardial ischemia including silent ischemia, and progenitor cell biology in the determination of endogenous regenerative capacity.

He is involved with multiple study areas including, angiogenesis, cell therapy, and biomarkers including cardiovascular genomics and metabolomics, and the role of mental stress in ischemia. Other studies include comprehensive assessment of vascular endothelial function, arterial stiffness and thickness in patients with arteriosclerosis and its risk factors to personalise risk assessment and the role of genetic and environmental risks on cardiovascular disease, particularly in relation to health disparities.

Since 2005, Dr. Quyyumi has been awarded more than $9 million in research funding. He serves on the Editorial Boards of several national journals, is a member on several Scientific Advisory Boards, and is a reviewer for the NIH-NHLBI Study Sections. Dr. Quyyumi has authored more than 180 peer-reviewed publications.

Prof. Quyyumi and colleagues, are making significant contributions to the scientific base and clinical acceptance of the EndoPAT, as evidenced by the following publications:


Ramadan R, Sheps DS, Bremner JD, Vaccarino V, & Quyyumi AA. The Degree of Microvascular Constriction During Mental Stress Predicts the Development of Mental-Stress-Induced Myocardial Ischemia. AHA 2012 abstract 18514.

