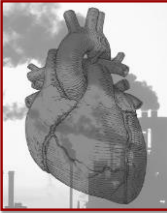


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### Association between Benzene Exposure, Circulating Angiogenic Cell Levels, and Cardiovascular Disease Risk in the Louisville Healthy Heart Study

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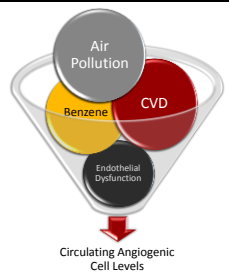
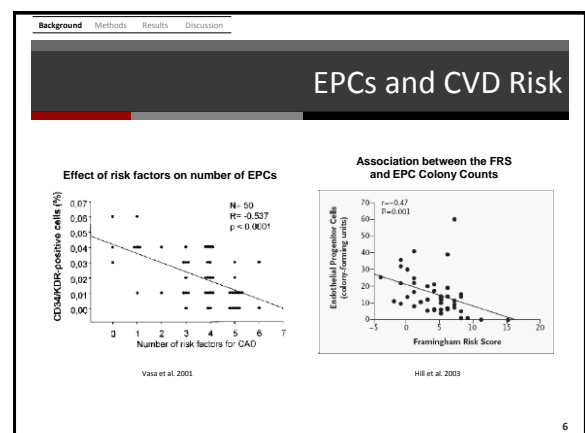
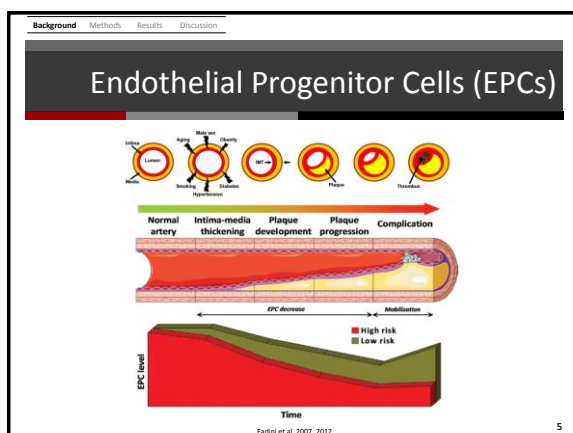
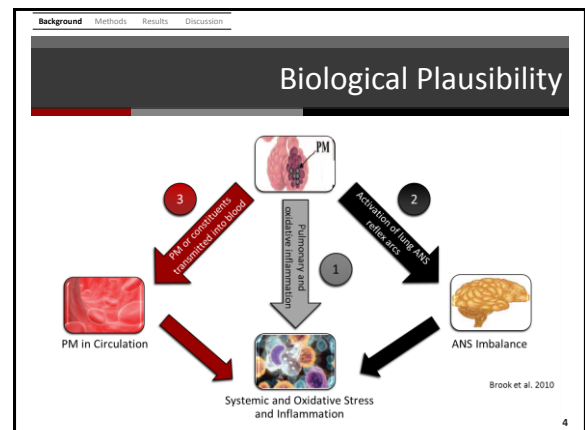
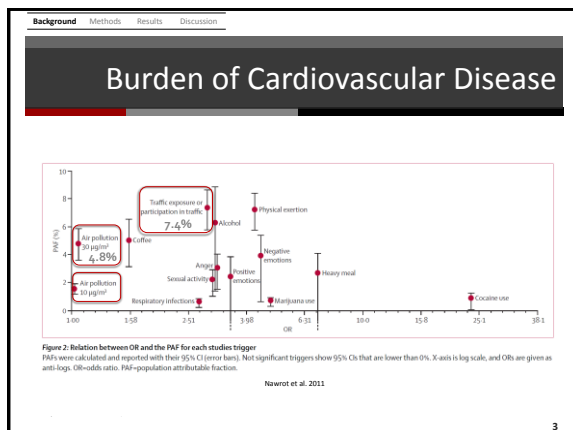
<sup>1</sup>University of Louisville Division of Cardiovascular Medicine; <sup>2</sup>Environmental and Occupational Health Sciences; <sup>3</sup>Biochemistry and Molecular Biology/Pediatrics; <sup>4</sup>and Biostatistics and Bioinformatics

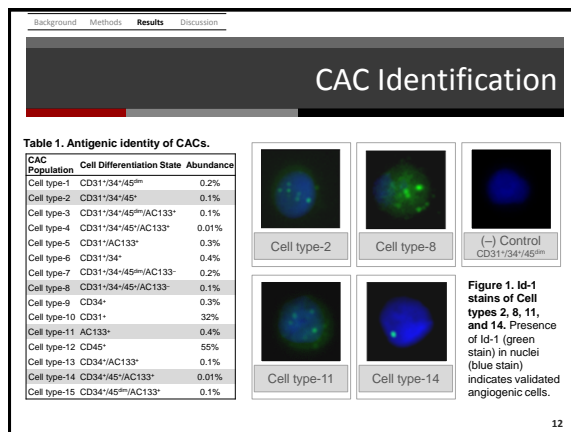
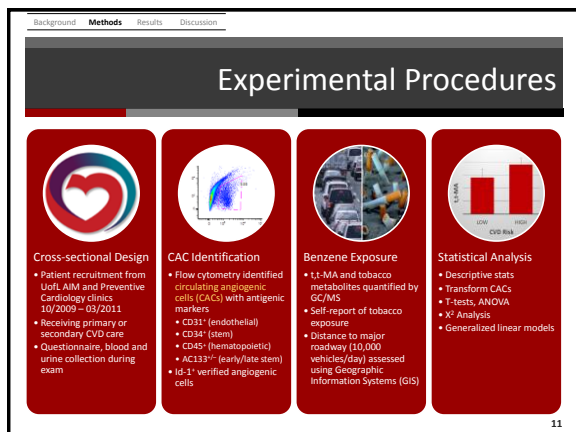
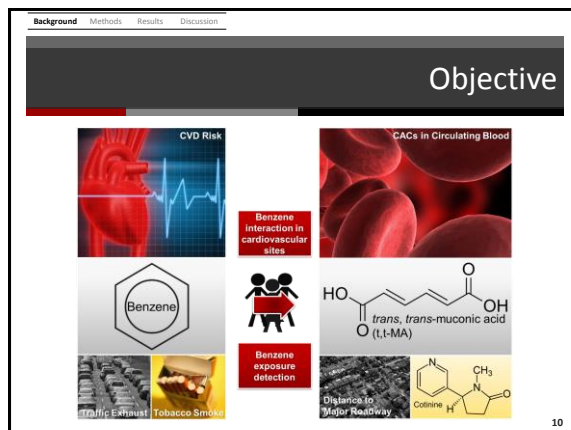
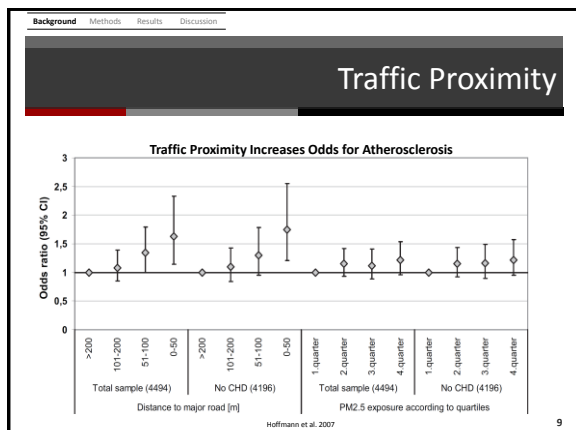
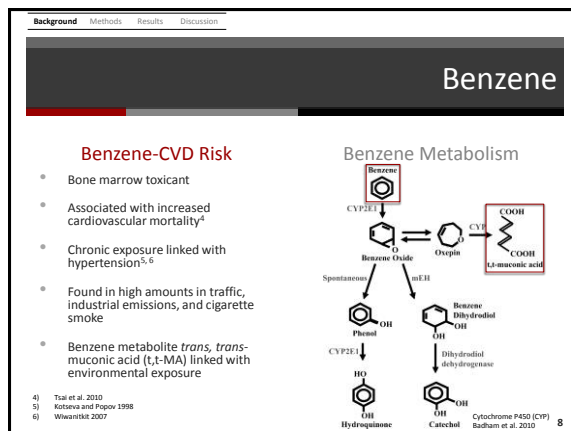
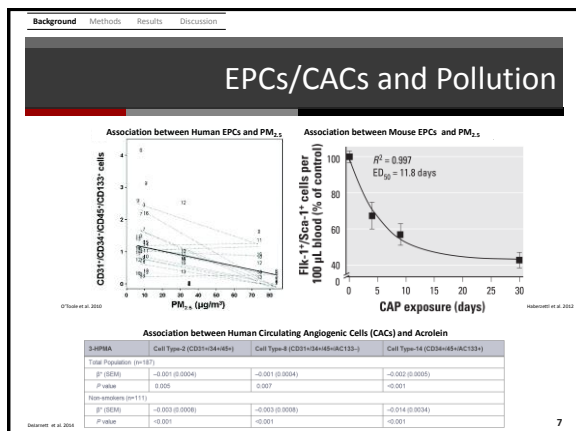
APHA Annual Meeting, 17 November 2014

Image: <http://ftp.cdc.gov/pub/health/DOH/108/108-11/HeartImage.JPG>

## Overview

- Background
  - Cardiovascular disease (CVD) burden
  - CVD and pollution
  - Endothelial progenitor cells (EPCs)/ Circulating angiogenic cells (CACs)
  - Benzene exposure effects
- Methods of the Healthy Heart Study
- Results
- Summary



Background	Methods	Results	Discussion		
<b>Table 2. Demographic summary of the Louisville Healthy Heart Study stratified by t-MA tertiles. Low t-MA ≤0.06; medium t-MA &gt;0.06–0.16; high t-MA &gt;0.16 mg/g creatinine. Revascularization includes coronary artery bypass graft, percutaneous coronary intervention, or stents. Platelet-leukocyte aggregates are the % total of cells CD41+45+.</b>					
<b>Categorical Variable - n (%)</b>	<b>Total n=210</b>	<b>Low t-MA n=70</b>	<b>Medium t-MA n=70</b>	<b>High t-MA n=70</b>	<b>p-value</b>
Gender					0.442
Male	101 (48)	32 (46)	38 (54)	31 (44)	
Female	109 (52)	38 (54)	32 (46)	39 (56)	
Ethnicity					0.301*
Caucasian	118 (56)	38 (54)	43 (61)	40 (57)	
African American	88 (42)	42 (60)	27 (39)	19 (27)	
Hispanic	4 (2)	2 (3)	0 (0)	2 (3)	
CVD Risk Factors					
Hypertension	168 (81)	58 (83)	67 (96)	64 (79)	0.877
Hyperlipidemia	108 (52)	38 (54)	37 (54)	52 (75)	0.024*
Diabetes	54 (26)	18 (26)	19 (28)	17 (25)	0.828
Obesity	118 (56)	38 (54)	40 (59)	40 (58)	0.969
Current smoker (self-reported)	82 (39)	18 (26)	33 (48)	33 (47)	0.003*
High CVD Risk Category	196 (79)	68 (98)	59 (84)	59 (84)	0.011*
Medical History					
Myocardial infarction	70 (34)	21 (30)	24 (35)	25 (36)	0.782
Stroke	20 (10)	7 (10)	3 (4)	10 (14)	0.137
Revascularization	98 (27)	14 (20)	17 (25)	25 (36)	0.107
Heart Failure	37 (18)	12 (18)	12 (17)	13 (19)	0.972
Medication					
ACE inhibitor	112 (53)	35 (51)	40 (59)	37 (54)	0.835
Angiotensin-receptor blockers	12 (6)	5 (7)	4 (6)	3 (4)	0.779
Aspirin	116 (57)	35 (51)	40 (59)	41 (60)	0.476
Beta-blocker	125 (59)	41 (59)	44 (65)	44 (65)	0.783
Calcium-channel blockers	46 (22)	14 (20)	17 (25)	15 (22)	0.801
Diuretics	79 (38)	25 (36)	31 (45)	23 (34)	0.330
Statins	106 (51)	31 (45)	34 (50)	43 (63)	0.086
Insulin	47 (23)	16 (23)	20 (29)	11 (16)	0.166
Continuous Variable - mean (SD)					
Age (years)	51 (10)	52 (13)	49 (10)	51 (12)	0.243
Cotinine (μg/g creatinine)	521 (1050)	148 (273)	686 (1431)	725 (963)	<0.001*
Framingham Risk Score	8 (9)	7 (7)	7 (7)	12 (9)	0.259
Lymphocyte Count X 10 <sup>9</sup>	13 (9)	13 (9)	13 (9)	14 (10)	0.724
Fibrinogen (mg/dL)	346 (109)	355 (128)	345 (111)	339 (82)	0.778
Platelet-leukocyte Aggregates	11 (8)	11 (8)	10 (8)	11 (7)	0.718
hsCRP (mg/L)	0.81	0.81	0.81	0.89	0.896
Median Household Income (X \$1000 USD)	31 (19)	29 (19)	30 (20)	30 (20)	0.686

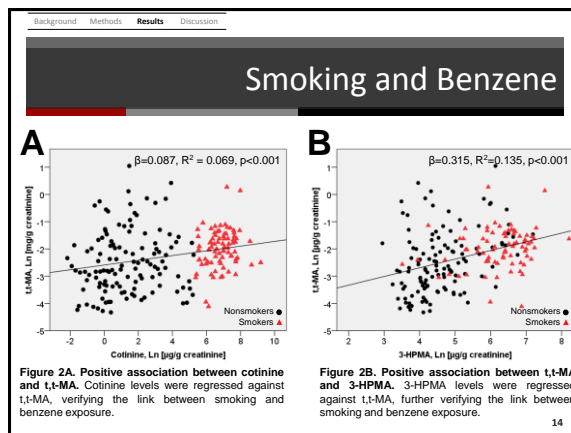
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\* = significant at the 0.05 level.

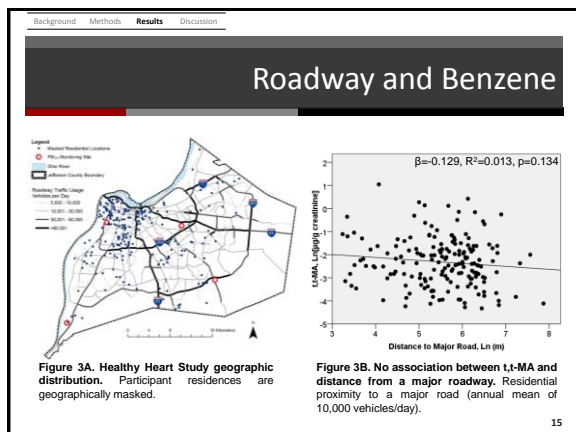
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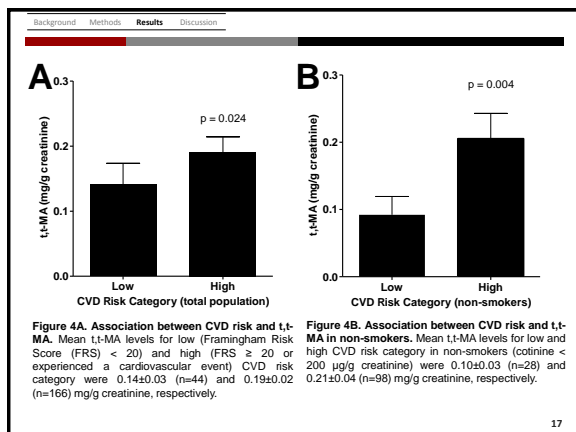
Background Methods Results Discussion

## Table 3. Significant associations (adjusted) between t-MA and circulating angiogenic cell levels.

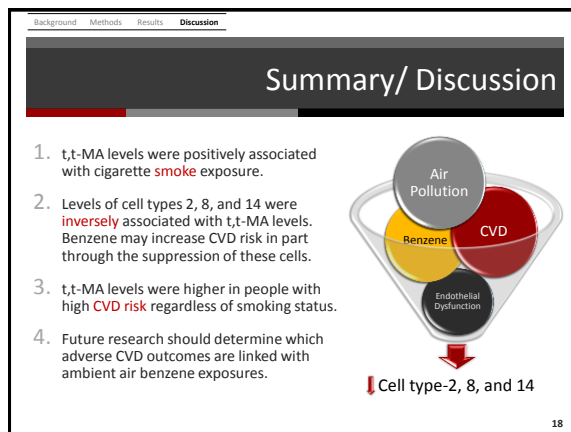
t-MA Regression	Cell type-2 (CD31+/34+/45+)	Cell type-8 (CD31+/34+/45+/IC133+)	Cell type-11 (AC133+)	Cell type-14 (CD34+/45+/IC133+)
<b>Total Population, adjusted for ethnicity, hyperlipidemia, and cotinine n=210</b>				
$\beta$	-1.783	-1.933	-0.047	-1.663
p-value	0.001*	0.001*	0.870	0.006*
<b>Non-smokers, adjusted for ethnicity, hyperlipidemia, and cotinine n=128</b>				
$\beta$	-2.246	-2.274	-0.304	-1.945
p-value	0.004*	0.003*	0.364	0.001*
<b>Caucasian, adjusted for hyperlipidemia, and cotinine n=118</b>				
$\beta$	-1.788	-1.755	-0.410	-1.576
p-value	0.014*	0.017*	0.068	0.015*
<b>African American, adjusted for gender, diuretics, calcium-channel blockers, SES, and cotinine n=88</b>				
$\beta$	-1.418	-1.603	1.594	-7.106
p-value	0.044*	0.030*	0.013*	0.032*

\* p < 0.05  
† Nonsmokers have cotinine < 200 μg/g creatinine.

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Background Methods Results **Discussion**



## Discussion

Strengths	Limitations
<ul style="list-style-type: none"> <li>• Novel investigation of t,t-MA and CVD risk factors</li> <li>• Large population study</li> <li>• Individual measure of benzene exposure</li> <li>• Empirical cigarette smoke exposure measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Biomarkers only collected at 1 time point</li> <li>• Many other benzene metabolites</li> <li>• Cotinine misclassification</li> <li>• Possible selection bias</li> <li>• No ambient benzene measurements</li> </ul>

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## Acknowledgements

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