



World Coffee Conference
17-19 May 2001 (London)

Coffee and Health



INSTITUTE FOR COFFEE STUDIES

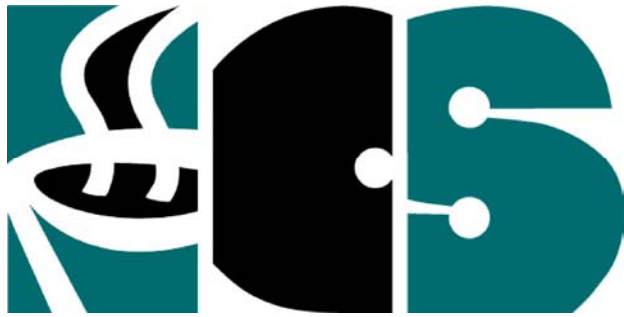
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ICS Director



INSTITUTE FOR COFFEE STUDIES



Vanderbilt University



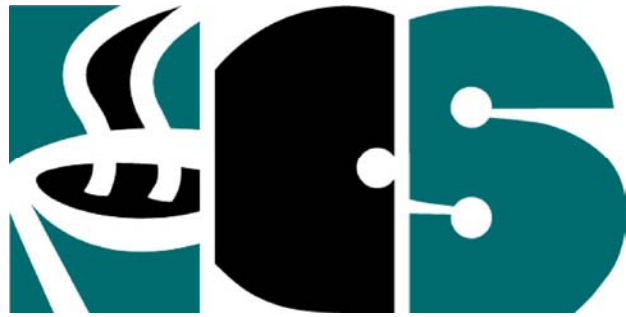
Mission

- To systematically investigate the *pharmacological actions* of the various compounds found in coffee
- To identify potential *health benefits and/or therapeutic uses* of coffee based on a fundamental understanding of its constituents
- To *disseminate results* and promote *educational exchange* with partner nations



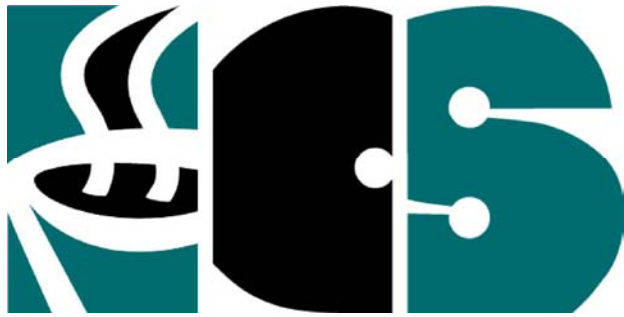
Rationale for establishment of ICS

- No compelling evidence that coffee consumption in moderation is detrimental to health
- Epidemiological evidence suggests potential health benefits of coffee (suicide, cirrhosis, cancer, heart disease, Parkinson's disease)
- *ICS investigations are intended to elucidate fundamental mechanisms of health benefits of coffee consumption rather than to disprove adverse health effects*



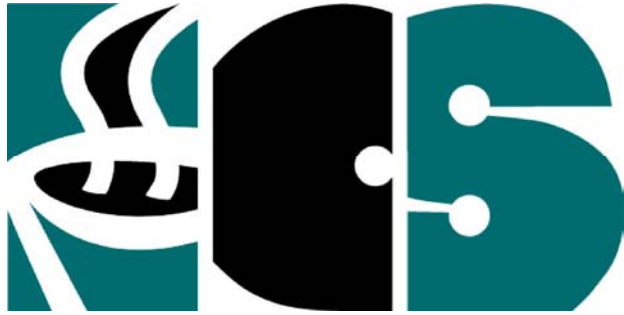
Academic independence

- ICS scientists are all faculty of Vanderbilt University or affiliated academic institutions
- All publications appear in peer-reviewed journals without censorship
- Unrestricted research grants
- Regular external review by leaders in relevant scientific disciplines



ICS research is relevant to physician education

- Physicians are still taught in medical school that coffee is detrimental to health and advise their patients accordingly
- *Fundamental mechanisms* underpinning health benefits of coffee consumption interest clinical scientists who determine medical curriculum content
- Implications for medical education, physician attitudes, and accepted health behaviors

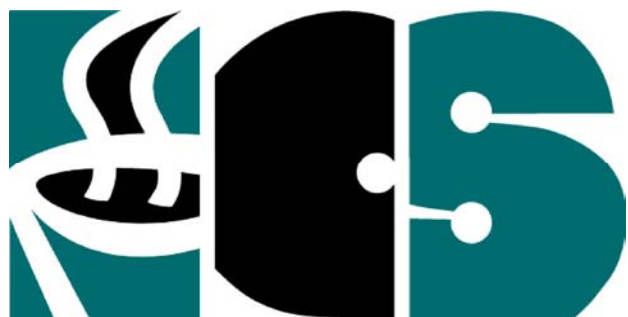


Chlorogenic acid and caffeine content of coffee*

Green coffee beans* → *Roasted coffee beans

CGA (8%)	2	CGA (4%)	1
quinides (0%)	0	quinides (4%)	1
caffeine (2%)	0.5	caffeine (2%)	0.5

*Percentage of total weight and grams in 3 cups of coffee



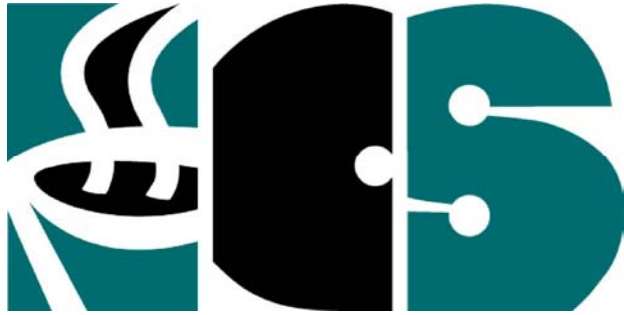
General research strategy at ICS

- Synthesize CGA quinides *de novo* and chemically modify to alter properties
- Screen these compounds for binding at many different neuroreceptors
- Determine detailed binding characteristics of compounds
- Coffee extracts ***and*** individual compounds studied in parallel



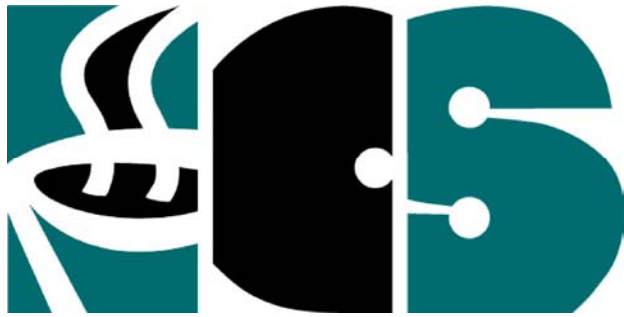
General research strategy at ICS

- Appropriate other *in vitro* measures of function implemented/developed
- Actions in animal models
- Actions in healthy humans, disease states
- Population studies



Ongoing research studies of CGAs

- Effects on adenosine and opioid systems
- Antioxidant effects
- Behavioral interactions with caffeine
- Neuroprotective effects
- Endothelial protective effects



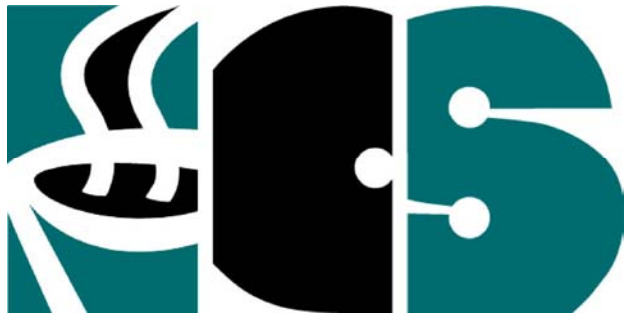
Adenosine

- Inhibits release of several neurotransmitters
- Increases regional blood perfusion
- Stabilizes membrane potentials and decreases heart and brain tissue excitability
- Prevents cellular damage during various tissue insults (e.g., oxidant stress, excitotoxicity)
- Caffeine is a recognized adenosine antagonist
- ***Do CGAs contribute to coffee effects on***



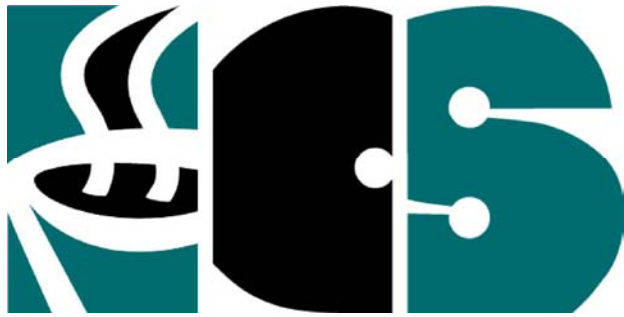
Opioids

- Endogenous opioids affect 'pleasure', pain, and 'drive' centers in the brain much as does morphine
- Opioid antagonist can prevent relapse in alcoholism
- CGA quinides inhibit mu-opioid receptors
- ***Can quinides in coffee be used to treat alcoholism or other addictions?***



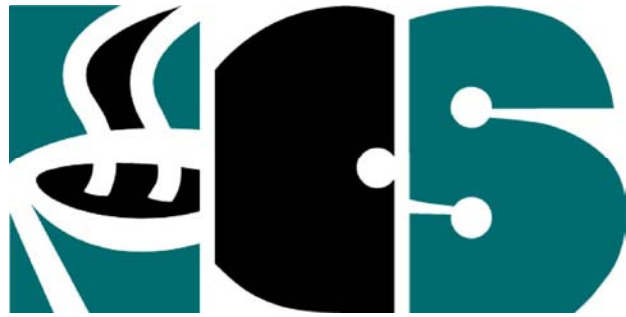
Antioxidants

- Highly reactive oxygen species formed in body can ***damage DNA, lipids, proteins***, etc.
- ROS implicated in cancer, heart disease, degenerative brain disorders, and aging
- Natural ingredients in coffee can reduce adverse effects of ROS (roasted > green)
- ***Do antioxidants present in coffee***



Antioxidant effects of CGAs *in vitro*

- *Uptake* of CGAs by human erythrocytes
- Ferric reduction *antioxidant potential*
- Preserve *natural* antioxidants (Vitamin E)
- Protect *cell membranes & human plasma* against oxidant stress
- Decrease generation of *free radicals* (toxic)
- Ongoing studies to investigate beneficial effects *in vivo*



Diseases with endothelial dysfunction:

- Chronic and acute smoking
- Hypertension
- Hypercholesterolemia
- Diabetes
- Congestive heart failure
- Unstable angina
- Atherosclerotic coronary vascular disease



Study of coffee constituents may help us better
**understand, prevent, and
treat common diseases**

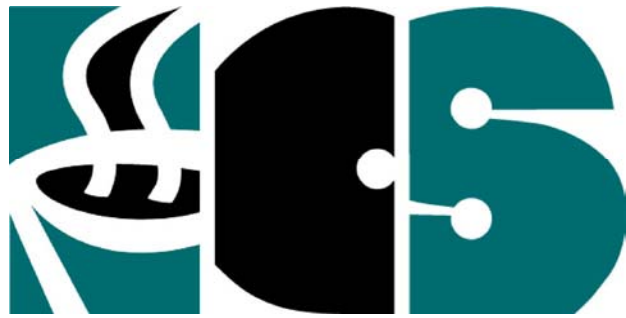
- Depression/anxiety (suicide)
- Atherosclerosis (cardiovascular mortality)*
- Degenerative brain disorders (Parkinson's and Alzheimer's diseases)*
- Cancer*
- Alcohol/drug addiction (cirrhosis)*

** Antioxidant mechanisms can be implicated*



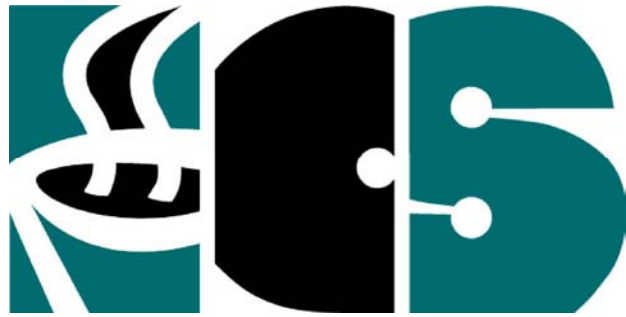
Future directions

- Pursue the latest biomedical research via Pilot and Feasibility Award Program
- Coffee Heart Study (ICS and WHF)
- Recruit trainees from partner nations
- Facilitate international scholarly activities at Vanderbilt through ICS
- Continue dissemination of ICS findings



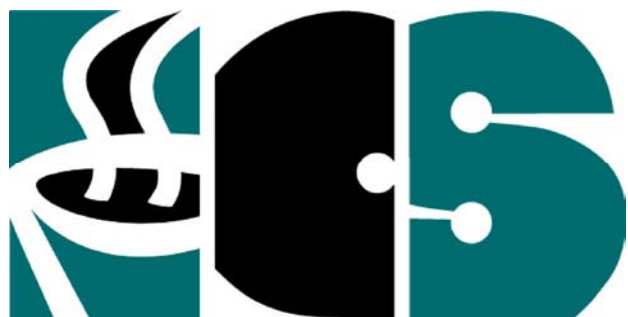
Implications of ICS research

- New horizons for traditional coffee industry research (agronomy, chemistry of ‘quality’)
- Other options than decaffeination
- Maximize coffee content of beneficial constituents through genetic engineering, roasting, blending, etc.



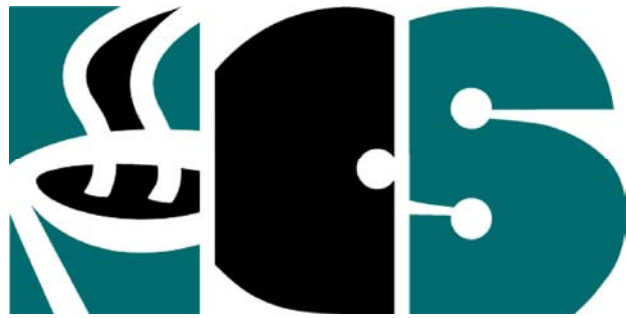
Implications of ICS research

- Develop “different” medicinal coffees (mood, memory, antioxidant, etc.)
- Develop new medications from natural constituents of coffee (“nutriceutical”)



Acknowledgments

- Association of Coffee Producing Countries (Brazil and Colombia)
- Coalition of Central American Coffee Producing Nations
- National Coffee Association (USA)
- All-Japan Coffee Association
- Kraft Foods (USA)



ICS Website

<http://mc.vanderbilt.edu/coffee/>