Coffee from Seed to Cup: The Biomedical Story from a Heart Surgeon's Perspective

James A Ameika MD FACS
Kona Cloud Coffee Estates Inc
Jonesboro Arkansas & Kona Hawaii

Arkansas? Hawaii? Coffee???

- Brief Background
  - College and Medical School in Arkansas
  - Army for 13 years
    - Honolulu
    - San Antonio
    - San Francisco
    - Saudi Arabia
  - Jonesboro for the last 19 years

Kona

Hawaii


KAUAI
Hanalei
Kilauea
NIIHAU
Waimea
Lihue
Puuwai
KAULA
N
Hawaii
Pacific
Ocean
OAHU
Haleiwa
Waimea
Makaha
Waianae
Wahiawa
Kaneohe
Pearl City
Kailua
Honolulu
MOLOKAI
Kalaupapa
Halawa
Kaunakakai
LANAI
Cahalnia
Kahului
MAUI
Wailua
Hana
Kaumalapau
Kihei
Kipahulu
KAHOOLAWE
Kapaau
Honokaa
Waimea
Paauilo
Honomu
Kalaoa
Hilo
Kailua
Pahoa
Kealia
Kalapana
Milolii
Punaluu
Honuapo
HAWAII
0 25 50 mi
0 25 50 km
160°
159°
158°
157°
156°
155°
22°
21°
20°
19°
©1999 maps.com


Hawaii
The BIG Island

Kona Beginnings

- Land Purchased in 1997
- Clearing and Planting 1998
- First Crop 2000
- Roasting 2001
- Web development 2003

Why is Kona Great for Coffee?

- Kona Micro-Climate
  - Warm sunny mornings
  - Cloudy misty afternoons
  - Volcanic well drained soil
  - Frost free growing
  - On the slopes of Mauna Loa (13,696 Feet)
- 19 Degrees North Latitude

Coffee & Kona

- Ancestral home of coffee is Ethiopia
- Coffee origins date to the 1400's in Yemen
- Coffee was first planted in Kona in 1828
- Original cuttings from Brazil
- Modern Kona coffee is from Guatemala
- About 600 farmers
- 2 Million pounds (1% of world production)

Coffee Growing

- Optimal Elevation 1500-3500 feet
- Taxonomy Coffea arabica & Coffea canephora
- C.arabica is 75 % of worldwide crop
- C.canephora or robusta is used as a filler
- Trees can live 75 – 100 years
- Hand picking every 2-3 weeks

Coffee Pictures


DIEDRICH

“Kona Coffee has a richer flavor than any other, be it grown where it may, and call it by what name you please”

Mark Twain


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Roasting Chemistry

Roasting

- Thermal and Chemical Reactions Occur
- Pyrolysis
- Maillard Reaction
- Carmelization
- Endothermic Reactions
- Exothermic Reactions

Major Coffee Acids

- Quinic Acid
- Citric Acid
- Chlorogenic Acid
- Phosphoric Acid
- Acetic Acid

Coffee Carbohydrates

- About 50% by weight of coffee's dry base
- Sucrose predominates and varies with ripening.
- Arabica has 2X the Sucrose of Robusta
- Mono, oligo and polysaccharides exist

Coffee Proteins

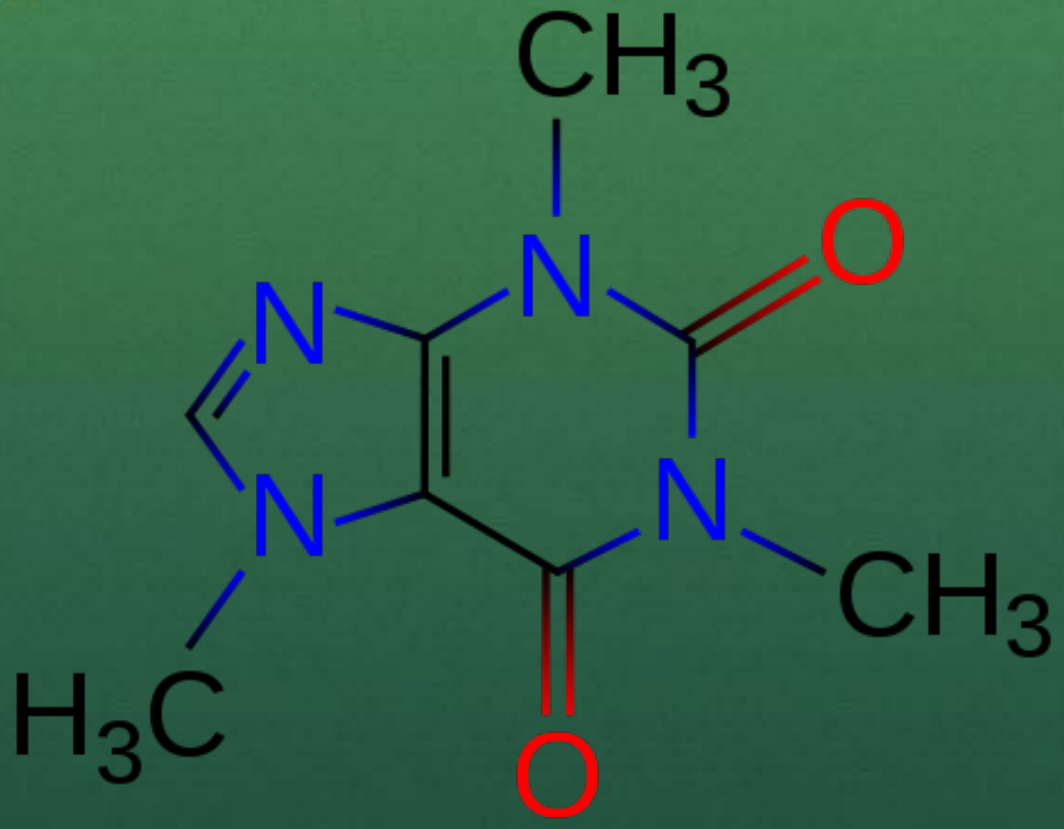
- Proteins account for 10-13% of dry matter
- Amino Acid concentrations dependent on stage of ripening
- Tryptophan, threonine, tyronine, serine, alanine, lysine, and arginine
- Play a critical role via Maillard Reaction

Coffee Lipids

- Arabica contains more lipids than Robusta
- Triglycerides account for 75%
- Diterpene alcohol esters 18%
- Deterpene alcohols 0.4%
- During roasting: lipids and caffeine remain virtually unchanged

Caffeine

Caffeine



Caffeine Chemistry

- Xanthine alkaloid
- Isolated in 1820
- Molecular Weight 194.19
- Arabica 1.2% Robusta 2.2%
- Concentration in a beverage is dependent on preparation technique
- Range of 60-150 mg per 8 oz. drink

Trigonelline

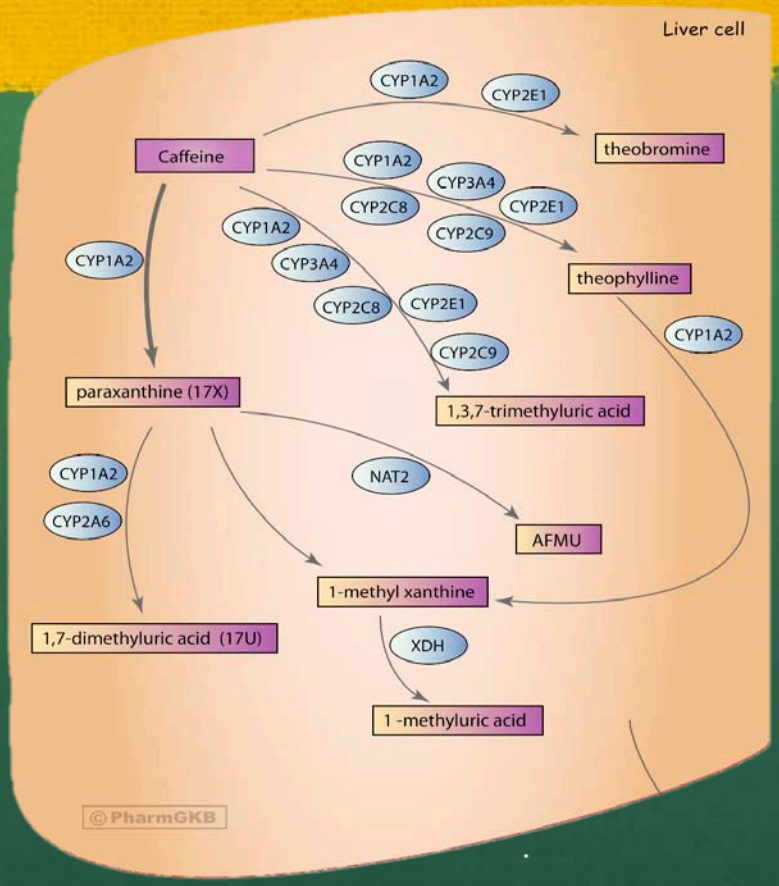
- Slightly bitter alkaloid
- Important precursor
- Degrades to the pyridines and nicotinic acid
- Roasting results in 50-80% loss
- Majority converted into pyridine
- Second product is nicotinic acid or niacin
- Coffee is an ample source of niacin

Medical Aspects of Coffee

Caffeine Metabolism

- Almost completely metabolized (97%)
- 75% via 3-N demethylation to paraxanthine
- 8% via 1-N demethylation to theobromine
- 8% via 7-N demethylation to theophylline
- 9% via C-8 hydroxylation to trimethyluric acid

Liver Metabolism



Genetics

- CYP1A2 is a member of the cytochrome P450 oxidase superfamily in the liver
- Major regulator of caffeine metabolism
- Varients exist in rate of metabolism
- Slow metabolism may be associated with: increased myocardial infarction, hypertension
- No evidence for elevation of cholesterol and caffeine

Caffeine and Fibrinolysis

- Fibrinolysis is the breakdown of clot in the body
- Clot formation is implicated in myocardial infarctions and strokes
- Regular coffee drinking is associated with increased fibrinolysis
- Effect not seen in decaf coffee drinkers
- Clinical significance is unknown

Caffeine & The Respiratory System

- Asthma is due to reversible airway obstruction secondary to smooth muscle constriction
- The methylxanthines are smooth muscle relaxant agents
- Theophylline is 2X more potent than caffeine
- Caffeine administration has a long history of use in newborns with neonatal apnea

Cancer

- Coffee contains more than 100 active chemicals
- No positive correlation between coffee intake and cancer incidence
- Cafestol and kahweol have been shown to be cancer protective in animal studies
- Hard to draw any overall conclusions

Weight Loss

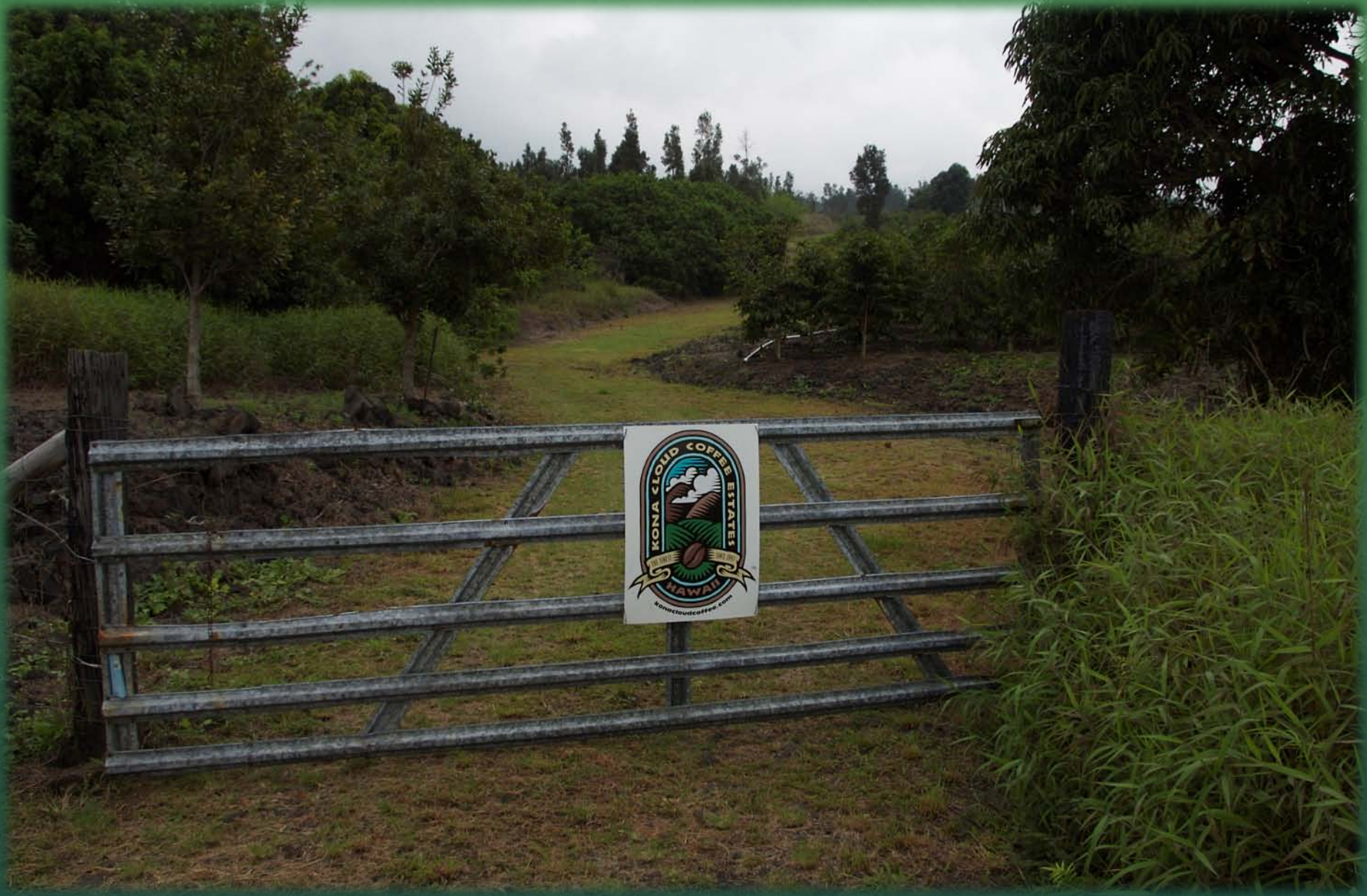
- Caffeine stimulates lipolysis
- Increases Free Fatty Acid release
- May lead to enhance fatty acid metabolism in endurance activities
- Increases basal metabolic rate
- Appetite suppressant
- Long term weight maintenance very complicated

Cafestol & Kahweol

- Diterpene alcohols
- In vitro: inhibits covalent bonding of aflatoxin to DNA
- Implicated in elevating cholesterol levels
- Effect only seen when paper filters are not used

Conclusions

KonaCloudCoffee.Com


KONA CLOUD COFFEE ESTATES
HAWAII
konacloudcoffee.com


Kona Cloud Coffee Esta
KONA CLOUD COFFEE ESTATES
THE FINEST
SINCE 1997
HAWAII
YOUR
SINGL
IGIN
KON
0%
FEE