

Coffee, pros and cons

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AIMS

- To announce the chemical composition of coffee, emphasizing above all on its bioactive compounds and its metabolites.

in

- To see the positive and negative effects that coffee consumption produces on human health.

Health effects of caffeine

Positive effects

- ✓ Reduces symptoms related Increases CVF. to Parkinson.
- ✓ Lower risk of CV disease.
- ✓ Potential protective effect in front of cancer disease.

Negative effects

development - Tolerance

frequent consumers.

- mild fatigue, Headache, depression in frequent consumers who leave its consumption.
- Abortion and bad development of foetus.

TRIGONELLINE

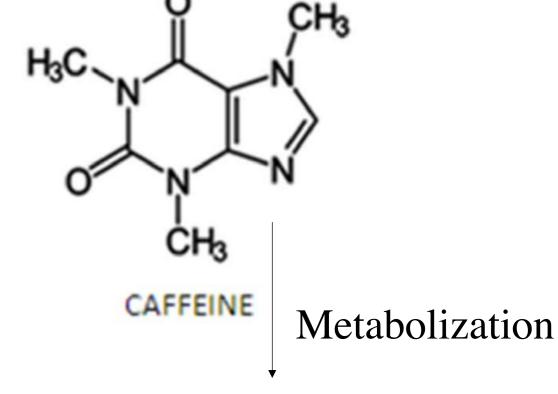
Trigonelline

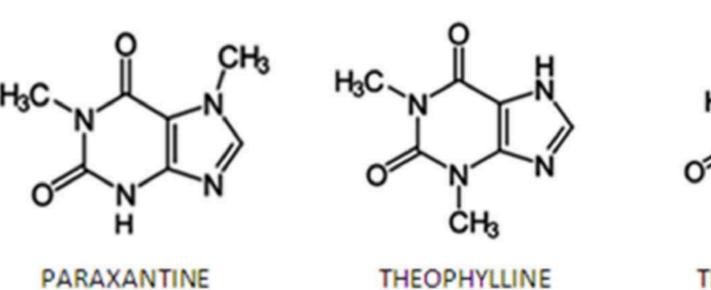
Nicotinic acid

From Arauz et al., 2017

Physiological effects of caffeine

Antagonist effects over adenosine receptors.





THEOBROMINE

Physiological effects of trigonelline Hypoglycemic, neuroprotective, antiinvasive, estrogenic and antibacterial. More over, decreases cholesterol ant triglycerides levels, and inhibits the invasion of hepatoma cells.

Health effects of trigonelline

- Anticarcinogenic.
- Speed up healing process in cancer disease.
- Anticariogenic (against Streptococcus mutans).

CAFFEINE

Health effects of diterpenes kahweol and cafestol

Increase CV risk, but it's counteracted by CGAs.

From Grases et al., 2014

KAHWEOL AND CAFESTOL

From Arauz et al., 2017

Kahweol

MELANOIDINS

Glucose + amino group

Roasting

glycosylsamine + H₂O

Health effects of melanoidins

- Anticariogenic against S. mutans.
- Decreases risk of colorectal cancer.
- Microflora growing, Prevotella over all
- Inhibits microorganisms by:
 - Chelating Fe³⁺

Roasting

Eliminating $Mg^{2+} \rightarrow membrane rupture$.

Physiological effects of diterpenes kahweol and cafestol

- Increase LDL cholesterol.
- Regulate Nrf2/ARE transcription factors.

Metabolization

5-CQA

From Uranga et al., 2016

Physiological effects of melanoidins

chelating, Antioxidant, metal anticariogenic, antihypertensive, antiglycative, modulation of colon microflora, effects on GIT. Besides, avoid lipid oxidation and absorption of lipid peroxidation cytotoxic products. More over, they increase colon mobility and inhibit some microorganisms.

Physiological effects of CGA's

CGAs

- Antioxidant effect.
- Platelet inhibition and antithrombotic effects.
- Block GLUT 2 or SGLT Decreases glucose levels.
- Effect on GST and NAD(P)H quinone reductase.
- Inhibits DNA metiltransferase.

Health effects of CGA's

- Chemo-preventive agents.
- Reduction of CV risk.
- Anticariogenic, inhibiting S. mutans.
- Potential reduction of Diabetes mellitus type II.
- Decreases cholesterol levels.
 - Anticarcinogenic effects.

CONCLUSIONS

Coffee effects on human health will be associated with a prolonged consumption. The bioactive components are caffeine, CGAs, trigonelline, cafestol, kahweol and melanoidins.

They have, in vitro, antioxidant, chemo-preventive, antihypertensive, hypoglycemic, antiglycative and anticariogenic effects, and as they go through the GIT, except trigonelline, their metabolites are those that enter the bloodstream. Epidemiological studies associate coffee consumption with a lower risk of Diabetes mellitus type II, hepatocellular, endometrial and colorectal cancer, and breast cancer in premenopausal women. The effects on the CV system are contradictory, but it seems that the negative effects of caffeine and diterpenes are counteracted by CGAs. The risk of Parkinson is also decreased in men and in women who have not taken postmenopausal oestrogen.

MAIN REFERENCES

Arauz, J., Ramos-Tovar, E., & Muriel, P. (2017). Coffee and the Liver. Liver Pathophysiology: Therapies and Antioxidants. Elsevier Inc.

Grases, F., Rodriguez, A., & Costa-Bauza, A. (2014). Theobromine inhibits uric acid crystallization. A potential application in the treatment of uric acid nephrolithiasis. PLoS ONE, 9(10).

Uranga, J. G., Podio, N. S., Wunderlin, D. A., & Santiago, A. N. (2016). Theoretical and Experimental Study of the Antioxidant Behaviors of 5-O-Caffeoylquinic, Quinic and Caffeic Acids Based on Electronic and Structural Properties. *ChemistrySelect*, 1(13), 4113–4120.