The Effects of Caffeine Ingestion and the -163 A>C CYP1A2 Polymorphism on Long Anaerobic Exercise Performance

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Caffeine Overview

- Chemical name: trimethylxanthine

- Metabolic byproducts:
  - Paraxanthine
  - Theophylline
  - Theobromine

- Functions:
  - CNS stimulant
  - Adenosine antagonist
CYP1A2 Overview

- Function: metabolizes caffeine

- Site of production: liver

- Variants
  - Homozygous AA: fast caffeine metabolism
    - More paraxanthine \( \rightarrow \) enhanced adenosine antagonism
  - Heterozygous AC/Homozygous CC: slow caffeine metabolism
Wingate (WaNT90) Overview

- Duration: 90 seconds

- Reliance on multiple energy systems
  - ATP-PCR system
  - Glycolytic system
  - Oxidative system

- Power → Endurance continuum
  - WaNT90 captures both variables

http://www.2015.handmadebicycleshow.com/exhibitor/dhd/
Average Power Output During 90-s Wingate Test

- Peak Power
- 0-30s interval
- 30-60s interval
- 60-90s interval

Power (W/Kg) vs. Time (s)
Purpose

- To examine the effects of caffeine on maximal anaerobic exercise performance during a 90 second Wingate (WaNT 90) with respect to the different CYP1A2 polymorphisms

- **WaNT90**
  - 5.5% body weight resistance

- **Conditions**
  - Placebo: maltodextrin
  - Experimental: 6 mg/kg caffeine anhydrous
Subjects

• 34 subjects
  • 19 male, 15 female

• Genetic variability
  • 24 AA, 10 AC/CC

• All recreationally active
Wingate Protocol

- Familiarization Session
  - Anthropometric data
  - Buccal cells
  - Modified Wingate: 30 sec, 5.5% body weight resistance

- Testing Sessions
  - Caffeine log, caffeine abstinence
  - Caffeine or maltodextrin consumption (1 hour prior)
  - Warmup with intermittent sprints (5 min)
  - WaNT 90
CYP1A2 Protocol

- Saline mouth rinse (0.9% NaCl)
- DNA isolation
- Polymerase chain reaction (PCR)
- Restriction digestion
- Gel electrophoresis
Results

![Bar graph showing peak power comparison between Placebo and Caffeine]
Results

![Graph showing peak power vs condition for different time intervals (0-30 sec, 30-60 sec, 60-90 sec) with Placebo and Caffeine conditions. The graph indicates a significant increase in peak power with caffeine compared to placebo across all time intervals.]
Results
Results
Conclusions

- Caffeine does not have any significant ergogenic benefit on long anaerobic exercise regardless of CYP1A2 polymorphism variant
  - Non-significant (1-4%) increase in AA caffeine performance

- Future directions:
  - Increased variability between subjects
  - Adenosine receptor activity
Acknowledgements

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References