

An Examination of the Scientific Justification for the Formulation of a Popular Weight-Loss Product: Hydroxycut

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Introduction

- In 2002, 64.5% of Americans were classified as either overweight or obese
- \$35 billion dollars on weight loss products, including weight loss supplements
- Hydroxycut, makes claims on their website, www.hydroxycut.com, that their product has been the best selling weight loss supplement for the past ten years

3 Claims

- 1. Lose more weight, faster!
- 2. Keep your appetite in check to make eating better a lot easier.
- 3. Burn more calories to look leaner and more muscular than ever before.

Purpose

- To determine if the three claims have any scientific merit and if they are in fact true.

Where is the Research?



- 10 Peer Reviewed Scientific Articles indexed on Medline/Pubmed on "Hydroxycut"
 - 9 negative, mostly case studies
 - 1 positive results in cholesterol
- "2" Summaries on Hydroxycut.com
 - (-)-hydroxycitric acid (HCA), 2) Niacin-bound chromium (NBC), and 3) Gymnema Sylvestra Extract (GSE)
- 2 Peer Reviewed Scientific Articles in PDF form on Hydroxycut.com
 - 1) Caffeine, and 2) Epigallocatechin Gallate (EGCG)

How much is there?

● 2 Caplets 3xs/day



Supplement Facts

Serving Size 2 Rapid Release Caplets
Servings Per Container 15

Amount Per Serving	% Daily Value
Calcium (as hydroxycitrate)*** 156 mg	16%
Chromium (as polynicotinate)** 133 mcg	111%
Potassium (as hydroxycitrate)*** 218 mg	6%
Hydroxagen Plus® 1.32 g	
<i>Garcinia cambogia</i> extract (rind)***	†
Standardized for 60% hydroxycitric acid	
<i>Gymnema sylvestre</i> extract (leaf)	†
Standardized for 25% gymnemic acids	
Phosphatidylserine-enriched soy lecithin	†
Supplying 50% phosphatidylserine, 4% phosphatidylcholine, 2% phosphatidylethanolamine	
HydroxyTea® 473 mg	†
Green tea extract (as <i>Camellia sinensis</i>) (leaf)	†
Standardized for 90% polyphenols, 75% catechins, 45% epigallocatechin gallate - 117 mg EGCG	
Caffeine anhydrous	†
White tea extract (as <i>Camellia sinensis</i>) (leaf)	†
Standardized for 50% polyphenols, 35% catechins, 15% EGCG	
Oolong tea extract (as <i>Camellia sinensis</i>) (leaf)	†
Standardized for 50% polyphenols, 25% catechins, 15% EGCG	
Supplying 200 mg of caffeine	
Ginger extract (as <i>Zingiber officinale</i>) (root)	†
Standardized for 5% gingerols	
Raspberry ketone	†
Quercetin dihydrate (as <i>Fava d'anta</i>)	†

†Daily Value not established.

OTHER INGREDIENTS: MICROCRYSTALLINE CELLULOSE, HYDROXYPROPYL-CELLULOSE, COATING (POLYVINYL ALCOHOL, TITANIUM DIOXIDE, POLYETHYLENE GLYCOL, TALC), SODIUM CARBOXYMETHYLCELLULOSE, CROSPVIDONE, STEARIC ACID, MAGNESIUM STEARATE, SILICA, SUCRALFAME-POTASSIUM.

Study 1 & 2: Background

- (-)-hydroxycitric acid (HCA)
- Niacin-bound chromium (NBC)
- Gymnema Sylvestra Extract (GSE)
 - All help to regulate appetite and burn fat

Study 1 & 2

- Purpose: To examine the efficacy of optimal doses of HCA-SX alone and in combination with NBC and GSE given on an empty stomach in human volunteers
- N: 30 (study 1) and 60 (study 2) (BMI= 30-55 kg/m²), 21-50 yo in India
- Methods: Randomized, double-blind placebo-controlled

Study 1 & 2

- ◎ 3 groups:
 - > 1: HCA-SX: HCA-SX 4,677mg (60% providing 2,800 HCA/day)
 - > 2: HCA-SX Formula: HCA-SX 4,677mg (60% providing 2,800 HCA/day) AND NBC 4mg (400ug Cr) AND GSE 400mg(100mg gymnemic acid)
 - > 3: placebo

Study 1 & 2

- Both study 1 & 2 took 3 doses/day 30-60 minutes before each meal for 8 weeks
- Walked 30 min 5 days/wk
- 2,000 kcal diet
 - > 17% Protein, 25% Fat, 58% Carbs
- Tested at 0, 4, 8 weeks
- No Serious adverse affects
 - > No diff b/w groups

Study 1 & 2: Results

	1-A	2-A	1-B	2-B	1-C	2-C
BODY WT	<u>12.1LBS</u>	<u>9.97 LBS</u>	<u>14.96 LBS</u>	<u>13.11 LBS</u>	3.06 LBS	3.52 LBS
BMI	6.39%	<u>5%</u>	7.9%	<u>6.1%</u>	1.7%	2%
APPETITE	<u>4%</u>	<u>15.6%</u>	<u>14.1%</u>	<u>21.2%</u>	2.8%	NC
SERUM LEPTIN LEVELS	<u>36.6%</u>	<u>39.2%</u>	<u>40.5%</u>	<u>44.3%</u>	.3%	2%
SEROTONIN	<u>40%</u>	-	<u>50%</u>	-	21%	-
URINARY FAT METABOLITES	<u>125-258%</u>	<u>35.6-106.4%</u>	<u>146-281%</u>	<u>56-134%</u>	SLIGHTLY ACON	6.2-21%

BLUE= DECREASE, BLACK=INCREASE, UNDERLINE= STATISTICAL SIGNIFICANCE

Study 1 & 2 Results

	1-A	2-A	1-B	2-B	1-C	2-C
LDL	<u>12.3</u>	<u>13.2</u>	<u>17.9</u>	<u>19</u>	.8	SLIGHT
HDL	<u>10.7</u>	<u>8</u>	<u>20.7</u>	<u>22</u>	NC	NC
TRI-G	<u>8.6</u>	<u>5.9</u>	<u>18.1</u>	<u>20.2</u>	NC	NC
VLDL	NC	NC	NC	NC	NC	NC
TOTAL	<u>6.3</u>	<u>7.2</u>	<u>9.1</u>	<u>9.5</u>	NC	NC

BLUE= DECREASE, BLACK=INCREASE, UNDERLINE= STATISTICAL SIGNIFICANCE

Results

- Want leptin to decrease
 - > protein encoded by obesity regulatory gene
 - > directly associated with fat in body
 - > HCA down regulates leptin
- Want serotonin to increase
 - > Controls eating behavior and body wt
- Want urinary fat oxidation to increase
 - > Biomarkers of fat oxidation
- Want appetite to decrease
 - > More food left on plate
 - > Measured in g/wk

Study 1 & 2

- Conclusions:
 - > HCA-SX produces positive effects in obesity management, while HCA-SX plus NBC and GSE produce even greater effects.

Study 3

- Purpose:

- > 1) to examine the extent to which daily administration of capsules containing a green tea extract (catechin polyphenols and caffeine) would stimulate thermogenesis and increase daily EE
- > 2) to determine whether the effects of green tea extract on the metabolic rate and substrate oxidation in humans would be greater than that explained by its caffeine content

Study 3

- N= 10 men, 8-30% body fat, no exercise, less than 200mg caffeine/day
- Methods: Randomized, double-blind placebo-controlled, human clinical
- 3 days in 24hr metabolic chamber, 1 of 3 treatments 3xs/day:
 - > 1) Green Tea Extract: 50mg caffeine (150mg/day), 90mg (270mg/day) ECGC (375mg catechins total/day)
 - > 2) Caffeine 50mg (150mg/day)
 - > 3) Placebo

Study 3

- 5-10days between each trial (5-6wk study)
- Ate 13% Protein, 40% Fat, 47% Carbs in chamber
 - > Calories 1.4x BMR
 - > No caffeine

Study 3: Results

- Energy Expenditure
 - > SD for diurnal EE
 - GT 4.5% greater than placebo
 - Caff 3.2% greater than placebo
 - > SD total 24hr EE
 - GT 3.5% greater than placebo
 - Caff 2.8% greater than placebo
 - > 6/10 increased EE w/ GT
 - > 2/10 Increased EE w/ Caff

Study 3: Results

○ RQ and Substrate Oxidation

- › SD for diurnal, nocturnal, total 24hr RQ
 - GT lower values at all 3 times than other 2
 - RQ Decreased in 8/10 w/ GT
- › BC urinary N₂ stayed same, can say that fat oxidation increased
- › Fat oxidation in 24hr was 41.5% which was SD from placebo at 31.6%

○ No HR difference

Study 3: Results

- Conclusion: Oral administration of GTE stimulated thermogenesis and fat oxidation and thus has a potential to influence body wt and body comp via changes in both EE and substrate utilization.

Study 4

- Purpose:

- > 1) To assess impact of 4 mixtures on GT and Caffeine on a) 24hr EE, b) RQ, c) substrate oxidation compared to placebo
- > 2) determine if there was a dose related effect of ECGC and if so, which produces a greater increase in EE and fat oxidation w/o inducing sign cardio-stimulatory effects when combined w/ caff

Study 4

- N= 14 men, 20-50 yo, BMI 20-27kg/m², no exercise, no caffeine
- Methods: randomized, placebo controlled, double-blind, cross-over design
- Spent 5 days in metabolic chamber, received one of 5 treatments 3xs/day:

Study 4

- 5 treatments: 4 received 600mg/day caffeine and diff ECGC
 - > 1) 270mg/day
 - > 2) 600 mg/day
 - > 3) 900 mg/day
 - > 4) 1200 mg/day
 - > 5) placebo (no caff, no ECGC)
- 5-10 days bw tests

Study 4

○ Results:

- › SD for CHO oxidation, 24hr dBP (increase 5mmg) and 24hr EE (increase 8%) GT, amount EGCG didn't matter
- › Changes for increase in sleep metabolism and 24hr sysBP (increase 7mmHG) in GT
- › No effect on RQ, lipid oxidation, catecholamine excretion
- › Key findings: Beyond a certain threshold, EGCG content of a compound only produces a small, non-significant additional increase in 24hr EE

Study 4

- Conclusion:

- > EGCG and caffeine mix should aid in weight loss in addition to nutritional counseling. This will help with body weight loss decrease in EE and a decrease in cardio-stimulatory effects.

So does Hydroxycut work?

Ingredient	Tested	Hydroxycut
HCA	2,800mg/day (1,2)	2,376mg /day
NBC	400 mcg/day (400ug Cr) (1,2)	399 mcg/day
GSE	.4g/day (100mg gymnemic acid) (1,2)	~.90-3.96g/day
Caffeine	150mg/day (3) 600mg/day (4)	600 mg/day
EGCG	270mg/day (3,4) 600mg/day (4) 900mg/day (4) 1200mg/day (4)	351 mg/day

Does the evidence support the claims?

- ① 1. Lose more weight, faster!
 - > Yes, study 1 and 2
- ① 2. Keep your appetite in check to make eating better a lot easier.
 - > Yes, study 1 and 2
- ① 3. Burn more calories to look leaner and more muscular than ever before.
 - > Yes, study 3 and 4

Overall Conclusion

- Hydroxycut: Needs more evidence
 - > Need to test mixture of ingredients at recommended doses
 - > Not sketchy scientists
 - > Recent studies
 - > Won't link to papers with negative results



Overall Conclusion

- › 1,000 of research on each ingredient
- › Dr. Nick Evans “remunerated,” - to pay, recompense, or reward for work, trouble, etc.
- › Negative papers are only case studies
- › w/ diet and exercise (1,2 control d&e, 3,4 neither)

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