서울대학교병원
SEOUL NATIONAL UNIVERSITY HOSPITAL

다이어트 건강 보조제의 득과실

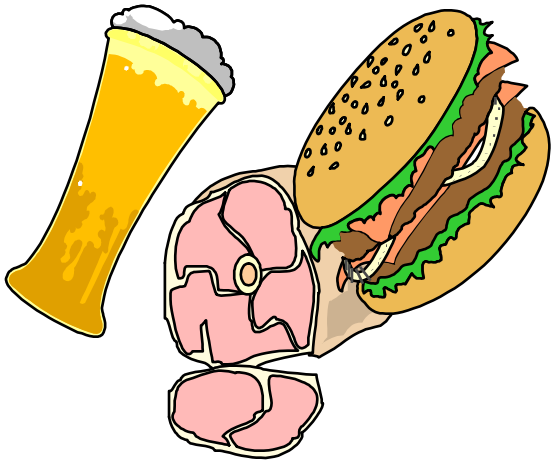
서울의대 건강지식센터

박민선

To live healthier

Energy intake expenditure balance

Energy input



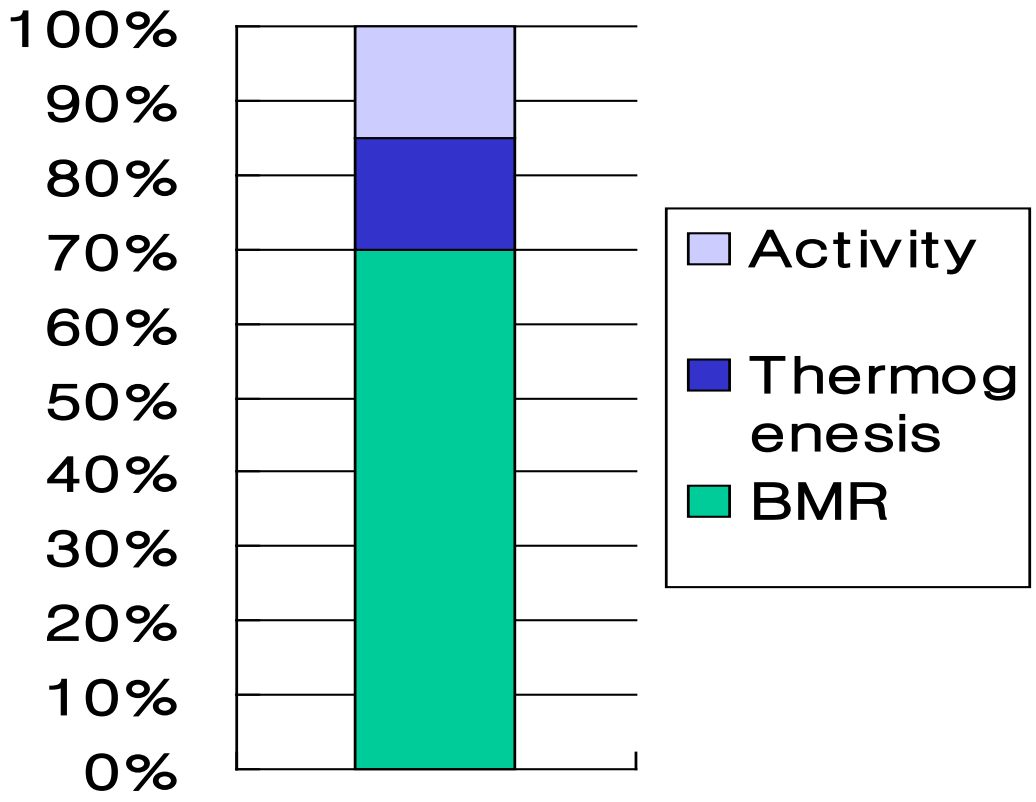
Energy output

Control factors

Genetic make-up
Stress
Diet

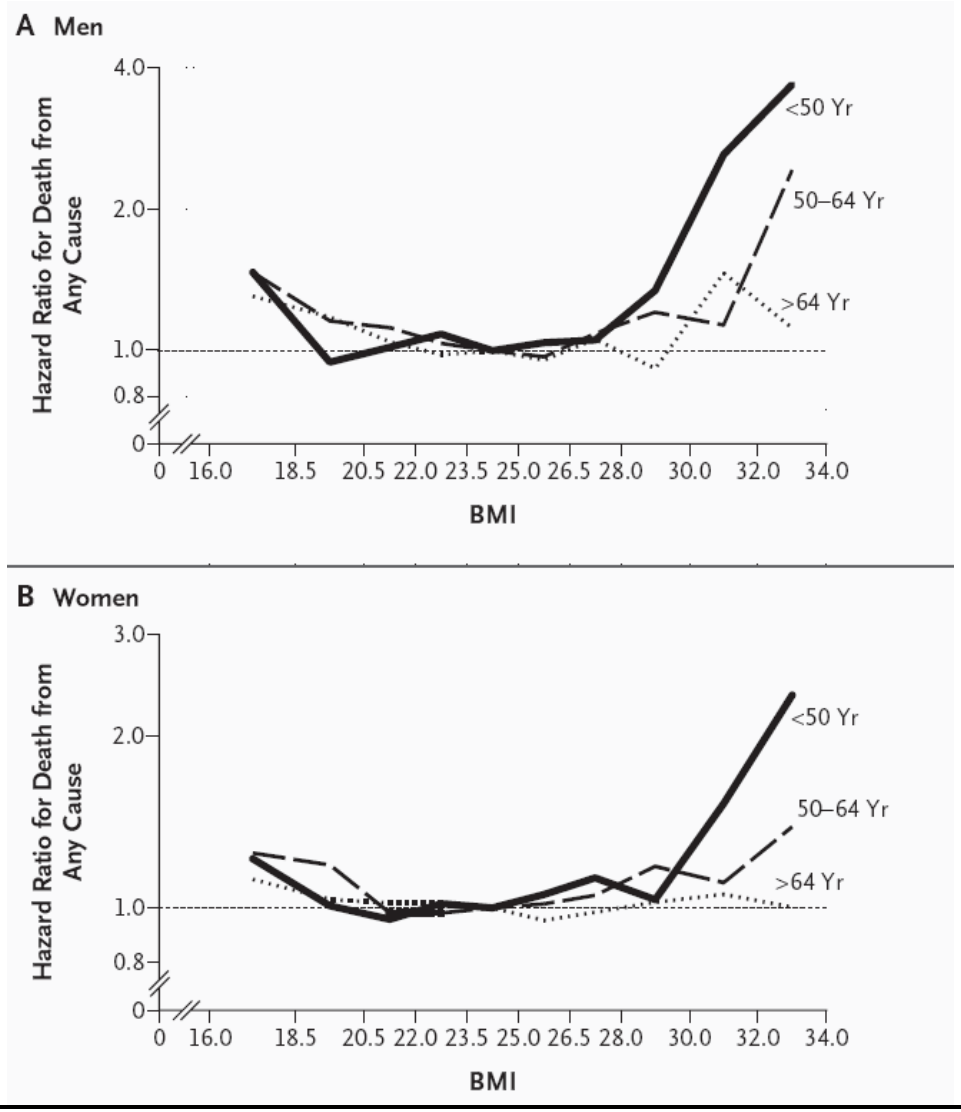
Exercise
Basal metabolism
Thermogenesis

소비에너지의 구성



Energy balance vs Morphology

BMI and mortality in Korean men and women



(Jee, NEJM, 2006)

적정 체중 (Kg)

신장 (cm)	정상 (BMI=21 kg/m²)	과체중 (BMI=23 kg/m²)	비만 (BMI=25 kg/m²)	고도비만 (BMI=30kg/m²)
150	47	52	56	67
155	50	55	60	72
160	54	59	64	77
165	57	63	68	82
170	61	66	72	87
175	64	70	77	92
180	68	75	81	97
185	72	79	86	103

1. Chromium Picolate

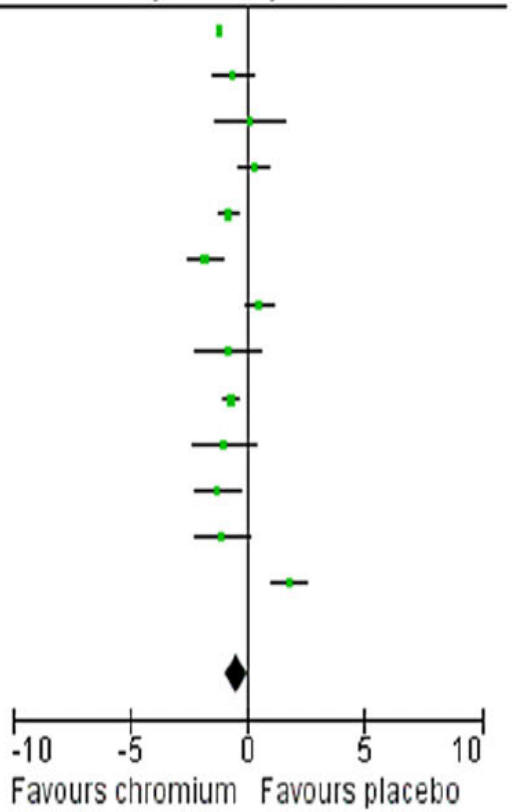
- **Main food source: egg, cereal, nuts and vegetables**
- **Carbohydrate, Protein, Fat metabolism 에 관여**
- **A cofactor to insulin**
- **Lean body mass 증가**
  Fat mass 감소
  BMR 증가
- **부작용**
  Watery diarrhea
  Vertigo
  Headache
  Urticaria

1. Chromium Picolate

Study or Subgroup	Chromium Mean	SD	Total	Placebo Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Aghdassi 2010	-1.1	0.009	23	0.1	0.01	23	10.3%	-1.20 [-1.21, -1.19]
Campbell 1999	-0.2	1.4	9	0.4	0.01	9	7.4%	-0.60 [-1.51, 0.31]
Cefalu 2010	0.8	4.2	70	0.7	4.9	67	4.9%	0.10 [-1.43, 1.63]
Crawford 1999	-1.2	1	23	-1.5	1.2	23	8.7%	0.30 [-0.34, 0.94]
Grant 1997a	-0.1	0.3	11	0.7	0.7	11	9.4%	-0.80 [-1.25, -0.35]
Grant 1997b	-1.1	1	11	0.7	0.7	11	8.3%	-1.80 [-2.52, -1.08]
Hockney 2006	1.2	0.8	56	0.7	2.3	56	8.7%	0.50 [-0.14, 1.14]
Iqbal 2009	-0.12	2.5	33	0.72	3	30	5.5%	-0.84 [-2.21, 0.53]
Joseph 1999	0.01	0.7	17	0.7	0.1	15	9.8%	-0.69 [-1.03, -0.35]
Kaats 1996a	-1.1	3.4	33	-0.1	2.7	55	5.5%	-1.00 [-2.36, 0.36]
Kaats 1996b	-1.4	2.9	66	-0.1	2.7	55	7.0%	-1.30 [-2.30, -0.30]
Kaats 1998	-2.9	3.5	62	-1.8	3	60	6.4%	-1.10 [-2.26, 0.06]
Volpe 2001	0.01	0.3	20	-1.8	1.6	17	8.1%	1.81 [1.04, 2.58]
Total (95% CI)			**434**			**432**	**100.0%**	**-0.50 [-0.97, -0.03]**

Heterogeneity: $Tau^2 = 0.56$; $Chi^2 = 126.22$, $df = 12$ ($P < 0.00001$); $I^2 = 90\%$

Test for overall effect: $Z = 2.10$ ($P = 0.04$)

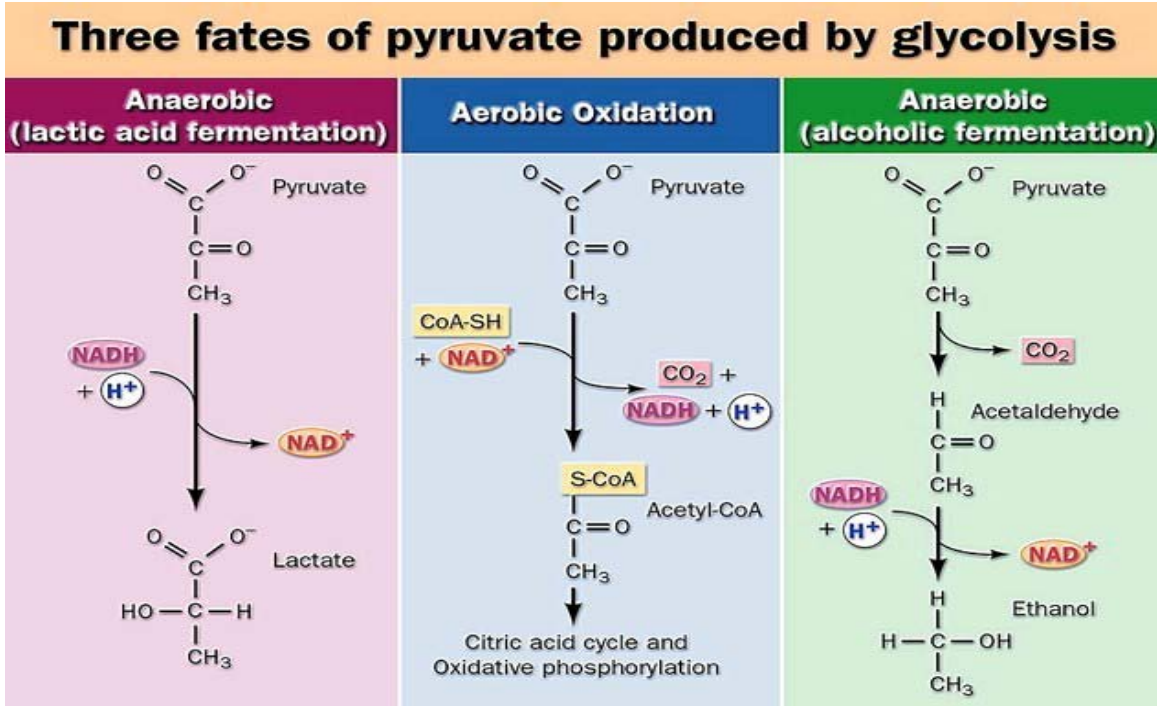


2. Pyruvate

- **Produced in the body by glycolysis**
- **Food source: cheese, wine, apples**
- **Increase of metabolism in muscle**
  Increase f physical endurance in rest or exercise

- **부작용**
  gas, bloating, diarrhea,
  increase in LDL-cholesterol

2. Pyruvate

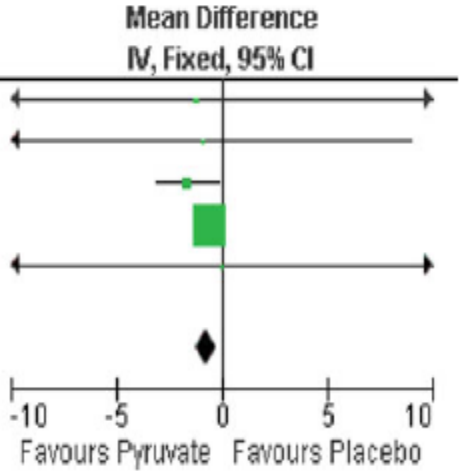

Three fates of pyruvate produced by glycolysis
Anaerobic (lactic acid fermentation)
Aerobic Oxidation
Anaerobic (alcoholic fermentation)
Pyruvate
NADH
+ H+
NAD+
Lactate
HO — C — H
CH3
CoA-SH
+ NAD+
CO2 +
NADH + H+
S-CoA
Acetyl-CoA
Citric acid cycle and
Oxidative phosphorylation
CO2
Acetaldehyde
Ethanol
H — C — OH

2. Pyruvate

Study or Subgroup	Pyruvate Mean	Pyruvate SD	Pyruvate Total	Placebo Mean	Placebo SD	Placebo Total	Weight	Mean Difference IV, Fixed, 95% CI
Kalman1999	-1.2	18.78	12	0	17	14	0.1%	-1.20 [-15.06, 12.66]
Koh-Banerjee2005	0.3	10.19	11	1.2	13.75	12	0.3%	-0.90 [-10.74, 8.94]
Stanko1992	-5.9	1.85	7	-4.3	0.79	7	12.0%	-1.60 [-3.09, -0.11]
Stanko1994	-0.7	0.82	17	-0.1	0.82	17	87.4%	-0.60 [-1.15, -0.05]
Stone1999	0	12	11	0	15.6	11	0.2%	0.00 [-11.63, 11.63]
Total (95% CI)			**58**			**61**	**100.0%**	**-0.72 [-1.24, -0.20]**

Heterogeneity: $Chi^2 = 1.54$, $df = 4$ ($P = 0.82$); $I^2 = 0\%$

Test for overall effect: $Z = 2.74$ ($P = 0.006$)



3. Conjugate Linoleic Acid

- **A group of isomers of linoleic acid**
- **Food source: meat, dairy products**
- **Decrease in the size of adipocyte**
  Modification of adipocyte differentiation

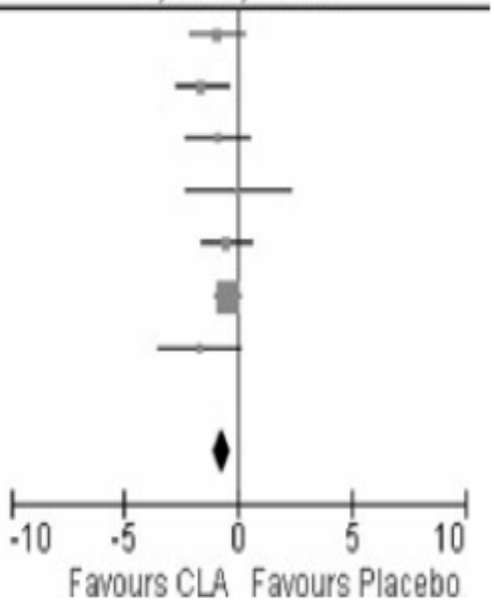
- **부작용**
  Constipation, diarrhea, soft stool

3. Conjugate Linoleic Acid

	CLA			Placebo				Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Gaullier 2004a	-1.1	3.7	61	-0.2	3	59	10.2%	-0.90 [-2.10, 0.30]
Gaullier 2004b	-1.8	3.4	60	-0.2	3	59	11.2%	-1.60 [-2.75, -0.45]
Gaullier 2007	-0.9	3.9	55	0	3.3	50	7.8%	-0.90 [-2.28, 0.48]
Larsen 2006	4	5.6	40	4	5	43	2.8%	0.00 [-2.29, 2.29]
Racine 2010	3.2	1.9	28	3.7	2.3	25	11.3%	-0.50 [-1.64, 0.64]
Sluijs 2010	0.21	2.9	173	0.65	2.1	173	52.1%	-0.44 [-0.97, 0.09]
Watras 2007	-0.6	2.5	22	1.1	3.2	18	4.5%	-1.70 [-3.51, 0.11]
Total (95% CI)			**439**			**427**	**100.0%**	**-0.70 [-1.09, -0.32]**

Heterogeneity: $Chi^2 = 5.09$, $df = 6$ ($P = 0.53$); $I^2 = 0\%$

Test for overall effect: $Z = 3.58$ ($P = 0.0003$)

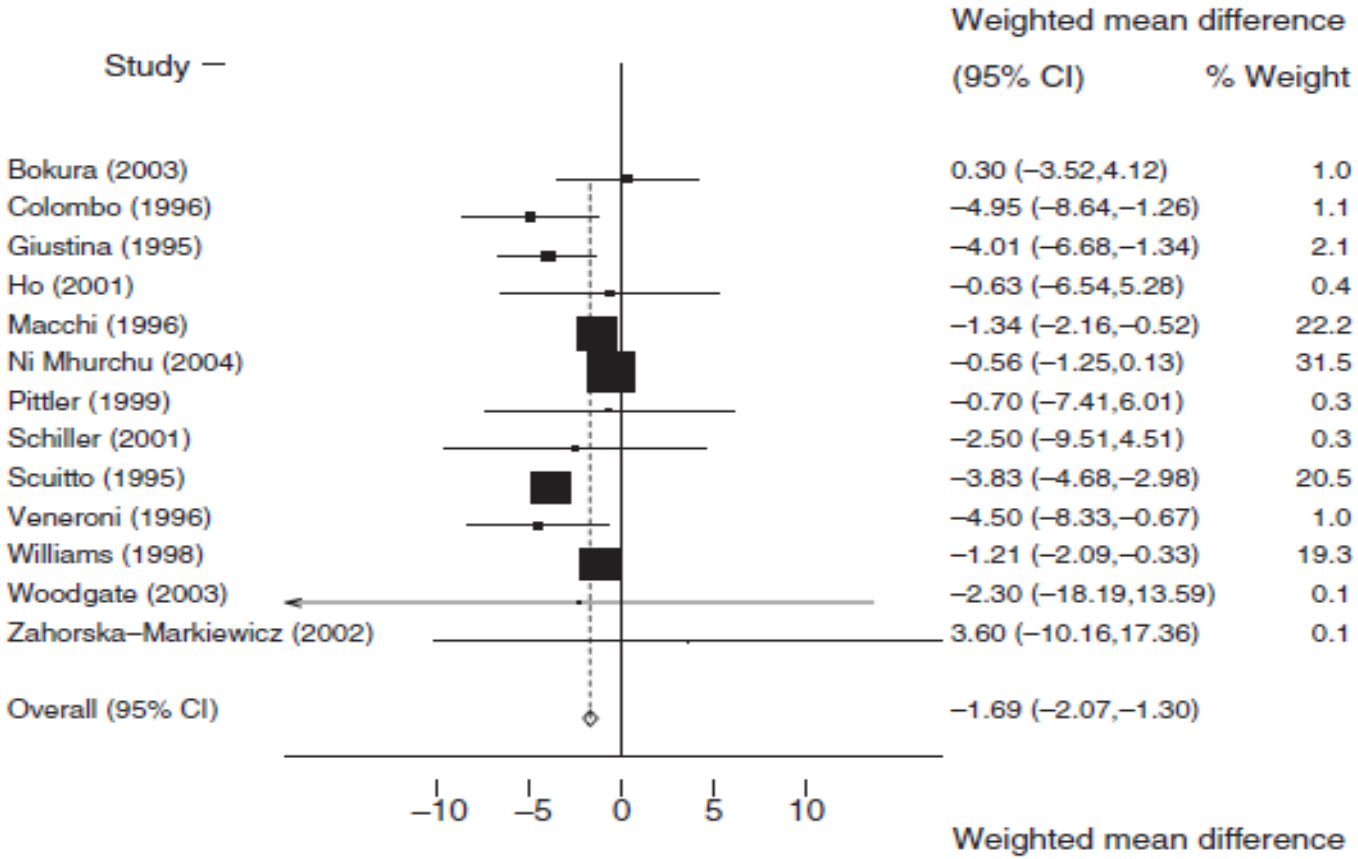


4. Chitosan

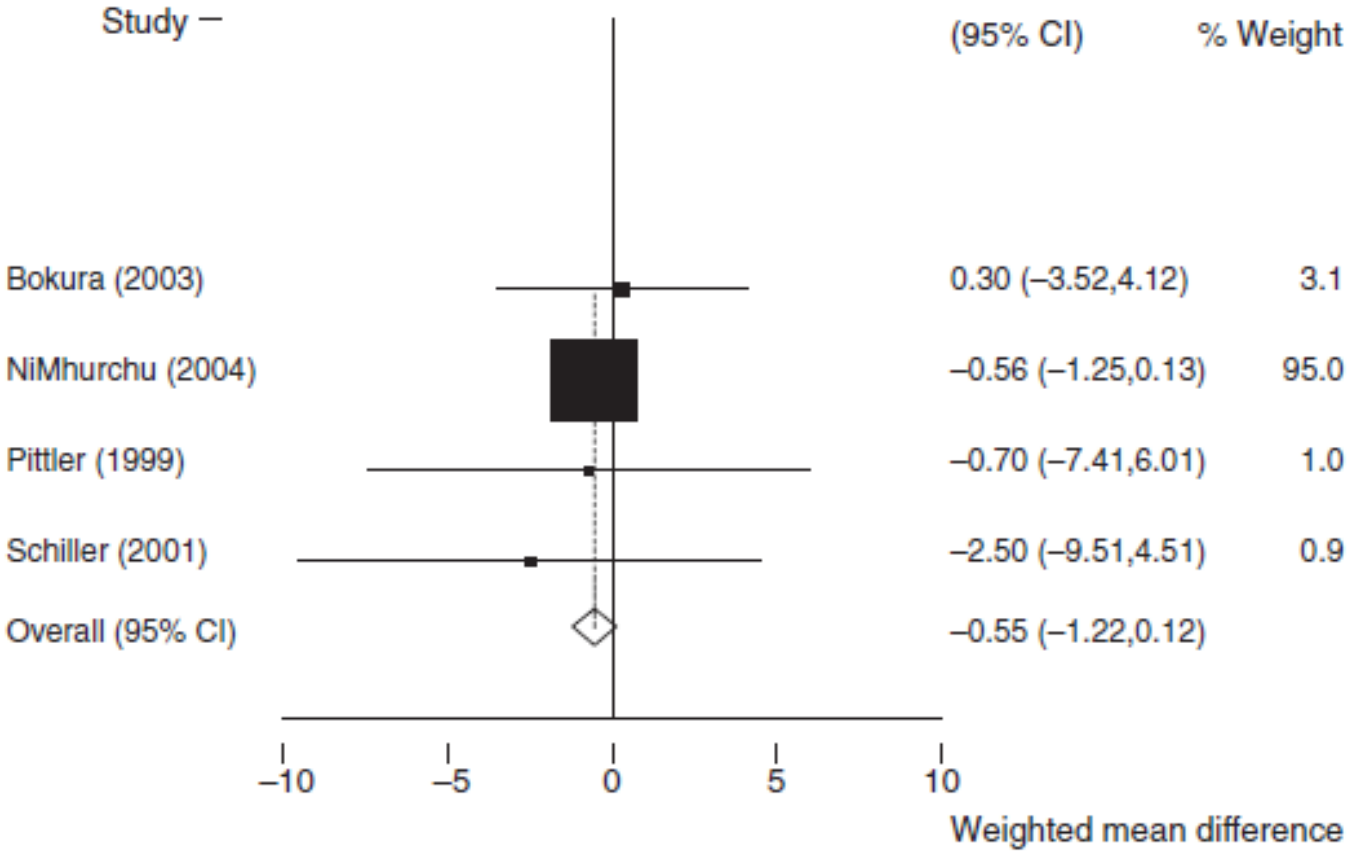
- **Derived from polysaccharide chitin (a by-product of Cructacean)**
- **Lipid binding and decrease in absorption in GI tract**
  Cholesterol lowering effect
- **Decrease in the size of adipocyte**
  Modification of adipocyte differentiation

- **부작용**
  Constipation, diarrhea, soft stool

4. Chitosan


Weighted mean difference
Study
(95% CI)
% Weight
Bokura (2003) 0.30 (–3.52,4.12) 1.0
Colombo (1996) –4.95 (–8.64,–1.26) 1.1
Giustina (1995) –4.01 (–6.68,–1.34) 2.1
Ho (2001) –0.63 (–6.54,5.28) 0.4
Macchi (1996) –1.34 (–2.16,–0.52) 22.2
Ni Mhurchu (2004) –0.56 (–1.25,0.13) 31.5
Pittler (1999) –0.70 (–7.41,6.01) 0.3
Schiller (2001) –2.50 (–9.51,4.51) 0.3
Scuitto (1995) –3.83 (–4.68,–2.98) 20.5
Veneroni (1996) –4.50 (–8.33,–0.67) 1.0
Williams (1998) –1.21 (–2.09,–0.33) 19.3
Woodgate (2003) –2.30 (–18.19,13.59) 0.1
Zahorska–Markiewicz (2002) 3.60 (–10.16,17.36) 0.1
Overall (95% CI) –1.69 (–2.07,–1.30)
–10
–5
0
5
10
Weighted mean difference

4. Chitosan


Study
(95% CI)
% Weight
Bokura (2003)
0.30 (–3.52,4.12)
3.1
NiMhurchu (2004)
–0.56 (–1.25,0.13)
95.0
Pittler (1999)
–0.70 (–7.41,6.01)
1.0
Schiller (2001)
–2.50 (–9.51,4.51)
0.9
Overall (95% CI)
–0.55 (–1.22,0.12)
–10
–5
0
5
10
Weighted mean difference

5. Calcium

- **Food source; dairy products, vegetables**
- **Bind to dietary fat forming compounds and decrease in fat absorption in GI tract**
  Preventing the increase of Vit D and PTH

→ Increase in intracellular Ca
→ Activating lipogenic process

- **부작용**
  Constipation, GI upset

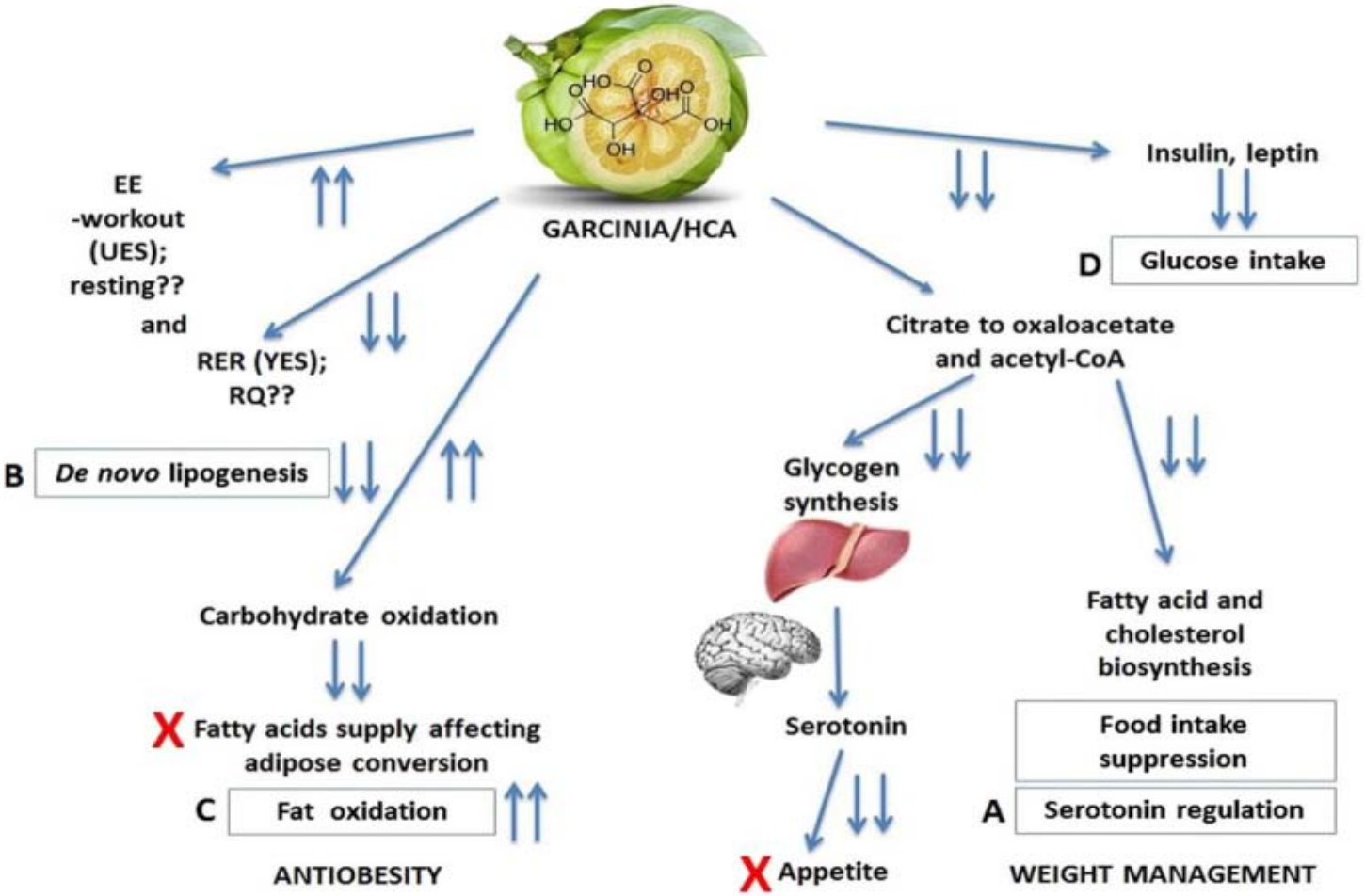
5. Calcium

Table II

Characteristics of intervention studies that assessed the effect of calcium intake on anthropometric measures and body composition

Reference	*Subjects characterisics (number of participants/ gender/age/BMI*	*Study duration*	*Habitual calcium intake (mg/day)*	*Treatment*	*Results*
Shapses et al. 2004[22]	100 ♀ pre and post-menopausal ≈ 40-60 years old; ≈ 33 kg/m²	25 weeks	600-1,000	1) 500 kcal + Placebo. 2) 500 kcal + 1,000 mg of calcium (source calcium citrate malate or calcium citrate).	There was no difference in body weight and body fat between treatments.
Reid et al. 2005[20]	1,471 ♀ post-menopausal; ≈ 74 years old, ≈ 26.5 kg/m²	30 months	Placebo = 878 ± 430 Ca = 861 ± 390	1,000 mg of calcium (source calcium citrate). Placebo.	Body weight, BMI, body fat and lean mass did not differ between the groups.
Yanoski et al. 2009[27]	340 ♀♂; 38.8 years old; 33.2 ± 6.8 kg/m² (Ca) and 33.6 ± 6.8 kg/m² (placebo)	2 years	Placebo = 878 ± 430 Ca = 887 ± 350	1,500 mg (source calcium carbonate). Placebo.	Body weight, body fat, BMI, WC, hip circumference did not differ between the groups.
Faghih et al. 2011[83]	85 ♀; ≈ 38 years old; ≈ 31 kg/m²	25 weeks	Control: 512.85 ± 72.71 Ca: 532.29 ± 149.77 Milk: 484.58 ± 131.07 Soy: 509.61 ± 101.19	1) 500 kcal; 500-600 mg of calcium. 2) 500 kcal; 1,300-1,400 mg of calcium (800 mg = source calcium carbonate). 3) 500 kcal; 1,200-1,300 mg of calcium (source milk). 4) 500 kcal; 1,200-1,300 mg of calcium (source soy extract fortified with calcium).	Changes in WC were higher in groups 3 and 4. Changes in body weight and BMI wew higher in the group that ingested calcium from milk.
Zemel et al. 2004[33]	32 ♀♂; 49 ± 6 years old; 34.9 ± 4.3 kg/m²	24 weeks	500-600	1) 500 kcal; 400-500 mg of calcium, placebo. 2) 500 kcal; 1,200-1,300 mg of calcium (800 mg = source calcium carbonate). 3) 500 kcal; 1,200-1,300 mg of calcium (source dairy).	Body weight and body fat, including in the trunk region, reduced after the consumption of the diets with high calcium content. Such effects were higher in the diet in which the calcium was derived from dairy products.
Kabrnová et al. 2008[64]	67 ♀; 49.1 ± 12.1 years old; 32.2 ± 4.1 kg/m²	4 weeks	Not specified	1) 600 kcal; diet with 350 mg of calcium + placebo. 2) 600 kcal; diet with 350 mg of calcium + 500 mg of calcium (calcium carbonate). 3) 600 kcal; diet with 350 mg of calcium + 500 mg of calcium (calcium citrate + phosphate + lactate).	There were no differences between the groups in terms of anthropometric measurements and body composition. In the placebo group, there was reduction in free fat mass, tending to be significant compared to the groups treated with calcium.
Wennersberg et al. 2009[28]	76 ♀ 37 ♂; ♀♂: 56.7 ± 7/51.2 ± 8.1 years old; 30 ± 3.3 kg/m² (control) 30.1 ± 3.6 kg/m² (milk)	6 months	Control: 644 ± 252 mg Milk: 815 ± 364 mg	The participants included in the milk group were instructed to increase 3-5 servings of dairy products daily intake.	Weight, BMI, WC, body fat did not change in the course of the study. When evaluating only the people who had basal ingestion lower than 700 mg there was reduction of WC in the milk group.
Gunther et al. 2005[12]	135 ♀; 18-30 years old; 22.1 ± 3.1 kg/m² (control); 23.3 ± 3.9 kg/m² (average) 22.4 ± 2.6 kg/m² (high)	1 year	Control: 695 ± 263 Average 727 ± 269 High: 693 ± 281	1) Control: keep usual intake. 2) 1,000-1,100 mg of Ca (source dairy). 3) 1,300-1,400 mg of Ca (source dairy).	There was no differents in the group as to weight, BMI, and body composition between treatments.
Reid et al. 2010[29]	323 ♂; ≈ 57 years old; ≈ 26 kg/m²	2 years	1) 800 ± 360 mg 1) 870 ± 470 mg 1) 930 ± 510 mg	1) Placebo. 2) 600 mg of Ca (source calcium citrate) 3) 1,200 mg of Ca (source calcium citrate) divided into two daily doses	There was an increase in fat mass in the groups and reduction in the lean mass with no difference between the groups.

6. Garcinia Cambogia



6. Garcinia Cambogia

G. cambogia	Mattes (2000)[12]	DB, RAN, PC, PAR, *Garcinia cambogia* ($n=42$; 2.4 g/day) or placebo ($n=47$; 2.4 g/day)	12	No significant difference found in *Garcinia cambogia* group in appetite and energy intake compared to placebo Significant difference was found in *Garcinia cambogia* group in BW and waist circumference	Non-significant data provided Mean ± SD values not provided
	Kovacs (2001)[11]	DB, RAN, PC, CO, ($n=21$), HCA + MCT (3.4 g/day), HCA (3.4/day) or placebo (3.4 g/day)	2	No significant difference found in *Garcinia cambogia* group in appetite, energy intake, eating behaviour, mood and BW compared to placebo	Non-significant data provided

식품군	총 교환 단위수	아 침	점 심	저 녁
곡류군	8	2	3	3
		 70g x 2교환=140g 잡곡밥 2/3공기 (140g)	 70g x 3교환=210g 조밥 1공기 (210g)	 70g x 3교환=210g 흑미밥 1공기 (210g)
어육류군	5	1	2	2
		 연두부 1교환 (150g)	 스테이크볶음 (쇠고기 1교환, 40g) 오징어초무침 (오징어 1교환, 50g)	 돈육고추잡채 (돼지고기 1교환, 40g) 동태전 (동태살 1교환, 50g)
채소군	7	2	3	2
		 콩나물국 1교환 (70g) 미역줄기볶음 0.5교환 (35g) 나박김치 0.5교환 (35g)	 들깨팽이버섯탕/스테이크 볶음/ 오징어초무침에 포함된 채소 1교환 연근조림 1교환 (40g) 청경채나물 1교환 (70g)	 근대된장국 (근대 1교환, 70g) 마늘쫑볶음 (마늘쫑 1교환, 40g)
지방군	4	1	1.5	1.5
		식용유 1작은스푼 (5g) 미역줄기볶음용	들깨가루 0.5교환 (4g) 식용유/참기름 1작은스푼 (5g) 연근조림/청경채나물 조리용	식용유 1.5작은스푼 (7.5g) 마늘쫑볶음/동태전 조리용
과일군	2	식사시간 사이 간식으로 드세요 사과 1교환 (1/3개, 80g) 딸기 1교환 (150g)		

운동으로 하루 **300kcal** 를 소비한다면?

7kcal 살 1gm→ 300kcal 살 40gm→ 1달 1.2 kg 감량

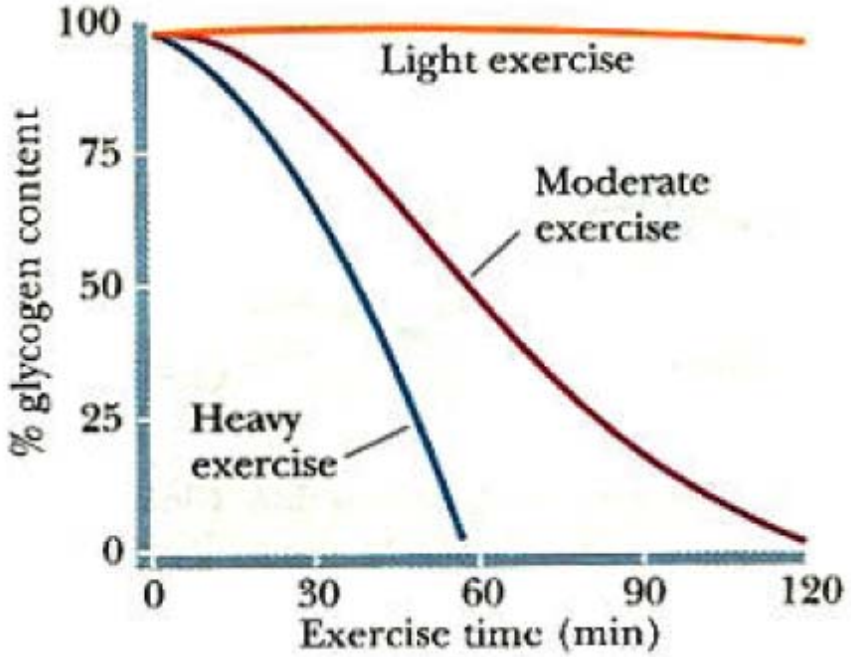
매일 500kcal → 2kg 감량가능

150kcal 소모할 수 있는 운동량의 3배이상을 하여야 함

45분간 줄넘기하기
45분간 계단 오르기
45분간 7.2km 달리기

운동시 에너지 대사

Glycogen Utilization in Working Muscle



감사합니다.