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Antiobesity and hypolipidemic effects of garlic (*Allium sativum* L.) stem extract in high fat diet-induced obese mice

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고지방 식이를 섭취한 비만 생쥐에서 마늘종 추출물 투여가 체중 및 혈중 지질에 미치는 효과

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실험목적 (Objectives)

This study was undertaken to investigate the effect of antiobesity and lipid metabolism of garlic (*Allium sativum* L.) stem extract (ASSE) in high fat diet-induced obese mice.

재료 및 방법 (Materials and Methods)

○ 실험재료

The male C57BL/6j 6-wk-old mice were used for this study. Garlic stem was purchased from a local market (Suwon, Korea). Orlistat (ORL) was purchased from Cayman Chemical (Ann Arbor, MI, USA). All chemicals and reagents used for this study were the highest grade available.

○ 실험방법

The mice were randomly assigned to a normal diet (ND) and a high fat diet (HFD) group. After eight weeks, the HFD group was divided to five groups and orally given different sources and concentrations for four weeks: the HFD group, three HFD+ASSE (100, 250 and 500mg/kg b.w) groups and the HFD+ORL (30mg/kg b.w) group.

실험결과 (Results)

The body weight of ASSE and ORL-treated groups were significantly reduced compared to HFD group. The administration of ASSE and ORL significantly suppressed weights of white adipose tissue. Additionally, the ASSE and ORL treatment significantly lowered serum lipid levels (total cholesterol, low-density lipoprotein cholesterol, triglycerides and total lipids) and decreased lipid vesicles in the hepatic lobule. The consumption of ASSE significantly increased the level of total and high molecular weight adiponectin, whereas it significantly decreased the level of leptin in serum. These results suggest that the ASSE has potential antiobesity and lipid-lowering actions on obese mice.

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Table 1 - Body weight and fat mass of mice administered with garlic stem extract

Group	Initial body weight (g)	Final body weight (g)	White adipose tissue (g/100g body weight)	
			Epididymal	Perirenal
ND + Vehicle	21.00 ± 0.06^{ns}	24.26 ± 0.69^{b}	2.52 ± 0.15^{c}	1.09 ± 0.11^{b}
HFD + Vehicle	21.05 ± 0.06	27.47 ± 0.48^{a}	4.54 ± 0.25^{a}	1.74 ± 0.09^{a}
HFD + ASSE 100	21.07 ± 0.03	26.48 ± 0.72^{a}	3.63 ± 0.23^{b}	1.36 ± 0.11^{ab}
HFD + ASSE 250	21.07 ± 0.06	24.83 ± 0.93^{b}	3.17 ± 0.30^{bc}	1.27 ± 0.19^{b}
HFD + ASSE 500	21.01 ± 0.02	25.83 ± 0.86^{ab}	3.38 ± 0.13^{b}	1.31 ± 0.09^{b}
HFD + ORL	21.12 ± 0.06	24.96 ± 0.62^{b}	3.12 ± 0.30^{bc}	1.00 ± 0.15^{b}

All values expressed as means ± S.E (n=10). ^{abc}Values of different letters are significantly different among columns at p-values < 0.05 by Duncan's multiple range tests. ^{ns}Not-significant.

Table 2 - Serum lipid parameters of mice administered with garlic stem extract

Group	TG (mg/dl)	TC (mg/dl)	LDL-C (mg/dl)	HDL-C (mg/dl)	Total lipid (mg/dl)
ND + Vehicle	86.80 ± 2.98^{b}	109.32 ± 4.50^{b}	45.53 ± 3.19^{b}	54.26 ± 4.24^{ns}	389.26 ± 6.42^{b}
HFD + Vehicle	126.01 ± 4.40^{a}	144.33 ± 5.57^{a}	61.69 ± 3.02^{a}	44.23 ± 5.77	467.18 ± 8.79^{a}
HFD + ASSE 100	102.95 ± 5.17^{b}	124.10 ± 4.00^{b}	56.98 ± 4.22^{ab}	51.41 ± 2.72	414.40 ± 5.59^{b}
HFD + ASSE 250	97.50 ± 8.27^{b}	116.10 ± 7.39^{b}	44.86 ± 4.96^{b}	48.52 ± 3.20	395.53 ± 9.38^{b}
HFD + ASSE 500	97.94 ± 6.92^{b}	123.90 ± 2.57^{b}	50.60 ± 4.86^{ab}	50.61 ± 2.48	419.39 ± 5.83^{b}
HFD + ORL	86.53 ± 7.52^{b}	120.89 ± 6.26^{b}	51.78 ± 4.93^{ab}	51.87 ± 3.37	393.62 ± 4.53^{b}

All values expressed as means ± S.E (n=10). TG, triglyceride; TC, total cholesterol; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol. ^{ab}Values of different letters are significantly different among columns at p-values < 0.05 by Duncan's multiple range tests. ^{ns}Not-significant.

Table 3 - Concentrations of serum adipokines in mice administered with garlic stem extract

Group	Total adiponectin (ng/ml)	Leptin (ng/ml)	Leptin to total adiponectin ratio
ND + Vehicle	32.12 ± 0.66^{a}	18.39 ± 2.37^{c}	0.57 ± 0.07^{b}
HFD + Vehicle	27.74 ± 0.67^{b}	40.52 ± 3.91^{a}	1.30 ± 0.11^{a}
HFD + ASSE 100	33.72 ± 0.74^{a}	31.23 ± 3.28^{b}	0.88 ± 0.01^{b}
HFD + ASSE 250	32.99 ± 0.70^{a}	24.52 ± 3.94^{bc}	0.71 ± 0.11^{b}
HFD + ASSE 500	29.95 ± 1.13^{ab}	21.69 ± 5.07^{bc}	0.68 ± 0.13^{b}
HFD + ORL	29.70 ± 1.34^{ab}	16.03 ± 4.17^{c}	0.55 ± 0.06^{b}

All values expressed as means ± S.E (n=10). ^{abc}Values of different letters are significantly different among columns at p-values < 0.05 by Duncan's multiple range tests.