



Article

β -Elemene Suppresses Obesity-Induced Imbalance in the Microbiota-Gut-Brain Axis

Yingyu Zhou ^{1,2}, Wanyi Qiu ¹, Yimei Wang ^{1,2}, Rong Wang ^{1,2}, Tomohiro Takano ^{1,2}, Xuyang Li ¹, Zhangliang Zhu ^{1,3}, Haruyo Nakajima-Adachi ², Masaru Tanokura ^{1,2,*}, Satoshi Hachimura ^{2,*} and Takuya Miyakawa ^{1,*}

Supplementary materials

Table S1. Chemical shifts of the metabolites.

	Metabolite	¹ H chemical shift (ppm)
1.	Lactate (Lac, C ₃ H ₆ O ₃)	1.32, 4.10
2.	Succinate (Suc, C ₄ H ₆ O ₄)	2.39
3.	Alanine (Ala, C ₃ H ₇ NO ₂)	1.47, 3.77
4.	Aspartate (Asp, C ₄ H ₇ NO ₄)	2.70, 2.79, 3.89
5.	Glycine (Gly, C ₂ H ₅ NO ₂)	3.55
6.	Myo-Inositol (Mins, C ₆ H ₁₂ O ₆)	3.26, 3.52, 3.61, 4.05
7.	Taurine (Tau, C ₂ H ₇ NO ₃ S)	3.25, 3.41
8.	Acetate (Ace, C ₂ H ₄ O ₂)	1.91
9.	γ -Aminobutyric acid (GABA, C ₄ H ₉ NO ₂)	1.89, 2.29, 3.00
10.	N-acetyl aspartate (NAA, C ₆ H ₉ NO ₅)	2.01, 2.48, 2.68, 4.38
11.	Propionate (Pro, C ₃ H ₆ O ₂)	1.04, 2.17
12.	Butyrate (But, C ₄ H ₈ O ₂)	0.88, 1.55, 2.14
13.	Serotonin (5-HT, C ₁₀ H ₁₂ N ₂ O)	3.11, 3.31, 6.88, 7.11, 7.29, 7.420, 10.00
14.	Creatine (Cr, C ₄ H ₉ N ₃ O ₂)	3.02, 3.92
15.	Creatine phosphate (PCr, C ₄ H ₁₀ N ₃ O ₅ P)	3.03, 3.94
16.	Choline (Cho, C ₅ H ₁₄ NO)	3.20, 3.51, 4.05
17.	Choline phosphate (PCho, C ₄ H ₁₀ N ₃ O ₅ P)	3.21, 3.58, 4.16
18.	Glutamate (Glu, C ₅ H ₉ NO ₄)	2.08, 2.34, 3.75
19.	Glutamine (Gln, C ₅ H ₁₀ N ₂ O ₃)	2.13, 2.45

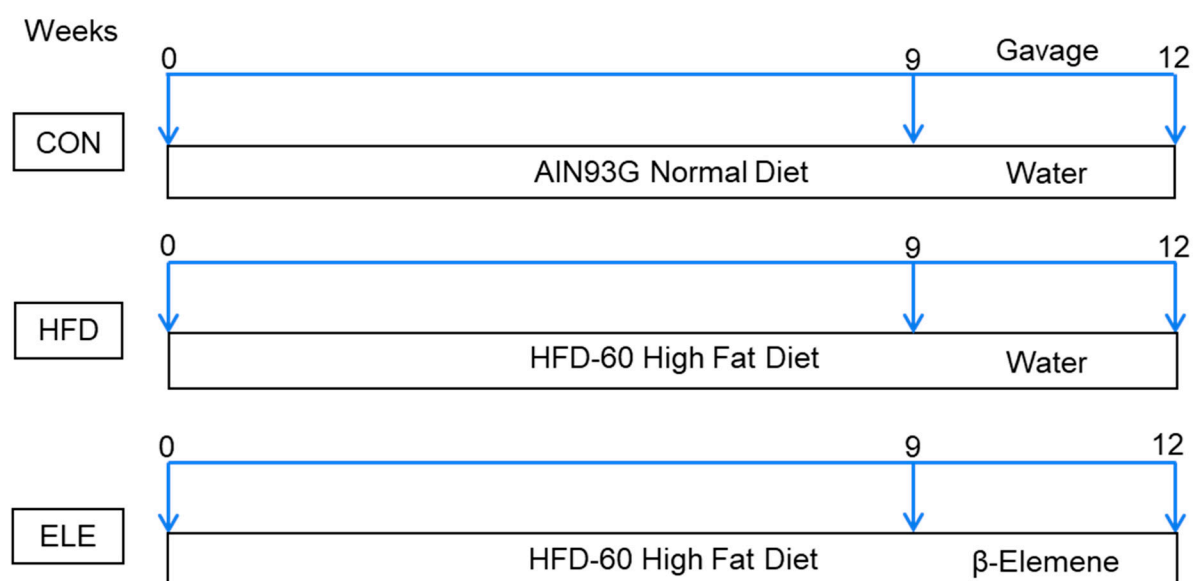


Figure S1. Schedule of the obesity mouse model.

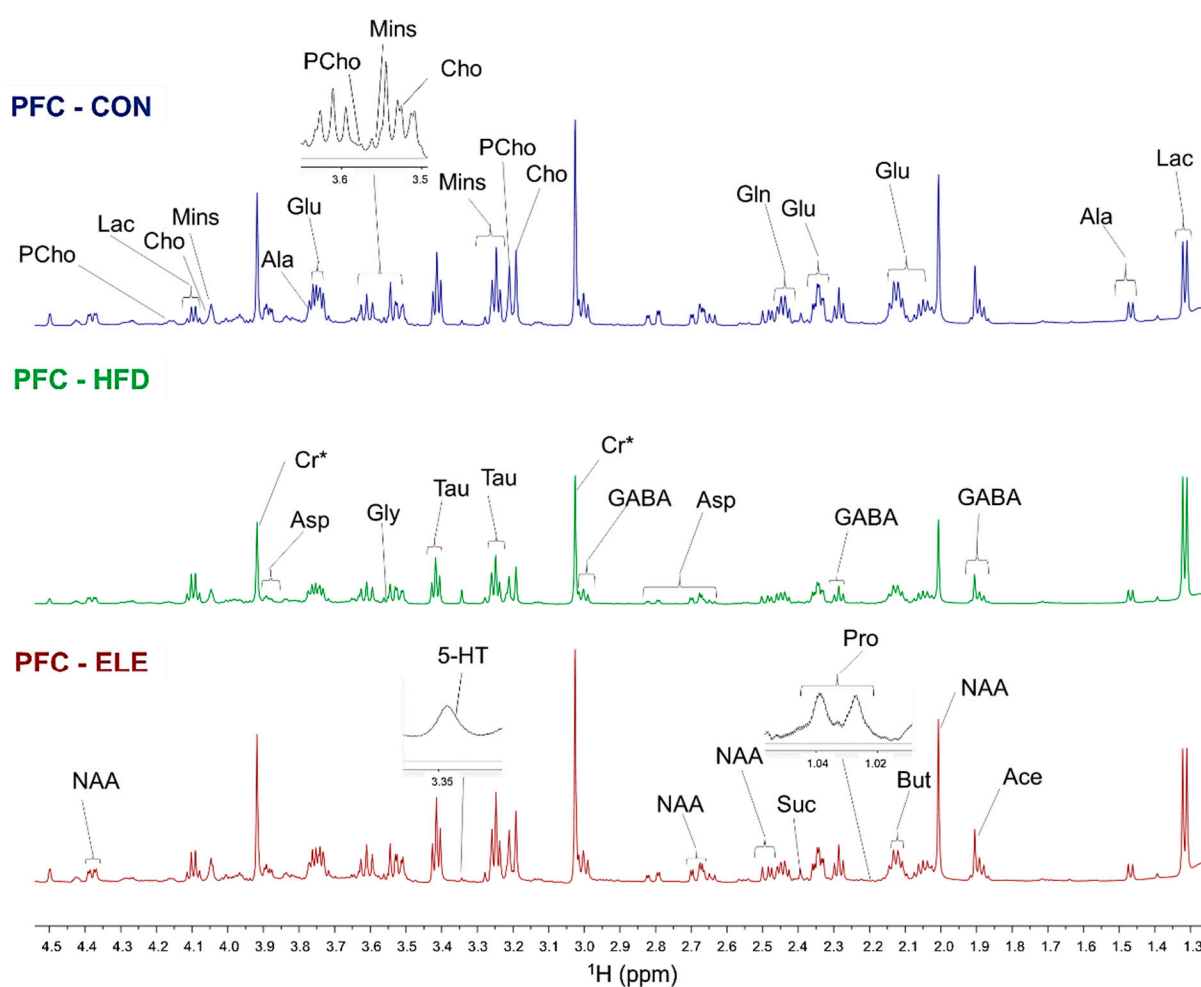


Figure S2. Representative ^1H NMR spectra of the PFC of each mice group. Cr*, Cr + PCr; CON, normal diet; HFD, high-fat diet; and ELE, HFD-induced obese mice under treatment with β -elementene.

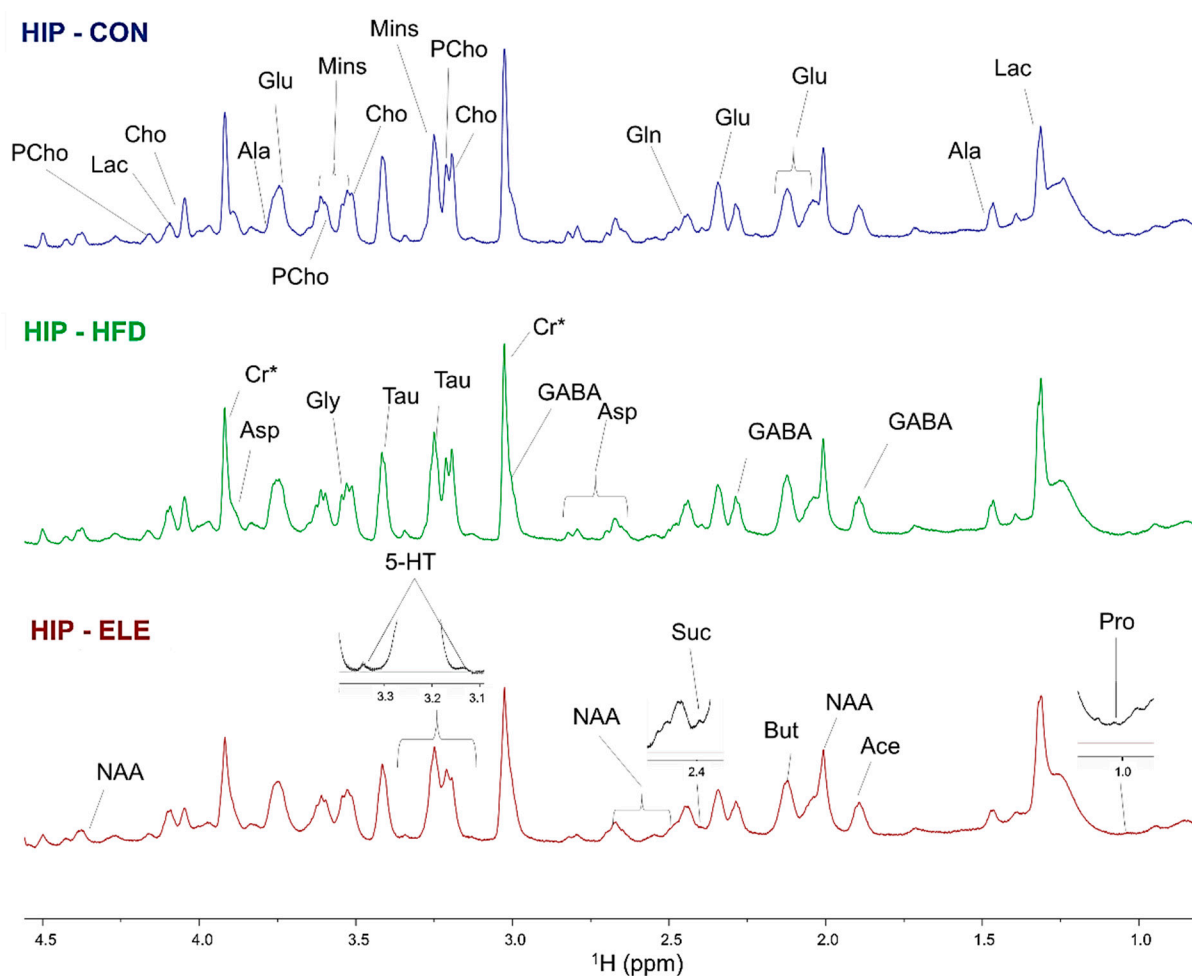


Figure S3. Representative ^1H NMR spectra of the HIP of each mice group. Cr*, Cr + PCr; CON; normal diet; HFD, high-fat diet; and ELE, HFD-induced obese mice under treatment with β -elemene.

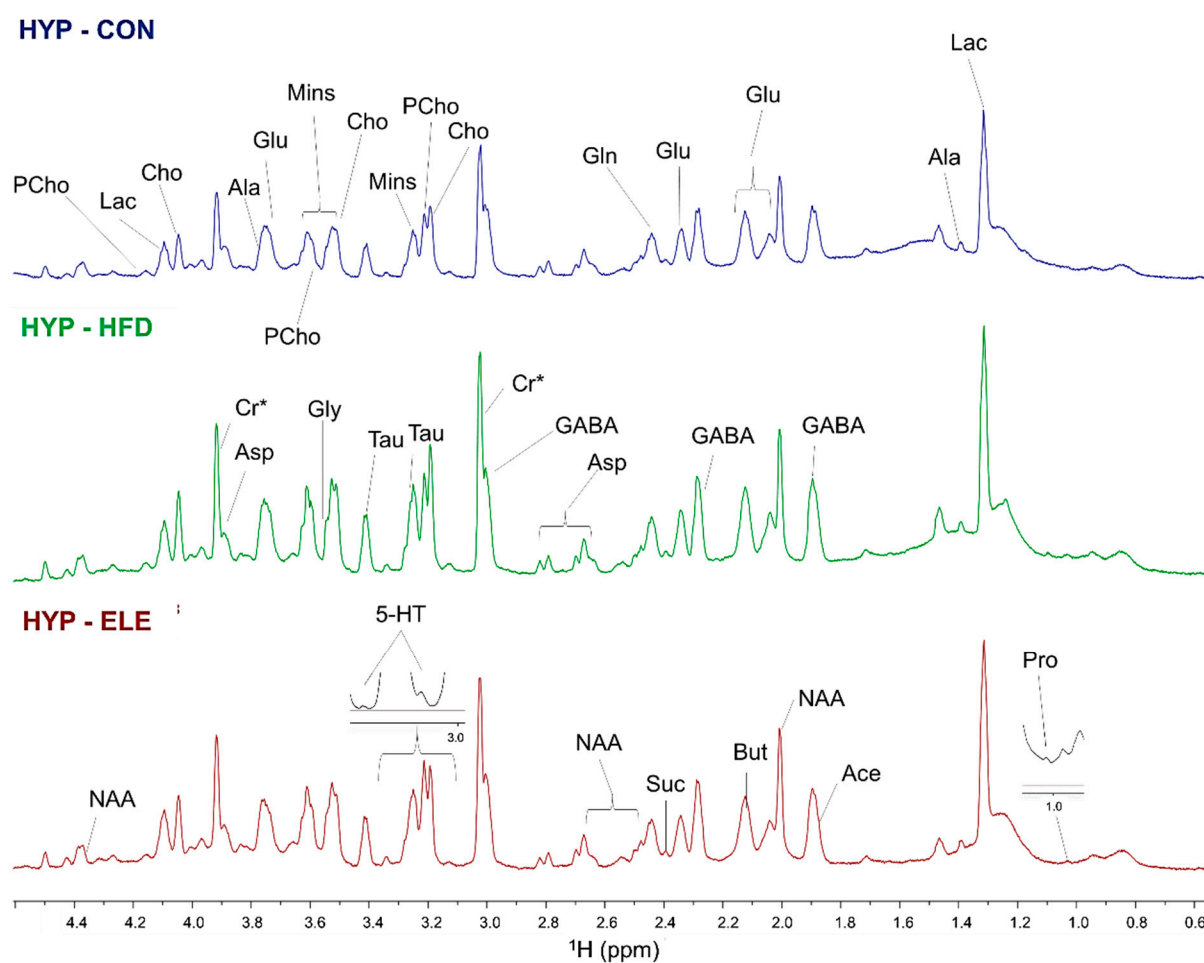


Figure S4. Representative ^1H NMR spectra of the HYP of each mice group. Cr*, Cr + PCr; CON, normal diet; HFD, high-fat diet; and ELE, HFD-induced obese mice under treatment with β -elemene.

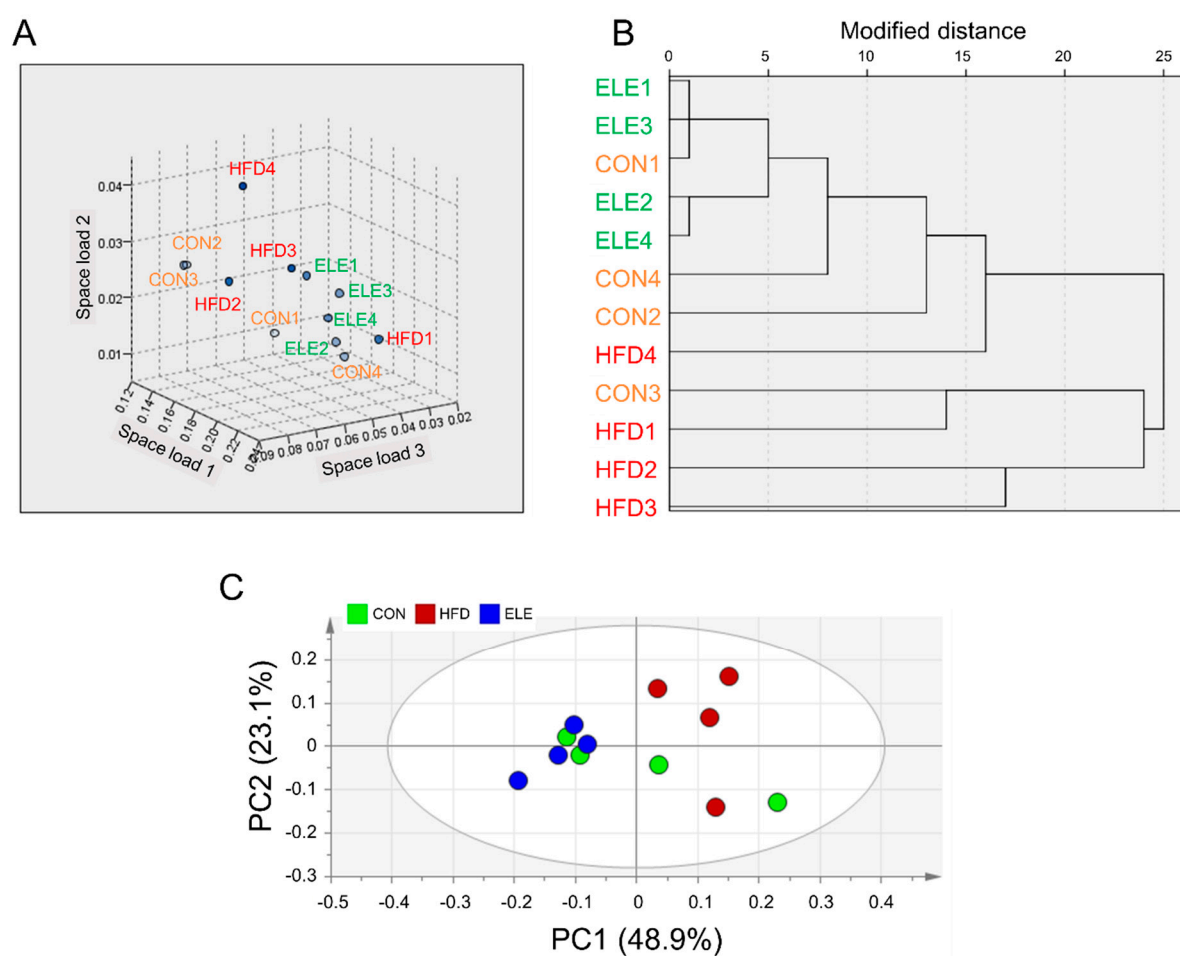


Figure S5. Effect of β -elemene on regulating brain metabolites in obese mice based on cluster analysis and principal component analysis. **(A)** Nearest neighbor analysis of the HYP. **(B)** Hierarchical cluster analysis of the HYP. **(C)** PCA score plot of the HYP. The spots with same color are derived from the same kind of samples. CON, normal diet; HFD, high-fat diet; and ELE, HFD-induced obese mice under treatment with β -elemene. Cr*, Cr + PCr; Cho*, Cho + PCho; and Glx, Glu + Gln.