

木耳萃取物改善卵巢切除大鼠血脂血糖代謝及骨質密度

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摘要

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本研究以卵巢切除 (OVX) 之動物模式，評估餵食木耳萃取物對更年期症狀的影響。Sprague Dawley (SD) 雌鼠經卵巢切除後分成 4 組，正常飼料組及給予 0.125、0.25 及 0.5 g kg⁻¹ 木耳萃取物組。研究顯示給予 OVX 大鼠木耳萃取物，可以增加血液的高密度脂蛋白膽固醇濃度，降低血液低密度脂蛋白膽固醇濃度及三酸甘油酯濃度，並可降低空腹血糖濃度及肝臟轉胺酶活性。OVX 大鼠的骨骼密度與木耳萃取物攝食有相關性。初期研究顯示，攝食木耳萃取物可以改善卵巢切除大鼠血脂、血糖代謝及增加骨質密度。

關鍵詞：木耳萃取物、更年期、卵巢切除、血液生化值、骨質密度。

前言

「更年期」為女性自正常的卵巢功能逐漸衰退至不具功能的過渡期 (Dell *et al.* 2000)，這期間因為體內雌激素 (estrogen) 的驟然下降，可能引起身體上許多不適，包括脂蛋白脂解酶活性改變，心臟血管疾病與血管疾病發生率增加，以及和這些症狀相關的血液生化值變化：總膽固醇、低密度脂蛋白膽固醇及三酸甘油酯值明顯高於停經前 (Parrish *et al.* 1967)，另也會發生血中鈣含量不足、骨密度急遽下降 (Brenner 1982) 等。研究證實木耳具有多方面的藥理作用，如降低血糖 (Yuan *et al.* 1998)、降低總膽固醇與低密度脂蛋白膽固醇，緩和動脈粥狀硬化 (Chen *et al.* 2008)、激活巨噬細胞 (Sheu *et al.* 2004) 及抑制血小板凝集、減少血栓形成 (Yoon *et al.* 2003) 等功效。

材料與方法

本試驗取木耳 (*Auricularia polytricha*) 乾

燥之子實體，加入 10× 體積去離子水復水後，加熱萃取，趁熱過濾，收集濾液，經冷凍乾燥為木耳萃取物 (APE)。以 5 週齡 SD (Sprague Dawley) 雌鼠為實驗動物，動物育養 1 wk 後施行卵巢切除術 (ovariectomized; OVX)。經 3 wk 復原期，先由尾靜脈採血後進行隨機組分成 4 組，正常飲食組 (V0)、添加不同劑量木耳萃取物組 V1 (0.125 g kg⁻¹ BW APE), V2 (0.25 g kg⁻¹ BW APE), V3 (0.5 g kg⁻¹ BW APE)。於飼育期 4 wk 結束後犧牲實驗動物，採集血液檢體及下肢股骨進行生化分析及切片判讀。

結果與討論

給予卵巢切除動物 0.125–0.5 g kg⁻¹ 木耳萃取物，血脂脂肪指標分析顯示，V3 餵食高劑量木耳萃取物組的三酸甘油酯 30.3 ± 0.63 mg dL⁻¹、低密度脂蛋白膽固醇 (LDL-C) 8.8 ± 0.28 mg dL⁻¹ 濃度，顯著低於 V0 正常飲食組；V3 組的高密度脂蛋白膽固醇 (HDL-C) 濃度 25.1 ±

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1.3 mg dL⁻¹ 顯著高於 V0 組，如表 1 所示。肝臟功能指標分析，V0 正常飲食組天門冬胺酸轉胺酶 (AST) 濃度 139.00 U L⁻¹ 及丙胺酸轉胺酶 (ALT) 濃度 60.00 U L⁻¹，與 10 週齡無特定病原 SD 大鼠的血清生化值 (Fang *et al.* 1996) 比較指數偏高，攝食木耳萃取物後各組 AST 濃度 (79.67–98.17 U L⁻¹) 及 ALT (41.25–44.67 U L⁻¹) 濃度均顯著低於 V0 組，推測與改善發炎現象有關。腎臟功能指標分析，V0 正常飲食組的白蛋白 (albumin) 濃度 3.7 mg dL⁻¹、肌酸酐 (creatinine) 濃度 0.76 mg dL⁻¹、尿素氮 (BUN) 濃度 20.1 mg dL⁻¹，與 10 週齡大鼠

生化值比較數值偏高，攝食木耳萃取物各組，OVX 大鼠腎臟功能指數顯著下降，尿素氮濃度 14.8–16.8 mg dL⁻¹，尿酸濃度 0.9–1.4 mg dL⁻¹。在空腹血糖值分析顯示，V0 組的血糖值 150.4 mg dL⁻¹ 遠高於 10 週齡大鼠生化值，攝食木耳萃取物後各組血糖值 110.2–122.6 mg dL⁻¹ 均顯著低於 V0 組，下降至正常範圍，顯示食用木耳萃取物具有改善 OVX 大鼠血脂、血糖代謝之功效。骨密度切片分析如圖 1、圖 2 所示，V0 正常飲食組骨質密度相對低於攝食木耳萃取物各組，將圖 1 之骨組織密度量化後，V0 組的骨組織密度 45%，攝食木耳萃取

表 1. 飲食中添加不同劑量的木耳萃取物對於卵巢切除雌鼠血漿生化值之影響。

Table 1. Effects of different dietary on plasma parameters of ovariectomized rats.

Plasma parameter	V0 ^z	V1	V2	V3
Total Cholesterol (mg dL ⁻¹)	86.6 ± 6.9	92.3 ± 8.3	81.8 ± 8.1	73.7 ± 4.5
HDL-C (mg dL ⁻¹)	20.7 ± 0.7	23.5 ± 1.7	23.2 ± 1.5	25.1 ± 1.3 ^{xy}
LDL-C (mg dL ⁻¹)	10.5 ± 0.3	11.0 ± 0.4	10.1 ± 0.3	8.8 ± 0.2 [*]
Triglyceride (mg dL ⁻¹)	60.5 ± 4.7	38.0 ± 8.3 [*]	43.0 ± 5.7 [*]	30.3 ± 0.6 [*]
AST (U L ⁻¹)	139 ± 44	87 ± 19 [*]	98 ± 11 [*]	80 ± 3 [*]
ALT (U L ⁻¹)	60.0 ± 5.9	41.3 ± 9.4 [*]	42.0 ± 5.6 [*]	44.7 ± 7.2 [*]
Albumin (mg dL ⁻¹)	3.7 ± 0.4	3.6 ± 0.3	3.6 ± 0.3	3.5 ± 0.2
Creatinine (mg dL ⁻¹)	0.76 ± 0.03	0.66 ± 0.04 [*]	0.67 ± 0.02 [*]	0.63 ± 0.01 [*]
BUN (mg dL ⁻¹)	20.1 ± 1.4	14.8 ± 0.7 [*]	16.1 ± 1.2 [*]	16.8 ± 0.2 [*]
Uric acid (mg dL ⁻¹)	2.2 ± 0.3	0.9 ± 0.1 [*]	1.4 ± 0.1 [*]	0.9 ± 0.1 [*]
Glucose AC (mg dL ⁻¹)	150 ± 7	123 ± 8 [*]	110 ± 8 [*]	116 ± 5 [*]

^z V0: OVX rat fed on chow diet; V1: OVX rat fed on chow diet supplemented with 0.125 g kg⁻¹ BW APE; V2: OVX rat fed on chow diet supplemented with 0.25 g kg⁻¹ BW APE; V3: OVX rat fed on chow diet supplemented with 0.5 g kg⁻¹ BW APE.

^y All values are presented as mean ± SEM (*n* = 6).

^{*} Significantly different from each group (*P* < 0.05).

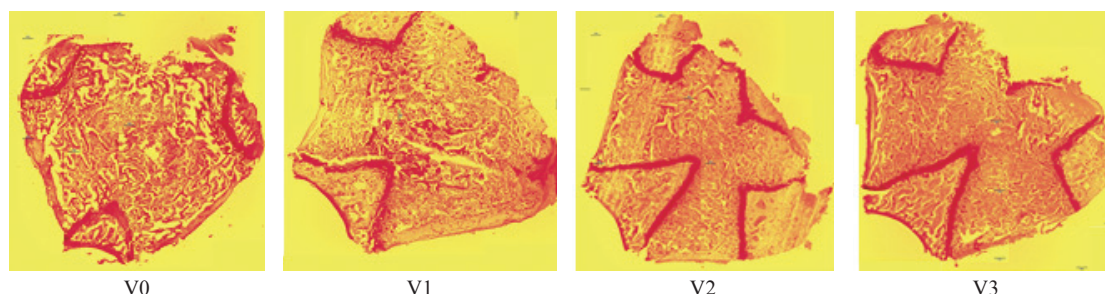


圖 1. 飲食中添加不同劑量的木耳萃取物之卵巢切除雌鼠骨組織切片。

Fig. 1. Bone slice of different dietary of ovariectomized rats. V0: OVX rat fed on chow diet; V1: OVX rat fed on chow diet supplemented with 0.125 g kg⁻¹ BW APE; V2: OVX rat fed on chow diet supplemented with 0.25 g kg⁻¹ BW APE; and V3: OVX rat fed on chow diet supplemented with 0.5 g kg⁻¹ BW APE.

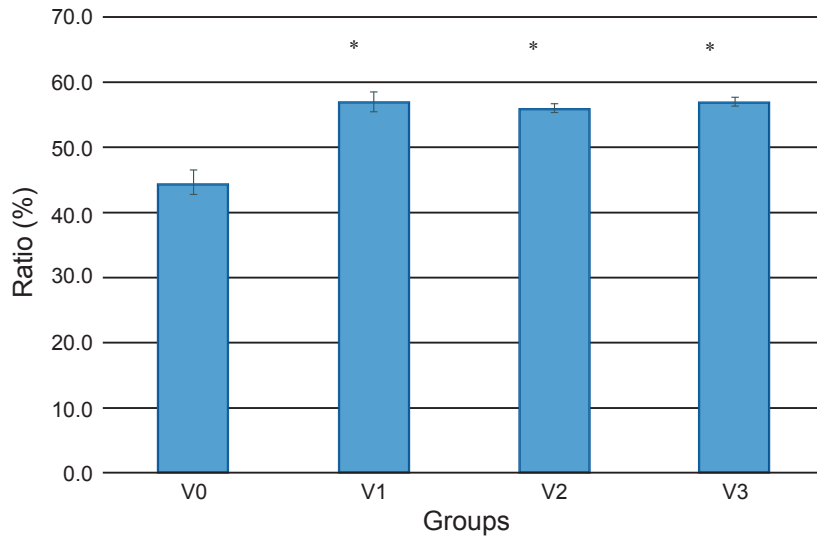


圖 2. 飲食中添加不同劑量的木耳萃取物對於卵巢切除雌鼠骨組織密度之影響。

Fig. 2. Effects of different dietary on bone density of ovariectomized rats. V0: OVX rat fed on chow diet; V1: OVX rat fed on chow diet supplemented with 0.125 g kg⁻¹ BW APE; V2: OVX rat fed on chow diet supplemented with 0.25 g kg⁻¹ BW APE; and V3: OVX rat fed on chow diet supplemented with 0.5 g kg⁻¹ BW APE. * Significantly different from each group ($P < 0.05$).

物各組的骨組織密度 55–57%，較為緻密，顯示攝食木耳萃取物可以顯著增加 OVX 大鼠的骨質密度，推測與減少鈣質流失有關，各項代謝機制及有效成分，有待繼續探討。

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***Auricularia polytricha* Extracts Improve Blood Lipid Blood Sugar Metabolism and Bone Density of Ovariectomized Rats**

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Abstract

Yang, H. T., H. C. Liu, and S. H. Yang. 2017. *Auricularia polytricha* extracts improve blood lipid blood sugar metabolism and bone density of ovariectomized rats. J. Taiwan Agric. Res. 66(2):167–170.

In this study, the efficacy of *Auricularia polytricha* extracts (APE) improving the menopausal symptoms was evaluated by an ovariectomized model. Female Sprague Dawley rats were divided into 4 groups after surgery, including OVX fed on chow diet, and OVX fed on 0.125, 0.25, or 0.5 g kg⁻¹ APE groups. Studies have shown that OVX SD rats supplemented with APE could increase plasma HDL-C concentration, but decreased LDL-C concentration, triglyceride levels, fasting glucose and liver transaminase activity. Bone density showed correlated with APE ingesting. In short, the *Auricularia polytricha* extract intake can improve lipid metabolism and increase bone density on ovariectomized rats.

Key words: *Auricularia polytricha* extracts, Menopause, Ovariectomy, Blood biochemistry, Bone density.

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