

# 不同來源的醣類、蛋白質及邊緣性缺銅對老鼠脂質代謝的影響

## Interaction of Dietary Carbohydrate, Protein and Marginal Copper on Lipid Metabolism in Rats

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### 摘要

本實驗主要目的是探討不同來源的醣類、蛋白質對邊緣性缺銅鼠所誘發高膽固醇的影響。將 40 隻雄性大白鼠，隨機分成 8 組，以銅濃度(2.5~8ppm)，醣類(米或玉米澱粉，62.2%)，及蛋白質(酪蛋白或黃豆蛋白，15%)作 2x2x2 factorial 的 7 週實驗設計。實驗結束時，分析血清總膽固醇(TC)，高/低密度脂蛋白膽固醇(HDL-C/LDL-C)，三酸甘油酯(TG)，藍胞漿素，肝臟總脂質(TL)，膽固醇和各組織礦物質濃度。結果顯示：食物攝取量無顯著差異，米澱粉/酪蛋白/有銅組分別有顯著較優的體重及餵食效率(P<0.05)。餵食米澱粉/黃豆蛋白組比玉米澱粉/酪蛋白組具較低的 TC 和 LDL-C 值(P<0.05)；邊緣性缺銅不影響 TC 但使血中 TG 值降低(P<0.001)，HDL-C/TC 比值在米澱粉/黃豆蛋白組較高。邊緣性缺銅的特徵：低的血銅和藍胞漿素值，較高的心臟重量(P<0.05)。肝中 TC 和 TL 值在米澱粉/黃豆蛋白組也較低(p<0.05)。銅合適組有較低的肝膽固醇值(P<0.003)。總結，邊緣性缺銅會影響鼠的生長及肝中膽固醇量，米澱粉/黃豆蛋白組的飼料具保護功效。

### Abstract

A study was conducted to explore the effects of the Chinese diet on lipid metabolism. Male weaning Sprague-Dawley rats (N=40) were fed purified diets for 7 weeks. These diets varied in carbohydrate (rice or corn starch, 62.2%), protein (casein or soybean, 15%) and copper (2.5-8ppm) in a 2x2x2 factorial design. Rats receiving marginal levels of copper had significantly lower final body weights and feed efficiencies compared to rats fed adequate levels of copper (p<0.05). The total cholesterol (TC) and low density lipoprotein-cholesterol (LDL-C) levels in serum were lower in rats fed rice starch with casein or soy protein diets compared to rats fed corn starch (p<0.05). Serum triglyceride levels were affected by copper levels (p<0.001). High density lipoprotein-cholesterol (HDL-C)/TC was higher in rats fed rice starch/soyprotein than in rats fed other diets. Groups receiving marginal levels of copper exhibited characteristic signs of copper deficiency: reduced serum copper, hypoceruloplasminemia, and higher relative heart weights (p<0.05). Liver total lipids and cholesterol were influenced by dietary factors; rice starch/soy protein groups had lower values than corn starch/casein groups (p<0.05). Copper adequate groups had lower total liver cholesterol than did the marginal copper groups

( $p < 0.003$ ). In conclusion, the growth and liver cholesterol level of rats were influenced by marginal copper level. Rice starch/soybean diet have protective effects on it.