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• 計畫中文名稱	產學合作計畫：改善糖尿病患之血糖、胰島素及脂質濃度之米麩穀粉產品開發(III)
• 計畫英文名稱	Effects of Rice Bran Diet on Blood Glucose, Insulin and Lipid in Diabetic Mellitus (III)
• 主管機關	行政院國家科學委員會
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• 中文關鍵字	米麩穀粉; 米穀粉; 糖尿病患; 血糖; 糖化血色素
• 英文關鍵字	Rice bran flour; Rice flour; Type 2 diabetes; Blood glucose; Glycated hemoglobin
• 中文摘要	由國內產之稻米成份中開發降低偏高血脂及血糖功效機能之保健食品。在第一年及第二年的計畫欲探討給予第 2 型糖尿病患者短期 (4 週) 或長期 (12 週) 攝取米麩穀粉對血糖、血脂的影響。在第三年則是探討合作廠商大量生產的產品對於第 2 型糖尿病患者血糖、血脂及胰島素的影響；及量產產品穩定性及安全性 (農藥、生菌數及重金屬) 的評估。第一年徵求台北地區 42 位 30-80 歲第 2 型糖尿病患，並經醫師診斷無併發症者加入本研究。先依受試者不同的 HbA1C 分成<6.8 (slight hyperglycemic, SLH)、6.8-8.5 (mildly hyperglycemic,MIH) 及> 8.5 (severely hyperglycemic, SEH) 三組，每天攝取 20 g 的米麩穀粉，爲期 4 週。在實驗期間受試者維持其平日的飲食及生活習慣，於第 0 週及 4 週，進行口服 75 公克葡萄糖耐受試驗，於 0、30、60、90、120、180 分鐘，抽取靜脈血液進行分析。結果顯示：MIH 及 SEH 組空腹血糖有下降的趨勢但無統計上的差異。在糖化血色素方面，僅在 SEH 這一組在攝取米麩穀粉 4 週後顯著的下降，具有統計上的差異 (P<0.05)。且 SEH 組在攝取 4 週米麩穀粉後葡萄糖曲線下面積也有顯著的下降 (P<0.05)。第二年計畫徵求台北地區 48 位 30-80 歲第 2 型糖尿病患，並經醫師診斷無併發症者加入本研究，受試者每天攝取 20 公克的米麩穀粉 (RB 組) 或白米穀粉 (Placebo 組，安慰劑)，試驗期爲 12 週，於第 0、4、8、12 週，進行口服葡萄糖耐受試驗。結果顯示：RB 組在攝取米麩穀粉第 4、8、12 週後，糖化血色素顯著性的降低 (P<0.05) 及顯著的增加胰島素曲線下面積。攝取白米穀粉 12 週後對於糖化血色素並無顯著性的改變。在血脂方面，RB 組攝取米麩穀粉第 12 週後血液中 LDL-C 有顯著性的降低。綜合上述第 2 型糖尿病患在攝取米麩穀粉 12 週後，可顯著的降低糖化血色素、血清 LDL-C 濃度以及增加葡萄糖耐受試驗胰島素曲線下的面積。第三年計畫招募宜蘭地區 24 位 30-80 第 2 型糖尿病患者，本研究爲隨機、雙盲交叉試驗。受試者先攝取 38 公克安慰劑 (白米穀粉) 或米麩穀粉 (RB 組) 5 週

	後，經過 2 週的排空期之後，再攝取 38 克米麩穀粉或安慰劑 5 週，共爲期 12 週。於第 0、5、7、12 週，進行口服葡萄糖耐受試驗。結果顯示：攝取米麩穀粉 5 週後，空腹血糖及糖化血色素顯著的降低。攝取安慰劑 5 週後對於糖化血色素並無顯著性的改變。綜合上述第 2 型糖尿病患在攝取米麩穀粉 5 週後，可 I 顯著的降低空腹血糖及糖化血色素。總結：第 2 型糖尿病患每日攝取 20 克米麩穀粉，不論是短期 (4 週) 或長期 (12 週) 皆可顯著的降低糖化血色素含量。且長期攝取米麩穀粉可增加胰島素分泌量及降低低密度脂蛋白膽固醇含量，故攝取米麩穀粉可改善第 2 型糖尿病患之血糖與血脂質的控制。此外，第 2 型糖尿病患者在攝取廠商所量產的米麩穀粉 5 週後，亦可顯著的降低 2.5%糖化血色素。所有米麩穀粉的重金屬及農藥含量皆符合安全範圍內。
• 英文摘要	Development of a new product of rice bran flour improves blood glucose and lipid levels in diabetes mellitus patients in Taiwan. The first and second year: we investigated the effects of rice bran flour supplementation on the blood glucose, lipid, and insulin concentration in type 2 diabetes mellitus subjects after 20 g of rice bran each day for 4 and 12 week. Third years: we investigated the effects of rice bran flour of mass production in factories on the blood glucose, lipid, and insulin concentration in type 2 diabetes mellitus for 12 week, and the stability and safety evaluation of rice bran of mass production in factories. The first year: forty two type 2 diabetes subjects in Taipei, aged 30 to 80 years volunteered to participate. According to different glycated hemoglobin (HbA1C) was separated SLH (slight hyperglycemic, HbA1C <6.8), MIH (mildly hyperglycemic, HbA1C 6.8-8.5), and > SEH (severely hyperglycemic, HbA1C <8.5). Subjects were supplement 20 g rice bran flour for 4 weeks. On the beginning and 4 weeks, we send the subjects for a three hour oral glucose tolerance test (OGTT). After 30, 60, 90, 120, and 180 min, blood was collected. The results showed that plasma glucose levels in MIH and SEH were tended to decrease. After diabetic subjects supplement rice bran for 4 weeks, HbA1C was significant decreased in SEH (P<0.05). Moreover, consumption of rice bran diets significant decreased the areas under the response curves for glucose in SEH. The second year: forty-eight type 2 diabetes subjects in Taipei, aged 30 to 80 years volunteered to participate. Subjects were supplement 20 g rice bran flour (RB group) or rice flour (Placebo group) for 12 weeks. On the beginning, 4, 8 and 12 weeks, we send the subjects for a three hour oral glucose tolerance test (OGTT). The results showed that HbA1C was significantly decreased in 4, 8, and 12 weeks in RB group compare with baseline. The areas under the response curves for insulin in 4, 8, and 12 weeks in RB group were significantly increased. In addition, blood LDL-cholesterol concentrations were significant decreased for 12 weeks in RB group. The third year: twenty-four type 2 diabetes subjects in Yilan, aged 30 to 80 years volunteered to participate. This study is designed as randomized, doubleblind and crossover trials, subjects were randomized to two sequences that included 5 weeks of treatment with 38 g of rice bran flour and rice flour. Treatment was preceded by a 14-day washout period. On the beginning, 5, 7 and 12 weeks, we send the subjects for a three hour oral glucose tolerance test (OGTT). The results showed that HbA1C and fasting plasma glucose concentration was significantly decreased after 5 weeks rice bran flour supplementation. On the contrary, subjects were supplement rice flour that did not affect HbA1C. In conclusion, type 2 diabetes mellitus subjects after 20 g of rice bran each day for 4 weeks (short term) or 12 weeks (long term) were significantly decrease. Long-term intakes of rice bran flour

were significantly increased insulin secretion and decreased LDL-cholesterol concentration. Type 2 diabetic patients supplement rice bran flour can improve blood glucose and lipid control. Furthermore, intakes of rice bran flour of mass production in factories in type 2 diabetic patients were significantly decreased 2.5% HbA1C. The heavy metal content and pesticides content of rice bran flour conformed to security level.