microfractures of cancellous bone and weight bearing trabeculae, bleeding of fatty marrow, and edema. They stated that edema was found only in a minority of the cases and that the frequently used diagnosis "bone marrow edema" should be replaced by "ill-defined signal intensity," "edema-like MRI imaging abnormality." The present experimental study shows clearly, that such subchondral bone lesions initiate changes in the zonal formation of articular cartilage indicating early osteoarthritic damage.

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Beneficial effects of soy protein isoflavones on lipid and blood glucose concentrations in type 2 diabetic subjects

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Evidence is emerging that dietary supplementation with soyprotein have a beneficial role in type 2 diabetes.[1,2] Nutritional intervention studies performed in animals and humans suggest that the ingestion of soyprotein with isoflavones and flaxseed rich in lignans improves glucose control and insulin resistance.[3] In animal models of obesity and diabetes, soyprotein has been shown to reduce serum insulin and insulin resistance.[2] In studies of human subjects with or without diabetes soyprotein also appears to improve hyperglycemia and reduce body weight, hyperlipidemia and hyperinsulinemia and supporting its beneficial effects on obesity and diabetes.[1,2]

A meta-analysis of 38 controlled clinical trials indicated that soyprotein was effective in lowering plasma cholesterol, low density lipoprotein (LDL) cholesterol, and triglycerides (Tg) concentration.[4] The purpose of the present study was to assess the effects of a processed defeated meal containing soyprotein 98 gr/ 100 gr and isoflavones 195 mg/ 100 gr taken one time daily as a beverage with regular meals for 3 months, on serum levels of total cholesterol, Tg, high density lipoprotein (HDL), LDL, fasting blood sugar (FBS), glycosylated hemoglobin weight and blood pressure.

Twenty-six type 2 diabetic subjects who were referred to Ahvaz Jondishapour University, diabetes center for uncontrolled diabetes, completed the study. Eleven patients had previous history of hypertension and 3 of microalbuminuria. All of the patients were treated with diet and anti diabetic drugs (18 sulfonylureas, 11 metformin, 4 combined sulfonylureas and metformin and 1 insulin). They took the prescribed medicine throughout the study without any changes. Subjects were asked to maintain their habitual diet and level of physical activity through out the study. All were in good general health and had a normal renal function. Informed written consent was obtained from each subject. All subjects received 25 gr/day defeated soyprotein meal providing a daily amount of 12 gr soyprotein with 50 mg isoflavones for 3 months. Subjects were instructed to mix their daily supplement in 200 ml water and consume as a beverage with their current meals. The participants were weighed monthly. Blood samples for measuring FBS, HbA1C, total cholesterol, Tg and HDL- cholesterol were obtained after an overnight fasting period before the study and monthly thereafter. The LDL cholesterol was calculated using the Friedwald equation. Blood pressure was measured before the study and at each monthly visit. Plasma glucose concentrations were measured by the glucose oxidase method and HbA1C by high performance liquid chromatography Serum Tg, total cholesterol and HDL-cholesterol were measured by pars Azemon kits on a RA-XY and RA-1000 Automatic Analyzer (Pars Azemon Company, Tehran, Iran). Statistical analysis was performed using the Statistical Package for Social Sciences version 11.5. Significant point was set at 0.05 level. A total of 26 (17 female and 9 male) type 2

Table 1 - Blood glucose, lipids and blood pressure before, during and after 3 months consumption of soy product.

Variables	Before study	After 1 months	After 2 months	After 3 months	*P*-value
FBS (mg/dl)	178 ± 60	16 ± 63	157 ± 53	152 ± 50	0.015
Glycosylated hemoglobin %	9.6 ± 1.7	9.3 ± 1.5	9 ± 1.3	8.8 ± 1.4	<0.001
LDL (mg/dl)	114 ± 38	112 ± 35	114 ± 38	110 ± 37	0.076
HDL (mg/dl)	46 ± 6	44 ± 6	45 ± 5	45 ± 5	0.27
TG (mg/dl)	267 ± 149	261 ± 146	243 ± 122	229 ± 113	0.008
Chol (mg/dl)	207 ± 42	203 ± 40	203 ± 40	196 ± 41	0.002
Systolic BP (mm Hg)	138 ± 31	132 ± 23	131 ± 18	130 ± 21	0.101
Diastolic BP (mm Hg)	87 ± 20	84 ± 16	84 ± 15	84 ± 16	0.384

FBS - fasting blood sugar, LDL - low density lipoprotein, HDL - high density lipoprotein, TG - triglyceride, Chol - cholesterol, BP - blood pressure

diabetic patients completed the study. Soy preparation was well tolerated. Patients age were between 39-70 years (54 ± 8.4 years). Mean time from diagnosis of type 2 diabetes was 6.5 ± 4.3 years (between one month to 15 years). The FBS and HbA1C levels decreased significantly after 3 months consumption of this soy product (152 ± 50 versus 178 ± 60 and 8.8 ± 1.4 versus 9.6 ± 1.7 percent respectively). Although serum total cholesterol (p<0.002) and Tg (p<0.008) levels lowered significantly after 3 months, there were no significant differences in LDL and HDL cholesterol levels (**Table 1**). Systolic and diastolic blood pressure and patients weights remained unchanged during the study. Only FBS level showed significant changes in first (p<0.03) and second (p<0.02) months after consumption of soy product. The soyprotein isoflavones (SPI) used in this study reduced FBS by 15%, HbA1C by 7%, TG by 14% and total cholesterol concentrations by 5%. The results showed that soy supplementation has a significant effect on both glycemic control and lipid profile in type 2 diabetes patients. The therapeutic potential of soy for diabetes was first suggested in 1910.[3] Few studies of the effect of soy on glycemic control in diabetes have shown inconsistent results that have been primarily attributed to the soluble fiber content of soy bean preparation.[3] In a study of 14 women and 6 men, 6 weeks of treatment with soyprotein (50 gr/day), isoflavones (165 mg/day), and cotyledon fiber (20 gr/day) compared with placebo (case in 50 gr/day and cellulose 20 gr/day) showed an improvement in lipid parameters but no difference in glucose, insulin, or HbA1C.[1] A cross-over trial of soy phytoestrogen (soyprotein 30 gr/day, isoflavones 132 mg/day versus placebo) intake in 32 postmenopausal women with type 2 diabetes for 2 weeks (with a 2 weeks washout period) showed a significant decrease in insulin resistance, HbA1C, total cholesterol, LDL cholesterol and cholesterol/HDL ratio, but no significant changes in HDL cholesterol, Tg, weight and blood pressure.[2] In this study, similar results were obtained regarding fasting blood glucose, HbA1C, total cholesterol, HDL-cholesterol, blood pressure and weight, however, LDL-chlesterol showed no significant decrease. In vitro studies suggested several mechanisms for a direct pharmacological action of soy on glycemic control, including a tyrosine kinase inhibitory action, changes in insulin receptor numbers and affinity, intracellular phosphorylation and alterations in glucose transport.[5]

In this study, decreases in both FBS and HbA1C without any changes in patient's weight seems to support a direct favorable effect of soy in these patients. The mechanisms for the lipid lowering effect of soy products are not known. There is persuasive evidence to implicate soy protein in the cholesterol-lowering effect. Soyprotein provide a large amount of protein with high-quality amino acids, which seems to upregulate LDL receptors directly by 50% or more.[3] The meta analysis of Anderson et al[4] however, indicated that a considerable proportion of the effect of soy products on serum cholesterol might be linked to the effects of isoflavones. Since isoflavones are compounds that have structure similar to estrogens and bind to estrogen receptors, it has been postulated that this may be responsible for the effects of soyprotein on serum lipids.

In conclusion, these results indicate beneficial effects of dietary supplementation with soy product on blood glucose and lipid profile of these type 2 diabetic patients. Thus, a dietary supplementation with soyprotein isoflavones in type 2 diabetic patients may provide an acceptable and effective option for blood glucose and lipid control, thereby decreasing the requirement for drug therapy in these patients.

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