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Effect of some Functional Foods on Induced Cataract in Experimental Animals

Thesis Submitted for Doctor Philosophy Degree in Science (Biochemistry and Nutrition)

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كلية البنات للاداب والعلوم والتربيه

تأثير بعض الاغذية الوظيفية على المياه البيضاء المستحدثة فى حيوانات التجارب

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للحصول على درجة دكتوراه الفلسفة

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Effect of some Functional Foods on Induced Cataract in Experimental Animals

Hasnaa Hatem Hassan Mohamed. Thesis Submitted for Ph.D. Degree in Science in "Biochemistry and Nutrition".

Abstract

Functional foods are foods that, by virtue of physiologically active components, provide health benefits beyond basic nutrition.. The object of the study is to examine the effect of dietary intake of garlic, onion, broccoli and soybean powders on preventing cataract formation. Total phenolic compounds in garlic, onion, broccoli and soybean powders were determined**.** Antioxidant and apoptotic status in addition to lipids profile and their relation to cataract were also investigated. Sixty five Wister rat pups were divided into ten groups. Group 1 (normal control, n=6) received basal diet; group 2 (cataract, n=8) received a single subcutaneous (s.c.) injection of sodium selenite (Na_2SeO_3) (30µmol/kg body weight) and fed on basal diet; group 3 (normal, fed on garlic, n=6) received basal diet containing 5% garlic powder; group 4 (cataract, fed on garlic, n=7) received s.c. injection of Na_2SeO_3 and fed on basal diet containing 5% garlic powder, group 5 (normal, fed on onion, n=6) received basal diet containing 10% onion powder; group 6 (cataract, fed on onion, n=6) received s.c. injection of Na_2SeO_3 and fed on basal diet containing 10% onion powder; group 7 (normal, fed on broccoli, n=7) received basal diet containing 10% broccoli powder; group 8 (cataract, fed on broccoli, n=6) received s.c. injection of Na_2SeO_3 and fed on basal diet containing 10% broccoli powder; group 9 (normal, fed on soybean, n=6) received basal diet containing 25% soybean powder and group 10 (cataract, fed on soybean, n=7) received s.c. injection of Na_2SeO_3 and fed on basal diet containing 25% soybean powder.

At the end of the experiment (two months) catalase (CAT), superoxide dismutase (SOD) activities, total antioxidant capacity (TAO), reduced glutathione (GSH), malondialdehyde (MDA) and nitric oxide (NO) were assessed in both blood and lenses. Fas ligand (FAS-L) as apoptotic marker was also assessed in the blood and lenses. The levels of serum lipid profile, serum glucose and blood

hemoglobin were determined in rats' blood. The crystalline lens protein patterns on sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) were identified and analyzed by computerized program.

Results of slit-lamp examination of both eyes of each rat revealed no lenticular opacification (cataract stage 0) in all eyes of groups 1,3,5,7 and 9. Complete lens opacification (stage 4) was noticed in the group 2 (100%), while mild lenticular opacification (cataract stage1) was noticed in 14.3%, 16.7%, 16.7% and 28.7% of rats in the groups treated with garlic, onion, broccoli and soybean, respectively. The mean activities of the antioxidant enzymes CAT and SOD and levels of TAO and GSH were significantly lower in blood and lenses of cataractous group than normal control group. Conversely, the mean levels of MDA, NO and FAS-L were significantly higher in blood and lenses of cataractous rats than normal control. Serum glucose was significantly higher in group 2 than in group 1, while blood hemoglobin didn't show any significant difference. In addition, the mean levels of total lipids (TL), triacylglycerols (TG), total cholesterol (TC) and low density lipoprotein-cholesterol (LDL-C) were significantly higher in selenite induced cataract group than in those of normal control. However, 5% garlic, 10% onion, 10% broccoli and 25% soybean powders significantly reversed the effect of sodium selenite on cataractous rats and improved the previous parameters. Also SDS-PAGE showed reduction of the soluble lens protein peaks and intensities in cataract group, while the peaks numbers and intensities of cataract groups fed on garlic, onion, broccoli and soybean were recovered in variable degrees. In conclusion, the results of this study suggested that consumption of diet containing 5% garlic, 10% onion, 10% broccoli and 25% soybean powders can prevent or retard selenite-induced cataract in Wistar rats. Also, they improved antioxidant status, reduced oxidative stress and apoptosis; and improved lipid profile in both normal and cataractous rats.

Key words: functional foods- garlic- onion- broccoli- soybean- selenite-induced cataract- phenolic compounds- oxidative stress- Fas-L- nitric oxide- lipid profile.

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