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Prophylactic role of combined treatment with wheat germ oil and ginseng against radiation injury in male rats

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Abstract

Background: This study was designed to investigate the possible ameliorating effect of combined treatment of rats with wheat germ oil [a rich source of vitamin E, octacosanol, policosanol and the essential fatty acids (linoleic and linolenic)] and the antioxidant properties of panax quinquefolium ginseng on radiation-induced oxidative body damage.

Materials and Methods: Animals received wheat germ oil by gavage at a dose of 80 mg/kg body wt and panax ginseng was intraperitioneally injected with 100 mg/kg body wt for 10 successive days pre as well as during irradiation and supplementation was extended during the period of radiation exposure of rats to fractionated doses 8 Gy (4 x2Gy).

Results: Experimental investigations were performed at 7^{th} and 10^{th} days after the last dose of irradiation revealed that whole body γ-irradiation of rats produced a significant rise in the activities of serum markers for liver damage as aspartate aminotransferase (ASAT), alaninetransaminase (ALAT), ammonia and buytryl cholinestase associated with decrease in the serum content of total protein, albumin (A), golublin (G) and A/G ratio indicating acute hepato-toxicity, at the 7^{th} and 10^{th} days post-irradiation. Also, radiation-induced biochemical disorders manifested by significant elvation in serum creatinine and urea levels. Serum lipid profile as total cholesterol (TC), triglyceride (TG), high density lipoprotein-cholesterol (HDL-C) and low density lipoprotein-cholestrol (LDL-C) levels were significantly higher than normal control rats associated with significant decrease in HDL/LDL ratio. Radiation induced an elevation of lipid peroxidation measured as thiobarbituric acid reactive substance (TARS) in plasma and liver. The rats that received combined treatment with wheat germ oil and panax ginseng supplement showed significantly less severe damage and remarkable improvement in all of the measured parameters when compared to irradiated rats. According to the results obtained it could be concluded that combined treatment with whole germ oil and panax ginseng might be a useful candidate against radiation-induced oxidative stress and metabolic disorders without any toxicity.

Key words: γ-irradiation, wheat germ oil, panax ginseng, liver injury

Introduction:

Ionizing radiation produces harmful effects on the organisms and due to wide spread use of radiation in diagnosis therapy, industry; so many pharmacological interventions could be most potent strategy to protect or amelioration the deleterious effect of ionizing radiation **(Jagetia, 2007)**. Ionizing radiations induce significant elevation in the physiological and metabolic processes, as well as, disorders in blood biochemical parameters **(El-Masry and Saad, 2005)** and causing chain reaction of oxidation **(Ammar, 2009).**

Wheat germ oil is extracted from the germ of the wheat kernel. Wheat germ oil is a valuable source of essential fatty acids, including linolenic, palmitic and oleic, protein, minerals, it is naturally rich in vitamins A, D and E, and also, contains vitamins B1, B2, B3,B6, policosanal and

octacosanols, and dietary fibers, phyto-chemicals and antioxidant propertiies **(Ikmak and Dunford, 2005).** Experimental studies demonstrated that wheat germ oil can reduce oxidative stress (**Alessandri *et al.*, 2006)**, improve lipid metabolism (**Singh *et al.*, 2006)**, lowers raised blood sugar and cholesterol levels **(Ikmak and Dunford, 2005),** useful in building muscle strength and endurance, promotes skin cell formation, improve urinary output, prevent rancidity and lower oxygen depletion **Vicky *et al.*, (2004).** The germ is the most nutritious portion of the wheat and it makes up about 2.5% of the weight. During the milling process the germ is separated from the bran and starch **(Jensen *et al.*, 2004 and Lui, 2007).**

Ginseng has been recognized as the most prized medicine among all herbal medicine. Ginseng contains many physiologically important constituents that include saponins, oils and phytosterol, carbohydrates and sugar, organic acids, nitrogenous substances, aminoacids and peptides, vitamins and minerals (iron, copper and zinc), and several enzymes (**Attele *et al.*, 1999).** Of the various compounds isolated from ginseng roots, the ginsenosides are known to have multiple pharmacological activities **(Baek *et al.*, 2006 and Wang *et al.*, 2007).**

Recent researchs indicates that ginseng has powerful antioxidant properties that may explain its initiating, anti-inflammatory, anti-cancer and antineoplastic effects (**Kitts and Hu, 2000).** Treatment with ginseng extract and dietary supplementation of ginseng have shown a variety of protective effects against oxidative damage *in vitro* and *in vivo*, ranging from isolated LDL oxidation and ischemic neuron dysfunction, to heart reperfusion injury and physical exercise (**Voces *et al.*, 1999)**. Furthermore, ginseng treatment reportedly increases longevity in rodents and used as a therapeutic agent for various diseases including hyperlipidemia, atherosclerosis and hypertension (**Jiang *et al.*, 2000)**.

Although a primary function of ginsenosides appears to be related to its free radical scavenging activity, some ginsenoside fractions have been shown to induce antioxidant enzyme cytosolic superoxide dismutase via enhanced nuclear protein binding to its promoter (**Chang *et al.*, 1999)**. Also, results of clinical research studies demonstrate that panax ginseng may improve psychologic function (**Wesnes *et al.*, 2000)**, immune function (**Scaglione *et al.*, 1990 and 2001)**, and conditions associated with diabetes (**Sotaniemi** et al.**, 1995).**

Material and Methods

Experimental animals

Male adult Wister albino rats weighing 150-200 g purchased from the Egyptian Organization for Biological products and Vaccines were used as experimental animals. Animals were maintained under standard conditions of ventilation, temperature and humidity. The rats were fed on standard pellets, containing all nutritive elements, and water intake was *ad libitum*

Irradiation facility

The irradiation facility was provided by the NCRRT, Nasr City, Cairo, Egypt. The source was ^{137}Cesium, Gamma cell-40 manufactured by the Atomic Energy of Canada Limited. The animals were received intermittent radiation dose level of 2 Gy increments delivered twice a week up to a cumulative dose of 8 Gy, at a dose rate of 1.4 Gy/min.

Wheat germ oil and Panax ginseng treatment

Wheat germ oil was supplied as a soft gel, was obtained from Arab Co. for PHARM. and Medicinal plants (MEPACO) Egypt. Wheat germ oil was dissolved in sesame oil just before the application to the rats. It was given to animals by gavage using stomach tube at a concentration of 81 mg/kg body weight **(Said and Azab, 2006).**

Panax ginseng was purchased from EIPICO, Egypt. It was dissolved in saline and intraperitaneally administrated to rats at a dose of 100 mg/kg body weight **(Song *et al.*,**

2003).

Experimental design

Animals were divided into 4 groups each of 8 rats: 1- Control (untreated) 2- Treated received combined mixture of wheat germ oil and panax ginseng 3- Irradiated: The animals were exposed to the fractionated dose of □-irradiation (8 Gy) for 2 weeks. 4- Treated-irradiated: animals of this group were supplied with both mixtures wheat germ oil and panax ginseng for 10 successive days before whole body exposure to gamma-radiation and supplementation was extended during the period of radiation exposure.

Sex animals from each group were randomly sacrificed by cervical dislocation 7th and 10th days post irradiation. Blood samples were obtained by heart puncture from ether anaesthetized rats. Serum samples were prepared by centrifugation at 3000 r.p.m. and liver samples were collected and prepared following normal laboratory procedures, for the measurement of the biochemical parameters. Liver tissues were homogenized in saline by the percentage of 1:9 tissue to saline respectively.

Biochemical analysis

The following parameters were measured: In serum, ASAT and ALAT activities was measured as described by **Reitman and Frankel (1957)**, Ammonia and butyryl cholinesterase were determined according to the methods of **(Wolheim, 1984 and Knedel and Bottger, 1967)** respectively. Total protein, albumin and globulin were performed according to methods of **Flask and Woollen (1984)**, **Doumas *et al.*, (1971)** and **Oser (1971)**, respectively. Creatinine and urea were estimated according to the procedure of **Bartles and Bohmer, (1972)** and **Fawcett and Soctt, (1960),** respectively. The content of total cholesterol (TC), triacylglycerols(TG), high-density lipoproteins (HDL) and low- density lipoproteins (LDL) were assayed according to the methods of **Richmond, (1973), Fossati and Prencipe (1982), Lopaz–Virella *et al.*, (1977), and Marshall (1992),** respectively.

Statistical analysis

Analysis of data was performed using analysis of variance (ANOVA) followed by Duncan's test. **(SAS "Statistical Analysis System", 1988)**.

Results

No signs of toxicity were reported due to administration of combined treatment of wheat germ oil and panax ginseng with animals. Also, no death was registered during the period of treatment.

The results obtained in the present study showed that the combined administration of wheat germ oil and ginseng to rats for 24 consecutive days induced insignificant changes in serum ASAT and ALAT activity, ammonia, butyryl cholinesterase, total protein, albumin, globulin, creatinine, urea and lipid profile (Tables 1-5).

Whole body exposure of rats to gamma-radiation (delivered as 2 Gy 2 times a week for 2 weeks) induced a significant increase in serum ASAT and ALAT activity, ammonia, butyryl cholinesterase, creatinine, urea, TC, TG, LDL-C accompanied with a significant decreases in levels of total protein, albumin, globulin and HDL-C, 7th and 10th days after the last irradiation dose as compared to control levels (Tables 1-5). Animals receiving wheat germ oil and panax ginseng for 10 consecutive days before irradiation and daily during the period of radiation exposure (7th and 10th days) showed a significant decrease of serum ASAT and ALAT activity, ammonia, butyryl cholinesterase, creatinine, urea, TC, TG, LDL-C levels compared to those of irradiated rats (Tables 1,2,4 and 5). These changes were associated with a significant increase in the levels of total protein, albumin, globulin and HDL-Concentration, as compared to irradiated rats (Table 3).

The concentration of lipid peroxides (TBARS) showed a significant increase

levels as compared to control rats during the 7th and 10th days of experimental intervals in the examined liver tissue in addition to blood plasma ($P \leq 0.05$), Table (6).

TBARS concentrations in liver and plasma were significantly decreased in treated group as compared to irradiated rats ($P \leq 0.05$), Table (6).

Table 1 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on serum activity of ASAT and ALAT

Animal groups	Time intervals	ASAT (U/L)	ALAT (U/L)
Control	7th day	85.8±2.2	22.25 ±2.3
	10th day	83.75±5.4	22.33±3.1
Wheat germ oil +Ginseng	7th day	83.33 ±4.4[c d]	22 ±1.8[c d]
	10th day	86 ±5.7[c d]	24.33 ±1.9[c]
Irradiation	7th day	117 ±3.3[a]	36.33 ±3[a]
	10th day	119 ±4.2[a]	27.25 ±1.5[a]
Wheat germ oil +Ginseng+ Irradiation	7th day	91 ±1.4[c d]	25.5 ±1.8[c]
	10th day	87.14±3[c d]	26.67 ±1.9[c]

Data are mean of 6 animals ±S.E and are considered significant at $p<0.05$.

a: Significant difference from control.

b: Significant difference from corresponding wheat germ oil +ginseng treated group.

c: Significant difference from irradiation 7 day.

d: Significant difference from irradiation 10 days

Table 2 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on serum level of ammonia and butyryl cholinesterase

Animal groups	Time intervals	Ammonia (ug/dl)	Butyryl cholinesterase (U/L)
Control	7th day	170.6±8.8	540.86 ±16.8
	10th day	175.61±10.2	558.03±10.4
Wheat germ oil +Ginseng	7th day	175.04 ±5.9$^{c\,d}$	557.2 ±27.7$^{c\,d}$
	10th day	188.66 ±7.5$^{c\,d}$	569.05 ±28.6^{cd}
Irradiation	7th day	238 ±7^{a}	770.24 ±42.4^{a}
	10th day	246.54 ±5.3^{a}	788.97 ±45.4^{a}
Wheat germ oil +Ginseng+ Irradiation	7th day	218.88 ±4$^{abc\,d}$	700.05 ±27.5^{ab}
	10th day	189.46±6.6$^{c\,d}$	567 ±10.8^{cd}

Legends as in Table1

Table 3 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on serum levels of total protein, albumin, globulin and A/G ratio

Animals groups	Time intervals	Total protein (g/dl)	Albumin (g/dI)	Globulin (g/dI)	A/G Ratio
Control	7th day	6.6±0.2	4 ±0.05	2.67±0.28	1.57±0.2
	10th day	6.5±0.2	3.91±0.09	2.46±0.24	1.71±0.2
Wheat germ oil +Ginseng	7th day	6.7 ±0.49$^{c\,d}$	4.06 ±0.03$^{c\,d}$	2.90±0.63^{c}	1.57±0.3
	10th day	6.4 ±0.2$^{c\,d}$	3.93 ±0.05$^{c\,d}$	2.43±0.15^{c}	1.64±0.1
Irradiation	7th day	5.4 ±0.4^{a}	2.69 ±0.05^{a}	1.82±0.0^{a}	1.43±0.3
	10th day	4.9 ±0.05^{a}	2.44 ±0.1^{a}	2.17±0.07^{a}	1.04±0.02^{a}
Wheat germ oil +Ginseng+ Irradiation	7th day	7.4 ±0.2$^{ac\,d}$	4.04 ±0.2$^{c\,d}$	2.68±0.12^{c}	1.3±0.1
	10th day	6.5±0.3$^{c\,d}$	4.05 ±0.04$^{c\,d}$	2.46±0.05^{c}	1.74±0.01^{bcd}

Legends as in Table1.

Table 4 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on the levels of creatinine and urea

Animals groups	Time intervals	Creatinine (mg/dL)	Urea (mg/dL)
Control	7th day	0.66±0.03	52.4 ±2.1
	10th day	0.71±0.04	51.75±2.6
Wheat germ oil +Ginseng	7th day	0.67 ±0.01$^{c\,d}$	55 ±2.9^{d}
	10th day	0.72 ±0.03^{d}	52.67 ±4.5^{d}
Irradiation	7th day	0.76 ±0.03^{a}	59.5 ±1.8^{a}
	10th day	0.92 ±0.1^{a}	66.5 ±1.1^{a}
Wheat germ oil +Ginseng+ Irradiation	7th day	0.69 ±0.06^{d}	58.5 ±4.6
	10th day	0.66±0.03$^{c\,d}$	54 ±1.4^{d}

Legends as in Table1.

Table 5 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on serum level of TC, TG, HDL-C, LDL-C and HDL/LDL ratio.

Animals groups	Time intervals	TC mg/dl	TG mg/dl	HDL-C mg/dl	LDL-C mg/dl	HDL/ LDL Ratio
Control	7th day	84.09±2.1	75.1 ±3.8	73±7.1	50.91 ±2.5	1.33±0.1
	10th day	82.22±2.4	77.43±4.9	71±5	51±3.3	1.41±0.1
Wheat germ oil +Ginseng	7th day	82.22 ±3.6$^{c\,d}$	70.42±2.2$^{c\,d}$	68 ±4.3$^{c\,d}$	51.7 ±3.5$^{c\,d}$	1,21±0.1
	10th day	80 ±4.7$^{c\,d}$	74.86 ±2.4^{cd}	68.7 ±2.4$^{c\,d}$	50.2±2.5^{cd}	1.48±0.2
Irradiation	7th day	99.85 ±4.6^{a}	103.24 ±4.3^{a}	51 ±3.5^{a}	90.43 ±8.8^{a}	1.19±0.1
	10th day	96.36 ±2.6^{a}	99.86 ±5.0^{a}	53 ±3.1^{a}	75.5 ±8.8^{a}	0.77±0.04^{a}
Wheat germ oil +Ginseng+ Irradiation	7th day	90.44 ±3.5	76.86 ±2.6^{cd}	69.5 ±6$^{c\,d}$	53.4 ±1.9^{cd}	1.32±0.2
	10th day	87.81±4^{cd}	84±7.7^{c}	70.33±4.2^{cd}	51.32±4.9^{cd}	1.37±0.1

Legends as in Table1.

Table 6 Effect of combined administration of wheat germ oil and panax ginseng to irradiated rats on serum and liver level of TBARS

Animals groups	Time intervals	Liver (n mol/g fresh tissue)	Plasma (n mol/ ml)
Control	7th day	239± 12	11.20± 0.80
	10th day	245± 11	11.00± 0.77
Wheat germ oil +Ginseng	7th day	237± 13	10.90± 0.70[c d]
	10th day	240± 14	10.80± 0.72[cd]
Irradiation	7th day	388± 18[a]	21.0± 1.7[a]
	10th day	401± 16[a]	22.7± 2.0[a]
Wheat germ oil +Ginseng+ Irradiation	7th day	300± 17[acd]	14.0± 1.0[acd]
	10th day	310± 16[acd]	15.0± 1.47[acd]

Legends as in Table1.

Discussion

Herbals, as botanical medical treatments, have generated a deal of public controversy in recent years. The constituents of ginseng that have been found are saponin (ginsenosides) as its major component, polysaccharide, polyacetylene, flavonoids, daucosterin, mucilaginous substances, amino acids, bitter substances, choline, pectin, fatty oil and ethereal oil **(Shin *et al.*, 2000)**.

The data in the present study revealed that a significant elevation in serum ASAT and ALAT activities, ammonia and butyryl cholinesterase was recorded post exposure of rats to gamma-radiation at all time intervals, which reflects detectable changes in liver function. This significant increase of these enzymes level may be attributed to the changes in tissue permeability due to irradiation that could enhance the release of the transaminases from their subcellular sites of production to extra cellular proceeds consequently to the blood circulation. The current investigation combined administration to irradiated rats effect of wheat germ oil and ginseng was done in view of possible minimizing the toxicity of ionizing radiation. The present work declared the significant elevation in liver enzymes as a result of □-radiation exposure was reduced by the treatment of irradiated rats with germ oil and ginseng before and during radiation exposure **Ammar (2009)**. In the present study, treatment of irradiated rats with both wheat germ oil and ginseng revealed non significant changes in the investigated parameters indicating its safe use. It seems that the present results agree with those of **Sisodia *et al.*, (2007)** and **Kunwar *et al.*, (2010)** who reported that ionizing radiation induce augmentation in the levels of serum ASAT and ALAT that were significantly ameliorated by pre-treatment with natural radio-protector.

One of the factors that play a central role in many pathways of radiation-induced damage is oxidative stress. Excessive production of oxygen radicals leads to altered enzyme activity, decreased DNA repair, and impaired utilization of oxygen, lipid peroxidation and protein oxidation. **(Kurose *et al.*, 1996).**

Ammonia is present in all living organisms as a product of degradation of proteins and other nitrogenous compounds. However, at higher levels, ammonia is toxic, leading to functional disturbances in the central nervous system that could lead to coma and death **(Subash and Subramanian, 2008).**

The irradiation of rats induced a decrease in serum total proteins, albumin, globulin and A/G ratio in response to ionizing radiation. This event may be attributed to impaired hepatic proteins synthesis due to damage of liver cells **(Srinivasan *et al.*, 1985),** loss from circulation, by leakage to the urine and/or enhanced proteins degradation **(Mahdy, 1991**). Irradiation seems likely to alter immune response of animals producing immune gamma-globulin **(Roushdy *et al.*, 1984).** Combined administration of wheat germ oil and ginseng before irradiation and daily during the period of radiation exposure significantly reduced the severity of changes which might be attributed to the antioxidant nature of vitamin E in wheat germ oil and ginseng, and its role in the maintenance of cell membrane structure **(Bansal *et al.*, 2005).**

Gamma irradiation of animals caused a significant increase in the level of serum creatinine and urea. Increase in serum urea was due to increase in glutamate dehydrogenase enzyme as a result of irradiation and this may increase carbamoyl phosphate synthetase activity leading to increase in urea concentration, **Ramadan *et al.*, (2001)**. The impaired detoxification fuction of the liver by irradiation could also contribute in the increase of urea in the blood **(Robbins *et al.*, 2001)** or deteriorating renal performance **(Geraci *et al.*, 1990).** Serum creatinine elevation by irradiation was attributed to the interaction of creatinine with their sites of biosynthesis **(El-Kashef and Saada 1988)**. Combined administration of wheat germ oil and ginseng before and daily within the period of irradiation significantly reduced the radiation-induced oxidative damage in the kidney. The results are consistent with those of **Alessandri *et al.*, (2006)** who reported that combined administration of wheat germ oil and ginseng decrease oxidative stress.

Wheat germ oil serves to lower marker of lipid peroxidation and stimulates antioxidant capacity of erythrocytes in radiated rats. Thus, the susceptibility of blood cells to peroxidation is decreased so the blood picture is improved. Wheat germ oil contains some B complex vitamins (B6, B12 and folic acid) that are essential in the formation of red blood cells **(Vicky *et al.*, 2004)**. It was claimed to be anti-inflammatory and described as a suitable natural antioxidant due to its high content of vitamin E **(Paranich *et al.*, 2000)**. The oil was reported, also, to be a valuable source of essential fatty acids, including linoleic acid and linolenic acid whose insufficiency was observed to cause tiredness, dry skin, immune insufficiency, anorexia, indigestion and cardiovascular disorders **(Mohamed *et al.*, 2005)**.

The present results showed an increase in serum total cholesterol, triglycerides and LDL-C with concomitant decrease in HDL-C level of irradiated. This may be explained by a reduction in the activity of lipoprotein lipase or hepatic lipase leading to elevated triglycerols level or other inflammatory products released following radiation exposure with modification of triglycerols metabolism indirectly **(Sedlakova *et al.*, 1986).** The hypercholesterolemia induced by irradiation of rats can be attributed to the increase in activation of β-hydroxy-3-methyl-glutaryl COA (HMG-COA) reductase which is the key regulatory enzyme of reaction process of cholesterol biosynthesis resulting in reduction of lipoprotein catabolism **(Sedlakova *et al.*, 1988).** The combined administration of wheat germ oil and ginseng to rats before irradiation and daily during the period of radiation exposure lowered TG level may be due to an increase in membrane permeability and fluidity causing decrease triglycerides and cholesterol levels, **Yousri *et al.*, (1991).** Several studies have demonstrated that monounsaturated fatty acid reduce serum TG level **(Jenkins *et al.*, 1999)**, in addition, wheat germ oil (WGO) has a number of other nutritional and health benefits factors

like high content of vitamin E and phytosterol **(Jonnala *et al.*, 2005)** which may be the reason of its lowering effect on triglyceride thus the reducing effect of WGO on triglyceride level was a positive finding of this study.

Said and Azab, (2006) reported that supplementation of rats with wheat germ oil (81 mg/ kg body wt) for 10 successive days before and 7 successive days after whole body gamma irradiation, significantly ameliorated serum lipid profile levels and reduced the severity of changes in the activity of serum CPK and modulated the alteration in activity of LDH and its isoenzymes patterns when compared with irradiated rats. Moreover, guinea pigs receiving wheat germ oil did not develop muscular dystrophy and showed normal creatine values **(Nobuko *et al.*, 2008)**. Wheat germ oil is rich in vegetable oil compounds, particularly vitamin E, octacosanol and omega-3 fatty acids **(Moure *et al.*, 2001)**. Furthermore, studies have shown that linoleic and linolenic acids-rich wheat germ oil decreases oxidative stress in patients with mild hypercholesterolemia **(Alessandri *et al.*, 2006).**

Alessandri et al, (2006) provided an evidence that wheat germ oil is an important source of n-3 fatty acids, which may exert an antiatherosclerotic effect via inhibition of oxidative stress–mediated CD40L upregulation.

Panax ginseng C.A. Meyer is a well-known medicinal herb native to China and Korea, and has been used as a herbal remedy in eastern Asia for thousands of years. However, there is different evidence of ginseng efficacy between traditional Chinese medicine (TCM), modern pharmacological experiments and clinical trials. In TCM, ginseng is a highly valued herb and has been applied to a variety of pathological conditions and illnesses such as hypodynamia, anorexia, shortness of breath, palpitation, insomnia, impotence, hemorrhage and diabetes. Modern pharmacological experiments have proved that ginseng possesses multiple constituents (ginsenosides, polysaccharides, peptides, polyacetylenic alcohols, etc.) and actions (central nervous system effects, neuroprotective effect, immunomodulation, anticancer, etc.), ginsenosides as the active ingredients, especially, having antioxidant, anti-inflammatory, anti-apoptotic and immunostimulant properties. Recently, ginseng has been studied in a number of randomized controlled trials investigating its effect mainly on physical and psychomotor performance, cognitive function, immunomodulation, diabetes mellitus, cardiovascular risk factors, quality of life, as well as adverse effects. Equivocal results have been demonstrated for many of these indications. Because of the poor quality of most clinical trials on ginseng, reliable clinical data in humans are still lacking. Therefore, a broader understanding of medical knowledges and reasoning on ginseng is necessary (**Xiang *et al.*, 2008).**

Kim and Park (2003) observed that serum TC, TG, LDL and plasma MDA levels were decreased by administration of panax ginseng extract (PGE) in humans for 8 weeks, but HDL was increased. Those results suggest that hypolipidemic effect of PGE is associated with a decrease in TC, TG, LDL and plasma MDA levels, and an increase in HDL. These findings support scientific claims that ginseng has hypolipidemic effect or antioxidant potential as the preventive or therapeutic supplementation of hyperlipidemia.

Ginseng that has been used as a medicine for at least 2,000 years currently is being cultivated throughout the world **(Kennedy and Scholey, 2003).** Numerous biochemical and pharmacological studies revealed that ginseng possess various biological properties as an anticancer, antioxidant, anti-inflammatory, antibiotic, anti-fungal and anti-hepatotoxic agent. Anticancer and therapeutics were potent of its active components such as ginsenosides in saponins of the 46 ginseng root, while polysaccharides have been observed to have immunomodulating and antiproliferative effects in certain tumor cell lines **(Kitts and Hu, 2000; Ben-Hur and Fulder, 1981;**

Song *et al.*, 2003, Chang *et al.*, 2002 and Lee *et al.*, 2005). Most effects of ginseng have been attributed to its antioxidant action and strongly radioprotective through its ability to stimulate hematopoietic stem cells. **Kumar *et al.*, (2003)** stated that ginseng markedly inhibits lipid peroxidation. It acts in indirect fashion to protect radical processes by inhibition of initiation of free radical processes and thus reduces the radiation damages in testes of Swiss albino mice.

According to the above stated results it could be concluded that supplementation of both wheat germ oil and ginseng to irradiated rats enhanced antioxidant activities and decreased lipid peroxidation, which may afford protection against radiation exposure hazards and oxidative stress and might preserve the integrity of tissue functions and minimize metabolic body disorders. Hence combined wheat germ oil and ginseng administration prior to radiation therapy may be useful to cancer patients to prevent normal cell da

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الدور الوقائى للمعاملة المزدوجة بزيت جنين القمح وٱلجنسنج فى تخفيف مضار التعرض للاشعاع فى ذكور الجرذان

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*قسم البحوث الدوائية الاشعاعية -** قسم بحوث البيولوجيا الاشعاعيةى- المركز القومى لبحوث وتكنولوجيا الاشعاع- هيئة الطاقة الذرية- مصر

صممت الدراسة للكشف عن التاثيرات الوقائية الممكنة للمعالجة المزدوجة بزيت جنين القمح والجنسنج وتقليل الاجهاد التأكسدى فى الجرذان المشعة. يعتبر زيت جنين القمح مصدرا ثريا لفيتامين هـ والاكتاكوزانول والبولى كوزانول والاحماض الدهنية الاساسية (لينوليك ولينولينك) التى تكون نافعة فى معادلة مضار الشقوق الحرة. كما يعرف الجنسنج بانة مضاد طبيعى للاكسدة. تم تناول زيت جنين القمح عن طريق الفم بواسطة الانبوبة المعدية بجرعة 81 مللى /كجم من وزن الجسم وحقن الجنسنج تحت الغشاء البريتونى بجرعة مقدارها 100مللى/كجم من وزن الجسم لمدة 10 ايام متتابعة اثناء وما بين التعرض للاشعاع الجامى الكلى فى جرعات مجزاة على اسبوعين بواقع 4 جراى لكل اسبوع على ان تكون الجرعة التراكمية الكلية 8 جراى.

تم تعيين مستويات انزيمات الكبد(ASAT & ALAT) والامونيا والبيوتريل كولين استريز والبروتين الكلى والالبومين والجلوبيولين و نسبة الألبومين الى الجلوبيولين مع قياس مستوى الدهون ممثلة فى الكوليسترول الكلى والدهون الثلاثية ونوعى الكوليسترول (عالى الكثافة ومنخفض الكثافة) مع حساب نسبة الكوليسترول عالى الكثافة إلى منخفض الكثافة. اظهرت النتائج ان تعرض الجرذان لاشعة جاما قد تسبب فى زيادة معنوية فى مستويات انزيمات الكبد (ASAT & ALAT) والامونيا والبيوتريل كولين استريز مع انخفاض ملحوظ فى مستوى البروتين الكلى والالبومين ,و نسبة الالبومين الى الجلوبيولين وقد زادت معدلات الكوليسترول الكلى والدهون الثلاثي المنخفض الكثافة مع انخفاض مستوى الكوليسترول عالى الكثافة كذلك انخفضت نسبة الكوليسترول عالى الكثافة الى الكوليسترول منخفض الكثافة و ذلك فى الجرذان التى تعرضت للاشعاع بالمقارنة بالمجموعة الضابطة. كما ارتفعت معدلات أكسدة الدهون فى البلازما والكبد و عادت الى معدلاتها بالمعالجة المزدوجة.

اما الجرذان التى عولجت بزيت جنين القمح والجنسنج فقد اظهرت تحسنا معنويا فى العوامل التى قيست فى الدم مقارنة بالمجموعة المشعة.

وبناء على نتائج الدراسة فان التعرض للاشعاع يؤدى الى اختزال كفائة انزيمات مضادات الاكسدة الدفاعية محدثا اكسدة عالية للدهون فى الدم. و لقد أدت المعاملة المزدوجة بزيت جنين القمح والجنسنج الى حدوث تاثيرات ايجابية على التلف التأكسدى الناتج عن تعرض الجرذان للإشعاع المؤين.