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Research Article

Banana Peels Enhanced with Lactobacillus Acidophilus as Radiotherapy Against Radiation Exposures Hazards

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Abstract

Banana peel is a food by product, even it considered a waste and throw away, while it could be used as a food or in some cases as a drug according to its nutritional constituents. In this study we aim to use a mixture of dried banana peel powder (5% or 10%), lacteol forte (*Lactobacillus acidophilus*) enhanced diet to improve immunological parameters and overcome gamma radiation hazards. Examining effects of the diet enhanced with synbiotic mixtures previously mentioned on nutritional, haematological, liver profile, oxidative stress, immunological parameters as well as Histopathological examination in gamma irradiated male albino rats. 6Gy whole body single dose irradiated rats were randomly distributed into three groups, the first group was left as a positive control (C(+ve)), the second group was fed on a diet supplied with 5% dried banana peel powder and 10^9 lactobacillus colon forming unit (5% Ban.) group and the third group the diet supplied with 10% dried banana peel powder and 10^9 lactobacillus colon forming unit (10%Ban.) group the three groups were compared with the normal group (C(-ve) rats in the same conditions without any type of treatment). The results showed that hematopoietic system was damaged due to gamma radiation exposure. Also, Intestine tissue histopathology of the irradiated group (C(+ve)) was partially damaged compared to normal (C(-ve)). Diffuse and deep mucosal necrosis leading to severe loss of villi and crypts with prominent necrosis and depletion of lymphocytes in Payer's patches were obseved. All these effects were treated using the banana peels lactobacillus acidophilus symbiotic mixture and 10% group was the best.

Keywords

Dried Banana Peel, Lacteol Forte, Ionizing Radiation, Nutritional and Immunological Effects

1. Introduction

The body major defense system is the immune system, which is the one able to recognize the danger and immediately deal with. The primary function of the immune system is to eliminate all viruses and microbes and pathogens resulted from it, as well as fighting the abnormal cells in the body [1].

Direct ionizing radiation effects on the immune system are well-documented and were among the first radiobiological observations made soon after the discovery of X-rays. Studies based on high dose ionizing radiation applied to cancer patients indicated that radiation had immune suppressive properties and this paradigm prevailed in the scientific literature for decades. DNA damage correlates with the dose and the probability of severe direct DNA damage after low doses and

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dose rates is low, thus other mechanisms may prevail. Not only the DNA-damage response related pathways, but also other, immune-related pathways may contribute to both cancer and non-cancer health outcomes from exposure to ionizing radiation [2-5].

Remarkable inflammation was observed as a result of the whole-body irradiation, shortening in villi, apoptosis and goblet cells in the small intestine damage. Also, the colon inflammation ranged between moderate to severe where apoptosis, congestion, crypt injury and goblet cell damage. Radiation therapy was used for cancer about 100 years ago, but the side effects limited its use. Side effects ranged between acute or chronic. The bowel in gastrointestinal is particularly vulnerable, because of its anatomical location and the rapidity of turnover of many GI epithelial cell types. Patient factors as chemotherapy, radiotherapy regimen, and organ mobility affects the severity of radiation damage [6].

Probiotics according to previous studies affected the development of strong immunity, and protected from infections or allergic substances due to many diseases, as well as it helped in improvement in total antioxidant capacity and plasma total glutathione level [7].

Banana peels were used for the treatment of many health problems. It is rich in phenolics compounds, over 40 compounds were identified. While, the composition and levels of these compounds are influenced by various factors, these factors include varieties, maturity, cultivation conditions, and pre-treatments. banana peels Phenolics compounds have been found to possess potent antioxidant and antimicrobial properties, and linked with various health benefits. Banana peels phenolic compounds could be recovered from this by-product for further utilization in food and pharmaceutical industries. Also, banana peel is a good source of dietary fiber, which could be extracted and used for medicinal purposes [8, 9].

A new concept has been introduced in biogenic known as synbiotics which is composed of probiotics and prebiotics. The dietary intervention with synbiotics aimed at correcting the breakdown of gut microbiota or subsequent imbalanced diets which may offer benefits for health by simplifying the weight reduction process. Probiotics like *Lactobacilli*, *Bifidobacterium*, *Saccharomyces boulardii* and prebiotics such as galactooligosaccharides (GOS), xylooligosaccharides (XOS), fructo-oligosaccharides (FOS) and inulin are the most commonly used substances to produce synbiotics [10, 11].

2. Materials and Methods

2.1. Materials

Banana peel was obtained and sun dried in Tanta, Egypt.

Lacteol forte (The starter culture of *Lactobacillus acidophilus*) was purchased from Sigma chemical and drugs Company.

2.2. Diet

Rats were fed on standard diet supplying the essential vitamins and trace elements, and water supplying was given *ad-libitum* for one week for adaptation. Diet was purchased from agricultural development company, 6 October, Giza, Egypt.

2.3. Experimental Animals

Twenty four male albino rats (*Sprague Dawley* strain) weighting approximately (100± 10g), were obtained from animal house of national center for radiation research and technology (Atomic Energy Authority, Egypt).

2.4. Methods

2.4.1. Banana Peels Powder Preparation

Banana peel samples were indirect sun dried for two weeks, ground into powder with a mechanical blender, and sieved with a mesh of size 0.5mm. The powdered samples obtained stored in clean brown bottles at room temperature (30±2 ℃) until using, according to [12].

2.4.2. Determination of the Chemical Composition of Banana Peel Powder

Protein, fat, moisture and ash of banana peel were determined according to the methods of the [13]. Total carbohydrates were calculated as following:

Carbohydrates % = 100 - (moisture % + protein % fat % + ash + Fiber %).

2.4.3. Nutritional and Biological Assessment

Rats were fed with pellets as a basic diet composed of the main components of the diet and mixed well with suggested ratios of the additives needed for the experiment in order to meet all of a rat's nutritional needs (Table 1).

Table 1. *Diets composition and groups.*

Groups	Diet composition			
	Basal weight (g)	**Banana peel powder weight (g)**	**Lacteol (*Lactobacillus genus bacteria*)**	**Total weight (g)**
C(-ve).	4000	-	-	4000
C(+ve).	4000	-	-	4000
5% Ban.	3800	200	4×10^{10} CFU	4680
10% Ban.	3600	400	4×10^{10} CFU	4940

* CFU: Colony Forming Units

2.5. Gamma–Irradiation Facility

Rats whole body were exposed to gamma radiation at the National Centre for Radiation Research and technology (NCRRT), Nasr City, Cairo, Egypt. Gamma Cell-40 (Cesium137) source was used allowed irradiation distribution homogeny. The dose rate during the experimental phases was 0.61 Gy /minute. Rats were exposed to 6 Gy as a one single dosage of whole body [14].

2.6. Experimental Design

Rats were adapted for one week and then divided into two main groups:

The first main group (6 rats) was fed on basal diet and kept as control negative group (C(-ve)).

The second main group (18 rats) was exposed to single dose of 6.0 Gy of gamma rays on the whole body [15]. After that the second main group was divided into 3 subgroups as follows:

The first subgroup: Irradiated rats were fed on basal diet and left as positive control group (C(+ve)).

The second subgroup: Irradiated rats were fed on basal diet supplemented with dried banana peel powder (50 g/kg diet) and (10^{10} CFU/kg diet) Lacteol forte (The starter culture of *Lactobacillus acidophilus*) (5%Ban.) [16].

The third subgroup: Irradiated rats were fed on basal diet supplemented with dried banana peel powder (100 g/kg diet) and (10^{10} CFU/kg diet) Lacteol forte (The starter culture of *Lactobacillus acidophilus*) (10%Ban.).

2.7. Biological Evaluation

During the experimental (28 day), the quantities of diet which were consumed and/or wasted were recorded everyday (feed intake), and rats weight was recorded weekly. Biological evaluation of the different groups was carried out by determination of body weight gain (BWG %) feed efficiency ratio (FER) [17].

2.8. Biochemical Analysis

After sacrificed of rats at the end of experiment, rats blood samples were collected from hepatic portal veins in dry centrifuge tubs. And, serum samples were separated by centrifugation at 4000 rpm for 10 minutes and kept in plastic vial at -20 till analysis.

2.9. Hematological Investigations

Using blood samples to determine the following parameters; Complete blood count was done in presence of anticoagulant using hematological analyzer (Exigo Eos Vet, Sweden). The red blood cell count (RBCs), hematocrit (HCT), hemoglobin (Hb) concentration and red cell indices, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and red blood cell distribution width absolute (RDWa), leukogram (includes white blood cell count (WBCs), lymphocytes (%), monocytes (%), granulocytes (%) platelet count (PLT) and mean platelet volume (MPV) [18].

2.9.1. Determination of Antioxidant Enzymes and Malondialdehyde Level as a Parameter for Lipid Peroxidation

Plasma Malondialdehyde (MDA) was estimated spectrophotometrically as thiobarbituric acid reactive substances (TBARS), Superoxide dismutase (SOD) and Catalase (CAT)were estimated [19-21].

2.9.2. Determination of Albumin and Total Protein

Albumin (Ab) and total protein were measured [22, 23].

2.9.3. Determination of Liver Function Parameters

Assessment of liver function markers and alpha-fetoprotein AFP level Liver function markers Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT), were assessed calorimetrically in serum samples of all groups

using commercial kits (Bio-Diagnostic Co, Cairo, Egypt) [24].

2.9.4. ELISA Assay for the Plasma Cytokine Profile

Granulocyte-macrophage colony-stimulating factor IL-6 and Tumor Necrosis Alpha (TNF-α) in serum were measured in duplicate by ELISA according to the manufacturers' instructions. Serum tumor necrosis factor-α (TNFα) concentrations was measured using an enzyme-linked immunosorbent assay (ELISA) (Pharmingen, USA) [25].

2.10. Histopathological Examination

Intestinal samples were taken from the ileum (30 cm distal to the pylorus) and were flushed with normal saline to remove gut contents. A 1cm long sample from each intestinal tissue fixed overnight in 4% paraformaldehyde and embedded in paraffin for histological analysis [26].

2.11. Statistical Analysis

Results are expressed as mean ± standard deviation (SD). Differences between means indifferent groups were tested for significance using a one-way analysis of variance (ANOVA) followed by Duncan's test and P value of 0.05 or less was considered significant. Comparative of means were performed according to least significant differences test (LSD) according to Snedecor, using SPSS (vertion20) [27].

3. Results and Discussion

3.1. Proximate Analysis of Banana Peel Powder

Table 2 and Figure 1 pointed out that banana peels organic matter (measures the nutritional value (lipids, proteins and carbohydrate) the high value indicates that banana peels are good sources of nutrients (Food Energy g/calories = 252.3+0.14). The content of protein, lipid, carbohydrates and crud fibre indicated that banana peel could be a good source of carbohydrates and fibre. The high fibre content also indicates that the peels could help treat constipation and improve general health and wellbeing.

Table 2. *Proximate composition of banana peels powders.*

Constituent	Banana peels powder (%)
Moisture	12.65+0.35
Crude Protein	16.72+0.12
Crude Fiber	14.86+0.31
Fats/Oils	15.86+0.24
Ash	12.52+0.14
Carbohydrates	27.39+0.13
pH	6.08+0.06
Food Energy g/calories	252.3+0.14

*Values are means + standard deviation of three determinations (n=3)
*Energy was calculated by summation of (fat x 9 k cal) + (carbohydrate x 4 k cal).

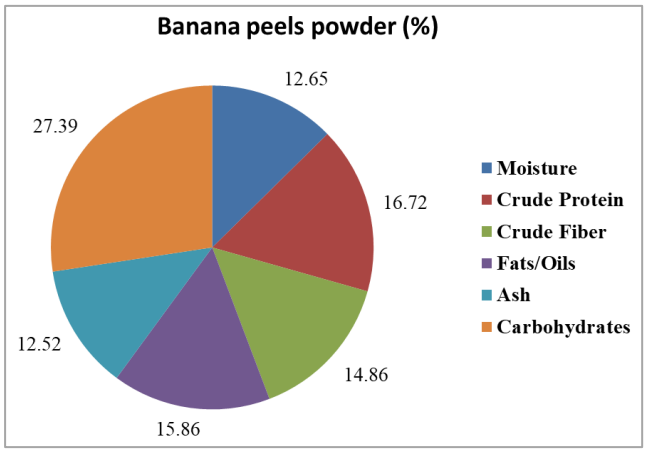


Figure 1. *The averages of moisture, crude protein, crude fiber, fats/oils, ash and carbohydrates (g/100g) in banana peel powder.*

3.2. Effect of Dried Banana Peel Powder Lacteol Forte Mixture Supplemented Diet on Nutrition Parameters of Irradiated Rats

There was significant decrease in FI of irradiated rats C (+ve) compared to negative control group. The treated groups, 5%Ban. and 10%Ban., groups showed significant ($p < 0.05$) decrease compared with C (+ve). Also, BWG, the irradiated group C (+ve) showed significant decrease compared to negative control group C(-ve). (5%Ban.) group showed nonsignificant increase as compared with (C(+ve)) group. Whereas, (10% Ban.) group showed significant increase compared with irradiated group C(+ve). Concerning FER, results revealed that the mean value of irradiated group (C(+ve)) was non-significantly ($p < 0.05$) decreased as compared with the C(-ve) group. In treated groups (5%Ban.) showed significant increase compared with C(+ve)) group. While, (10%Ban.) group showed non-significant ($p < 0.05$) increase compared with C(+ve). From these results it could be concluded that the used diets had a positive nutritional effects, but (10%Ban.) group was the most related to normal (C-ve) group.

Table 3. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on bogy weight gain, feed intake and feed efficiency ratio of irradiated rats.*

Groups	Parameters		
	FI (g/day. rat)	BWG (%)	FER
C(-ve)	22.6+0.112^{a}	61.57+5.36^{a}	2.97+0.26^{bc}
C(+ve)	17.8+0.203^{b}	35.64+11.6^{cd}	1.93+0.72^{c}
5%Ban.	13.8+0.077^{d}	42.17+4.29^{bc}	3.22+0.43^{ab}
10%Ban.	17.6+.066^{c}	50.31+7.70^{ab}	2.52+0.40^{bc}

*Values are means ±standard deviation (n = 5). Values in a column with different letters (a, b, c, etc) differ significantly ($P < 0.05$) using one way ANOVA test, while those with similar letters are nonsignificantly different.

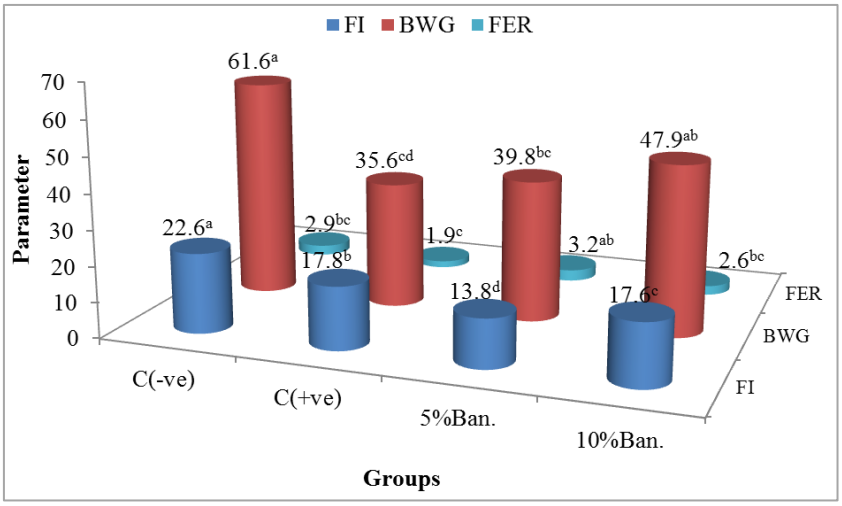


Figure 2. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on nutritional (Feed Intake, Body weight Gain and Feed Efficiency Ratio) parameters in gamma irradiated rats.*

3.3. Haematological Assessment of the Effect of Dried Banana Peel Powder Lacteol Forte Mixture Supplemented Diet on Irradiated Rats

Data present in Table 4 and Figure 3 summarize the blood picture of the experiment rats, there were significant decrease in (WBC, RBC, Hb and PLT) counts due to radiation exposure, the entire treatment didn't significantly affected the decrease in the parameters studied this may be due to short time period.

Table 4. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on the complete blood count of the irradiated rats.*

Groups	Parameters				
	WBC* 10^3 mm^3	RBC * 10^6 mm^3	Hb g/dl	PLT $10^3 mm^3$	MPV μm^3
C(-ve)	6.04+0.93^{bc}	5.54+0.91^{a}	11.70+1.44^{a}	526.20+38.55^{a}	7.82+0.63^{ab}
C(+ve)	1.40+0.16^{d}	1.85+0.68^{b}	5.86+1.38^{b}	363.60+116.20^{b}	8.60+0.45^{a}
5%Ban.	10.24+1.48^{a}	2.42+0.81^{b}	6.34+2.16^{b}	211.40+61.41^{c}	8.26+0.45^{ab}
10%Ban.	5.00+1.19^{c}	1.95+0.51^{b}	5.08+1.32^{b}	152.20+27.08^{c}	8.12+0.38^{ab}

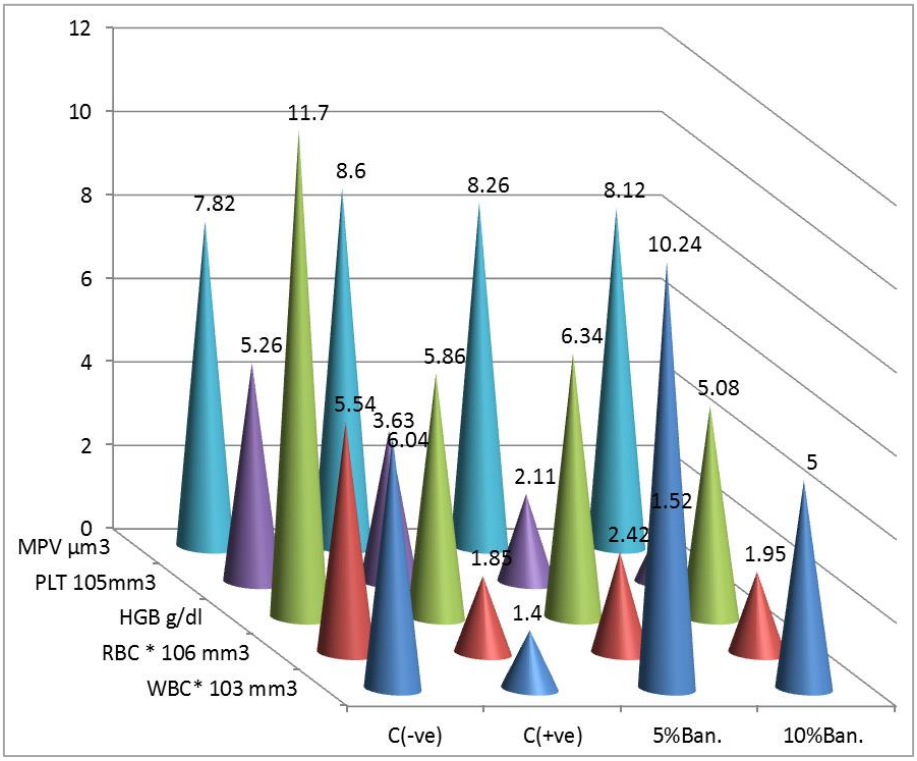


Figure 3. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on complete blood count in gamma irradiated rats.*

3.4. The Effect of Dried Banana Peel Powder Lacteol Forte Mixture Supplemented Diet on Liver Profile of Irradiated Rats

Alanine aminotransferase (ALT) present in the serum of the irradiated group significantly increased compared with (C(-ve)) group, whereas all treated (5%Ban., 10%Ban.) groups, their ALT values showed significant decrease compared with irradiated (C(+ve)) group. Aspartate aminotransferase (AST) present in the serum of the irradiated (C(+ve)) group significantly increased compared with normal control (C(-ve)) group, whereas all treated (5%Gar. and 10%Gar.) groups, their ALT showed significant decrease compared with irradiated (C(-ve)) group. Total protein of the irradiated (C(+ve)) group, the change was nonsignificantly increase compared with (C(-ve)) group. Between the treated groups, 5%Ban. group showed nonsignificant decrease compared with (C(+ve)). While 10%Ban. group, the change was significant decrease compared with (C(+ve)). Serum albumin of the irradiated (C(+ve)) group showed nonsignificant change compared with (C(-ve)) group. Also, 5%Ban. group was nonsignificantly increased compared with (C(+ve)) group. Whereas 10%Ban., group showed nonsignificant decrease compared with (C(+ve)) group. From that we could conclude that 10%Ban. was the most related group to the normal (C(-ve)) group (Table 5 and Figures 4 and 5).

Table 5. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on the Liver Profile Parameters of the irradiated rats.*

Groups	Parameter			
	ALT U/L	AST U/L	Total Protein g/dL	Albumin g/dL
C(-ve)	36.00+2.00^{d}	196.80+16.65^{b}	6.02+0.56^{ab}	3.42+0.11^{ab}
C(+ve)	63.80+2.77^{a}	245.2+22.52^{a}	6.22+0.45^{a}	3.32+0.29^{ab}
5%Ban.	33.40+3.43^{d}	169.8+23.78^{c}	6.04+0.57^{ab}	3.56+0.09^{a}
10%Ban.	45.00+1.58^{c}	125.0+18.1^{d}	5.32+0.59^{b}	3.08+0.55^{b}

*Values are means ±standard deviation (n = 5). Values in a row with different letters differ significantly (P <.05).

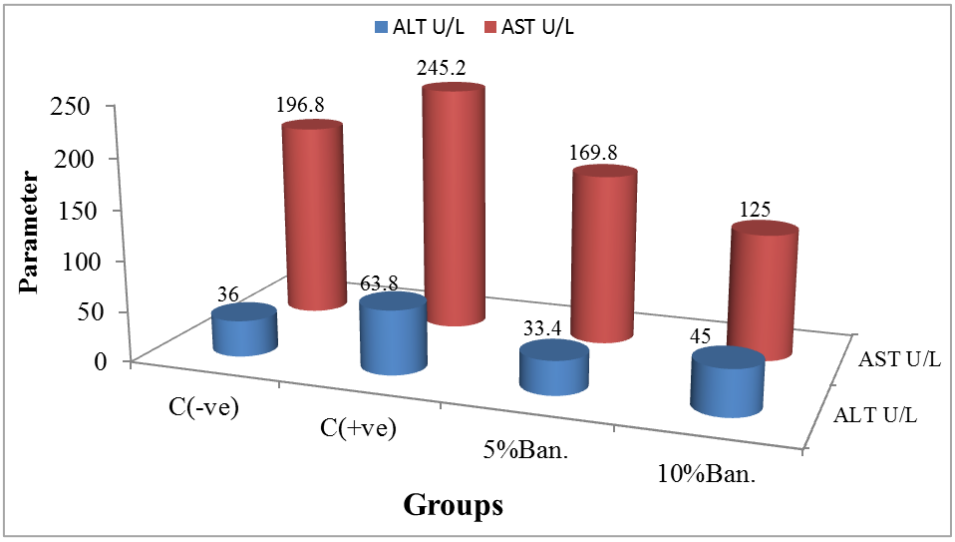


Figure 4. *Effect of dried banana peel powderlacteol forte mixture supplemented diet on liver profile (AST and ALT U/L) parameters in gamma irradiated rats.*

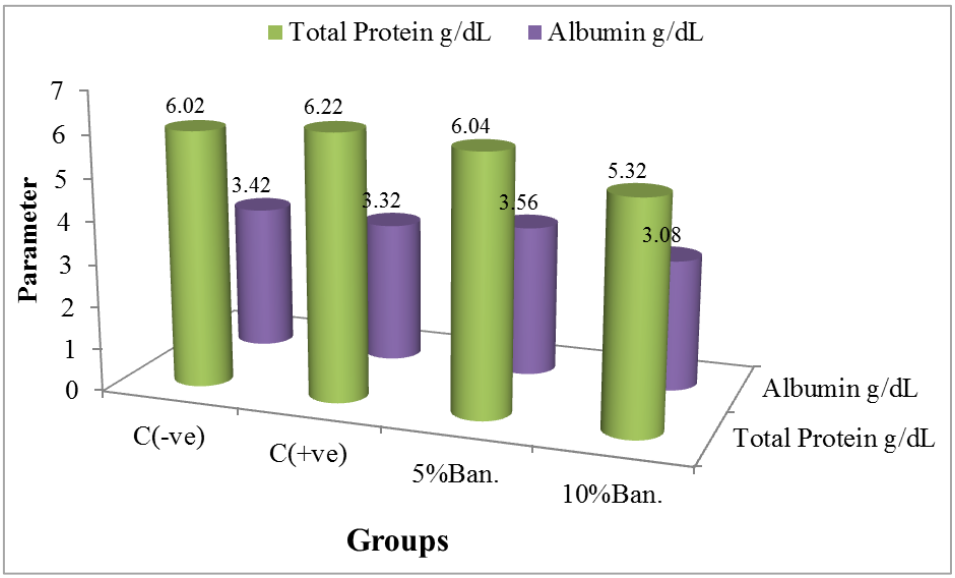


Figure 5. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on lipid profile (Total Protein and Albumin g/dL) parameters in gamma irradiated rats.*

3.5. The Effect of Dried Banana Peel Powder Lacteol Forte Mixture Supplemented Diet on Oxidative Stress Parameters

Superoxide dismutases (SODs) present in the serum of the irradiated group significantly decreased compared with (C(-ve)) group, whereas all treated (5%Ban. and 10%Ban.) groups, the (SODs) values showed significant increase compared with irradiated (C(+ve)) group (Table 6 and Figure 6). 10%Ban. group showed the nearest value compared with (C(-ve)) group. Malondialdehyde (MDA) present in the serum of the irradiated group significantly increased compared with (C(-ve)) group, whereas (5%Ban. and 10%Ban.) groups, (MDA) values showed significant decrease compared with irradiated (C(+ve)) group. 5%Ban. group showed the nearest value compared with (C(-ve)) group. Catalase (CAT) present in the serum of the irradiated group significantly decreased compared with normal control (C(-ve)) group, whereas all treated (5%Ban. and 10%Ban.) groups, the (CAT) values showed significant increase compared with irradiated (C(+ve)) group. 5%Ban.. group showed the nearest value compared with (C(-ve)) group.

Table 6. *Effect dried banana peel powder lacteol forte mixture supplemented diet on the oxidative stress Parameters of the irradiated rats.*

Groups	Parameter		
	SOD U/ml	MDA U/ml	CAT U/ml
C(-ve)	429.08+42.79^{b}	20.82+2.77^{b}	306.64+22.9^{c}
C(+ve)	92.01+2.99^{c}	28.97+4.58^{a}	181.13+15.49^{d}
5%Ban.	1702.4+18.9^{a}	19.74+2.96^{b}	398.47+16.92^{b}
10%Ban.	447.85+35.71^{b}	16.87+3.29^{b}	660.21+17.12^{a}

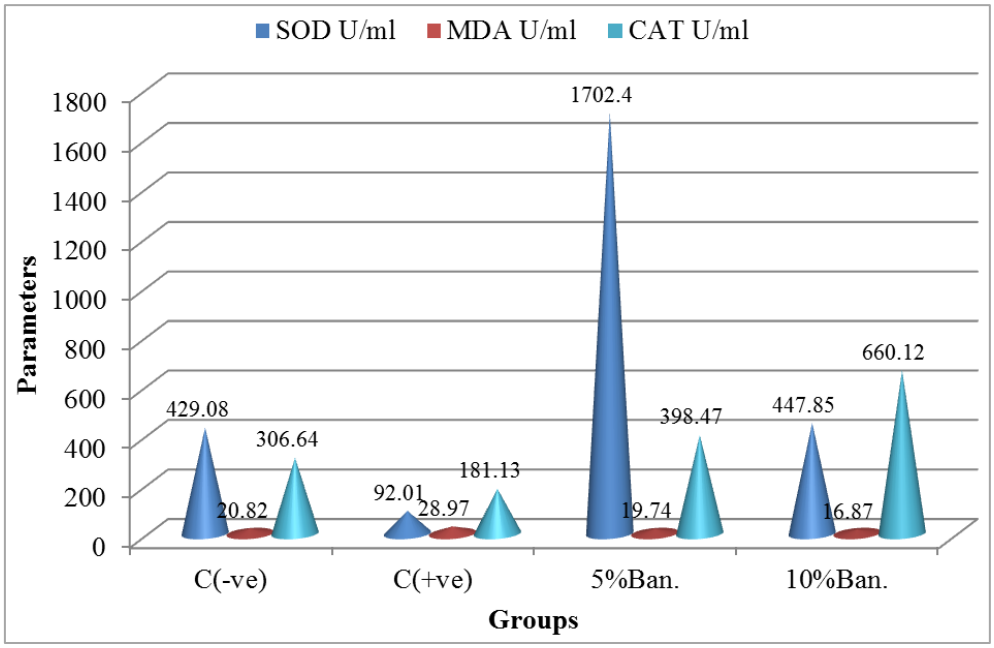


Figure 6. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on oxidative stress (SOD, MDA and CAT U/ml) parameters in gamma irradiated rats.*

3.6. The Effect of Dried Banana Peel Powder Lacteol Forte Mixture Supplemented Diet on Immunological Parameters

Data summarize the immunological parameters in serum of the irradiated rates and the treated groups are found in Table 7. Interleukin 6 (IL-6) present in the serum of the irradiated group) significantly increased compared with normal control (C(-ve)) group, whereas all treated (5%Ban. and 10%Ban.) groups, their (IL-6) values showed significant decrease compared with irradiated (C(+ve)) group. 10%Ban. group showed the best value related to (C(-ve)) group.

Tumor necrosis factor (TNF-α) present in the serum of the irradiated group significantly increased compared with (C(-ve)) group, whereas (5%Ban. and 10%Ban.) groups, showed significant decrease compared with irradiated (C(+ve)) group. 10%Ban. group showed the most related value compared with (C(-ve)) group.

Elhadary *et al.*, pointed out that radiation treatment by different two doses (0.4 or 0.8 Gy) changed several cytokines production. there were increase in IL6 and TNF-α due to gamma radiation exposure. Whereas high dose was more effective than lowdose. They explain the obtained results due to LDR increased capacity of T cells and increase expression of vascular endothelial growth factor (VEGF), which is the key mediator of angiogenesis in tumor cells, promoting angiogenesis [28].

Table 7. *Effect dried banana peel powder lacteol forte mixture supplemented diet on the Immunological Parameters of the irradiated rats.*

Groups	Parameter	
	Il6 pg/ml	**TNF-α pg/ml**
C(-ve)	44.64+1.11^{d}	215.20+1.14^{b}
C(+ve)	81.69+1.04^{a}	239.47+1.52^{a}
5%Ban.	56.30+1.05^{b}	176.59+2.39^{d}
10%Ban.	50.27+2.04^{c}	193.46+1.83^{c}

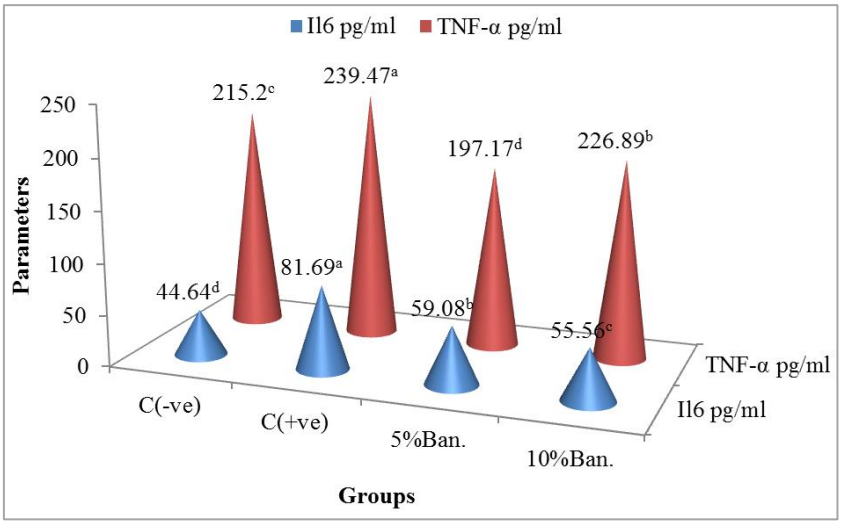


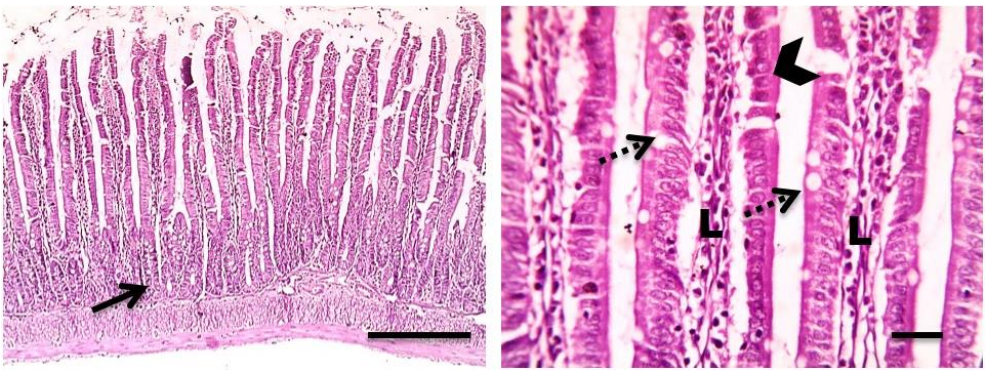
Figure 7. *Effect of dried banana peel powder lacteol forte mixture supplemented diet on immunological (TNF-α and IL6 pg/ml) parameters in gamma irradiated rats.*

3.7. Intestine Pathological Studies

From the intestine pathological studies we could notice that there are major changesinclude; mucosal necrosis deep diffuse, noticed villi and crypts loss. Also, Payer's patches lymphocytes depletion as well as prominent necrosis.

(5% Ban.) group showing partially decreased severity of pathological lesions that varied from necrosis of few villi to desquamation of covering epithelial columnar cells. Signs of regeneration are observed in some sections indicated by marked hyperplasia of covering epithelial columnar cells. Moderate depletion of lymphocytes in Payer's patches is seen.

(10% Ban.) group showing slightly decreased severity of pathological lesions that varied from mild to moderate necrosis of villi. Signs of regeneration are very mild as indicated by hyperplasia of covering epithelial columnar cells in very few villi. Mild depletion of lymphocytes in Payer's patches is seen.



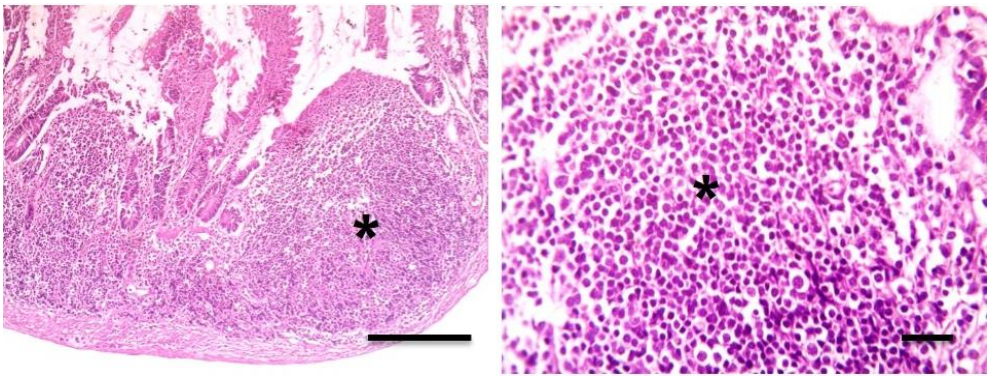


Figure 8. *Microscopic pictures of H&E stained ileal sections showing normal long villi covered with columnar epithelium (arrowheads) and goblet cells (dashed arrows), normal lamina propria (L), normal crypts (arrows) with normal lymphocytic population in Payer's patches (*) in control (C(-ve)) group. Low magnification X: 100 and high magnification X: 400.*

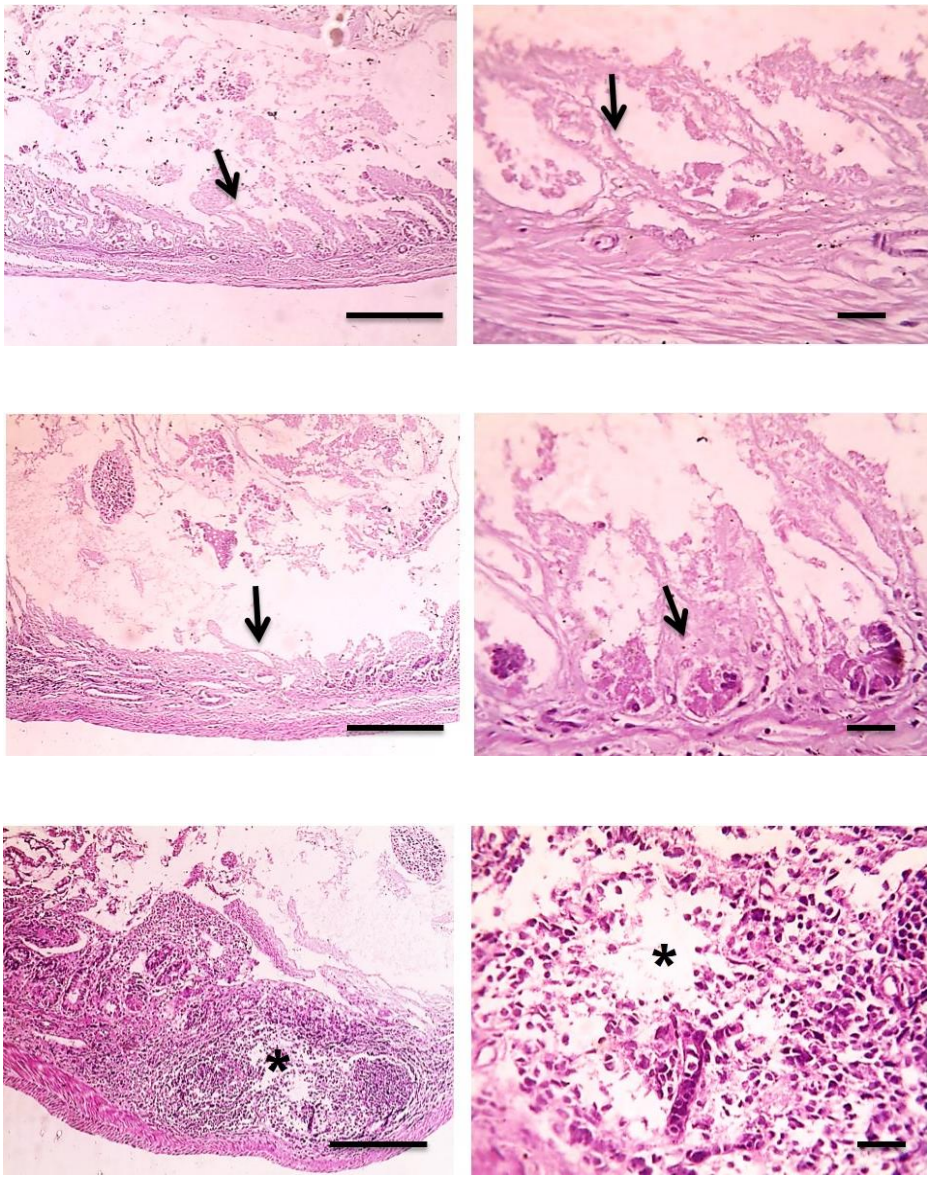


Figure 9. *Microscopic pictures of H&E stained ileal sections from Irradiated (C(+ve)) group showing diffuse and deep mucosal necrosis leading to severe loss of villi and crypts (arrows) with prominent necrosis and depletion of lymphocytes in Payer's patches (*). Low magnification X: 100 and high magnification X: 400.*

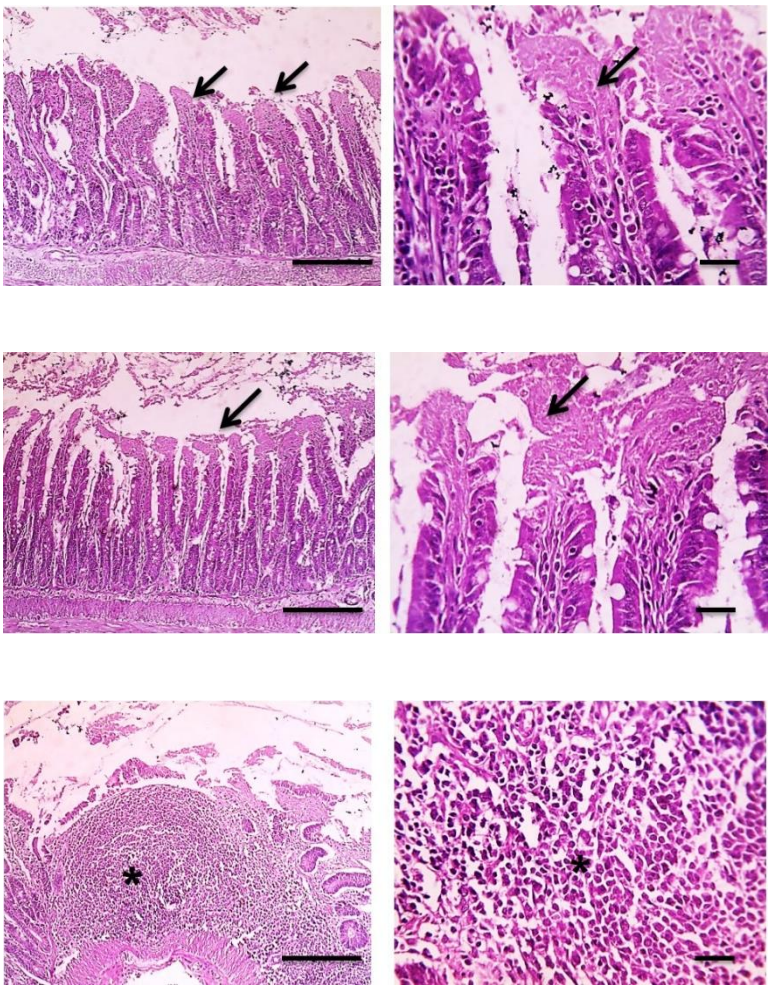


Figure 10. *Microscopic pictures of H&E stained ileal sections from (5%Ban.) group showing more decreased severity of pathological lesions than in previous groups including necrosis in tips of some villi (thin arrows) with restored lymphocytes density in Payer's patches (*) is seen. Low magnification X: 100 and high magnification X: 400.*

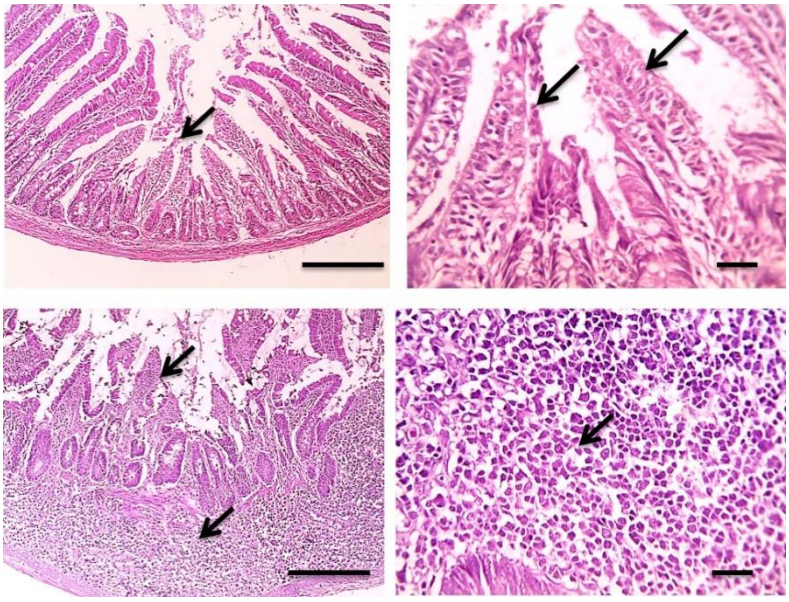


Figure 11. *Microscopic pictures of H&E stained ileal sections from (10%Ban. Gp.) showing mild pathological lesions including loss of epithelial columnar cells covering few villi (thin arrows) with restored lymphocytes density in Payer's patches (*) is seen. Low magnification X: 100 and high magnification X: 400.*

The obtained results agreed with that reported by Becker, High levels of radiation exposure lead to acute radiation syndrome. It is worth noting that hematopoietic syndrome, which involves damage to the immune system and bone marrow and can occur at radiation doses < 1 Gy, is often the main illness observed at lower levels of radiation (0.7-4 Gy) [29].

Radiation doses between 5 and 12 Gy cuased severe symptoms. intestinal crypt cells loss and the mucosal barrier breakdown led to abdominal pain, nausea, vomiting, diarrhea, and gastrointestinal bleeding. These symptoms combined with hematologic complications and accelerated the lethal effects of radiation. An increase of anemia due to both blood cell loss and gastrointestinal bleeding and infection due to impaired gastrointestinal barrier function enabling bacterial invasion into the bloodstream of patients with radiation-induced immunosuppression. symptoms by directly triggering apoptosis of stem cells located in the intestinal crypts was believed to be due to radiation exposure. The stem cells lose, cuase the intestinal lumen no longer be replaced, which led to loss of intestinal villi and impaired function. More recently, a second explanation was proposed that suggested that damage to the crypts occurs secondary to endothelial cell damage.

Also, Nath *et al.*, reviewed Biological Activities of Lactose-Derived Prebiotics and Symbiotic with Probiotics on Gastrointestinal System, The lactose-derived prebiotics biological activities are examined with the presence of gut microflora, mainly probiotics (Lactobacillus spp. in the small intestine and Bifidobacterium spp. in the large intestine). galacto-oligosaccharide reduced the risks of diarrhea of several types such as, traveler's diarrhea, osmotic diarrhea and Clostridium difficile associated relapsing diarrhea. Bowel diseases inflammatory was prevented by Lactulose and lactosucrose as Crohn's disease and ulcerative colitis. Lactulose and lactitol reduced and prevented hepatic encephalopathy risks. Furthermore, constipation in individuals of all ages were prevented with lactulose, galacto-oligosaccharide and lactitol. [30].

4. Conclusion

The obtained results indicated that; the entire treatment had positive effect on all studied parameters, the high concentration group was the most relevant to the normal group, several histopathologic changes were observed in intestine tissue due to radiation exposure, these changes included: diffuse and deep mucosal necrosis leading to severe loss of villi and crypts with prominent necrosis and depletion of lymphocytes in Payer's patches.

There are partially decrease of pathological lesions that varied from necrosis of few villi to desquamation of covering epithelial columnar cells. Regeneration signs are clearly observed in some sections indicated by marked hyperplasia of covering epithelial columnar cells. Lymphocytes in Payer's patches moderate depletion is seen in low dose group (5%Ban.).

Pathological lesions severity were decreased that varied from mild to moderate necrosis of villi. Regeneration sings are very mild as indicated by hyperplasia of covering epithelial columnar cells in very few villi. Llymphocytes in Payer's patches is mild depletion seen in high concentration group (10%Ban.).

Abbreviations

CFU	Colony Forming Unit
RBCs	Red Blood Cell Count
HCT	Haematocrit
Hb	Haemoglobin
MCV	Mean Corpuscular Volume
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin Concentration
WBCs	White Blood Cell Count
LYM#	Lymphocytes Count
MON#	Monocytes Count
GRA#	Granulocytes Count
PLT	Platelet Count
ALT	Alanine Transaminase
AST	Aspartate Transaminase
TP	Total Protein
SODs	Super Oxide Dismutase
CAT	Catalase
MDA	Malonaldyde
IL-6	Inter Luckine 6
TNF-α	Tumor Necrosis Factor

Conflicts of Interest

The authors of this paper declares that there are not any conflict of interest in any organization or entity.

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