Biological Studies on Quality and Safety of Diets Presented in some Flight Companies

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Abstract:

The present study was designed to evaluate the Biological Studies on Quality and Safety of Diets Presented in some Flight Companies . Forty two adult male albino rats, average body weights was (140 g±5) fed on basal diet with meat lunch, chicken lunch and breakfast of two common flight companies. Body weight gain, feed intake, liver functions, kidney functions, blood glucose and some blood components were determined. The obtained results showed a significant decrease in the levels of body weight gain, feed intake, liver functions, renal functions, blood glucose and some blood components of group 7 which fed on breakfast of company 2 while a significant increase in the levels of body weight gain, feed intake, liver functions, kidney functions, blood glucose and some blood components of group 3 which fed on chicken lunch in normal levels when compared with the other group . Fed rats on meat lunch led to increase in liver and kidney functions of rats fed on basal diet with meat lunch when compared with the other groups. These findings indicated that the breakfast diet of company 2 had the lowest biological value while, the diets were presented at company 1 had the highest biological value.

Keywords: **Food safety –kidney functions- liver functions- flight company**

INTRODUCTION

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene,food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer (**Shiklomanov, 2000).**The terms food safety and food quality can sometimes be confusing. Food safety refers to all those hazards, whether chronic or acute, that may make food injurious to the health of the consumer. It is not negotiable **(Andrew , 2006).**Quality includes all other attributes that influence a product's value to the consumer. This includes negative attributes such as spoilage, contamination with filth, discoloration, off-odours and positive attributes such as the origin, colour, flavour, texture and processing method of the food. This distinction between safety and quality has implications for public policy and influences the nature and content of the food control system most suited to meet predetermined national objectives **(Surak, 1992).** Food control is defined as a mandatory regulatory activity of enforcement by national or local authorities to provide consumer protection and ensure that all foods during production, handling, storage, processing, and distribution are safe, wholesome and fit for human consumption; conform to safety and quality requirements; and are honestly and accurately labelled as prescribed by law. The foremost responsibility of food control is to enforce the food law(s) protecting the consumer against unsafe, impure and fraudulently presented food by prohibiting the sale of food not of the nature, substance or quality demanded by the purchaser **(**

Luning et al., 2002). Confidence in the safety and integrity of the food supply is an important requirement for consumers. Foodborne disease outbreaks involving agents such as Escherichia coli, Salmonella and chemical contaminants highlight problems with food safety and increase public anxiety that modern farming systems, food processing and marketing do not provide adequate safeguards for public health. Factors which contribute to potential hazards in foods include improper agricultural practices; poor hygiene at all stages of the food chain; lack of preventive controls in food processing and preparation operations; misuse of chemicals; contaminated raw materials, ingredients and water; inadequate or improper storage, etc. Specific concerns about food hazards have usually focused on: • Microbiological hazards; • Pesticide residues; • Misuse of food additives; • Chemical contaminants, including biological toxins; and • Adulteration. The list has been further extended to cover genetically modified organisms, allergens, veterinary drugs residues and growth promoting hormones used in the production of animal products. For more details see Annex 3. Consumers expect protection from hazards occurring along the entire food chain, from primary producer through consumer (often described as the farm-to-table continuum). Protection will only occur if all sectors in the chain operate in an integrated way, and food control systems address all stages of this chain. As no mandatory activity of this nature can achieve its objectives fully without the cooperation and active participation of all stakeholders e.g. farmers, industry, and consumers, the term Food Control System is used in these Guidelines to describe the integration of a mandatory regulatory approach with preventive and educational strategies that protect the whole food chain. Thus an ideal food control system should include effective enforcement of mandatory requirements, along with training and education, community outreach programmes and promotion of voluntary compliance (**Codex Alimentarius Commission, 2009)**. An airline meal or in-flight meal is a meal served to passengers on board a commercial airliner. These meals are prepared by airline catering services. These meals vary widely in quality and quantity across different airline companies and classes of travel. They range from a simple beverage in short-haul economy

class to a seven-course gourmet meal in l ong-haul first class. When ticket prices were regulated in the American domestic market, food was the primary means airlines differentiated themselves **(Vass, 2010).** The type of food varies depending upon the airline company and class of travel. Meals may be served on one tray or in multiple courses with no tray and with a tablecloth, metal cutlery, and glassware (generally in first and business classes).The airline dinner typically includes meat (most commonly chicken or beef) or fish, a salad or vegetable, a small bread roll, and a dessert.

Caterers usually produce alternative meals for passengers with restrictive diets. These must usually be ordered in advance, sometimes when buying the ticket. Some of the more common examples include:

- Cultural diets,such, as French, Italian, Chinese, Japanese or Indian style.
- Infant and baby meals. Some airlines also offer children's meals, containing foods that children will enjoy such as baked beans, mini-hamburgers and hot dogs.
- Medical diets, including low/high fiber, low fat/cholesterol, diabetic, peanut free, non-lactose, low salt/sodium, low-purine, low-calorie,low-protein, bland (non-spicy) and gluten-free meals.
- Religious diets, including kosher, halal, and Hindu, Buddhist and Jain vegetarian (sometimes termed Asian vegetarian) meals.
- Vegetarian and vegan meals. Some airlines do not offer a specific meal for vegetarians; instead, they are given a vegan mealb (Li, 2008**).** .

For several Islamic airlines (e.g. Emirates, Etihad Airways, Gulf Air, Iran Air, Qatar Airways, Saudia, Pakistan International Airlines,Malaysia Airlines and Turkish Airlines) in accordance of Islamic customs, all classes and dishes on the plane are served a Muslim meal with Halal certification - without pork and alcohol. While Emirates, Etihad, and Qatar are still providing bottles of wine to non-Muslim passengers, the cabin crew does not deliver alcoholic beverages lest to violate Islamic customs, unless those non-Muslim passengers request it. Because Iran and Saudi Arabia are apply strict Sharia regulations,

all Iran , Egypt Air and Saudia airplanes do not deliver pork and alcoholic substances; moreover, all airlines flying to and from Iran or Saudi Arabia are prohibited from using pork and alcohol **(Faergemand and Jespersen , 2004)**The safety of passengers and crew is a top priority for the airline industry. This includes serving in-flight food that is not harmful to the health and safety of passengers and crew. Today, examples of the harmful effects of improperly prepared or "unsafe" food are on the rise, and regulators and courts worldwide are responding. Now, more than ever, you need to demonstrate diligence. You need to be confident that your airline's caterers are making conscientious efforts to prepare food using methods designed to protect the health and safety of your passengers and crew. Airlines are responsible for the food they serve on board aircraft, whether it is prepared in anairline-owned "flight kitchen" or obtained from an independently owned catering company.The steps involvedincluding food preparation, transporting to the aircraft, storing and finally,serving on the aircraft need to be well coordinated in order to avoid contamination **(WHO, 2009).**

In its widest sense, the safety of food must be achieved through safe production, storage, and handling in order to avoid food-borne illnesses such as food intoxication, infectious diseases, or other detrimental effects. In principle, such illnesses can be caused by agents of biological, chemical, or physical nature **(Martin and Robert, 2001).**Without proper precautions and utilizing the practices in food safety,people are put into a risky situation. In 2006 there were 1,270-reported foodborne diseaseoutbreaks in the USA, resulting in 27,634 illnesses and eleven deaths. Some ofthese statistics could be prevented if the proper education and training of food safety is given toall food service industry employees. Even more disturbing are the estimates provided by theCDC in 2010 that these diseases sicken seventy-six million Americans per year, causing 300,000hospitalizations and 5,000 deaths.The CDC contends that many of these illnesses do not getrecorded **(Colton and Covert, 2007).**

MATERIALS AND METHODS

Sampling:A total number of 6 samples of foods which were collected from two flight companies. All samples collected

within about one year, were collected in sterilized plastic bags and transferred aseptically an ice box to the biological labe to evaluate the biological effect of tested diets.

1. Biological methods

1-1 Diet: Standard diet prepared from fine ingredients per 100 g according to **AIN, (1993)**. The Composition of vitamin and minerals diet was according to **Campbell, (1963) and Hegsted *et al.* (1941)** respectively.

1 – 2 – Animals: Forty two adult male albino rats, average body weights ranged between (140 g±5) obtained from Research Institute of Ophthalmology in Giza section of Animals House. Rats will house in wire cages under the normal laboratory condition and fed on (normal) basal diet.

2 – Methods:-

2-1-Experimental design and animal groups: The rats distributed into 7 groups each of 6 rats. All groups of rats housed in wire cages and fed on the basal diet during experimental period for 4 weeks according to the following groups:

Group (1): Control negative group (C-ve), in which normal rats fed on basal diet during experimental period for 4weeks.

Group (2): Rats received basal diet with meat lunch of company 1for 4 weeks.

Group (3): Rats received basal diet with chicken lunch of company 1for 4 weeks.

Group (4): Rats received basal diet and breakfast of company 1 for 4 weeks.

Group (5): Rats received basal diet with meat lunch of company 2for 4 weeks.

Group (6): Rats received basal diet with chicken lunch of company 2for 4 weeks.

Group (7): Rats received basal diet and breakfast of company 2 for 4 weeks.

Each of the above groups kept in a single cage. Diet was given in non scattering feeding cups to avoid loss or contamination of food, water provided to the rats by means of glass tubes projecting through the wire cage from an inverted bottle supported to one side of the cage. Rats weighted at the beginning of experimental then weekly and at the end of the experiment.

2-2-Blood Samples: Blood samples collected after 12 hours fasting at the end of experiment in which the rats scarified under ether anaesthesia. Blood samples received into two types of tubes, one with EDTA for collecting whole blood for complete blood count (CBC) and other cleaned dry centrifuge tubes in which blood leave to clot at room temperature, then centrifuged for 10 minutes at 3000 r.p.m to separate the serum. Serum carefully aspirated and transfered into clean cuvet tubes and

stored frozen at-20^{o}C for biochemical analysis as described by **(Schermer, 1967).**

2-3-Organs: At the same time, the organs:, kidney, spleen, liver and stomach removed, cleaned and weighted organs according to method mentioned by **Drury and Wallington (1980).**

3-Biological evaluation: During the experimental period for each experimental part, the diet consumed recorded every day, and body weight record every week. The body weight gain (BWG %), feed efficiency ratio (FER), and also organ\body weight% determinated according to **Chapman *et al.* (1959)** using the following equations.

$$\text{BWG\%} = \frac{\text{(Final weight-Initial weight)} \times 100}{\text{Initial weight}}$$

$$\text{FER} = \frac{\text{Grams gain in body weight}}{\text{Grams of food consumed}}$$

4-Biochemical Analysis:

Determination of Serum glucose: The principle use of glucose determination according to **Tietz (1996).**

Determination of renal functions: Urea and uric acid were determined according to the enzymatic method of **Patton and Crouch (1977).**

Determinations of serum and urine Creatinine: Creatinine and albumin were determied according to kinetic method of **Henry (1974).**

Determination of liver functions: Determination of GPT carried out according to the method of **Henry (1974).**Determination of GOT carried out according to the method of **Henry (1974).**

Laboratory analysis of blood: Concentration of (Hgb), PCV, MCV, WBC, RBC, platelet count, neutrophiles, lymphocytes and monocytes will estimate according to the method described by **Dacie and Lewis (1998).**

5-Statistical analysis of data: A randomized complete block design with three replication was used. Diffrences among means for all studied diete traits were tested for significance according to the least significance diffrences (L.S.D) as described by **SPSS (2000).**

Results and discussion

1-Effect of feeding rats on different companies meals on feed intake (FI), body weight gain (BWG), and feed efficiency ratio (FER).

Data presented in table (1) showed the effect of feeding rats on different companies meals on feed intake. It could be observed that rats feeding on the basal diet (control), the feed

intake (FI) was 10.5 ± 0.13 g/day. Rat fed on diet 3 followed 1 and 5, the weight gain was increased than the control group. This increase in group 1 and 3 was statically non-significant, there is no significant between groups 1, 2, 5 and control group. The seventh group was the lowest one in feed intake. It could be noticed that the body weight gain (BWG) in rats feeding of diet as control group was higher than that the other groups. It was being 2.14 ± 0.56 g/day**.** All the mean values of body weight gain of tested diet groups were lower than the control. Differences between all mean values were significant when compared to control group . There is no significant differences between groups 1,5 and 6.The lowest group in body weight gain was the last group which recorded 0.52 ± 0.16 g/ day. There is no significant differences between groups 2,3 and 4 also, between groups (1 and 6). Mean while, rats fed on group 7 which contained breakfast of company 2 showed a significant decrease compared to control rats which was 0.055 ± 0.007 and these results were in the same line of **Shiklomanov (2000)** who found that diet contained meat and chicken led to increase the feed intake and body weight in the normal level .

Table (1): Effect of feeding rats on different diet diets on feed intake (FI), body weight gain (BWG) and feed efficiency ratio (FER)

Groups	Parameters		
	Feed intake g/day	Body weight gain g/day	Feed efficiencyratio g/day
Control group (G1)	$10.5^{b} \pm 0.03$	$2.41^{a} \pm 0.26$	$0.229^{a} \pm 0.01$
G2	$10.9^{a} \pm 0.08$	$1.97^{b} \pm 0.11$	$0.181^{b} \pm 0.01$
G3	$10.54^{b} \pm 2.35$	$1.28^{c} \pm 0.19$	$0.121^{c} \pm 0.001$
G4	$9.78^{d} \pm 0.05$	$1.07^{d} \pm 0.22$	$0.109^{c} \pm 0.001$
G5	$10.83^{b} \pm 1.23$	$1.58^{b} \pm 0.41$	$0.145^{b} \pm 0.002$
G6	$10.38^{c} \pm 0.38$	$1.92^{b} \pm 0.26$	$0.185^{b} \pm 0.005$
G7	$9.38^{d} \pm 0.48$	$0.52^{f} \pm 0.16$	$0.055^{d} \pm 0.002$
L.S.D	1.43	0.12	0.031

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Effect o feeding rats on different companies diets on some relative organs weight of rats.

Data presented in table (1) showed the effect of feeding rats on different diet on some relative organs weight. It could be observed that the relative weight of liver, kidney and heart were, 2.63 ± 0.14, 0.58±0.12 and 0.55±0.03g/100g body weight respectively for control group. While in rats group fed on diet of group 7, the relative weights of the previously mentioned organs were 1.86±0.45, 0.34 ±0.19 and 0.34±0.21g/100 bw. Respectively followed by the relative weight of group fed on diet 3. The results denoted showed there were a significant increase in relative liver weight in group4 compared to the other tested group diets.For weight of liver, there is no significant differences between rats feed on G2 (diet 2) and G5 (diet 5) also, between G1 (diet 1) and G6 (diet 6). Regarding kidney relative weight, there were significant decrease in G2 (diet 2) G4 (diet 4) and G6 (diet 6) compared to control group, which were 0.43 ± 1.21 and 0.46±0.51 g , 0.46 ± 0.51 and0.59± 0.02 g/100g bw. and at the same time there were significant decrease in G1 (diet 1) and G3 (diet 3) and G3 recorded 0.51 ± 0.19 .

According to data presented in the same table (3), it is clear that heart relative weight which showed the highest significant decrease in G3 (diet 3) and G7 (diet 7) compared to control (obese rats) which the mean levels were 0.40±0.03, 0.34±0.11 and 0.56±0.02g/100g body weight respectively

Table (2): Effect of feeding rats on different diet diets on some relative organs weight (g) of obese rats

Groups	Organs		
	Relative liver Weight g/100	Relative kidney Weight g/100	Relative large intestine Weight g/100
Control group (G1)	$2.63^{a} \pm 0.14$	$0.58^{a} + 0.12$	$0.55^{a} + 0.03$
G2	$2.36^{d} + 0.57$	$0.50^{b} + 0.23$	$0.48^{b} + 0.11$
G3	$2.42^{c} + 0.14$	$0.43^{c} + 1.21$	$0.46^{b} + 0.07$
G4	$2.53^{b} + 2.14$	$0.46^{c} + 0.51$	$0.51^{a} + 0.02$
G5	$2.46^{c} + 0.35$	$0.54^{a} + 0.29$	$0.53^{a} + 0.21$
G6	$2.33^{d} + 2.14$	$0.46^{c} + 0.51$	$0.51^{a} + 0.12$
G7	$1.86^{e} + 0.35$	$0.34^{d} + 0.19$	$0.34^{c} + 0.21$
L.S.D	1.82	0.31	0.31

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Data presented in table (2) showed the effect of feeding rats on different companies diets on blood glucose level.

The results in table (4) indicated that the mean value of glucose for rats fed control diet was 189.5 ± 4.21mg/dl, while the glucose level fed on diet 7 was 68.6 ± 4.5mg/dl was the lowest result.

There were significant decrease in all groups as compared control group except G1 and G4, which were 160.5±5.76 and 165.3 ± 2.1 mg/dl respectively. There is no significant differences between the two groups and this result was according to the obtained result of **Colton and Covert (2007)** who reported that the breakfast meal contained high fiber sources which led to decrease the level of glucose .

Table (3): Effect of feeding rats on different diet diets on blood glucose level of obese rats

Groups	Parameter
	Glucose (mg/dl)
Control group (G1)	189.5^{a} ±4.21
G2	160.5^{b}±5.76
G3	148.2^{d}± 6.5
G4	87.5^{f} ± 3.4
G5	158.6^{c} ± 4.5
G6	130.3^{e} ± 3.1
G7	68.6^{g} ± 4.5
L.S.D	7.54

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

4. Complete blood cells (CBC) parameters of rats fed on different companies diets.

Data given in table (3) showed the effect of feeding rats on different diet on hemoglobin level. It is clear form table (4) that rats fed control diet, the hemoglobin levels was 13.03 ± 0.23g/dl, while rat's groups 5,6 and 7 showing significant decrease when compared to rats fed on control diet. While there is no significant differences in the hemoglobin levels between G1,G2 and G3 as compared control. Rats fed on diet 7 was the lowest hemoglobin level.

Results of table (3) showed non-significant changes in control group and diet 2 on red blood cells count. Also, There is no significant differences between G1, G3,G4 and G6.

From the same table, it could be noticed that the control group was the highest level in red blood cells and rats fed on diet 7 was the lowest one .

It is clear form table (3) that rats fed on control diet, white blood cells count in obese rats was $5.3 \pm 1.12 \times 10^3$.

There were significant differences between all groups and control group. While, there is no significant differences between groups from 1 to 6. Group 7 recorded the lowest level of WBC.

Results of table (3) and Fig. (5-c) showed significant decrease in group 7 as compared to the other groups on platelet count.

There is no significant differences between G2, G5 and the control group which were 377 ± 10.45, 377 ± 8.05 and $378 \pm 11.45 \times 10^3$ respectively, also there is no significant differences which observed in G3, G4 and G6.

Table (4): Complete blood cells (CBC) parameters of rats fed on different companies diets .

Groups	Parameters			
	Hemoglobin (g/dl)	RBC $\times 10^6$	WBC $\times 10^3$	PLC $\times 10^3$
Control group (G1)	$13.03^a \pm 0.23$	$6.03^a \pm 2.14$	$5.3^a \pm 1.12$	$378^a \pm 11.54$
G2	$13.4^a \pm 0.03$	$5.6^b \pm 1.01$	$4.5^b \pm 1.34$	$354^b \pm 1.94$
G3	$13.7^a \pm 2.43$	$5.87^a \pm 1.06$	$4.3^b \pm 0.95$	$377^a \pm 10.45$
G4	$13.33^a \pm 0.05$	$5.59^b \pm 0.09$	$4.6^b \pm 2.11$	$331^c \pm 2.13$
G5	$12.0^b \pm 0.001$	$5.41^c \pm 0.05$	$4.5^b \pm 1.01$	$377^a \pm 8.05$
G6	$12.13^b \pm 0.05$	$5.55^b \pm 0.09$	$4.6^b \pm 2.11$	$331^c \pm 2.13$
G7	$10.0^c \pm 0.001$	$4.91^d \pm 0.05$	$3.5^c \pm 1.01$	$177^d \pm 1.45$
L.S.D	0.91	2.004	0.97	2.071

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

5. Effect of feeding rats on different companies diets on liver functions of rats.

It could be observed that in table (4) rats fed on control group, the mean value of AST enzyme was 46.1 + 1.27U/L, the other mean levels of other groups showed significant decrease as compared to control group. In the same table (5) showed non significant for aspartate amino transaminase (AST) enzyme activity between groups (G1, G2, G4 and G6) as compared control group, the mean values of the same groups were 35.2 + 0.21, 32.1+ 0.52, 34.7 + 0.35 and 34.7 + 0.35 U/L respectively. Which considered the best group was observed for rats fed on diet3**.** It could be noticed that rats fed high fatty diet, the serum levels of (ALT) enzyme activity was 39.8 ± 4.31 U/L, while rat's group fed on diet 7 was 28.9 ± 0.52 U/L. While other groups are found significant decrease in the serum levels of (ALT) enzyme activity in the other groups as compared control (obese rats). There is no significant differences between the results obtained in groups 2, 4, 5 and 6. Rats fed on diet 7 showed significant decrease in the serum levels of (ALT) enzyme activity as compared control, the value was 29.4 ± 1.5 U/L .The results in table (4) indicated that the mean value of (ALP) enzyme, for rats fed on control group was 80.1± 2.97U/L, while the lowest recorded in group 7. These results denote that there is no significant differences in mean value of (ALP) enzyme for (G1, G4, G6 and control group), the mean values were 77.7±1.41, 79.7^{a}±0.05, 79.7±0.35 and 80.1±2.97U/L respectively. Which consider the best group rats on diet 3 which in normal level.

Table (6): Effect of feeding rats on different companies diets on liver functions of rats

Groups	Parameters		
	AST(U/L)	ALT(U/L)	ALP(U/L)
Control group (G1)	46.1^{a}±1.27	39.8^{a}±4.31	80.1^{a}±2.97
G2	35.2^{c}±0.21	32.9^{c}±2.31	77.7^{a}±1.41
G3	32.1^{c}±0.52	34.4^{b}±2.21	74.1^{b}±6.01
G4	34.7^{c}±0.35	34.7^{b}±0.25	79.7^{a}±0.05
G5	39.1^{b} ±0.16	34.9^{b}±0.52	73.7^{b}±0.16
G6	34.7^{c} ±0.35	34.7^{b}±0.25	79.7^{a}±0.35
G7	19.1^{d}±0.16	28.9^{c}±0.52	63.7^{c}±0.16
L.S.D	3.98	4.02	3.11

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

6. Effect of feeding rats on different companies diets on kidney functions (mg/dL) of rats.

It could be noticed that the highest level of serum creatinine was 0.89±0.31mg/100ml in rats fed on control diet. While, in group 7 creatinine level of rats was 1.73±1.04mg/dl, and this was showing significant increase in as compared to control and the other groups. There is no significant differences between groups 1,4 and 5, also between 2,3 and 6. It clear that the mean value of serum levels of albumin in control group was 4.84±0.102 mg/dl. while rats in group 7 was 3.72±0.01 mg/dl .These results revealed that there is no significant in serum levels of albumin of rats fed on diet 1 and 2, also between groups 3 and 7 . In rats on fed on different diet, there were significant decrease in the serum levels of albumin in rats fed on tested diet and control group.

It could be noticed that the rats fed on control diet, the uric acid in serum was raised 3.35±0.105mg/dl. While rat's uric acid in rat's serum fed diets 3 and 7 were decreased than the others. This decrease was statically significant between these groups and the others. The mean values were 1.82±0.18 and 1.56±0.12mg/dl, the serum uric acid levels significant increase in control group also the groups fed diets diet 4,5 and 6.There is no significant differences between group 1 and group. It is evident (table 6) the serum urea levels increase in control group, were being 45.2±1.15 mg/dl. Further in serum urea decrease recorded when rats were fed different diet which were 40.46±0.21, 36.21±1.7, 30.76±2.3, 34.15±2.1, 37.18±2.2, 34.15±2.1 and 30.18±2.2mg/dl for groups 1,2,3,4,5,6 and 7 respectively, groups 3 and 7 which consider the best group rats.

Table (7): Effect of feeding rats on different companies diets on kidney functions of rats

Groups	Parameters			
	Creatinine mg/100ml	Albumin mg/100ml	Uric Acid mg/100ml	Urea Nitrogen mg/100ml
Control group (G1)	0.89^{b}±031	4.84^{a}±0.102	3.35^{a}±0.105	45.2^{a}±1.15
G2	0.76^{c}±0.21	4.41^{b}±1.05	2.95^{b}±0.212	40.46^{b}±2.1
G3	0.67^{d}±0.12	4.44^{b}±2.01	2.45^{b}±0.101	36.21^{c}±1.7
G4	0.77^{c}±0.21	4.11^{c}±1.02	3.35^{a}±2.05	34.15^{d}±1.1
G5	0.73^{c}±0.14	4.72^{a}±0.01	3.36^{a}±1.12	37.18^{c}±2.2
G6	0.67^{d}±0.21	4.11^{c}±1.32	3.35^{a}±2.05	34.15^{d}±2.1
G7	1.73^{a}±1.04	3.72^{d}±0.01	1.56^{c}±0.12	30.18^{c}±2.2
L.S.D	3.97	2.12	1.98	6.67

Values are mean±SD. Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Conclusion

From the obtained results , it could be concluded that the diets which presented at flight companies should be met the biological requirement of passengers and the flight crew and kept the healthy status especially for the chronic diseases.

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الملخص العربي

دراسة كيميائية وبيولوجية علي جودة وسلامة الوجبات الغذائية المقدمة علي بعض شركات الطيران

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ملخص الدراسة :

تهدف هذه الدراسة التي اجريت لتقييم الدراسات البيولوجية علي جودة وسلامة الوجبات المقدمة علي شركات الطيران المختلفة وقد اجريت هذه التجربة علي ٤٢ اثنان وأربعون فرد من الذكور الألبينو التي تبلغ اوزانهم ١٤٠ جرام ± ١٠جم التي غذيت علي وجبة اللحم في الغذاء ووجبة الفراخ واللحم في الإفطار والغذاء من شركتين من شركات الطيران المعروفة ، وقد اظهرت النتائج ان هناك انخفاض في مستوي معدل وزن الجسم وظائف الكبد ، وظائف الكلي ومستوي الجلوكوز في الدم ، ومكونات الدم الاخري وأيضا قد اظهرت النتائج للمجموعة السابعة التي غذيت علي طعام الافطار زيادة في معدل الوزن ووظائف الكبد ، وظائف الكلي وأيضا المجموعة رقم ٣ التي غذيت علي الفراخ في طعام الغذاء اظهرت النتائج أيضا أن هذه المجموعة كانت ذات المستويات الطبيعية حينما قورنت بالمجموعات الأخري والفئران التي غذيت علي النظام الغذائي القاعدي مع غذاء اللحوم ومقارنة مع المجموعات الأخري الي زيادة في وظائف الكبد ووظائف الكلي كما اشارت هذه النتائج ان نظام غذائي الافطار للشركة رقم ٢ كان ادني قيمة بيولوجية في حين تقديم الوجبات الغذائية في الشركة رقم ١ كان اعلي قيمة بيولوجية .

الكلمات الافتتاحية : سلامة الغذاء – وظائف الكلي – وظائف الكبد – شركات الطيران.