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RESEARCHES ON EFFECT OF THE FAST-FOOD CONSUMPTION ON ORGANISM HEALTH

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Abstract

The concept of "fast food" refers to food prepared and served in all specialized restaurants, the expression being recognized by the Merriam-Webster dictionary since 1951, which defines it as specially designed food for immediate availability but with a low attention paid to both quality and quantity. The purpose of this paper is to characterize nutritionally fast food products and to highlight a series of imbalances and risks to which the consumer is exposed in the event of excessive consumption of such preparations. Therefore, 4 different diets were used for the differential feeding of the 4 batches of mice. Thus, for the control group (M), the diet was balanced with nutrients and a caloric intake considered normal for a healthy person performing a medium physical activity respecting the ratio 1/1/4 - 1 g protein / 1 g lipids / 4 g carbohydrate. For the first experimental batch (E1), food was chosen from a large chain of fast food restaurants in the world, where a menu contained a slice of chicken wrapped in a thin layer of bread crumbs, roasted in oil, sauce, pickled cucumber, bun, fried potatoes. For the 2nd experimental batch (E2) prepared food was made entirely of pizza (fluffy top, mozzarella, tomato sauce, pepperoni, beef, olives, mushrooms, pressed ham and yellow oatmeal. the third experimental batch (E3) was given a spicy chicken thigh covered with breadcrumbs and toast, fried potatoes, mayonnaise sauce. The following indicators were the dynamics of weight gain, food consumption, haematological and biochemical analysis of blood. Following the research carried out, it was found that the fast-food type administered to the mice in the experimental groups was rich in energy and did not have a nutritional balance which led to daily average increases higher than the control group was 2.22 times in the E1 group, 1.96 times in the E2 batch, and 1.81 times in the E3 group. Also, the mice in the experimental groups had median consumption (19.72 g) with 69.7% for the E1 batch, 2.83% for the E2 batch and 7.96% for the E3 batch. All of these increased values negatively influenced the health of mice by inducing their hepatic steatosis.

Keywords*:* fast food, mice, liver steatosis, cholesterol, carbohydrates

INTRODUCTION

The concept of "fast food" refers to the prepared and served in all specialized restaurants, the expression being recognized by the Merriam-Webster dictionary since 1951, which gives it the definition of food specially designed for immediate availability but with a low attention paid to both quality and quantity *(Whithey E. et al., 2007; Simeanu D., 2015; Bowman S.A. and Viyard B.T., 2004).*

Fast-food embodies a culture of time and instantaneous efficiency, but the problem of time-saving becomes permanent in the minds of all consumers, even when time is not a relevant factor in the context. It is well known that, beyond the common tendencies in the food process at a global level, each region and every nation is distinguished by certain features that, according to fast food food critics, erode the interest in all that culinary tradition local (*Lean M. and Combert E., 2017; Ahmadi M., 2008*). As is normal, Romania does not make an exception to this general rule and, according to a Euromonitor International study, it was considered the European-wide market that experienced the highest annual average increase in the food service industry, the value of sales, and the number of locations opened during 1999-2005 *(Diaconescu M., 2003).*

MATHERIAL AND METHOD

In order to accomplish this study, four batches of laboratory mice, of which one control group (M) and three experimental groups (E1, E2 and E3) of 10 individuals each (5 males and 5 females) were formed.

The mouse is an omnivorous animal with simple digestive tract, but also requires a high consumption of food. Over the course of a day, a mouse can consume a quantity of food equivalent to its body weight. Feeding of the mice was done once a day, between 10:00-12:00, and the remainder of day 2 was collected.

In order to achieve the proposed goal, 4 different diets were used for the differential feeding of the 4 batches of mice.

Therefore, for the group (M), the diet was balanced with nutrients and a caloric intake considered normal for a healthy person performing a medium physical activity, respecting the ratio of 1/1/4 - 1 g protein / 1 g lipids / 4 g carbohydrate. Food served to the control group consisted of 200 g of rice, 300 g of chicken breast, 20 g of white bread, 200 g of carrot, 100 g of apple and 20 g of oil.

For the feeding of the 3 experimental batches, fast-food products, very popular, especially among children and young people, were used.

Thus, to the first experimental batch (E1) was given a menu from a large chain of fast food restaurants in the world weighing 108.4 g, containing a slice of chicken covered in a thin layer of bread crumbs, prepared by roasting in vegetable oil for two minutes, sauce, two slices of pickled cucumber and a bun, together with a portion of fried potatoes in vegetable oil weighing 70.06 g.

For the 2nd experimental batch (E2) the prepared food was made entirely from pizza, purchased from an international chain of restaurants with the following ingredients: fluffy top, mozzarella cheese, tomato sauce,

salami type pepperoni, beef, olives, mushrooms, pressed ham and yellow pepper.

The mice in the 3rd experimental batch (E3) received a fast-food menu consisting of a spicy chicken thigh, covered with breadcrumbs and roasted in vegetable oil, potatoes fried in vegetable oil, a mayonnaise sauce (oil-in-water emulsion containing 43.5% sunflower oil, 32% water, sugar, corn starch, mustard 6.5%, garlic powder 1.4%, milk protein, salt iodine, wine vinegar, pepper, Xantan thickeners, acidifiers such as citric acid and lactic acid, and as preservatives: potassium sorbate and sodium benzoate).

In order to homogenize all the ingredients and to facilitate their consumption, all four types of food were chopped twice and placed in Petri dishes. A uniform drying followed, resulting in a granulated dried feed, which was packaged and labeled accordingly.

For watering mice in the control group, only water was used while the experimental groups were given carbonated beverage and water administered every three days to facilitate mice 'sanitation.

Both food and carbonated beverage or water were available ad-libitum for the animals.

RESULTS AND DISCUSSIONS

To determine the basic chemical compounds from the mice ration products, the Food-Check food analyzer was used. The parameters determined were the protein and lipid content, carbohydrates and the amount of water (Table 1).

Table 1

Chemical composition and energy value of feed administered to mice

Parametrii analizaţi	Experimental batces			
	M	E1	E2	E3
Proteins (%)	5.89	7.65	11.80	7.55
Lipids (%)	6.02	12.88	31.4	5.42
Carbohydrates (%)	22.6	4.04	9.4	20.53
Energy (Kcal/100 g)	173.7	275.7	264.3	289.43

Following the analysis of the feed mixture to feed the batches to the Food-Check infrared spectrophotometer, the following results were obtained:

- for the control group (M) the total protein content was 5.89%, the fat percentage was 6.02%, the carbohydrates a total of 22.6% with an energetic intake of 173.7 Kcal, value was lower by 58.7% compared to E1, with 52.2% vs. E2 and 66.6% vs. E3;

- ❖ first experimental batch (E1): 7.65% protein, 12.88% fat, 22.3% carbohydrate, resulting in an energy intake of 275.7 Kcal, with a proteins / lipids / carbohydrates ratio of 1/0.6/1.9;
- ❖ the 2nd experimental batch (E2): protein 11,80%, fat 31,4%, carbohydrate 9,4%, energetic intake of 264,3 Kcal, with a proteins / lipids / carbohydrate ratio of 1/0.4/1.3;
- ❖ the 3rd experimental batch (E3): had a diet containing 7.55% protein, 5.42% fat, 20.53% carbohydrate, cumulating an energy intake of 289.43 Kcal with a proteins / lipids / carbohydrates of 1/1.4/0.4.

A brief analysis of the served feed highlights the fact that fast-food menus were high in energy and not nutritionally balanced.

Dynamics of weight gain

The weighing's took place at the beginning of the experimental period, on the 15th day and at the end of the experiment (day 30). The values are shown in Table 2.

Table 2

Dynamics of weight gain

S.e.	Weighing I (ziua 1)				Weighing II (day 15)				Weighing III (day 30)			
	M	E1	E2	E3	M	E1	E2	E3	M	E1	E2	E3
$\overline{X}$	19.8	19.4	22.5	19.2	22.5	30.13	31.3	28.35	28.12	37.44	38.4	33.9
$\mathbf{S^2}$	7.4	18.7	6.6	13.55	11.6	23.19	14.8	7.04	12.82	31.21	15.9	3.82
s	2.9	4.1	2.3	3.63	3.1	4.9	3.6	2.55	3.3	4.5	5.03	1.95
$\mathbf{s}_{\bar{x}}$	0.5	1.1	0.9	1.12	1.3	1.8	1.1	0.77	1.4	1.85	1.5	0.64
V%	13.07	18.2	11.2	19.01	15.02	15.96	12.5	9.41	12.04	15.67	10.2	5.76

**S.e. – statistical estimators*

At the beginning of the experimental period, the control group had an average weight of 19.8 g and the experimental batches of: 19.4 g - E1, 22.5 g - E2, 19.2 g - E3. The value of the variability coefficient was in the range of 10-20%, which shows an average homogeneity of mice weights in all four groups.

During the experimental half-year, a new weighing was carried out, registering weight gains in all batches as follows: group M weighing an average of 22.5g, the standard deviation had a slightly higher value than the first weighing, but not so much it can be said that the average has had a high degree of error. The same situation is found for the E1 and E2 batches, which recorded average weights of 30.13 g and 31.3 g, respectively. Batch E3 had an average weight of 28.35 g. The coefficient of variability was 9.41% in the 3rd batch resulting in a good homogeneity of the studied

character, and in the case of the E1 and E2 batches, the value was in the range of 10-20%, indicating the average homogeneity of this attribute.

At the end of the experimental period (day 30), average weights were 28.12 g - M batch, 37.44 g - batch E1, 38.4 g - batch E2 and 33.9 g - batch E3. For the first 3 batches (M, E1, E2), the value of the variability coefficient oscillated in the range of 10-20%, resulting in the average homogeneity, and the group E3 had a coefficient of variability of 5.76, maintaining its good homogeneity.

From the analysis of the gains obtained on weight gain, it was observed that after all 30 days, all three experimental batches achieved an average daily average increase over the control group of 2.22 times in the E1 group, 1.96 times in the group E2 and 1.81 times in batch E3 (Table 3).

Table 3

Increase in weight gain

Experimental batches	**Body weight at the beginning of the period (g)**	**Body weight at the end of the period (g)**	**ADG (g)**	**Cumulated ADG (g)**	**Tightening rate 5=(2:1)**
0	**1**	**2**	**3**	**4**	**5**
M	19.8	28.12	0.27	8.32	1.42
E1	19.4	37.44	0.60	18.04	1.92
E2	22.5	38.40	0.53	15,9	1.71
E3	19.2	33.90	0.49	14.7	1.76

Regarding the average daily gain recorded throughout the experiment, it was established that it was 0.27 g in the control group, 0.60 g in the E1 batch, 0.53 g in the E2 batch and 0.49 g in the batch E3.

From the analysis of the data presented in Tables 2 and 3, it is clear that mice that have consumed fast-food foods have achieved much larger body masses than mice in the control group up to almost double the weight - E1 group.

Food consumption

The consumption rate of the meal was consistent with the body weight achieved. It is known that there is a certain correlation between the rate of growth and the consumption of food, in that those animals with better growth perform most times with high consumption of food.

From the data presented in Table 4, there is a total consumption of 591.6 g of feed for the M batch, 1004.30 g of feed for the E1 batch, 608.44 g of feed for the E2 batch and 638.70 g of the feed for the E3 batch.

Table 4

Food consumption

Experimental batches	Food consumption recorded in 30 days (g)	The daily average consumption of food (g/zi)	Liquid consumption in 30 days (ml)
M	591.6	19.72	1980 ml water
E1	1004.30	33.47	2230 ml carbonated beverage and 550 ml water
E2	608.44	20.28	2450 ml carbonated beverage and 600 ml water
E3	638.70	21.29	2370 ml carbonated beverage and 600 ml water

Liquid consumption was 1980 ml water for batch M, batch E1 consumed 2230 ml carbonated beverage and 550 ml water, batch E2 consumed 2450 ml carbonated beverage and 600 ml water, and the E3 batch registered a consumption of 2370 ml carbonated beverage next to 600 ml of water.nFrom the data presented above, it results that mice that consumed an unbalanced nutrient-rich and energy-rich food but which also contained certain fast food-specific food additives had significantly higher food intake than mice have had a balanced diet and less energy.

Thus, in group M, the average daily food consumption was 19.72 g, while in batch E1 it was higher by 69.7%, in batch E2 by 2.83% and in batch E3 by 7.96%.

Hematological and biochemical analysis of blood

Hematological and biochemical blood tests were essential to determine the health of mice in both control and experimental batches. Following the hematological analyzes for the four batches, the values given in Table 5 were obtained.

Table 5

Hematological and biochemical analysis of blood

Nr. crt.	Parameters	U.M.	Reference values	M	E1	E2	E3
1	Red cells (WBC)	L 10^3/mm^3	3.0-15.0	10.6	10.5	2.5	2.6
2	White cells (RBC)	10^6/mm^3	5.0-12.0	9.59	9.44	7.31	8.56
3	Hemoglobin (HGB)	g/dL	11.1-18.0	15.04	13.7	12.08	12.3
4	Hematocrit (HCT)	%	36.0-52.0	42.6	44.6	36.5	38.1
5	Platelets (PLT)	L 10^3/mm^3	140-600	546	703	92	129
6	Average erythrocyte volume (MCV)	µm^3	44-69	44	46	49	45
7	Globular mean of	Pg	12.0-24.5	15.8	14.5	16.7	14.3

	hemoglobin (MCH)						
8	Concentration of mean red blood cell hemoglobin (MCHC)	g/dL	21.6-42.0	34.9	30.8	32.5	30.5

In terms of cellular elements, there are no significant differences between batches, and values fall within the normal range, but leukopenia can be observed due to medullary depressions produced by certain substances that are perceived as toxic to the body.

It is worth mentioning that even in the control group, the values are slightly increased compared to the normal range of the species, but this is due to nonspecific feeding for these rodents. Another argument would be hepatic steatosis, which was highlighted by anatomo-pathological analysis, with visible visible lipid accumulations in the liver only in mice in the experimental groups.

Biochemical blood analysis is a method of analyzing blood glucose, renal function and hydro electrolyte balance. The results are shown in Table 6.

Tabelul 6

Biochemical analysis of blood

Nr. crt.	**Parameters**	**U.M.**	**Reference values**	**M**	**E1**	**E2**	**E3**
1	Glucose	mg/dL	203.21-270.95	44	148	157	143
2	Albumin	g/dL	4.216-4.621	1.79	1.59	1.8	1.44
3	Total protein	g/dL	6.036-6.473	4,82	5.8	6.06	5.67
4	Total cholesterol	mg/dL	136.5-162.24	138	124	134	109
5	Triglycerides	mg/dL	86.45-106.11	102	120	121	119
6	TGO/AST	u/L	49.95-65.51	62	238	240	230
7	TGP/ALT	u/L	17.84-25.72	25	182	188	187

After analyzing all the results we can mention the following:

- ✓ albumin is the non-glycosylated protein synthesized by the liver parenchyma is considered an acute phase reactant, being also a global indicator of the body's nutritional status;
- ✓ Alanine aminotransferase and aspartate aminotransferase are the most important indicators for the detection of hepatic lesions, hence elevated values 2-3 times the normal, reflecting hepatic steatosis;
- ✓ Low cholesterol levels indicate severe hepatocellular lesions;
- ✓ Hypertriglyceridemia indicates a liver disease.

Morpho-pathological analysis

The liver, also called the body of the human body, is the most sensitive barometer of health, and with multiple, circulatory and metabolic

valences, it is also the organ of aggressive potential, favoring and generating varied morbid pictures at the same time.

Following a morpho pathological analysis, the liver that came from the control group showed normal characteristics, while the liver from all three experimental batches was diagnosed with liver steatosis. Although it is not a disease of its own, fatty liver is a general term used to describe the excess fat storage in the liver. It is a reversible condition characterized by a cumulative triglyceride in liver cells during the process called steatosis or abnormal lipid retention inside cells. This condition sometimes occurs temporarily or even in the long term, is not painful and can be asymptomatic for a long time.

CONCLUSIONS

Based on the research, it can be concluded that the fast-food type administered to the mice in the experimental groups was rich in energy and did not have a nutritional balance. Following consumption of such food and carbonated beverages, the mice from all three experimental batches achieved an average daily increase over the control group of 2.22 times in the E1 batch, 1.96 times in the E2 batch and 1.81 or E3. Also, mice in the experimental batches achieved average daily feedings higher than M (19.72 g) with 69.7% for E1, with 2.83% for E2 and 7.96% in the case of the E3 batch.

Following haematological and biochemical blood tests and morpho-pathological examination, it was found that the mice in the control group functioned in normal parameters and the liver had normal characteristics, while the liver from all three experimental groups was diagnosed with hepatic steatosis.

In view of the above, we can finally conclude that fast food is not a healthy solution for the population. Consumption of such products should be balanced, rational and low enough to avoid food imbalances that may have serious health effects.

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