Evaluation of food additives in some local food products and study their chemical, physiological and histological effects in laboratory mice

A Thesis

Submitted to the council of the College of Agriculture, University of Basra in Partial Fulfillment of the Requirements for the Degree of Doctor of philosophy in Food Science

(Human Nutrition)

By

Rana Dawood Salman AL-Kamil

M.Sc. Food science 1999

Supervision

Prof .Dr. Ali A. Sahi **Assist.Prof Dr. Kassim F. AbdulKareem**

1437 A.H **2016 A.D**

Summary

Due to the progressive expansion in the use of chemical additives in food processing associated with absence of quality control and loss of proper application of the international standards of food additives, making human beings exposed to high risks from ingestion of these foods which might be so mild in cases like simple poisoning and more complex like cancers, the present study was performed, which includes four axes:

The First Axis:

1- A questionnaire study of food additives: the results of which indicated that 55.42% of consumers eat packed food continuously, and most of them(61.44%) have no interest in reading the labels on the outside cover of the packaging , despite the fact that 49.39% of them consume it daily. Whereas 51.80% of consumers had no specific knowledge or familiarity about food additives, 54.14% of them do not possess any knowledge about their side effects and 77.10% of them did not know the symbols listed out.

2- A survey of some food products that used sodium benzoate as a preservative in their manufacture. The results indicated that 163 types of food samples contain sodium benzoate, including different products such as soft drinks, canned juices, sherbet, jams, tomato sauce, pickles, ketchup and ambah.

3- A survey of some food products in which sugar enters in their composition, These include 231 products which mentioned the word sugar or artificial sugar within labels on the outside without mentioning its kind .These products include: imported ice cream, jams, candies, soft drinks and diet drinks, cake, sherbet , fruit preserved in sugar solution and biscuits.

4- A questionnaire study of the market sales of locally made pickles.

The results indicated that: 71.79% of consumers frequently ate pickles in large quantities despite the fact that 48.71% of them does not have any information about sodium benzoate preservatives added to some of its , whereas 64.10% of them have no information about its side effects that result from the ingestion of these products beyond the allowable limits.

5- A questionnaire study for the market sales of locally made ice cream.

The results showed that: 77.77% of consumers ingested ice cream in large quantities despite the fact that 63.88% of them did not have any information on the sweetener saccharin added to some of its. While 62.50% of consumers possess no information about the side effects resulting from consumption of products that contain artificial sweeteners used in food processing especially when there is more than the allowable limit.

The second axis:

1- The primary detection of sodium benzoate in 50 samples of locally made pickles, of which 35 samples gave a positive result at examination that indicated presence of this substance, which constitute 70% of the total samples that have been tested.
2- Analysis of the samples with positive result in primary detection using high performance liquid chromatography technology(HPLC) to estimate the amount of sodium benzoate .The results showed that the average of concentration sodium benzoate range between 0.9125-4.3682 gm\kg and 68.57% of the total samples analyzed exceed the limit set by the Codex Alimentarius Commission.
3- The primary detection of sodium saccharin for 50 samples of locally made ice cream, the results showed that 21 samples gave positive results, which constitute 42% of the total samples that have been tested.
4- Analysis of the samples of positive result for saccharin by using HPLC showed that the average of concentration sodium saccharin range between 1.4377-4.5484 gm\kg and all the values exceed the limit set by the Codex Alimentarius Commission.

The third axis:

Side effects of sodium benzoate, sodium saccharin on the albino mice
In this experiment 42 albino mice were used and were divided into three groups , control group containing 6 mice were orally gavage with distilled water only, the second group was divided into three sections, each section contains 6 mice were orally gavage with sodium benzoate in concentrations of 300, 600 and 1200 mg / kg of body weight for the first, second and third section respectively , the third group also has three sections, each contains 6 mice which were orally gavage with sodium saccharin in concentrations of 4000 and 8000 and 16,000 mg / kg of body weight for the first, second and third section respectively.

1- Effect on the rate of weight of mice and the relative weight of the liver and kidneys: The results showed a significant decrease ($P < 0.05$) in the average weight of the mice with increasing dose of sodium benzoate and sodium saccharin compared to the control group while increased the relative weight of the liver significantly ($P < 0.05$) compared with the control mice. The same finding is observed in the kidneys.

2-The effect of sodium benzoate, sodium saccharin on some biochemical blood test which included assessing the level of liver ALT and AST enzymes .The results showed a significant increase ($P < 0.05$) in the average level of the enzymes mentioned with increasing dose of sodium benzoate and sodium saccharin compared to the average level of enzymes for the control group.

3- The effect of sodium benzoate and sodium saccharin on some blood parameters, which showed a significant increase ($P < 0.05$) in the average number of white blood cells with increasing the dose of sodium benzoate and sodium saccharin compared to the control group. While a significant decrease in red blood cells, hemoglobin and packed cells volume accompanied the increased dose of sodium benzoate and sodium saccharin compared to the control group.

The fourth axis:

The histopathological changes of the liver and kidney of mice given oral gavage of sodium benzoate and sodium saccharin revealed:

1- Liver: microscopic examination showed increasing damage of the liver tissue with increasing the dose of sodium benzoate and sodium saccharin, characterized by congestion of sinusoids of the liver and necrosis of a large number of hepatocytes and accumulation of inflammatory cells.

2- Kidneys: the microscopic examination showed increasing damage of the kidney with increasing dose of sodium benzoate and sodium saccharin. Vascular congestion and renal tubular damage with infiltration of inflammatory cells were prominent pathological findings in these animals.