

Histopathological Modifications due to Intake of Powdered Milk

M. Bilal Shahid¹, Nusrat Majeed², Anam Javed^{1*}, Safa Qadeer¹, Rimsha Safiq¹, Mudassur Ali¹, Haris Harry¹, Hamid Raza¹, Saman Fatima¹

¹School of Zoology, Minhaj University Lahore, Punjab, Pakistan

²Instructor, Department of Biology, Virtual University of Pakistan, Davis Road Campus, Lahore, Pakistan

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*Corresponding author: Anam Javed

School of Zoology, Minhaj University Lahore, Punjab, Pakistan

Abstract

Milk is considered as one of the healthiest diet because it contains proteins, calcium, iron, vitamin D and other macro and micro nutrients. But people often use powdered milk due to unawareness of its side effects on the development and growth of body. Powdered milk has all of bioactive elements which effect on body weight by depositing fats in adipose tissues. In this experimental work, two powdered milk samples: nido and everyday. Powdered milk samples were converted into liquid by treating with distilled water. For experiment albino mice (*Mus musculus*) were selected and dose was given orally for four weeks. The histopathological results of hepatic and renal tissues were found striking even onset of tumorigenesis was observed. The alterations in both hepatic and renal tissues related to necrosis, glomerular size, blood vessels' diameter and their wall thickness, lobules, bile duct and nuclear enlargement were observed. From current study it was concluded that powdered milk of any brand is not suitable for health and growth and in this regard, organized efforts of general public awareness are required.

Keywords: Powdered milk, mice, hepatic, renal, tumorigenesis, necrosis.

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1. INTRODUCTION

Powdered milk is composed of essential nutrients along with considerable amount of amino acids, fatty acids, vitamins and minerals in a specific proportion. However; powdered milk products may also comprise of hazardous chemicals and contaminants, which is basically a drawback of this demanding and economical product [7]. Moreover, reported data suggest that the presence of heavy metals and of other harmful trace elements in local powdered milk samples make them inappropriate for use [6]. Similarly, another spectroscopic study based on qualitative and quantitative analyses of local and branded powdered milk samples available in Pakistan showed that their common constituents: Ca, K, Mg, Na, P, Zn, Al, and S as nutritional elements, whereas Cd, Cr, Cu Mn, and Ni as heavy metals and such compositions may induce several health ailments among users [10].

Whereas to estimate possible health risks, mammalian model based investigations are done and in this regard, a study based on male hamsters was organized to check side effects of different types of powdered milk samples and results showed the significant decrease in serum cholesterol and

triacylglycerol levels along with lower lipids metabolism in liver tissues [2]. In addition to this, recently reported kidney damage estimation due to powdered milk consumption highlighted suppressed renal wounds' healing, myofibroblast differentiation, and renal macrophage infiltration in users [4]. Other reported health issues are different allergic reactions like casein allergic risk, body weight gain, inflammation, cytotoxicity, carcinogenesis, genotoxicity and fatal mutations [5, 11]. That's why; the need of further investigation is required to study possible side effects of locally available powdered milk.

2. MATERIALS AND METHODS

2.1 Animal Collection and Habituation

Male albino mice (*Mus musculus*) of 6 weeks age were purchased from University of Veterinary and Animal Science, Lahore. They were placed and habituated under controlled conditions at room temperature (25°C ± 2°C) humidity 40-50% for one week in animal house of school of Zoology, Minhaj University, Lahore. They were divided into 3 groups; two groups were experimental groups A and B and one was control group.

2.2 Dose Optimization

For dose optimization the solutions of powdered milk samples were made by using distilled water. For solution preparation, 50g of each sample was dissolved in 100ml of distilled water separately. Group I: (Control Group) was orally administrated with clean water. Group II: (Experimental Group A) were given 0.2ml of Nido solution. Group III: (Experimental Group B) were given 0.2ml of Everyday solution. These doses were orally administrated daily for four weeks.

2.3. Histopathology

The kidney and liver tissues were collected and fixed in formalin and their histological sections were prepared by microtomy. The slides were prepared for both tissues and stained by using Haematoxyline and Eosin staining method. Microscopic observation were noted at 40X and photomicrographs were recorded using PixelPro software [12].

2.4 Statistical analysis

Recent version of SPSS will be used for data analysis. Single factor anova will be applied [8].

3. RESULTS AND DISCUSSION

Powdered milk involves vast range of health side effect on regular use. In the current study histopathological effects of powdered milk on renal and hepatic tissues of mice was studied. The mice were treated with samples A and B and histological sections

were compared with control group, it was noticed that diameter of renal blood vessels were increased in both A & B groups. Moreover, considerable tissue area was affected due to necrosis in renal tissues and the nuclei size of these renal cells was also changed. Glomeruli size was also increased 16.6 μ m in 1st week to 20 μ m in 4th week in group A and 13.53 μ m in 1st week to 18.5 μ m in 4th week in group B (Table 1).

Similarly, variations in diameter of hepatic blood vessels were also noticed in both groups A & B. Tissue necrosis was also found in hepatic tissues of both A & B groups. In case of liver lobule size measurement, an initial decrease then increase was observed from 1st to 4th week in group A 2.22 μ m to 5.3 μ m but in 2nd week it was noticed about 11.62 μ m whereas in group B it increased suddenly in 1st week 16.91 μ m as compared to control group 5.07 μ m and then it was decreased in 4th week up to 4.54 μ m (Table 2).

In addition to this, data of bile duct size indicated rise in diameter in both A & B group from 1st to 4th week, 8.77 μ m to 12.05 μ m and 6.87 μ m to 10.78 μ m, respectively (Table 3). These all variations emphasized that powdered milk in take is not suitable for health as it affects the metabolism and physiology of consumers in different ways due to the presence of toxic metals like aluminum, dehydrating agents, contaminants and different food preservatives to increase its shelf life [1, 3, 9].

Table 1: Histopathological effects of powdered milk samples in renal tissues

Weeks	Artery diameter (μ m)			Vein diameter (μ m)			Glomerular Diameter (μ m)			Necrotic Area Diameter (μ m)	
	Control	Group A	Group B	Control	Group A	Group B	Control	Group A	Group B	Group A	Group B
1	9.64 \pm 1.1 (3)	12.6 \pm 1.02 (3)	16.6 \pm 2.56 (3)	13.5 \pm 2.5 (3)	16.6 \pm 2.56 (3)	13.5 \pm 2.5 (3)	15.54 \pm 0.92 (3)	16.6 \pm 2.56 (3)	13.5 \pm 2.5 (3)	18.5 \pm 3.3 (3)	21.03 \pm 12.5 (3)
2		10.14 \pm 2.25 (3)	13.76 \pm 1.2 (3)		13.76 \pm 1.2 (3)	14.16 \pm 2.3 (3)		13.76 \pm 1.2 (3)	14.16 \pm 2.3 (3)	9.4 \pm 0.6 (3)	19.23 \pm 5.6 (3)
3		12.37 \pm 2.9123 (3)	14.16 \pm 1.12 (3)		14.16 \pm 1.12 (3)	14.05 \pm 1.01 (3)		14.16 \pm 1.12 (3)	14.05 \pm 1.01 (3)	15.74 \pm 5.9 (3)	11.2 \pm 1.35 (3)
4		12.1 \pm 1.6 (3)	20 \pm 1.2 (3)		20 \pm 1.2 (3)	18.5 \pm 2.24 (3)		20 \pm 1.2 (3)	18.5 \pm 2.24 (3)	13.01 \pm 1.8 (3)	29.38 \pm 15.7 (3)

*Values of Mean \pm S.E.M (n). Data of respective columns were compared by employing single factor analysis of variance.

Table 2: Histopathological effects of powdered milk samples in hepatic blood vessels & cells

Weeks	Artery diameter (μ m)			Vein diameter (μ m)			Diameter of necrotic area (μ m)	
	Control	Group A	Group B	Control	Group A	Group B	Group A	Group B
1	11.2 \pm 4 (3)	9.4 \pm 1 (3)	6.02 \pm 1.3 (3)	22.6 \pm 12.9 (3)	10.46 \pm 1.8 (3)	8.53 \pm 2.8 (3)	32.23 \pm 6.63 (3)	27.16 \pm 9.76 (3)
2		10 \pm 2.7 (3)	7.2 \pm 0.8(3)		8.8 \pm 3.25 (3)	7.53 \pm 1.21 (3)	18.4 \pm 3.02 (3)	11.84 \pm 0.83 (3)
3		14.8 \pm 3.8(3)	14.3 \pm 5.7 (3)		23.7 \pm 2.02 (3)	17.65 \pm 4.2 (3)	19 \pm 8.41 (3)	14.58 \pm 5.2 (3)
4		10.2 \pm 3.45 (3)	8.7 \pm 4 (3)		17.01 \pm 5.34(3)	5.4 \pm 1.0 (3)	13.10 \pm 1.2 (3)	21.03 \pm 6.6 (3)

*Values of Mean \pm S.E.M (n). Data of respective columns were compared by employing single factor analysis of variance.

Table 3: Histopathological effects of powdered milk samples on diameters of bile duct & liver lobule

Weeks	Diameter of bile duct (μm)			Diameter of liver lobule (μm)		
	Control	Group A	Group B	Control	Group A	Group B
1	6.23 \pm 2.5 (3)	8.78 \pm 5.76 (3)	6.87 \pm 2.02 (3)	5.1 \pm 1.8 (3)	2.22 \pm 0.11 (3)	17 \pm 8.24 (3)
2		5.71 \pm 1.14 (3)	7.83 \pm 3.72 (3)		11.62 \pm 2.8 (3)	6.7 \pm 1.5 (3)
3		8.35 \pm 2.6 (3)	10.4 \pm 3.63 (3)		5.0 \pm 1.01 (3)	4.65 \pm 0.53 (3)
4		12.05 \pm 2.22 (3)	10.8 \pm 5.6 (3)		5.3 \pm 1.6 (3)	4.54 \pm 0.7 (3)

*Values of Mean \pm S.E.M (n). Data of respective columns were compared by employing single factor analysis of variance.

4. CONCLUSION

It was concluded that both selected powdered milk brands are not suitable for health and their regular intake usually causes serious health problem. So people should prefer the use of fresh and liquid milk instead of powdered one.

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