

# Morphological Changes in Liver of Albino Rats Associated with Olive Oil Diet: An Experimental Study

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## ABSTRACT

**Aim:** To see the possible effects of Olive oil on liver morphology.

**Methods:** Fifty albino rats of eight weeks age were selected and divided into five groups of ten animals each with equal number of males and females. Group A, normal control, was fed on synthetic diet, group B was on low Olive oil diet only and group C was on low Olive Oil + hypercholesterolemic diet. Group D was on high Olive oil diet only and group E was on hypercholesterolemic diet for the next 24 weeks. Histological examination was done on H&E, reticulin, trichrome and oil red O stains. Liver revealed increased Portal triad changes and lobular changes in groups E. These findings were statistically significant when compared with group A. While Bile duct proliferation, portal triad inflammation were mild in group C and D. Regarding lobular changes, groups C, D and E showed lobular steatosis while lobular fibrosis is seen in group E only.

**Conclusion:** It is concluded that Olive oil proved to be beneficial diet. It causes reduced hepatic injury in low and high concentration. Diet with high cholesterol causes marked morphological changes in liver.

**Keywords:** Olive oil, liver, portal triad.

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## INTRODUCTION

Fats are composed of mostly long chain saturated fatty acids for example, palmitic acid, stearic acid and exist in solid or semi solid state at 37<sup>0</sup>C. They are mostly derived from the animal sources. Oils contain fatty acids that are mostly unsaturated and exist in liquid form. Monounsaturated fats contain palmito oleic acid and oleic acid. Oleic acid is present in Olive oil. Polyunsaturated fatty acids (PUFA) for example, linoleic acid, are present in edible oils like corn oil, soya oil, sunflower oil, cotton seed oil and palm oil<sup>1</sup>.

Olive oil, comprising of high contents of monounsaturated fatty acids, significantly reduces serum cholesterol. Polyunsaturated fatty acids are susceptible to oxidation. LDL oxidation appears to be necessary for LDL uptake by macrophages. MUFA prevent LDL oxidation. Anti-oxidant supplements can protect cellular structure against oxidative stress and lipid peroxidation<sup>2</sup>. In an experimental model, increase in hepatic total cholesterol was observed when dietary lipids levels were increased from 12% to 20 % while protein levels were maintained at 30%. High fat diet increases responsiveness of hepatic stellate cells and fat storing cells of the liver, leading to proliferation of cells, hyperplasia of rough

endoplasmic reticulum and increased collagen synthesis<sup>3</sup>.

## METHODOLOGY

Fifty albino rats of 8 weeks age were taken for this study. The animals were randomly divided into five groups of ten rats each. Group A animals were given synthetic diet for next 24 weeks. Rest of the rats (Groups B, C, D and E) were weighed and fed on experimental diet for a total period of 24 weeks.

### Animal Grouping

- Group A, was given synthetic diet
- Group B was given low Olive oil diet only.
- Group C was given low Olive oil diet supplemented with atherogenic element.
- Group D was given high Olive oil diet only.
- Group E was given atherogenic diet only.

### Specimen Collection

The rats of group A, B, C, D and E were scarified at the end of 24 weeks. They were dissected, and livers excised. The biopsy specimens were kept in the labeled jars for fixation with 10% buffered formalin<sup>4</sup>.

## RESULTS

The detail of results are given in tables 1, 2, 3 and 4.

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Table 1: Morphological changes in group A and B

Microscopic Feature	No. of animals with positive changes		P-values (A Vs B)
	Group A	Group B	
BDP	01	02	0.12 (NS)
Portal triad fibrosis	00	01	0.23 (NS)
Portal triad necrosis	00	00	0.00 (NS)
Portal triad inflammation	02	03	0.32 (NS)
Lobular Steatosis	00	01	0.1(NS)
Lobular fibrosis	00	00	0.00 (NS)
Lobular necrosis	00	00	0.00 (NS)

Table 2: Morphological changes in group A and C

Microscopic Feature	No. of animals with positive changes		P-values (A Vs C)
	Group A	Group C	
BDP	01	04	0.51 (NS)
Portal triad fibrosis	00	02	0.00062 (significant)
Portal triad necrosis	00	00	0.00 (NS)
Portal triad inflammation	02	05	0.0031(significant)
Lobular Steatosis	00	08	0.0014 (significant)
Lobular fibrosis	00	01	0.14(NS)
Lobular necrosis	00	00	0.00 (NS)

Table 3: Morphological changes in group A and D

Microscopic Feature	No. of animals with positive changes		P-values (A Vs D)
	Group A	Group D	
BDP	01	02	0.51 (NS)
Portal triad fibrosis	00	01	0.113 (NS)
Portal triad necrosis	00	00	0.00 (NS)
Portal triad inflammation	02	04	0.0021(significant)
Lobular Steatosis	00	02	0.05 (significant)
Lobular fibrosis	00	01	0.13 (NS)
Lobular necrosis	00	00	0.00 (NS)

Table 4: Morphological changes in group A and E

Microscopic Feature	No. of animals with positive changes		P-Values (A Vs E)
	Group A	Group E	
BDP	01	03	0.00041(significant)
Portal triad fibrosis	00	07	0.0032(significant)
Portal triad necrosis	00	00	0.0016(significant)
Portal triad inflammation	02	02	0.001(significant)
Lobular Steatosis	00	08	0.00014 (significant)
Lobular fibrosis	00	05	0.0013 (significant)
Lobular necrosis	00	00	0.0021(significant)

**DISCUSSION**

Microscopic features regarding portal triad and lobular changes in group B were non-significant when compared with control group. The microscopic findings regarding BDP and portal triad inflammation were significant in group C when compared with control group. Microscopic features revealed mild to moderate type of lobular steatosis only. These mild changes were consistent with the results of, BoshnakolVa et al (1994)<sup>5</sup>, Cullen et al (1996)<sup>4</sup> and Fernandez et al (1997)<sup>6</sup>, who also observed significant morphological changes in liver of albino rats.

Microscopic examination revealed that portal triad inflammation appeared in group D is mild in nature and is statistically significant as compared to control group (A) while lobular steatosis in group D is mild to moderate in nature and difference is significant. These findings are in agreement with the results of Husveth et al (2000)<sup>7</sup>, Kratz et al (2002)<sup>8</sup> and Puiggros et al (2002)<sup>2</sup>.

Microscopic examination revealed that the number of lesions i.e. BDP, Portal triad fibrosis, portal triad necrosis appeared in group E are highly significant as compared to control group (A). Animals of group E revealed that the number of lesions regarding lobular steatosis, fibrosis and necrosis

appeared are highly significant when compared with group (A). These results are in favor of the findings of Husveth et al (2000)<sup>7</sup> and Puiggros et al (2002)<sup>2</sup>, who also observed moderate to severe type of morphological changes in liver of albino rats with such type of diet.

## CONCLUSION

It is concluded that Olive oil proved to be beneficial diet. It causes reduced hepatic injury in low and high concentration and protects liver from effects of hypercholesteremic diet.

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