Effect of choline on chronic liver disease in rats

تأثير الكولين على مرض الكبد المزمن في الفئران

By

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Introduction

Introduction

choline is considered an essential nutrient in humans, choline deficiency can lead to liver impairment.

Choline is needed to properly transport fat from the liver to cells throughout the body. A benefit of choline is cleaning the liver because choline is partially responsible for keeping the liver clear from fat build-up that can accumulate and cause harm.

choline is required for the proper metabolism of fats. In the liver, fat and cholesterol are packaged into lipoproteins called very low-density lipoproteins (VLDL) for transport through the blood to tissues that require them. Phosphatidylcholine is a required component of (VLDL) particles. Without adequate phosphatidylcholine, fat and cholesterol accumulate in the liver.

In people who have low levels of choline present within their body, some studies have found that they are more at risk for experiencing liver damage and even liver failure.

Choline is a nutrient found in many food sources, including milk, liver, eggs, peanuts, soybeans, beef ،cauliflower, whole wheat bread, and cabbage.

Food	Serving	Total Choline (mg)
Beef liver, pan fried	3 ounces*	355
Wheat germ, toasted	1 cup	172
Egg	1 large	126
Atlantic cod, cooked	3 ounces	71
Beef, trim cut, cooked	3 ounces	67
Brussel sprouts, cooked	1 cup	63
Broccoli, cooked	1 cup, chopped	62
Shrimp, canned	3 ounces	60
Salmon	3 ounces	56
Milk, skim	8 fl oz.	38
Peanut butter, smooth	2 tablespoons	20
Milk chocolate	1.5-ounce bar	20

*A three-ounce serving of meat or fish is about the size of a deck of cards.

Adequate Intake levels for choline: males 14 years and older (550 mg) and females 19 years and older (425 mg).

Prevention of liver damage was the main criterion used in establishment of these recommended level.

Wheat and bread are important parts in people food in many countries, and when bread is made from whole grains, only lack of few essential nutrients occurs.

Whole grains are rich in many components, including dietary fiber, starch, fat, antioxidant nutrients, minerals, vitamin, lignans and phenolic compounds, all of which have been linked to reduced risk of chronic diseases.

Most of the components are found in the germ and bran which are reduced in the grain refining process

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This work was carried out to:

- *Determine the organoleptic evaluation of supplemented bread with different levels of choline as compared to control sample.*

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- *Determine the diet that is containing different levels of choline also supplemented bread with the same different levels on:*

1. *food intake*
2. *body weight gain and liver weight to body weight %.*
3. *Serum Lipid fraction*
4. *Serum Liver function*

in chronic liver disease in rats.

Methodology

72 Rats

First Main Group
12 Rats

Second Main Group
60 Rats

The first main group

.Fed on basal diet

fed on basal diet containing bread

The second main group

divided into 10 sub-groups (N = 6) rats as a "chronic liver disease rats" as the following:

- **The first subgroup fed on basal diet "control positive".**
- **The second subgroup fed on basal diet containing un-supplemented bread "control positive".**

- **The treatments subgroup** fed on basal diet
+
(¼%, ½%, 1% and 1.5%)
choline chloride.

- **The others subgroup** fed on basal diet containing supplemented bread which provide the diet with
(¼%, ½%, 1% and 1.5%)
choline chloride.

✓ ***Processing procedures*** **:**

Supplemented bread with different level of choline.

Bread was supplemented with different levels of choline chloride powder {¼% (15 gm), ½% (30 gm), 1% (60 gm) and 1.5 % (90 gm)} and on account the flour it.

✓ ***Oragnoleptic evaluation*** :

- A number of 20 judges were asked to evaluate taste, appearance, external and internal color, flavor, hardness, crumb volume and highest according to the following judging scale:

Excellent	17 – 20
Very good	13 – 16
Good	9 – 12
Fair	5 – 8
Poor	0 – 4

Results

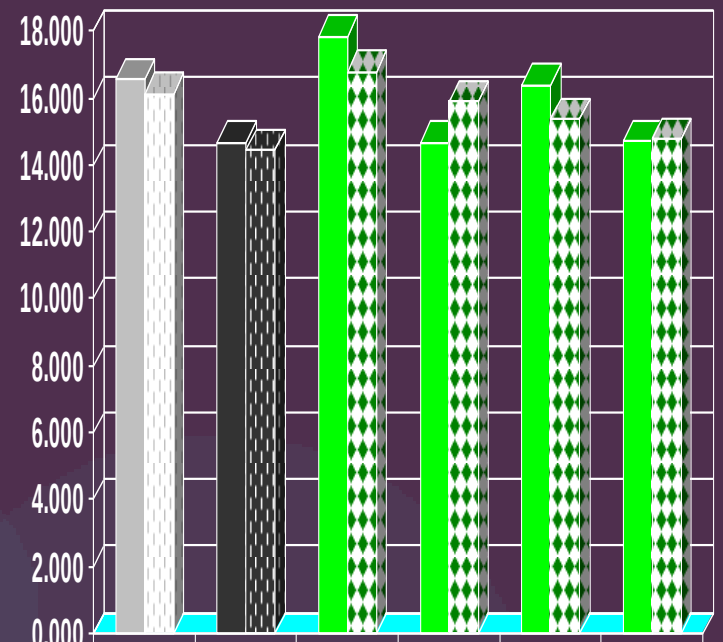
Organoleptic evaluation of supplemented bread with choline chloride as compared with control sample

Types / characteristics	Control Mean ± SD	Sup. bread with ¼% choline Mean ± SD	Sup. bread with ½% choline Mean ± SD	Sup. bread with 1% choline Mean ± SD	Sup. bread with 1.5% choline Mean ± SD
Appearance (20)	17.400 ^{A} ± 0..843	16.900 ^{A} ± 1.100	17.400 ^{A} ± 1.174	16.500 ^{A} ± 2.799	16.000 ^{A} ± 1.563
External color (15)	14.100 ^{A} ± 0.838	12.800 ^{BC} ± 0.422	13.700 ^{AB} ± 1.160	12.600 ^{C} ± 1.838	11.900 ^{C} ± 1.101
Internal color (15)	13.200 ^{A} ± 1.230	12.600 ^{B} ± 0.516	14.100 ^{A} ± 0.738	13.000 ^{A} ± 1.633	13.200 ^{A} ± 1.476
Taste (15)	14.100^{A} ± 0.838	13.500 ^{B} ± 1.354	13.300 ^{AB} ± 0.483	12.600^{BC} ± 1.647	11.900^{C} ± 1.449
Flavor (5)	4.700 ^{A} ± 0.483	4.300 ^{A} ± 0.823	3.700 ^{B} ± 0.483	3.300 ^{B} ± 0.483	3.500 ^{B} ± 0.527
Hardness (10)	8.300 ^{A} ± 1.636	7.500 ^{A} ± 1.509	7.700 ^{A} ± 1.160	7.300 ^{A} ± 1.636	7.100 ^{A} ± 1.969
Crumb volume (10)	7.800 ^{A} ± 1.316	6.400 ^{A} ± 2.011	7.600 ^{A} ± 2.221	7.100 ^{A} ± 2.183	7.200 ^{A} ± 1.316
Highest (10)	8.300 ^{A} ± 0.823	7.700 ^{AB} ± 1.494	8.400 ^{A} ± 1.174	7.300 ^{AB} ± 2.213	6.800 ^{B} ± 1.751

* No significantly different between the values had the same letter.
*Significant differences at ($p<0.05$)

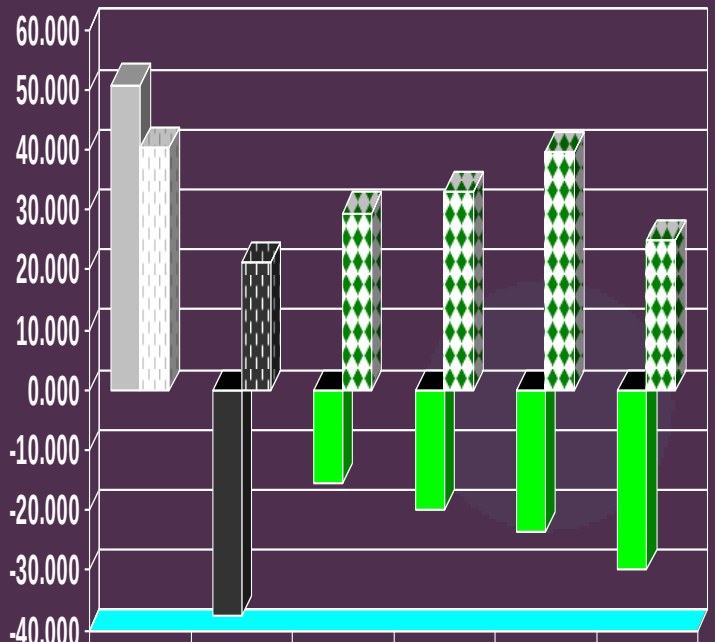
* SD: Stander deviation

Food Intake



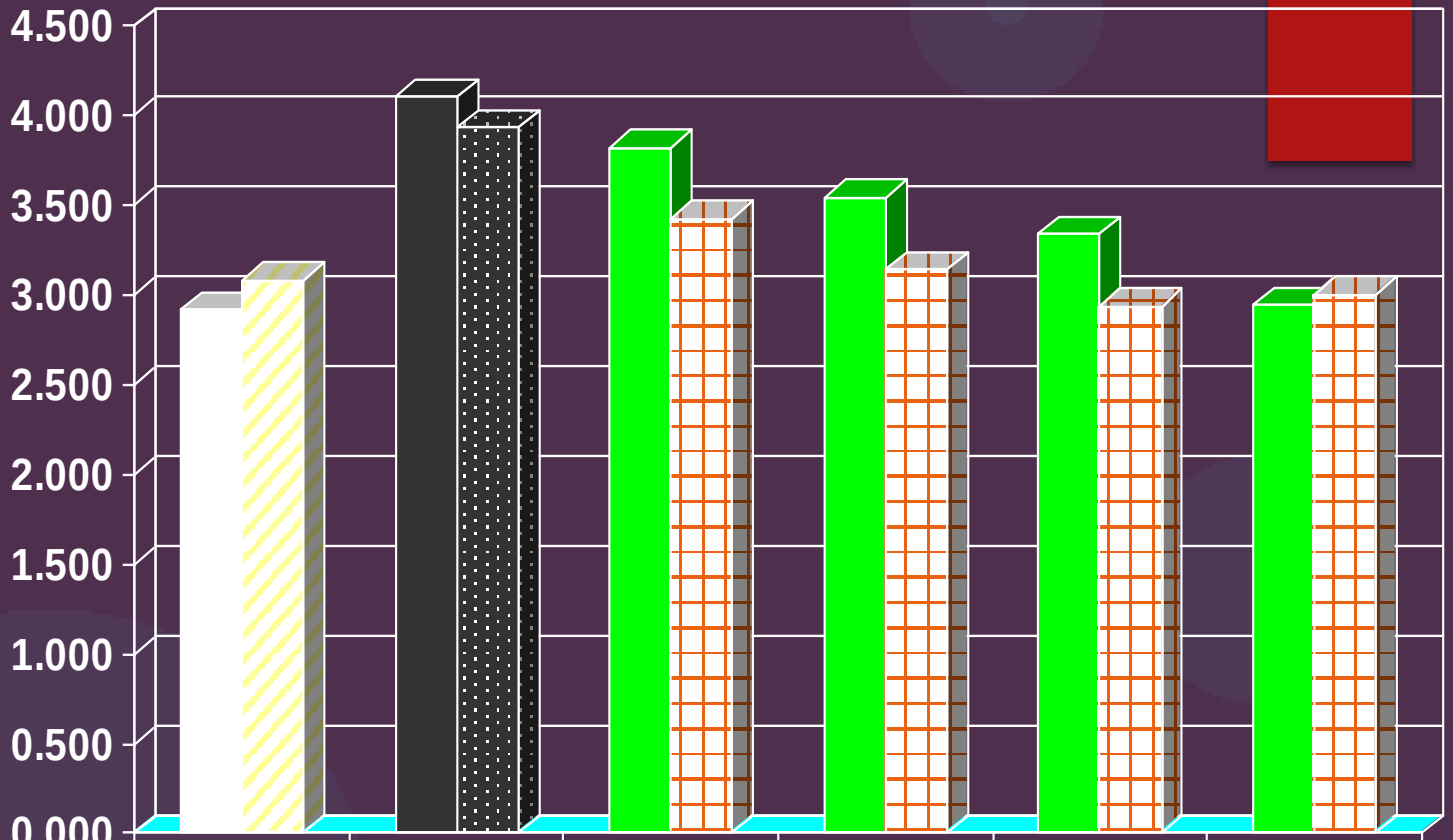
	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
B.D + Choline	16.577	14.678	17.850	14.678	16.398	14.696
B.D + Sup bread	16.131	14.458	16.785	15.893	15.387	14.762

BWG%



	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
B.D + Choline	50.865	-37.644	-15.707	-20.040	-23.730	-29.950
B.D + Sup bread	40.399	21.180	29.511	32.882	39.588	24.885

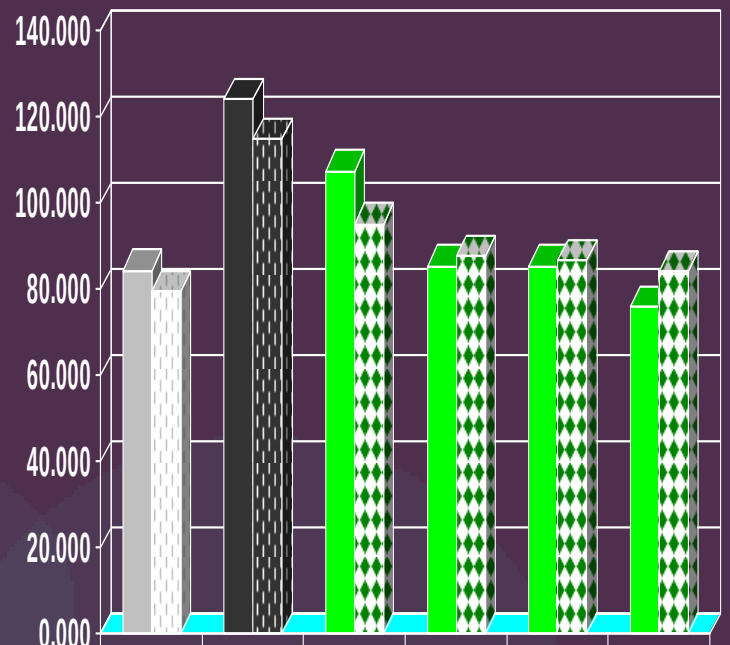
Effect of different levels of choline on food intake and BWG% in rats suffering from chronic liver disease



	C (-)	C (+)	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
B.D + Choline	2.913	4.103	3.821	3.542	3.337	2.943
B.D + Sup bread	3.080	3.931	3.421	3.137	2.935	3.002

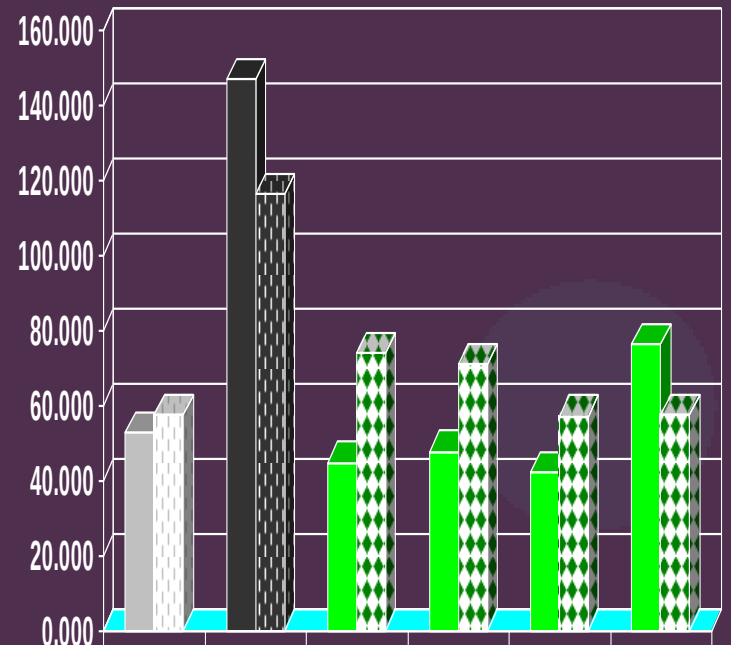
Effect of different levels of choline on liver weight / body weight % in rats suffering from chronic liver disease

Cholesterol



	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
Un-sup	84.391	123.964	107.435	85.357	85.437	75.949
Sup bread	79.481	114.824	95.202	87.758	86.665	84.092

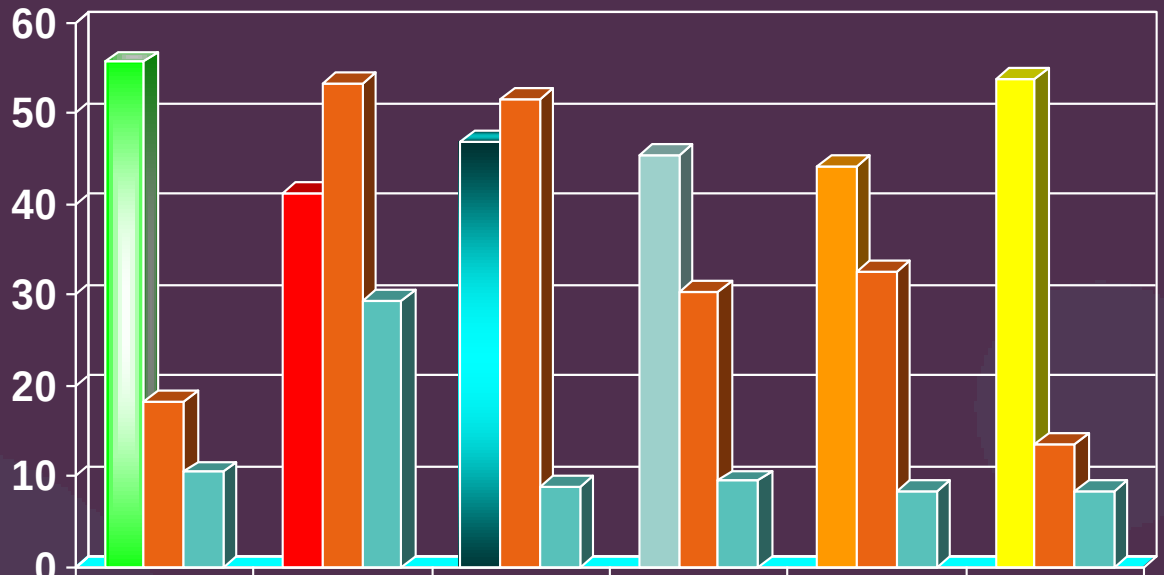
TG



	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
Un-sup	52.559	146.772	44.626	47.653	42.161	75.949
Sup bread	57.563	116.152	73.829	70.957	57.035	57.439

Effect of different levels of choline on cholesterol and TG in rats suffering from chronic liver disease

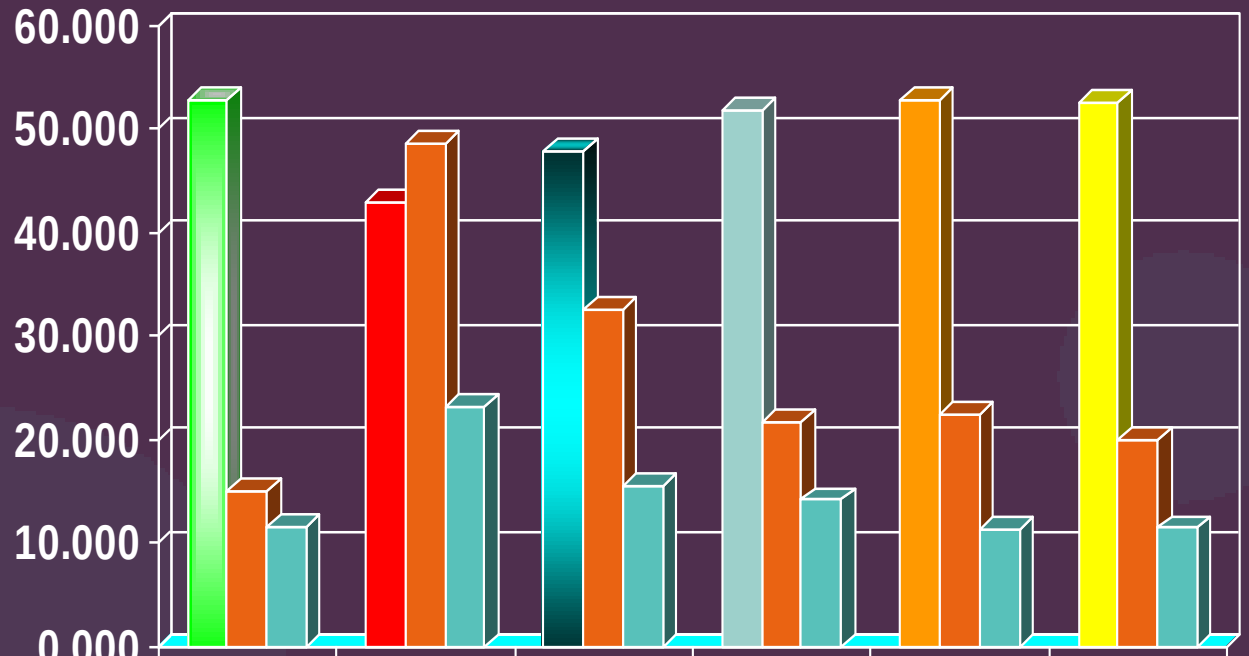
Basal diet + Choline



	C (-)	C (+)	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
HDL-c(mg/dl)	55.66	41.319	46.875	45.519	44.235	53.782
LDL-c (mg/dl)	18.22	53.322	51.637	30.308	32.623	13.673
VLDL-c (mg/dl)	10.5117	29.323	8.925	9.531	8.4155	8.495

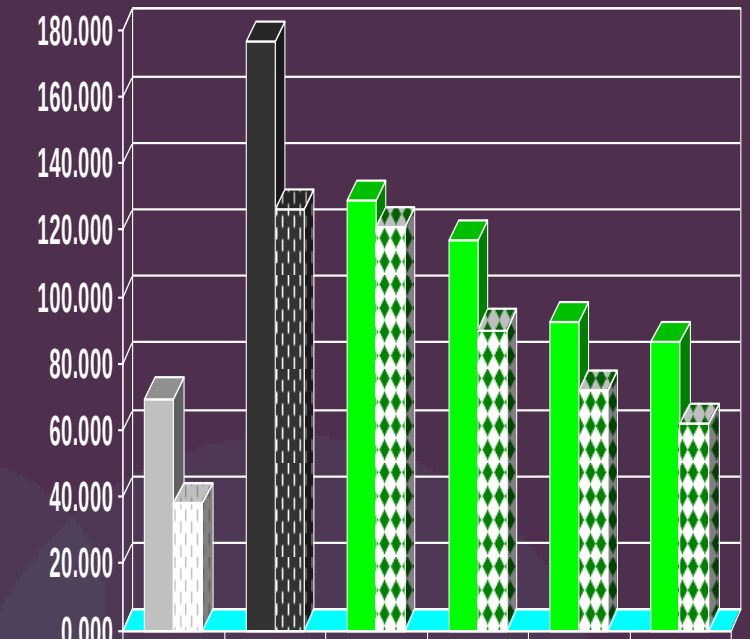
Effect of different levels of choline on low density lipoproteins cholesterol in rats suffering from chronic liver disease

Basal diet + Sup bread



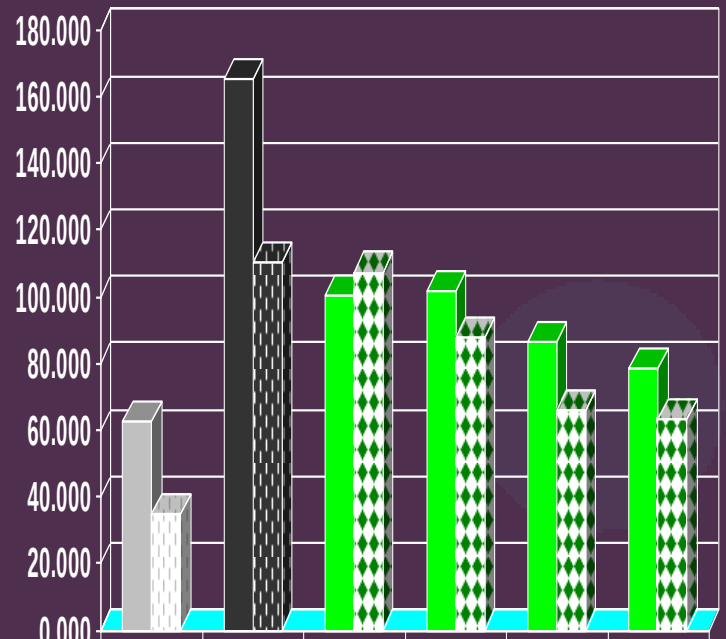
	C (-)	C (+)	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
HDL-c(mg/dl)	52.907	43.034	47.865	51.827	52.812	52.622
LDL-c (mg/dl)	15.066	48.559	32.571	21.741	22.437	19.983
VLDL-c (mg/dl)	11.513	23.230	15.599	14.191	11.407	11.488

B.D + Choline



	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
AST (u/l)	69.515	176.212	128.687	117.064	92.336	86.283
ALT (u/l)	38.115	126.195	120.990	90.000	71.790	61.780

B.D + Sup bread



	C (-)	C (+) Un-Sup	1/4 Choline	1/2 Choline	1 Choline	1.5 Choline
AST (u/l)	62.630	165.290	100.300	101.660	86.330	78.550
ALT (u/l)	34.862	110.290	107.173	87.895	66.037	63.430

Effect of different levels of choline on AST & ALT in rats suffering from chronic liver disease

Conclusion

It was found that liver damage can be reversed by supplementation of different levels of dietary choline chloride and also with the supplemented bread, which provides the diet with the same doses of choline.

Thank you