International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Evaluation of Hepatoprotective Effects of Carotenoid on Liver Enzymes of Adult Wistar Rats

Ezejindu D N, Ukoha Ukoha, Asomugha A L,

Department of Anatomy, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

Corresponding Author: Ezejindu D N

Received: 23/11//2013 *Revised: 21/12/2013* *Accepted: 30/12/2013*

ABSTRACT

This study was carried out to determine the hepatoprotective effects of carotenoid on liver enzymes of adult wistar rats following low and high consumption. Twenty wistar rats of weights 150 – 210kg were divided into four groups of five animals each. The control group A was orally administered with 0.35ml of distilled water daily; the experimental groups B,C and D were orally administered with 0.4ml, 0.5ml and 0.6ml of carotenoid respectively. Twenty four hours after the last administration, the animals were weighed, and sacrificed using chloroform inhalation method; liver tissues were removed and weighed. Blood samples were collected through cardiac puncture using sterile syringes and needles. Blood for serum preparation was collected into sterile plain tubes and stored in the refrigerator for analysis. The activities of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase (ALP) were determined using randox kit method. The final body weight of the experimental groups increased significantly ($P<0.001$) with the control. The relative liver weight of the experimental groups increased statistically with the control. The activity levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase (ALP) in the experimental groups were similar with the control. The present study therefore suggests that consumption of carotenoid at low and high doses did not cause any biochemical alterations in the liver enzymes.

Keywords: Carotenoid, Hepatoprotective, Body weight, Liver weigh, Wistar rats.

INTRODUCTION

Carotenoids are organic pigments that are found in the chloroplasts and chromoplasts of plants and some other photosynthetic organisms. There are over 600 known Carotenoids; they are split into two classes xanthophylls and carotenes. All carotenoids are produced from 8 isoprene molecules and 40 carbon atoms.[1]

In humans, three carotenoids (beta-carotene, alpha-carotene and beta-cryptoxanthin have vitamin A activity meaning they can be converted to retinal and these and other carotenoids can also act as antioxidants. In the eye, certain other carotenoids (lutein, astaxanthin and zeaxanthin) act directly to absorb damaging blue and near-ultraviolet light in order to protect the macula of the retain.[2] People consuming diets rich in carotenoids from natural food, such as fruits and vegetable are healthier and have lower mortality from a

number of chronic illnesses.[3] Although a recent meta-analysis of 68 reliable antioxidant Supplementation experiments involving a total of 232, 606 individuals concluded additional β-carotene from supplements is unlikely to be beneficial and may be harmful,[4] this may be to the inclusion of studies involving smokers-β-carotene under intense oxidative stress gives breakdown products that reduce plasma vitamin A and worsen the living cell proliferation induced by smoke.[5,6]

The physiological absorption of these fat – soluble vitamins in humans and other organisms depends directly on the presence of fats and bile salts.[7] Carotenoids have many physiological functions. Given their structure, carotenoids are efficient free-radical scavengers and they enhance the vertebrate immune system.[8] Some carotenoids are produced by bacteria to protect themselves from oxidative immune attack. The golden pigment that gives some strains of S. aureus is a carotenoid called staphyloxanthin. This carotenoid is a virulence factor with an antioxidant action that helps the microbe evade death by reactive oxygen species used by the host immune system.[9] The Liver is the key organ regulating homeostasis in the body. It is involved in almost all the biochemical pathways related to growth and many other functions in the body. Because of its unique metabolism and relationship to the gastrointestinal tract, the liver is an important target for toxicity produced by drugs, xenobiotics and oxidative stress.[10] More than 900 drugs, toxins and herbs have been reported to cause liver injury. In the absence of reliable liver protection drugs in modern medicine, a large number of medicinal preparations are recommended for the treatment of liver disorders and quite often claimed to offer sufficient relief. Attempts are made globally to get scientific evidence for these traditionally reported herbal drugs. This scenario provides a necessity to carry out research on hepatotoxicity. [10]

Hence, this study aims at investigating the hepatoprotective effects of carotenoid on liver enzymes in adult wistar rats.

MATERIALS AND METHODS

Breeding of Animals: Twenty wistar rats were procured from animal house of Anatomy Department, University of Calabar, Cross River State, Nigeria. They were bred in the animal house of University of Uyo Akwa Ibom State, Nigeria. They were allowed for a period of seven days for acclimatization under normal temperature ($27^oC – 30^oC$) and fed ad libitum with water and guinea feed pallets from Agro fed mill Nigeria Ltd.

Drug Preparation: Commercial carotenoid was obtained from Golden Neo-life Diamite (GNLD) Int-Spartan by pharmaceutical contractors Isando Raod, Isando, South Africa and purchased from No 6 Itu Road Uyo, retail outlet, Akwa Ibom State, Nigeria. One capsule of cartenoid containing 900mg was dissolved in 10mls of distilled water and administered to the animals.

Experimental Protocols: The twenty animals were weighed and allocated into four groups of five animals each. Group A served as the control and received 0.35ml of distilled water; the experimental groups B, C & D received 0.4ml, 0.5ml and 0.6ml of carotenoid respectively for a period of twenty one days orally. On the 22^{nd} day, the animals weight were taken. Twenty four hours after the last administration, the animals were sacrificed using chloroform inhalation method. Liver tissues were removed and weighed. Blood samples were collected through cardiac puncture using sterile syringes and needles. Blood for serum preparation was collected into sterile plain tubes without anti-coagulant. Serum

samples were separated into sterile plain tubes and stored in the refrigerator for analysis. The activities of serum aspartate aminotransferase (AST), alanine amino-transferase (ALT) and alkaline phosphotase (ALP) were determined using randox kit method.

RESULTS

Morphometric Analysis of Body Weights

Table1. Comparison of mean initial and final body weight and weight change in all the groups (A,B,C &D). (Mean ±SEM given for each measurement).

	GP.A	GP.B	GP.C	GP.D	F-RATIO	PROB.OF SIG
INITIAL BODY WT.	190.10± 3.60	192.80± 4.60	195.60± 6.60	198.40± 7.20	64.230	<0.001
FINAL BODY WT.	200.40± 5.50	209.30± 2.70	212.30± 4.20	215.20± 2.50	40.240	<0.001
WT. CHANGE	10.10± 2.20	17.10± 4.60	17.70± 6.20	17.60± 6.50	7.280	<0.001

The final body weight for the experimental groups B,C &D increased significantly (P<0.001) relative to the control (A).

Morphometric Analysis of Liver Weight

Table 2. Comparism of mean relative liver weight of group A and experimental groups B,C&D. (Mean ± SEM given for each measurement).

	GP.A	GP.B	GP.C	GP.D	F-RATIO	PROB. OF SIG
LIVER WT.	5.10± 0.240	5.25± 0.260	5.31± 0.320	5.42± 0.600	54.60	<0.001

The relative liver weights for the experimental groups increased significantly (P<0.001) with the control.

Activities of serum levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase (ALP)

Table 3. Comparison of Activities of serum levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase (ALP)

(Mean ±SEM given for each measurement)

	GP.A	GP.B	GP.C	GP.D	F-RATIO	PROB.OF SIG
AST	75.60± 2.60	76.70± 4.20	76.90± 6.30	77.10± 6.10	29.04	<0.001
ALT	63.20± 4.50	64.70± 6.20	64.90± 2.40	65.20± 3.50	30.10	<0.001
ALP	180.40± 3.70	181.10± 2.80	181.90± 5.20	182.30± 2.60	10.40	<0.001

The activities of serum aspartate aminostransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase (ALP) levels increased significantly (P<0.01) with the control.

DISCUSSION

Knowledge of the health attributes of plants dates back thousands of years. Today scientific research has identified essential minerals and compounds in plants that are not only required for proper nutrition, but are responsible for health maintenance and disease prevention. These health promoting compounds are referred to as phytonutrients. Carotenoids are a type of phytonutrient whose consumption has been associated with reduced risks of cancers, virus diseases, cataract and age-related macular degeneration.[2] In the present study, the mean initial and final body weight for the experimental groups treated with carotenoid

in different doses increased significantly with the control. Carotenoid in this instance functions primarily as a dietary supplement enhancing growth.

The comparison of the mean relative weight of the experimental groups with the control indicated no significance increase or decrease ($P<0.001$). This could be as a result of the antioxidant properties possessed by Carotenoid.

The activity levels of aspartate aminotransferase (AST) alanine amino-tranferase (ALT) and alkaline phosphotase (ALT) were statistically similar with the control.

CONCLUSION

Cartenenoid administered to animals in low and high doses did not induce adverse alterations in biochemical parameters of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphotase and no histopathological lesions was observed in the liver tissues.

REFERENCES

1. Armstrong GA, Heart JE (1996). Cartenoids 2: Genetics and molecular biology of carotenoid pigment biosynthesis. FASEB J.10 (2): 228-37.
2. Kidd, Parris (2011), Astaxanthin, cell membrane nutrient with diverse clinical benefits and anti-aging potential. Alternative medicine Review 16 (4).335-364.
3. Diplock AT, Charleux JL, KOK EJ, Crozier G, Rice C, Evans M, Roberfroid W, Stahi J (1998). Functional food science and defence against reactive oxidative species. British Journal of Nutrition 80 suppl. 1,577-5112.
4. Bjclakovic G et al, Nikolova D, aluud LL¸Simonetti, Gluud C (2007). Mortality in randomized trials of antioxidant supplements for primary and secondary prevention: systematic review and meta-analysis JAMA297 (8): 842-57
5. Alija AJ, Bresgen N, Sommerbury O, Siems W, Ecki PM (2004). Cytotoxic and genotoxic effects of B-carotene breakdown products on primary rat hepatocytes. Carcinogensis 25 (5): 827-31.
6. Unlu N, et al, Bohn T, Clinton SK, Schwartz SJ (2005). Carotenoid absorption from salad and Salsa by humans is enhanced by the addition of avocado oil. Human nutrition and met abolism 135 (3): 431-6
7. Linus Pauling Institute "Micronutrient information center. Carotenoids retrieved 3 August 2013.
8. β-carotene and other carotenoids as anti-oxidants from US, national Library of Medicine 2008.
9. Liu GY, Essex A, Buchanan JT et al (2005). Staphylococcus aureus golden pigment impairs neutrophil killing and promotes virulence through its antioxidant activity. Exp. Med 202 (2):209-15.
10. Jaeschke H, GJ Cederbaum AL, Hinson JA, Pessayre D, Lemastery JJ.(2002). Machanism of hepatotoxicity. Toxicol Sci 65:166-76.
11. Anusha MM, Venkateswarlu V, Prabhakaramis, Shareen TJ, Pushapa Kumari and D Ranganayakulu. (2011). Hepatoprotective activity of aqueous extract of portulaca oleracea in combination with lycopene in rats. Indian journal of Pharmacology; 43(5) 63.

How to cite this article: Ezejindu DN, Ukoha U, Asomugha AL. Evaluation of hepatoprotective effects of carotenoid on liver enzymes of adult wistar rats. Int J Health Sci Res. 2014;4(2):31-34.

****