www.jmscr.igmpublication.org

Impact Factor 3.79
ISSN (e)-2347-176x
crossref DOI: http://dx.doi.org/10.18535/jmscr/v3i9.23

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

# Histopathological study of the effect of Ultraviolet light on the liver injury healing in Rats (Sprague-Dawley)

Authors

**Abdulbari A Al.faris[1], Luay Ahmed Naeem[2], Ammar Maatoq Hashim[3]**

Department of Surgery, Veterinary Medicine College, University of Basrah-Iraq

**ABSTRACT**

*The aims of this study was to investigated the role effect of Ultraviolet light on healing of liver injury in rats. fifteen adult healthy rats were used. It is divided in to two groups, treated group (Ultraviolet group) (9 rats), and control group (6 rats), for histopathological study 45 days post operation. The liver injury was done in the each rats after general anesthesia by scalpel. post-operation, in treated group, the rats were exposed to Ultraviolet light for 30 minute/daily (the rats exposed 5 days weekly) to period 45days continuously , but in control group, the rats leave without treated. In control group, the histopathological study of the prepared slides of the 45 day postoperative showed diffused enlargement of hepatocytes and congested of central vein and only minimal periportal fibrosis. In UV light group, the histopathological section showed the periportal fibrosis, also fibrosis around a portal artery. Minimal vacculation and enlargement of hepatocytes, also showed bile duct proliferation, diffuse enlargement of hepatocyte, septal fibrosis and mononuclear cells. Several areas of lobules with septal Fibrosis. Conclusion, the healing of the liver injury in treated group rapid from control group.*

***Keywords***- *Liver, Rat and Ultraviolet light.*

## INTRODUCTION

The liver is a vital organ of the digestive system present in vertebrates and some other animals. It has a wide range of functions, including detoxification, protein synthesis, and production of biochemicals necessary for digestion. The liver is necessary for survival; there is currently no way to compensate for the absence of liver function in the long term, although new liver dialysis techniques can be used in the short term[1]. This gland plays a major role in metabolism and has a number of functions in the body, including glycogen storage, decomposition of red blood cells, plasma protein synthesis, hormone production, and detoxification. It lies below the diaphragm in the abdominal-pelvic region of the abdomen. It produces bile, an alkaline compound which aids indigestion via the emulsification of lipids. The liver's highly specialized tissues regulate a wide variety of high-volume biochemical reactions, including the synthesis and breakdown of small and complex molecules, many of which are necessary for normal vital functions [1] .The liver is the only human internal organ capable of natural regeneration of lost tissue; as little as 25% of a liver

can regenerate into a whole liver. Regeneration is very rapid. The liver will return to a normal size in 1 to 2 weeks following the removal of greater than 50% of the liver by mass [2]. Ultraviolet light as a medical treatment has been used since the beginning of the century. The technique is merely using UV light to stimulate the immune system and various enzyme systems. It is a tested and proven therapy that has accomplished incredibly miraculous cures with absolutely no side effects, and yet until recently it has been suppressed and ignored by American medicine [3]. UV light has been used in disinfection for many years, and it is still used for that purpose. It requires little sophisticated equipment, no complicated drugs, and it cures by stimulating the body's own immune response and various enzyme systems [4]. A small quantity of blood is treated with UV light (photoluminescence) and amazing things happen upon re-injection into the bloodstream. The body's defenses are rapidly organized to destroy all invading organisms whether viral, bacterial or fungal. The author cites two cases, husband and wife, who both had the flu. One treatment completely reversed the system in both patients within two hours[3]. The Physiologic effects of Ultraviolet radiation include Bactericidal on motile bacteria Increased vascularization of wound margins Hyperplasia and exfoliation Increased Vitamin D production Excitation of calcium metabolism Tanning [5].

## MATERIALS AND METHODS

Fifteen healthy male rats were brought from a Basrah local markets and kept under proper management conditions at Basrah Veterinary College. Their ages ranged between 6-8 months with a body weight of 200-250 gm. The animals were divided into two groups, group I (control) and group II (treated group), with 9 rabbits in treated group and 6 rabbits in control group. A mixture of Xylazine and ketamine at ratio of 1:0.5 was injected IM (intramuscularly) to induce general anesthesia, the dose of ketamine was 50mg/kg, and dose of xylazine was 5mg/kg (Xylazine, Sanofi; Sante Nutrition, Laballasrere-3301, Libonne Codex, France; Ketamine, Rotex-medicr GMBH, Germany) [6].

In each rat, laperatomy operation, make incision by scalpel to the liver and control on the bleeding and suturing the injury by make only stitch from catgut 0/2usp, the control group was treatment only with systemic antibiotic orally, while the second group was exposed for 30 minutes daily to ultraviolet radiation, (the rats exposed 5 days weekly) for 45 days and giving systemic antibiotic orally, however, the ultraviolet irradiation process was performed by special restraint of the rats by keeping in the UV light box fig(1) and at 40cm distance from the irradiation source. histological evaluation was collected from the liver including a part of the liver edge on the 45 days postoperative. The specimen was preserved in 10% formalin solution for slide preparation, which was later stained with hematoxylen and eosin stain.

**Fig (1)** UV light box and irradiation of animals

## RESULTS

In control group, the histopathological study at 45 day postoperative showed diffused enlargement of hepatocytes in Fig (4,5) and congested of central vein and only minimal periportal fibrosis in Fig (6,7). In Uv light group, the histopathological section showed the periportal fibrosis, also fibrosis around a portal artery in Fig (8,9). Minimal vacculation and enlargement of hepatocytes in Fig(10), in other slides showed Several areas of lobules with septal Fibrosis in Fig (11,12,13) , also showed the bile duct proliferation, diffuse enlargement of hepatocyte in Fig (14,15,16). septal

fibrosis and mononuclear cells in Fig (17). Conclusion: in positive control group with injuried to the liver, showing the bile duct proliferation and enlargement of hepatocyte and only minimal periportal fibrosis. In UV light group showed enlargement of hepatocyte, motre periportal fibrosis and one to several septal fibrosis, also a portal artery enclosed by fibrosis and alarge area of altered hepatocyte with fibrosis.

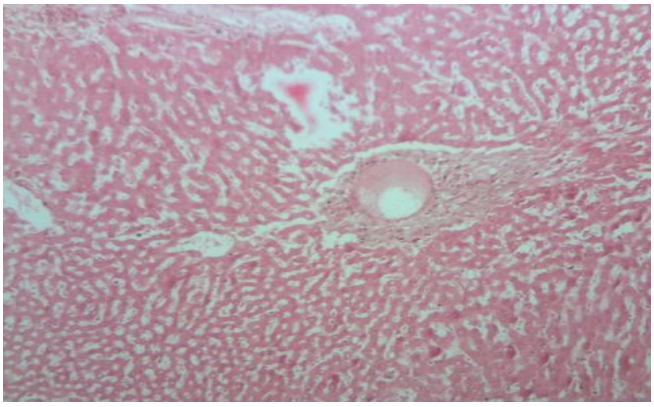

**Fig (2)** normal liver, central vein, with minimal dilation of semisolid x10

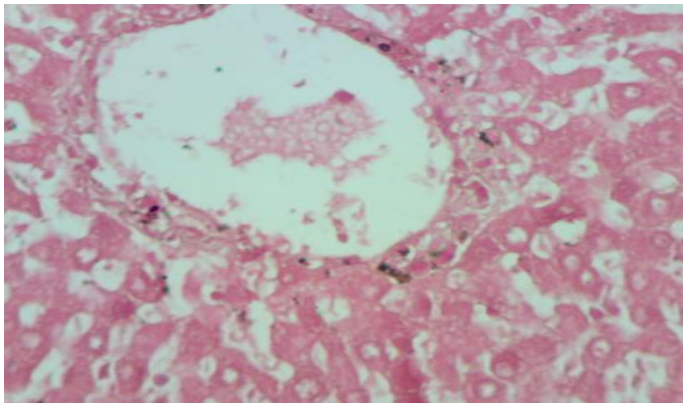

**Fig (3)** normal liver, central vein x40.

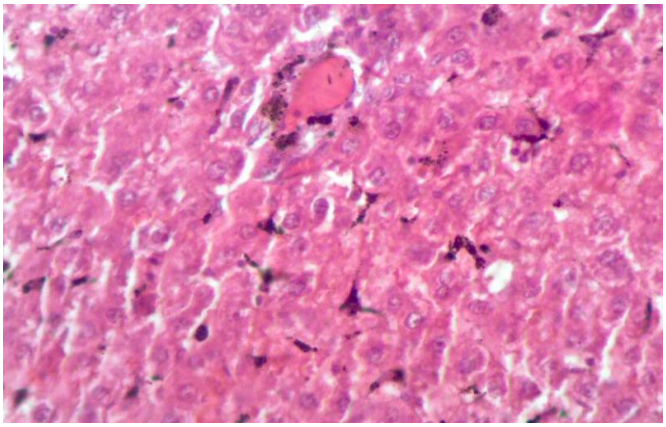

**Fig (4)** control group (45 days) diffuse enlargement of hepatocytes x40.

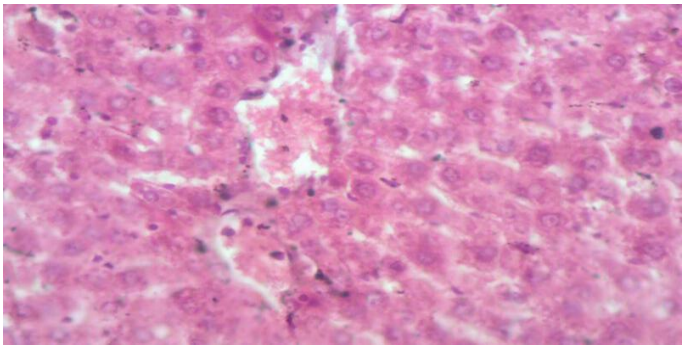

**Fig (5)** control group (45 days) diffuse enlargement of hepatocytes x40.

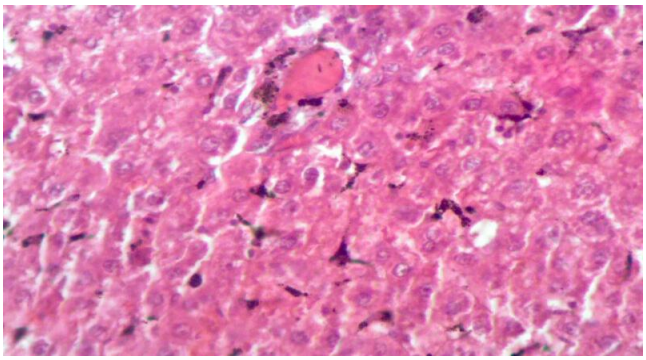

**Fig (6)** control group (45 days) congested of central vein and enlargement of hepatocytes x40.

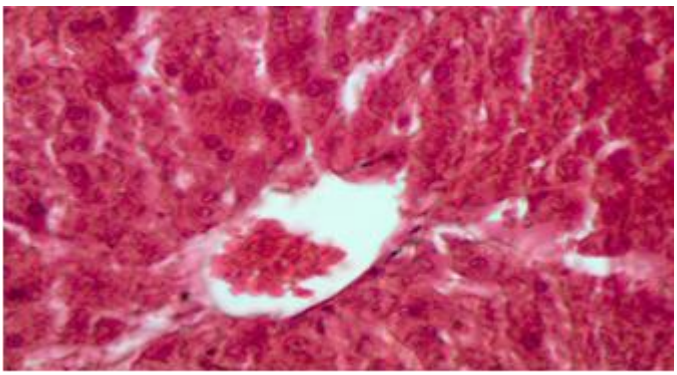

**Fig (7)** control group central vein and enlargement of hepatocyte x40.

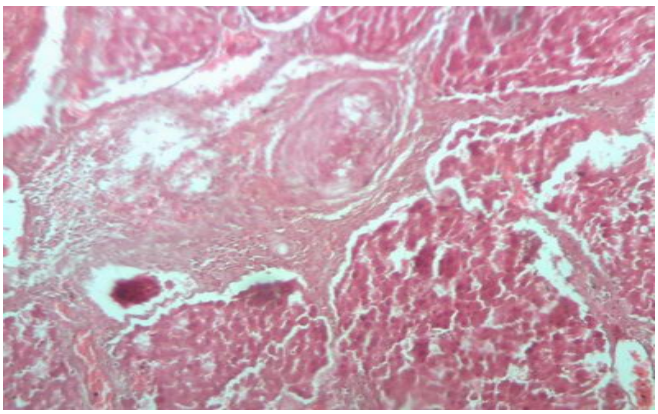

**Fig (8)** UV light group at(45days)fibrosis around portal artery and periportal fibrosis x40.

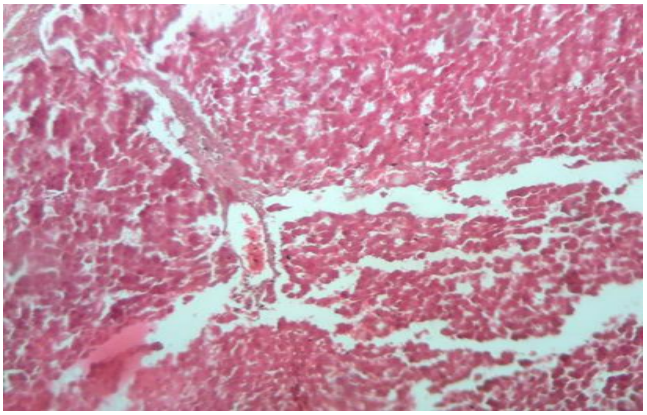

**Fig (9)** UV light group (45 days) septal fibrosis x40.

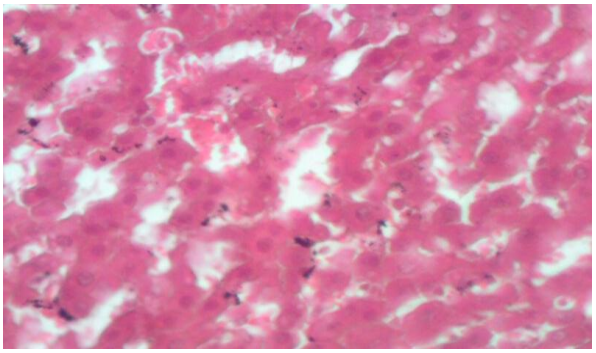

**Fig (10)** UV light group (45 days) enlargement vacculated hepatocyte x40.

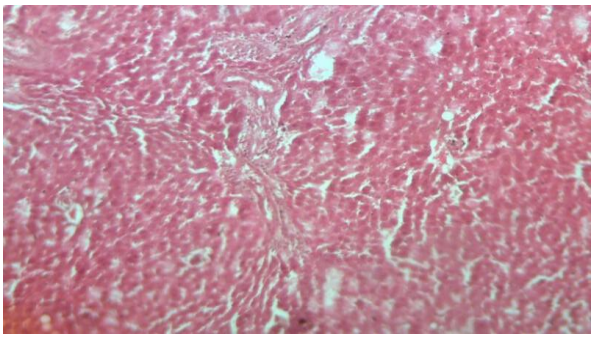

**Fig (11)** UV light group(45days)several areas lobules with septal fibrosis x40.

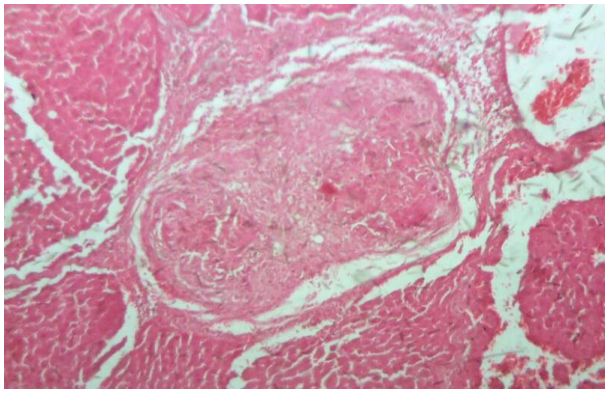

**Fig (12)** UV light group (45 days) periportal fibrosis and septal fibrosis x10.

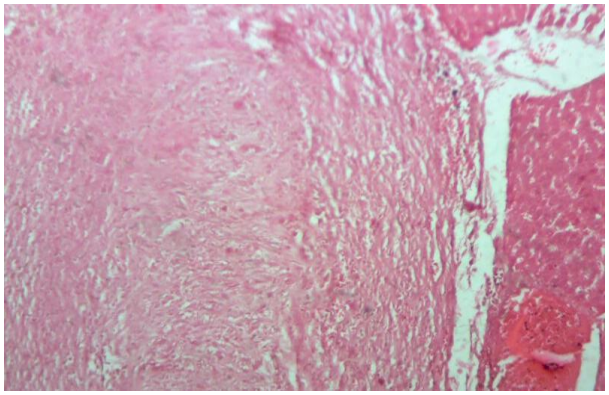

**Fig (13)** UV light group (45 days) large area of altered hepatocyte with fibrosis x10.

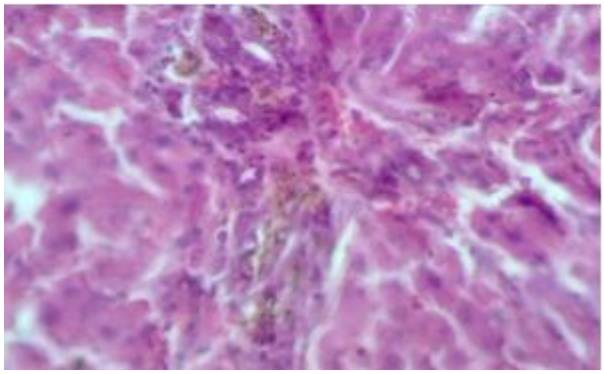

**Fig (14)** UV light group(45 days)bile duct proliferation, periportal region x40.

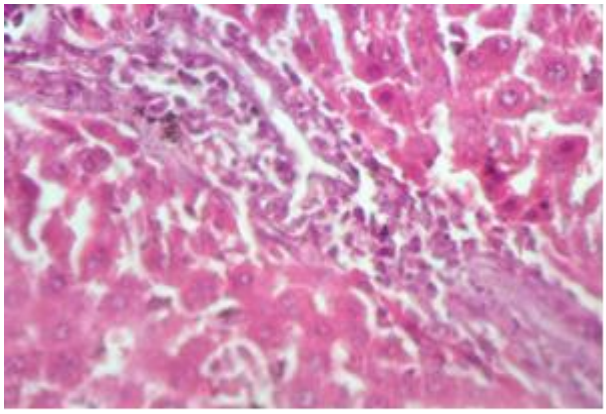

**Fig (15)** UV light group (45 days)bile duct proliferation in periportal and minimal periportal fibrosis x40.

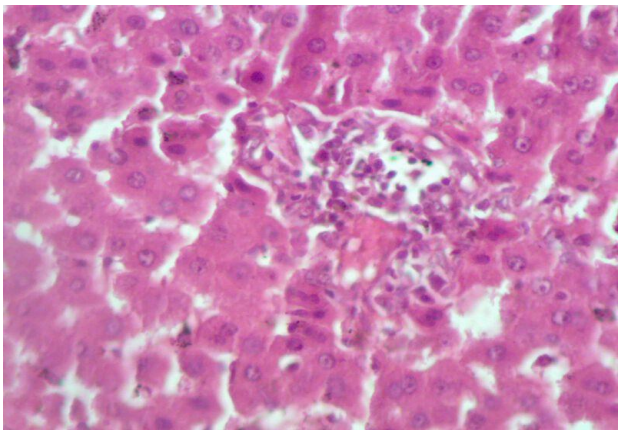

**Fig (16)** UV light group (45 days) bile duct proliferation x10.

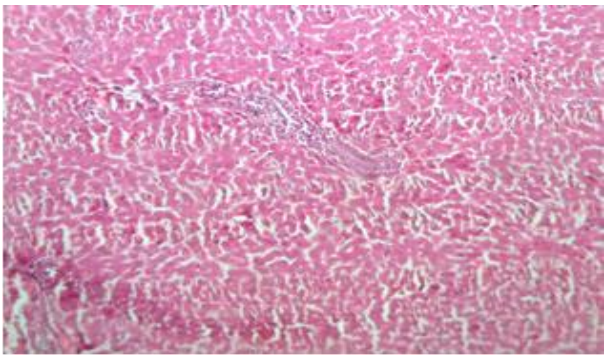

**Fig (17)** UV light group (45 days) diffuse enlargement of hepatocyte and focus of mononuclear x40.

## DISCUSSION

UV light therapy (photoluminescence) has the remarkable ability to allow the ill body to make rapid readjustments back to normal biological self-regulation. The self-regulatory abilities of the body are really responsible for the many healings of medical science. No drug can cure an illness -- unless the body's own mechanisms are functioning correctly [3]. The results showed the effectiveness of ultraviolet light on the healing of liver in rats. In control group showed diffused enlargement of hepatocytes and congested of central vein and only minimal periportal fibrosis ,this results agreement with Ramadori et al [7] which found during liver damage a large number of cytokines are synthesized locally among which TGF-β, TNF-α, platelet-derived growth factor and insulin-like growth factor-I are thought tobe special importance for liver fibrogensis. The processes of liver repair and fibrogensis rememble that of a wound healing process. Following injury and acute inflammation response take place resulting in moderate cell necrosis and extracellular matrix dammage. After that the tissue repair take place where dead cells are replaced by normal tissue with regeneration specialized cells by proliferation. Not present any studies on this research. A UV lamp that emits ultraviolet radiation similar to sunlight and thus produces vitamin D3 in the skin Vitamin D is an important nutrient for intestinal calcium absorption for optimal skeletal health. Vitamin D can either be ingested from the diet (vitamin D2 or D3) or produced in the skin (D3). Vitamin D (vitamin D2 or D3) absorption from the diet occurs primarily in the duodenum and jejunum. Vitamin D3 (cholecalciferol) is the form of vitamin D that can be produced endogenously in the skin following ultraviolet B (UVB) radiation. After production in the skin, vitamin D3 is converted to the major circulating form of vitamin D, 25-hydroxyvitamin D3 (25(OH) D3). Circulating 25 (OH) D3 is then converted to 1,25- dihydroxyvitamin D3 by the kidney 1-α-hydroxylase to act as a steroid hormone to increase the efficiency of calcium absorption primarily in the duodenum to maintain proper serum calcium levels for skeletal health and other cellular signaling processes[8]. Vitamin D was considers antioxidant in the body and can accelerated the regeneration of liver. Vitamin D is an important secosteroid hormone with pleiotropic effects . While its role in the regulation of calcium and bone homeostasis is well established, recently there is increasing recognition that vitamin D has immunomodulatory, anti-inflammatory and anti-fibrotic properties and plays an important role in the regulation of cell proliferation and differentiation. These extraskeletal effects are relevant in the pathogenesis and treatment of many causes of liver diseases[9]. Liver regeneration is regulated by growth factors, cytokines, and other endocrine and metabolic factors. Calcium is important for cell division, but its role in liver regeneration [10].

Less UV exposure is required to kill bacteria in the human body than is necessary in the laboratory. When a small part of the infected bloodstream is

exposed to UV light for less time than is required to kill bacteria in the laboratory, the pathogenic bacteria in the body are usually completely destroyed. In fact, many organisms are destroyed by an amount of irradiation that merely stimulates normal body cells. Blood cells are huge compared to bacteria and are stimulated, while the same UV dosage kills the bacteria. Also, certain significant amounts of two photo-sensitive amino acids -- phenylalanine and tyrosine -- that are absent in most body cells. These amino acids absorb additional UV energy that kills the bacteria. Other effects of UV irradiation of the blood include increased effficiency of oxygen exchange, dilation of coronary arteries, rapid reversal of paralytic ileus (paralyzed gut following surgery), prevention and reversal of thrombophlebitis, restoration of normal autonomic nervous system balance, and dramatic relief in 80 percent of asthma patients. Ultraviolet irradiation typically causes the body to eliminate uric acid more rapidly, suggesting usefulness as a treatment for gout, gouty arthritis, bursitis and other inflammatory conditions of muscles and joints[3]. Vitamin D is a fat-soluble vitamin important for several biological processes, particularly bone formation and immune function. Vitamin D is either absorbed from food or produced in the skin after exposure to sunlight. In recent decades, researchers have discovered that a healthy liver is necessary to maintain adequate levels of vitamin D in the body. Many kinds of liver diseases that cause damage to the liver can result in low levels of vitamin D in the body. Vitamin D deficiency is a common problem in chronic liver disease and is closely associated with disease severity[11].

## REFERENCES


1. M. Anthea, J. Hopkins, Ch. W. McLaughlin, S. Johnson, M. Q. Warner, D.LaHart and Wright J. D., Human Biology and Health. Englewood Cliffs, New Jersey, USA: Prentice Hall. ISBN 0-13-981176-1.OCLC 32308337. 1993.
2. D. Häussinger., Liver Regeneration. Berlin: De Gruyter ed.. p. 1. ISBN 9783110250794. 2011.
3. D.O. McDonagh., The Healing Power of Light Photoluminescence: UV Lght Irradiation inthe Laboratory. 1997.
4. S. Barnhart and E. Contributor, Medical Use of Ultraviolet Lights. 1997.
5. E. S. Thomas, M.D. ,P. Gonzalez, M.D and S. Cuccurullo, M.D., Modalities that use physical energy for their therapeutic effect. Physical Medicine and Rehabilitation Board Review.2004.
6. B.S. Maggie , A.A. Karl , E.R. Harvey and August , H.B., Effect of a short-term fast on Ketamine-Xylazine anesthesia in Rats. J Am assoc Lab Animals Sci. 50(3):344-348. 2011.
7. G. Ramadori , F. Moriconi , I. Malik and Dudas, J., Physiology and pathophysiology of liver inflammation damage and repair. Journal of Physiology and Pathophysiology, 59, suppl 1,107-117. 2008.
8. P. Chandra1, L. Linda., T. R. Ziegler1, J.Tian, M. Luo, A. A. Stecenko, T. C. Chen, M. F. Holick, and Vin T., Treatment of vitamin D deficiency with UV light in patients with malabsorption syndromes: a case series. 1Graduate Program in Nutrition and Health Sciences and Department of Medicine, Atlanta, GA,USA. Published in final edited form as: Photodermatol Photoimmunol Photomed. October ; 23(5): 179–185. doi:10.1111/j. 1600-0781.2007.00302.x. 2007.
9. M. T. Kitson, S. K. Roberts., D-livering the message: The importance of vitamin D status in chronic liver disease Department of Gastroenterology, The Alfred, Melbourne, Australia Journal of Hepatology vol. 57 j 897–909. 2012.
10. L. Lagoudakis, I. Garcin, B. Julien, K. Nahum, D. A. Gomes, L. Combettes, M. H. Nathanson, and Thierry T., Cytosolic Calcium Regulates Liver Regeneration in the Rat. Hepatology. August; 52(2): 602–611. doi:10.1002/hep. 23673. 2010.
11. S. Nair., Vitamin D Deficiency and Liver Disease. Gastroenterol Hepatol (N Y). Aug; 6(8): 491–493. 2010.