EFFECT OF HE-NE LASER ON BLOOD SERUM TESTOSTERONE AND TESTICULAR TISSUE IN ADULT MALE RATS

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Abstract:

The current study was conducted to examine the effect of He-Ne laser therapy on the blood serum testosterone level and testicular tissue in adult male rats. Thirty five Albino Western adult male rats aged 3-4 months and weighing approximately 250-300 g were used and divided in to three groups. The testicular tissue of rats in the first treatment was exposed to a dose of irradiation 1.02 j/cm^2 (40 second) once daily for three successively days, while second treatment was exposed to a dose of irradiation 2.03 j/cm^2 (80 second) once daily for three successive date, while the third group remained without any treatments (control).

The results showed that the process of irradiation adversely affected on the level of blood serum testosterone in the first and second treatment compared to the normal level in the control group. The histological examination in treatment one showed low reduction in numbers of sertoli , leydig and spermatid cells at day one, while in day two showed medium reduction in numbers of sertoli , leydig and spermatid cells,and high reduction in numbers of sertoli , leydig and spermatid cells in day three of irradiation. In treatment two, the results showed medium reduction in numbers of sertoli , leydig and spermatid cells at day one, while in day two showed high reduction in numbers of sertoli , leydig and spermatid cells and very high reduction in numbers of sertoli , leydig and spermatid cells in day three of irradiation . In conclusion the current study revealed that steers factor cause reduction in numbers of sertoli , leydig and spermatid cells lead to low fertility rate within increasing of duration and repetition of irradiation.

Keywords: *- He-Ne laser, Rats, Testosterone*

Introduction:

Laser has many biomedical applications since it can be used in medical fields, in bio-stimulation of various organs, at low energy level in speeding up the wound healing process and it has the ability to stimulate the formation of epithelial cells, and it reduces the inflammatory phase during the healing process (Meikha, 2005). The irradiation of diode laser 830 nm, at a dose 28.05 j/cm2 in rats affected on both qualitative and quantitative changes of the epithelial cells in seminiferous tubules, and showed no effect on sertoli cells, yet there was an increment in spermatids number (Taha and Valojerdi , 2004). While the irradiation of He-Ne laser at a dose of 1 j/cm2 and treating the rats with serotonin in their peritoneal cavity protect them from the negative effects of irradiation (Omran *etal*., 2001). Another study on rats using Nd-Yag laser, the irradiation accelerated the spermatogenesis process, and a temporary reduction in testicular interstitial tissues (Huyan and Ren , 1986).The use of He-Ne laser on rams at three different doses (high, medium and low) showed that both medium and low doses have prolonged sperms vitality (Jiuming,1989). The aim of this study was to evaluate the effect of He-Ne laser irradiation (5mw) on the level of serum testosterone, and the testicular tissue of adult rats.

Materials and Methods:

This study was conducted at Salahaddin University - Erbil - College of Agriculture, Department of Animal Resource, from September 2011, until March 2012. In this study 35 male rats (western albino) aged 3-4months and weighed about 250-300 g. The rats were kept in cages at a temperature of 21ċ, and exposed to a photoperiod of 12/12 hours (light/darkness), while free access to standard diet was in the form of pellets. The rats were kept in cages for 10 days prior to the beginning of the experiment, and randomly divided into three groups, each of the first and second groups included 15 rats, while the third (control) group included 5 rats. The testicular tissue of rats in the treatment one (T1) were irradiated once daily for three successively days to a dose of 1.02 j/cm^2 for (40 seconds), and treatment two (T2) were irradiated once daily for three successively days to a dose of 2.03 j/cm^2 for (80 seconds),

while the third group (control) remained without any treatment. After a period of 24 hours from each irradiation process in (T1 &T 2) samples of blood serum and testicular tissue were collected for histopathological examination.

Histological biopsies were installed in neutral formalin solution. According to (Drury *et al*., 1976), the formalin fixed samples were processed, sectioned and stained. The procedure was carried in the laboratory of Histopatholgy, Department of Pathology, College of Medicine, University of Salahhadin – Erbil. The thickness of the microtome sections ranged from 4-5 micrometers, while the prepared slides were stained with Hematoxylin and Eosine stain.

Results:

Serological Examination:

Results showed that the irradiation affect adversely on the level of serum testosterone in (T1&T2), which was decreased with repeated irradiation during three successive days, while the control group remained within the normal level (Table 1).

Table (1): Results of testosterone hormone level concentration in blood serum of radiated and control groups.

Irradiated Rats	T1	T2	Control
	Testosterone conc. in blood serum (ng/ml)	Testosterone conc. in blood serum (ng/ml)	Testosterone conc. in blood serum (ng/ml)
Day one	1.97	1.6	-
Day two	0.86	0.44	-
Day three	0.22	0.11	-
Without irradiation	-	-	3.54

Histopathological Examination:

Treatment One

The results indicated low reduction in the numbers of Sertoli , Leydig and Spermatid cells during the first day of exposing while medium reduction at day two, and high reduction at day three for all cells. As shown in the table (2) and figures (1-3).

Table (2): Results of Histopathological Examination of T1, T2 and Control Groups

Types of Cells	**T1**			**T2**			Control
	Day one	Day tow	Day three	Day one	Day tow	Day three	
Sertoli Cells	Low Reduction	Medium Reduction	High Reduction	Medium Reduction	High Reduction	V. High Reduction	Normal
Leydig Cells	Low Reduction	Medium Reduction	High Reduction	Medium Reduction	High Reduction	V. High Reduction	Normal
Spermatid Cells	Low Reduction	Medium Reduction	High Reduction	Medium Reduction	High Reduction	V. High Reduction	Normal

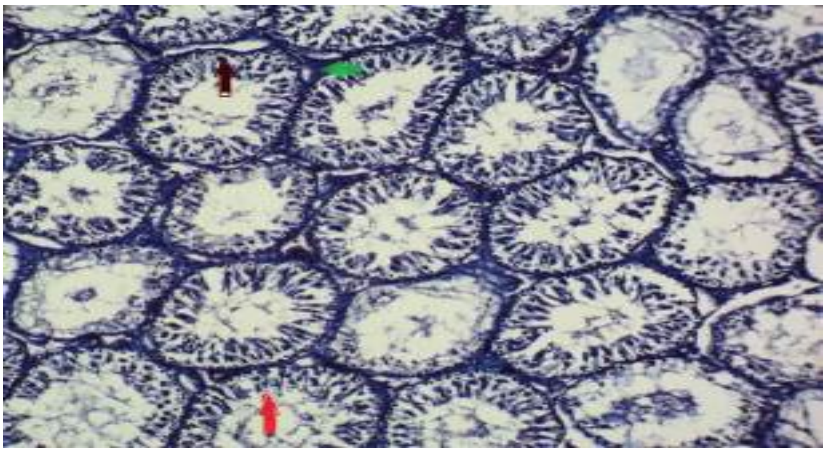

Figure (1): Shows histological changes of rats testis cells irradiated (T1) for day one. Low Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

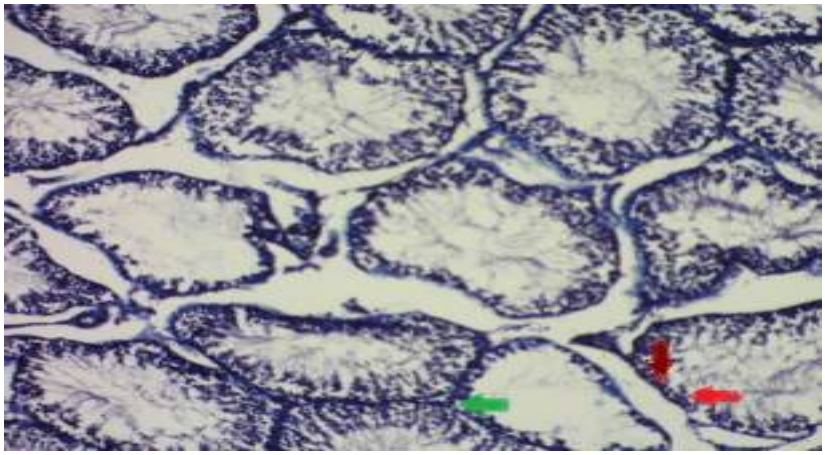

Figure (2): Shows histological changes of rats testis cells irradiated (T1) for day two. Medium Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

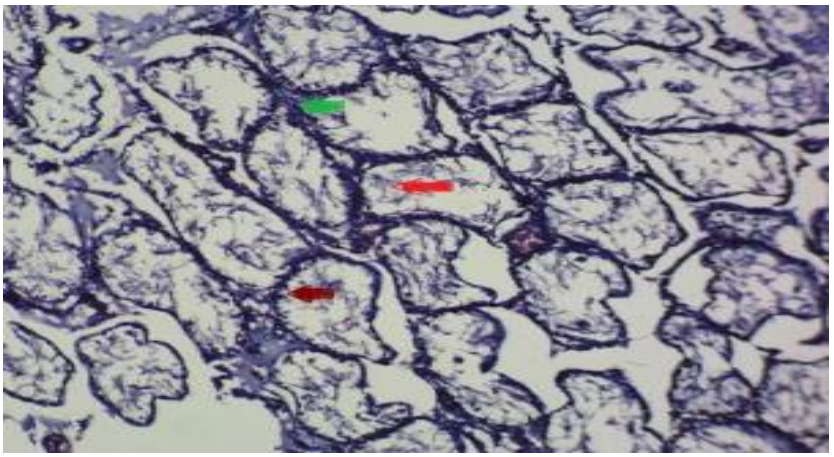

Figure (3): Shows histological changes of rats testis cells irradiated (T1) for day three. High Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

Treatment Two

The results indicated medium reduction in the numbers of Sertoli , Leydig and Spermatid cells during the first day of exposure while high reduction at day two, and very high reduction at day three for all cells, as shown in the table (2) and figures (4-6).

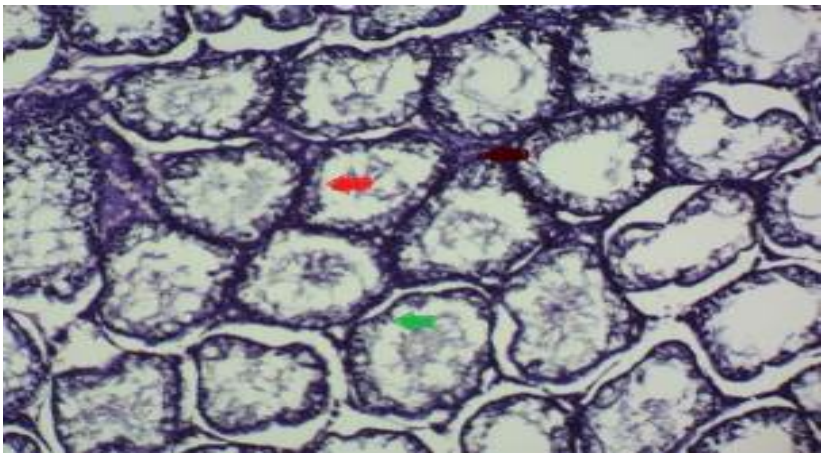

Figure (4): Shows histological changes of rats testis cells irradiated (T2) for day one. Medium Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

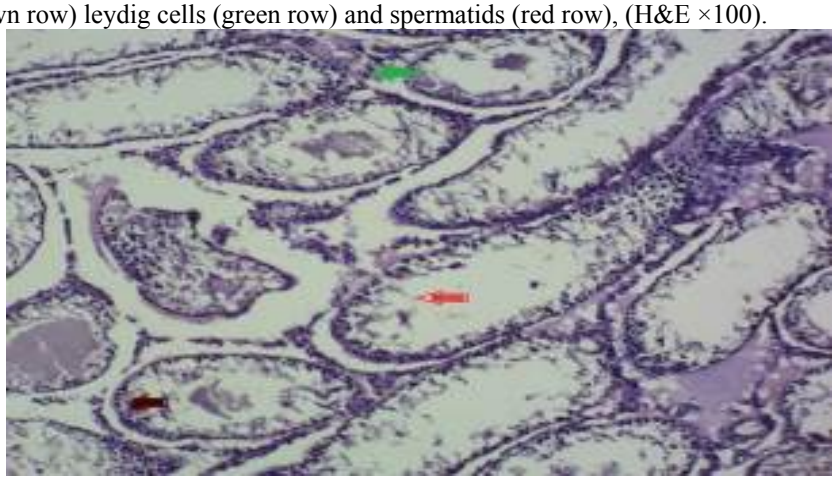

Figure (5): Shows histological changes of rats testis cells irradiated (T2) for day two. High Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

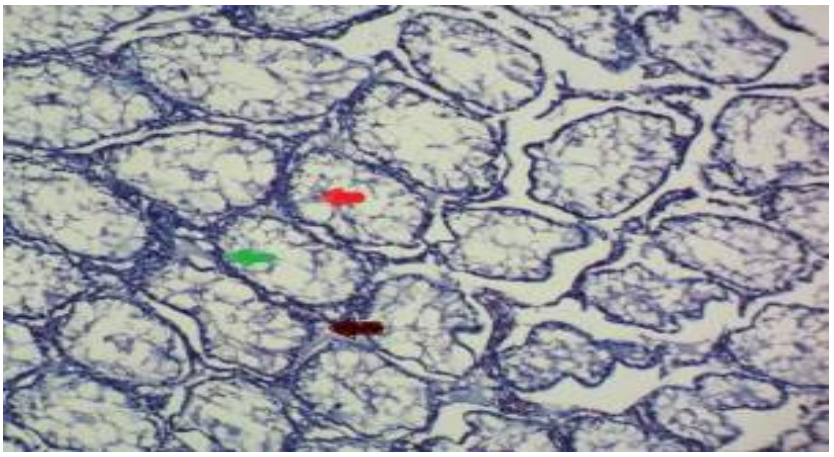

Figure (6): Shows histological changes of rats testis cells irradiated (T2) for day three. V. High Reduction in sertoli cells (brown row) leydig cells (green row) and spermatids (red row), (H&E ×100).

Control group

Results showed a normal structure of testicular tissue. As shown in figure (7).

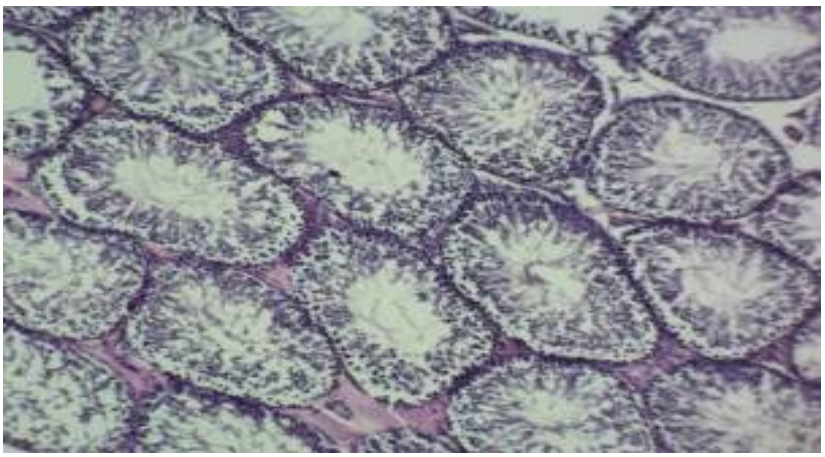

Figure (7): Shown the normal histological section of rats testis cells of (control group), (H&E ×100).

Discussion:

Recently (Mailankto *etal*., 2009) claimed that stress and pollution increase in our daily life due to the development in technology and the misuse of chemical materials, the study showed that rats exposed to mobile phone waves for a duration of one hour daily for a period of 28 days decreased semen quality and consequently fertility. The normal level of testosterone in the blood serum of male rats ranges from 3.51-3.96 ng/ml (Bartke *etal*., 1973, Najim, 2012). Results of our study showed that the average testosterone concentration in adult male rats in the control group was 3.54 ng /ml. While in (T1&T2) showed reduction in the level of testosterone with the increasing of number and length of the period of irradiation. The results agree with those Omran *etal*., (2001) who reported the adverse effect of He-Ne laser on rats blood serum testosterone concentration without using serotonin as a protective agent from laser irradiation, which acts in maintain the necessary cholesterol level to form testosterone in leydig cells. The natural formation of testosterone hormone in leydig cells is made by fats and interaction between (LH) and its receptors in leydig cells (Arthur *etal*., 1998). Irradiation works on the inhibition of testosterone hormone formation process, and this might be explained by the effect of laser on (LH) receptors in testicular interstitial tissue, which proved by (Orr and Mann, 1992). The stress increase glucocorticosteroid hormone level that adversely affects receptors in leydig cells, which leads to decrease in testosterone levels. (Knoll, 1991) pointed that stress generally affects on LH hypothalamo-pituitary- testis axis which leads to decreased in both (LH) and testosterone levels. While Irine *etal*., (1980), showed a decrement in testosterone level as a result of stress which leading to an increase in deposited lipid droplets in leydig cells and consequently reduction of testosterone level.

Histological results in the present study showed that irradiation with He-Ne laser affected in both (T1&T2) adversely affected the numbers of leydig cells, and this disagree with the results of Irine *etal*., (1980) who reported the stress had no effect on morphological and pathological changes of leydig cells during earlier stress days. On other hand histological results showed that the irradiation adversely affect the numbers of sertoli cells in (T1&T2) and cause increasing with the duration and repetition of irradiation .This result disagree with those reported by Taha and Valojerdi , (2004) who reported that the sertoli cells in rats testis were not affected by laser irradiation. Since male fertility and sperm formation process depend mainly on sertoli cells, therefore any damage to sertoli cells will adversely affect the process of spermatogenesis (William and Jing, 2005) that's agree with current study. The stress causes inhibition on spermatogenesis stages, by affecting hypothalamo-pituitary-testis axis, as well as fat accumulation in testicular interstitial tissue and thus there will be sever cellular degeneration (Rai *etal*., 2003). Finally our study revealed that steers factor which cause reduction

in numbers of sertoli , leydig and spermatid cells lead to low fertility rate within increasing of duration and repetition of irradiation.

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كاريگەرى تيشكى ليْزەر هيليْوم – نيْون بەسەر ئاستى هۆرمۆنى نيْرينە لە مەسلى خۆين لەگەل شانەى گونى نيْرەى جورجى بالغ.

پوختە:

ئەم تۆيْژينەوەيە ئەنجام درا بە مەبەستى تاقيكردنەوەى كاريگەرى چارەسەرى تيشكى لليْزەر هيليْوم– نيْون بەسەر ئاستى خەستى هۆرمۆنى نيْرينە لە مەسلى خۆين لەگەل شانەى گونى نيْرەى جورجى بالغ . سى و پيْنج جورجى نيْرى بالغ جۆرى ويستن ئەلبالينۆ بە تەمەنى 4-3 مانگ بە كيْشى 300-250 گم بەكار هات وە دابەش كرا بۆ سىْ گروپ.

گروپى يەكەم شانەى گون بەر تيشك كەوت بە برِى 1.02 جول/ سم^2 (40 چركە) رۆژانە يەك جار بۆ سىْ رۆژى يەك بەدواى يەك. گروپى دووەم شانەى گون بەر تيشك كەوت بە برِى 2.03 جول/ سم^2 (80 چركە) رۆژانە يەك جار بۆ سىْ رۆژى يەك بەدواى يەك. بەلاّم گروپى كۆنترۆل (گروپى سيْيەم) بەبىْ بەركەوتنى تيشك مايەوە. لە دەرئەنجامدا دەركەوت كەوا تيشك كاريگەرى نيْگەتيفى هەبوو لەسەر ئاستى خەستى هۆرمۆنى نيْرينە لە مەسلى خۆيْنى جورجەكانى بۆ هەردوو گروپى يەكەم و دووەم، بە بەراورد لەگەل گروپى كۆنترۆل. كاتيْك دەرئەنجامى پشكنينى شانەيى لە گروپى يەكەمدا دابەزينى كەمى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى يەكەم ، وە دابەزينى ماماوەندى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى دووەم. بەلاّم دابەزينى بەرزى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى سيْيەم. لە گروپى دووەمدا دابەزينى ماماوەندى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى يەكەم ، وە دابەزينى بەرزى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى دووەم. بەلاّم دابەزينى زۆر بەرزى لە ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيدى دەرخست لە رۆژى سيْيەم. لە دەرئەنجامى ئەم تۆيْژينەوەيە دەركەوت كاريگەرى شەكەتى هۆكارە بۆ دابەزينى ژمارەى خانەكانى سيسْرتۆلى، لەيدك وە سپيْرماتيد كە ئەمەش هۆكارە بۆ دابەزينى ريْژەى پيتيْن لە ئەنجامى زۆرى ماوە و دووبارە كردنەوەى تيشك.

تأثير أشعة الليزر – هليوم نيون على مستوى هرمون الشحمون الذكري في مصل الدم و النسيج الخصوي في ذكور الجرذان البالغة

الخلاصة :

اجريت هذه التجربة لأختبار تأتيثر أشعة الليزر – هليوم نيون على النسيج الخصوي و مستوى هرمون الشحمون الذكري في مصل دم الجرذان البالغة. أستخدمت في هذه الدراسة خمسة و ثلاثون جرذا ذكرا بالغا من نوع ويسترن ألباينو بأعمار تتراوح مابين 4-3 أشهر و أوزان 300 -250 غم و قسمت الى ثلاثة مجاميع .

المجموعة الاولى تم تعريض النسيج الخصوي الى الاشعاع بجرعة 1.02 جول/ سم2 لمدة (40 ثانية) مرة واحدة يوميا و لمدة ثلاثة أيام متتالية. المجموعة الثانية فقد عرضت الى الاشعاع و بجرعة 2.03 جول/ سم^2 لمدة (80 ثانية) مرة واحدة يوميا و لمدة ثلاثة أيام متتالية. في حين ان مجموعة السيطرة (المجموعة الثالثة) فقد تركت بدون معالجة أشعاعية. أظهرت النتائج بان عملية الاشعاع أثرت بشكل سلبي على تركيز مستوى هرمون الشحمون الذكري في مصل الجرذان للمجموعة الاولى و الثانية مقارنة بالمستوى الطبيعي لمجوعة السيطرة. بينما أظهرت نتائج الفحص النسجي في المجموعة الاولى ان التشعيع أدى الى أنخفاض طفيف في أعداد خلايا كل من سيرتولي ، ليدك و سليفات النطف في اليوم الاول من المعالجة. اما في اليوم الثانى كان الانخفاض متوسط في اعداد الخلايا الانفة الذكر. في حين ان زيادة التعرض في اليوم الثلث أدى الى أنخفاض كبير في اعداد كل من كل من سيرتولي ، ليدك و سليفات النطف. اما المجموعة الثانية أدى التشعيع الى أنخفاض متوسط في أعداد خلايا كل من سيرتولي ، ليدك و سليفات النطف في اليوم الاول من المعالجة. اما في اليوم الثانى كان الانخفاض عاليا في اعداد هذه الخلايا. في حين ان الانخفاض كان عاليا جدا في اعداد كل من كل من سيرتولي ، ليدك و سليفات النطف في اليوم الثالث. نستنتج من ما تقدم بأن التشعيع بالليزر – هليوم نيون يؤدي الى انخفاض في اعداد كل من خلايا سيرتولي، ليدك و سليفات النطف مما يؤدي الى أنخفاض في معدل الخصوبة و يزداد هذا التأتثير السلبي بزيادة الجرعة و تكرار فترة الاشعاع .