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RESEARCH ARTICLE

Biophysical Effect of Electromagnetic Radiation on Sex Ratio of White Mice

Q. KH. AL-dulamey[1], YasirA. Al-Jawwady[2], A. H. Ismail[3]

1. Collegeof Science /BiophysicsDepartment/Universityof Mosul
2. College of Science /Physics Department/University of Mosul
3. College of Education/BiologyDepartment/University of Mosul

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Corresponding Author

Q. KH. AL-dulamey

Abstract

The present research aims to find the biophysical effect of electromagnetic radiation on the number of overall mice offspring and the number of female and male mice offspring and sex ratio for male and female mice too of marry to (exposed female x normal male **).** The results showed that the decreasing in number of the offspring for overall, male and female white mice as well as sex ratio decreased $P<0.05$ for male mice at 100,150 and 200 $\mu W/cm^2$ comparison with control group, but the female sex ratio had increased in comparison with control group at 100,150 and 200 $\mu W/cm^2$.

INTRODUCTION

Due to the effect of mobile phone **(Dasdag *et al* , 1999)** found harmful effect in rat male when exposed to radioic frequency of mobile phone . He obtained from during exposed experimental group of rats male to radioic frequency for (1) month at period (2 hours/day) , the number of epididymal sperms were decreased and also diameter of seminiferous tubules of rats were decreased when were compared with control group .while no any different in shape of normal sperms .

The dangerous from the exposure of mobile phone and which is make men sterile contact with number of sperms and obtained problems in their motion and structure . Many studies refer to these radiations can cause to a change hormon secreation as result for legdig cell denaturation and sertoli cell which is do to reproductive the cell **(Roosli *et al* ,2004).**

The searcher **(Wang *et al* ,2003)** was obtained in his studied on mice that the leydig cell which was more cell to become exposed to electromagnetic radiation and the problems in the cell often effect on the sperms structure . Using mobile phone cell and bring it due to near the reproductive organics for along time can effect on the men with sterile because of the negative effect on sperms quality by decrease number of sperms and powerful of it on motion rather than the different in shape **(Agarwal *et al* ,2008: Geny , *et al* 2007) .**

In study to know effect of electromagnetic radioic frequency with 50 GHz sperms count and weight of testis and in reproductive organics in rats male ,where **(Singh and Behari ,2005)** found that decrease in sperms count in epididymis while he found no any different in weight of rats testis which exposed to this electromagnetic wave compared with control group and the number of sperms cell decreased significant in seminiferous tubular in rats which exposed for one and two hours .

In another study both (**Kim *et al* , 2007)** show the effect of electromagnetic field with 2.45 GHz in spermatogenesis cell of rats male which exposed for one or two hours per day . After 8 weeks from the exposure the quantum analysis for leydig cell showed increase in number of this cell rather than increase in level of serum

testosterone and found decrease in number of generating cell to spermatocytes in seminiferous tubular in rats which exposed to radiation while no any change obtain in control group . As well as **(Salama *et al* , 2010)** found that the rabbits which exposed to radioic frequency at low intensity obtained decrease in diameter of seminiferous tubular .

Finally in the study of **(Falzone *et al* , 2010)** which was found that the continuous exposure to electromagnetic field with low frequencies lead to Apoptosis for germ cell of testis in mice from Balb/c while no important effect appear on body weight and weight of testicular but appeared increase in death of germ cell for testis . The results refer to take place Apoptosis in spermatocytes .

Materials and method :

White mice were used in this study *Mus musculus* which range between 2-3 months of age and 23 -30 gm of weight . Healthy these mice were obtained from the collage of veterinary in Mosul University . They were kept in plastic cages supplied with metal lids (20x30x15 cm dimensions) steps were taken to ensure good hygiene , and changing the sawdust weekly . and feeding mixture which consists of 35% wheat ,34% corn 20% soybean , 10 % protein and 1% dried milk . They were also supplied with water along the time of experimentation **(Aljanabi,2008).**

Work System :

The system is made of source of generating microwaves aimed at the mice with 5 GHz frequency , with different power densities in microwatt units/ cm^2 . The instruments were connected to the internet with six hour exposure daily ,it is known that the power density is provided the internet . as Diagram (1).

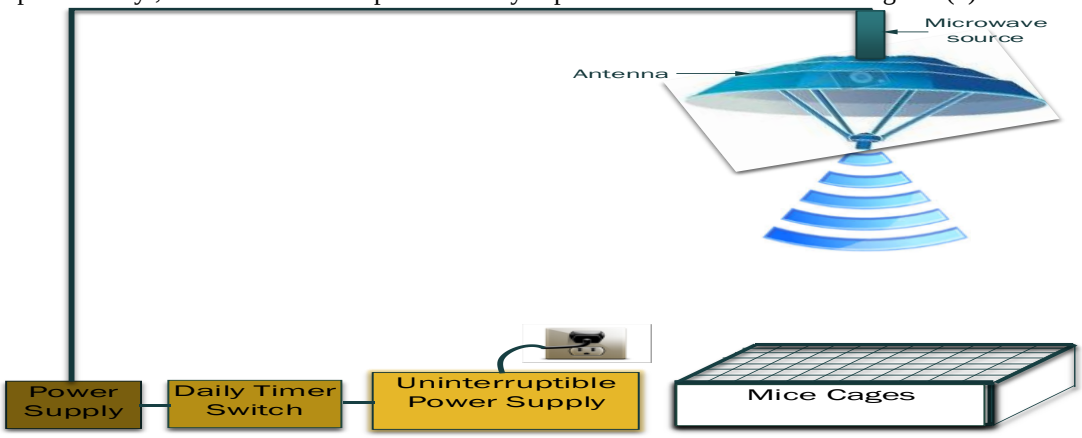
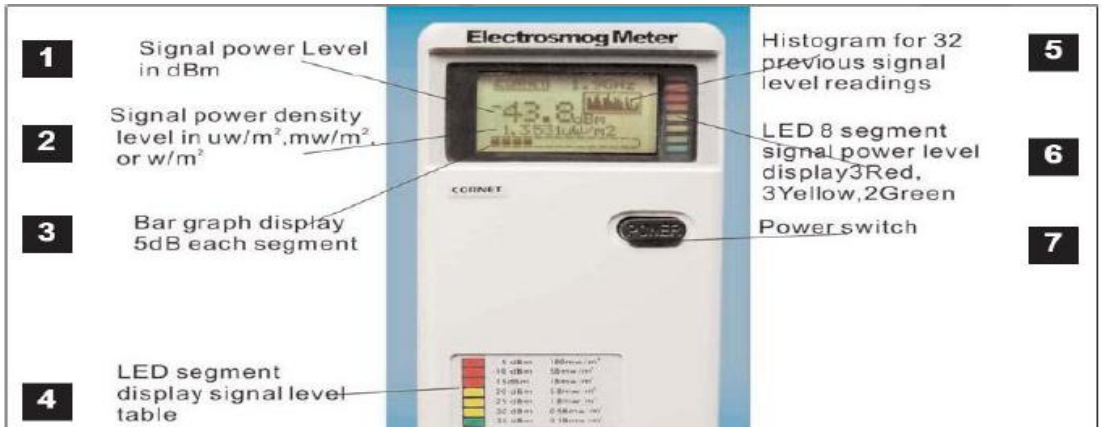


Diagram (1): work set up

The power meter was used to determine the power density during the first stage radiation power density level meter microwave . This instrument is used to measure the density power of electromagnetic waves in W/m^2 units . This instrument reveals the radiation dose levels of radioic waves within the microwave frequencies used in telecommunication which include blue tooth , *Wi-Fi* ,electricity generating station , fixed towers of mobile phone and energy towers rather than the measurement of radiation dose released from television and computer screen and video display units (VDU). Also this instrument is able to measure the intensity sound waves associated with high frequency waves of in dB units with positive or negative levels. Look to diagram (2) showing the Electrosmog meter.

Diagram (2) :



Electrosmog power meter .(CORNET ,2012)

This instrument have another function such as the measurement of intensity of electrical field in E (V/m) units ,when the instrument placed closer to the source of generating the micro waves rather than the ability to draw a diagram showing the relation between power density and sound waves intensity at a certain point between the detector and the source . The detector have other uses such as the power density of radiation dose of the microwave released from the other environment as a type of radiation contamination and also to discover the radiation leak from microwave ovens.

Experimental design :

sixty mice were used in the experiment ,they were divided into groups and given the needed doses as follow:

1- First group (control) include 15 mice included in not exposed to the micro wave electromagnetic field (control) which included (2) female and(1) male mice in every cage from (5) cages of mice as wee as in all group .
2- Second group includes 15 mice they were exposed to 100 $\mu W/cm^2$
3- Third group includes 15 mice and exposed to 150 $\mu W/cm^2$
4- Fourth group includes 15 mice exposed to 200 $\mu W/cm^2$
5- In Groups (2-4) , the number of male mice are 45 used for 45 days at a rate of 6 hours daily .

The work system was prepared at 5 GHz frequency as in diagram no(1) with different exposure of power density (100, 150 and 200 $\mu W/cm^2$) on white mice for 45 days and at period 6 hours daily.

Statistical analysis :

with one way analysis of variance was used in this experiment . Differences were determined by Duncabs multiple range test in all measurements. At($p \leq 0.05$) percent level **(steel and Torri,1980)** by using SAS ,1986.

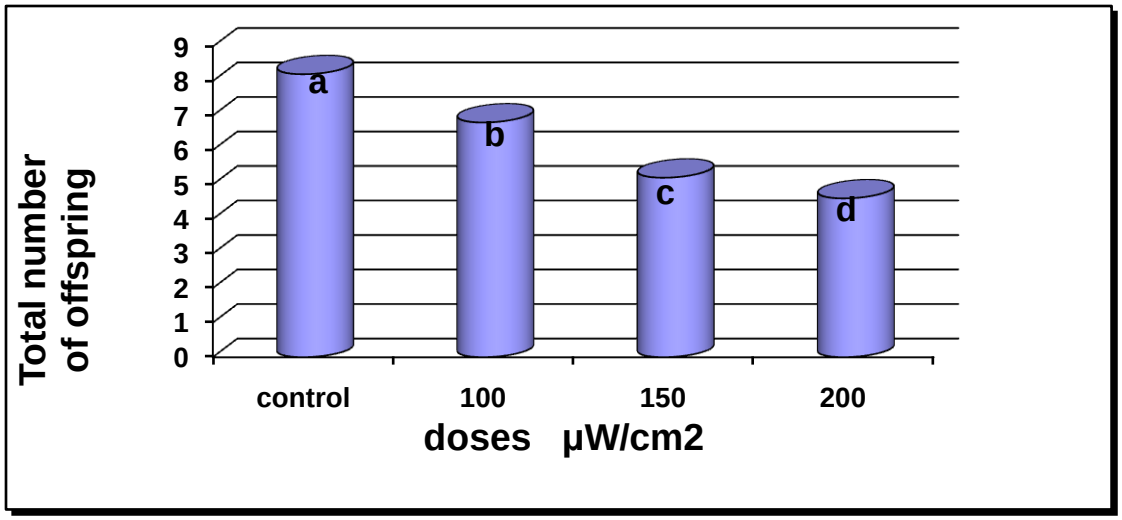
Results:

Effect of microwave radiation at 100, 150 and 200 $\mu W/cm^2$ doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male) on :

. 1- Total number of offspring :

The effect of microwave radiation at 100, 150 and 200 $\mu W/cm^2$ doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male **)**. A significant decreases were noticed ($p< 0.05$) in the total number of offspring when exposed to 100, 150 and 200 $\mu W/cm^2$ compared with the control group . This decrease is proportional to the increase of doses as in the diagrams (3) .

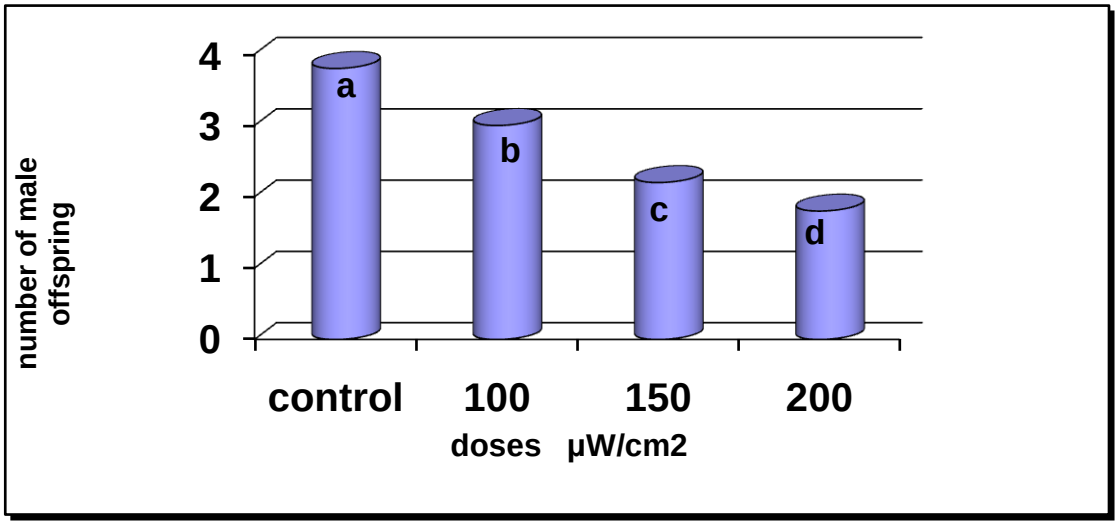
Diagrams (3) effect of microwave radiation **on total number of offspring** of marry to (exposed female x normal male **)**



2- number of male offspring

The effect of microwave radiation at 100, 150 and 200 µW/cm^2 doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male **)**. A significant decreases were noticed ($p< 0.05$) in the number of male offspring when exposed to 100, 150 and 200 µW/cm^2 compared with the control group . This decrease is proportional to the increase of doses as in the diagrams (4).

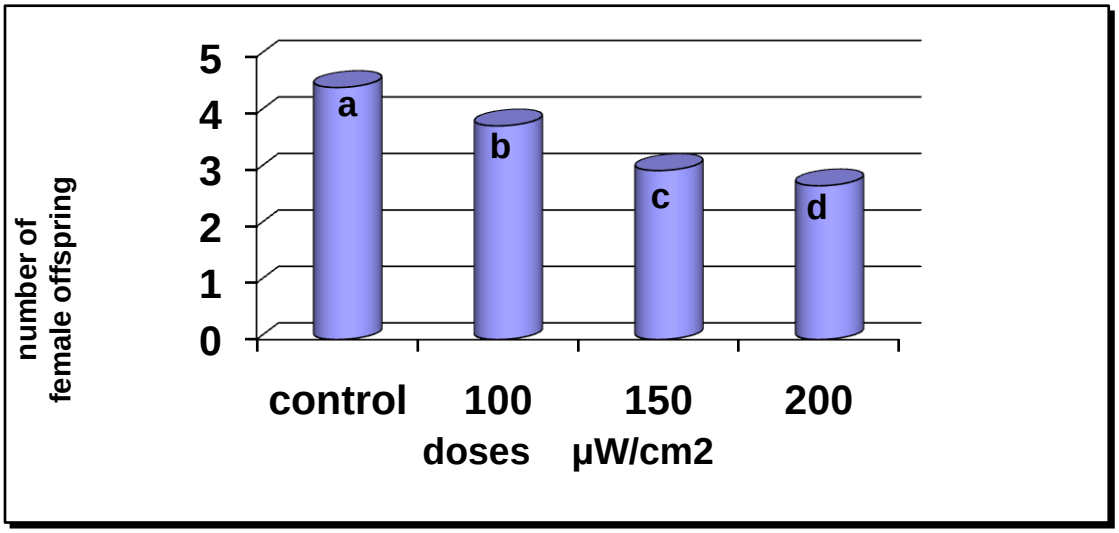
Diagram (4) effect of microwave radiation on number of male offspring of marry to ((exposed female x normal male)



3- number of female offspring

The effect of microwave radiation at 100, 150 and 200 µW/cm^2 doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male **)**. A significant decreases were noticed ($p< 0.05$) in the number of female offspring when exposed to 100, 150 and 200 µW/cm^2 compared with the control group . This decrease is proportional to the increase of doses as in the diagram (5) .

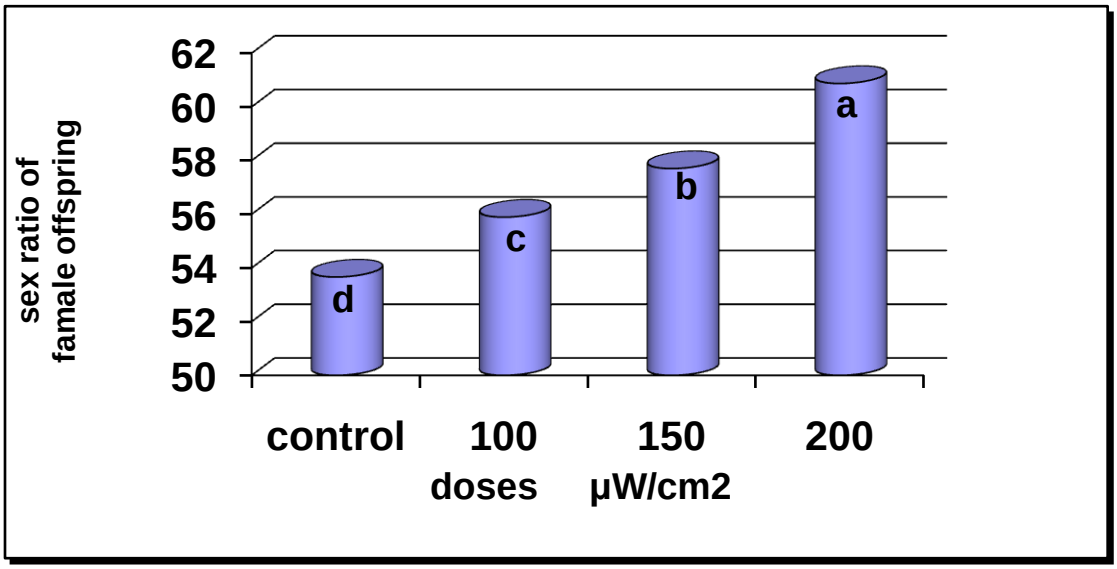
Diagram (5) effect of microwave radiation on number of female offspring of marry to (exposed female x normal male)



4-sex ratio of male offspring

The effect of microwave radiation at 100, 150 and 200 μW/cm^2 doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male **)**. A significant decreases were noticed ($p< 0.05$) in the sex ratio of male offspring when exposed to 100, 150 and 200 μW/cm^2 compared with the control group . This decrease is proportional to the increase of doses as in the diagram (6)

Diagram (6) effect of microwave radiation on sex ratio of male offspring of marry to (exposed female x normal male)

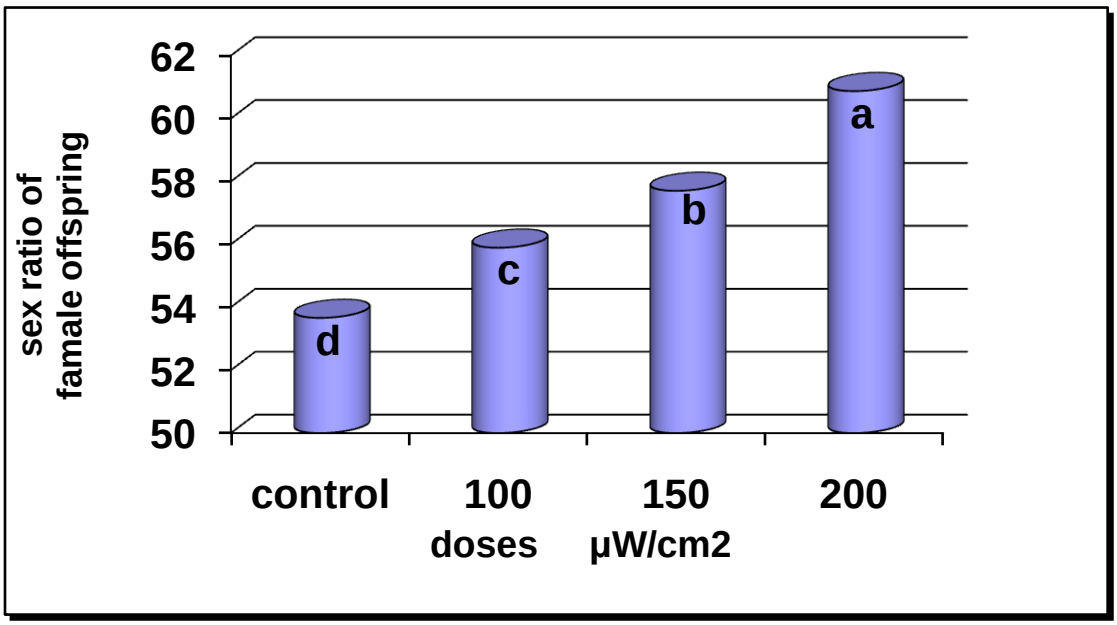


5-sex ratio of female offspring

The effect of microwave radiation at 100, 150 and 200 μW/cm2 doses for 45 days at 6 hours daily with 5 GHz on marry to (exposed female x normal male **)**. A significant inecreases were noticed ($p< 0.05$) in the sex ratio of female offspring when exposed to 100, 150 and 200 μW/cm2 compared with the control group . This decrease is proportional to the increase of doses as in the diagram (7) .

Diagram (7) effect of microwave radiation **on sex ratio of female offspring** of marry to (exposed female x normal male **)**

The diagrams from (3-7) represent with the following information:



- Values expressed by average ± experimental error
- The different letters on each rectangular means significant differences at less than 0.05 % level .
- Number of animals is15 per each group

Discussion :

From diagram (3) we find decrease in number of total offspring of mice which exposed to microwave radiation and as well as in diagrams (4,5) also we find decrease in total offspring number of male and female mice compared with control group in cases from marry(exposed female x normal male **)** with the frequency 5 GHz at period (6) hours for (45) days for doses 100,150 and 200 $\mu W/cm^2$ and this can agree with (**Al-Hakeem,2006)** that the electromagnetic field with short wave length with three frequencies (1.6 , 2.4, 3.2) MHz and with power density (16 mW/cm^2) has effects at period (7) hours daily led to decrease in number of total offspring ,male offspring and female offspring of rats as well as agree with **(Manikowska *et al* ,1985)** which he found decrease in number of sperms and their ability to fertilization in mice which exposed to frequency 2.45 GHz rather than decrease in total offspring number . The reason for decrease in number of total offspring ,male offspring and female offspring to mice when they exposed to microwave radiation which have harmful effect in testis function return to decrease in number of living and normal sperms and next lead to decrease in fertilized ratio **(Akdag *et al* ,1999)** or result from the rising in temperature of testis and lead to decrease in number of sperms .The mice which exposed to frequency 2.45 GHz appear increase in temperature which is led to denaturation primary sperms cell and decrease in ability on fertilization **(Manikowska *et al* ,1985)** or the reason return to the exposure to electromagnetic field lead to free radical specially effective oxygen return to decrease in ATP concentration in the sperms and next unable on Fertilization **(Griveeu et al ,1995)** rather than effective oxygen become harmful for cells and tissue result changes in tissue and in cells then tissue of body which include testis cell**(Ishihara *et al* ,2003).**

From diagram (6) we can see decrease in sex ratio of mice male which exposed to microwave radiation but in diagram (7) we can see increase in sex ratio of mice female which exposed to microwave radiation for the marry (exposed female x normal male **)** with frequency 5 GHz to period (6) hours daily for (45) days of the doses 100 , 150 and 200 $\mu W/cm^2$ and that agree with **(shahryar ,2011)** which was used three group from hamsters first of these group represent control group and second group which exposed to radiation with 900 mHz for (1) hour / day before gestation have a same number in male and female from hamsters and third group as second group exposed to same frequency during gestation and obtained increase in sex ratio of female hamsters with magnitude (34.2%) compared with control group in the second offspring, as well as agree with **(Al-Hakeem,2006)** that the microwave field with the short wave length of three frequencies (1.6, 2.4, 3.2) MHz and with power density (16 mW/cm^2 has effects at period (7) hours daily led to increase in sex ratio of female and decrease in sex ratio of male rats .

The reasons which led to changes in sex ratio of male and female mice which exposed to microwave radiation with frequency (5)GHz at period (6) hours daily for (45) days of doses (100 , 150 and 200) $\mu W/cm^2$ return to analysis or denauration of ribose nucleic acid DNA because of the electromagnetic waves effect considered non ionizing radiation and the ability of penetration of it less than short waves, therefore it was effected by thermal effect where the exposure to these radiation lead to increase temperature of that part which exposed to radiation and lead to change in function and structure of the cells and that depend on the exposure power and value of the radiation energy **(Khalyl, ,1999)** or the radiations effect by direct method when the particle loss energy inside material and take place energy deposition with it achieve another charger particles and then send the energy deposition from charger particles to the cell **(Latin American Exports Committee , 2010)**and this effect on process of mitosis and process of sperm formation specially x- chromosome which is change of female sex without effect on y-chromosome then resulted decrease in activity of sperms which bring y- chromosome effected in the end on marry of irradiated mice to appeared important changes in sex ratio of female and male mice . The testerone achieve series of interaction and chemical changes which cause to increase multiplier of genetic information which store in DNA **(Brutorska *et al* ,2010)**. The multiplier process which achieve can lead to produce many series of ribosome nucleic acid (rRNA) which represent original part to build the protein and many poly of messenger ribose nucleic acid (mRNA) which has a function to limit the amino acid series which completed during response of endrogene and many of DNA which become inside achieve cell division during the end phase of mitosis **(Mainwarin ,2009)** which show the sex ratio of male and female mice.

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