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RESEARCH PAPER

Effect of MgO-NPs on the Morphology and Function of Kidney in Male Albino Mice

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ABSTRACT

This research study was to determine what the MgO NPs had on the morphology and activity of kidney in male albino mice Musmusculus. The studying implied providing mice with 150 mg/kg of MgO NPs (19-25 nm) by means of intraperitoneal administration during the period of 7 and 14 days. It was documented by appearing of change in the appearance of change exterior in animal (weight and behaviors) and interior (kidney) and the outcome the studying was changed in the existence in the kidney function rate in the albino Mice male the injected by the MgO - NPs by intraperitoneal concentration of 150 mg / kg during a period of 7 days and 14 days such as height significantly P 0.05 in the rate urea and Creatinine in a Serum the blood Compared with totals the control group the nonexistence difference

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INTRODUCTION

Nanoparticles are tiny materials (that at least one of their size is less than 100 nm) with different properties, which predefines their use in new applications. These features render them quite appealing to both medical and business innovations [1]. In the recent years, the development of nanotechnology has been accompanied by an organic and inorganic Nano-sized particles with the expanded application target using its capacity as a modifier in the enterprise, medicine, therapeutics, synthetic fabrics and food packaging [2].

In medical sciences, due to the properties of MgO, it is now employed in the treatment Heartburn, stomach sore, and bone medicine reconstruction, Present day, studies are considered to use MgO nanoparticle in tumor prevention and in addition, it marvelously exhibits the capacity to transform into an antiseptic agent, Other laboratory tests indicated the future application of MgO nanoparticle in cancer recovery and among them, there exists a method called the Nano-cryosurgery and hyperthermia. The applications of the MgO nanoparticles and the fear on the toxicity of the nano-particle are increasing [3-4]. Unfortunately, there is limited knowledge regarding the effect of such prolonged exposure of nanoparticles in relation to the health of human beings and the environment. Potential impacts of nanoparticles on the health and the environment require even a closer assessment prior to their production in large quantities and

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usage in numerous fields [5]. It is thus notable that any estimate of the value concerning the ratio of cost/benefits of nanoparticle use in a technological or medical procedure is taken in as far as it is possible. Nanomaterials toxicity like nanoparticles, quantum dots, nanotubes and nanowires, have been announced in the past few years [6]. Nanomaterials are produced in large scale and utilized in variety of fields but we are impartially informed about the levels of nanomaterials in the environment and how they affect human health regarding nanoparticles. Human beings are subjected to both natural and fabricated nanoparticles through the atmosphere and exposure through water supply, food chain as well as in the medical field [7,8].

MATERIALS AND METHODS

Target preparation (MgO)

MgO synthesis the aqueous solution of Magnesium Nitrate hydroxide has been prepared by the following procedure. 0.02 moles of Magnesium Nitrate hydrate Mg $(NO_3)_2.6H_2O$ was dissolved in 100 ml of the distilled water to get the aqueous solution of Magnesium Nitrate hydroxide. The mixture of Magnesium Nitrate hydrate was stirred in distilled water until it was clear in the course of 4 hours. In a stirred way, a dropwise addition of the ammonia has been made into Magnesium Nitrate hydrate solution to adjust the pH to 9. Immediately a precipitate was produced. The precipitate collected was washed numerous times using methanol followed by distilled water using a filter respectively and dried in the oven overnight in a temperature of 100 °C. The samples were finely ground and annealed in Muffle furnace at 500 °C during three hours. Finally, the white Nano powder was obtained.2 magnesium Nitrate hydrate $Mg(NO_3)_2$ distilled water H_2O Stirring Ammo Ammonia solution precipitation Centrifuging Drying at 100 C Calcination at 500 C Mg O powder. The powder so obtained was re-grounded and the ad mixture addition done and less than 20 tons was put through using a compressor of 2.7cm diameter target and 0.7cm thickness. The acquired target was dense and homogenous as much as possible so that the quality of the deposit was good.

Nano- particles by PLAP synthetizations method

As argued by a new study, the method of the PlAL synthetizations appears to be the most convincing and potentially viable technology of producing MgO nanoparticles [9]. In some studies, the technique of the PlAL of MgO nanoparticles was performed through pulse laser neodymium-doped yttrium aluminum garnet Nd-YAG (1065nm wavelength) at (1 hertz) using the laser energy of 500mj radiation, under the contact of these nanoparticles in the surface of the target, which is said to be one of the most important methods of producing nanomaterials, and in addition the approach is said to be eco-friendly[10].

Experimental Animals

24 Male Mice albino Swiss Age 8-12 weeks At the rate of Weight 25- 29 gm was used and done under clean conditions Cages, and put the animals in a Phase Laboratory occasion Where Ventilation, and heat, and lighting, and was left animals off the animals of a period of time, Two weeks Reason Adaptation in a Home animal Before Process Injection, And it was also given Water of tap And food Special. The animals separated to four groups and by the reality to six animals per Collection, injected two groups intra Peritoneal With magnesium, oxide NPS, and of two periods 7 and 14 days with 150 mg piece of kg concentration, and by the other two people injection intra peritoneum with chloride sodium 0.9%, 7 and 14 periode days and a measure 0.1 ml.

Studying Functional

The blood Sample With the drawl in a today in a next one at end Period Injection In all Animals studying of through stab the heart Puncture Distance Anesthesia The animals partially with the substance Chloroform/sample the blood in a Pipes Contains on the Gelatin gel tube Then Put the Pipes to the Device Expulsion Central Centrifuge (5000) Cycle/minute duration period of ten minutes for the purpose Seasons the blood Serum Around Ingredients the blood Other. Transferred Serum to a Plastic Pipes manufacturing and stored at a Fridge until and Analyses Procedure Special functions Kidneys Urea and Creatinine and Uric Acid.

Analysis of Statistics

The analysis results adopted the program Statistics Social Package of Social Sciences (SPSS) Release 24. With the animals before and after treatment, done use t-Test To calculate Differences and testing F-test in a way Analysis of Variance

(ANOVA)) To calculate Differences significant at the level Pleq0.05 between Averages and used Least significant difference (LSD) To find out Which Differences Statistic between Aggregates.Done Offered Results on Form the average Account Mean ± Standard Error [11].

RESULTS AND DISCUSSION

Characterization of MgO materials

In order to determine the crystal phase, powder X-ray Diffraction (XRD) method was applied to MgO nanoparticles on the Philips X-ray diffractometer under CuKa radiation with the wave length equal to 0.15406 nm. Fig. 1 has established that magnesium oxide appears in cubic phase; there were no distinct peaks of impurities. The Fig. 2 possessed five of the typical reflection peaks attributed to (111), (200), (220), (311) and (222) in MgO_3. The parameter of cubic unit cell is a=b=c 4.130. The formula of Debye-Scherrer was used on the highest peak (200) and the mean crystal size was then calculated,

$$D = \frac{0.94\lambda}{\Delta(2\theta)\cos\theta}$$

Where; D = average size of a crystallite, the wavelength of X-rays is 1 (1.504 nm), theta is Bragg angle of diffraction and Beta is full width at half max which is measured as Gaussian curve at the Peak (200). The average particle diameter of magnesium oxide might be considered as 19 nm. [12-13].

Uv-Visible spectroscopy

UV-visible spectra obtained with the help of Uv-vis spectrophotometer on the prepared MgO Nano powder are recorded by using the absorbance

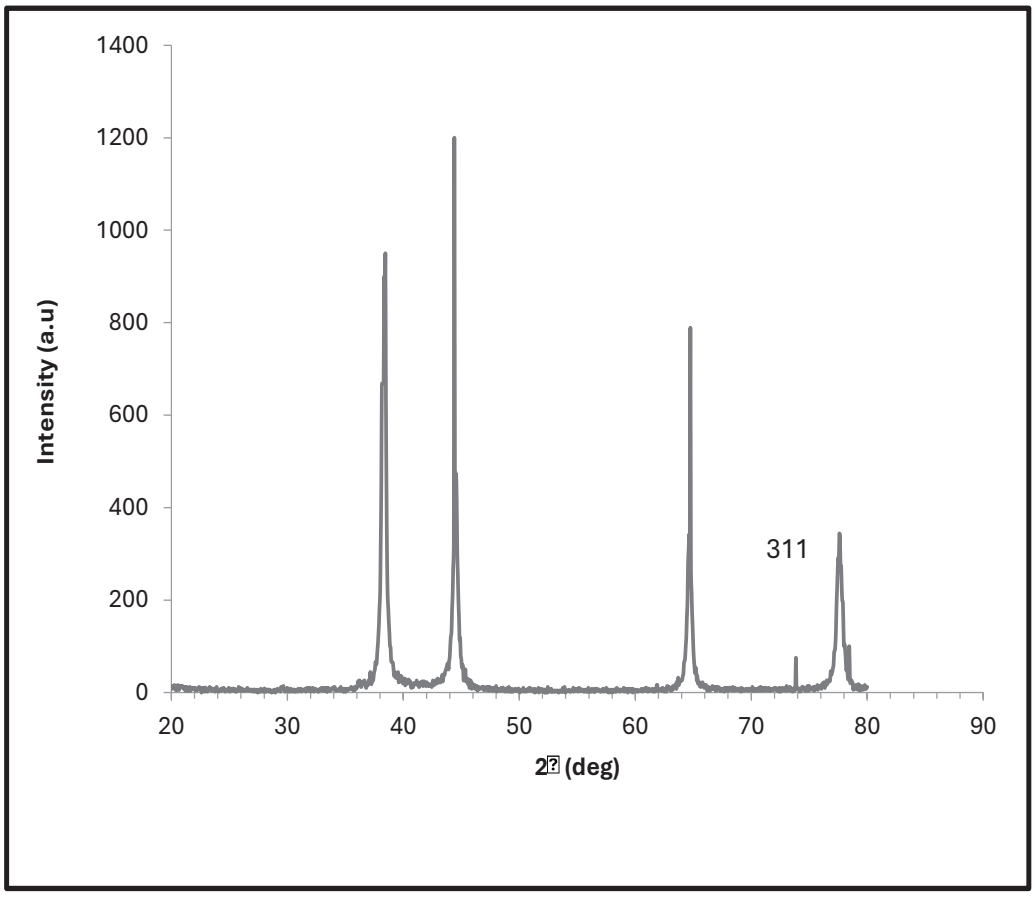

Fig. 1. XRD pattern of MgO nanoparticles.

format of the Uv-vis and the absorbance of MgO NPs was obtained by using wavelength range of 200-900 nm. We have obtained the typical appearance of absorption lines of MgO as far as 800nm. Some absorption peaks of spectrum of the MgO can be observed in Fig. 2. A generalised absorption spectrum has been discovered between the range of 260-330 nm of MgO [13]. In the spectrum, two absorption humps exist between 320 and 400 nm at 380 nm and at 500 and 600 nm with maximum ranging at 550 nm.

Tauc's Energy band gap of magnesium oxide was determined by Tauc relation:$(\alpha h\nu) = A(h\nu - Eg)$ Where: Alpha is the absorption coefficient, h is the planck constant, A is a meaningless constant, Eg is the energy band gap and n is a meaningless constant whilst n is one-half when the band is direct. The band gap of the MgO nanoparticles was obtained by means of the graph of the Fig. 3 and extrapolating the curve that was drawn between (h ν) and $(\alpha h\nu)^2$. ν In the case, represent optical absorption coefficient [14], where is the frequency. It was seen that as we extrapolated the curve it came to an energy band gap and that the band gap was about 4.8eV.

Scanning Electron Microscopy (SEM)

Fig. 4 contains SEM images of the synthesized nanomaterial. Here is pile up of a multiple layer assembled particle. In nature, man-made particles are non-homogenous and crystalline and 19nm [15].

Atomic Force Microscopy (AFM)

Atomic force microscopy is a method, which is applied to carry out analysis of the particle size and the morphology of the particle. It scans the surface of the sample providing 2D/3D topographies of the sample prepared. Fig. 5 has presented 2D and 3D topography images. In 2D topographic image of MgO nanoparticles, the size of nanoparticles was analyzed, which is between 19 and 25 nm. The topographic image of 3D nanoparticles of MgO was found to be maximum 25 nm by using 3D topographic image of nanoparticles. The MgO nanoparticles size average was identified as 25nm. Its nanoparticles are extremely acicular [16,17]. Acicular describes the crystal habit of a radiating mass of elongated sharp needle like crystals. The surface is in conformity with the interstitial voids that behaves like the pores giving additional active

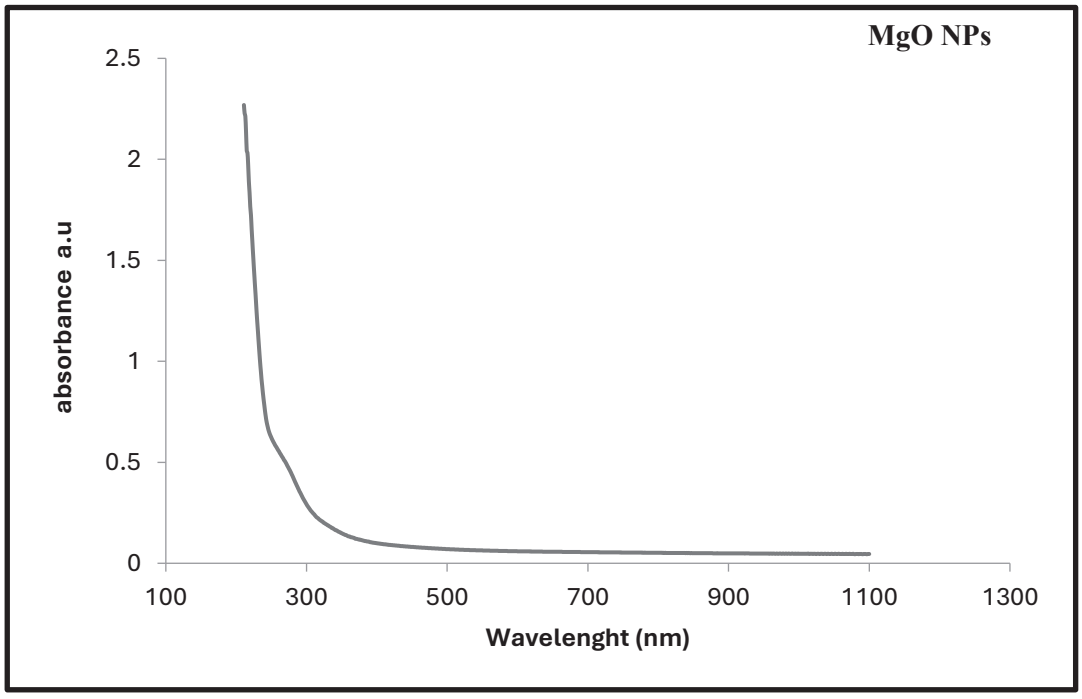

Fig. 2. UV-Vis absorption curve of Mg O nanoparticles.

sites.

Portal shifts in the look and action of mice

The findings of a study were Current Some Effects Foreign Affairs on Mice Injected with MgO NPS in a concentration of 150mg/kg over a seven-day period During which delicate loos and lethargy and convergence with convexity back were recorded and increased Symptoms With a plus period during Injection involved 14 days, color turn to brown greening the animals Injected One turn the color black green in the animals Injected 14 days.

The external kidney appearance changes

The morphological changes at the checkup the color of Kidneys At both the animals Is red Injected Denatured The existence at MgO - NPs Around the kidney (Fig. 6a) Twenty-one days of the developed, several changes The comparison with the control group Including pallor the color Kidneys and lack in a amount of Fatty Around the kidney (Fig. 6b) In the comparison of the groups. (Fig. 6c).

Weight of animal bodies

These findings indicated a Reduction (P < = 0.05) in mean Weight of Animals received intraperitoneal IP injection with a concentration of

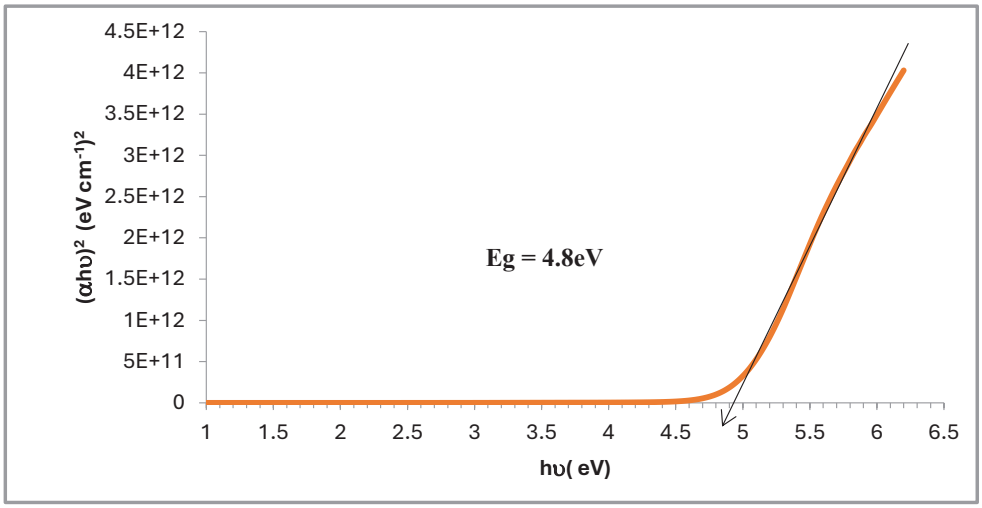

Fig. 3. Band gap spectra of MgO nanoparticles.

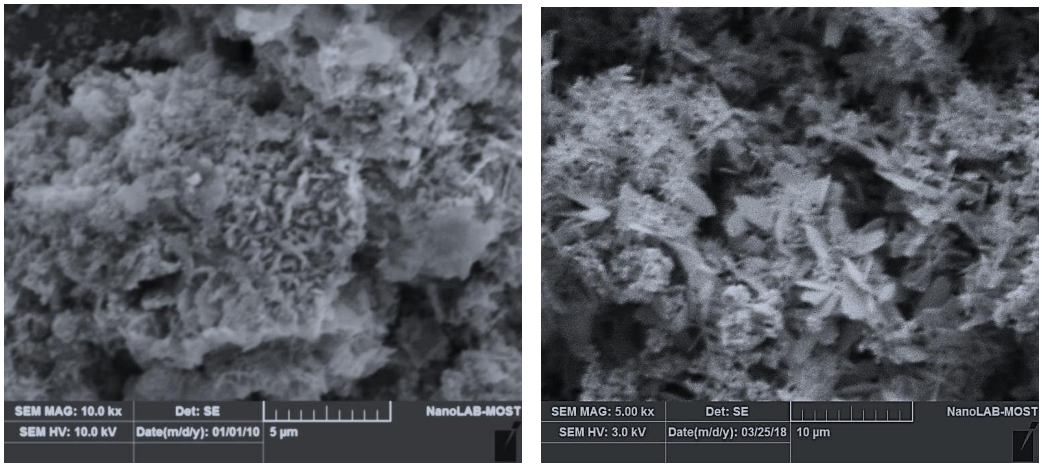

Fig. 4. Micrograph of synthesized MgO NPs.

150 mg/kg after 14 days of administration to the group of MgO NPs compared to the filing group, whereas the 7 days administration did not cause any difference (P > 0.05) in average weights of their bodies when compared to the group Control (Table 1).

The readings are derived as arithmetic mean of the weights of animals + standard error: type face vertically represent absence of morphological differences between the readings (P > 0.05) whereas different characters vertically between readings refer to the moral differences (Pleq 0.05).

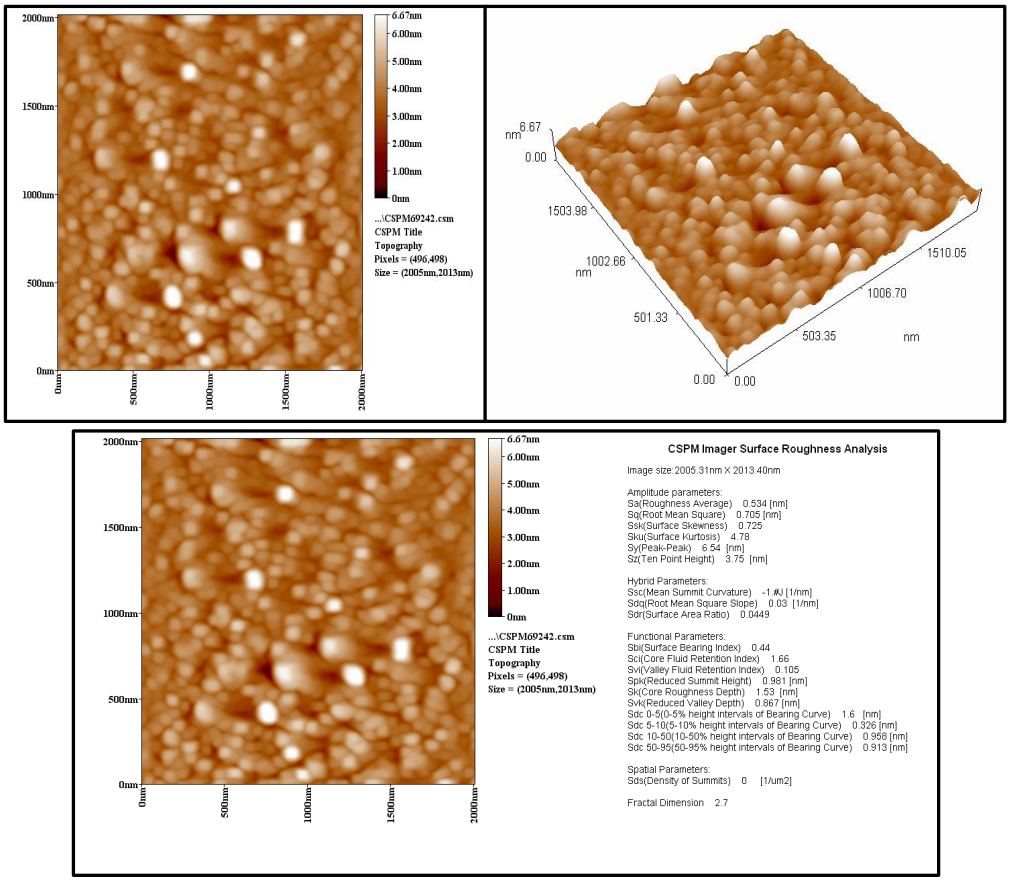

Fig. 5. AFM of MgO NPs.

Table 1. Shows changes in animals weights after injection of 150 Mg/kg concentration of MgO N Ps for period 7 and 14 days compared within animals group.

Treatments	Duration of injection (day)	Body Wight animal(gm)	
		Before treatment	After treatment
Control	7	29.35± 0.28	29.75 ± 0.68 a
150mg/kg MgO -NPs	7	31.02 ± 2.10	29.95 ± 1.68 a
control	14	24.08 ± 0.73	27.08 ± 0.81 a
150 mg/kg MgO -NPs	14	24.06 ± 0.45	23.52 ± 0.64 b

Weights and diameters Kidney

No significant difference (p>0.05) was registered in the general dimensions and weights of kidney of the mice in which the treatment was injected by a dose of 150 mg/kg substance MgO -NPs to the 7th and 14 th days of the injection compared with the reference groups (Table. 2).

The readings represent the arithmetic mean ± standard error, typeface vertically signifies lack moral differences between readings (P > 0.05).

Physiological study

Urea, Creatinine and Uric Acid concentration

In this study, statistical outcomes indicated that lead to an increase significant (P = 0.05) in the concentration Of Urea and Creatinine, but insignificant (P > 0.05) change in the concentration of uric acid (mg/dl) in the plasma of MgO -NPs injected mice within 7 and 14 days after injection-by-injection concentration of 150 mg/kg compared with Control group (Table 3).

The readings represent the arithmetic mean ± standard error, typeface vertically signify lack moral differences between readings (P > 0.05), while various characters vertically between the readings indicate the moral differences between reading

The results of the present study showed a number of behavioral, functional and changes that can be discussed by agencies.

The Alterations in appearance, behavior and weights of mice

The outcome of the current research found that the male albino mice intraretinally injected with IP and treated with 150 mg/kg of MgO- NPs at the end of 7 days had several external and internal changes in their phenotypes namely Lethargy, introversion, and Convexity back, and the reason behind these symptoms may be related to the toxic effect of MgO-NPs to the body in general. Other symptoms involve loss of appetite that

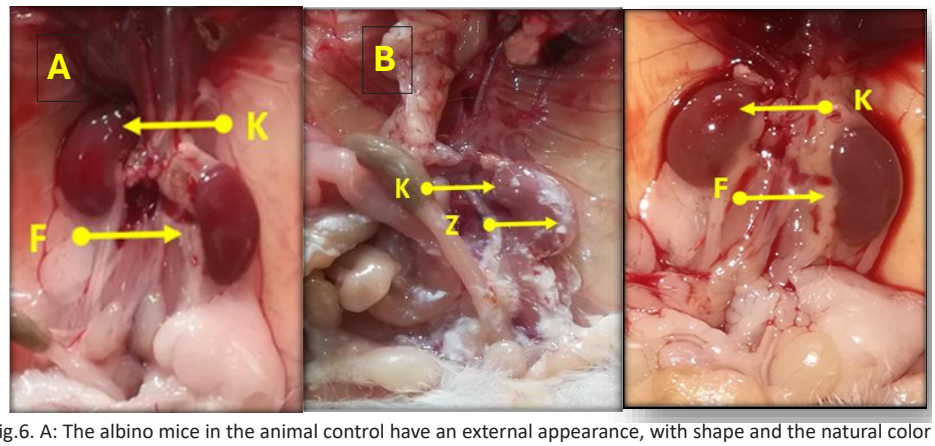

Fig.6. A: The albino mice in the animal control have an external appearance, with shape and the natural color to the kidney and lipid (F: Fat) surrounding the kidneys (Kidney K). B:outward looking kidney albino mice the included animals using 150 Mg / kg of MgO -N Ps after 7 Days firstly, where the kidneys become pale and some parts of the lipid that surround them disappear. C: exterior features of kidney albino mice that have been injected with pigments such as MgO NPs at 150 mg/kg dosage 14 days into the injected animal reveals pallor of the kidney and dissipation of lipid material around the kidney and the MgO NPs (M: MgO NPs) on the surface of the kidney.

Table 2. Shows the total weights and dimensions (length-width-height) millimeter in control animals and animals injected 150 mg/kg concentration of MgO -N Ps For period 7 And 14 Days.

Treatment	period	weight	length	width	height
Control	7	0.23±0.02a	1.15±0.03a	0.65±0.03a	0.5± 0a
150mg/kg MgO –NPs	7	0.24±0.02a	1.12±0.04a	0.62±0.02a	0.52±0.02 a
Control	14	0.23± 0.02a	1.13±0.03a	0.65±0.03a	0.53± 0.03 a
150mg/kg MgO –NPs	14	0.22±0.01a	1.11±0.01a	0.6±0a	0.5±0a

could either involve gastrointestinal disorder or liver function because of MgO -NPs treatment and low weight loss that did not show significant difference merely because there was loss of appetite and absence of fatty mass surrounding kidneys. The color of the kidney turns to look pale red as opposed to the red control group. The change of renal color would be attributed to contraction of renal glomeruli and decline of the blood circulation into the renal tissue. It was more on top of the above symptoms as the duration of the injection went up to 14 days and also more load of the white nanoparticles on the surface of the kidney as compared to the control group. In addition to that, the injection lasted 14 days. The bodyweight loss (P=0.0005) in the 14 days and the color of faeces turned to brownish brown in the injected animals in seven days and blackish-green in those injected in 14 days. Though the outcome did not reveal any variation in the size and weight of kidneys in all the experimental animals.

All the above symptoms can be ascribed to the toxicity of MgO (NPs that influence the formation of the antioxidant enzymes, increasing the generation of reactive oxygen species (ROS) that refer to the chemically reactive molecules naturally formed within biological systems, and high concentrations of such molecules that cause the breakdown of oxidation and reduction because of the absence of such antioxidants as Glutathione peroxidase, superoxide Dismutase and catalase that reduce these molecules [18].

Nanoparticles affected the liver and kidney of main organs, which are pointed [19]. The dose delivered orally of the nanoparticles MgO -NPs at ratio 100 mg/kg duration of the experiment 75 days resulted in a reduction in both the enzyme Glutathione (GSH) and increase in both the enzyme Catalase (CAT) level and lipid peroxidation levels thus, causing oxidative stress.

The findings indicated that weight loss was in line with the work of [20] The investigations revealed that when male mice were treated with MgO -NPs at 100 and 200 mg / kg and 7 and 14 days, a decrement in the body weight and lipids were notified as compared to those of the control animals. This has been explained by the anorexia of food as the mice had poor digestion capacity due to deposition of nanoparticles in the digestive tract as a result of the oral administration.

Changes in the functional

The statistical outputs of the present research demonstrated that there was significant changes in the concentration of urea and Creatinine in serum in animals injected with a concentration of 150 mg/kg MgO -NPs and compared with the group Control after 7 and 14 days; there was no significant changes between the concentration of uric acid concentration in serum between animals injected with a concentration of 150 mg/kg of MgO -NPs and the control group after 7 and 14 days. This is the reason that Increased serum Creatinine concentration and serum urea can be attributed to the effect Toxic to MgO NPs in a Kidneys. The findings of the current study are congruent with Study [21] In which they dose Mice with 300 mg / kg of MgO NPs intraperitoneal IP to cause an increase in the level of urea and Creatinine in the eight-day period of the injection whereas he concluded that there was a decrease in the uric acid concentration in the blood serum due to the high concentration content of MgO NPS. Although research has revealed its [22].

Injection of the rats with concentration 70, 50, 30 Mg / kg of the titanium dioxide Nanoparticles MgO-NPs completed during 21 days caused slight changes in the urea and uric acid concentration level and there was no effect on the level of Creatinine. Compare the findings of the present research study with the researcher [23]. The ratio of rats treated with B MgO -NPS Orally and daily at 333.33 mg / kg over 5 days and 333.33, did not show any significant difference in the urea and creatinine. It is possible that the cause of exposure or non-exposure is attributable to the findings of

Table 3. Shows changes in the concentration of urea and uric acid and Creatinine (mg/dl) between animals and control animals injected with a concentration of 150 Mg/Kg of MgO -N Ps throw period 7 and 14 Days.

Treatment	period	urea	Creatinine	Uric acid
Control	7	36±2.04a	0.88±0.11a	4.1±0.31a
150mg/kg MgO –NPs	7	41.5±1.84b	1.45±0.19b	5.37±0.65a
Control	14	37.25± 1.25a	0.92±0.12a	3.88±0.44a
150mg/kg MgO –NPs	14	41.17±0.75b	1.40±0.17b	3.93± 0.45a

the given research.

The findings of this paper corroborate those of [24] Since it was seen to raise the degree of creatinine and urea in injection of mice intraperitoneally IP over a period of week with nanoparticles Ag-NPs with concentration of 2000mg/kg. There was no study that demonstrated Any functional variation in the creatinine and urea concentrations in the male kidney Wister Due to the absence of focus on use in users as has been done by other people since here just treatment of MgO -NPs and a dose (10 mg/kg) with duration (five days).

CONCLUSION

The current study arrived at some crucial conclusions and they are when injecting male mice eggs into the peritoneum cavities with the concentration of Mg oxide nanoparticles at rates of 150 mg / kg / day and during the periods of seven and 14 days have the potential to cause numerous adverse effects, which are as follows:

1-Loss of appetite, low animal weight, lethargy and convexity of the back and blackening of the color of the stool are the occurring signs and symptoms.

2- The taking place of alteration in the manners like kidney pallor and absence of fatty tissue around the kidneys.

3-The manifestation of the functional changes through the high rate of creatinine and urine in the blood and all these changes were enhanced due to the enhacement in the length of the injection because it was worst in the case of the length of the injection of 14days.

4-The infiltration of some inflammation cells, necrosis and destruction of some of the epithelial cells lining the renal tubules, enlargement of their nuclei, blood vessel congestion, damage and shrinking of glomeruli, calcium molds in the inside of the renal tubules, swellings of the renal tubules, and damage of the glomerulus and renal particles are some of the changes which significantly occur in the histological structure of the kidneys.

5-The above mentioned all may be the result of the toxicity of the MgO nanoparticles in the kidneys of white mice, which resulted in the increase of the reactive oxygen types and the absence of the antioxidant types of enzymes or the cell membrane damage which leads to the imbalance of permeability of the material in the membranes and hence the renal poisoning.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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