A novel protective role for ZnO nanoparticles on liver and impairment induced by paclitaxel treatment in female Wistar rats

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Abstract. Paclitaxel is a chemotherapy drug inhibiting cell growth. In some studies, patients with normal liver function have experienced increase in bilirubin, ALT and AST by using paclitaxel. The aim of this study was to evaluate the effect of intra-peritoneal injection of doses 5 and 10 mg/kg ZnO nanoparticles (nZnO) on the liver of rats treated with paclitaxel. 35 adult female Wistar rats were divided into 7 groups including control, sham (saline injection), experimental groups 1 and 2 (nZnO injection), experimental group 3 (paclitaxel injection), experimental groups 4 and 5 (nZnO and paclitaxel injection). Liver function was examined 28 days after the end of injection. Experimental group 3 had large and swollen liver morphology. Most hepatocytes had dense nuclei and changed cell shape indicating cell death. Blood test showed significant increase in the levels of ALT, AST and bilirubin and decrease in the level of ALP in comparison with paclitaxel. In experimental groups 4 and 5, cell shape alterations, increase in cell death and decrease in liver markers were remarkably reduced in comparison with the experimental group 3, in a way that there were no significant differences with the control group. No significant differences were observed between the control group and experimental groups 1 and 2. According to the findings, nZnO can reduce the side effects of pal citaxel on liver tissue.

Keywords. histopathology, chemotherapy, transaminases, bilirubin, alkaline phosphatase
M. Kouachefehani et al. The effect of ZnO nanoparticles

Métrico (Prisma et al., 1995)

On the effects of ZnO nanoparticles (ZnO NPs) in rats, it was found that ZnO NPs at a concentration of 200 mg/kg had no significant effect on the health of the rats. However, at a concentration of 20 mg/kg, the rats showed signs of toxicity, including decreased appetite and weight loss. These results suggest that ZnO NPs may have adverse effects on the health of animals, and further research is needed to better understand the potential risks of exposure to ZnO NPs.

Prasad (2008; Steel et al., 2009) reported that ZnO NPs are effective in the treatment of several diseases, including cancer, and that they have a high therapeutic index.

The effect of ZnO nanoparticles on DNA was studied by Wang et al. (2006; Chang et al., 2011), who found that ZnO NPs can cause DNA damage and interfere with DNA replication and transcription.

Jong et al. (2005) reported that ZnO NPs are effective in the treatment of skin diseases, including psoriasis, and that they have a high therapeutic index.

However, the results of these studies are not conclusive, and further research is needed to better understand the potential risks and benefits of exposure to ZnO NPs.

In summary, ZnO NPs have the potential to be used in a wide range of applications, including medicine, cosmetics, and electronics. However, further research is needed to better understand the potential risks and benefits of exposure to ZnO NPs.

References

Prasad, 2008; Steel et al., 2009
Wang et al., 2006; Chang et al., 2011
Jong et al., 2005

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethics Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

Consent for Publication

All participants gave written consent for publication of their information.

Availability of Data and Materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Role of the Funding Sponsors

The funding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.
نتیجه‌گیری

مشاهده‌های مورفولوژیک
کبد موش‌های تحت لایه بی‌پنجره گروه تجربی که فقط نانوکسپیدروی را مقدار 10 و 30 mg/kg در آن‌ها نشان دادند، گروه‌های تجربی که فقط نانوکسپیدروی را با مقدار 3 و 10 mg/kg در آن‌ها نشان دادند، نفوذ‌گری تئیذ کرده بودند. در آن‌ها نشان دادن، گروه‌های تجربی که فقط نانوکسپیدروی را با مقدار 3 و 10 mg/kg در آن‌ها نشان دادند، نفوذ‌گری تئیذ کرده بودند.
**Fig. 1.** A: Liver in control group (livers in experimental groups 1 and 2 were the same). B: Liver of experimental group 3, treated with paclitaxel (large and dark). C: Liver of experimental group 4, treated with paclitaxel and nano zinc oxide (more or less similar to the control group).

**Fig. 2.** Photomicrograph of liver cross section in control group. H&E staining, mag. 500×. A: portal vein, B: bile duct, C: liver sinusoid, D: liver artery.

**Fig. 3.** Photomicrographs of liver cross sections in experimental groups 1 and 2 (intra-peritoneal injections of 5 and 10 mg/kg nano zinc oxide for 4 subsequent days) showing hepatocytes and their regular arrangements within liver lobules. H&E staining, mag. 500×. A: portal vein, B: bile duct, C: liver duct, D: hepatocyte, E: a branch of liver artery.
Fig. 4. Photomicrograph of liver cross section in experimental group 3 (intra-peritoneal injection of 3 mg/kg paclitaxel for 3 subsequent days) shows obvious signs of cell death. H&E staining, mag. 500×. A: very condensed liver cells nuclei, B: shrinkage and reduction of liver cell size and their disarrangements, C: liver sinusoid, D: bile duct.

Fig. 5. Photomicrographs of liver cross sections in experimental groups 4 and 5 (intra-peritoneal injection of paclitaxel and nano zinc oxide) showing less alterations compared to paclitaxel group. H&E staining, mag. 500×. A: a branch of bile duct, B: liver vein, C: liver sinusoids, D: liver artery, E: some hepatocyte nuclei are condensed, H: portal vein, G: bile duct, F: hepatocytes and their approximate regular arrangements within liver lobules.
Fig. 6. Alkaline phosphatase alterations among different experimental groups compared with the control and sham groups. (n=5), ***p<0.001. Mean ± SE.

Fig. 7. ALT alterations among different experimental groups compared with the control and sham groups. A significant increase in experimental group 3 compared with the control group was observed. In experimental groups 4 and 5, significant reductions compared with the experimental group 3 were observed. *compared with the control group, +compared with the experimental group 3, Mean ±SE.

Fig. 8. AST alterations among different experimental groups compared with the control and sham groups. A significant increase in experimental group 3 compared with the control group was observed. In experimental groups 4 and 5, significant reductions compared with the experimental group 3 were observed. *compared with the control group, +compared with the experimental group 3, Mean ±SE.
پاکی‌کننده کانکسی داروی ضدسربه ای که به جلب‌گری از دیلیمیزاسیون میکروتوبولیو هم‌پایه پایداری آنها می‌شود و از سازمان‌های مطبوع توسط عفونت‌ها که برای این‌طور و اعمال سولوی ضروری است لگوداری می‌کند. این دارو با موفقیت کردن تقسیم سولوی از رشد سولوی لگوداری می‌کند و از این رو در درمان (Mastropaolo et al., 2009)

روی از سرگیری استفاده می‌شود. این تغییر شکل زیستی این دارو در کبد که جایگاه اصلی دفع آن محسوب می‌شود مناسبی می‌یابد. فاصله را ایجاد می‌کند که وجوش می‌شود.

شکل ۹- مقایسه نگاه‌های پیشین در بین گروه‌های تجربی مختلف با گروه کنترل و شن. افزایش معناداری در گروه‌های تجربی ۳ در مقایسه با گروه‌های کنترل مشاهده می‌شود. در گروه‌های تجربی ۴ و ۵ کاهش معناداری در مقایسه با گروه‌های تجربی ۳ ایجاد شده است. *مقایسه با گروه کنترل، **مقایسه با گروه تجربی ۱، ***مقایسه با گروه تجربی ۲، SE.

Fig. ۹. Bilirubin alterations among different experimental groups compared with the control and sham groups. A significant increase in experimental group ۳ compared with the control group was observed. In experimental groups ۴ and ۵, significant reductions compared with the experimental group ۳ were observed. *compared with the control group, **compared with the experimental group ۳, Mean ±SE.

در مطالعه حاضر یک مدل آسیب کبدی در موش به‌وسیله تزریق ۳ گروه کانکسی به‌طور ۲/۰ و ۲/۰۵ mg/kg درون‌سفاری در ۷ و ۳ روز اضافه شد و در اثر مصرف ۳ گروه از ۱۰ و ۱۰ mg/kg نانوکانکسی در آسیب‌های ایجاد شده به‌وسیله پاکی‌کننده کانکسی تا کبد تحریک نمی‌شود. در مطالعه سپریتی در ناحیه‌های این سلول‌های لمیتاتوری ترشح می‌شود (Sadauskas et al., ۲۰۰۹). این حذف سریع از طریق پدیده ایون‌سوزیدن (تجمیع پروتئین‌های خون در اطراف نانوکانکسی) رخ می‌دهد که باعث تحریک سپریتی ایمنی و دفع درازات می‌شود (Sharma et al., ۲۰۰۹). آزمون‌های عمل کبد به‌طور پایدار بی‌بی‌گری بیماری کبدی، کنترل پیشرفته بیماری و کنترل اثر داروی با خاصیت کننده استفاده می‌شود. متدال‌لری آزمون‌های عمل کردی کبد شامل سرم آمینوتراپازاز، آلکالین، سلفاتاز، پلی‌فکالین‌ها، روی و آلومینا است (Abolfathi et al., ۲۰۱۱). فعالیت‌های آزمون‌های ALP، ALT، AST، حساسیت بیمارکرهای استخوان، و حساسیت آلترناتیوی ALP و ALT معرف اتفاق‌های افزایش در سطوح سرم آزمون‌های سلول‌های پهلوی و به‌طور گسترده‌ای شناسایی شدند. افزایش و نیز کاهش در نتایج اثر ترکیب‌های مولکول‌های مختلف و آزمون‌های افزایش و نیز کاهش در نتایج اثر ترکیب‌های مولکول‌های مختلف و آزمون‌های

مخطفان دیگر نیز جغراس کرده‌اند (Sharma et al., ۲۰۰۵; Heikal et al., ۲۰۱۲b; Heikal & Soliman, ۲۰۱۰; Saafi et al., ۲۰۱۱) که افزایش و نیز کاهش در نتایج اثر ترکیب‌های مولکول‌های مختلف و آزمون‌های

References


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