

Nano Congress 2020: Defensive effects of free curcumin and its nanoparticles on diethylnitrosamine-induced hepatocellular carcinoma in murine model - Marwa Hassan - Theodor Bilharz Research Institute

Marwa Hassan

Theodor Bilharz Research Institute, Egypt

Curcumin, a natural compound present in turmeric, has a potential aptitude to suppress carcinogenesis in pre-clinical models. However, its therapeutic applications are constrained by its prominent metabolic instability as well as inadequate absorption. The current study was designed to enhance the curcumin bioavailability by exploiting the drug delivery systems; nanoparticles. Eleven groups of mice with six animals in each group were divided into: control group, hepatocellular carcinoma (HCC) group induced by diethylnitrosamine (DEN) injection, 2 groups treated with DEN plus high dose (50 mg/kg) and low dose (10 mg/kg) of free curcumin, 2 groups treated with high and low dose of free curcumin, nanoparticles control group, 2 groups treated with DEN plus high dose (3.3 mg/kg) and low dose (0.6 mg/kg) of nanoparticulate curcumin, and 2 groups treated with high and low dose of nanoparticulate curcumin. It was found that DEN administration significantly increased serum liver enzymes, VEGF, TNF- α , AFP, MDA, and NF- κ B. Also, it decreased serum albumin and tissue antioxidant activities and caused severe histological changes in hepatic tissue. Oral treatment of DEN-injected mice with either high dose of free curcumin or the two tested doses of nanoparticulate curcumin resulted in a significant improvement of all the tested parameters and the histopathology of liver tissue. In conclusion, our results showed that the high dose of free curcumin and the two doses of nanoparticulate curcumin were effective in preventing DEN-induced HCC indicating that the nanoparticles improved curcumin bioavailability as they were effective in preventing HCC despite their enormously low doses.

Materials and methods

Chemicals

Diethylnitrosamine (DEN) was acquired from Sigma Aldrich (St. Louis, MO, USA) and phenobarbital (PB) containers were gotten from The Government Pharmaceutical Organization (Bangkok, Thailand). The alpha fetoprotein ELISA pack and doxorubicin hydrochloride were bought from Cusabio Technology (Taiwan) and Toronto Research Chemicals Inc. (Toronto, Canada). Doxorubicin hydrochloride was bought from Toronto Research Chemicals Inc. (Toronto, Canada). PCA-ZnAl-IEEX was newly arranged utilizing particle trade strategy in Materials Synthesis and Characterization Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia. An intensive portrayal of the nanocomposites was done before the in vivo investigation.

Animal preparation

Fifteen-day-old male BALB/c mice were gotten from the Animal Resources Unit, Faculty of Veterinary Medicine, and Universiti Putra Malaysia. The mice were housed in five creatures/confine with woodchip bedding. The mice were set apart by the tail for distinguishing proof and were kept up under standard states of temperature ($25 \pm 2^\circ\text{C}$), relative stickiness ($70 \pm 5\%$) and a 12-hour light-dim cycle. The creatures were taken care of with standard mouse pellets and faucet water not obligatory all through the tests. The examination convention was endorsed by the Universiti Putra Malaysia Institutional Animal Care and Use Committee (UPM/IACUC/AUP-R35/2014).

Acceptance of hepatocellular carcinoma in BALB/c mice

Forty male neonatal BALB/c mice were infused with 10 μL of 50 $\mu\text{g/g}$ body weight of DEN intraperitoneally. Female mice were barred from the investigation. Following DEN infusion, the mice were come back to the moms to keep taking care of. After weaning (at 28 days old), the mice were housed into five gatherings (5 creature/pens), and 500 mg/L of phenobarbital (PB) was brought into their drinking water for 12 weeks. The drinking water containing PB was changed every day, and admission was permitted at not obligatory. The ordinary benchmark group containing 10 BALB/c mice was permitted to have typical drinking water. Force count was played out from the earlier utilizing GPower factual programming with an intensity of roughly 80% and an alpha of 0.05. Four mice kicked the bucket from cardiovascular injury during the acceptance time frame. The body loads were checked week by week all through the acceptance time frame. Toward the finish of multi week PB treatment, creatures were randomized into five gatherings; non-actuated (10 creatures) and HCC gathering (4 gatherings of 9 creatures each). DOX-rewarded mice fill in as positive control.

Affirmation of the nearness of hepatocellular carcinoma

At week 12 after the inception and acceptance forms, three mice each were haphazardly chosen from the ordinary and incited gatherings and blood was pulled back by means of heart cut. The serum alpha-fetoprotein (αFP) level, which is a tumor marker for HCC, was estimated utilizing an ELISA unit (Cusabio Technology, Taiwan).

The degree of αFP was set at 150 ng/mL for the acceptance of liver tumor. This level has been recently answered to actuate essential liver disease and teratocarcinoma.