Perspective

Pharmaceutical BIOPROCESSING

Mercury Induces Cytotoxicity Activates Stress Genes in Human Liver Carcinoma Cells

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Abstract

Mercury may be a non-essential component that exhibits a high degree of toxicity to humans and animals. Exposure to mercury has been related to a major variety of adverse health effects including: upset, anaemia, biological process abnormalities, neurobehavioral disorders, excretory organ and liver harm, and cancer in some cases. In many studies, the toxicity of mercury has been attributed to its high affinity to protein-containing sulfhydryl teams. However, very little is thought relating to the molecular mechanisms by that mercury exerts its toxicity, cause, and carcinogenesis. This analysis was thus designed to assess the cellular and molecular responses of human liver malignant neoplastic disease cells following exposure to mercury. Toxicity experiment yielded a LD50 worth of three.5 ± 0.6 µg/mL upon forty eight hours of exposure, indicating that mercury is extremely poisonous. A dose response relationship was recorded with regard to each toxicity and cistron induction. Overall, 9 out of the 13 recombinant cell lines tested showed inductions to statistically vital levels .

Keywords: Mercury • cytotoxicity • gene expression• HepG2 cells

Introduction

Mercury could be a stable and protracted environmental stuff since it can't be degraded or destroyed. Therefore, it tends to accumulate within the soils and sediments. Excessive levels of mercury within the marine surroundings will have an effect on marine assemblage and cause risk to human customers of food. Hence, mercury compounds found within the marine surroundings cause risks to human health through the consumption of contaminated food. several metals square measure essential to life and solely become harmful once exposures to assemblage become excessive whereas bound non-essential metals don't have specific exposure thresholds for the induction of adverse effects, the biological responses to mercury exposure square measure an immediate consequence of exposure and square measure outlined through a dose-effect relationship, wherever the chance of adverse effects is assumed to be proportional to the exposure. the most phylogenesis sources of mercury square measure varied industrial purpose sources, together with gift and former mining activities, foundries and smelters, and diffuse sources like combustion by merchandise, constituents of merchandise. Most of the mercury within the atmosphere is elemental mercury vapor, that circulates within the atmosphere for up to a year, and therefore will be wide distributed and transported thousands of miles from doubtless sources of emissions. Most of the mercury in water, soil, sediments, or plants and animals is within the type of inorganic mercury salts and organic styles of mercury. The mercury cycle within the surroundings is more difficult by the very fact that within the surroundings there's a continuing inter-conversion between varied styles of mercury through chemical reaction and reduction reactions. Elemental mercury is eventually aloof from the atmosphere by chemical reaction to a soluble species and by dry deposition. Though large-scale releases of mercury are controlled within the us, part transport

implicates smaller sources (combustion of coal, municipal solid waste and biodegradable pollution sludge) because the reason for widespread elevations of mercury concentrations in remote ecosystems

Description

HepG2 cells, a transformed human hepatoma cell line and recombinant HepG2 cell lines were obtained from Xenometrix, Inc. (Boulder, Colorado). In the laboratory, cells were stored in liquid nitrogen until use. They were next thawed by gentle agitation of their containers (vials) for 2 minutes in a water bath at 37° C. After thawing, the content of each vial was transferred to a 75cm2 tissue culture flask, diluted with DMEM supplemented with 10% fetal bovine serum (FBS) and 1% streptomycin and penicillin, and incubated for 24 hours at 37° in a 5% CO2 incubator to allow the cells to grow, and form a monolayer in the flask. recombinant constructs generated by creating stable transfectants of different mammalian promoter – chloramphenicol acetyltransferase (CAT) were obtained from Xenometric Inc. (Boulder, CO). Each construct contained a unique stress gene promoter or response element fused to the CAT reporter gene. Seeded plates were incubated for 24 hours at 36° C in a 5% CO2 incubator, followed by a replacement of the old medium by a fresh one containing the appropriate amount of each of the test chemical using deionized water as the solven. A specific, constant volume was transferred from each well of the chemical dilution plate to the plate containing the cells to give each cell line five chemical doses and a zero control dose, each in triplicates. The transcriptional fold inductions for each recombinant cell line at each mercury concentration were calculated using the CAT-Tox computer software based on the optical density readings at 600 nm and 405 nm. The software also converted the 550 nm readings to cell viability percentages. Standard deviations were determined, and the Student's t-test values were computed to determine if there were significant differences in cell viability and gene induction in treated cells compared to the control cells. The toxicity of mercury is primarily associated with the cationic state ($Hg^{2+),}$ however absorption, tissue distribution, and bio transformations are all influenced by the valence state of the metal .Mercury salts pose a greater health hazard to humans via ingestion, than metallic mercury. Typically, fatalities range from ingestion of 1 to 4 grams of mercuric chloride, although some have occurred with as little as 0.5 gram.

Acknowledgement

None

Conflict of Interest

No conflict of interest

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