Effects of insecticides fenitrothion, endosulfan and abamectin on antioxidant parameters of isolated rat hepatocytes

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ABSTRACT

Fenitrothion, endosulfan and abamectin are insecticides that affect various organs in humans and animals. The present study was conducted to investigate their cytotoxicity in isolated male rat hepatocytes. The study suggests that incubation of hepatocytes with 10 or 100μM of each insecticide for 2h significantly decreased the cell viability. Increased leakage percentage of lactate dehydrogenase (LDH), alanine transaminase (ALT) and aspartate aminotransferase (AST) were detected in hepatocytes due to the same dose of insecticide exposure confirmed membrane damage of hepatocytes. Fenitrothion (100 μM) increased the cellular lipid peroxidation (LPO) levels more than the other insecticides. The activities of the antioxidant enzymes like superoxide dismutase (SOD), glutathione peroxidise (GSH-Px) and glutathione-S-transferase (GST) were decreased by fenitrothion incubation more than endosulfan and abamectin. The same treatment reduced the level of antioxidant glutathione (GSH) and increased the level of LPO. The activities of glutathione-S-transferase (GST) and gamma glutamyl transpeptidase (γ-GT) were more affected by fenitrothion and endosulfan, respectively, indicating an oxidative stress. There was negative correlation coefficient among GSH, GST and γ-GT. A significant correlation was also found between γ-GT and cell viability. The present study revealed that fenitrothion showed varying pathological signs depending on the dose; high dose caused marked damage of isolated hepatocytes in the oxidative and antioxidant parameters. Endosulfan induced cell membrane damage of the hepatocytes more than abamectin and fenitrothion as indicated by increasing the leakage percentages of LDH, ALT, AST and γ-GT. Therefore, hepatotoxicity of insecticides increased in a time and dose-dependent manner and depended on the class of the insecticide.
Amelioratory effect of vitamin E on organophosphorus insecticide diazinon-induced oxidative stress in mice liver

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ABSTRACT

Considering that the involvement of reactive oxygen species (ROS) has been implicated in the toxicity of organophosphate insecticides (OPIs), the aim of this study was to investigate the ameliorative properties of vitamin E (vitE) against the subchronic effect of diazinon (DZN) on oxidative damage markers such as lipid peroxidation (LPO) and the antioxidant defense system (ADS) in the liver of male MFI albino mice. The groups were intraperitoneally (i.p) administered with either vehicle or vitE (100mg/kg body weight) or ¼ LD50 of DZN (16.25mg/kg b.w.) or ½ LD50 of DZN; 32.5mg/kg b.w) or ¼ LD50–DZN+vitE or ½ LD50+vitE every consecutive day for 14 days. Hepatic damage markers analysis revealed that alanine transferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and lactate dehydrogenase (LDH) were significantly decreased in both DZN doses. Also, the significantly increased levels of biomarkers of oxidative stress as LPO and protein carbonyl (PC) and the decreased antioxidant defenses like reduced glutathione (GSH), and free radical scavenger enzymes viz., catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GSH-Px), and glutathione reductase (GSH-Rx) were noted in DZN-treated groups as compared to control group. Distinctly lower levels of GSH and increased levels of LPO, along with alterations in endogenous antioxidant enzymes were evident in hepatic toxicity of DZN which is dose-dependent. Hepatic specific marker enzymes were restored to normalcy in mice supplemented with vitE following treatment with DZN which otherwise was decreased in the DZN-treated mice. The results show that co-treatment of vitE with DZN prevents or diminishes the oxidative stress of DZN-treated mice and may act as a putative protective agent against DZN-induced liver tissue injury.
Effect of Streptomyces 23-2B metabolites on hepatic lipid peroxidation and some antioxidant parameters in Wister rats

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ABSTRACT

Streptomyces 23-2B is one of actinomycetes associated with marine clam Donax trunculus and has potential source of bioactive metabolites, which possesses a broad spectrum antibiotic and anticancer activities. This study aims to evaluate the effect of Streptomyces 23-2B metabolites on hepatic lipid peroxidation (LPO), reduced glutathione (GSH) levels, as well as serum uric acid, total cholesterol (TC), triglyceride (TG), nitric oxide (NO) and tumor necrosis factor-alpha (TNF-α) levels of rat. Animals were divided into four groups: the control group, which received 0.1 ml of 10% Tween-80 by intraperitoneally injection, and the other three experimental groups, which received 10% Tween 80 solution of Streptomyces 23-2B metabolites in doses of 0.5, 5 and 50 mg/kg body weight at an interval 2 days for 2 weeks. LPO levels showed significant decrease with the lowest doses. The effect at a dose of 50 mg/kg of Streptomyces 23-2B metabolites on TG was more pronounced than the other two doses (0.5 and 5 mg/kg body weight). Hypocholesterolemia was recorded in the treated rats with 0.5 and 5 mg/kg of Streptomyces 23-2B. However, the highest dose enhanced the elevation of serum TNF-α and NO levels. Thus, the present study reveals that Streptomyces 23-2B metabolite is a newly discovered biomaterial from microorganisms. The novel substance showed inhibitory activity against LPO in rat liver homogenate and improving the immune response by releasing TNF-α and NO in serum.
Antimicrobial, antitumor and in vivo cytotoxicity of actinomycetes inhabiting marine shellfish

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ABSTRACT

Sixty-three actinomycete strains isolated from the marine shellfish Donax trunculus anatinus were phenotypically identified as ten genera, in addition to two unidentified strains. Their metabolic extracts exhibited wide antimicrobial activities towards 11 reference and clinical cultures; and 17.5% showed antitumor activities with solid tumor selectivity of four Nocardioides, Kitasatosporia and Streptomyces strains. Streptomyces 23-2B was particularly noted for its high antitumor activity against Ehrlich’s ascites carcinoma with plateau inhibitory effect at 500, 250 and 50 μg/ml concentrations, promising solid tumor selectivity and high cytotoxicity to human carcinoma of liver (HEPG2), cervix (HELA) and breast (MCF7) (IC50: 3.89, 9.4 and 10 μg/ml, respectively). In vivo cytotoxicity of S.23-2B metabolites showed common sign of unimpaired kidney and liver functions, as indicated from non-significant elevation in serum enzymatic activities, urea, creatinine, total protein and albumin levels in response to 0.5 and 5 μg/g doses after alternate-day injection for 2 weeks. Microorganisms associated with the marine shellfish are suggested to be potential source of bioactive metabolites.
Oxidative stress responses of rats exposed to Roundup and its active ingredient glyphosate

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ABSTRACT

Glyphosate is the active ingredient and polyoxyethyleneamine, the major component, is the surfactant present in the herbicide Roundup formulation. The objective of this study was to analyze potential cytotoxicity of the Roundup and its fundamental substance (glyphosate). Albino male rats were intraperitoneally treated with sub-lethal concentration of Roundup (269.9mg/kg) or glyphosate (134.95mg/kg) each 2 days, during 2 weeks. Hepatotoxicity was monitored by quantitative analysis of the serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) activities, total protein, albumin, triglyceride and cholesterol. Creatinine and urea were used as the biochemical markers of kidney damages. The second aim of this study to investigate how glyphosate alone or included in herbicide Roundup affected hepatic reduced glutathione (GSH) and lipid peroxidation (LPO) levels of animals as an index of antioxidant status and oxidative stress, respectively, as well as the serum nitric oxide (NO) and alpha tumour necrosis factor (TNF-α) were measured. Treatment of animals with Roundup induced the leakage of hepatic intracellular enzymes, ALT, AST and ALP suggesting irreversible damage in hepatocytes starting from the first week. It was found that the effects were different on the enzymes in Roundup and glyphosate-treated groups. Significant time-dependent depletion of GSH levels and induction of oxidative stress in liver by the elevated levels of LPO, further confirmed the potential of Roundup to induce oxidative stress in hepatic tissue. However, glyphosate caused significant increases in NO levels more than Roundup after 2 weeks of treatment. Both treatments increased the level of TNF-α by the same manner. The results suggest that excessive antioxidant disruptor and oxidative stress is induced with Roundup than glyphosate.