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Biochemical and histopathological effects of formulations containing Malathion and Spinosad in rats

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Abstract

Two insecticide formulations, malathion (57% EC) & spinosad (24% SC) were evaluated for their toxic potential using male albino rats. The animals were orally administered formulations containing either malathion or spinosad at three different doses corresponding to Acceptable Daily Intake (ADI) (0.30 & 0.02 mg a.i.kg⁻¹ b.w.), No Observed Adverse Effect Level (NOAEL) (29.0 & 9 mg a.i.kg⁻¹ b.w.) and 1/100 LD₅₀ (13.75 & 37.38 mg a.i.kg⁻¹ b.w.), respectively for 8 weeks. No mortalities were observed. Significant loss of body weight was noted with spinosad-NOAEL. Generally, the weights of livers increased significantly, while those of kidneys were decreased. At 1/100 LD₅₀ dose, spinosad showed significant increase in alanine aminotransferase while malathion-ADI showed significant decrease. At all doses, there was a significant decrease in aspartate aminotransferase, except in animals receiving malathion at a dose equivalent to ADI. The three doses of spinosad caused significant increase in serum alkaline phosphatase. Both malathion and spinosad inhibited serum acetylcholinesterase, and induced insignificant changes in total lipid concentrations. The NOAEL and 1/100 LD₅₀ of spinosad induced significant decreases in uric acid concentration, while that of malathion showed an opposite trend. Both insecticides led to degenerative changes of hepatocytes, granulation of cytoplasm, vacuolation of hepatocytes and hepatic necrosis. In kidney, degenerative changes of epithelium lining of renal tubules were associated with occlusion of the lumen and necrotic changes associated with desquamation of epithelium lining. The overall findings of the present study highlight the necessity of evaluating the toxic hazards of formulated pesticides even at the recommended "safe doses" of the technical compounds.

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Alterations in Membrane Bound Alkaline Phosphatase and ATPase Activities in Selected Tissues of Wistar Rats during Phosphamidon Toxicity

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Abstract

The effect of phosphamidon was studied on membrane ATPases, alkaline phosphatase activity levels and lipid peroxidation in the brain and liver tissues of wistar rats during acute ($6.63 \text{ mg kg}^{-1} \text{ body weight day}^{-1}$), sub-acute ($4.43 \text{ mg kg}^{-1} \text{ body weight day}^{-1}$) and no-effect level ($0.1 \text{ mg kg}^{-1} \text{ body weight day}^{-1}$) doses. Significant increase in alkaline phosphatase activity and reduction in ATPase system suggest possible involvement of phosphatase as an alternative energy source during energy crisis so as to maintain normal physiological activities. In addition, alterations in the above enzyme systems coupled with hypoxic injury may also significantly alter and /or disrupt a variety of transport or permeability mediated physiological and biochemical phenomena across the membrane system and within the cell itself. Further, the ability of the animal to resist the stress from oxidative agents, induced during phosphamidon toxicity, was reflected by the increased glutathione peroxidase activity.

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Protective role of Piperine against Cadmium induced hepatic and renal toxicity in mice

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Abstract

Cadmium (Cd), an industrial and environmental ubiquitous pollutant, is toxic to several tissues, most notably hepatic, on acute administration and renal following chronic exposure. Piperine, an alkaloid, is the main component of *Piper longum* Linn. and *Piper nigrum* Linn.. The efficacy of piperine (2.5 mg/kg/day, oral for 7 days) in metal mobilization and tissue morphology, of Cd as CdCl_2 (1.8 mg/kg, i.p, 4th day) treated Balb/c mice was investigated. The uptake of Cd and trace metals was observed in both liver and kidney along with focal necrosis in the former and cloudy swelling of the proximal and distal tubules in the latter. Cytoprotection by piperine was clearly evident in the present study. The hepatic and renal Cd levels were significantly decreased and histopathological changes were also minimized by piperine treatment. The antioxidative activity of piperine could be responsible for its efficacy, affecting metallothionein as well as the defense system.

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Subacute toxicity of ellagic acid in cholesterol fed hyperlipidemic rats

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Abstract

In the present study, the effect of ellagic acid (500 mg/kg) on lipid profile and histology of vital organs of rats on cholesterol fed hyperlipidemic rat was studied. Ellagic acid along with cholesterol treatment (cholesterol, 500 mg/kg + cholic acid, 250 mg/kg + coconut oil, 10 ml/kg) was administered orally to Wistar rats daily for 90 days. Blood samples were collected on day 0 and day 60 of the treatment period and were analyzed for lipid profile.

The treatment was continued for next 30 days and rats were sacrificed on 90th day. In control group (vehicle, gum acacia 2%) showed increase in cholesterol, TG (Triglyceride), VLDL (Very Low Density Lipoprotein), LDL (Low Density Lipoprotein), in rats while HDL (High Density Lipoprotein) was reduced. On other hand in ellagic acid group there was non-significant increase in HDL. The ellagic acid treated group (500 mg/kg) showed significant decrease in cholesterol and LDL, however no significant decrease in TG and VLDL was observed. Histopathology of control group showed atherosclerosis while ellagic acid group showed no atherosclerosis.

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Cytotoxic response of endosulfan and chlorpyrifos pesticides in poultry lymphocyte culture

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Abstract

Cytotoxic effect of endosulfan, an organochlorine, and chlorpyrifos, an organophosphate, pesticide was evaluated using poultry lymphocyte cell culture. 48 h exposure of endosulfan and chlorpyrifos revealed prominent changes in the cells like shrinkage of nucleus, change in shape and size of the cells, rupture of cell membrane and disintegration of cells in dose-dependent manner at doses ranging from 1-100 $\mu\text{g.ml}^{-1}$ in RPMI-1640 culture media. Chlorpyrifos was found to be more cytotoxic than endosulfan as evident by their median inhibitory concentrations of 15.85 $\mu\text{g.ml}^{-1}$ and 20.89 $\mu\text{g.ml}^{-1}$, respectively. It is concluded that lymphocyte culture model may be used to determine zero-immunotoxic dose levels of endosulfan and chlorpyrifos and other pesticides in animals.

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Detection of carbaryl residue by HPLC in foods of plant and animal origin in Kumaon region of Uttarakhand

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Abstract

This survey was undertaken to determine the residues of carbaryl pesticide in surface water, milk, poultry eggs and meat, green fodder and grain samples collected from different centres of Kumaon region of State of Uttarakhand. Residue analysis of carbaryl was done by HPLC using UV-VIS detector at wavelength 280 nm. The highest mean residual concentration (mg/ml or g) of carbaryl was 0.0527 mg/ml in water followed by 0.0541 in meat, 0.0506 in poultry eggs, 0.0453 in milk, 0.0435 in food grain, and 0.0344 in green fodder. The percentage of positive samples for carbaryl residues was higher in plain areas than hilly regions of the State. However, none of the samples contained residual concentration above the maximum residue limit (MRL) as per guidelines of FAO/WHO (1986).

Amelioration of fluoride toxicity in rats through vitamins (C, D) and calcium

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Abstract

The healthy, adult male rats (*Rattus norvegicus*) were treated with fluoride water (F.W.+5.8 ppm), F.W.+ ascorbic acid and F.W. + vitamins (C, D) and Ca⁺² for 60 days. Fluoride water ingestion to rats for 60 days resulted in significant reduction of seminal vesicle weight, sperm motility and sperm density of cauda epididymis and testis as compared to control values. The level of testosterone diminished significantly leading to reduced fertility and numbers of litters. The total erythrocytes number, hemoglobin and haematocrit value declined. The concentration of protein, fructose and ascorbic acid decreased, whereas, the cholesterol concentration of testis and enzyme activity of acid phosphatase increased significantly (P<0.001) as compared to control value. The exogenous feeding of ascorbic acid and vitamin C, vitamin D and calcium along with fluoride water for 60 days caused recovery in all altered parameters studied including circulating level of testosterone, blood physiology, sperm function and fertility. The data suggest that ascorbic acid and vitamin C, vitamin D and Ca⁺² treatment can play a prophylactic role to maintain normal physiology in fluoride toxicity.

Patho-biochemical studies on experimentally induced gout by administration of sodium bicarbonate in broilers

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Abstract

Gout is a metabolic disorder that results in hyperuricemia and deposition of monosodium urate crystals in various parts of the body. The possibility of inducing gout in broiler chicks via the administration of sodium bicarbonate was investigated with the objective of developing an experimental model for gout induction, which may help in evaluating therapeutic compounds for preventing gout in chicks and would rather provide an insight into the patho-biochemical changes associated with gout. Broiler chicks given sodium bicarbonate at 5% in drinking water (Group 2) showed mortality within 5-7 days. The visceral gout was evident on necropsy. However, the gout did not develop in chicks given 1% sodium bicarbonate (Group 1). Microscopic examination revealed significant urate deposits, tubular necrosis, glomerulo-nephritis and foreign body granulomas in the renal interstitium in chicks of Group 2. These urate deposits were demonstrated by Deglantha stain and were found to be a salt of calcium (Von Kossa stain). Consistent with these findings were higher concentration of uric acid in plasma of chicks of Group 2. The study revealed that administration of 5% sodium bicarbonate in drinking water for one week is a simple method of inducing gout in 2-week-old broiler chicks.

Protective effect of *Ocimum sanctum* on ethanol-induced oxidative stress in swiss albino mice brain

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Abstract

Chronic ethanol consumption is a medical problem with important socio-economic repercussions worldwide. Its chronic consumption enhances the oxidative damage to neurons and resulting in cell death. In this study we evaluated the protective effect of *Ocimum sanctum* on ethanol-induced oxidative stress in Swiss albino mice brain. Mice were divided into groups comprising of vehicle control, ethanol control, *Ocimum sanctum* water extract (OSWE) treatment at three doses, quercetin as a reference drug control and the treatment was given orally for 30 days. Oxidative stress and anti-oxidant related enzymes were estimated from brain homogenate. OSWE was found to inhibit the lipid peroxidation and nitric oxide and enhance the superoxide dismutase in dose dependent manner.

Evaluation of maternal toxicity in rats treated with deltamethrin 1%+triazophos 35% EC

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Abstract

Effect of a pesticide combination (Deltamethrin 1% + triazophos 35% EC) on reproductive system was evaluated in Wistar rats. Pesticide combination was administered at the dose level of 10, 20 and 30 mg/kg body weight to the male and female rats. Male animals were dosed orally by gavage for a period of 15 weeks (70 days prior to mating, during mating and thereafter till sacrifice). Female animals were dosed in similar way for 14 days prior to mating (at least two cycles), during mating, throughout gestation and lactation period. Body weight and feed intake were altered significantly at high dose group. Survival mortality and live births were significantly affected at high dose group with decreased pup number, pup weight, increased mortality. Results of current investigation are indicating that the test article is potent maternal toxicant at high dose groups.

Toxic levels of calcium and phosphorus in the serum of cholecalciferol (vitamin D₃) fed house rats (*Rattus rattus*)

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Abstract

Sex specific variation in the concentration of serum calcium and phosphorus levels were observed in the control house rats as these values were higher in case of male than female rats. Single oral administration of different doses of cholecalciferol/vitamin D₃ (30, 40, 50 and 100 mg/kg body weight) to house rats resulted in significantly higher levels of serum calcium and phosphorus compared to control rats. Optimum concentration of calcium was found to be 11.41 mg/dl and 10.36 mg/dL respectively in male and female rats at 50 mg/kg dose of cholecalciferol. Also, maximum phosphorus level was observed to be 9.81 mg/dL in males and 8.30 mg/dL in females after oral intake of 50 mg/kg dose of cholecalciferol. Thus highest value of calcium and phosphorus product was reported at 50 mg/kg dose from the serum of both the sexes. Toxic levels of calcium and phosphorus resulted in the mineralization of soft tissues leading to death of the house rats.

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Phototoxicological studies of riboflavin and chloroquine on *Daphnia magna*.

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Abstract

The effect of solar and ultraviolet (UV-B) radiation has been examined on *Daphnia magna* in presence of riboflavin and chloroquine. *Daphnia magna* were divided into nine groups and exposed to natural solar light and UV-B individually and in combination of riboflavin and chloroquine. Exposure lasted for 3 days with the duration of 1 hour per day. Results on mortality rate indicates that mortality was highest 62% in chloroquine + ultraviolet-B exposed group, 49% in solar radiation + chloroquine exposure, 39% after chloroquine treatment, 38% in Ultraviolet-B + riboflavin exposure, 36% in UV-B exposed groups and minimum in control and riboflavin treated groups. Solar and UV-B radiations further have more harmful effect on *Daphnia* in presence of riboflavin and chloroquine thus showing their phototoxic effect. Exposure of UV-B radiation increase mortality rate and decreases the rate of reproduction in *Daphnia magna*. UV-B dose measured in Dehradun on clear sunny day was 0.380mw/cm² in the month of January at 12.00 noon in natural solar radiation.

Short Communication

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Sex specific value of oral LD₅₀ of cholecalciferol (vitamin D₃) against house rat (*Rattus rattus*)

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