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## **Lead induced structural and functional alteration of sperm cell among industrial workers**

**Subarna Gupta, A.K. Mukherjee, S.K. Bhattacharya, S.K. Roy and Amal Roy Chowdhury\***

### **Abstract**

Effect of lead had been studied among two groups of industrial workers of battery manufacturing and pigment factories. These workers were exposed to inorganic lead for 7-10 years (group II) and 10-15 years (group III) for a daily working duration of 8 hours. The control subjects (group I) were selected from persons without any occupational exposure to lead. All the subjects were of same socio-economic status and between the age group of 30-40 years. Semen and blood samples were collected from all the subjects. Blood and semen lead were measured by atomic absorption spectrophotometric method. Sperm count, motility, morphological abnormalities and hypoosmotic swelling test (HOST) were carried out. Seminal plasma acid phosphatase and sperm ATPase activities were measured in all the subjects. Sperm membrane lipid peroxidation and seminal plasma ascorbate and dehydro ascorbate were measured to note the lead induced generation of oxidative stress. Blood and semen lead content increased significantly with the increase in duration of exposure. Decrease in sperm count and increase in acid phosphatase activity along with significant increase in sperm morphological abnormalities, decrease in membrane integrity along with increased membrane lipid peroxidation suggested lead induced generation of oxidative stress which resulted in structural alteration to the sperm cells. The

protective action of seminal plasma by the ascorbate – dehydro ascorbate system was not sufficient to restrict the oxidative stress. Along with structural alterations, sperm motility and ATPase activity also decreased indicating functional impairment of the sperm cells. Therefore, lead probably is responsible for the generation of oxidative stress, resulting in the structural as well as functional alteration to the spermatozoal component.

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## **Effect of *Asteracantha longifolia* Nees. against galactosamine induced liver dysfunction in rat**

**Sunita Shailajan\*, Naresh Chandra, R.T.Sane and Sasikumar Menon**

### **Abstract**

The present investigation aims at studying the efficacy of *A.longifolia* Nees., against galactosamine induced rat liver dysfunction. It also evaluates and compares the efficacy of slurry, aqueous extract and ethanolic extract of whole plant powder. The blood biochemistry and histopathological examination of liver was done to assess the hepatoprotective action. The study showed hepatoprotective effect by *A. longifolia* in the rat model studied.

Toxicol. Int.Vol. 14, No. 1, 2007 pp 15-19

## **Evaluation of immunotoxic effect of short-term administration of quinalphos and imidacloprid in white leghorn cockerels**

**A. Siddiqui<sup>1</sup>, M. Choudhary<sup>2</sup>, H. V. Goriya<sup>1</sup>, S. K. Bhavsar<sup>1</sup> and A. M. Thaker<sup>1\*</sup>**

### **Abstract**

The effects of quinalphos and imidacloprid on immune response to Ranikhet disease vaccine in WLH cockerels were evaluated. Quinalphos and imidacloprid treatments were started a day after R<sub>2</sub>B vaccination. Birds were given quinalphos orally at 50 and 100µg and imidacloprid at 1 and 2 mg / kg body weight daily for 28 days. A significant decrease in the total protein was observed on the 14th, 21st and 28th day of treatment in quinalphos-treated groups. Non-significant reduction of total protein was seen in imidacloprid treated group at 1 mg/kg body weight on 28th day of treatment. On the 21st and 28 th days of treatment, a significant decrease in total albumin was observed in birds of both insecticide-treated groups. A significant reduction in total globulin was only observed at both dose levels in quinalphos-treated groups after second week of administration. A decline in HI antibody titer was observed in both the insecticide treated groups a week after its administration. A decline in total proteins, total globulins and reduction in HI antibody titer in the insecticide treated birds as compared to control birds suggest that quinalphos and imidacloprid induce immunosuppression.

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## **Evaluation of mutagenicity of synthetic pyrethroids by salmonella microsome - reversion assay**

**Sonia Sethi\*, Nupur Mathur and Pradeep Bhatnagar**

### **Abstract**

Second generation pyrethroids were tested for mutagenicity in a bacterial reversion assay system with two strains TA 98 and TA 100 of *Salmonella Typhimurium*. Three Insecticides Cypermethrin, Fenvalerate and Deltamethrin were tested before and after activation with liver postmitochondrial fraction (Hepatic S9 mix) of

Swiss Albino mice. All the three insecticides studied in the present study were found to be non-mutagenic with strains TA 98 and TA100 in the absence of S9 liver mix. After activation with S9 liver mix, the insecticides showed mutagenicity with TA 98 but no mutagenicity with TA100. Thus this study reveals that these insecticides are capable of causing base pair mutations after metabolic activation.

Toxicol. Int.Vol. 14, No. 1, 2007 pp 25-31

## **Tert-butyl hydroperoxide (t-BHP) induced structural and functional alterations in isolated rat hepatocytes and rat liver mitochondria and protection accorded by antioxidants**

**Sudhir Mehrotra\*, Sangram Singh, Ankush Gupta and Rajat Sandhir®**

### **Abstract**

Tert-butyl hydroperoxide caused high amplitude mitochondrial swelling in a dose dependent and time dependent manner in isolated rat liver mitochondria. Synthetic antioxidant butylated hydroxytoluene and natural thiol reducing agent Dithiothreitol accorded maximum protection, whereas reduced glutathione led to partial protection against t-BHP induced swelling. Both butylated hydroxytoluene and  $\alpha$ -tocopherol protected the mitochondria from t-BHP induced impairment of mitochondrial electron flow. Reduced glutathione accorded more protection against t-BHP induced increase in intracellular free calcium concentration in contrast to vitamin E and butylated hydroxytoluene. Our results indicate that high amplitude mitochondrial swelling, impairment of mitochondrial electron flow along with increase in intracellular free calcium concentration may be involved in the hepatotoxic action of t-BHP.

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## **NDEA induced oxidative stress in albino rats-impact of dietary protein level**

**Vanita Kaushal, S. Sharma, A.P.S. Brar and Giridhar Soni\***

### **Abstract**

In order to study the effect of dietary protein levels on the toxicity of N-nitrosodiethylamine (NDEA), rats were fed diet containing 5%, 10% or 20% protein (casein) along with NDEA (100 mg/kg diet) and were sacrificed after 3 weeks of feeding. Oral administration of NDEA resulted in decreased gain in body weight, feed and protein efficiency ratio, and the effects being severe under low dietary protein conditions. Osmotic fragility of erythrocytes and lipid peroxidation of erythrocytes, liver and lungs were significantly higher and activities of defense enzymes viz. catalase, superoxide dismutase and peroxidase either decreased or remained unaltered in rats receiving low protein diets. The results are further supported by histopathological observations. It can be concluded that the oral administration of NDEA causes a number of biochemical and toxicological effects through induced oxidative stress. Severity of immical effects of NDEA was more in rats receiving diet poor in protein content.

## **Short - term toxicity study of dl - menthol in rats**

**Contzen Pereira, Arun Narsimhan, Coralie D'Lima, Remya Goswami and Madhuri Hambarde\***

### **Abstract**

The study evaluates the toxicity of menthol in three groups of male Wistar rats. Rats of group I served as control, group II rats intraperitoneally were administered 0.25 ml absolute alcohol each, four times at weekly intervals (7 days) while group III was intraperitoneally administered 0.6 µg dl-menthol dissolved in 0.25 ml of absolute alcohol (5 µg/ kg body weight/ day) each, at same time intervals. Treatment was carried out for 5 weeks. After the completion of treatment, serum and liver enzymes and other biochemical parameters were assessed. Mean body weights showed a significant decrease in menthol treated rats towards the 4th week of treatment. A significant increase in the liver and serum ACP, ALP, ALT and AST enzyme levels was observed in the menthol treated rats. On the other hand, a significant increase was also observed in liver glycogen, triglycerides and cholesterol levels in menthol treated rats compared to the other groups. From this study it is evident that dl-menthol when administered intraperitoneally, leads to a toxic effect which can be confirmed by the elevated serum and liver enzymes.

## **Acute toxicity studies of T11TS: A glycopeptide with antineoplastic effects against glioma**

**Pallab Sarkar, Malabika Bhattacharjee, Sagar Acharya, Anirban Ghosh, Santanu Kumar Tripathi<sup>1</sup> and Swapna Chaudhuri\***

### **Abstract**

T11TS, a glycopeptide molecule isolated from sheep red blood cell (SRBC) membrane has novel immunostimulatory and antitumor activity in brain tumor rat model. Preclinical acute toxicity studies of this molecule involving intravenous (i.v.) and intraperitoneal (i.p.) routes were designed as 'Limit test', where an animal group received the test article (@ 2100 mg of T11TS /kg body weight) and other group worked as the vehicle control. No acute or delayed death was registered in groups receiving the test article through either of the two routes. No significant deviations in body weight, relative organ weight (of major organs), locomotor functions, different reflex activities and skin/fur condition were found between drug receiving groups and corresponding vehicle control groups. Except a growth arrest stage of the lymphocyte, common haematological parameters were found normal in drug receiving animals. In addition, standard blood glucose level, normal kidney and liver function tests indicated to the undisturbed internal homeostasis and normal functioning of these important organs. Among the immunological parameters, E-rosette formation by the T lymphocytes from drug receiving groups was completely ceased. But, non specific cytotoxicity of lymphocytes activity was intact. Phagocytic potential of the macrophage was also found to be normal in drug receiving groups. Thus it can be concluded that T11TS has a very limited adverse effects on the organs and systems of the animals.

## **Hepatoprotective effect of root extracts of *Tylophora Indica* (wight & arn) against ethanol induced liver damage in rats**

**Nilesh Patel<sup>1</sup>, Vipul Gujrati<sup>1</sup>, T.S. Gouda<sup>1\*</sup>, N.VenkatRao<sup>1</sup>, K. Nandakumar<sup>1</sup>, Md. Shalam<sup>1</sup> and S. M. Shanta Kumar<sup>2</sup>**

## **Abstract**

The aim of the present work was to study the hepatoprotective activity of alcoholic (ALRT) and aqueous (AQRT) extracts against ethanol induced liver damage in rats. Administration of ethanol (3.76 g/kg, bid, po) for 25 days produced significant changes in physical (increased liver weight and volume), biochemical (increase in serum GPT, GOT, ALP, direct bilirubin, total bilirubin, cholesterol, triglycerides with decrease in total protein and albumin levels), histological (damage to hepatocytes) and functional (increase in thiopentone induced sleeping time) parameters of liver, reflecting liver damage. Pretreatment with ALRT (125 and 300 mg/kg, bid, po) and AQRT (200 and 500 mg/kg, bid, po) 1 h before ethanol administration for 25 days significantly protected the physical, biochemical, histological and functional changes induced by ethanol. These results suggest that ALRT and AQRT protected the livers of rats against ethanol induced hepatic damage. ALRT was found to possess greater hepatoprotective activity than AQRT.

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## **Evaluation of maximization sensitization of the saline extract of Titanium coated with diamond like carbon material**

**P.V. Mohanan<sup>1\*</sup>, C.V. Muraleedharan<sup>1</sup>, G.S. Bhuvaneshwar<sup>1</sup>, F. Derangere<sup>2</sup>, Y. Sampeur<sup>2</sup> and R. Suryanarayanan<sup>2</sup>**

## **Abstract**

Titanium coated with Diamond like Carbon (DLC) material was subjected to a battery of toxicological/biocompatibility studies. In the present study we made an effort to evaluate the sensitization potential of the DLC material as per Guinea pig maximization test. There are ten guinea pigs in the test group and 5 in the control group. The physiological saline extract of the DLC material was prepared as per standard protocol. The extract of DLC material (test) was intradermally injected (0.1ml each) to ten animals and physiological saline alone (control) to 5 animals. Seven days after the intradermal injection, the physiological saline extract of the material and physiological saline alone was topically applied (0.5ml) to the test and control animals respectively. Fourteen days after the topical application is the challenge phase, where the physiological saline extract of the material was topically applied (0.5ml) to the hind limb area (untested site) and covered with an occlusive dressing. 24h later, the challenge site was observed for the evidence of erythema or oedema. The results of the study concluded that the DLC material does not elicit any skin sensitization potential under study conditions.

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## **Modulation of toxic effects of organic mercury by different antioxidants**

**Sangeeta Shukla<sup>\*</sup>, Varsha Singh and Deepmala Joshi**

## **Abstract**

Mercury exposure related oxidative stress has been incriminated at least in part, to its toxic effects in different organs. The present investigation was carried out to study the ameliorative effects of nutritional supplementation (zinc, selenium, lipoic acid and magnesium) in the liver, kidney, brain and blood. Adult rats of Sprague Dawley strain were administered a bolus dose of mercury as dimethyl mercury @ 10 mg/kg orally.

Treatment of zinc, selenium, lipoic acid and magnesium were given for three days after 72 h of toxicant administration. Single oral dose of mercury caused significant increase in lipid peroxidation, whereas reduced glutathione levels were observed in liver, kidney and brain. Significant rise in the activities of transaminases, serum alkaline phosphatase and lactate dehydrogenase was observed after toxicant administration. A fall was observed in the activities of acetylcholinesterase in fore, mid and hind brain. All the therapeutic agents showed recouplement in all the parameters, where as selenium and magnesium were found to be more effective and suitable antagonistic agents for mercury toxicity.

Toxicol. Int. Vol. 14, No. 1, 2007 pp 73-81

## **Impact of untreated and treated tannery effluents on seed germination and growth characteristics of Mung bean (*Vigna radiata*)**

**A. Kannan and Raj K. Upreti\***

### **Abstract**

Tannery effluent containing various toxic chemicals is known to contaminate water and soil and may affect the crops. Toxic nature of tannery effluents depends on type of process, processing chemicals and the treatment of effluent before discharge. The effect of two untreated tannery effluents from out-let of chrome tanning and vegetable tanning units, and one treated effluent from out-let of treatment plant were used in the study. Mung bean seeds were presoaked for 30 h in different concentrations (5% to 20%; v/v) of each effluent and germination characters were analysed. Membrane preparations from 7 days old seedlings were also analysed for alkaline phosphatase,  $\text{Ca}^{2+}$ - $\text{Mg}^{2+}$ -ATPase, and total hexose, sialic acid and phospholipids contents. Results revealed that the leaching of carbohydrates and proteins from seeds following presoaking were 1 to 6-fold higher in chrome and vegetable effluents concentrations. In case of treated effluent it was maximally up to 3-fold. Ninety two to 100% germination was observed with vegetable and treated effluents up to a concentration of 10%. It was only 24% in case of the lowest concentration (5% v/v) of chrome effluent. All germination parameters showed significant concentration-dependent reduction in untreated effluents as compared to the treated effluent. Evaluation of seedlings membrane transport enzymes and structural constituents also revealed concentration dependent decline (ranging from 15 to 50%). Changes in all parameters were much less in treated effluent. These findings suggest that treated effluent following more than ten times dilution can be used for irrigation of legume crops.

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## **Effects of co-administration of cisplatin with imidazolium hexafluorocuprate or $\alpha$ -tocopherol on cisplatin induced toxicity and antitumor activity**

**Suniti Sarna\* and Rakesh K. Bhola**

### **Abstract**

Antitumor activity and host toxicity of therapeutical and subtherapeutical dose of cisplatin either alone or in combination with  $\alpha$ -tocopherol or imidazolium hexafluorocuprate (IHFC) was studied in mice bearing Dalton's lymphoma. The administration of cisplatin alone caused significant reduction in tumor volume and packed cell volume at therapeutical dose but subtherapeutical dose reduced tumor volume and packed cell volume when combined with  $\alpha$ -tocopherol. The co-administration of IHFC with cisplatin did not affect the antitumor activity of cisplatin but decreased the host toxicity caused by cisplatin. IHFC and  $\alpha$ -tocopherol being antioxidants were responsible for reduction of cisplatin induced toxicity.

## **Effect of exposure to chromium on humoral and cellular immunity in fish**

**Madhu P. Saxena\* and Jyotika Kapur-Ghai**

### **Abstract**

The water of a local rivulet (Buddha Nallah) was found to contain chromium in concentration of 0.065 mg/L (maximum permissible limit 0.05 mg/L). The effect of chromium on humoral and cellular immunity of common carp fish (*Cyprinus carpio*) was, therefore, evaluated. Fish were exposed for 3 months to water containing various concentrations of chromium. Total plasma immunoglobulins (g/ml) were found to be  $241.67 \pm 4.77$ ,  $190 \pm 5.77$ , and  $130 \pm 5.77$  compared to the control value of  $560 \pm 7.30$  g/ml after exposure to chromium at concentrations of 2, 3 and 5 mg/L, respectively for 90 days. The levels of rosette forming cells (T cells) were 9%, 11%, and 13% as compared to 20% in control fish after exposure to chromium at 5, 3 and 2 mg/L, respectively for 90 days. Thus, exposure to chromium was found to depress both, the humoral and the cellular immunity of fish.