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Acetylcholinesterase and butyrylcholinesterase - important enzymes of human body

2005-07-01

The serine hydrolases and proteases are an ubiquitous group of enzymes that is fundamental to many critical life functions. Human tissues have 2 distinct cholinesterase activities: acetylcholinesterase and butyrylcholinesterase. Acetylcholinesterase functions in the transmission of nerve impulses, whereas the physiological function of butyrylcholinesterase remains unknown. Acetylcholinesterase is one of the crucial enzymes in the central and peripheral nerve system. Organophosphates and carbamates are potent inhibitors of serine hydrolases and well suited probes for investigating the chemical reaction mechanism of the inhibition. Understanding the enzyme’s chemistry is essential in preventing and/or treating organophosphate and carbamate poisoning as well as designing new medicaments for cholinergic-related diseases like Alzheimer’s disease.

Authors: Patocka, Jiri; Kuca, Kamil; Jun, Daniel

Full source: Acta Medica (Hradec Kralove, Czech Republic) 2004, 47(4), 215-228 (Eng)

Determination of blood lead by atomic absorption method

2005-07-01

This study develops a simple, rapid and accurate method for determination of blood lead to detect blood lead level in children in rural area. A 0.5 mL blood sample was diluted with NH4H2PO4, Triton X - 100 and HNO3, and the blood lead was determined by atomic absorption method. The detection limit was 1.40μg/L, relative SD 1.95% - 3.49% and recovery 89.99% - 109.8%. The method had been successfully used in 503 children. This method is good for determination of blood lead level.

Authors: Liu, Li-e; Liu, Jie; Zhu, Mingjun; Yan, Suqing

Full source: Zhongguo Weisheng Jianyan Zazhi 2004, 14(5), 528-530 (Ch)

Pilot study for comparison of reticulocyte-micronuclei with lymphocyte-micronuclei in human biomonitoring

2005-07-01

Biomonitoring tries to determine the consequences for humans of exposures to environmental or pharmaceutical agents. Radioiodine therapy was chosen to represent a short time exposure and hemodialysis treatment in end-stage renal failure was chosen to represent a chronic exposure. The results show that iodine radiation induced measurable genomic damage in the lymphocyte-micronucleus assay as well as in the reticulocyte-micronucleus test. Of two groups of patients under hemodialysis treatment, a reduced genomic damage was found with the lymphocyte-micronucleus test, but not with the reticulocyte-micronucleus test in the group undergoing daily hemodialysis, which removes uremic toxins more efficiently as compared to conventional hemodialysis, the treatment applied in the other group. The limited life-span of reticulocytes may make them less suitable for accumulation of chronic low level damage than lymphocytes. In conclusion, the lymphocyte-micronucleus test may be applicable to more exposure situations (including low chronic exposure), but the reticulocyte-micronucleus assay may be easier to perform in a clinical setting. The latter reflects a more rapid reduction of genomic damage after an acute exposure.

Authors: Stopper, H.; Hempel, K.; Reiners, Chr.; Vershenya, S.; Lorenz, R.; Vukicevic, V.; Heidland, A.; Grawe, J.

Full source: Toxicology Letters 2005, 156(3), 351-360 (Eng)
Application of an enzyme-linked immunosorbent assay for the analysis of paraquat in human-exposure samples

2005-07-01

Paraquat is a toxic quaternary ammonium compound used as an herbicide around the world. Easy, fast, and inexpensive but sensitive methods are needed to study the effects of long-term, low-level exposure of paraquat on human health. An ELISA (ELISA) was used for quantification of paraquat in urine and air-filter samples collected in a human-exposure study among farm workers in Costa Rica. With an LOQ of 2 ng mL\(^{-1}\), this ELISA method was able to distinguish the exposed from the nonexposed farm workers. For the air-filter analysis, paraquat was extracted by 9M H\(_2\)SO\(_4\) at 60\(^\circ\)C for 12 h, and the results obtained by ELISA showed good correlation with the spectrophotometric (256 nm) measurements. Paraquat in acid-stabilized urine samples was very stable, and no significant losses were detected during a 3-mo storage at room temperature, at 4\(^\circ\)C, or at -20\(^\circ\)C.

Authors: Koivunen, M. E.; Gee, S. J.; Park, E.-K.; Lee, K.; Schenker, M. B.; Hammock, B. D.

Full source: Archives of Environmental Contamination and Toxicology 2005, 48(2), 184-190 (Eng)

Genetic polymorphisms of cytokine genes and risk for trichloroethylene-induced severe generalized dermatitis: A case-control study

2005-07-01

Trichloroethylene (TCE)-induced severe generalized dermatitis (SGD) is considered to be a contact allergic disease and is dependent on a cell-mediated immune response. Little is known about its pathogenesis. Several lines of evidence suggest that tumor necrosis factor (TNF) and interleukin 4 (IL-4) are involved in the immunological and inflammatory reactions. To investigate the relation between polymorphisms of TNF and the IL-4 gene and the risk of TCE-induced SGD, a case-control study was conducted consisting of 111 patients diagnosed with SGD and 152 TCE-exposed workers without SGD. The results reveal that the frequency of TNF alpha-308 wild allele in cases was significantly higher than that in control subjects. Individuals with a heterozygous genotype of TNF alpha-308 were assocd. with the decreased risk of TCE-induced SGD relative to the homozygous genotype. No significant differences in the allele and genotype frequencies could be demonstrated at any other polymorphic loci among both groups. The finding of a possible contribution of a TNF-alpha genetic polymorphism is a primary result because the pathogenesis of TCE-induced SGD is complex and likely to involve the interaction of a number of genes.

Authors: Dai, Yufei; Leng, Shuguang; Li, Laiyu; Niu, Yong; Huang, Hanlin; Cheng, Juan; Zheng, Yuxin

Full source: Biomarkers 2004 (Pub. 2005), 9(6), 470-478 (Eng)

Inhibition of human cytochrome P450 3A4 activity by zinc(II) ion

2005-07-01

Effects of Zn\(_2\)+ on the activity and conformation of cytochrome P 450 3A4 (CYP3A4) were investigated. Zn\(_2\)+ specifically inhibited the testosterone 6beta-hydroxylation activity of CYP3A4 with an IC\(_{50}\) value of 27 muM. Zn\(_2\)+ inhibited the CO-binding spectra of CYP3A4 reduced by NADPH-cytochrome P 450 reductase (CPR) and NADPH only in the presence of b5. Zn\(_2\)+-induced conformational changes of CYP3A4 were monitored by CD

Several lines of evidence suggest that tumor necrosis factor (TNF) and interleukin 4 (IL-4) are involved in the immunological and inflammatory reactions.
and intrinsic fluorescence. Zn2+ showed no significant effects on the activity of CYP3A4 supported by tert-Bu hydroperoxide, an oxygen surrogate, and on the reduction of b5 by CPR and NADPH. These results suggest that the inhibitory effects of Zn2+ come from preventing the stimulation of b5 on CYP3A4 activity.

Authors: Kim, Joon-Sik; Yun, Chul-Ho
Full source: Toxicology Letters 2005, 156(3), 341-350 (Eng)

**Metals in urine and peripheral arterial disease**

2005-07-01

Exposure to metals may promote atherosclerosis. Blood cadmium and lead were associated with peripheral arterial disease (PAD) in the 1999-2000 National Health and Nutrition Examination Survey (NHANES). In the present study the authors evaluated the association between urinary levels of cadmium, lead, barium, cobalt, cesium, molybdenum, antimony, thallium, and tungsten with PAD in a cross-sectional analysis of 790 participants >= 40 years of age in NHANES 1999-2000. In conclusion, urinary cadmium, tungsten, and possibly antimony were associated with PAD in a representative sample of the U.S. population. For cadmium, these results strengthen previous findings using blood cadmium as a biomarker, and they support its role in atherosclerosis. For tungsten and antimony, these results need to be interpreted cautiously in the context of an exploratory analysis but deserve further study. Other metals in urine were not associated with PAD at the levels found in the general population.

Authors: Navas-Acien, Ana; Silbergeld, Ellen K.; Sharrett, A. Richey; Calderon-Aranda, Emma; Selvin, Elizabeth; Guallar, Eliseo
Full source: Environmental Health Perspectives 2005, 113(2), 164-169 (Eng)

**Genetic and other sources of variation in the activity of serum paraoxonase/diazoxonase in humans: consequences for risk from exposure to diazinon**

2005-07-01

Diazinon is the only organophosphorus insecticide that is currently approved for use in sheep dip in the UK. Reports that some individuals may be genetically more susceptible to possible chronic adverse health effects, due to variations in PON1 activity, are complicated by the reliability of activity measurements. In the present study, the influence of 3 polymorphisms of paraoxonase on serum diazoxonase activity was investigated in 85 healthy volunteers. In conclusion, although there is a wide variation in activity in individuals both within and between genotypes, those individuals with a combination of Q and M alleles generally have a lower ability to detoxify diazoxon, which implies a potentially greater susceptibility to toxicity from diazinon.

Authors: O’Leary, Karen A.; Edwards, Robert J.; Town, Margaret M.; Boobis, Alan R.
Full source: Pharmacogenetics and Genomics 2005, 15(1), 51-60 (Eng)

**Expression of cytochrome P450 1A1 and its contribution to oxidation of a potential human carcinogen 1-phenylazo-2-naphthol (Sudan I) in human livers**

2005-07-01

Cytochrome P 450 1A1 (CYP1A1) is one of the most important enzymes implicated in the metabolic activation of carcinogens. To date, there is still...
conflicting evidence for the expression of enzymically functional CYP1A1 in human liver. In the present work, the authors clearly demonstrate that CYP1A1 capable of metabolizing a carcinogen 1-phenylazo-2-naphthol (Sudan I) is expressed in livers of 8 American Caucasian donors. Using 2 independent methods (immunoblotting and N-terminal sequencing), CYP1A1 protein was detected and quantified in all human hepatic microsomes tested in the study. Its levels, ranging from 0.97 to 3.0 pmol/mg protein, correlated with activities catalyzed by this enzyme [7-ethoxyresorufin O-deethylation (EROD) and oxidation of Sudan I], indicating the presence of enzymically active CYP1A1. Even though levels of CYP1A1 expression are low, <0.7% of total hepatic CYP, the CYP1A1 contribution to oxidation of carcinogenic Sudan I in the test set of human liver microsomes ranges from 12 to 30%.

Authors: Stiborova, Marie; Martinek, Vaclav; Rydlova, Helena; Koblas, Tomas; Hodek, Petr
Full source: Cancer Letters (Amsterdam, Netherlands) 2005, 220(2), 145-154 (Eng)

Exposure to PCBs and p,p'-DDE and human sperm chromatin integrity
2005-07-01
Persistent organochlorine pollutants (POPs) such as polychlorinated biphenyls (PCBs) and dichlorodiphenyldichloroethylene (p,p'-DDE), the major metabolite of dichlorodiphenyltrichloroethane (DDT), are stable lipophilic compounds widely found in the environment and in the general population. They can enter the food chain, and their negative impact on male reproduction is currently under active scrutiny. To explore the hypothesis that environmental exposure to these compounds is associated with altered sperm chromatin structure integrity in human sperm, the authors conducted a study of 176 Swedish fishermen (with low and high consumption of fatty fish, a very important exposure source of POPs). The results suggest that POP exposure may have a slight negative impact on human sperm chromatin integrity.

Authors: Rignell-Hydbom, Anna; Rylander, Lars; Giwercman, Aleksander; Joensson, B. A. G.; Lindh, Christian; Eleuteri, Patrizia; Rescia, Michele; Leter, Giorgio; Cordelli, Eugenia; Spano, Marcello; Hagmar, Lars
Full source: Environmental Health Perspectives 2005, 113(2), 175-179 (Eng)

Partial protection by respirators on airways responses following exposure in a swine house
2005-07-01
Exposure to swine dust leads to an intense airway inflammation and increased bronchial responsiveness. The effect of a respiratory protection device during exposure in a swine house was evaluated. The subjects with a respirator showed an attenuated inflammatory nasal response. An increase in bronchial responsiveness was observed in both groups, significantly greater in the unprotected group. The use of respirators reduced endotoxin exposure by >90%. The use of a respirator attenuated the inflammatory response compared with an unprotected group. The minor effect on bronchial responsiveness suggests that gases and/or ultrafine particles may also be important factors.

Authors: Palmberg, Lena; Larsson, Britt-Marie; Sundblad, Britt-Marie; Larsson, Kjell
Full source: American Journal of Industrial Medicine 2004, 46(4), 363-370 (Eng)
The influence of electromagnetic field on antioxidant capacity and malondialdehyde content

2005-07-01

This study evaluates the effects of electromagnetic field on health of workers acting in three-power plants of high tension. The quenching factor of chemiluminescence reaction recorded significant decreases from statistically viewpoint at two from the three groups investigated. The lipid peroxides, monitored by means of malondialdehyde, have been shown statistically significant increases at the all three groups investigated.

Authors: Meghea, Aurelia; Dragoiu, Mihaela Simona; Neagu, C.; Olinescu, R.; Giurginca, Maria

Full source: Scientific Bulletin - University “Politehnica” of Bucharest, Series B: Chemistry and Materials Science 2003, 65(3), 3-8 (Eng)