



The American Academy of Clinical Toxicology

Uniting scientists and clinicians in the advancement of research, education, prevention and treatment of diseases caused by chemicals, drugs and other toxins.

ABSTRACTING SERVICE

HERBS & DIETARY SUPPLEMENTS SPECIAL INTEREST GROUP

April 5, 2011

1. Liu D, Zhang J, Han B, Pen L. An electrophysiological study of acute tetrodotoxin poisoning. *Cell Biochem Biophys*. 2011;59(1):13-8.

To evaluate the electrophysiological changes in patients with acute tetrodotoxin (TTX) poisoning from ingestion of globefish (Tetraodontidae) patients exposed to TTX were compared with age-matched controls. The cohort of TTX-poisoning cases was clinically subdivided into mild, moderate, or severe cases. The motor nerve conduction velocity (MCV), sensory nerve conduction velocity (SCV), F-wave, H-reflex, and somatosensory-evoked potentials (SEP) of the median, ulnar, and common peroneal nerve (CPN) were determined using established techniques. Four of the 64 (6.3%) TTX-poisoning cases died and were omitted from the final analysis. The MCV and SCV of the median, ulnar, and CPN nerves in all the TTX-poisoning cases were significantly slower than the healthy controls. Severe cases of TTX poisoning had more significant reduction in nerve function. Thus, electroneurophysiological analysis could be used to determine the extent, course, and range of nerve system damage in patients with acute TTX poisoning.
2. Guo J, Gan XT, Haist JV, Rajapurohitam V, Zeidan A, Faruq NS, et al. Ginseng inhibits cardiomyocyte hypertrophy and heart failure via NHE-1 inhibition and attenuation of calcineurin activation. *Circ Heart Fail*. 2011;4(1):79-88.

BACKGROUND: Ginseng is a medicinal plant used widely in Asia that has gained popularity in the West during the past decade. Increasing evidence suggests a therapeutic role for ginseng in the cardiovascular system. The pharmacological properties of ginseng are mainly attributed to ginsenosides, the principal bioactive constituents in ginseng. The present study was carried out to determine whether ginseng exerts a direct antihypertrophic effect in cultured cardiomyocytes and whether it modifies the heart failure process in vivo. Moreover, we determined the potential underlying mechanisms for these actions.

METHODS AND RESULTS: Experiments were performed on cultured neonatal rat ventricular myocytes as well as adult rats subjected to coronary artery ligation (CAL). Treatment of cardiomyocytes with the alpha(1) adrenoceptor agonist phenylephrine (PE) for 24 hours produced a marked hypertrophic effect as evidenced by significantly increased cell surface area and ANP gene expression. These effects were attenuated by ginseng in a concentration-dependent manner with a complete inhibition of hypertrophy at a concentration of 10 mug/mL. Phenylephrine-induced hypertrophy was associated with increased gene and protein expression of the Na(+)-H(+) exchanger 1 (NHE-1), increased NHE-1

activity, increased intracellular concentrations of Na(+) and Ca(2+), enhanced calcineurin activity, increased translocation of NFAT3 into nuclei, and GATA-4 activation, all of which were significantly inhibited by ginseng. Upregulation of these systems was also evident in rats subjected to 4 weeks of CAL. However, animals treated with ginseng demonstrated markedly reduced hemodynamic and hypertrophic responses, which were accompanied by attenuation of upregulation of NHE-1 and calcineurin activity. CONCLUSIONS: Taken together, our results demonstrate a robust antihypertrophic and antiremodeling effect of ginseng, which is mediated by inhibition of NHE-1-dependent calcineurin activation.

3. Jay-Russell MT. Raw (unpasteurized) milk: are health-conscious consumers making an unhealthy choice? *Clin Infect Dis*. 2010;51(12):1418-9.
4. Ritchey MD, Sucusky MS, Jefferies T, McCormick D, Hesting A, Blanton C, et al. Lead Poisoning Among Burmese Refugee Children--Indiana, 2009. *Clin Pediatr (Phila)*. 2011.
Recent routine screening revealed multiple cases of unexplained lead poisoning among children of Burmese refugees living in Fort Wayne, Indiana. A cross-sectional study was conducted to determine (a) the prevalence of elevated blood lead levels (BLLs) among Burmese children and (b) potential sources of lead exposure. A case was defined as an elevated venous BLL (≥ 10 mug/dL); prevalence was compared with all Indiana children screened during 2008. Environmental and product samples were tested for lead. In all, 14 of 197 (7.1%) children had elevated BLLs (prevalence ratio: 10.7) that ranged from 10.2 to 29.0 mug/dL. Six cases were newly identified; 4 were among US-born children. Laboratory testing identified a traditional ethnic digestive remedy, Daw Tway, containing a median 520 ppm lead. A multilevel linear regression model identified daily use of thanakha, an ethnic cosmetic, and Daw Tway use were related to elevated BLLs ($P < .05$). Routine monitoring of BLLs among this population should remain a priority.
5. Nin Chau T, Cheung WI, Ngan T, Lin J, Lee KW, Tat Poon W, et al. Causality assessment of herb-induced liver injury using multidisciplinary approach and Roussel Uclaf Causality Assessment Method (RUCAM). *Clin Toxicol (Phila)*. 2011;49(1):34-9.
OBJECTIVE: To evaluate an algorithmic approach involving a multidisciplinary team for causality assessment of suspected herb-induced liver injury (HILI) cases and to compare the causality score using this multidisciplinary approach and Roussel Uclaf Causality Assessment Method (RUCAM). METHODS: A team consisting of hepatologist, clinical toxicologist, analytical toxicologist, and Chinese medicine (CM) pharmacist was formed to do causality assessment based on a protocol for suspected HILI cases. The likelihood of the diagnosis of individual case was first assessed systematically by a hepatologist and clinical toxicologist independently after collecting information about four aspects: (1) clinical course, (2) exclusion of alternative causes, (3) quality of the prescription and herbal product by examining the CM prescriptions and analysis of biological

and herb samples, (4) scientific support on comprehensive literature review on English and Chinese medical database, and subsequently concluded in a consensus meeting held by the multidisciplinary team. The final causality score of each patient was compared with the likelihood of causality as assessed by RUCAM. RESULTS: Between 2005 and 2007, 48 consecutive patients with suspected HILI were enrolled and 21 patients were excluded due to the establishment of an alternative cause of liver impairment or the lack of any information on the herbs taken. Twenty-seven patients were recruited, among them 15 consumed Chinese herbal medicines, 10 used proprietary Chinese medicinal products, and 2 used both. The concordance between the causality assessment of the hepatologist and clinical toxicologist was moderate (weighted kappa = 0.48, 95%CI 0.30-0.66). The causality assessment process concluded that the likelihood of HILI was "highly probable" in 5 cases and "probable" in 12, whereas there were 5 "highly probable" and 16 "probable" cases as assessed by RUCAM. The causality assessment by the multidisciplinary approach and RUCAM also showed moderate agreement (weighted kappa= 0.51, 95%CI 0.22-0.81). CONCLUSION: A multidisciplinary approach using defined algorithms is a scientific approach in causality assessment for HILI. Further study is needed to assess its accuracy and applicability.

6. Sheu SY, Yao CH, Fu YT, Wang WL. Acupuncture as complementary therapy for hypoxic encephalopathy: a case study. *Complement Ther Med.* 2010;18(6):265-8.

OBJECTIVE: In acute carbon monoxide intoxication, more serious neuronal damage may induce hypoxic encephalopathy with variable degrees of brain damage, ranging from confusion to deep coma. We report herein on a patient who developed hypoxic encephalopathy and acute respiratory failure after acute carbon monoxide intoxication. Acupuncture therapy has been applied along with prescription medication to restore consciousness. CLINICAL PRESENTATION: The patient had a 2-month history of consciousness disturbance and frequent generalised episodic clonic twitching with upward gazing, which was diagnosed as hypoxic encephalopathy. INTERVENTION: Acupuncture therapy has been applied to restore consciousness with routine treatment and medication prescription. The patient was treated 29 times by abdominal acupuncture in conjunction with scalp, body and foot acupuncture according to the 12 meridians' points as an assistant therapy. After 2 months of acupuncture treatment, the patient regained consciousness; the Glasgow Coma Scale (GCS) index increased from 7 to 15, before and after acupuncture therapy. CONCLUSION: This case report suggests that there may be a role for complementary treatment with acupuncture in such cases, and it would be more definitive, meaningful and a welcome addition to our database of knowledge if more case studies about the possibility of acupuncture use in these circumstances were done.

7. Hamel J. A review of acute cyanide poisoning with a treatment update. *Crit Care Nurse.* 2011;31(1):72-81; quiz 82.
Cyanide causes intracellular hypoxia by reversibly binding to mitochondrial

cytochrome oxidase a(3). Signs and symptoms of cyanide poisoning usually occur less than 1 minute after inhalation and within a few minutes after ingestion. Early manifestations include anxiety, headache, giddiness, inability to focus the eyes, and mydriasis. As hypoxia progresses, progressively lower levels of consciousness, seizures, and coma can occur. Skin may look normal or slightly ashen, and arterial oxygen saturation may be normal. Early respiratory signs include transient rapid and deep respirations. As poisoning progresses, hemodynamic status may become unstable. The key treatment is early administration of 1 of the 2 antidotes currently available in the United States: the well-known cyanide antidote kit and hydroxocobalamin. Hydroxocobalamin detoxifies cyanide by binding with it to form the renally excreted, non-toxic cyanocobalamin. Because it binds with cyanide without forming methemoglobin, hydroxocobalamin can be used to treat patients without compromising the oxygen-carrying capacity of hemoglobin.

8. Hays JT, Ebbert JO. Adverse effects and tolerability of medications for the treatment of tobacco use and dependence. *Drugs*. 2010;70(18):2357-72. Tobacco use is the leading cause of preventable death and disability in the world. Although gradually declining in most developed countries, the prevalence of tobacco use has increased among developing countries. Treatment for tobacco use and dependence is effective, although long-term abstinence rates remain disappointingly low. In response, new treatments continue to be developed. In addition, many of the pharmacotherapies that have been available for years have found new applications with the use of medication combinations, higher doses and a longer duration of therapy for approved medications. There are now seven medications (nicotine patch, nicotine gum, nicotine lozenge, nicotine inhaler, nicotine nasal spray, bupropion sustained release and varenicline) approved for tobacco dependence treatment in most countries, and many national and professional society practice guidelines recommend their use. Although each of the medications used for tobacco dependence treatment has been rigorously tested for efficacy and safety, broader experience in clinical trials and in observational population-based studies suggests that adverse events associated with these medications are relatively common. Since 2008, two of the medications (varenicline and bupropion) have come under increasing scrutiny because of reports of unexplained serious adverse events (SAEs), including behaviour change, depression, self-injurious thoughts and suicidal behaviour. To date, this association has not been shown to be caused by these medications, but concerns about medication safety continue. Prescribers require a working knowledge of the common adverse effects for all of these medications as well as a more detailed knowledge of the SAE potential. Nicotine replacement therapy (NRT) has been rigorously tested in clinical trials for over 30 years. A number of adverse effects are commonly associated with NRT use, although SAEs are rare. The adverse effects associated with NRT are due to the pharmacological action of nicotine as well as the mode and site of the NRT application. Bupropion has been tested in over 40 controlled clinical trials and has been associated with higher rates of treatment discontinuation due to adverse events than NRTs. A

number of SAEs are associated with bupropion and new warnings were recently added to bupropion prescribing information because of observed neuropsychiatric symptoms including suicidal thoughts and behaviours. Varenicline is the most recently approved medication for tobacco dependence treatment and, although proven safe in clinical testing, new safety concerns have arisen based on post-marketing reports. Warnings have been added to the prescribing information for varenicline because of neuropsychiatric symptoms also including suicidal thoughts and behaviours. Informed decision making regarding the use of pharmacotherapy for the treatment of tobacco dependence requires knowledge about the risks of drug treatment that is weighed against the risks of continued tobacco use and the benefits of treatment. Over half of all long-term smokers will die of a tobacco-related disease and the risk of a serious or life-threatening adverse event with tobacco cessation pharmacotherapy is vanishingly small. Pharmacotherapy for tobacco dependence is also among the most cost-effective preventive health interventions. Given these factors, the benefit : risk ratio is strongly in favour of pharmacotherapy for tobacco dependence treatment in virtually all smokers who are motivated to quit.

9. Di Sotto A, Mazzanti G, Carbone F, Hrelia P, Maffei F. Genotoxicity of lavender oil, linalyl acetate, and linalool on human lymphocytes in vitro. *Environ Mol Mutagen.* 2011;52(1):69-71.
The potential genotoxicity of lavender essential oil and its major components, linalool, and linalyl acetate, was evaluated in vitro by the micronucleus test on peripheral human lymphocytes. In the range of non-toxic concentrations (0.5-100 µg/ml), linalyl acetate increased the frequency of micronuclei significantly and in concentration-dependent manner; lavender oil did so only at the highest concentration tested, whereas linalool was devoid of genotoxicity. None of the tested substances led to an increase in nucleoplasmic bridges or nuclear buds frequency. These findings suggest that the mutagenic activity of lavender oil can be related to the presence of linalyl acetate, which seems to have a profile of an aneugenic agent.
10. Strom S, Helmfrid I, Glynn A, Berglund M. Nutritional and toxicological aspects of seafood consumption--an integrated exposure and risk assessment of methylmercury and polyunsaturated fatty acids. *Environ Res.* 2011;111(2):274-80.
Seafood consumption is associated with both risks and beneficial effects to human health. Consequently, an integrated exposure assessment of intake of toxic and nutritious agents in seafood is of importance prior to determination of dietary advisories. We have developed a probabilistic model for the estimation of simultaneous intake of methylmercury (MeHg) and long-chain n-3 polyunsaturated fatty acids (LC-n3 PUFAs) from seafood, to estimate the population proportion at risk for exceeding tolerable MeHg intake and not reaching adequate intake of PUFAs. Seafood consumption data was collected among women of childbearing age using a food frequency questionnaire. A database of mercury and fatty acids concentration in seafood was constructed. A

Latin Hypercube simulation was used to calculate the intake of MeHg and LC n-3 PUFAs. Eleven percent of the population exceeded the MeHg reference dose of 0.1 mug/kg bw/day, whereas only 44% reached an adequate PUFA intake. A small proportion (3.7%) exceeded the MeHg reference dose while at the same time did not reach an adequate PUFA intake. Furthermore, we simulated two scenarios in which seafood is consumed according to a general recommendation of three servings per week, whereof one serving of oily seafood. The first scenario included seafood with typically low MeHg concentrations (mean 0.056 and 0.027 mug MeHg/g fish in lean and oily species, respectively), and the second included seafood typically high in MeHg concentrations (mean 0.50 and 0.26 mug MeHg/g fish in lean and oily species, respectively). In the "high" scenario, almost 100% of the population exceeded the reference dose, whereas the corresponding proportion was only 5% in the "low" scenario. Overall, the results stress the importance of communicating species specific seafood consumption advisories for women of childbearing age in general and for pregnant women in particular, while at the same time encourage them to consume more seafood.

11. Jadeja RN, Thounaojam MC, Ansarullah, Jadav SV, Patel MD, Patel DK, et al. Toxicological evaluation and hepatoprotective potential of Clerodendron glandulosum.Coleb leaf extract. *Hum Exp Toxicol.* 2011;30(1):63-70. This inventory evaluates toxicological effects and hepatoprotective potential of Clerodendron glandulosum.Coleb (CG) aqueous extract. Acute and subchronic toxicity tests were performed using Swiss albino mice as per the guideline of Organisation for Economic Cooperation and Development (OECD). Also, hepatoprotective potential of CG extract was examined in experimental model of carbon tetrachloride (CCl(4))-induced hepatotoxicity. Acute and subchronic toxicity tests revealed that CG extract is non-toxic and its median lethal dose (LD(50)) value is >5000 mg/kg bodyweight. Also, rats pretreated with CG extract followed by administration of CCl(4) recorded significant decrement in plasma marker enzymes of hepatic damage, total bilirubin content and hepatic lipid peroxidation. While, hepatic reduced glutathione, ascorbic acid content, activity levels of superoxide and catalase and plasma total protein content were significantly increased. Microscopic examination of liver showed that pretreatment with CG extract prevented CCl(4)-induced hepatic damage in CG + CCl(4) group. CG extract has hepatoprotective potential by modulating activity levels of enzymes and metabolites governing liver function and by helping in maintaining cellular integrity of hepatocytes that is comparable with that of standard drug silymarin. CG extract exhibits potent hepatoprotective activity against CCl(4)-induced hepatic damage but does not exhibit any toxic manifestations.
12. Ambadath V, Venu RG, Madambath I. Comparative study of the efficacy of ascorbic acid, quercetin, and thiamine for reversing ethanol-induced toxicity. *J Med Food.* 2010;13(6):1485-9. This study compares the curative effect of three antioxidants-ascorbic acid,

quercetin, and thiamine-on ethanol-induced toxicity in rats. Administration of ethanol at a dose of 4 g/kg of body weight/day for 90 days initiated chronic alcohol-induced oxidative stress as shown by increased malondialdehyde level and DNA fragmentation in liver and brain. Ethanol administration also led to a decrease in DNA content. Activities of toxicity marker enzymes-alanine aminotransferase, aspartate aminotransferase, and gamma-glutamyltranspeptidase-in liver and serum increased progressively upon ethanol administration. After ethanol administration for 90 days, the efficacy of antioxidant treatment of the alcohol-induced toxicity was studied by supplementing ascorbic acid (200 mg/100 g of body weight/day), quercetin (50 mg/kg of body weight/day), and thiamine (25 mg/kg of body weight/day) for 30 days. These groups were compared with the abstention group (not treated with ethanol). All the alterations induced by alcohol were reduced significantly by the supplementation of antioxidants and also with abstention. The regression by antioxidants was greater than that of abstention. Antioxidants significantly reduced the oxidative stress induced by ethanol intoxication, increased membrane integrity, and also increased organ regeneration. Ascorbic acid was shown to be more effective than quercetin and thiamine in treating both hepatotoxicity and neurotoxicity induced by alcohol administration. This may be due to the higher antioxidant potential of ascorbic acid in physiological conditions.

13. Wijeratne NG, Doery JC, Graudins A. Occult lead poisoning from Ayurvedic medicine produced, prescribed and purchased in India. *Med J Aust.* 2011;194(4):205-6.
14. Williams GD, Kirk EP, Wilson CJ, Meadows CA, Chan BS. Salicylate intoxication from teething gel in infancy. *Med J Aust.* 2011;194(3):146-8.
15. Hori H, Takayanagi T, Kamada Y, Shimoyoshi S, Ono Y, Kitagawa Y, et al. Genotoxicity evaluation of sesamin and episesamin. *Mutat Res.* 2011;719(1-2):21-8.
Sesamin is a major lignan that is present in sesame seeds and oil. Sesamin is partially converted to its stereoisomer, episesamin, during the refining process of non-roasted sesame seed oil. We evaluated the genotoxicity of these substances through the following tests: a bacterial reverse mutation assay (Ames test), a chromosomal aberration test in cultured Chinese hamster lung cells (CHL/IU), a bone marrow micronucleus (MN) test in Crlj:CD1 (ICR) mice, and a comet assay using the liver of Sprague-Dawley (SD) rats. Episesamin showed negative results in the Ames test with and without S9 mix, in the in vitro chromosomal aberration test with and without S9 mix, and in the in vivo comet assay. Sesamin showed negative results in the Ames test with and without S9 mix. In the in vitro chromosomal aberration test, sesamin did not induce chromosomal aberrations in the absence of S9 mix, but induced structural abnormalities at cytotoxic concentrations in the presence of S9 mix. Oral administration of sesamin at doses up to 2.0g/kg did not cause a significant increase in either the percentage of micronucleated polychromatic erythrocytes in the in vivo bone marrow MN test

or in the % DNA in the comet tails in the in vivo comet assay of liver cells. These findings indicate that sesamin does not damage DNA in vivo and that sesamin and episesamin have no genotoxic activity.

16. McHale CM, Zhang L, Hubbard AE, Smith MT. Toxicogenomic profiling of chemically exposed humans in risk assessment. *Mutat Res.* 2010;705(3):172-83. Gene-environment interactions contribute to complex disease development. The environmental contribution, in particular low-level and prevalent environmental exposures, may constitute much of the risk and contribute substantially to disease. Systematic risk evaluation of the majority of human chemical exposures, has not been conducted and is a goal of regulatory agencies in the U.S. and worldwide. With the recent recognition that toxicological approaches more predictive of effects in humans are required for risk assessment, in vitro human cell line data as well as animal data are being used to identify toxicity mechanisms that can be translated into biomarkers relevant to human exposure studies. In this review, we discuss how data from toxicogenomic studies of exposed human populations can inform risk assessment, by generating biomarkers of exposure, early effect, and/or susceptibility, elucidating mechanisms of action underlying exposure-related disease, and detecting response at low doses. Good experimental design incorporating precise, individual exposure measurements, phenotypic anchors (pre-disease or traditional toxicological markers), and a range of relevant exposure levels, is necessary. Further, toxicogenomic studies need to be designed with sufficient power to detect true effects of the exposure. As more studies are performed and incorporated into databases such as the Comparative Toxicogenomics Database (CTD) and Chemical Effects in Biological Systems (CEBS), data can be mined for classification of newly tested chemicals (hazard identification), and, for investigating the dose-response, and inter-relationship among genes, environment and disease in a systems biology approach (risk characterization).
17. Park JH, Park E. Influence of iron-overload on DNA damage and its repair in human leukocytes in vitro. *Mutat Res.* 2011;718(1-2):56-61. Iron is an important element that modulates the production of reactive oxygen species, which are thought to play a causative role in biological processes such as mutagenesis and carcinogenesis. The potential genotoxicity of dietary iron has been seldom studied in human leukocyte and only few reports have investigated in human colon tumor cells. Therefore, DNA damage and repair capacity of human leukocytes were examined using comet assay for screening the potential toxicity of various iron-overloads such as ferric-nitrilotriacetate (Fe-NTA), FeSO₄, hemoglobin and myoglobin, and compared with 200μM of H₂O₂ and HNE. The iron-overloads tested were not cytotoxic in the range of 10-1000 μM by trypan blue exclusion assay. The exposure of leukocytes to Fe-NTA (500 and 1000 μM), FeSO₄ (250-1000 μM), hemoglobin (10 μM) and myoglobin (250 μM) for 30 min induced significantly higher DNA damage than NC. Treatment with 500 and 1000 μM of Fe-NTA showed a similar genotoxic effect to H₂O₂, and a significant higher genotoxic effect than

HNE. The genotoxicity of FeSO₄ (250-1000 microM), hemoglobin (10 microM) and myoglobin (250 microM) was not significantly different from that of H₂O₂ and HNE. Iron-overloads generated DNA strand break were rejoined from the first 1h. Their genotoxic effect was not observed at 24h. These data from this study provide additional information on the genotoxicity of iron-overloads and self-repair capacity in human leukocytes.

18. McFadden R, Peterson N. Interactions between drugs and four common medicinal herbs. *Nurs Stand*. 2011;25(19):65-8.
Herbal remedies are popular in the UK, but there is evidence that some of the most commonly used herbs can interact with conventional drugs, sometimes with potentially serious consequences. This article looks at four common herbal remedies and examines the scientific evidence for their interactions with drugs.
19. Mahapatra S, Belgrad JL, Adeoye MA. Psychotropic drug-related eosinophilia with systemic symptoms after acute caffeine ingestion. *Pediatrics*. 2011;127(1):e235-8.
Drug-related eosinophilia with systemic symptoms (DRESS) is a potentially life-threatening, multiorgan condition that can result from drug treatment. Antiepileptic medications have provided the best-studied link of any class of medications. Here, we report the case of a 16-year-old boy with long-standing bipolar disorder who was chronically treated with aripiprazole and fluoxetine and developed DRESS syndrome after ingestion of high doses of caffeine. His classic presentation with fever, morbilliform rash, lymphadenopathy, and visceral involvement, including leukocytosis, eosinophilia, and hepatitis, was consistent with this diagnosis. Furthermore, the patient's symptoms dramatically improved after corticosteroid therapy and discontinuation of all psychotropic medications. We propose that the development of DRESS syndrome is a net result of inconsistent medication adherence coupled with the ingestion of near-toxic doses of caffeine, which can lead to rhabdomyolysis and, through renal impairment, lead to the accumulation of toxic oxidative metabolites of either or both psychotropic medications. We also present one of the few reported cases of caffeine-induced rhabdomyolysis and propose its role in the development of DRESS in this patient.
20. Kersey M, Chi M, D BC. Anaemia, lead poisoning and vitamin D deficiency in low-income children: do current screening recommendations match the burden of illness? *Public Health Nutr*. 2011:1-5.
OBJECTIVE: Low-income children are routinely screened for anaemia and elevated blood lead levels (EBLL) but not for vitamin D deficiency. We sought to determine the relative prevalence of and the relationship among vitamin D deficiency, anaemia and EBLL among healthy low-income paediatric clinic patients. DESIGN: Retrospective chart review. SETTING: Paediatric outpatient clinic in an urban safety net hospital in a northern US state. SUBJECTS: Healthy toddlers and children under 6 years of age (n 127) who were seen for a routine well child check-up (WCC). RESULTS: The prevalence of vitamin D insufficiency

(25-hydroxyvitamin D (25(OH)D) < 30 ng/ml) was 62 %; the prevalence of vitamin D deficiency (25(OH)D < 20 ng/ml) was 29 %. These rates were far higher than those for anaemia (Hb < 11.0 g/dl) at 10 %, EBLL (Pb > 9 mug/dl) at 1 % or even mildly EBLL (Pb 5-9 mug/dl) at 4 % (range: 1-11). There was no relationship among any of the following: vitamin D status, anaemia or EBLL. The vast majority of children with vitamin D deficiency had both normal Hb (86 %) and Pb level (100 %). After controlling for child's age, gender and race/ethnicity, there was no association between Hb (continuous, g/dl) and vitamin D deficiency (adjusted OR (aOR) = 0.97, 95 % CI 0.64, 1.47; P = 0.88). The only significant predictor of vitamin D deficiency was increasing age in years (aOR = 1.39, 95 % CI 1.03, 1.86; P = 0.03). None of these associations changed materially when deficiency was defined as <15 ng/ml. CONCLUSIONS: Vitamin D deficiency was far more common than anaemia or EBLL, and Hb and Pb status were not predictors of vitamin D status.