
Abstract: This study presents a new approach for rapid detection of sulfide using a glassy carbon electrode (GCE) modified with alizarin (Az) and reduced graphene oxide (rGO) nanosheets. The fabricated Az-rGO/GCE sensor shows a notable electrocatalytic activity to sulfide oxidation. The currents of anodic peak centered at +465mV in 0.2M pH 7.0 phosphate buffer were related linearly to the concentrations of sulfide, based on the cyclic voltammetric studies. The linear range was 0.002-3.28mM, and the detection limit was 1µM. The proposed method was applied in sulfide determination of hydrogen sulfide pretreated fruits, and the method was also verified with recovery studies.


Abstract: Removal of high concentrations of hydrogen sulfide using a biofilter packed with expanded schist under extreme acidic conditions was performed. The impact of various parameters such as H2S concentration, pH changes and sulfate accumulation on the performances of the process was evaluated. Elimination efficiency decreased when the pH was lower than 1 and the sulfate accumulation was more than 12mgS-SO4(2-)/g dry media, due to a continuous overloading by high H2S concentrations. The influence of these parameters on the degradation of H2S was clearly underlined, showing the need for their control, performed through an increase of watering flow rate. A maximum elimination capacity (ECmax) of 24.7gm(-3)h(-1) was recorded. As a result, expanded schist represents an interesting packing material to remove high H2S concentration up to 360ppmv with low pressure drops. In addition, experimental data were fitted using both Michaelis-Menten and Haldane models, showing that the Haldane model described more accurately experimental data since the inhibitory effect of H2S was taken into account.


Abstract: AIM: Oxidative stress is a key contributor to endothelial dysfunction and associated cardiovascular pathogenesis. Hydrogen sulfide (H2S) is an antioxidant gasotransmitter that protects endothelial cells against oxidative stress. Sirtuin3 (SIRT3), which belongs to the silent information regulator 2 (SIR2) family, is an important deacetylase under oxidative stress. H2S is able to regulate the activity of several sirtuins. The present study aims to investigate the role of SIRT3 in the antioxidant effect of H2S in endothelial cells. RESULTS: Cultured EA.hy926 endothelial cells were exposed to hydrogen peroxide (H2O2) as a model of oxidative stress-induced cell injury. GYY4137, a slow-releasing H2S donor, improved cell viability, reduced oxidative stress and apoptosis, and improved mitochondrial function following H2O2 treatment. H2S reversed the stimulation of MAPK phosphorylation, downregulation of SIRT3 mRNA and reduction of the superoxide dismutase 2 and isocitrate dehydrogenase 2 expression which were induced by H2O2. H2S also increased activator protein 1 (AP-1) binding activity with SIRT3 promoter and this effect was absent in the presence of the specific AP-1 inhibitor, SR11302 or
curcumin. Paraquat administration to mice induced a defected endothelium-dependent aortic vasodilatation and increased oxidative stress in both mouse aorta and small mesenteric artery, which were alleviated by GYY4137 treatment. This vasoprotective effect of H2S was absent in SIRT3 knockout mice. **INNOVATION:** The present results highlight a novel role for SIRT3 in the protective effect of H2S against oxidant damage in the endothelium both in vitro and in vivo. **CONCLUSION:** H2S enhances AP-1 binding activity with the SIRT3 promoter, thereby upregulating SIRT3 expression and ultimately reducing oxidant-provoked vascular endothelial dysfunction. Antioxid. Redox Signal. 00, 000-000

Abstract: Selective removal of hydrogen sulfide (H2S) from sour natural gas mixtures is one of the key challenges facing the natural gas industry. Adsorption and pervaporation processes utilizing nanoporous materials, such as zeolites, can be alternatives to highly energy-intensive amine-based absorption processes. In this work, the adsorption behavior of binary mixtures containing H2S and methane (CH4) in seven different all-silica zeolite frameworks (CHA, DDR, FER, IFR, MFI, MOR, and MWW) is investigated using Gibbs ensemble Monte Carlo simulations at two temperatures (298 and 343 K) and pressures ranging from 1 to 50 bar. The simulations demonstrate high selectivities that, with the exception of MOR, increase with increasing H2S concentration due to favorable sorbate-sorbate interactions. The simulations indicate significant inaccuracies of predictions using unary adsorption data and ideal adsorbed solution theory. In addition, the adsorption of binary H2S/CH4 mixtures in MFI is considered to probe whether the presence of H2S induces coadsorption and reduces the hydrophobic character of all-silica zeolites. The simulations show preferential adsorption of H2S from moist gases with a selectivity of about 18 over H2O

Abstract: Understanding molecular interactions with monolayers and bilayers of graphene and its derivatized forms is very important because of their fundamental role in gas sensing and separation, gas storage, catalysis, etc. Herein, motivated by the recent realization of graphene-based sensors for the detection of single gas molecules, we use density functional theory to study the noncovalent interactions of molecules and molecular clusters with graphene, graphene oxide, and graphane, which are represented by coronene-based molecular model systems, C24H12 (coronene), C24OH12 (coroepoxide), and C24H36 (perhydrocoronene), respectively. The objective is to understand the structural and energetic changes that occur as a result of adsorption on monolayers and intercalation within bilayers. To begin with, the interactions of coronene, coroepoxide, and perhydrocoronene with a variety of small molecules like HF, HCl, HBr, H2O, H2S, NH3, and CH4 are studied. Subsequently, the binding of coronene and coroepoxide substrates with molecular clusters of HF, H2O, and NH3 is studied to understand the strength of adsorption on the substrates and the effect of substrates on hydrogen-bonding interactions within the molecular clusters. Further, bilayers of the model systems, namely, coronene-coronene, coronene-coroepoxide, and two configurations of coroepoxide-coroepoxide (one in which the oxygen atoms are facing each other and the other in which they do not face each other) are generated. The energetics for the nanoscale confinement or intercalation of the clusters within the bilayers along with the impact of the intercalation on the intermolecular hydrogen-bonding interactions are investigated. Our coronene-based model systems can provide a simple way of describing the rather complex events that occur in representative regions of graphene-based heterogeneous substrates
Abstract: In this work we have determined dissociation energies of O-H...S hydrogen bond in the H2S complexes of various phenol derivatives using 2-color-2-photon photofragmentation spectroscopy in combination with zero kinetic energy photoelectron (ZEKE-PE) spectroscopy. This is the first report of direct determination of dissociation energy of O-H...S hydrogen bond. The ZEKE-PE spectra of the complexes revealed a long progression in the intermolecular stretching mode with significant anharmonicity. Using the anharmonicity information and experimentally determined dissociation energy, we also validated Birge-Sponer (B-S) extrapolation method, which is an approximate method to estimate dissociation energy. Experimentally determined dissociation energies were compared with a variety of ab initio calculations. One of the important findings is that omegaB97X-D functional, which is a dispersion corrected DFT functional, was able to predict the dissociation energies in both the cationic as well as the ground electronic state very well for almost every case.

Abstract: In this work, flame-spray-made undoped SnO2 nanoparticles were loaded with 0.1-5 wt % electrolytically exfoliated graphene and systematically studied for NO2 sensing at low working temperatures. Characterizations by X-ray diffraction, transmission/scanning electron microscopy, and Raman and X-ray photoelectron spectroscopy indicated that high-quality multilayer graphene sheets with low oxygen content were widely distributed within spheriodal nanoparticles having polycrystalline tetragonal SnO2 phase. The 10-20 mum thick sensing films fabricated by spin coating on Au/Al2O3 substrates were tested toward NO2 at operating temperatures ranging from 25 to 350 degrees C in dry air. Gas-sensing results showed that the optimal graphene loading level of 0.5 wt % provided an ultrahigh response of 26342 toward 5 ppm of NO2 with a short response time of 13 s and good recovery stabilization at a low optimal operating temperature of 150 degrees C. In addition, the optimal sensor also displayed high sensor response and relatively short response time of 171 and 7 min toward 5 ppm of NO2 at room temperature (25 degrees C). Furthermore, the sensors displayed very high NO2 selectivity against H2S, NH3, C2H5OH, H2, and H2O. Detailed mechanisms for the drastic NO2 response enhancement by graphene were proposed on the basis of the formation of graphene-undoped SnO2 ohmic metal-semiconductor junctions and accessible interfaces of graphene-SnO2 nanoparticles. Therefore, the electrolytically exfoliated graphene-loaded FSP-made SnO2 sensor is a highly promising candidate for fast, sensitive, and selective detection of NO2 at low operating temperatures.

Abstract: Current models of the formation and distribution of gold deposits on Earth are based on the long-standing paradigm that hydrogen sulfide and chloride are the ligands responsible for gold mobilization and precipitation by fluids across the lithosphere. Here we challenge this view by demonstrating, using in situ X-ray absorption spectroscopy and solubility measurements, coupled with molecular dynamics and thermodynamic simulations, that sulfur radical species, such as the trisulfur ion [Formula: see text], form very stable and soluble complexes with Au(+) in aqueous solution at elevated temperatures (>250 degrees C) and pressures (>100 bar). These species enable extraction, transport, and focused precipitation of gold by sulfur-rich fluids 10-100 times more efficiently than sulfide and chloride only. As a result, [Formula: see text] exerts an important control on the source, concentration, and distribution of gold in its major economic deposits from magmatic,
hydrothermal, and metamorphic settings. The growth and decay of [Formula: see text] during the fluid generation and evolution is one of the key factors that determine the fate of gold in the lithosphere.


Abstract: Corticosterone, one of the glucocorticoids, is toxic to neurons and plays an important role in depressive-like behavior and depression. We previously showed that hydrogen sulfide (H2S), a novel physiological mediator, plays an inhibitory role in depression. However, the mechanism underlying H2S-triggered antidepressant-like role is not clearly known. Brain-derived neurotrophic factor (BDNF), a neurotrophic factor, plays a neuroprotective role that is mediated by its high-affinity tropomysin-related kinase B (TrkB) receptor. In this study, to investigate the underlying mechanism of H2S-induced antidepressant-like role, we explored whether H2S could protect neurons against corticosterone-mediated cytotoxicity and whether this protective role of H2S was involved in the regulation of BDNF-TrkB pathway. Our data demonstrated that sodium hydrosulfide (NaHS), the donor of H2S, could prevent corticosterone-induced cytotoxicity, apoptosis, accumulation of intracellular reactive oxygen species (ROS) and loss of mitochondrial membrane potential (MMP) in PC12 cells. NaHS not only induced the up-regulation of BDNF but also prevented the down-regulation of BDNF by corticosterone. It was also found that blocking BDNF-TrkB pathway by K252a, an inhibitor of TrkB, abolished the protection of H2S against corticosterone-induced cytotoxicity, apoptosis, accumulation of ROS, and loss of MMP. These results suggest that H2S protects against the neurotoxicity of corticosterone by modulation of the BDNF-TrkB pathway.


Abstract: A new turn-on fluorescent probe, incorporating 7-nitrobenzoxadiazole (NBD) ether group into a BODIPY molecule, was synthesized and studied for the detection of H2S and biothiols in aqueous solution and in living cells. The design was based on thiol-induced thiolysis of the NBD ether bond and followed by the cleavage and the release of free meso-(4-hydroxybenzyl)-substituted BODIPY fluorophore. The BODIPY-based probe displayed highly sensitive and selective fluorescence enhancement respond to H2S over competing biothiols such as cysteine (Cys) and glutathione (GSH), mainly due to the weak reactivity of biothiols toward the probe. There was a good linearity between the fluorescence intensity and the concentrations of H2S in the range of 1-200 microM with a detection limit of 2.6 microM. The proposed reaction mechanism was confirmed by mass spectrometry and optical spectroscopy, and the mechanism of turn-on fluorescent response was further determined by the density functional theory (DFT) calculations using Gaussian 03 program. Moreover, the probe was successfully applied for the fluorescence imaging of H2S in HeLa cells under physiological conditions (pH 7.4).


Abstract: A low-temperature microplasma generated in a dielectric barrier discharge (DBD) was used as a radiation source for the excitation of hydrogen sulfide and its determination by molecular emission spectrometry (MES). The excitation/emission chamber was enclosed to eliminate spectral interference from ambient air. The spectral emission lines of hydrogen sulfide were clearly discriminated from the background spectrum, and the emission line at 365.06 nm was selected for parameter optimization and quantitative analysis. The S(2-) ions in aqueous samples were reacted with acid to generate hydrogen sulfide and then determined. The experimental parameters affecting the determination of hydrogen sulfide and S(2-) were optimized. The limits of detection were 1.4 mg m(-3) for H2S and 11.2 mg L(-1) for S(2-). The repeatability of the method was satisfactory, as the RSD values were 2.3% for H2S and 1.8% for S(2-). The enclosed DBD-MES system was
demonstrated to be a useful tool for the determination of hydrogen sulfide in gas samples and S(2-) in aqueous samples

Abstract: Hydrogen sulfide (H2S) is a member of the growing family of gasotransmitters. Once regarded as a noxious molecule predominantly present in the atmosphere, H2S is now known to be synthesized endogenously in mammals. H2S participates in a myriad of physiological processes ranging from regulation of blood pressure to neuroprotection. Its chemical nature precludes H2S from being stored in vesicles and acting on receptor proteins in the fashion of other chemical messengers. Thus, novel cellular mechanisms have evolved to mediate its effects. This review focuses on sulfhydration (or persulfidation), which appears to be the principal post-translational modification elicited by H2S

Abstract: H2S is shown, for the first time, to play an extraordinary dual role due to its nucleophilicity and reducing property with our single chemosensor, [4-(piperidin-1-yl)naphthalene-1,2-dione]. The initial nucleophilic attack via Michael addition (a lower concentration of H2S, blue fluorescence) is followed by the reduction of the 1,2-diketo functionality (a higher concentration of H2S, green fluorescence). This chemosensor, which also shows biological response, is remarkably effective in sensing the same analyte (H2S) at its different concentrations in a relay pathway via a fluorescence "off-on-on" mechanism, and this is also supported by DFT calculation and Cyclic voltammograms

Abstract: This study evaluated the effects of AP39 [(10-oxo-10-(4-(3-thioxo-3H-1,2-dithiol-5yl)phenoxy)decyl)triphenyl phosphonium bromide], a mitochondrially targeted donor of hydrogen sulfide (H2S) in an in vitro model of hypoxia/oxidative stress injury in NRK-49F rat kidney epithelial cells (NRK cells) and in a rat model of renal ischemia-reperfusion injury. Renal oxidative stress was induced by the addition of glucose oxidase, which generates hydrogen peroxide in the culture medium at a constant rate. Glucose oxidase (GOx)-induced oxidative stress led to mitochondrial dysfunction, decreased intracellular ATP content, and, at higher concentrations, increased intracellular oxidant formation (estimated by the fluorescent probe 2, 7-dichlorofluorescein, DCF) and promoted necrosis (estimated by the measurement of lactate dehydrogenase release into the medium) of the NRK cells in vitro. Pretreatment with AP39 (30-300 nM) exerted a concentration-dependent protective effect against all of the above effects of GOx. Most of the effects of AP39 followed a bell-shaped concentration-response curve; at the highest concentration of GOx tested, AP39 was no longer able to afford cytoprotective effects. Rats subjected to renal ischemia/reperfusion responded with a marked increase (over 4-fold over sham control baseline) blood urea nitrogen and creatinine levels in blood, indicative of significant renal damage. This was associated with increased neutrophil infiltration into the kidneys (assessed by the myeloperoxidase assay in kidney homogenates), increased oxidative stress (assessed by the malondialdehyde assay in kidney homogenates) and an increase in plasma levels of IL-12. Pretreatment with AP39 (0.1, 0.2 and 0.3 mg/kg) provided a dose-dependent protection against these pathophysiological alterations; the most pronounced protective effect was observed at the 0.3 mg/kg dose of the H2S donor; nevertheless AP39 failed to achieve a complete normalization of any of the injury markers measured. The partial protective effects of AP39 correlated with a partial improvement of kidney histological scores and reduced TUNEL
staining (an indicator of DNA damage and apoptosis). In summary, the mitochondria-targeted H2S donor AP39 exerted dose-dependent protective effects against renal epithelial cell injury in vitro and renal ischemia-reperfusion injury in vivo. We hypothesize that the beneficial actions of AP39 are related to the reduction of cellular oxidative stress, and subsequent attenuation of various positive feed-forward cycles of inflammatory and oxidative processes.

(15) Tian X, Li Z, Lau C, Lu J. Visualization of in Vivo Hydrogen Sulfide Production by a Bioluminescence Probe in Cancer Cells and Nude Mice. Anal Chem 2015 Oct 27. Abstract: Hydrogen sulfide (H2S) has emerged as an exciting endogenous gasotransmitter in addition to nitric oxide and carbon monoxide. However, its precise measurement in living cells and animals remains a challenge. In this study, a novel bioluminescence H2S probe was designed and synthesized by modifying the 6'-amino group of d-aminoluciferin into a 6'-azido group, which was highly selective against other reactive sulfur, nitrogen, and oxygen species. Our H2S probe azidoluciferin sensitively reacted with H2S to release d-aminoluciferin with a strong bioluminescence signal. On the basis of its high selectivity and sensitivity, the H2S probe was used to detect H2S production in live cancer cells and nude mice. The bioluminescence signal decreased in mice treated with propargylglycine, an inhibitor of H2S, suggesting that our H2S probe can detect endogenous H2S in real time, in vivo. Overall, the excellent sensing properties of the probe combined with its bioimaging capability make it a useful tool to study H2S biological roles.

(16) Wong HL, Smith DL, Visscher PT, Burns BP. Niche differentiation of bacterial communities at a millimeter scale in Shark Bay microbial mats. Sci Rep 2015;5:15607. Abstract: Modern microbial mats can provide key insights into early Earth ecosystems, and Shark Bay, Australia, holds one of the best examples of these systems. Identifying the spatial distribution of microorganisms with mat depth facilitates a greater understanding of specific niches and potentially novel microbial interactions. High throughput sequencing coupled with elemental analyses and biogeochemical measurements of two distinct mat types (smooth and pustular) at a millimeter scale were undertaken in the present study. A total of 8,263,982 16S rRNA gene sequences were obtained, which were affiliated to 58 bacterial and candidate phyla. The surface of both mats were dominated by Cyanobacteria, accompanied with known or putative members of Alphaproteobacteria and Bacteroidetes. The deeper anoxic layers of smooth mats were dominated by Chloroflexi, while Alphaproteobacteria dominated the lower layers of pustular mats. In situ microelectrode measurements revealed smooth mats have a steeper profile of O2 and H2S concentrations, as well as higher oxygen production, consumption, and sulfate reduction rates. Specific elements (Mo, Mg, Mn, Fe, V, P) could be correlated with specific mat types and putative phylogenetic groups. Models are proposed for these systems suggesting putative surface anoxic niches, differential nitrogen fixing niches, and those coupled with methane metabolism.

(17) Song R, Liu G, Li X, Xu W, Liu J, Jin H. Elevated Inducible Nitric Oxide Levels and Decreased Hydrogen Sulfide Levels Can Predict the Risk of Coronary Artery Ectasia in Kawasaki Disease. Pediatr Cardiol 2015 Oct 24. Abstract: Kawasaki disease (KD) is a vasculitis disease in children that is associated with coronary artery ectasia (CAE). We investigated whether inducible nitric oxide synthase (i-NOS) and hydrogen sulfide (H2S) could be used to predict CAE secondary to KD. We enrolled 65 children with KD (35 cases with CAE and 30 cases without CAE), 33 healthy children, and 32 children with fever but without vasculitis disease (febrile group). We measured plasma nitric oxide (NO), total nitric oxide synthase (Total-NOS), i-NOS, constructive nitric oxide synthase (c-NOS) levels, and H2S content in all patients. Plasma NO, Total-NOS, i-NOS, and H2S were higher in KD children than in healthy and febrile children (P < 0.05). The i-NOS level was higher in KD children with CAE compared to those without CAE, while the H2S was lower (both P < 0.05). Using a combination of i-NOS (higher than 10 U/mL) and H2S (lower than 3.31 mumol/L) to predict CAE had 80%
sensitivity and 81% specificity (P < 0.05). Elevated plasma i-NOS and decreased plasma H2S levels in the acute phase of KD have good predictive value for CAE and may be used to guide appropriate clinical treatment and prevent future cardiovascular complications.


Abstract: Endogenous hydrogen sulfide (H2S) is involved in the regulation of vascular tone. We hypothesized that lowering of calcium and opening of K channels as well as calcium-independent mechanisms are involved in H2S-induced relaxation in rat mesenteric small arteries. Amperometric recordings revealed that free [H2S] after addition to closed tubes of NaSH, Na2S, and GYY4137 were, respectively, 14%, 17%, and 1% of added amount. The compounds caused equipotent relaxations in isometric myographs, but based on the measured free [H2S], GYY4137 caused more relaxation in relation to released free [H2S] than NaSH and Na2S in rat mesenteric small arteries. Simultaneous measurements of [H2S] and tension showed that 15 μM of free H2S caused 61% relaxation in superior mesenteric arteries. Simultaneous measurements of smooth muscle calcium and tension revealed that NaSH lowered calcium and caused relaxation of norepinephrine-contracted arteries, while high extracellular potassium reduced NaSH relaxation without corresponding calcium changes. In norepinephrine-contracted arteries, NaSH (1 mM) lowered phosphorylation of myosin light chain, while phosphorylation of myosin phosphatase target subunit 1 (MYPT-1) remained unchanged. Inhibitors of guanylate cyclase, protein kinase A and G failed to reduce NaSH relaxation, while blockers of voltage-gated KV7 channels inhibited NaSH relaxation, and blockers of mitochondrial complex I and III abolished NaSH relaxation. CONCLUSION: the present findings suggest that low micromolar concentrations of free H2S by a dual mechanism opens K channels followed by lowering of smooth muscle calcium and by a mechanism involving mitochondrial complex I and III leads to uncoupling of force, and hence vasodilation.


Abstract: ETHNOPHARMACOLOGICAL RELEVANCE: Leaves of Phyllanthus acidus (PA) have been used in Thai traditional medicine for the treatment of hypertension. We have previously shown that chronic treatment of a PA water extract to middle-aged male rats caused a lowering of the body and serum lipids, two of the parameters that are implicated in cardiovascular disease. AIM OF THE STUDY: To investigate if chronic treatment of middle-aged male rats with a PA water extract affected the perivascular (aortic) adipose tissue (PVAT) and/or their vascular functions. MATERIALS AND METHODS: Fresh leaves of PA were extracted with water and orally gavaged to the middle-aged male rats for 6 weeks. Vascular functions were studied in vitro using isolated thoracic aorta with and without PVAT, and mesenteric rings in Krebs Heinselte solution with results recorded with a Polygraph or a Myograph system. The amount of blood vessel eNOS and CSE (cystathionine-gamma-lyase) expression was measured by Western blotting. RESULTS: PA treatment caused a lower maximal contractile response to phenylephrine (Phe) of the endothelium-intact aortic ring than that of the control group. This effect was abolished by NG-nitro-l-arginine (l-NA) or by denudation of the endothelium. DL-propargylglycine (PAG, H2S inhibitor) and TEA (Ca2+-activated K+ channel blocker), but not glybenclamide (ATP-activated K+ channel blocker), caused a similar increase in the baseline of the endothelium-intact aortic ring in the presence of l-NA in both the PA-treated and control aortic rings. This effect sequentially resulted in a greater contractile response of the aortic rings of both groups to Phe. Glybenclamide also caused a similar increase in the maximal contraction of the endothelium-intact blood vessels with l-NA to both groups. PAG, TEA or glybenclamide did not modify the phenylephrine C-R curves for either group of the PVAT-endothelium-intact aortic rings preincubated with l-NA. The CSE levels of the
thoracic aorta and at the PVAT were not different between the PA-treated and the control group. Relaxation of the Phe-precontracted thoracic aortic ring to acetylcholine, but not to glyceryl trinitrate, was higher for the PA-treated than for the control aortic rings and this effect was abolished by I-NA. The mesenteric rings of the PA treated group showed a lower sensitivity on the contractile response to Phe than that of the control group, and this effect was abolished by I-NA. Vasodilatation to acetylcholine, but not to glyceryl trinitrate, of the PA treated-mesenteric ring was more sensitive than that of the control group and this effect was abolished by I-NA. The expression of eNOS by the PA treated thoracic aorta and the mesenteric arteries was higher than the control group. These results demonstrated that chronic treatment with a PA water extract to middle-aged rats affected their vascular functions by increasing the nitric oxide production from the endothelial cells and also modulated the responsiveness of the thoracic aortic- and mesenteric rings to phenylephrine and acetylcholine.


Abstract: A selective and sensitive quartz enhanced photoacoustic spectroscopy (QEPAS) sensor, employing an erbium-doped fiber amplifier (EDFA), and a distributed feedback (DFB) laser operating at 1582 nm was demonstrated for simultaneous detection of ammonia (NH(3)) and hydrogen sulfide (H(2)S). Two interference-free absorption lines located at 6322.45 cm(-1) and 6328.88 cm(-1) for NH(3) and H(2)S detection, respectively, were identified. The sensor was optimized in terms of current modulation depth for both of the two target gases. An electrical modulation cancellation unit was equipped to suppress the background noise caused by the stray light. An Allan-Werle variance analysis was performed to investigate the long-term performance of the fiber-amplifier-enhanced QEPAS sensor. Benefitting from the high power boosted by the EDFA, a detection sensitivity (1sigma) of 52 parts per billion by volume (ppbv) and 17 ppbv for NH(3) and H(2)S, respectively, were achieved with a 132 s data acquisition time at atmospheric pressure and room temperature.


Abstract: The biological removal of pollutants, especially through biotrickling filters (BTFs), has recently become attractive for the low investment and operational costs and the low secondary pollution. This paper is intended to investigate the state of the art on BTF applications. After an overview on the biodegradation process and the typical parameters involved, this paper presents the analysis of a group of 16 literature studies chosen as the references for this sector. The reference studies differ from one another by the pollutants treated (volatile organic compounds [VOC], hydrogen sulphide, nitrogen oxides and trimethylamine), the geometry and size of the BTFs, and the procedures of the tests. The reference studies are analyzed and discussed in terms of the operational conditions and the results obtained, especially with respect to the removal efficiencies (REs) and the elimination capacities (ECs) of the pollutants considered. Empty bed residence time (EBRT), pollutant loading rate, temperature, pH, oxygen availability, trickling liquid flow rate, inoculum selection and biomass control strategies revealed to be the most important operational factors influencing the removal performance of a BTF.


Abstract: In this eighteenth (2016) Annual Review Issue of The Journal of Pathology, we present a collection of 19 invited review articles that cover different aspects of cellular and animal models of disease. These include genetically-engineered models, chemically-induced models, naturally-occurring models, and combinations thereof, with the
focus on recent methodological and conceptual developments across a wide range of human diseases

Abstract: Volatile sulfur and volatile organic compound (VSC and VOC, respectively) emissions were measured over a 3.5 year period from 21 field monitoring sites across Australia to determine their potential contribution to sewer odours and support the evaluation of odour abatement processes used to treat sewer emissions. Measured VOC concentrations were generally less than 250 μg/m3, although some VOCs (toluene, trimethylbenzene and cymene) were present at higher concentrations. In general, sewer headspace VOCs are unlikely to be a significant contributor to sewer odours and VOC monitoring is only recommended for sites with a history of significant trade waste discharges or where odour character descriptors are typical of VOCs. A range of VSCs were identified, including hydrogen sulfide, ethyl mercaptan, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, dimethyl trisulfide, carbon disulfide, and carbonyl sulfide. From a concentration perspective, the VSCs were dominated by hydrogen sulfide, followed by methyl mercaptan, and then a range of sulfides. Significant variations in VSC concentration and relative importance were observed between the cities and all identified VSCs were potentially odorous. An odorant prioritisation methodology to identify key and high priority odorants was developed and successfully demonstrated. While some high priority VOCs were identified, VSCs (hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide) were the dominant priority odorants. A wider range of VSCs should be assessed in addition to hydrogen sulfide to improve the evaluation of odour abatement processes.

Abstract: A poly-Lys tag was fused to the Lucina pectinata hemoglobin I (HbI) coding sequence and purified using an efficient and fast process. HbI is a hemeprotein that binds hydrogen sulfide (H2S) with high affinity and it has been used to understand physiologically relevant reactions of this signaling molecule. The (Lys)6-tagged rHbI construct was expressed in E. coli and purified by immobilization on a cation exchange matrix, followed by size-exclusion chromatography. The identity, structure, and function of the (Lys)6-tagged rHbI were assessed by mass spectrometry, small and wide X-ray scattering, optical spectroscopy, and kinetic analysis. The scattering and spectroscopic results showed that the (Lys)6-tagged rHbI is structurally and functionally analogous to the native protein as well as to the (His)6-tagged rHbI. Kinetics studies with H2S indicated that the association (k on) and dissociation (k off) rate constants were 1.4 x 105/M/s and 0.1 x 10-3/s, respectively. This results confirmed that the (Lys)6-tagged rHbI binds H2S with the same high affinity as its homologue.

Abstract: Background/Aims: The internal anal sphincter (IAS) plays an important role in maintaining continence and a number of neurotransmitters are known to regulate IAS tone. The aim of this study was to determine the relative importance of the neurotransmitters involved in the relaxant and contractile responses of the porcine IAS. Methods: Responses of isolated strips of IAS to electrical field stimulation (EFS) were obtained in the absence and presence of inhibitors of neurotransmitter systems. Results: Contractile responses of the sphincter to EFS were unaffected by the muscarinic receptor antagonist atropine (1 μM), but were almost completely abolished by the adrenergic neuron blocker guanethidine (10 μM). Contractile responses were also reduced (by 45% at 5 Hz, P 0.01) following desensitisation of purinergic receptors with alpha,beta,methylene-ATP (10μM). In the presence of guanethidine, atropine and alpha,beta,methylene-ATP, the remaining
relaxatory responses to EFS were examined. These responses were not altered by the cyclooxygenase inhibitor indomethacin (5 μM), the vasoactive intestinal polypeptide receptor antagonist [D-p-Cl-Phe6,Leu17]-vasoactive intestinal peptide, (PheLeu-VIP; 100 nM), or the purinoceptor antagonists 8-phenylthopyline (P1 receptors) or suramin (P2 receptors). However relaxation responses were reduced by L-NNA (100 μM) an inhibitor of nitric oxide (NO) synthesis (40-50% reduction), zinc protoporphyrin IX (10 μM) an inhibitor of carbon monoxide (CO) synthesis (20-40% reduction) and also propargylglycine (30 μM) and aminooxyacetic acid (30 μM), inhibitors of hydrogen sulphide (H2S) synthesis (15-20% reduction). Conclusions: Stimulation of IAS efferent nerves releases excitatory and inhibitory neurotransmitters: noradrenaline is the predominant contractile transmitter with a smaller component from ATP, whilst three gases mediate relaxation responses to EFS, with the combined contributions being NO>CO>H2S.

Abstract: Using pharmacological and biochemical approaches, Ca2+ involved in the betulin production in mycelia of Phellinus linteus induced by hydrogen sulfide (H2S) were investigated. The results showed that 2 mM H2S donor NaHS or 10 mM CaCl2 was found to enhance the betulin content in the mycelia of Phellinus to the maximum, which were 112.43 and 93.24 % higher than that in the control, respectively. Further, NaHS and CaCl2 co-treatment also showed positive outcome, which were 128.95 or 24.52 % higher than that in the control or NaHS treatment. At the same time, NaHS also enhanced the content of Ca2+ and CaM. But, the above positive inductive effects for Ca2+, CaM, and betulin production can be blocked with either Ca2+ channel blocker (LaCl3, 2-aminoethoxydiphenyl borate) or Ca2+ chelator (ethylenediaminetetraacetic acid (EDTA)). Among of them, betulin content was reduced 35.06 % by NaHS and EGTA to the minimum, and this reduction could be reversed by the application of CaCl2 (NaHS + EGTA + CaCl2). From above results, it can be concluded that endogenous and exogenous calcium involved in the betulin production from submerged culture of P. linteus induced by hydrogen sulfide.

Abstract: Cadmium sulphide is one of the most promising materials for solar cells and of great interest due to its useful applications in photonics and electronics, thus the development of bio-mediated synthesis of cadmium sulphide nanoparticles (CdS NPs) is one of the essential areas in nanoparticles. The present study demonstrates for the first time the eco-friendly biosynthesis of CdS NPs using the yeast Trichosporon jirovecii. The biosynthesis of CdS NPs were confirmed by UV-Vis spectrum and characterized by X-ray diffraction assay and electron microscopy. Scanning and transmission electron microscope analyses shows the formation of spherical CdS NPs with a size range of about 6-15 nm with a mean Cd:S molar ratio of 1.0:0.98. T. jirovecii produced hydrogen sulfide on cysteine containing medium confirmed by positive cysteine-desulfhydrase activity and the colony color turned yellow on 0.1 mM cadmium containing medium. T. jirovecii tolerance to cadmium was increased by the UV treatment and three 0.6 mM cadmium tolerant mutants were generated upon the UV radiation treatment. The overall results indicated that T. jirovecii could tolerate cadmium toxicity by its conversion into CdS NPs on cysteine containing medium using cysteine-desulfhydrase as a defense response mechanism.

Abstract: Obesity and diabetes represent a significant and escalating worldwide health burden. These conditions are characterized by abnormal nutrient homeostasis. One such perturbation is altered metabolism of the sulfur-containing amino acid cysteine. Obesity is associated with elevated plasma cysteine, whereas diabetes is associated with reduced cysteine levels. One mechanism by which cysteine may act is through its enzymatic
breakdown to produce hydrogen sulfide (H2S), a gasotransmitter that regulates glucose and lipid homeostasis. Here we review evidence from both pharmacological studies and transgenic models suggesting that cysteine and hydrogen sulfide play a role in the metabolic dysregulation underpinning obesity and diabetes. We then outline the growing evidence that regulation of hydrogen sulfide levels through its catabolism can impact metabolic health. By integrating hydrogen sulfide production and breakdown pathways we reassess current hypothetical models of cysteine and hydrogen sulfide metabolism, offering new insight into their roles in the pathogenesis of obesity and diabetes.


Abstract: BACKGROUND: The carnitine/acylcarnitine carrier (CAC or CACT) mediates transport of acylcarnitines into mitochondria for the beta-oxidation. CAC possesses Cys residues which respond to redox changes undergoing to SH/disulfide interconversion.

METHODS: The effect of H2S has been investigated on the [3H]carnitine/carnitine antiport catalyzed by recombinant or native CAC reconstituted in proteoliposomes. Site-directed mutagenesis was employed for identifying Cys reacting with H2S. RESULTS: H2S led to transport inhibition, which was dependent on concentration, pH and time of incubation. Best inhibition with IC50 of 0.70μM was observed at physiological pH after 30-60min incubation. At longer times of incubation, inhibition was reversed. After oxidation of the carrier by O2, transport activity was rescued by H2S indicating that the inhibition/activation depends on the initial redox state of the protein. The observed effects were more efficient on the native rat liver transporter than on the recombinant protein. Only the protein containing both C136 and C155 responded to the reagent as the WT. While reduced responses were observed in the mutants containing C136 or C155. Multi-alignment of known mitochondrial carriers, highlighted that only the CAC possesses both Cys residues. This correlates well with the absence of effects of H2S on carriers which does not contain the Cys couple. CONCLUSIONS: Altogether, these data demonstrate that H2S regulates the CAC by inhibiting or activating transport on the basis of the redox state of the protein.

GENERAL SIGNIFICANCE: CAC represents a specific target of H2S among mitochondrial carriers in agreement with the presence of a reactive Cys couple.


Abstract: The development of hydrogels that are responsive to external stimuli in a well-controlled manner is important for numerous biomedical applications. Herein we reported the first example of a hydrogel responsive to hydrogen sulphide (H2S). H2S is an important gasotransmitter whose deregulation has been associated with a number of pathological conditions. Our hydrogel design is based on the functionalization of an ultrashort hydrogelating peptide sequence with an azidobenzyl moiety, which was reported to react with H2S selectively under physiological conditions. The resulting peptide was able to produce hydrogels at a concentration as low as 0.1 wt%. It could then be fully degraded in the presence of excess H2S. We envision that the novel hydrogel developed in this study may provide useful tools for biomedical research.


Abstract: OBJECTIVE: Hydrogen sulfide (H2S) plays multiple roles in the function of the central nervous system in physiological and pathological conditions, such as cerebral ischemia. Recent studies have reported controversial results about the role of H2S in cerebral ischemia. The aim of this study was to evaluate the effects of amino-oxyacetic acid (AOAA), an inhibitor of H2S synthesis, on ischemic injury in an experimental model of stroke. METHODS: Using laser Doppler monitoring, cerebral ischemia was induced by transient middle cerebral artery occlusion (MCAO) for 1 hour in rats. AOAA (.025, .05, .1,
and .5 mmol/kg intraperitoneally [i.p.] was injected at the beginning of MCAO. Infarct volume, cerebral edema, and activity of antioxidant enzymes were measured using the standard methods 24 hours after ischemia. RESULTS: The administration of AOAA at doses .025, .05, and .1 mmol/kg significantly reduced the infarct volume (P < .001). Furthermore, .025 and .05 mmol/kg of AOAA significantly reduced brain edema and improved the neurological outcome (P < .001). The administration of AOAA did not significantly change the malondialdehyde content, activities of superoxide dismutase, or glutathione peroxidase antioxidant enzymes in the brain tissue (P > .05). CONCLUSION: The results showed that AOAA administered at a low dose has protective effects; however, at higher doses it did not exert any protective effect against cerebral ischemia and even worsened the ischemic injury. This finding suggests that H2S might be both beneficial and harmful in cerebral ischemic injury depending on its concentration in transient model of focal cerebral ischemia.

(32) Ghosh S, Bhattacharyya R, Saha H, Chaudhuri CR, Mukherjee N. Functionalized ZnO/ZnO2 n-N straddling heterostructure achieved by oxygen plasma bombardment for highly selective methane sensing. Phys Chem Chem Phys 2015 Oct 14;17(41):27777-88. Abstract: Metal oxide semiconductors have been extensively used as reducing gas sensors with major limitations regarding selectivity and operating temperature which is relatively high for most of the cases making the device unusable in some critical situations. Higher operating temperature is also associated with the higher power consumption, which goes against the miniaturization of the device. In order to resolve these problems, here we introduced a ZnO/ZnO2 straddling 'n-N' isotype heterostructure as a highly selective and sensitive methane sensor at moderately low operating temperature. ZnO-Zn(OH)2 precursor films were treated in oxygen plasma in a pulsed DC magnetron sputtering system. Morphological analyses by field emission scanning electron microscopy showed flake-like growth of the grains with high surface roughness, whereas X-ray diffraction (XRD) showed polycrystalline nature of the films. Polycrystalline ZnO2 peaks were observed in the XRD pattern in addition to the existing ZnO, which indicates modification of the precursor to oxygen rich heterostructure of ZnO/ZnO2. This was further supported by the shifting of the O1s peak in the X-ray photoelectron spectroscopic analysis. Plasma treated ZnO/ZnO2 heterostructured films were found to show high selectivity towards methane (with respect to H2S and CO) and sensitivity (approximately 96%) at a comparatively low operating temperature.

(33) Jiang B, Sun Z, Hou Y, Yang L, Yang F, Chen X, et al. Isolation and properties of an endo-beta-mannanase-producing Bacillus sp. LX114 capable of degrading guar gum. Prep Biochem Biotechnol 2015 Oct 14. Abstract: Endo-beta-mannanase, catalyzing the random hydrolysis of beta-1.4 mannosidic linkage in the backbone of (hetero) mannan, can increase feed conversion efficiency of animal feed or form functional mannanooligosaccharides. In this study, a Gram-positive, straight-rod, facultative anaerobic bacterium producing endo-beta-mannanase was isolated from soil sample. The isolate only ferment glucose, galactose, sorbose and raffinose to acid. The test in hydrogen sulphide production was positive. Combining the data acquired from phenotypic analysis and phylogenetic analysis based on 16S rRNA gene sequences, this strain presumably represented a novel species of the genus Bacillus and was designated as LX114. The strain LX114 could break down guar gum molecules leading to a rapid decrease of the viscosity of guar gum solutions. Endo-beta-mannanase activity was also detected in the culture supernatant. The isolate LX114 would be useful for potential application in degrading plant cell wall for increasing feed conversion efficiency and formation of functional oligosaccharides.

(CBS) and cystathionine gamma-lyase (CSE), as well as other enzymes in mammalian tissues. These discoveries have led to the crowning of H2S as yet another toxic gas that serves as a gasotransmitter like NO and CO. H2S is thought to exert its biological effects through its reaction with cysteine thiols in proteins, yielding sulfurred thiol (-SSH) derivatives. One of the first proteins shown to be modified by H2S was glyceraldehyde 3-phosphate dehydrogenase (GAPDH) [1] where the S-sulfuration of the active site cysteine (Cys 152) resulted in ~7-fold increase in the activity of the enzyme. In the present study we have attempted to reproduce this result with no success. GAPDH in its reduced, or hydrogen peroxide, or glutathione disulfide, or nitrosonium oxidized forms was reacted with sulfide or polysulfides. Sulfide had no effect on reduced GAPDH activity, while polysulfides inhibited GAPDH to ~42% of control. S-sulfuration of GAPDH occurred at Cys 247 after sulfide treatment, Cys 156 and Cys 247 after polysulfide treatment. No evidence of S-sulfuration at active site Cys 152 was discovered. Both sulfide and polysulfide was able to restore the activity of glutathione disulfide oxidized GAPDH, but not to control untreated levels. Treatment of glutathione disulfide oxidized GAPDH with polysulfide also produced S-sulfuration of Cys 156. Treatment of a C156S mutant of GAPDH with sulfide and polysulfide resulted in S-sulfuration of Cys 152, which also caused a decrease and not an increase in enzymatic activity. Computational chemistry shows S-sulfuration of Cys 156 may affect the position of catalytic Cys 152, raising its pKa by 0.5, which may affect the nucleophilicity of Cys 152. The current study raises significant questions about the reported ability of H2S to activate GAPDH by the sulfuration of its active site thiol, and indicates that polysulfide is a stronger protein S-sulfurating agent than sulfide

(35) Vellecco V, Mancini A, Ianaro A, Calderone V, Attanasio C, Cantalupo A, et al. Cystathionine beta synthase derived -Hydrogen sulfide is involved in human Malignant Hyperthermia. Clin Sci (Lond) 2015 Oct 12. Abstract: Hydrogen sulfide is an endogenous gasotransmitter and its mechanism of action involves activation of KATP channels and phosphodiesterases (PDE)s inhibition. Since both mechanisms are potentially involved in the Malignant Hyperthermia (MH), here we have addressed the involvement of the L-cysteine/hydrogen sulfide pathway in MH. Skeletal muscle biopsies obtained from 25 susceptible MH (MHS) and 56 negative (MHN) have been used to perform the in vitro contracture test (IVCT). Quantitative Real-Time PCR (qPCR) and western blotting studies have been also performed. Hydrogen sulfide levels are measured both in tissue samples and plasma. In MHS biopsies an increase in cystathionine beta-synthase (CBS) occurs, both as message and protein expression compared to MHN. Hydrogen sulfide biosynthesis is increased in MHS biopsies (0.128±0.12 vs. 0.943±0.13 nmole/mg protein*min-1 MHN and MHS, respectively p<0.01). NaHS addition to MHS samples evokes in IVCT a response similar to that elicited by either caffeine or halothane. Incubation of MHN biopsies with NaHS, prior to caffeine or halothane challenge, switches a MHN into a MHS response. In conclusion we demonstrate the involvement of the L-cysteine/hydrogen sulfide pathway in MH, giving a new insight into MH molecular mechanisms. This finding has potential implications for clinical care and could help to define less invasive diagnostic procedures

(36) Weir SM, Knox A, Talent LG, Anderson TA, Salice CJ. Direct and indirect effects of petroleum production activities on the Western Fence lizard (Sceloporus occidentalis) as a surrogate for the dunes sagebrush lizard (Sceloporus arenicola). Environ Toxicol Chem 2015 Oct 12. Abstract: The dunes sagebrush lizard (Sceloporus arenicola) is a habitat specialist of conservation concern limited to shin oak sand dune systems of New Mexico and Texas. Because much of the dunes sagebrush lizard's habitat occurs in areas of high oil and gas production, there may be direct and indirect effects of these activities. We used the congeneric Western fence lizard (Sceloporus occidentalis) as a surrogate species to determine direct effects of 2 contaminants associated with oil and gas drilling activities in the Permian Basin: herbicide formulations (Krovar and Quest) and hydrogen sulfide gas (H2 S). We exposed lizards to 2 concentrations of H2 S (30 or 90 ppm) and herbicide
formulations (1x or 2x label application rate) representing high-end exposure scenarios. We evaluated sublethal behavioral endpoints including sprint speed and time to prey detection and capture. Neither H$_2$S nor herbicide formulations caused significant behavioral effects compared to controls. In order to understand potential indirect effects of oil and gas drilling on the prey base, we quantified terrestrial invertebrate biomass and order diversity at impacted sites to compare to non-impacted sites. We found a significant decrease in biomass at impacted sites, but no significant effects on diversity. Our results suggest little risk from direct toxic effects, but the potential for indirect effects should be further explored. This article is protected by copyright. All rights reserved


Abstract: Oxidative stress and inflammation play crucial role in the pathogenesis of chronic obstructive pulmonary disease (COPD). Most patients with COPD show a poor response to corticosteroids. Hydrogen sulfide (H$_2$S) has been implicated in the pathogenesis of COPD, but its expression and effects in lung tissue from COPD patients are not clear. In peripheral lung tissue samples from 24 patients, we found that compared with nonsmokers, the protein level of cystathionine-gamma-lyase (CSE) was decreased in smokers and COPD patients. CSE mRNA increased but cystathionine-beta-synthase (CBS) mRNA decreased in COPD patients. H$_2$S donors increased glutathione and superoxide dismutase in CS exposed U937 cells and inhibited CS-induced TNF-alpha and IL-8 secretion. Dexamethasone alone had no effect on lipopolysaccharide (LPS) induced TNF-alpha release by alveolar macrophages from CS exposed rats, however the combination of dexamethasone and H$_2$S donor significantly inhibited TNF-alpha release. Thus, H$_2$S metabolism is altered in lung tissue of smokers and COPD patients. Supplementation of H$_2$S protects against CS-induced oxidative stress and inflammation in macrophages and H$_2$S on steroid sensitivity deserves further investigation


Abstract: Hydrogen sulfide, one of three known gasotransmitters, is involved in physiological processes, including reproductive functions. Oocyte maturation and surrounding cumulus cell expansion play an essential role in female reproduction and subsequent embryonic development. Although the positive effects of exogenous hydrogen sulfide on maturing oocytes are well known, the role of endogenous hydrogen sulfide, which is physiologically released by enzymes, has not yet been described in oocytes. In this study, we observed the presence of Cystathionine beta-Synthase (CBS), Cystathionine gamma-Lyase (CTH) and 3-Mercaptopyruvate Sulfurtransferase (3-MPST), hydrogen sulfide-releasing enzymes, in porcine oocytes. Endogenous hydrogen sulfide production was detected in immature and matured oocytes as well as its requirement for meiotic maturation. Individual hydrogen sulfide-releasing enzymes seem to be capable of substituting for each other in hydrogen sulfide production. However, meiosis suppression by inhibition of all hydrogen sulfide-releasing enzymes is not irreversible and this effect is a result of M-Phase/Maturation Promoting Factor (MPF) and Mitogen-Activated Protein Kinase (MAPK) activity inhibition. Furthermore, cumulus expansion expressed by hyaluronic acid (HA) production is affected by the inhibition of hydrogen sulfide production. Moreover, quality changes of the expanded cumuli are indicated. These results demonstrate hydrogen sulfide involvement in oocyte maturation as well as cumulus expansion. As such, hydrogen sulfide appears to be an important cell messenger during mammalian oocyte meiosis and adequate cumulus expansion

Abstract: A series of lanthanide-based, azide-appended complexes were investigated as hydrogen sulfide-sensitive probes. Europium complex 1 and Tb complex 3 both displayed a sulfide-dependent increase in luminescence, while Tb complex 2 displayed a decrease in luminescence upon exposure to NaHS. The utility of the complexes for monitoring sulfide levels in industrial oil and water samples was investigated. Complex 3 provided a sensitive measure of sulfide levels in petrochemical water samples (detection limit approximately 250 nM), while complex 1 was capable of monitoring muM levels of sulfide in partially refined crude oil

Abstract: Development of efficient methods for detection of endogenous H2S in living cells and tissues is of considerable significance for better understanding the biological and pathological functions of H2S. Two-photon (TP) fluorescent probes are favorable as powerful molecular tools for studying physiological process due to its non-invasiveness, high spatiotemporal resolution and deep-tissues imaging. Up to date, several TP probes for intracellular H2S imaging have been designed, but real-time imaging of endogenous H2S-related biological processes in tissues is hampered due to low sensitivity, long response time and interference from other biothiols. To address this issue, we herein report a novel two-photon fluorescent probe (TPP-H2S) for highly sensitive and fast monitoring and imaging H2S levels in living cells and tissues. In the presence of H2S, it exhibits obviously improved sensitivity (LOD: 0.12 muM) and fast response time (about 2 min) compared with the reported two-photon H2S probes. With two-photon excitation, TPP-H2S displays high signal-to-noise ratio and sensitivity even no interference in cell growth media. As further application, TPP-H2S is applied for fast imaging of H2S in living cells and different fresh tissues by two-photon confocal microscope. Most importantly we first measured the endogenous H2S level in different viscera by vivisection and found that the distribution of endogenous H2S mostly in brain, liver and lung. The excellent sensing properties of TPP-H2S make it a practically useful tool for further studying biological roles of H2S

Abstract: Hydrogen sulfide is ubiquitous in biological systems and exerts function over a wide range of important physiological processes. Complementing free H2S, the reductant-labile sulfur pool plays significant roles in the translocation and action of sulfide, however the chemistry of reductant-labile sulfide sources has not been studied systematically. Using a combination of NMR and UV-Vis spectroscopy, we investigated the spectroscopic properties and reactivity of three isolated organic persulfides and report a simple model for persulfide reactivity, including their roles as nucleophiles, electrophiles, and sulfide donors

Abstract: IMPLICATIONS The manuscript focuses on the adsorption of hydrogen sulfide (H2S) by biochars derived from wastes. The characteristics and mechanisms of hydrogen sulfide (H2S) adsorption on three different biochars derived from agricultural/forestry wastes through pyrolysis at various temperatures were investigated. In this study, the H2S breakthrough capacity was measured using a laboratory-characterized using pH and Fourier transform infrared spectroscopy analysis. The results obtained demonstrate that all biochars were effective in H2S sorption. The sorption capacity of the biochar for H2S removal is related to the pyrolysis temperature and pH of the surface
Abstract: Results are presented that suggest that thiazyl hydride (HSN)/thionitrosyl hydride (sulfimide, HNS) can be used as light-sensitive compounds for NO-delivery in biological media, as well as markers for the possible detection of intermediates in nitrites + H2S reactions at the cellular level. They are expected to be more efficient than the HNO/HON isovalent species and hence they should be considered instead. A set of characteristic spectroscopic features are identified that could aid in the possible detection of these species in the gas phase or in biological environments. The possibility of intramolecular dynamical processes involving excited states that are capable of interconverting HNS and its isomeric form HSN is examined.

Abstract: Autophagy plays an important role in liver triglyceride (TG) metabolism. Inhibition of autophagy could reduce the clearance of TG in the liver. Hydrogen sulfide (H2S) is a potent stimulator of autophagic flux. Recent studies showed H2S is protective against Hypertriglyceridemia (HTG) and noalcoholic fat liver disease (NAFLD), while the mechanism remains to be explored. Here we test the hypothesis that H2S reduces serum TG level and ameliorates NAFLD through stimulating liver autophagic flux by AMPK-mTOR pathway. The level of serum H2S in patients with HTG was lower than that of control subjects. Sodium hydrosulfide (NaHS, H2S donor) markedly reduced serum TG levels of male C57BL/6 mice fed with high-fat diet (HFD), which was abolished by co-administration of chloroquine (CQ), an inhibitor of autophagic flux. In HFD mice, administration of NaSH increased LC3BII to LC3BI ratio, decreased p62 protein level. Meanwhile, NaSH increased the phosphorylation of AMPK, and thus reduced the phosphorylation of mTOR by western blot study. In cultured LO2 cells, high fat treatment reduced the ratio of LC3BII to LC3BI and the phosphorylation of AMPK, which were reversed by the co-administration of NaSH. Knockdown of AMPK by siRNA in LO2 cells blocked the autophagic enhancing effects of NaSH. The same qualitative effect was observed in AMPKalpha2-/- mice. These results for the first time demonstrated that H2S could reduce serum TG level and ameliorate NAFLD by activating liver autophagy via

Abstract: Hydrogen polysulfides (H2Sn) have a higher number of sulfane sulfur atoms than hydrogen sulfide (H2S), which has various physiological roles. We recently found H2Sn in the brain. H2Sn induced some responses previously attributed to H2S but with much greater potency than H2S. However, the number of sulfur atoms in H2Sn and its producing enzyme were unknown. Here, we detected H2S3 and H2S, which were produced from 3-mercaptopyruvate (3 MP) by 3-mercaptopyruvate sulfurtransferase (3MST), in the brain. High performance liquid chromatography with fluorescence detection (LC-FL) and tandem mass spectrometry (LC-MS/MS) analyses showed that H2S3 and H2S were produced from 3 MP in the brain cells of wild-type mice but not 3MST knockout (3MST-KO) mice. Purified recombinant 3MST and lysates of COS cells expressing 3MST produced H2S3 from 3 MP, while those expressing defective 3MST mutants did not. H2S3 was localized in the cytosol of cells. H2S3 was also produced from H2S by 3MST and rhodanese. H2S2 was identified as a minor H2Sn, and 3 MP did not affect the H2S5 level. The present study provides new insights into the physiology of H2S3 and H2S, as well as novel therapeutic targets for diseases in which these molecules are involved.

Abstract: We constructed a new global potential energy surface (PES) for the electronic ground state (\((1)A^*\)) of H2S based on 21,300 accurate ab initio energy points over a large configuration space. The ab initio energies are obtained from multireference configuration interaction calculations with a Davidson correction using basis sets of quadruple zeta quality. The neural network method is applied to fit the PES, and the root mean square error of fitting is small (1.68 meV). Time-dependent wave packet studies for the \(S((1)D) + H2(X(1)Sigmag(+)) \rightarrow H(2)S + SH(X(2)Pi)\) reaction on the new PES are conducted to study the reaction dynamics. The calculated integral cross sections decrease with increasing collision energy and remain fairly constant within the high collision energy range. Both forward and backward scatterings can be observed as expected for a barrierless reaction with a deep well on the PES. The calculated integral cross sections and differential cross sections are in good agreement with the experimental results.

Abstract: Interactions of hydrogen sulfide (HS-/H2S), a reducing signaling species, with superoxide dimutases (SOD) are poorly understood. We applied low-T EPR spectroscopy to examine the effects of HS-/H2S and superoxide radical anion [Formula: see text] on metallocenters of FeSOD, MnSOD, and CuZnSOD. HS-/H2S did not affect FeSOD, whereas active centers of MnSOD and CuZnSOD were open to this agent. Cu2+ was reduced to Cu1+, while manganese appears to be released from MnSOD active center. Untreated and [Formula: see text] treated FeSOD and MnSOD predominantly show 5 d-electron systems, i.e. Fe3+ and Mn2+. Our study provides new details on the mechanisms of (patho)physiological effects of HS-/H2S.

Abstract: The aim of this study was to evaluate the performance of an autotrophic denitrification process for desulfurization of biogas produced from a chicken manure digester. A laboratory scale upflow fixed bed reactor (UFBR) was operated for 105 days and fed with sodium sulfide or H2S scrubbed from the biogas and nitrate as electron donor and acceptor, respectively. The S/N ratio (2.5 mol/mol) of the feed solution was kept constant throughout the study. When the UFBR was fed with sodium sulfide solution with an influent pH of 7.7, about 95 % sulfide and 90 % nitrate removal efficiencies were achieved. However, the inlet of the UFBR was clogged several times due to the accumulation of biologically produced elemental sulfur particles and the clogging resulted in operational problems. When the UFBR was fed with the H2S absorbed from the biogas and operated with an influent pH of 8-9, around 98 % sulfide and 97 % nitrate removal efficiencies were obtained. In this way, above 95 % of the H2S in the biogas was removed as elemental sulfur and the reactor effluent was reused as scrubbing liquid without any clogging problem.

Abstract: Early reperfusion of the blocked vessel is critical to restore the blood flow to the ischemic myocardium to salvage myocardial tissue and improve clinical outcome. This reperfusion strategy after a period of ischemia, however, may elicit further myocardial damage named myocardial reperfusion injury. The manifestations of reperfusion injury include arrhythmias, myocardial stunning and micro-vascular dysfunction, in addition to significant cardiomyocyte death. It is suggested that an overproduction of reactive oxygen species, intracellular calcium overload and inflammatory cell infiltration are the most important features of myocardial ischemia-reperfusion injury. This suggests that reperfusion injury might provide a target for improved outcomes after myocardial infarction but thus far that aim has not been met. In this review, various pharmacological interventions to treat myocardial reperfusion injury including the antioxidant flavonols, hydrogen sulfide,
adenosine, opioids, incretin-based therapies and cyclosporin A which targets the mitochondrial permeability transition pore are discussed.

Abstract: Vast quantities of hydrogen sulfide (H2S) emitted from landfill sites require urgent disposal. The current study focused on source control and examined the migration and conversion behavior of sulfur compounds in two lab-scale simulated landfills with different operation modes. It aimed to explore the possible strategies and mechanisms for H2S endogenous mitigation inside of landfills during decomposition. It was found that the strength of H2S emissions from the landfill sites was dependent on the municipal solid waste (MSW) degradation speed and vertical distribution of sulfide. Leachate recirculation can shorten both the H2S influence period and pollution risk to the surrounding environment. H2S endogenous mitigation may be achieved by chemical oxidation, biological oxidation, adsorption, and/or precipitation in different stages. Migration and conversion mainly affected H2S release behavior during the initial stabilization phase in the landfill. Microbial activities related to sulfur, nitrogen, and iron can further promote H2S endogenous mitigation during the high reducing phase. Thus, H2S endogenous mitigation can be effectively enhanced via control of the aforementioned processes.

Abstract: The use of methane and acetate as electron donors for biological reduction of thiosulphate in a 5-L laboratory membrane bioreactor was studied and compared to disproportionation of thiosulphate as competing biological reaction. The reactor was operated for 454 days in semi-batch mode; 30 % of its liquid phase was removed and periodically replenished (days 77, 119, 166, 258, 312 and 385). Although the reactor was operated under conditions favourable to promote thiosulphate reduction coupled to methane oxidation, thiosulphate disproportionation was the dominant microbial process. Pyrosequencing analysis showed that the most abundant microorganisms in the bioreactor were phototrophic green sulphur bacteria (GSB) belonging to the family Chlorobiaceae and thiosulphate-disproportionating bacteria belonging to the genus Desulfocapsa. Even though the reactor system was surrounded with opaque plastic capable of filtering most of the light, the GSB used it to oxidize the hydrogen sulphide produced from thiosulphate disproportionation to elemental sulphur. Interrupting methane and acetate supply did not have any effect on the microbial processes taking place. The ultimate goal of our research was to develop a process that could be applied for thiosulphate and sulphate removal and biogenic sulphide formation for metal precipitation. Even though the system achieved in this study did not accomplish the targeted conversion using methane as electron donor, it does perform microbial conversions which allow to directly obtain elemental sulphur from thiosulphate.

Abstract: Acute pulmonary edema is one of the major outcomes of exposure to high levels of hydrogen sulfide (H2S). However, the mechanisms involved in H2S-induced acute pulmonary edema are still poorly understood. Therefore, the present study is designed to evaluate the role of epithelial sodium channel (ENaC) in H2S-induced acute pulmonary edema. The Sprague-Dawley rats were exposed to sublethal concentrations of inhaled H2S, then the pulmonary histological and lung epithelial cell injury were evaluated by hematoxylin-eosin staining and electron microscopy, respectively. In addition to morphological investigation, our results also revealed that H2S exposure significantly decreased the alveolar fluid clearance and increased the lung tissue wet-dry ratio. These changes were demonstrated to be associated with decreased ENaC expression. Furthermore, the extracellular-regulated protein kinases 1/2 pathway was demonstrated to
be implicated in H2S-mediated ENaC expression, because PD98059, an ERK1/2 antagonist, significantly mitigated H2S-mediated ENaC down-regulation. Therefore, our results show that ENaC might represent a novel pharmacological target for the treatment of acute pulmonary edema induced by H2S and other hazardous gases.

Abstract: Reductive soil disinfestation (RSD), namely amending organic materials and mulching or flooding to create strong reductive status, has been widely applied to improve degraded soils. However, there is little information available about sulfate (SO4(2-)) transformation and sulfur (S) gas emissions during RSD treatment to degraded vegetable soils, in which S is generally accumulated. To investigate the effects of liming on SO4(2-) transformation and S gas emissions, two SO4(2-)-accumulated vegetable soils (denoted as S1 and S2) were treated by RSD, and RSD plus lime, denoted as RSD0 and RSD1, respectively. The results showed that RSD0 treatment reduced soil SO4(2-) by 51% and 61% in S1 and S2, respectively. The disappeared SO4(2-) was mainly transformed into the undissolved form. During RSD treatment, hydrogen sulfide (H2S), carbonyl sulfide (COS), and dimethyl sulfide (DMS) were detected, but the total S gas emission accounted for <0.006% of total S in both soils. Compared to RSD0, lime addition stimulated the conversion of SO4(2-) into undissolved form, reduced soil SO4(2-) by 81% in S1 and 84% in S2 and reduced total S gas emissions by 32% in S1 and 57% in S2, respectively. In addition to H2S, COS and DMS, the emissions of carbon disulfide, methyl mercaptan, and dimethyl disulfide were also detected in RSD1 treatment. The results indicated that RSD was an effective method to remove SO4(2-), liming stimulates the conversion of dissolved SO4(2-) into undissolved form, probably due to the precipitation with calcium

Abstract: INTRODUCTION: Resveratrol (RVT) found in red wine protects against erectile dysfunction and relaxes penile tissue (corpus cavernosum) via a nitric oxide (NO) independent pathway. However, the mechanism remains to be elucidated. Hydrogen sulfide (H2 S) is a potent vasodilator and neuromodulator generated in corpus cavernosum. AIMS: We investigated whether RVT caused the relaxation of mice corpus cavernosum (MCC) through H2 S. METHODS: H2 S formation is measured by methylene blue assay and vascular reactivity experiments have been performed by DMT strip myograph in CD1 MCC strips. MAIN OUTCOME MEASURES: Endothelial NO synthase (eNOS) inhibitor Nomega-Nitro-L-arginine (L-NNA, 0.1 mM) or H2 S inhibitor aminooxyacetic acid (AOAA, 2 mM) which inhibits both cystathionine-beta-synthase (CBS) and cystathionine-gamma-lyase (CSE) enzyme or combination of AOAA with PAG (CSE inhibitor) has been used in the presence/absence of RVT (0.1 mM, 30 min) to elucidate the role of NO or H2 S pathways on the effects of RVT in MCC. Concentration-dependent relaxations to RVT, L-cysteine, sodium hydrogen sulfide (NaHS) and acetylcholine (ACh) were studied. RESULTS: Exposure of murine corpus cavernosum to RVT increased both basal and L-cysteine-stimulated H2 S formation. Both of these effects were reversed by AOAA but not by L-NNA. RVT caused concentration-dependent relaxation of MCC and that RVT-induced relaxation was significantly inhibited by AOAA or AOAA + PAG but not by L-NNA. L-cysteine caused concentration-dependent relaxations, which are inhibited by AOAA or AOAA + PAG significantly. Incubation of MCC with RVT significantly increased L-cysteine-induced relaxation, and this effect was inhibited by AOAA + PAG. However, RVT did not alter the effect of exogenous H2 S (NaHS) or ACh-induced relaxations. CONCLUSIONS: These results demonstrate that RVT-induced relaxation is at least partly dependent on H2 S formation and acts independent of eNOS pathway. In phosphodiesterase 5 inhibitor (PDE-5i) nonresponder population, combination therapy with RVT may reverse erectile dysfunction via stimulating endogenous H2 S formation.

Abstract: OBJECTIVE: Endogenous hydrogen sulfide (H2S), a novel gasotransmitter in cardiovascular regulation, plays an important protective role in the development and progression of atherosclerosis (AS). This study was designed to explore the effects of H2S donor on the production of adrenomedullin (ADM) and atrial natriuretic peptide (ANP) in AS rats. METHODS: Male Sprague-Dawley rats were randomly divided into control group (n=10), AS group (n=10), and AS+NaHS group (n=10). Rats in the AS and AS+NaHS groups were given 3-day intraperitoneal injections of vitamin D3 and 8-week high-fat diet to induce AS, and the rats in the AS+NaHS group were intraperitoneally injected with H2S donor NaHS. Oil red O staining was applied to detect changes in the areas of the atherosclerotic plaques in the aortic root and the coronary artery; sulfide-sensitive electrode method was used to measure the plasma concentration of H2S. ADM and ANP levels in plasma were determined by radioimmunoassay. RESULTS: Compared with the control group, marked atherosclerotic plaques were observed in the aortic root and the coronary artery in AS rats. Moreover, plasma H2S level decreased significantly, ADM level increased, and ANP level decreased significantly in AS rats (P <0.01). However, after the treatment with H2S donor NaHS for 8 weeks, the above changes in AS rats were reversed, demonstrated by significantly reduced areas of the atherosclerotic plaques in both the aortic root and the coronary artery, significantly increased plasma H2S level, significantly decreased plasma ADM level, and significantly increased plasma ANP level (P<0.01). CONCLUSIONS: H2S plays an important regulatory effect on vasoactive peptides ADM and ANP in AS rats

Abstract: The formation of adipocere slows further decomposition and preserves corpses for decades or even centuries. This resistance to degradation is a serious problem, especially with regard to the reuse of graves after regular resting times. We present results from an exhumation series in modern graveyards where coffins from water-saturated earth graves contained adipocere embedded in black humic material after resting times of about 30 years. Based on the assumption that this humic material resulted from in situ degradation of adipocere, its presence contradicts the commonly held opinion that adipocere decomposition only occurs under aerobic conditions. To test our hypothesis, we collected black humic material, adipocere as well as soil samples above and below coffins from representative graves (n=7). A comprehensive chemical analysis of the samples substantiated our in situ degradation theory. Element compositions and fatty acid mass spectra confirmed that the humic black material originated from the corpses. A van Krevelen diagram classified the excavated adipocere material as lipid, whereas the black humic material was closer to the carbohydrate region. Mass fragmentograms of the humic material revealed the presence of large amounts of saturated vs. unsaturated nC16 and nC18 fatty acids, which is typical for adipocere. In addition, the soil samples exhibited a lipid signature deriving primarily from plant waxes and root components (C20C32). Solid-state 13C NMR spectra of adipocere displayed well-resolved signals of saturated aliphatic chains and a signal that corresponded to carboxylic acid groups. The NMR spectra of the black humic material revealed signals characteristic of long aliphatic chains. The intensities varied in relation to the state of degradation of the sample, as did the signals of oxidized aliphatic chains, acetics and ketals, aromatic structures, esters and amids. The analyses confirmed that the black humic material was indeed derived from adipocere, so the assumption is that the components detected must have developed from aliphatic fatty acids via a number of oxidation and condensation processes. We therefore
propose the existence of chemical pathway(s) for the degradation of adipocere under poikiloaerobic conditions. Possible (biogeo)chemical reaction chains include (1) the autoxidation of fatty acids enhanced by haemoglobin, methaemoglobin and haemin, (2) the use of alternative electron acceptors, which leads to the formation of H2S that then reacts abiotically with iron (from haemoglobin), rendering iron sulphide, and (3) the Maillard reaction. These findings are another step forward in understanding the chemistry of buried corpses.


Abstract: Our aim is to highlight the subtle relationship that exists between microbiota and mitochondria. Microbiota targets mitochondria by modulating the Reactive Oxygen Species (ROS) production and the mitochondrial activity through interactions with toxins, proteins or other metabolites released by gut microbiota. The intriguing relationship that exists between mitochondria and microbiota is strengthened by the probable prokaryotic origin of mitochondria. Emerging data implicates a role for ROS, nitric oxide, Short Chain Fatty Acids and hydrogen sulfide in the cross-talk between microbiota - mitochondria and REDOX signaling. Several studies have shown that microbiota act and modulate mitochondrial activity, and use it as a relay to strengthen host-microbiota interaction. This modulation depends on the gut bacterial strain quality and diversity to increase its pathogenic versus beneficial effects. Furthermore, based on conclusions from new studies, it is possible that microbiota can directly interact with the host cell gene expression by favoring bacterial and mitochondrial DNA insertion in the nuclear genome. The emerging knowledge of microbiota-mitochondria interaction may be of great importance to better understand the mechanism of mitochondrial and metabolic diseases, and the syndromes associated with change in quality and quantity of microbiota species. We suggest that microbiota via mitochondrial modulation influence cell homeostasis and metabolism. The challenge will be to find strategies to modulate the quality and diversity of microbiota rather than acting on microbiota metabolites and microbiota related factors. The medicine of tomorrow will be completely personalized. Firstly there will be a test to show the quality, quantity and diversity of microbiota, and secondly a preventive or therapeutic strategy will be administrated (probiotics, diet, prodrug or fecal transplantation). The era of digital medicine is here.


Abstract: We report an innovative photoelectrochemical process (PEC) based on graphite electrode modified with electroactive polyvinylpyrrolidone bearing osmium complex (Os-PVP). The system relies on the in situ enzymatic generation of CdS quantum dots (QDs). Alkaline phosphatase (ALP) catalyzes the hydrolysis of sodium thiophosphate (TP) to hydrogen sulfide (H2S) which in the presence Cd2+ ions yields CdS semiconductor nanoparticles (SNPs). Irradiation of SNPs with the standard laboratory UV-illuminator (wavelength of 365nm) results in photooxidation of 1-thioglycerol (TG) mediated by Os-PVP complex on the surface of graphite electrode at applied potential of 0.31V vs. Ag/AgCl. A novel immunoassay based on specific enzyme linked immunosorbent assay (ELISA) combined with the PEC methodology was developed. Having selected the affinity interaction between bovine serum albumine (BSA) with anti-BSA antibody (AB) as a model system, we built the PEC immunoassay for AB. The new assay displays a linear range up to 20ngmL-1 and a detection limit (DL) of 2ngmL-1 (S/N=3) which is lower 5 times that of the traditional chromogenic ELISA test employing p-nitro-phenyl phosphate (pNPP).


Abstract: Odorous emissions from agricultural and waste management operations can
cause annoyance to local populations. Volatile sulfur compounds (VSCs) are dominant odorants that are often lost during collection using sample bags. The degree of VSC losses depends on factors such as storage time, bag materials, temperature, sample relative humidity (RH), light exposure, and the presence of volatile organic compounds (VOCs). To assess the impact of those factors on the stability of 10 VSCs (hydrogen sulfide, methanethiol, ethanethiol, dimethyl sulfide, tert-butanol, ethyl methyl sulfide, 1-butanol, dimethyl disulfide, diethyl disulfide, and dimethyl trisulfide), laboratory-based experiments were conducted according to a factorial experimental design. Linear mixed-effects models were constructed for loss predictions. The estimated recovery of HS in Tedlar bag was 8 to 10% higher than in Mylar and Nalophan between 6 and 30 h. At \( \leq 20 \) degrees C and without being exposed to light, at least 75% relative recovery of the 10 VSCs in Tedlar bags can be achieved after 18 h, whereas, a maximum of 12 h of storage should not be exceeded to ensure a minimum of 74% relative recovery of the VSCs in Mylar and Nalophan bags.

(60) Rivers-Auty J. An evolutionary perspective on the immunomodulatory role of hydrogen sulphide. Med Hypotheses 2015 Aug 3. Abstract: Most preclinical studies on endogenous hydrogen sulphide signalling have given little consideration to the fact that the human body contains more bacterial cells than human cells, and that evolution provides the context for all biology. Whether hydrogen sulphide is pro or anti-inflammatory is heavily debated within the literature, yet researchers have not fully considered that invasive bacteria produce hydrogen sulphide, often at levels far above the endogenous levels of the host. Here I argue that if hydrogen sulphide is an endogenous signalling molecule with immunomodulatory functions, then it must have evolved in the presence of virulent bacteria which produce hydrogen sulphide, and at levels far above the endogenous levels of the host. Here I argue that if hydrogen sulphide is an endogenous signalling molecule with immunomodulatory functions, then it must have evolved in the presence of virulent bacteria which produce hydrogen sulphide. This context leads to two competing theories about the evolution of endogenous hydrogen sulphide signalling. The detectable emission theory proposes that bacteria produce hydrogen sulphide as part of normal metabolism and hosts which evolved to detect and respond to this hydrogen sulphide would gain a selective survival advantage. This predicts that the endogenous production of hydrogen sulphide is a mechanism which amplifies the bacterial hydrogen sulphide signal. The opposing protective agent theory predicts that bacterial hydrogen sulphide is an effective defence against the bactericidal mechanisms of the host's immune response. In this case, endogenous hydrogen sulphide production is either at inconsequential levels to alter the immune response, or is involved in the inflammation resolution process. Evidence suggests that the direct interactions of hydrogen sulphide with the bactericidal mechanisms of the innate immune system are most congruent with the protective agent theory. Therefore, I argue that if hydrogen sulphide is an immunomodulatory endogenous signalling molecule its effects are most likely anti-inflammatory.

(61) Dudek M, Razny K, Bliska-Wilkosz A, Iciek M, Sapa J, Wlodek L, et al. Hypotensive effect of alpha-lipoic acid after a single administration in rats. Anatol J Cardiol 2015 Jun 30. Abstract: OBJECTIVE: The effect of alpha-lipoic acid on blood pressure was investigated many times in chronic studies, but there are no studies on the effect of this compound after a single administration. Alpha-lipoic acid is a drug used in diabetic neuropathy, often in obese patients, to treat hypertension. Therefore, knowledge of the potential antihypertensive effect of alpha-lipoic acid even after a single dose and possibly too much pressure reduction is interesting and useful. METHODS: The mechanism of the hypotensive effect of alpha-lipoic acid was examined in normotensive rats in vivo after a single intraperitoneal administration, blood pressure in the left carotid artery of the rats was measured prior to the administration of the compounds (alpha-lipoic acid and/or glibenclamide) and 80 min thereafter. RESULTS: Alpha-lipoic acid at a dosage of 50 mg/kg b.w. i.p. significantly decreased the blood pressure from the 50th min after drug administration. This cardiovascular effect of this compound was reversed by glibenclamide, a selective KATP blocker. Glibenclamide alone at this dose did not significantly affect the blood pressure. Statistical significance was evaluated using two-way ANOVA.
CONCLUSION: This suggests that alpha-lipoic acid affects ATP-dependent potassium channels. It is possible that this is an indirect effect of hydrogen sulfide because alpha-lipoic acid can increase its concentration. The results obtained in this study are very important because the patients taking alpha-lipoic acid may be treated for co-existing hypertension. Therefore, the possibility of blood pressure lowering by alpha-lipoic acid should be taken into account, although it does not lead to excessive orthostatic hypotension.

(62) Surita SC, Tansel B. Evaluation of a Full-Scale Water-Based Scrubber for Removing Siloxanes from Digester Gas: A Case Study. Water Environ Res 2015 May;87(5):444-9. Abstract: Siloxanes are becoming more prominent in digester gas at water resource recovery facilities because of their wide use in personal care products. This study evaluates a full-scale water-based scrubber operating in a water resource recovery facility (Miami, FL). The digester gas is used for energy generation due to its high methane content. During energy generation, siloxanes are converted to silicates and Silicon Dioxide (SiO2), which leave deposits on engine components. Trimethylsilanol (TMSOH), Octamethyltrisiloxane (L3), Hexamethylcyclotrisiloxane (D3), Octamethylycloytetrasiloxane (D4), Decamethylcyclopentasiloxane (D5), and Dodecamethylcyclohexasiloxane (D6) were detected in the digester gas. D4 and D5 were present at the highest concentrations, 5000 and 1800 µg/m³, respectively. Sampling results have indicated that scrubbers employed for hydrogen sulfide (H2S) removal at the facility do not provide effective removal of siloxanes due to their high Henry’s Constant. Post scrubber treatment is needed to remove siloxanes from the digester gas prior to combustion.

(63) Ostrakhovitch EA, Tabibzadeh S. Homocysteine in Chronic Kidney Disease. Adv Clin Chem 2015;72:77-106. Abstract: Hyperhomocysteinemia occurs in chronic- and end-stage kidney disease at the time when dialysis or transplant becomes indispensable for survival. Excessive accumulation of homocysteine (Hcy) aggravates conditions associated with imbalanced homeostasis and cellular redox thereby resulting in severe oxidative stress leading to oxidation of reduced free and protein-bound thiols. Thiol modifications such as N-homocysteinylation, sulfination, cysteinylation, glutathionylation, and sulfhydration control cellular responses that direct complex metabolic pathways. Although cysteiny modifications are kept low, under Hcy-induced stress, thiol modifications persist thus surpassing cellular proteostasis. Here, we review mechanisms of redox regulation and show how cysteiny modifications triggered by excess Hcy contribute development and progression of chronic kidney disease. We discuss different signaling events resulting from aberrant cysteiny modification with a focus on transsulfuration.

(64) Duan Y, Wu X, Liang S, Jin F. Elevated Blood Ammonia Level Is a Potential Biological Risk Factor of Behavioral Disorders in Prisoners. Behav Neurol 2015;2015:797862. Abstract: Hydrothion (H2S) and ammonia (NH3) can be toxic for the human central nervous system and cause psychological disturbances and behavioral disorders. In order to evaluate the association between the two potential toxicants and mental health, in this study, we compare a male prisoner and control population. Forty-nine male prisoners and 52 control volunteers took part in the study. An aggressive behavior assessment, the Self-Rating Depression Scale (SDS), and the State-Trait Anxiety Inventory (STAI) were used to characterize the participants’ mental health status. Venous blood was collected for detection of H2S and NH3. The results indicated that blood NH3 was significantly higher in male prisoners than in controls. However, blood H2S was significantly lower. Blood NH3 was also significantly and positively correlated with prisoners. In the multivariate adjusted models, after controlling for age, education, marital status, and BMI, we found a positive association between NH3 and prisoners, but not blood H2S. While the functions of the two toxicants were quite different, blood NH3 may be a potential biological risk factor for behavioral disorders and blood H2S showed neuroprotection. Additionally, the impact of
other factors such as diet and gut bacteria should be considered when evaluating risk for behavioral disorders.

Abstract: BACKGROUND/AIMS: To evaluate the relationship between plasma hydrogen sulfide (H2S) and cardiovascular risk markers, including pulse pressure (PP), left ventricular mass index (LVMI) and intima-media thickness (IMT), and mortality in chronic hemodialysis (CHD) patients and further investigate the underlying cardiovascular protection mechanism of H2S. METHODS: CHD patients, 113 of them, were studied. Plasma H2S was measured through zinc acetate reaction. cPKCβII membrane translocation and phosphorylation of Akt were detected by western blot. RESULTS: Lower plasma H2S level in CHD patients was predictor of an increased PP, LVMI and IMT. Patients with lower H2S had a lower survival at the end of the study. H2S was an independent predictor of all-cause and cardiovascular mortality when adjusted for other risk factors. CHD patients with lower H2S showed an increase of cPKCβII activation, but phosphorylation of Akt decreased. The level of VCAM-1 and ICAM-1 increased significantly. CONCLUSIONS: Lower plasma H2S in CHD patients is associated with cardiovascular risk factors and mortality, which may be mediated by the cPKCβII/Akt pathway and further VCAM-1/ICAM-1 upregulation.

Abstract: The aim of this paper is to investigate effect and mechanism of Danhong injection (DH) on angiogenesis in the diabetic hind limb ischemia mouse model. Thirty diabetic hind limb ischemic model mice and ten normal mice, established by intraperitoneal (i.p.) injection of streptozotocin (STZ) or PBS and ligation/excision of femoral artery, and then twenty diabetic hind limb ischemic model mice of all were evenly randomized to saline (control, n = 10) and DH i.p. injection (2 mL/kg weight for 7 days, n = 10) groups. Limb perfusion recovery and femoral blood hydrogen sulfide (H2S) and vessel regeneration and lower limb vascular endothelial growth factor (VEGF)/cystathionine gamma-lyase (CSE) expression were evaluated during intervention and after euthanasia, respectively. DH i.p. increased ischemic limb perfusion and promoted collateral circulation generation without decreasing blood glucose level. Increased local CSE-H2S-VEGF expression contributed to beneficial effects of DH injection. In conclusion, activation of local CSE-H2S-VEGF axis might participate in proangiogenesis effects of DH injection in diabetic hind limb ischemia model mice, suggesting a potential therapy for diabetic patients with critical limb ischemia.

Abstract: It was shown in acute experiments on laboratory rats that intraportal injection of hydrogen sulfide's precursor L-cysteine (15 mg/kg) caused dilatation of the intrahepatic vessels. As a result, systemic blood pressure (SBP) and blood pressure in the portal vein (PVP) significantly decreased on 17.6 and 24.5%, respectively, and the rate of local blood flow in the liver (LF) and its blood filling (BF) increased on 28.2 and 24.4% respectively. Application of hydrogen sulfide donor NaHS (7 mg/kg) resulted in similarly directed changes: SBP and PVP decreased on 20.8% and 26.2% respectively, LF and BF increased on 16.4% and 30.9% respectively. Application of L-cysteine in the conditions of tstatiken-gamma-lyase blockade by LD-proparhiltsyn led to an increase in SBP on 20.4% and PVP on 26.6% and a decrease of BF on 21.5% and LF in the liver on 11.7% comparing with baseline values of these parameters. So, blockade of tstatiken-gamma-lyase not only completely removed the effects of L-cysteine, but also inhibited synthesis of H2S from its endogenous predecessors, which led to vasoconstriction.
of liver's blood vessels and, consequently, to an increase of blood pressure and a decrease of liver blood flow rates and volume of blood deposited in liver.


Abstract: In this study we characterized and sequenced the genome of Arcobacter anaerophilus strain IR-1 isolated from enrichment cultures used in nitrate-amended corrosion experiments. A. anaerophilus IR-1 could grow lithoautotrophically on hydrogen and hydrogen sulfide and lithoheterothrophically on thiosulfate and elemental sulfur. In addition, the strain grew organoheterothrophically on yeast extract, peptone, and various organic acids. We show for the first time that Arcobacter could grow on the complex organic substrate tryptone and oxidize acetate with elemental sulfur as electron acceptor. Electron acceptors utilized by most Epsilonproteobacteria, such as oxygen, nitrate, and sulfur, were also used by A. anaerophilus IR-1. Strain IR-1 was also uniquely able to use iron citrate as electron acceptor. Comparative genomics of the Arcobacter strains A. butzleri RM4018, A. nitrofigilis CI and A. anaerophilus IR-1 revealed that the free-living strains had a wider metabolic range and more genes in common compared to the pathogen strain. The presence of genes for NAD(+)−reducing hydrogenase (hox) and dissimilatory iron reduction (fre) were unique for A. anaerophilus IR-1 among Epsilonproteobacteria. Finally, the new strain had an incomplete denitrification pathway where the end product was nitrite, which is different from other Arcobacter strains where the end product is ammonia. Altogether, our study shows that traditional characterization in combination with a modern genomics approach can expand our knowledge on free-living Arcobacter, and that this complementary approach could also provide invaluable knowledge about the physiology and metabolic pathways in other Epsilonproteobacteria from various environments.


Abstract: INTRODUCTION: Insufficient mesenteric perfusion is a dramatic complication in critically ill patients. Hydrogen sulfide, a newly recognized endogenous gaseous mediator, acts as an intestinal vasoactive agent and seems to protect against mesenteric ischemic damage. We investigated whether sodium hydrogen sulfide, a hydrogen sulfide donor, can improve mesenteric perfusion in an experimental model of pigs, both in physiological and ischemic conditions. METHODS: The study was conducted at Careggi University Hospital (Florence, IT). Fourteen male domestic pigs (approximately 10 Kg) were anesthetized and mechanically ventilated. Animals were randomized in control and ischemia groups. Mesenteric ischemia was induced with a positive end-expiratory pressure of 15 cmH2O. After mini-laparotomy, each animal received incremental doses of sodium hydrogen sulfide every 20 minutes. Perfusion of both the jejunal mucosa and sternal skin were measured by laser Doppler flowmeter, and systemic hemodynamic parameters were monitored. RESULTS: In the control group, sodium hydrogen sulfide was able to significantly improve the mesenteric perfusion, showing a 50% increase from the baseline blood flow. In the ischemia group, NaHS-induced a two-fold increase of the mesenteric post-ischemic perfusion with a recovery up to 70% of pre-positive end-expiratory pressure mesenteric blood flow. Sodium hydrogen sulfide did not directly or indirectly (by blood flow redistribution) affect the sternal skin microcirculation, heart rates, or mean arterial pressure, suggesting a tissue-specific micro-vascular action. CONCLUSIONS: In a porcine model, we observed a mesenteric perfusion recovery mediated by administration of hydrogen sulfide donor without affecting general hemodynamic.

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Abstract: Salmonella enterica subsp. enterica serovar Choleraesuis is a highly invasive pathogen of swine that frequently causes serious outbreaks, in particular in Asia, and can also cause severe invasive disease in humans. In this study, 21 S. Choleraesuis isolates, detected from 21 patients with diarrhea in China between 2010 and 2011, were found to include 19 H2S-negative S. Choleraesuis isolates and two H2S-positive isolates. This is the first report of H2S-negative S. Choleraesuis isolated from humans. The majority of H2S-negative isolates exhibited high resistance to ampicillin, chloramphenicol, gentamicin, tetracycline, ticarcillin, and trimethoprim-sulfamethoxazole, but only six isolates were resistant to norfloxacin. In contrast, all of the isolates were sensitive to cephalosporins. Fifteen isolates were found to be multidrug resistant. In norfloxacin-resistant isolates, we detected mutations in the gyrA and parC genes and identified two new mutations in the parC gene. Pulsed-field gel electrophoresis (PFGE), multilocus sequence typing (MLST), and clustered regularly interspaced short palindromic repeat (CRISPR) analysis were employed to investigate the genetic relatedness of H2S-negative and H2S-positive S. Choleraesuis isolates. PFGE revealed two groups, with all 19 H2S-negative S. Choleraesuis isolates belonging to Group I and H2S-positive isolates belonging to Group II. By MLST analysis, the H2S-negative isolates were all found to belong to ST68 and H2S-positive isolates belong to ST145. By CRISPR analysis, no significant differences in CRISPR 1 were detected; however, one H2S-negative isolate was found to contain three new spacers in CRISPR 2. All 19 H2S-negative isolates also possessed a frame-shift mutation at position 760 of phsA gene compared with H2S-positive isolates, which may be responsible for the H2S-negative phenotype. Moreover, the 19 H2S-negative isolates have similar PFGE patterns and same mutation site in the phsA gene, these results indicated that these H2S-negative isolates may have been prevalent in China. These findings suggested that surveillance should be increased of H2S-negative S. Choleraesuis in China.