Abstract: In this work we investigated the specific spoilage organism (SSO) of large yellow croaker (Pseudosciaena crocea) stored at 4 degrees C and role of quorum sensing (QS) system of SSO isolated from the spoiled fish. According to microbial count and 16S rRNA gene of the isolated pure strains, Shewanella, mainly Shewanella baltica and Shewanella putrefaciens, was predominant genera at the end of shelf-life of P. crocea. Among Shewanella isolates, S.baltica02 was demonstrated as SSO in spoilage potential characteristics by inoculation into sterile fish juice using sensory and chemical analyses. Autoinducer 2 and two cyclic dipeptides (DKPs) including cyclo-(l-Pro-l-Leu) and cyclo-(l-Pro-l-Phe), no any AHLs, were detected in cell-free S. baltica culture. Interestingly, S.baltica02 had the highest QS activity among three spoilers of S. baltica. The production of biofilm, trimethylamines (TMA) and putrescine in these spoilers significantly increased in the presence of cyclo-(l-Pro-l-Leu), rather than cyclo-(l-Pro-l-Phe) and 4,5-dihydroxy-2,3-pentanedione (the AI-2 precursor, DPD). In accordance with the effect of signal molecules on the spoilage phenotype, exposure to exogenous cyclo-(l-Pro-l-Leu) was also showed to up-regulate the transcription levels of luxR, torA and ODC, and no effect of luxS indicated that S. baltica could sense cyclo-(l-Pro-l-Leu). In the fish homogenate, exogenous cyclo-(l-Pro-l-Leu) shortened lag phase durations and enhanced growth rates of the dominant bacteria, H2S producing bacteria, under refrigerated storage, while exogenous DPD retarded growth of competing bacteria, such as Enterobacteriaceae. Meanwhile, cyclo-(l-Pro-l-Leu) also promoted the accumulation of metabolites on the spoilage process of homogenate. S.baltica02 luxS mutant preliminarily proved that AI-2 might not play a signaling role in the spoilage. The present study suggested that the spoilage potential of S. baltica in P. crocea might be regulated by DKP-based quorum sensing.

Abstract: According to the displacement method, herein we reported a water soluble copper complex [Cu(MaT-cyclen)2] as a fluorescent probe for the detection of H2S. For this, 1-((1-(10-methylanthracen-9-yl)methyl)-1H-1,2,3-triazol-4-yl)methyl)-1,4,7,10-te traazacyclododecane (MaT-cyclen) was synthesized first. To improve its solubility in aqueous media, sodium acetate group was introduced into 8-hydroxy-2-quinoline successfully. MaT-cyclen was chelated with Cu(II) to form [Cu(MaT-cyclen)2] complex, which displayed high sensitivity and selectivity for H2S over the other possible competitive substances on the basis of forming CuS. Meanwhile, [Cu(MaT-cyclen)2] displayed rapid response (<1min), well reversibility, lowest detection limit (205nM), and high sensitivity for recognizing H2S in aqueous solution. Furthermore, its potential utility for biological applications was confirmed by fluorescence imaging of H2S in live cells as well as in zebra fish.
Abstract: A setup for measuring spectral source levels (SSLs) of ships transiting along a seaway, the traffic density and shipping noise, is presented. The results feed shipping-noise modeling that reproduces the actual in situ observations to map shipping-noise variability over space and time for investigating its effects on aquatic organisms. The ship's SSL databank allows sorting the different contributors to total shipping noise for assisting in exploring mitigation approaches (e.g., fleet composition, rerouting). Such an acoustic observatory was deployed since November 2012 for a complete annual cycle of measurements in the deep downstream part of the St. Lawrence Seaway.

Abstract: Hydrogen sulfide (H2S), traditionally known for its toxic effects, is now involved in regulating vascular tone. Here we investigated the vasoconstrictive effect of H2S on cerebral artery and the underlying mechanism. Sodium hydrosulfide (NaHS), a donor of H2S, concentration-dependently induced vasoconstriction on basilar artery, which was enhanced in the presence of isoprenaline, a beta-adrenoceptor agonist or forskolin, an adenylyl cyclase activator. Administration of NaHS attenuated the vasorelaxant effects of isoprenaline or forskolin. Meanwhile, the NaHS-induced vasoconstriction was diminished in the presence of 8B-cAMP, an analog of cAMP, but was not affected by Bay K-8644, a selective L-type Ca(2+) channel agonist. These results could be explained by the revised effects of NaHS on isoprenaline-induced cAMP elevation and forskolin-stimulated adenylyl cyclase activity. Additionally, NaHS-induced vasoconstriction was enhanced by removing the endothelium or in the presence of L-NAME, an inhibitor of nitric oxide synthase. L-NAME only partially attenuated the effect of NaHS which was given together with forskolin on the pre-contracted artery. In conclusion, H2S induces vasoconstriction of cerebral artery via, at least in part, cAMP/adenylyl cyclase pathway.

Abstract: Significant enhancement of solution-processed CuInxGa1-x(Se,S)2 (CIGSSe) thin-film solar cell performance was achieved by inducing a band gap gradient in the film thickness, which was triggered by the chalcogenization process. Specifically, after the preparation of an amorphous mixed oxide film of Cu, In, and Ga by a simple paste coating method chalcogenization under Se vapor, along with the flow of dilute H2S gas, resulted in the formation of CIGSSe films with graded composition distribution: S-rich top, In- and Se-rich middle, and Ga- and S-rich bottom. This uneven compositional distribution was confirmed to lead to a band gap gradient in the film, which may also be responsible for enhancement in the open circuit voltage and reduction in photocurrent loss, thus increasing the overall efficiency. The highest power conversion efficiency of 11.7% was achieved with Jsc of 28.3 mA/cm2, Voc of 601 mV, and FF of 68.6%.

Abstract: A core-shell structure results in zero-valent iron nanoparticles (NZVI) with manifold functional properties. In this study, the long-term effects of NZVI on hydrogen sulphide removal in an anaerobic sludge digester were investigated. Within 20 days, the average hydrogen sulphide content in the biogas was successfully reduced from 300 (or 3620 of sulphate-rich sludge) mg Nm(-3) to 6.1 (121), 0.9 (3.3) and 0.5 (1.3) mg Nm(-3) in the presence of 0.05, 0.10 and 0.20% (wt) NZVI, respectively. Methane yield was enhanced at the low NZVI dose (0.05-0.10%) but decreased at the elevated dose (0.20%). Methane production and volatile solid degradation analyses implied that doses of
0.5-0.10% NZVI could accelerate sludge stabilization during anaerobic digestion. The phosphorus fractionation profile suggested that methane production could be inhibited at the elevated NZVI dose, partly due to the limited availability of soluble phosphorus due to the immobilization of bioavailable-P through the formation of vivianite. An analysis of the reducible inorganic sulphur species revealed that the elimination of hydrogen sulphide occurred via the reaction between hydrogen sulphide and the oxide shell of NZVI, which mainly formed FeS and some FeS2 and S(0).

Abstract: This study is to determine the therapeutic effects of Panax notoginseng saponins (PNSs) on coxsackievirus B3 (CVB3)-induced myocarditis, and whether cystathionine-gamma-lyase (CSE)/hydrogen sulfide (H2S) pathway is involved. Mouse model of myocarditis was induced by CVB3 infection, and the mice were subjected to vehicle (saline) or drug treatments (sodium bisulfide (NaHS), propargylglycine (PAG), or PNSs). The results showed that there were inflammatory cell infiltrations, interstitial edemas, and elevated inflammatory cytokines, in CVB3-induced myocarditis. PAG administration increased, whereas NaHS treatment decreased the severity of the myocarditis. PNS treatment dramatically alleviated these myocardial injuries and decreased the viral messenger RNA (mRNA) expression by the enhanced expression of CSE/H2S pathway. Moreover, the therapeutic effects of PNSs on myocarditis were stronger than those of NaHS. Finally, the effect of PNSs on CSE/H2S pathway and cardiac cell protection were verified in cultured cardiac cells. PNSs may be a promising medication for viral myocarditis therapy.

Abstract: Sulfhemoglobinemia is a rare disorder characterized by the presence of sulfhemoglobin in the blood. It is typically drug-induced and may cause hypoxia, end-organ damage, and death through oxygen deprivation. We present here a case of non-drug-induced sulfhemoglobinemia in a 7-day-old preterm infant complicated by hemolytic anemia. Microbiota compositional analysis of fecal samples to investigate the origin of hydrogen sulphide revealed the presence of Morganella morganii at a relative abundance of 38% of the total fecal microbiota at the time of diagnosis. M morganii was not detected in the fecal samples of 40 age-matched control preterm infants. M morganii is an opportunistic pathogen that can cause serious infection, particularly in immunocompromised hosts such as neonates. Strains of M morganii are capable of producing hydrogen sulphide, and virulence factors include the production of a diffusible alpha-hemolysin. The infant in this case survived intact through empirical oral and intravenous antibiotic therapy, probiotic administration, and red blood cell transfusions. This coincided with a reduction in the relative abundance of M morganii to 3%. Neonatologists should have a high index of suspicion for intestinal pathogens in cases of non-drug-induced sulfhemoglobinemia and consider empirical treatment of the intestinal microbiota in this potentially lethal condition.

Abstract: Hydrogen sulfide (H2 S) is a gasotransmitter known to regulate bone formation and bone mass in unperturbed mice. However, it is presently unknown whether H2 S plays a role in pathologic bone loss. Here we show that ovariectomy (ovx), a model of postmenopausal bone loss, decreases serum H2 S levels and the bone marrow (BM) levels of two key H2 S-generating enzymes, cystathione beta-synthase (CBS) and cystathione
gamma-lyase (CSE). Treatment with the H2 S-donor GYY4137 (GYY) normalizes serum H2 S in ovx mice, increases bone formation and completely prevents the loss of trabecular bone induced by ovx. Mechanistic studies revealed that GYY increases murine osteoblastogenesis by activating Wnt signaling through increased production of the Wnt ligands Wnt16, Wnt2b, Wnt6 and Wnt10b in the BM. Moreover, in vitro treatment with 17beta-estradiol upregulates the expression of CBS and CSE in human BM stromal cells (hSCs), while a H2 S-releasing drug induces osteogenic differentiation of hSCs. In summary, regulation of H2 S levels is a novel mechanism by which estrogen stimulates osteoblastogenesis and bone formation in mice and human cells. Blunted production of H2 S contributes to ovx induced bone loss in mice by limiting the compensatory increase in bone formation elicited by ovx. Restoration of H2 S levels is a potential novel therapeutic approach for postmenopausal osteoporosis. This article is protected by copyright. All rights reserved

Abstract: Isolates of anaerobic fungi from rumen, animal faeces and compost displayed morphological similarity with known anaerobic fungi. According to their ITS sequences, species were related to Neocallimastix and Piromyces. Rumen fungi tolerated exposure to an aerobic atmosphere for at least four days. Under anaerobic conditions, they could grow on both, defined or complex substrates. Growth in liquid media was monitored by the continuous measurement of metabolic gases (O2, CO2, H2, CO, H2S, CH4). Monitored metabolism was complex, showed that both CO2 and H2 were produced and subsequently consumed by yet unknown metabolic pathway(s). CO and H2S were evolved similarly, but not identically with the generation of CO2 and H2 suggesting their connection with energetic metabolism. Anaerobic fungi from snail faeces and compost produced concentrations of H2S, H2, CO near the lower limit of detection. The rumen isolates produced cellulases and xylanases with similar pH and temperature optima. Proteolytic enzymes were secreted as well. Activities of some enzymes of the main catabolic pathways were found in cell-free homogenates of mycelia. The results indicate the presence of the pentose cycle, the glyoxylate cycle and an incomplete citrate cycle in these fungi. Differences between isolates indicate phenotypic variability between anaerobic fungi

Abstract: The microbial biocenosis in highly saline fluids produced from the cold well of a deep geothermal heat store located in the North German Basin was characterized during regular plant operation and immediately after plant downtime phases. Genetic fingerprinting revealed the dominance of sulfate-reducing bacteria (SRB) and fermentative Halanaerobiaceae during regular plant operation, whereas after shutdown phases, sequences of sulfur-oxidizing bacteria (SOB) were also detected. The detection of SOB indicated oxygen ingress into the well during the downtime phase. High 16S ribosomal RNA (rRNA) and dsrA gene copy numbers at the beginning of the restart process showed an enrichment of bacteria, SRB, and SOB during stagnant conditions consistent with higher concentrations of dissolved organic carbon (DOC), sulfate, and hydrogen sulfide in the produced fluids. The interaction of SRB and SOB during plant downtimes might have enhanced the corrosion processes occurring in the well. It was shown that scale content of fluids was significantly increased after stagnant phases. Moreover, the sulfur isotopic signature of the mineral scales indicated microbial influence on scale formation

Abstract: Increasing evidence suggests that altered gut microbiota is implicated in the
pathogenesis of hepatitis B virus-induced chronic liver disease (HBV-CLD). However, the structure and composition of the oral microbiota of patients with HBV-CLD remains unclear. High-throughput pyrosequencing showed that decreased oral bacterial diversity was found in patients with HBV-CLD. The Firmicutes/Bacteroidetes ratio was increased significantly, which indicated that dysbiosis of the oral microbiota participated in the process of HBV-CLD development. However, the changing patterns of the oral microbiota in patients with HBV-induced liver cirrhosis (LC) were almost similar to patients with chronic hepatitis B (CHB). HBV infection resulted in an increase in potential H2S- and CH3SH-producing phylotypes such as Fusobacterium, Filifactor, Eubacterium, Parvimonas and Treponema, which might contribute to the increased oral malodor. These key oral-derived phylotypes might invade into the gut as opportunistic pathogens and contribute to altering the composition of the gut microbiota. This study provided important clues that dysbiosis of the oral microbiota might be involved in the development of HBV-CLD. Greater understanding of the relationships between the dysbiosis of oral microbiota and the development of HBV-CLD might facilitate the development of non-invasive differential diagnostic procedures and targeted treatments of HBV-CLD patients harbouring specific oral phylotypes.

(13) Iciek M, Kowalczyk-Pachel D, Biliska-Wilkosz A, Kwiecien I, Gorny M, Wlodek L. S-sulfhydration as a cellular redox regulation. Biosci Rep 2015 Nov 25. Abstract: For many years reactive oxygen and nitrogen species (ROS and RNS) have been recognized as key messengers in the process of thiol-based redox regulation. Relatively recently, literature reports began to mention reactive sulfur species (RSS) and their role in thiol regulation. This review is focused on biogenesis and biological properties of RSS, including: hydropersulfides, polysulfides and hydrogen sulfide (H2S). Based on the most up-to-date literature data, the paper presents biological significance of S-sulfhydration process. In this reaction, sulfane sulfur is transferred to the -SH groups forming hydropersulfides. Protein cysteine residues, called "redox switches" are susceptible to such reversible modifications. In line with the most recent reports, it was emphasized that sulfane sulfur-containing compounds (mainly hydrogen persulfides and polysulfides) are real and better mediators of S-sulfhydration-based signaling than H2S. We also overviewed proteins participating in the formation and transport of reactive sulfur species and in mitochondrial H2S oxidation. In addition, we reviewed many reports about proteins unrelated to sulfur metabolism which are modified by S-sulfhydration that influences their catalytic activity. We also addressed the problem of the regulatory function of S-sulfhydration reaction in the activation of KATP channels (vasorelaxant) and transcription factors (e.g. NFkappaB) as well as in the mechanism of therapeutic action of garlic-derived sulfur compounds. Some aspects of comparison between RNS and RSS are also discussed in this review.

(14) Henthorn HA, Pluth MD. Mechanistic Insights into the HS-Mediated Reduction of Aryl Azides Commonly Used in HS Detection. J Am Chem Soc 2015 Dec 9;137(48):15330-6. Abstract: Hydrogen sulfide (H2S) is an important biological mediator and has been at the center of a rapidly expanding field focused on understanding the biogenesis and action of H2S as well as other sulfur-related species. Concomitant with this expansion has been the development of new chemical tools for H2S research. The use of H2S-selective fluorescent probes that function by H2S-mediated reduction of fluorogenic aryl azides has emerged as one of the most common methods for H2S detection. Despite this prevalence, the mechanism of this important reaction remains under-scrutinized. Here we present a combined experimental and computational investigation of this mechanism. We establish that HS-, rather than diprotic H2S, is the active species required for aryl azide reduction. The hydrosulfide anion functions as a one-electron reductant, resulting in the formation of polysulfide anions, such as HS2-, which were confirmed and trapped as organic polysulfides by benzyl chloride. The overall reaction is first-order in both azide and HS- under the investigated experimental conditions with DeltaS = -14(2) eu and DeltaH = 13.8(5) kcal/mol in buffered aqueous solution. By using NBu4SH as the sulfide source, we
were able to observe a reaction intermediate (\( \lambda_{\text{max}} = 473 \) nm), which we attribute to formation of an anionic azidothiol intermediate. Our mechanistic investigations support that this intermediate is attacked by HS- in the rate-limiting step of the reduction reaction. Complementing our experimental mechanistic investigations, we also performed DFT calculations at the B3LYP/6-31G(d,p), B3LYP/6-311++G(d,p), M06/TZVP, and M06/def2-TZVPP levels of theory applying the IEF-PCM water and MeCN solvation models, all of which support the experimentally determined reaction mechanism and provide cohesive mechanistic insights into H2S-mediated aryl azide reduction.


Abstract: Hierarchical 3D ZnIn2S4/graphene (ZnIn2S4/Gr) nano-heterostructures were successfully synthesized using an in-situ hydrothermal method. The dual functionality of these nano-heterostructures i.e. for solar hydrogen production and lithium ion batteries has been demonstrated for the first time. The ZnIn2S4/Gr nano-heterostructures were optimized by varying the concentrations of graphene for utmost hydrogen production. An inspection of the structure shows the existence of layered hexagonal ZnIn2S4 wrapped in graphene. The reduction of graphene oxide (GO) to graphene was confirmed by Raman and XPS analyses. The morphological analysis demonstrated that ultrathin ZnIn2S4 nanopetals are dispersed on graphene sheets. The optical study reveals the extended absorption edge to the visible region due to the presence of graphene and hence is used as a photocatalyst to transform H2S into eco-friendly hydrogen using solar light. The ZnIn2S4/Gr nano-heterostructure that is comprised of graphene and ZnIn2S4 in a weight ratio of 1 : 99 exhibits enhanced photocatalytically stable hydrogen production i.e. approximately 6365 mumole h(-1) under visible light irradiation using just 0.2 g of nano-heterostructure, which is much higher as compared to bare hierarchical 3D ZnIn2S4. The heightened photocatalytic activity is attributed to the enhanced charge carrier separation due to graphene which acts as an excellent electron collector and transporter. Furthermore, the usage of nano-heterostructures and pristine ZnIn2S4 as anodes in lithium ion batteries confers the charge capacities of 590 and 320 mA h g(-1) after 220 cycles as compared to their initial reversible capacities of 645 and 523 mA h g(-1), respectively. These nano-heterostructures show high reversible capacity, excellent cycling stability, and high-rate capability indicating their potential as promising anode materials for LIBs. The excellent performance is due to the nanostructuring of ZnIn2S4 and the presence of a graphene layer, which works as a channel for the supply of electrons during the charge-discharge process. More significantly, their dual functionality in energy generation and storage is quite unique and commendable.


Abstract: The contributions of gasotransmitters to itch sensation are largely unknown. In this study, we aimed to investigate the roles of hydrogen sulfide (H2S), a ubiquitous gasotransmitter, in itch signaling. We found that intradermal injection of H2S donors NaHS or Na2S, but not GYY4137 (a slow-releasing H2S donor), dose-dependently induced scratching behavior in a mu-opioid receptor-dependent and histamine-independent manner in mice. Interestingly, NaHS induced itch via unique mechanisms that involved capsaicin-insensitive A-fibers, but not TRPV1-expressing C-fibers that are traditionally considered for mediating itch, revealed by depletion of TRPV1-expressing C-fibers by systemic resiniferatoxin treatment. Moreover, local application of capsaizapine (TRPV1 blocker) or HC-030031 (TRPA1 blocker) had no effects on NaHS-evoked scratching. Strikingly, pharmacological blockade and silencing of Cav3.2 T-type calcium channel by mibebradil, ascorbic acid, zinc chloride or Cav3.2 siRNA dramatically decreased NaHS-evoked scratching. NaHS induced robust alloknesis (touch-evoked itch), which was inhibited by T-type calcium channels blocker mibebradil. Compound 48/80-induced itch was
enhanced by an endogenous precursor of H2S (L-cysteine) but attenuated by inhibitors of H2S-producing enzymes cystathionine gamma-lyase and cystathionine beta-synthase. These results indicated that H2S, as a novel nonhistaminergic itch mediator, may activates Cav3.2 T-type calcium channel, probably located at A-fibers, to induce scratching and allokinesis in mice.

Abstract: The sulfhydration of cysteine residues in proteins is an important mechanism involved in diverse biological processes. We have developed a proteomics approach to quantitatively profile the changes of sulfhydrated cysteines in biological systems. Bioinformatics analysis revealed that sulfhydrated cysteines are part of a wide range of biological functions. In pancreatic beta cells exposed to endoplasmic reticulum (ER) stress, elevated H2S promotes the sulfhydration of enzymes in energy metabolism and stimulates glycolytic flux. We propose that transcriptional and translational reprogramming by the Integrated Stress Response (ISR) in pancreatic beta cells is coupled to metabolic alternations triggered by sulfhydration of key enzymes in intermediary metabolism.

Abstract: INTRODUCTION: Hydrogen sulfide (H2S) is an endogenous gasotransmitter, involved in the regulation of several biological functions. Conversely, impaired biosynthesis of H2S is associated with important diseases. This paves the way to exciting pharmacological perspectives for drugs acting on the "H2S system". Areas covered: At the beginning of this manuscript, the authors present the biological roles and mechanisms of action of hydrogen sulfide. The authors then discuss the developments in the modulation of the H2S system via heterogeneous molecules, which behave as sources of exogenous H2S, and are promising drugs for a number of diseases. Expert opinion: The rate of H2S generation, the physicochemical characteristics and the bioavailability greatly affect the overall pharmacological profile of each H2S-releasing compound. Therefore, the development of broad collections of original moieties endowed with heterogeneous rates/mechanisms of H2S-release and a variety of physicochemical, biological and pharmacological features is the most timely and compelling issue in the field of H2S-based drug discovery.

Abstract: INTRODUCTION: Hydrogen sulphide (H2S) is an endogenous gasotransmitter, involved in the regulation of several biological functions. Conversely, impaired biosynthesis of H2S is associated with important diseases. This paves the way to exciting pharmacological perspectives for drugs acting on the "H2S system". Areas covered: This paper attempts to overview the most representative compounds acting as sources of exogenous H2S and are promising drugs for a number of serious disorders: hypertension, heart diseases, asthma, neurodegenerations, etc. Fewest H2S-releasing drugs have been evaluated in models of human diseases, with truly exciting results. Natural H2S-donors are also present in edible plants and the release of H2S accounts for the beneficial effects on the human health. A limited number of other compounds showing heterogeneous H2S-releasing moieties have been reported, but poorly characterized by pharmacological point of view. Expert opinion: The rate of H2S generation, the physicochemical characteristics and the bioavailability greatly affect the overall pharmacological profile of each H2S-releasing compound. Therefore, the development of widest collections of original moieties endowed with heterogeneous rates/mechanisms of H2S-release and a variety of physicochemical, biological and pharmacological features is the most timely and compelling issue in the field of H2S-based drug discovery.
Abstract: Hydrogen sulfide (H2S), a colorless gas smelling of rotten egg, has long been considered a toxic gas and environment hazard. However, evidences show that H2S plays a great role in many physiological and pathological activities, and it exhibits different effects when applied at various doses. In this review, we summarize the chemistry and biomedical applications of H2S-releasing compounds, including inorganic salts, phosphorodithioate derivatives, derivatives of Allium sativum extracts, derivatives of thioaminoacids, and derivatives of antiinflammatory drugs

Abstract: In this work, we have first employed the combined quantum mechanics/molecular mechanics (QM/MM) method to study the photodissociation mechanism of thioacetic acid CH3C(O)SH in the S1, T1, and S0 states in argon matrix. CH3C(O)SH is treated quantum mechanically using the complete active space self-consistent field and complete active space second-order perturbation theory methods; argon matrix is described classically using Lennard-Jones potentials. We find that the C-S bond fission is predominant due to its small barriers of ca. 3.0 and 1.0 kcal/mol in the S1 and T1 states. It completely suppresses the nearby C-C bond fission. After the bond fission, the S1 radical pair of CH3CO and SH can decay to the S0 and T1 states via internal conversion and intersystem crossing, respectively. In the S0 state, the radical pair can either recombine to form CH3C(O)SH or proceed to form molecular products of CH2CO and H2S. We have further employed our recently developed QM/MM generalized trajectory-based surface-hopping method to simulate the photodissociation dynamics of CH3C(O)SH. In 1 ps dynamics simulation, 56% trajectories stay at the Franck-Condon region; the S1 C-S bond fission takes place in the remaining 44% trajectories. Among all nonadiabatic transitions, the S1 --> S0 internal conversion is major (55%) but the S1 --> T1 intersystem crossing is still comparable and cannot be ignored, which accounts for 28%. Finally, we have found a radical channel generating the molecular products of CH2CO and H2S, which is complementary to the concerted molecular channel. The present work sets the stage for simulating photodissociation dynamics of similar thio-carbonyl systems in matrix

Abstract: Hypothermia and rewarming produces organ injury through the production of reactive oxygen species. We previously found that dopamine prevents hypothermia and rewarming-induced apoptosis in cultured cells through increased expression of the H2S-producing enzyme cystathionine beta-Synthase (CBS). Here, we investigate whether dopamine protects the kidney in deep body cooling and explore the role of H2S-producing enzymes in an in vivo rat model of deep hypothermia and rewarming. In anesthetized Wistar rats, body temperature was decreased to 15 degrees C for 3h, followed by rewarming for 1h. Rats (n>/>=5 per group) were treated throughout the procedure with vehicle or dopamine infusion, and in the presence or absence of a non-specific inhibitor of H2S-producing enzymes, amino-oxyacetic acid (AOAA). Kidney damage and renal expression of three H2S-producing enzymes (CBS, CSE and 3-MST) was quantified and serum H2S level measured. Hypothermia and rewarming induced renal damage, evidenced by increased serum creatinine, renal reactive oxygen species production, KIM-1 expression and influx of immune cells, which was accompanied by substantially lowered renal expression of CBS, CSE, and 3-MST and lowered serum H2S levels. Infusion of dopamine fully attenuated renal damage and maintained expression of H2S-producing enzymes, while normalizing serum H2S. AOAA further decreased the expression of H2S-producing enzymes and serum H2S level, and aggravated renal damage. Hence, dopamine
preserves renal integrity during deep hypothermia and rewarming likely by maintaining the expression of renal H2S-producing enzymes and serum H2S

(23) Yip YW, Law GL, Wong WT. A highly selective on-off-on responsive lanthanide(iii) based probe for recognition of copper and hydrogen sulfide. Dalton Trans 2015 Nov 19. Abstract: The development of a europium(iii) based probe for the detection of Cu(ii) ions and hydrogen sulphide is presented. With the addition of Cu(ii) ions, displayed the greatest quenching among the other cations examined. The binding constant was 74 026 +/- 2899 M⁻¹. Once combined with Cu(ii) ions, demonstrated high specificity for hydrogen sulfide compared to other organic and inorganic sulfur compounds. exhibited an on-off-on type luminescence change with the alternate addition of Cu(ii) ions and H2S along with reversible forming-separating of the complex

(24) Sukul P, Trefz P, Kamysek S, Schubert JK, Miekisch W. Instant effects of changing body positions on compositions of exhaled breath. J Breath Res 2015;9(4):047105. Abstract: Concentrations of exhaled volatile organic compounds (VOCs) may depend not only on biochemical or pathologic processes but also on physiological parameters. As breath sampling may be done in different body positions, effects of the sampling position on exhaled VOC concentrations were investigated by means of real-time mass spectrometry. Breaths from 15 healthy volunteers were analyzed in real-time by PTR-ToF-MS-8000 during paced breathing (12/min) in a continuous side-stream mode. We applied two series of body positions (setup 1: sitting, standing, supine, and sitting; setup 2: supine, left lateral, right lateral, prone, and supine). Each position was held for 2 min. Breath VOCs were quantified in inspired and alveolar air by means of a custom-made algorithm. Parallel monitoring of hemodynamics and capnometry was performed noninvasively. In setup 1, when compared to the initial sitting position, normalized mean concentrations of isoprene, furan, and acetonitrile decreased by 24%, 26%, and 9%, respectively, during standing and increased by 63%, 36%, and 10% during lying mirroring time profiles of stroke volume and pET-CO₂. In contrast, acetone and H2S concentrations remained almost constant. In setup 2, when compared to the initial supine position, mean alveolar concentrations of isoprene and furan increased significantly up to 29% and 16%, respectively, when position was changed from lying on the right side to the prone position. As cardiac output and stroke volume decreased at that time, the reasons for the observed changes have to be linked to the ventilation/perfusion ratio or compartmental distribution rather than to perfusion alone. During final postures, all VOC concentrations, hemodynamics, and pET-CO₂ returned to baseline. Exhaled blood-borne VOC profiles changed due to body postures. Changes depended on cardiac stroke volume, origin, compartmental distribution and physico-chemical properties of the substances. Patients’ positions and cardiac output have to be controlled when concentrations of breath VOCs are to be interpreted in terms of biomarkers

(25) Hartle MD, Meininger DJ, Zakharov LN, Tonzetich ZJ, Pluth MD. NBu₄SH provides a convenient source of HS(-) soluble in organic solution for H2S and anion-binding research. Dalton Trans 2015 Nov 18;44(46):19782-5. Abstract: Hydrogen sulfide (H2S) has gained significant interest within the scientific community due to its expanding roles in different (patho)physiological processes. Despite this importance, the chemical mechanisms by which H2S exerts its action remain under-scrutinized. Biomimetic investigations in organic solution offer the potential to clarify these mechanisms and to delineate the differential reactivity between H2S and HS(-). However, such studies are hampered by the lack of readily-available sources of HS(-) that are soluble in organic solution. Here we present a simple method for preparing analytically pure tetrabutylammonium hydrosulfide (NBu₄SH), which we anticipate will be of significant utility to researchers in the H2S and anion-binding communities

Abstract: Cystathionine beta-synthase (CBS) is a key enzyme in human (patho)physiology with a central role in hydrogen sulfide metabolism. The enzyme is composed by a pyridoxal 5'-phosphate (PLP)-binding catalytic domain, flanked by two domains: a heme-binding N-terminal domain and a regulatory C-terminal domain binding S-adenosyl-L-methionine (AdoMet). CO or NO. binding at the ferrous heme negatively modulate the enzyme activity. Conversely, AdoMet binding stimulates CBS activity. Herein we provide experimental evidence for a functional communication between the two domains. We report that AdoMet binding significantly enhances CBS inhibition by CO. Consistently, we observed increased affinity (approximately 5-fold) and faster association (approximately 10-fold) of CO to the ferrous heme at physiological AdoMet concentrations. NO. binding to reduced CBS was also enhanced by AdoMet, although to a lesser extent (approximately 2-fold higher affinity) as compared to CO. Importantly, CO and NO. binding were unchanged by AdoMet in a truncated form of CBS lacking the C-terminal regulatory domain. These unprecedented observations demonstrate that CBS activation by AdoMet puzzlingly sensitizes the enzyme towards inhibition by exogenous ligands, like CO and NO.. This further supports the notion that CBS regulation is a complex process, involving the concerted action of multiple physiologically-relevant effectors

Abstract: Nitroxyl (HNO) is a biological signaling agent that displays distinctive reactivity compared to nitric oxide (NO). As a consequence, these two reactive nitrogen species trigger different physiological responses. Selective detection of HNO over NO has been a challenge for chemists, and several fluorogenic molecular probes have been recently developed with that goal in mind. Common constructs take advantage of the HNO-induced reduction of Cu(II) to Cu(I). The sensing mechanism of such probes relies on the ability of the unpaired electron in a d orbital of the Cu(II) center to quench the fluorescence of a photoemissive ligand by either an electron or energy transfer mechanism. Experimental and theoretical mechanistic studies suggest that proton-coupled electron transfer mediates this process, and careful tuning of the copper coordination environment has led to sensors with optimized selectivity and kinetics. The current optical probes cover the visible and near-infrared regions of the spectrum. This palette of sensors comprises structurally and functionally diverse fluorophores such as coumarin (blue/green emission), boron dipyrromethane (BODIPY, green emission), benzoresorufin (red emission), and dihydroxanthenes (near-infrared emission). Many of these sensors have been successfully applied to detect HNO production in live cells. For example, copper-based optical probes have been used to detect HNO production in live mammalian cells that have been treated with H2S and various nitrosating agents. These studies have established a link between HSNO, the smallest S-nitrosothiol, and HNO. In addition, a near-infrared HNO sensor has been used to perform multicolor/multianalyte microscopy, revealing that exogenously applied HNO elevates the concentration of intracellular mobile zinc. This mobilization of zinc ions is presumably a consequence of nitrosation of cysteine residues in zinc-chelating proteins such as metallothionein. Future challenges for the optical imaging of HNO include devising probes that can detect HNO reversibly, especially because ratiometric imaging can only report equilibrium concentrations when the sensing event is reversible. Another important aspect that needs to be addressed is the creation of probes that can sense HNO in specific subcellular locations. These tools would be useful to identify the organelles in which HNO is produced in mammalian cells and probe the intracellular signaling networks in which this reactive nitrogen species is involved. In addition, near-infrared emitting probes might be applied to detect HNO in thicker specimens, such as acute tissue slices and even live animals, enabling the investigation of the roles of HNO in physiological or pathological conditions in multicellular systems.

Abstract: CO2 adsorption on synthetic zeolites has become a consolidated approach for biogas upgrading to biomethane. As an alternative to synthetic zeolites, tuff waste from building industry was investigated in this study: indeed, this material is available at low price and contains a high fraction of natural zeolites. A selective adsorption of CO2 and H2S toward CH4 was confirmed, allowing to obtain a high purity biomethane (CO2 < 2 g m-3 i.e. 0.1%; H2S < 1.5 mg m-3), suitable for injection in national grids or as vehicle fuel. The loading capacity was found to be 45 g Kg-1 and 40 mg Kg-1, for CO2 and H2S respectively. Synthetic gas mixtures and real biogas samples were used, and no significant effects due to biogas impurities (e.g. humidity, dust, moisture etc.) were observed. Thermal and vacuum regenerations were also optimised and confirmed to be possible, without significant variations in efficiency. Hence, natural zeolites from tuffs may successfully be used in a pressure/vacuum swing adsorption (PSA/VSA) process.

(29) Long YY, Du Y, Fang Y, Xu J, He YN, Shen DS. Effect of migration and transformation of iron on the endogenous reduction of HS in anaerobic landfill. Waste Manag 2015 Nov 12. Abstract: Hydrogen sulfide (H2S) is a major odor in landfill gas and needs urgent treatment. In this study, the effect of migration and transformation of iron on the endogenous reduction of H2S was investigated in two simulated landfills. The results showed that the H2S emission concentration from the landfill cover of conventional anaerobic landfill (CL) and anaerobic landfill with leachate recirculation (RL) could reach 19.4mgm-3 and 24.1mgm-3, respectively. However, the migration and transformation of iron in anaerobic landfill with different operational modes results in different endogenous reduction mechanism for H2S. The proportion of precipitation-reduction mechanism and oxidation-reduction mechanism in CL was 73.3% and 26.3%, respectively. But for RL, the function of oxidation was enhanced, and the sulfide content was reduced 23.1% compared with CL. The iron in landfill with leachate recirculation revealed good endogenous reduction effect on H2S control after a period of time landfilling.

(30) Moustafa A, Habara Y. Reciprocal interaction among gasotransmitters in isolated pancreatic beta-cells. Free Radic Biol Med 2015 Nov 11;90:47-58. Abstract: We aimed to elucidate the interplay among the three well-known gas molecules, nitric oxide (NO), carbon monoxide (CO) and hydrogen sulfide (H2S), and their effects on intracellular Ca2+ concentration ([Ca2+]i) and insulin secretion in rat pancreatic beta-cells. Immunofluorescence studies demonstrated the expression of constitutive enzymes that are responsible for the production of NO, CO and H2S. CO and H2S increased NO production as indicated by the increase in diaminofluorescein-2 triazole fluorescence. NO and CO induced an elevation in the sulfane sulfur pool and concomitantly H2S production. The NO- and CO-induced H2S production was partially inhibited by hypotaurine, an H2S scavenger. NO and H2S produced CO production as revealed by a myoglobin assay. A calmodulin antagonist in the absence of extracellular Ca2+ significantly attenuated NO and H2S production. NO and CO induced a [Ca2+]i increase mainly via Ca2+ release from internal stores; however, H2S induced a [Ca2+]i increase via the influx of extracellular Ca2+. NO dose-dependently stimulated basal insulin release but CO dose-dependently inhibited it. H2S showed an insignificant effect on basal insulin secretion from freshly isolated pancreatic islets. Herein, we address for the first time the reciprocal and synergistic relation among gasotransmitters with diverse effects on basal insulin secretion that regulate beta-cells functions and homeostasis.

(31) Alves JM, Lima AC, Pais IA, Amir N, Celestino R, Piras G, et al. Reassessing the evolutionary history of the 17q21 inversion polymorphism. Genome Biol Evol 2015 Nov 11. Abstract: A polymorphic inversion that lies on chromosome 17q21 comprises two major haplotype families (H1 and H2) that not only differ in orientation but also in copy-number. While the processes driving the spread of the inversion-associated lineage (H2) in humans remain unclear, a selective advantage has been proposed for one of its subtypes. Here, we genotyped a large panel of individuals from previously overlooked populations using a custom array with a unique panel of H2-specific single nucleotide polymorphisms (SNPs).
and found a patchy distribution of H2 haplotypes in Africa, with North Africans displaying a higher frequency of inverted subtypes, when compared to Sub-Saharan groups. Interestingly, North African H2s were found to be closer to "non-African" chromosomes further supporting that these populations may have diverged more recently from groups outside Africa. Our results uncovered higher diversity within the H2 family than previously described, weakening the hypothesis of a strong selective sweep on all inverted chromosomes and suggesting a rather complex evolutionary history at this locus.


Abstract: Doxorubicin (DOX) is a widely used chemotherapeutic agent, which can give rise to severe cardiotoxicity, limiting its clinical use. Preliminary evidence suggests that hydrogen sulfide (H2S) may exert protective effects on DOX-induced cardiotoxicity. Therefore, the aim of the present study was to investigate whether peroxiredoxin III is involved in the cardioprotection of H2S against DOX-induced cardiotoxicity. The results demonstrated that DOX not only markedly induced injuries, including cytotoxicity and apoptosis, it also increased the expression levels of peroxiredoxin III. Notably, pretreatment with sodium hydrosulfide significantly attenuated the DOX-induced decrease in cell viability and increase in apoptosis, and also reversed the increased expression levels of peroxiredoxin III in H9c2 cardiomyocytes. In addition, pretreatment of the H9c2 cells with N-acetyl-L-cysteine, a scavenger of reactive oxygen species, prior to exposure to DOX markedly decreased the expression levels of peroxiredoxin III. In conclusion, the results of the present study suggested that exogenous H2S attenuates DOX-induced cardiotoxicity by inhibiting the expression of peroxiredoxin III in H9c2 cells. In the present study, the apoptosis of H9c2 cardiomyocytes was assessed using an methyl thiazolyl tetrazolium assay and Hoechst staining. The levels of Prx III and cystathionine-gamma-lyase were examined by western blotting.


Abstract: New molecular beam scattering experiments have been performed to measure the total (elastic plus inelastic) cross sections as a function of the velocity in collisions between water and hydrogen sulfide projectile molecules and the methane target. Measured data have been exploited to characterize the range and strength of the intermolecular interaction in such systems, which are of relevance as they drive the gas phase molecular dynamics and the clathrate formation. Complementary information has been obtained by rotational spectra, recorded for the hydrogen sulfide-methane complex, with a pulsed nozzle Fourier transform microwave spectrometer. Extensive ab initio calculations have been performed to rationalize all the experimental findings. The combination of experimental and theoretical information has established the ground for the understanding of the nature of the interaction and allows for its basic components to be modelled, including charge transfer, in these weakly bound systems. The intermolecular potential for H2S-CH4 is significantly less anisotropic than for H2O-CH4, although both of them have potential minima that can be characterized as 'hydrogen bonded'.


Abstract: The sorptive removal properties of a synthetic A4 zeolite were evaluated against sulfur dioxide (SO2) and four reference reduced sulfur compounds (RSC: hydrogen sulfide (H2S), methanethiol (CH3SH), dimethyl sulfide (DMS, (CH3)2S), and dimethyl disulfide (DMDS, CH3SSCH3). To this end, a sorbent bed of untreated (as-received) A4 zeolite was loaded with gaseous standards at four concentration levels (10-100 part-per-billion (ppb (v/v)) at four different volumes (0.1, 0.2, 0.5, and 1 L increments) in both increasing (IO:
0.1-1.0 L) and decreasing volume order (DO: 1.0 to 0.1 L). Morphological properties were characterized by PXRD, FTIR, and BET analysis. The removal efficiency of SO2 decreased from 100% for all concentrations at 0.1 L (initial sample volume) to approximately 82% (100 ppb) or approximately 96% (10 ppb) at 3.6 L. In contrast, removal efficiency of RSC was near 100% at small loading volumes but then fell sharply, irrespective of concentration (10-100 ppb) (e.g., 32% (DMS) to 52% (H2S) at 100 ppb). The adsorption capacity of zeolite, if expressed in terms of solid-gas partition coefficient (e.g., similar to the Henry's law constant (mmol kg⁻¹ Pa⁻¹)), showed moderate variabilities with the standard concentration levels and S compound types such as the minimum of 2.03 for CH₃SH (at 20 ppb) to the maximum of 13.9 for SO2 (at 10 ppb). It clearly demonstrated a notable distinction in the removal efficiency of A4 zeolite among the different S species in a mixture with enhanced removal efficiency of SO2 compared to the RSCs.


Abstract: BACKGROUND: Trimebutine maleate, a noncompetitive spasmylotic agent with some affinity for peripheral mu- and kappa-opioid receptors has been evaluated as a treatment in a limited number of patients undergoing sedation-free full colonoscopy. The efficiency of such treatment was comparable to sedation-based colonoscopies to relieve from pain and discomfort. METHODS: A new and improved trimebutine salt capable of releasing in vivo hydrogen sulphide (H2 S), a gaseous mediator known to reduce nociception, has been developed. This drug salt (GIC-1001) is composed of trimebutine bearing a H2 S-releasing counterion (3-thiocarbamoylbenzoate, 3TCB), the latter having the ability to release H2 S. GIC-1001 has been tested here in a mouse model of colorectal distension. RESULTS: In mice, while orally given trimebutine (the maleate salt, non-H2 S-releaser) only slightly reduced the nociceptive response to increasing pressures of colorectal distension, oral administration of GIC-1001 (the H2 S-releaser) was able to significantly reduce nociceptive response to all noxious stimuli, in a dose-dependent manner. This effect of GIC-1001 was significantly better than the effects of its parent compound trimebutine administered at equimolar doses. CONCLUSIONS: Taken together, these results demonstrated increased antinociceptive properties for GIC-1001 compared to trimebutine, suggesting that this compound would be a better option to relieve from visceral pain and discomfort induced by lumenal distension.


Abstract: BACKGROUND: Hydrogen sulfide (H2S) exhibits protective effects in various disease models including cerebral ischemia-reperfusion (I/R) injury. Nonetheless, mechanisms and identity of molecules responsible for neuroprotective effects of H2S remain incompletely defined. In the current study, we observed that thiosulfate, an oxidation product of H2S, mediates protective effects of an H2S donor compound sodium sulfide (Na2S) against neuronal I/R injury. METHODS AND RESULTS: We observed that thiosulfate in cell culture medium is not only required but also sufficient to mediate cytoprotective effects of Na2S against oxygen glucose deprivation and reoxygenation of human neuroblastoma cell line (SH-SY5Y) and murine primary cortical neurons. Systemic administration of sodium thiosulfate (STS) improved survival and neurological function of mice subjected to global cerebral I/R injury. Beneficial effects of STS, as well as Na2S, were associated with marked increase of thiosulfate, but not H2S, in plasma and brain tissues. These results suggest that thiosulfate is a circulating “carrier” molecule of beneficial effects of H2S. Protective effects of thiosulfate were associated with inhibition of caspase-3 activity by persulfidation at Cys163 in caspase-3. We discovered that an SLC13 family protein, sodium sulfate cotransporter 2 (SLC13A4, NaS-2), facilitates transport of thiosulfate, but not sulfide, across the cell membrane, regulating intracellular concentrations.
and thus mediating cytoprotective effects of Na2S and STS. CONCLUSIONS: The protective effects of H2S are mediated by thiosulfate that is transported across cell membrane by NaS-2 and exerts antiapoptotic effects via persulfidation of caspase-3. Given the established safety track record, thiosulfate may be therapeutic against ischemic brain injury.


Abstract: AIMS: To identify enzymes and metabolites in the rhizobacteria filtrates that have a nematicidal effect on X. index and perform molecular characterization of the strains evaluated. METHODS AND RESULTS: A series of four bacteria selected for their nematicidal potential were considered for in vitro, biochemical and molecular studies. The direct effect of the bacterial filtrates was evaluated in vitro on X. index juveniles and adults. Hydrogen sulfide and hydrogen cyanide liberation and protease, chitinase, collagenase and lipase activity were verified in the strains. Up to five housekeeping genes and one ITS 16S-23S rRNA were analysed. All bacterial filtrates presented 54 to 100% mortality when evaluated during up to 72 h of nematode exposure. Strains presented protease activity; two of them (strains FB833T and FR203A) showed reliable collagenase and chitinase activities respectively, and three of them showed strong lipolytic activity (FB833T, FR203A and FS213P). Strain B. megaterium FB133M had no lipase activity and presented the lowest nematicidal effect. B. amyloliquefaciens FR203A had the largest lethal effect.

CONCLUSION: The rhizobacteria strains evaluated in this study possess nematicidal compounds, which may offer an interesting alternative for X. index control. SIGNIFICANCE AND IMPACT OF THE STUDY: This is the first report of exoenzymes and metabolites associated to nematicidal effect of rhizobacteria on X. index, which can be a possible alternative for control of this plant-parasitic nematode. This article is protected by copyright. All rights reserved.


Abstract: BACKGROUND: Hospitals are rarely reported as settings for mass psychogenic illness (MPI). The present report scrutinizes an outbreak of probable MPI among hospital staff, with medical intervention reinforcing the course of the illness. CASE REPORT: Four of seven staff members in an emergency department became acutely ill with nonspecific symptoms. After uneventful observation they were discharged, but symptoms worsened at reassembly for debriefing. Poisoning with hydrogen sulfide was suspected, and the victims were transferred by helicopter for hyperbaric oxygen (HBO) treatment. During the following 9 days, 14 possible poisoning victims were identified, 6 of whom were transferred for HBO. After hospital stays with repeated HBO treatment and examinations without identification of significant physical disease, the majority of the 10 HBO-treated victims remained symptomatic, some on prolonged sick leave. The ward was closed for several weeks during comprehensive but negative investigations for toxic chemicals. Clinical data and lack of indication of chemical exposure, together with an attack pattern with only some individuals becoming ill in a shared environment, suggest MPI. Iatrogenic influence from dramatic intervention was probably a strong driving force in the outbreak. WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?: Awareness of MPI may prevent unnecessary and potentially harmful treatment as well as improve health care resilience, particularly with respect to preparedness. Outbreaks of illness in a group of symptomatic victims without indication of significant physical disease should be managed by observation and limited intervention.


Abstract: Chronic kidney disease is associated with vasculitis and is also an independent risk factor for peripheral vascular and coronary artery disease in Diabetic patients. Despite
optimal management, a significant number of patients progress towards end-stage renal disease (ESRD), a suggestion that the disease mechanism is far from clear. A reduction in hydrogen sulfide (H2S) has been suggested to play a vital role in diabetic vascular complications including diabetic nephropathy (DN). This mini review highlights the recent findings on the role of hydrogen sulfide (H2S) in mitigating abnormal extracellular matrix metabolism in DN. A discussion on the development of the newer slow releasing H2S compounds and its therapeutic potential is also included.

Abstract: H2S is produced mainly by two enzymes: cystathionine-beta-synthase (CBS) and cystathionine-gamma-lyase (CSE), using L-cysteine (L-Cys) as the substrate. In this study, we investigated the role of H2S in gastric accommodation using CBS(+/-) mice, immunohistochemistry, immunoblot, methylene blue assay, intragastric pressure (IGP) recording and electrical field stimulation (EFS). Mouse gastric fundus expressed H2S-generating enzymes (CBS and CSE) and generated detectable amounts of H2S. The H2S donor, NaHS or L-Cys, caused a relaxation in either gastric fundus or body. The gastric compliance was significantly increased in the presence of L-Cys (1 mM). On the contrary, AOAA, an inhibitor for CBS, largely inhibited gastric compliance. Consistently, CBS(+/-) mice shows a lower gastric compliance. However, PAG, a CSE inhibitor, had no effect on gastric compliances. L-Cys enhances the non-adrenergic, non-cholinergic (NANC) relaxation of fundus strips, but AOAA reduces the magnitude of relaxations to EFS. Notably, the expression level of CBS but not CSE protein was elevated after feeding. Consistently, the production of H2S was also increased after feeding in mice gastric fundus. In addition, AOAA largely reduced food intake and body weight in mice. Furthermore, a metabolic aberration of H2S was found in patients with functional dyspepsia (FD). In conclusion, endogenous H2S, a novel gasotransmitter, involves in gastric accommodation.

Abstract: The pathogenesis of pain in irritable bowel syndrome (IBS) is poorly understood and treatment remains difficult. The present study was designed to investigate roles of adrenergic signaling and the endogenous hydrogen sulfide producing enzyme cystathionine beta-synthetase (CBS) in a previously validated rat model of IBS induced by neonatal colonic inflammation (NCI). Here we showed that NCI-induced visceral hypersensitivity (VH) was significantly attenuated by beta2 subunit inhibitor but not by beta1 or beta3 or alpha subunit inhibitor. NCI markedly elevated plasma norepinephrine (NE) concentration without alteration in expression of beta2 subunit receptors in dorsal root ganglion (DRGs) innervating the colon. In addition, NCI markedly enhanced TRPV1 and CBS expression in the colon DRGs. CBS inhibitor AOAA reversed the upregulation of TRPV1 in NCI rats. In vitro experiments showed that incubation of DRG cells with NE markedly enhanced expression of TRPV1, which was reversed by application of AOAA. Incubation of DRG cells with the H2S donor NaHS greatly enhanced TRPV1 expression. Collectively, these data suggest that activation of adrenergic signaling by NCI sensitizes TRPV1 channel activity, which is likely mediated by upregulation of CBS expression in peripheral sensory neurons, thus contributing to chronic visceral hypersensitivity.

Abstract: BACKGROUND: Beneficial effects of carbohydrate fermentation on gastrointestinal health are well established. Conversely, protein fermentation generates harmful metabolites but their relevance to gastrointestinal health is poorly understood. AIM: To review the effects of increased protein fermentation on biomarkers of colonic health, factors influencing fermentative activity and potential for dietary modulation to minimise detrimental effects. METHODS: A literature search was performed in PubMed, Medline,
EMBASE and Google scholar for clinical and pre-clinical studies using search terms - 'dietary protein', 'fermentation', 'putrefaction', 'phenols', 'sulphide', 'branched-chain fatty acid', 'carbohydrate fermentation', 'gastrointestinal'. RESULTS: High protein, reduced carbohydrate diets alter the colonic microbiome, favouring a potentially pathogenic and pro-inflammatory microbiota profile, decreased short-chain fatty acid production and increased ammonia, phenols and hydrogen sulphide concentrations. These metabolites largely compromise the colonic epithelium structure, causing mucosal inflammation but may also directly modulate the enteric nervous system and intestinal motility. Increased protein fermentation as a result of a high-protein intake can be attenuated by addition of oligosaccharides, resistant starch and nonstarch polysaccharides and a reduction in total protein or specifically, aromatic and sulphur-containing amino acids. These factors may have clinical importance as novel therapeutic approaches to problems, in which protein fermentation may be implicated, such as malodorous flatus, irritable bowel syndrome, ulcerative colitis and prevention of colorectal cancer. CONCLUSIONS: The direct clinical relevance of excessive protein fermentation in the pathogenesis of irritable bowel syndrome, malodorous flatus and ulcerative colitis are underexplored. Manipulating dietary carbohydrate and protein intake have potential therapeutic applications in such settings and warrant further clinical studies

Abstract: Therapeutic gases enriched into perfusion solutions have been effectively used for the improvement of organ transplant quality. At present, the enrichment of perfusion solutions with gases requires complex machinery/containers and handling precautions. Alternatively, the gas is generated within the perfusion solution by supplemented carbonylated transition metal complexes with associated toxicological concerns when these metals contact the transplant. Therefore, we developed therapeutic gas releasing systems (TGRSs) allowing for the controlled generation and release of therapeutic gases (carbon monoxide and hydrogen sulfide) from otherwise hermetically sealed containers, such that the perfusion solution for the transplant is saturated with the gas but no other components from the TGRS are liberated in the solution. The release from the TGRS into the perfusion solution can be tailored as a function of the number and thickness of gas permeable membranes leading to release patterns having been linked to therapeutic success in previous trials. Furthermore, the surrogate biomarker HMGB1 was significantly downregulated in ischemic rat liver transplants perfused with enriched CO solution as compared to control. In conclusion, the TGRS allows for easy, reliable, and controlled generation and release of therapeutic gases while removing safety concerns of current approaches, thereby positively impacting the risk benefit profile of using therapeutic gases for transplant quality improvement in the future

Abstract: The effects of adding a bulking agent and chemically pretreating municipal kitchen waste before aerobic composting were studied using a laboratory-scale system. The system used 20-L reactors and each test lasted 28days. The objective was to decrease NH3 and H2S emissions during composting. The bulking agent, dry cornstalks, was mixed with the kitchen waste to give a mixture containing 15% (wet weight) bulking agent. A combined treatment was also conducted, in which kitchen waste mixed with the bulking agent was pretreated with ferric chloride (FeCl3). Less leachate was produced by the composted kitchen waste mixed with bulking agent than by the kitchen waste alone, when the materials had reached the required maturity. The presence of cornstalks also caused less H2S to be emitted, but had little impact on the amount of NH3 emitted. The FeCl3 was found to act as an effective chemical flocculant, and its presence significantly decreased the amounts of NH3 and H2S emitted. Kitchen waste mixed with cornstalks and
treated with FeCl3 emitted 42% less NH3 and 76% less H2S during composting than did pure kitchen waste

Abstract: An extensive measuring campaign targeted on sewer odor problems was undertaken in San Francisco. It was assessed whether a conceptual sewer process model could reproduce the measured concentrations of total sulfide in the wastewater and H2S gas in the sewer atmosphere, and to which degree such simulations have potential for further improving odor and sulfide management. The campaign covered measurement of wastewater sulfide by grab sampling and diurnal sampling, and H2S gas in the sewer atmosphere was logged. The tested model was based on the Wastewater Aerobic/Anaerobic Transformations in Sewers (WATS) sewer process concept, which never had been calibrated to such an extensive dataset. The study showed that the model was capable of reproducing the general levels of wastewater sulfide, wastewater pH, and sewer H2S gas. It could also reproduce the general variability of these parameters, albeit with some uncertainty. It was concluded that the model could be applied for the purpose in mind.

Abstract: As an endogenous gaseous mediator, H2S exerts anti-oxidative, anti-inflammatory and cytoprotective effects in kidneys. This study was designed to investigate the protective effect of H2S against uranium-induced nephrotoxicity in adult SD male rats after in vivo effect of uranium on endogenous H2S formation was explored in kidneys. The levels of endogenous H2S and H2S-producing enzymes (CBS and CSE) were measured in renal homogenates from rats intoxicated by an intraperitoneally (i.p.) injection of uranyl acetate at a single dose of 2.5, 5 or 10 mg/kg. In rats injected i.p. with uranyl acetate (5 mg/kg) or NaHS (an H2S donor, 28 or 56 mumol/kg) alone or in combination, we determined biochemical parameters and histopathological alteration to assess kidney function, examined oxidative stress markers, and investigated Nrf2 and NF-kappaB pathways in kidney homogenates. The results suggest that uranium intoxication in rats decreased endogenous H2S generation as well as CBS and CSE protein expression. NaHS administration in uranium-intoxicated rats ameliorated the renal biochemical indices and histopathological effects, lowered MDA accumulation, and restored GSH level and anti-oxidative enzymes activities like SOD, CAT, GPx and GST. NaHS treatment in uranium-intoxicated rats activated uranium-inhibited protein expression and nuclear translocation of transcription factor Nrf2, which increased protein expression of downstream target-Nrf2 genes HO-1, NQO-1, GCLC, and TXNRD-1. NaHS administration in uranium-intoxicated rats inhibited uranium-induced nuclear translocation and phosphorylation of transcription factor kappaB/p65, which decreased protein expression of target-p65 inflammatory genes TNF-alpha, iNOS, and COX-2. Taken together, these data implicate that H2S can afford protection to rat kidneys against uranium-induced adverse effects through induction of antioxidant defense by activating Nrf2 pathway and reduction of inflammatory response by suppressing NF-kappaB pathway.

Abstract: Hydrogen sulfide (H2S) has emerged as an important gasotransmitter in the vasculature. In this study, we tested the hypothesis that H2S contributes to coronary vasoregulation and evaluated the physiological relevance of two sources of H2S, namely, cystathionine-gamma-lyase (CSE) and 3-mercaptoppyruvate sulfurtransferase (MPST). MPST was detected in human coronary artery endothelial cells as well as rat and mouse
coronary artery; CSE was not detected in the coronary vasculature. Rat coronary artery homogenates produced H2S through the MPST pathway but not the CSE pathway in vitro. In vivo coronary vasorelaxation response was similar in CSE knockout mice, wild-type mice (WT), and WT mice treated with the CSE inhibitor propargylglycine, suggesting that CSE-produced H2S does not have a significant role in coronary vasoregulation in vivo. Ex vivo, MPST substrate 3-mercaptopyruvate (3-MP) and H2S donor sodium hydrosulfide (NaHS) elicited similar coronary vasoreactivity responses. Pyruvate did not have any effects on vasoreactivity. The vasoactive effect of H2S appeared to be NO-dependent: H2S induced coronary vasoconstriction in the presence of NO and vasorelaxation in its absence. Maximal endothelial-dependent relaxation was intact after 3-MP, and or NaHS induced an increase in pre-constriction tone, suggesting that eNOS activity was not significantly inhibited. In vitro, H2S reacted with NO, which may, in part explain the vasoconstrictive effects of 3-MP and NaHS. Taken together, these data show that MPST rather than CSE generates H2S in coronary artery, mediating its effects through direct modulation of NO. This has important implications for H2S-based therapy in healthy and diseased coronary arteries

(48) Sarna LK, Sid V, Wang P, Siow YL, House JD, O K. Tyrosol Attenuates High Fat Diet-Induced Hepatic Oxidative Stress: Potential Involvement of Cystathionine beta-Synthase and Cystathionine gamma-Lyase. Lipids 2015 Oct 30. Abstract: The Mediterranean diet is known for its cardioprotective effects. Recently, its protective qualities have also been reported in patients with non-alcoholic fatty liver disease (NAFLD). Oxidative stress is one of the important factors responsible for the development and progression of NAFLD. Hydrogen sulfide (H2S), a multifaceted gasotransmitter, has emerged as a potential therapeutic target in NAFLD. Cystathionine beta-synthase (CBS) and cystathionine gamma-lyase (CSE) are major enzymes responsible for endogenous H2S synthesis. Since oxidative stress contributes to NAFLD pathogenesis, the objective of this study was to investigate the effect of tyrosol, a major compound in olive oil and white wine, on high fat diet-induced hepatic oxidative stress and the mechanisms involved. Mice (C57BL/6) were fed for 5 weeks with a control diet (10 % kcal fat), a high fat diet (60 % kcal fat, HFD) or a HFD supplemented with tyrosol. High fat diet feeding induced hepatic oxidative stress, as indicated by the significant increase in lipid peroxidation and NADPH oxidase activity. Tyrosol supplementation significantly increased hepatic CBS and CSE expression and H2S synthesis in high fat diet-fed mice. Such effects were associated with the attenuation of high fat diet-induced hepatic lipid peroxidation and the restoration of the redox equilibrium of the antioxidant glutathione. Tyrosol also inhibited palmitic acid-induced oxidative stress in hepatocytes (HepG2 cells). These results suggest that the antioxidant properties of tyrosol may be mediated through functional changes in CBS and CSE activity, which might contribute to the hepatoprotective effect of the Mediterranean diet

(49) Liu X, Fu Z, Wu Y, Hu X, Jr., Zhu T, Jr., Jin C, Jr. Neuroprotective effect of hydrogen sulfide on acute cauda equina injury in rats. Spine J 2015 Oct 30. Abstract: BACKGROUND: Hydrogen sulfide (H2S), as a novel gaseous messenger molecule, plays an important role in signal transduction and biological modulation. PURPOSE: In the present study the effect of H2S after compression injury of cauda equina was studied. STUDY DESIGN: The setting of this study is the laboratory investigation. METHODS: 162 rats were randomly allocated into three groups: sham group, compression group, and H2S group. Cauda equina compression (CEC) injury in rats was induced by implanting silicone gels (10x1x1 mm) into the epidural spaces L5 and L6; laminectomy was performed at the L4 level of the vertebra in the sham-operated group. Experimental group was treated with sodium hydrosulfide (NaHS) intraperitoneally (20 micromol/kg body weight), while the compression and sham group received equal volume of physiological saline. Levels of malonaldehyde (MDA) and glutathione (GSH) were determined immediately before the CEC surgery, 12 h, 24 h, 48 h and 72 h after the CEC surgery. Furthermore, hematoxylin and eosin (H&E) staining and terminal deoxynucleotidyl transferase-mediated biotinylated UTP nick end labeling (TUNEL) assay was performed
48h after CEC. RESULTS: H&E staining showed that myelin sheath and the cauda equina fibers in compression group were less compact and highly degenerated compared to the sham group, and that H2S treatment could improve the status. TUNEL staining exhibited that decreased number of TUNEL positive cells was found in H2S group than in compression group. The level of MDA was increased in sham and H2S group compared to compression group (P<0.05, P<0.01); while the level of GSH was decreased (P<0.05, P<0.01). CONCLUSIONS: With the above data, we conclude that H2S could reduce the oxidative stress and has neuroprotective effect in acute cauda equina syndrome (CES).

Abstract: This study is the first to characterize the S stability of a composite tailings (CT) deposit undergoing pilot wetland reclamation in the Athabasca Oil Sands Region (AOSR, Alberta, Canada). As CT is sulfur, organic carbon and bacterially rich, the goal of this study was to characterize the in situ aqueous distribution of sulfur compounds across the wetland, sand cap and underlying CT zones of the deposit, in an effort to establish the potential for microbial sulfur cycling and generation of H2S, an explosive, corrosive and toxicity risk. Porewater samples from three depths spanning the different layers of the deposit, as well as wetland surface ponded water samples were collected for geochemical analyses (July and Sept 2013), and for microbial enrichments (both S reducing and S oxidizing bacteria) in June 2014. While porewater SigmaH2S(aq) was detected at all depths across the three zones of the deposit, results identify that the sand cap layer required for construction, acts as a mixing zone generating the highest solution H2S concentrations (>500 uM or 18 mg/L) and H2S gas levels (over 100 and up to 180 ppm) observed. Porewater dissolved sulfate concentrations (0.14-6.97 mM) were orders of magnitude higher and did not correlate to the observed distribution of SigmaH2S concentrations throughout the deposit. Unique to the sandcap, dissolved organic carbon positively correlated with the observed maxima of SigmaH2S(aq) seen in this layer. The water management of the deposit is a critical factor in the observed S trends. Active dewatering of the CT resulted in migration of S rich water up into the sandcap, while downwelling labile organic carbon from the developing wetland acted in concert to stimulate microbial generation of the H2S in this structural layer to the highest levels observed. Functional enrichments identified that diverse S reducing and oxidizing microbial metabolisms are widespread throughout the deposit, indicating that these waste materials are biogeochemically reactive with implications for longterm stability. These results are of relevance to both the oil sands region, as well as other mine contexts where S rich wastes occur, identifying the need to consider the potential bacterially driven cycling of S and C in the generation of constituents of concern, as well as the water management of such waste deposits to minimize risk.

Abstract: The purpose of this narrative review is to highlight insights into the importance and frequency of metabolic vitamin B12 (B12) deficiency, reasons why it is commonly missed, and reasons for the widespread but mistaken belief that treatment of B12 deficiency does not prevent stroke or improve cognitive function. Metabolic B12 deficiency is common, being present in 10%-40% of the population; is frequently missed; is easily treated; and contributes importantly to cognitive decline and stroke in older people. Measuring serum B12 alone is not sufficient for diagnosis; it is necessary to measure holotranscobalamin or functional markers of B12 adequacy such as methylmalonic acid or plasma total homocysteine. B-vitamin therapy with cyanocobalamin reduces the risk of stroke in patients with normal renal function but is harmful (perhaps because of thiocyanate accumulation from cyanide in cyanocobalamin) in patients with renal impairment. Methylcobalamin may be preferable in renal impairment. B12 therapy slowed gray matter atrophy and cognitive decline in the Homocysteine and B Vitamins in Cognitive Impairment Trial. Undiagnosed metabolic B12 deficiency may be an important missed opportunity for prevention of dementia and stroke; in patients with metabolic B12 deficiency, it would be
prudent to offer inexpensive and nontoxic supplements of oral B12, preferably methylcobalamin or hydroxycobalamin. Future research is needed to distinguish the effects of thiocyanate from cyanocobalamin on hydrogen sulfide, and effects of treatment with methylcobalamin on cognitive function and stroke, particularly in patients with renal failure.

Abstract: Hydrogen sulfide (H2S) is recognized as one of three gasotransmitters together with nitric oxide (NO) and carbon monoxide (CO). As a signaling molecule, H2S plays an important role in physiology and shows great potential in pharmaceutical applications. Along this line, there is a need for the development of H2S prodrugs for various reasons. In this review, we summarize different H2S prodrugs, their chemical properties, and some of their potential therapeutic applications.

Abstract: In the present review, we tried to evaluate the known properties of gas hydrates and gases participating in the formation of gas hydrates from the point of view of the mechanisms of cryoinjury and cryoprotection, to consider the papers on freezing biological materials in the presence of inert gases, and to analyze the perspectives for the development of this direction. For the purpose, we searched for the information on the physical properties of gases and gas hydrates, compared processes occurred during the formation of gas hydrates and water ice, analyzed the influence of the formation and growth of gas hydrates on the structure of biological objects. We prepared a short review on the biological effects of xenon, krypton, argon, carbon dioxide, hydrogen sulfide, and carbon monoxide especially on hypothermal conditions and probable application of these properties in cryopreservation technologies. The description of the existing experiments on cryopreservation of biological objects with the use of gases was analyzed. On the basis of the information we found, the most perspective directions of work in the field of cryopreservation of biological objects with the use of gases were outlined. An attempt was made to forecast the potential problems in this field.

Abstract: [This corrects the article on p. 243 in vol. 47, PMID: 26069359.]

Abstract: BACKGROUND: Bamboo leaf extract solution (BLES) and sodium copper chlorophyllin solution (SCCS) are known for their anti-oxidant activities. Oral malodor is often related with periodontal pathogens. The present study was undertaken to investigate the anti-bacterial effect of both BLES and SCCS on anaerobic periodontal bacteria producing oral malodorous volatile sulfur compounds (VSC). METHODS: Porphyromonas gingivalis W83 (PG), Prevotella intermediai TDC19B (PI), Fusobacterium nucleatum ATCC25586 (FN) and Prevotella nigrescence ATCC33563 (PN) were investigated as oral isolated bacteria. VSC production ability of the oral strains was investigated by gas chromatography. With serial dilution of BLES or SCCS, the strains PG, PI, FN or PN were cultured anaerobically with AnaeroPack at 37 for 3 days. For the determination of anti-bacterial action of BLES or SCCS, the inoculum was cultured with original concentrations of BLES 0.16% (w/v) or SCCS 0.25% (w/v). RESULTS: Gas chromatography exhibited that all strains, PG, PI, FN and PN were responsible for producing a high range of H2S and a moderate range of CH3SH. Anti-bacterial effect of BLES or SCCS on the strains was observed. Inhibition of BLES or SCCS on the strains was revealed as concentration dependent. BLES or SCCS inhibited bacterial proliferation.
at higher concentrations (PG; 0.04% BLES or 0.03% SCCS, PI; 0.002% BLES or 0.03% SCCS, FN; 0.005% BLES or 0.01% SCCS, PN; 0.01% BLES or 0.015% SCCS). No viable bacterial colony observed at original concentration of BLES 0.16% or SCCS 0.25%. Strain growth was eliminated from inhibition at lower concentrations (PG; 0.02% BLES or 0.015% SCCS, PI; 0.001% BLES or 0.015% SCCS, FN; 0.002% BLES or 0.007% SCCS, PN; 0.005% BLES or 0.007% SCCS). CONCLUSION: High concentrations of both BLES (0.16%) and SCCS (0.25%) show superior inhibiting capability on all four oral malodor associated periodontal anaerobes during testing, suggesting that these compounds might have a beneficial effect on oral health care


Abstract: Aging increases the risk of cardiovascular diseases. The objective of this study was to show the effect of propargylglycine (PPG) upon cardiohemodynamics in old rats. We used pressure-volume (PV) conductance catheter system (Millar Instruments, USA) in order to evaluate systolic and diastolic function in vivo. It has been shown that introduced PPG (11,31 mg/kg) decreases both arterial stiffness (by 1,5 times) and end-diastolic stiffness (by 2,1 times) in old rats. Using PPG in heart mitochondria resulted in increasing levels of H2S (by 112%), NO2- (by 162%) and in growing activity of cNOS (by 3 times). Additionally, PPG decreased the mitochondrial pools of the uric acid, the marker of the superoxide (‘O2-) formation and of the ATP degradation. These results suggest that PPG activates alternative ways of H2S synthesis, stimulates the NO and H2S synthesis and suppresses the ATP degradation and ‘O2 formation. These actions of PPG improve arterial stiffness and end-diastolic stiffness

Abstract: The impact of sulfate deprivation and atmospheric H2S and SO2 nutrition on the content and composition of glucosinolates was studied in Brassica juncea and B. rapa. Both species contained a number of aliphatic, aromatic and indolic glucosinolates. The total glucosinolate content was more than 5.5-fold higher in B. juncea than in B. rapa, which could solely be attributed to the presence of high levels of sinigrin, which was absent in the latter species. Sulfate deprivation resulted in a strong decrease in the content and an altered composition of the glucosinolates of both species. Despite the differences in patterns in foliarly uptake and metabolism, their exposure hardly affected the glucosinolate composition of the shoot, both at sulfate-sufficient and sulfate-deprived conditions. This indicated that the glucosinolate composition in the shoot was hardly affected by differences in sulfur source (viz., sulfate, sulfite and sulfide). Upon sulfate deprivation, where foliarly absorbed H2S and SO2 were the sole sulfur source for growth, the glucosinolate composition of roots differed from sulfate-sufficient B. juncea and B. rapa, notably the fraction of the indolic glucosinolates was lower than that observed in sulfur-sufficient roots

Abstract: Hydrogen sulfide (H2S) is a hazard primarily in the oil and gas industry, agriculture, sewage and animal waste handling, construction (asphalt operations and disturbing marshy terrain), and other settings where organic material decomposes under reducing conditions, and in geothermal operations. It is an insoluble gas, heavier than air,
with a very low odor threshold and high toxicity, driven by concentration more than duration of exposure. Toxicity presents in a unique, reliable, and characteristic toxidrome consisting, in ascending order of exposure, of mucosal irritation, especially of the eye ("gas eye"), olfactory paralysis (not to be confused with olfactory fatigue), sudden but reversible loss of consciousness ("knockdown"), pulmonary edema (with an unusually favorable prognosis), and death (probably with apnea contributing). The risk of chronic neurocognitive changes is controversial, with the best evidence at high exposure levels and after knockdowns, which are frequently accompanied by head injury or oxygen deprivation. Treatment cannot be initiated promptly in the prehospital phase, and currently rests primarily on supportive care, hyperbaric oxygen, and nitrite administration. The mechanism of action for sublethal neurotoxicity and knockdown is clearly not inhibition of cytochrome oxidase c, as generally assumed, although this may play a role in overwhelming exposures. High levels of endogenous sulfide are found in the brain, presumably relating to the function of hydrogen sulfide as a gaseous neurotransmitter and immunomodulator. Prevention requires control of exposure and rigorous training to stop doomed rescue attempts attempted without self-contained breathing apparatus, especially in confined spaces, and in sudden release in the oil and gas sector, which result in multiple avoidable deaths.

Abstract: The key mechanism for hepatotoxicity resulting from acetaminophen (APAP) overdose is cytochrome P450-dependent formation of N-acetyl-p-benzoquinone imine (NAPQI), a potent electrophilic metabolite that forms protein adducts. The fundamental roles of glutathione in the effective conjugation/clearance of NAPQI have been established, giving a molecular basis for the clinical use of N-acetylcysteine as a sole antidote. Recent evidence from in vitro experiments suggested that sulfide anions (S(2-)) would yield hydrogen sulfide anions (HS(-)) under physiological pH could effectively react with NAPQI. This study evaluated the protective roles of HS(-) against APAP-induced hepatotoxicity in mice. We utilized cystathionine gamma-lyase-deficient (Cth(-/-)) mice that are highly sensitive to acetaminophen toxicity. Intraperitoneal injection of acetaminophen (150 mg/kg) into Cth(-/-) mice resulted in highly elevated levels of serum alanine/aspartate aminotransferases and lactate dehydrogenase associated with marked increases in oncoytic hepatocytes; all of which were significantly inhibited by intraperitoneal preadministration of sodium hydrosulfide (NaHS). NaHS preadministration significantly suppressed APAP-induced serum malondialdehyde level increases without abrogating APAP-induced rapid depletion of hepatic glutathione. These results suggest that exogenous HS(-) protects hepatocytes by directly scavenging reactive NAPQI rather than by increasing cystine uptake and thereby elevating intracellular glutathione levels, which provides a novel therapeutic approach against acute APAP poisoning.

Abstract: BACKGROUND: The aim of the study was to evaluate serum levels of the target enzyme for H2S toxicity--cytochrome c oxidase (COX) and enzymes involved in the synthesis of H2S--cystathionine beta-synthase (CBS) and cystathionine gamma-lyase (CSE) in copper mine miners. MATERIAL AND METHODS: The initial and basic study was conducted respectively in 237 and 88 miners, working in 2 mining shafts: I--no H2S emissions recorded in the last 10 years (study group A) and II--H2S emissions occurred (study group B). A medical examination was performed and 10 ml of blood was collected from miners immediately after exiting the mine. RESULTS: There were no clinical or biochemical changes typical for H2S toxicity. Sulphhemoglobin was undetectable and there were no changes in the red-ox system. However, in group B, regulatory changes were found; a tendency to higher concentration of CBS and CSE, a higher activity of angiotensin...
converting enzyme (ACE) compared to group A (p<0.05) and a linear relationship between ACE and CSE (r=0.6927; p<0.001). It has been shown that cigarette smoking decreases COX (p<0.05), however, in miners working in shaft II, the decreased level of COX may result also from the presence of H2S in the gaseous emissions. CONCLUSIONS: COX concentration can be a sensitive indicator of exposure to H2S. The measurements of blood H2S concentrations carried out in workplaces should explain the cause of the changes observed in the COX, CBS and CSE activity.


Abstract: BACKGROUND/AIMS: Peritoneal fibrosis is one of the long-term complications in peritoneal dialysis (PD) patients. Recent evidences have suggested that hydrogen sulfide (H2S) is beneficial in treating various fibrotic diseases, including pulmonary fibrosis, cirrhosis, kidney fibrosis and cardiac hypertrophy. However, no information is known about the effect of H2S on peritoneal fibrosis. In the present study, we investigated the effect of H2S on peritoneal fibrosis and explored its potential mechanisms. METHODS: We developed a model of peritoneal fibrosis by intraperitoneally injecting 4.25%-glucose PD fluids and lipopolysaccharide to Sprague-Dawley rats. The rats received daily intraperitoneal injections of NaHS (56 mug/kg), an H2S donor. After 28 days, the peritoneal equilibration test (PET) was used to assess peritoneal function. At the end of dialysis, the rats were killed and parietal peritoneum was harvested for microscopic examination and immunohistochemistry. RESULTS: On the 28th day, the parietal peritoneum of the PD rats markedly thickened as a result of increased depositions of type III collagen and fibronectin. Moreover, the number of ED-1-positive cells and the expressions of monocyte chemoattractant protein-1, transforming growth factor-beta1 (TGF-beta1), alpha-smooth muscle actin and CD31 were significantly increased in the fibrotic peritoneum. Administration of NaHS markedly decreased the biomarkers of inflammation, fibrosis and angiogenesis in the peritoneum. NaHS also improved peritoneal function assessed by PET. CONCLUSION: Exogenous H2S ameliorates the pathologic process of peritonitis via attenuating inflammatory events and TGF-beta1 synthesis. These results suggest that H2S may be a potential therapy against peritoneal fibrosis during chronic PD. In the future, compounds releasing H2S at controlled rate will be assessed as potential candidates to treat peritoneal fibrosis.


Abstract: BACKGROUND: GPBAR1 is a bile acids activated receptor expressed in entero-hepatic tissues. In the liver expression of GPBAR1 is restricted to sinusoidal and Kupffer cells. In the systemic circulation vasodilation caused by GPBAR1 agonists is abrogated by inhibition of cystathione-gamma-liase (CSE), an enzyme essential to the generation of hydrogen sulfide (H2S), a vasodilatory agent. Portal BAR501 is a semisynthetic bile acid derivative endowed with a potent and selective agonistic activity toward GPBAR1. METHODS: Cirrhosis was induced in mice by carbon tetrachloride (CCL4) administration for 9 weeks. Liver endothelial dysfunction was induced by feeding wild type and Gpbar1/-/- mice with methionine for 4 weeks. In both models, mice were administered BAR501, 15 mg/kg/day. RESULTS: By transactivation assay we demonstrate that BAR501 is a selective GPBAR1 agonist devoid of any FXR agonistic activity. In naïve rats, BAR501 effectively reduced hepatic perfusion pressure and counteracted the vasoconstriction activity of norepinephrine. In the CCI4 model, 9 weeks treatment with BAR501 effectively protected against development of endothelial dysfunction by increasing liver CSE expression and activity and by reducing endothelin (ET)-1 gene expression. In mice feed methionine, treatment with BAR501 attenuated endothelial dysfunction and caused a GPBAR1-dependent regulation of CSE. Using human liver sinusoidal cells, we
found that modulation of CSE expression/activity is mediated by both genomic (recruitment of CREB to CRE in the CSE promoter) and non-genomic effects, involving a Akt-dependent phosphorylation of CSE and endothelial nitric oxide (NO) synthase (eNOS). BAR501, phosphorylates FOXO1 and inhibits ET-1 transcription in liver sinusoidal cells.

CONCLUSIONS: BAR501, a UDCA-like GPBAR1 agonist, rescues from endothelial dysfunction in rodent models of portal hypertension by exerting genomic and non-genomic effects on CSE, eNOS and ET-1 in liver sinusoidal cells.


Abstract: INTRODUCTION: High concentrations of CO2 in natural gas affect its calorific value and corrode the equipment and pipelines related to its transportation and usage. Therefore, strict control over the H2S and CO2 contents in natural gas is essential. CO2 is an important industrial gas that can bring a great deal of economic profit when it is fully utilized. CASE DESCRIPTION: The natural gas produced at the Oudeh gas field in Syria contains high carbon content natural gas, in which the CO2 content is in the range of 17.5-18.8 %, while the H2S content is in the range of 2.8-3.2 %. However, there have been few studies conducted on treatment solutions for natural gas with high carbon contents. In this paper, several commonly used methods for deacidification of natural gas were introduced. Among these methods, the most suitable one was chosen for desulfurization and decarbonization of the natural gas produced at the Oudeh gas field based on its gas quality. CONCLUSIONS: Optimization and analysis of the primary operating parameters for the desulfurization and decarbonization processes were conducted to obtain the optimized values for the input temperature of the lean solution (42 degrees C), reflux ratio (0.8), number of trays in the absorber unit (17), and circulation rate of the lean solution (330 m(3)/h), etc. Additionally, the influence of the operating pressure of the regenerator unit on the regeneration system was also investigated. The energy consumption of the apparatus and the corrosion level of sour gas to the apparatus were reduced after optimization. Based on the investigation of the natural gas treatment for this gas field, it can serve as a reference for the purification of high carbon contents natural gas.