Abstract: A flexible piezo-driven active H2S sensor has been fabricated from CdS nanorod arrays. By coupling the piezoelectric and gas sensing properties of CdS nanorods, the piezoelectric output generated by CdS nanorod arrays acts not only as a power source, but also as a response signal to H2S. Under externally applied compressive force, the piezoelectric output of CdS nanorod arrays is very sensitive to H2S. Upon exposure to 600 ppm H2S, the piezoelectric output of the device decreased from 0.32 V (in air) to 0.12 V. Such a flexible device can be driven by the tiny mechanical energy in our living environment, such as human finger pinching. Our research can stimulate a research trend on designing new material systems and device structures for high-performance piezo-driven active gas sensors.

Abstract: Sensitive detection of acetone and hydrogen sulfide levels in exhaled human breath, serving as breath markers for some diseases such as diabetes and halitosis, may offer useful information for early diagnosis of these diseases. Exhaled breath analyzers using semiconductor metal oxide (SMO) gas sensors have attracted much attention because they offer low cost fabrication, miniaturization, and integration into portable devices for noninvasive medical diagnosis. However, SMO gas sensors often display cross sensitivity to interfering species. Therefore, selective real-time detection of specific disease markers is a major challenge that must be overcome to ensure reliable breath analysis. In this work, we report on highly sensitive and selective acetone and hydrogen sulfide detection achieved by sensitizing electrospun SnO2 nanofibers with reduced graphene oxide (RGO) nanosheets. SnO2 nanofibers mixed with a small amount (0.01 wt %) of RGO nanosheets exhibited sensitive response to hydrogen sulfide (Rair/Rgas = 34 at 5 ppm) at 200 degrees C, whereas sensitive acetone detection (Rair/Rgas = 10 at 5 ppm) was achieved by increasing the RGO loading to 5 wt % and raising the operation temperature to 350 degrees C. The detection limit of these sensors is predicted to be as low as 1 ppm for hydrogen sulfide and 100 ppb for acetone, respectively. These concentrations are much lower than in the exhaled breath of healthy people. This demonstrates that optimization of the RGO loading and the operation temperature of RGO-SnO2 nanocomposite gas sensors enables highly sensitive and selective detection of breath markers for the diagnosis of diabetes and halitosis.

Abstract: Accumulating evidence has shown that hydrogen sulfide (H2S) acts as a signaling regulator in plants. Here we show that H2S delays the postharvest senescence of broccoli in a dose-dependent manner. H2S maintains higher levels of metabolites,
such as carotenoids, anthocyanin, and ascorbate, and reduces the accumulation of malondialdehyde, H2O2, and the superoxide anion. Further investigations showed that H2S sustained higher activities of guaiacol peroxidase, ascorbate peroxidase, catalase, and glutathione reductase and lower activities of lipoxygenase, polyphenol oxidase, phenylalanine ammonia lyase, and protease than those of water control. Moreover, the expression of the chlorophyll degradation related genes BoSGR, BoCLH2, BoPaO, BoRCCR, as well as cysteine protease BoCP1 and lipoxygenase gene BoLOX1, was down-regulated in postharvest broccoli treated with H2S. The functions of H2S on the senescence of other vegetables and fruits suggest its universal role acting as a senescence regulator

Abstract: The application of VUV lamp-based single photon ionization (SPI) was limited due to low photon energy and poor photon flux density. In this work, we designed a quasi-trapping chemical ionization (QT-CI) source with a commercial VUV 10.6 eV krypton lamp for time-of-flight mass spectrometry. The three electrode configuration ion source with RF voltage on the second electrode constitutes a quasi-trapping region, which has two features: accelerating the photoelectrons originated from the photoelectric effect with VUV light to trigger the chemical ionization through ion-molecule reaction and increasing the collisions between reactant ion O2(+) and analyte molecules to enhance the efficiency of chemical ionization. Compared to single SPI based on VUV krypton lamp, the QT-CI ion source not only apparently improved the sensitivity (e.g., 12-118 fold enhancement were achieved for 13 molecules, including aromatic hydrocarbon, chlorinated hydrocarbon, hydrogen sulfide, etc.) but also extended the range of ionizable molecules with ionization potential (IP) higher than 10.6 eV, such as propane, dichloroethane, and trichloromethane

Abstract: This paper proposes a novel self-developed JTS-01 desulfurizer and JZC-80 alkaline adsorbent for H2S removal and gas cleaning of the COREX coal gas in small-scale and commercial desulfurizing devices. JTS-01 desulfurizer was loaded with metal oxide (i.e., ferric oxides) catalysts on the surface of activated carbons (AC), and the catalyst capacity was improved dramatically by means of ultrasonically assisted impregnation. Consequently, the sulfur saturation capacity and sulfur capacity breakthrough increased by 30.3% and 27.9%, respectively. The whole desulfurizing process combined selective adsorption with catalytic oxidation. Moreover, JZC-80 adsorbent can effectively remove impurities such as HCl, HF, HCN, and ash in the COREX coal gas, stabilizing the system pressure drop. The JTS-01 desulfurizer and JZC-80 adsorbent have been successfully applied for the COREX coal gas cleaning in the commercial plant at Baosteel, Shanghai. The sulfur capacity of JTS-01 desulfurizer can reach more than 50% in industrial applications. Compared with the conventional dry desulfurization process, the modified AC desulfurizers have more merit, especially in terms of the JTS-01 desulfurizer with higher sulfur capacity and low pressure drop. Thus, this sorption enhanced catalytic desulfurization has promising prospects for H2S removal and other gas cleaning

Abstract: Hydrogen sulfide (H2S) emissions were determined from an anaerobic lagoon at a swine concentrated animal feeding operation (CAFO) in North Carolina. Measurements of H2S were made continuously from an anaerobic lagoon using a
dynamic flow-through chamber for approximately 1 week during each of the four seasonal periods from June 2007 through April 2008. H2S lagoon fluxes were highest in the summer with a flux of 3.81 +/- 3.24 μg m(-2) min(-1) and lowest in the winter with a flux of 0.08 +/- 0.09 μg m(-2) min(-1). An air-manure interface (A-MI) mass transfer model was developed to predict H2S manure emissions. The accuracy of the A-MI mass transfer model in predicting H2S manure emissions was comprehensively evaluated by comparing the model predicted emissions to the continuously measured lagoon emissions using data from all four seasonal periods. In comparison to this measurement data, the A-MI mass transfer model performed well in predicting H2S fluxes with a slope of 1.13 and an r(2) value of 0.60, and a mean bias value of 0.655 μg m(-2) min(-1). The A-MI mass transfer model also performed fairly well in predicting diurnal H2S lagoon flux trends.

(7) Hunault CC, Boerleider RZ, Hof BG, Kliest JJ, Meijer M, Nijhuis NJ, et al. Review of acute chemical incidents as a first step in evaluating the usefulness of physiologically based pharmacokinetic models in such incidents. Clin Toxicol (Phila) 2014 Feb;52(2):121-8. Abstract: Abstract Context. Acute chemical incidents can have substantial public health consequences in terms of morbidity and mortality. Objective. We aimed to characterize acute chemical incidents and near-misses in the Netherlands and compare the results with previous studies. This review is a first step in evaluating whether Physiologically Based Pharmacokinetic (PBPK) models can be of value in acute chemical incidents. Material and methods. Government, regional, municipal and University Hospital Institutes involved in the management of acute chemical incidents in the Netherlands were contacted, and they provided data between 2008 and 2010 on the characteristics and consequences of the incidents. The study is a retrospective epidemiological study based on data from five institutes. Incidents involving biological agents or radiation were excluded. Results. A total of 764 reports were available which involved 722 incidents after cross-matching the different sources of data. Forty incidents were excluded, leaving 682 incidents for which information was available in accordance with the inclusion criteria. Of the 682 incidents included in this study, most occurred in non-industrial buildings (37%) or industrial sites (34%). The most frequently observed event types were loss of containment (60%) and fire (36%), leading to gas emission (54%), followed by spill of liquid or solid chemicals (36%). The chemicals involved were most often products of combustion (e.g. smoke, soot, particles, 25%) and volatile organic compounds (e.g. solvents, styrene, xylene, 23%), followed by inorganic gases (e.g. carbon monoxide, hydrogen, hydrogen sulphide, 13%). A minimum of 847 people experienced adverse health effects following exposure during a chemical incident, and 10 fatalities were reported. The most frequently reported symptoms were respiratory (27%), due to irritant chemicals. The number of incidents related to fire and the number of injured people were higher in this study than in previous studies; 49% of the injured were transported to hospital. Discussion. This study helps to identify which chemicals are frequently involved in acute chemical incidents in the Netherlands. The results will be used in future to assess whether PBPK models may be useful for risk assessment of chemicals often involved in acute chemical incidents and for which human toxicological and kinetic data are scarce.

(8) Sheng J, Shim W, Lu J, Lim SY, Ong BH, Lim TS, et al. Electrophysiology of human cardiac atrial and ventricular telocytes. J Cell Mol Med 2014 Feb;18(2):355-62. Abstract: Telocytes (TCs) with exceptionally long cellular processes of telopodes have been described in human epicardium to act as structural supporting cells in the heart. We examined myocardial chamber-specific TCs identified in atrial and ventricular fibroblast culture using immunocytochemistry and studied their electrophysiological property by whole-cell patch clamp. Atrial and ventricular TCs with extended telopodes and alternating podoms and podomers that expressed CD34, c-Kit and PDGFR-beta were identified. These cells expressed large conductance Ca(2+) -activated K(+) current (BKCa ) and inwardly rectifying K(+) current (IKir ), but not transient outward K(+) current.
(Ito) and ATP-sensitive potassium current (KATP). The active channels were functionally competent with demonstrated modulatory response to H2S and transforming growth factor (TGF)-beta1 whereby H2S significantly inhibited the stimulatory effect of TGF-beta1 on current density of both BKCa and IKir. Furthermore, H2S attenuated TGF-beta1-stimulated KCa1.1/Kv1.1 (encode BKCa) and Kir2.1 (encode IKir) expression in TCs. Our results show that functionally competent K(+) channels are present in human atrial and ventricular TCs and their modulation may have significant implications in myocardial physiopathology.

(9) Shouk R, Abdou A, Shetty K, Sarkar D, Eid AH. Mechanisms underlying the antihypertensive effects of garlic bioactives. Nutr Res 2014 Feb;34(2):106-15. Abstract: Cardiovascular disease remains the leading cause of death worldwide with hypertension being a major contributing factor to cardiovascular disease-associated mortality. On a population level, non-pharmacological approaches, such as alternative/complementary medicine, including phytochemicals, have the potential to ameliorate cardiovascular risk factors, including high blood pressure. Several epidemiological studies suggest an antihypertensive effect of garlic (Allium sativum) and of many of its bioactive components. The aim of this review is to present an in-depth discussion regarding the molecular, biochemical and cellular rationale underlying the antihypertensive properties of garlic and its bioactive constituents with a primary focus on S-allyl cysteine and allicin. Key studies, largely from PubMed, were selected and screened to develop a comprehensive understanding of the specific role of garlic and its bioactive constituents in the management of hypertension. We also reviewed recent advances focusing on the role of garlic bioactives, S-allyl cysteine and allicin, in modulating various parameters implicated in the pathogenesis of hypertension. These parameters include oxidative stress, nitric oxide bioavailability, hydrogen sulfide production, angiotensin converting enzyme activity, expression of nuclear factor-kappaB and the proliferation of vascular smooth muscle cells. This review suggests that garlic and garlic derived bioactives have significant medicinal properties with the potential for ameliorating hypertension and associated morbidity; however, further clinical and epidemiological studies are required to determine completely the specific physiological and biochemical mechanisms involved in disease prevention and management.

(10) Y S, Ch S, Chv R. Bacillus luteus sp. nov., isolated from a soil. Int J Syst Evol Microbiol 2014 Jan 29. Abstract: Two bacterial strains (JC167T and JC168) were isolated from a soil sample collected from Mandpam, Tamilnadu, India. Colonies of both strains are orange and cells stain Gram-positive. Cells are small rods, formed terminal endospore of ellipsoidal to oval shape. Both strains were positive for catalase, oxidase, hydrolysis of starch/gelatin and negative for chitin hydrolysis, H2S production, indole production and nitrate reduction activity. Major fatty acids of both strains (>5%) are anteiso-C15:0, iso-C16:0, iso-C15:0, anteiso-C17:0, iso-C14:0, C16:0 with minor (<5 but >1%) amounts of iso-C17:0, anteiso-C17:0B/isol and C16:1omega11c. Diphosphatidylglycerol, phosphatidylethanolamine and phosphatidyglycerol are the major polar lipids of both strains. Cell wall amino acids are L-alanine, D-alanine, D-glutamic acid and meso-diaminopimelic acid. beta-Carotene and five unidentified carotenoids are present in both strains. Mean genomic DNA G+C content was 53.4±1 mol% and two strains were closely related (mean DNA-DNA hybridization >90%). 16S rRNA gene sequence comparisons of both strains indicated that they represent members of the genus Bacillus within the family Bacillaceae of the phylum Firmicutes. Both strains have sequence similarity of 97.6% with Bacillus saliphilus 6AGT and <96.8% with other members of the genus Bacillus. Sequence similarity between strain JC167T and 168 was 100%. Strain JC167T showed 25.8±1 % reassociation (based on DNA-DNA hybridization) with Bacillus saliphilus DSM 15402T (=6AGT). Distinct morphological, physiological and genotypic differences from the previously described taxa support the classification of strain JC167T as a representative.
of a novel species in the genus Bacillus, for which the name Bacillus luteus sp. nov. is proposed. The type strain is JC167T (=KCTC 33100T= LMG 27257T)


Abstract: It is well known that hypervalent molecules are more stable with very electronegative ligands such as fluorine. For example, while SF6 is uniquely stable and experimentally well characterized and many of the features of SF4 have been characterized, neither H4S nor H6S has been observed. Furthermore, no hypervalent sulfur species with mixed hydrogen and fluorine ligands have been experimentally characterized to date. In this work, we present detailed calculations of the electronic structure of H2S, SF2, and HSF. While all three compounds have similar bent singlet ground states, the potential energy surfaces of various low lying electronic states as a function of bond angle reveal very different behaviors, in particular for linear geometries. We use the disparate bonding motifs of the low-lying triplet states to rationalize the differences between SF4 and the hypothetical H4S molecule. We also make predictions about the effects of hydrogen substitution on the energetics and geometries of hypervalent sulfur fluoride compounds.


Abstract: Hartree-Fock (HF) is known to suffer from drawbacks in the description of the relative stabilities between the hemi-bonded (HB) and proton-transferred (PT) isomers of the water dimer cation, (H2O)2+. The energy difference predicted by HF is too large, approximately 27 kcal/mol, which is lowered to 7 kcal/mol when correlation effects are added. The error in HF has been previously attributed to the large dynamic correlation effects in the HB structure as well to the large symmetry breaking this structure exhibits.

In this study we use the recently developed projected Hartree-Fock (PHF) methods to study the relative stability of the two isomers of (H2O)2+ as well as its second and third row analogs, namely, (H2S)2+ and (H2Se)2+. In PHF, symmetries are broken and restored in a variation-after-projection approach and thus can deal easily with systems for which HF itself spontaneously breaks symmetry. We use different flavors of PHF (SUHF, KSUHF, SGHF, and KSGHF) to explore their ability in capturing dynamic correlation effects and to compare their performance to different wave function based methods. We study the role of the symmetry-breaking in the above systems, using wave function based methods with unrestricted and restricted wave functions as well as performing a single-shot symmetry restoration (a projection-after-variation scheme).


Abstract: We describe a method for synthesizing large-area and uniform molybdenum disulfide films, with control over the layer number, on insulating substrates using a gas phase sulfuric precursor (H2S) and a molybdenum metal source. The metal layer thickness was varied to effectively control the number of layers (2 to 12) present in the synthesized film. The films were grown on wafer-scale Si/SiO2 or quartz substrates and displayed excellent uniformity and a high crystallinity over the entire area. Thin film transistors were prepared using these materials, and the performances of the devices were tested. The devices displayed an on/off current ratio of 105, a mobility of 0.12 cm2 V-1 s-1 (mean mobility value of 0.07 cm2 V-1 s-1), and reliable operation.

Abstract: Thermococcus sp. strain ES1 is an anaerobic, hyperthermophilic archaeon from a hydrothermal vent that catabolizes sugars and peptides and produces H2S from S degrees, H2, acetate and CO2 as its primary metabolites. We present the complete genome sequence of this strain (1,957,742bp) with a focus on its substrate utilization and metabolite production capabilities. The sequence will contribute to the development of heterotrophic archaea for bioenergy production and biogeochemical modeling in hydrothermal environments.

Abstract: Separating silver (Ag+) from lead (Pb2+) is one of the many merits of the porous polymer framework reported here. The selective metal binding stems from the well-defined chelating unit of N-heterocycles, which consists of a triazine (C3N3) ring bonded to three 3,5-dimethylpyrazole moieties. Such a rigid and open triad also serves as the distinct building unit in the fully conjugated 3D polymer scaffold. Because of its strong fluorescence and porosity (e.g., BET surface area: 355 m2/g), and because of the various types of metal species that can be readily taken up, this versatile framework is especially fit for functionalization. For example, with AgNO3 loaded, the framework solid exhibits a brown color in response to water solutions of H2S—even at the dilution of 5.0 µM (0.17 ppm); whereas cysteine and other biologically relevant thiols do not cause notable change in color. In another example, tunable white light emission was produced when an Ir(III) complex was doped (e.g., about 0.02% of the polymer weight) onto the framework. Mechanistically, the bound Ir(III) centers become highly emissive in the orange-red region, complementing the broad, bluish emission from the polymer host to result in the overall white-light quality: the color attributes of the emission are therefore easily tunable by the Ir(III) dopant concentration. With this exemplary study, we intend to highlight metal uptake as an effective approach to modify and enrich the properties of porous polymer frameworks, and to stimulate interest in further examining metal-polymer interactions in the context of sensing, separation, catalyses and other applications.

Abstract: Non-coordinative interactions between a metal ion and the aromatic ring of a fluorophore can act as a versatile sensing mechanism for the detection of metal ions with a large emission change of fluorophores. We report the design of fluorescent probes based on arene-metal-ion interactions and their biological applications. This study found that various probes having different fluorophores and metal binding units displayed significant emission redshift upon complexation with metal ions, such as AgI, CdII, HgII, and PbII. X-ray crystallography of the complexes confirmed that the metal ions were held in close proximity to the fluorophore to form an arene-metal-ion interaction. Electronic structure calculations based on TDDFT offered a theoretical basis for the sensing mechanism, thus showing that metal ions electrostatically modulate the energy levels of the molecular orbitals of the fluorophore. A fluorescent probe was successfully applied to the ratiometric detection of the uptake of CdII ions and hydrogen sulfide (H2S) in living cells. These results highlight the utility of interactions between arene groups and metal ions in biological analyses.

Abstract: Filamentous Desulfobulbaceae have been reported to conduct electrons over centimetre-long distances, thereby coupling oxygen reduction at the surface of marine sediment to sulphide oxidation in sub-surface layers. To understand how these 'cable
bacteria establish and sustain electric conductivity, we followed a population for 53 days after exposing sulphidic sediment with initially no detectable filaments to oxygen. After 10 days, cable bacteria and electric currents were established throughout the top 15 mm of the sediment, and after 21 days the filament density peaked with a total length of 2 km cm⁻². Cells elongated and divided at all depths with doubling times over the first 10 days of <20 h. Active, oriented movement must have occurred to explain the separation of O₂ and H₂S by 15 mm. Filament diameters varied from 0.4-1.7 μm, with a general increase over time and depth, and yet they shared 16S rRNA sequence identity of >98%. Comparison of the increase in biovolume and electric current density suggested high cellular growth efficiency. While the vertical expansion of filaments continued over time and reached 30 mm, the electric current density and biomass declined after 13 and 21 days, respectively. This might reflect a breakdown of short filaments as their solid sulphide sources became depleted in the top layers of the anoxic zone. In conclusion, cable bacteria combine rapid and efficient growth with oriented movement to establish and exploit the spatially separated half-reactions of sulphide oxidation and oxygen consumption.

The ISME Journal advance online publication, 23 January 2014; doi:10.1038/ismej.2013.239

(18) Zhang M, Shan H, Chang P, Wang T, Dong W, Chen X, et al. Hydrogen sulfide offers neuroprotection on traumatic brain injury in parallel with reduced apoptosis and autophagy in mice. PLoS One 2014 Jan 23;9(1):e87241. Abstract: Hydrogen sulfide (H₂S), a novel gaseous mediator, has been recognized as an important neuromodulator and neuroprotective agent in the central nervous system. The present study was undertaken to study the effects of exogenous H₂S on traumatic brain injury (TBI) and the underlying mechanisms. The effects of exogenous H₂S on TBI were examined by using measurement of brain edema, behavior assessment, propidium iodide (PI) staining, and Western blotting, respectively. Compared to TBI groups, H₂S pretreatment had reduced brain edema, improved motor performance and ameliorated performance in Morris water maze test after TBI. Immunoblotting results showed that H₂S pretreatment reversed TBI-induced cleavage of caspase-3 and decline of Bcl-2, suppressed LC3-II, Beclin-1 and Vps34 activation and maintained p62 level in injured cortex and hippocampus post TBI. The results suggest a protective effect and therapeutic potential of H₂S in the treatment of brain injury and the protective effect against TBI may be associated with regulating apoptosis and autophagy.

(19) Peng YJ, Makarenko VV, Nanduri J, Vasavda C, Raghuraman G, Yuan G, et al. Inherent variations in CO-H₂S-mediated carotid body O₂ sensing mediate hypertension and pulmonary edema. Proc Natl Acad Sci U S A 2014 Jan 21;111(3):1174-9. Abstract: Oxygen (O₂) sensing by the carotid body and its chemosensory reflex is critical for homeostatic regulation of breathing and blood pressure. Humans and animals exhibit substantial interindividual variation in this chemosensory reflex response, with profound effects on cardiorespiratory functions. However, the underlying mechanisms are not known. Here, we report that inherent variations in carotid body O₂ sensing by carbon monoxide (CO)-sensitive hydrogen sulfide (H₂S) signaling contribute to reflex variation in three genetically distinct rat strains. Compared with Sprague-Dawley (SD) rats, Brown-Norway (BN) rats exhibit impaired carotid body O₂ sensing and develop pulmonary edema as a consequence of poor ventilatory adaptation to hypobaric hypoxia. Spontaneous Hypertensive (SH) rat carotid bodies display inherent hypersensitivity to hypoxia and develop hypertension. BN rat carotid bodies have naturally higher CO and lower H₂S levels than SD rat, whereas SH carotid bodies have reduced CO and greater H₂S generation. Higher CO levels in BN rats were associated with higher substrate affinity of the enzyme heme oxygenase 2, whereas SH rats present lower substrate affinity and, thus, reduced CO generation. Reducing CO levels in BN rat carotid bodies increased H₂S generation, restoring O₂ sensing and preventing hypoxia-induced pulmonary edema. Increasing CO levels in SH carotid bodies reduced H₂S generation, preventing hypersensitivity to hypoxia and controlling hypertension in SH rats.

Abstract: Although hydrogen sulfide (H2S) is generally thought to be a toxic gas, it has been reported to protect various tissues against ischemia-reperfusion injury. In the present study, we histologically investigated whether H2S, using sodium hydrosulfide (NaHS) as its donor, had a protective effect on N-methyl-D-aspartate (NMDA)-induced retinal injury in the rat in vivo. Under ketamine/xylazine anesthesia, male Sprague-Dawley rats were subjected to intravitreal NMDA injection. NaHS (0.163-120 mumol/kg) was intraperitoneally administered 15 min before NMDA injection. Morphometric evaluation at 7 days after NMDA injection showed that intravitreal NMDA injection resulted in ganglion cell loss. NaHS dose-dependently prevented this damage. NaHS (120 mumol/kg) significantly decreased the numbers of TUNEL-positive, 4-hydroxy-2-nonenal-positive, and 8-OHdG-positive cells 12 h after NMDA injection. In another experimental series, we demonstrated that NaHS (120 mumol/kg) significantly reduced the retinal injury induced by intravitreal NOC12 (400 nmol/eye), which was a nitric oxide donor and reported to induce oxidative stress, in the retina, 7 days after intravitreal injection. These results suggested that H2S protects retinal neurons against the injury induced by intravitreal NMDA in rats in vivo. Anti-oxidative activity of H2S are possibly involved in underlying protective mechanisms.


Abstract: A novel, red-pigmented, pleomorphic and short rod-shaped haloarchaeon, designated B8T, was isolated from a salt-fermented seafood. Strain B8T was found to be able to grow at 20-45 degrees C, in the presence of 15-30 % (w/v) NaCl and at pH 7.0-9.0. The optimum requirements were found to be a temperature range of 35-40 degrees C, pH 8.0 and the presence of 25 % NaCl. The cells of strain B8T were observed to be Gram-staining negative and lysed in distilled water. Anaerobic growth did not occur in the presence of nitrate, L-arginine, dimethyl sulfoxide or trimethylamine N-oxide. The catalase and oxidase activities were found to be positive and nitrate was reduced in aerobic conditions. Tween 20, 40 and 80 were found to be hydrolyzed, whereas casein, gelatin and starch were not hydrolyzed. Indole or H2S was not formed and urease activity was not detected. A phylogenetic analysis based on the 16S rRNA gene sequences indicated that strain B8T is most closely related to members of the genus Halorubrum in the family Halobacteriaceae. Strain B8T was found to have three 16S rRNA genes, rrnA, rrnB and rrnC; similarities between the 16S rRNA gene sequences are 99.0-99.8 %. Strain B8T shared 99.0 % 16S rDNA gene sequence similarity with Halorubrum (Hrr.) lipolyticum JCM 13559T and Hrr. saccharovorum DSM 1137T, 98.8 % with Hrr. kocurii JCM 14978T, 98.3 % with Hrr. Iacusprofundui DSM 5036T, 98.0 % with Hrr. arcis JCM 13916T, 97.7 % with Hrr. aignens JCM 13560T and 97.0 % with Hrr. aquaticum JCM 14031T, as well as 93.7-96.5 % with other type strains in the genus Halorubrum. The DNA-DNA hybridization experiments showed that strain B8T shared equal or lower than 50 % relatedness with reference species in the genus Halorubrum. The genomic DNA G+C content of strain B8T was determined to be 64.6 mol%. The major isoprenoid quinone of strain B8T was identified as menaquinone-8 and the major polar lipids as phosphatidylglycerol, phosphatidylglycerol phosphate methyl ester, phosphatidylglycerol sulfate, sulfated mannosyl glucosyl diether and an unidentified phospholipid. Based on this polyphasic taxonomic study, strain B8T is considered to represent a new species in the genus Halorubrum, for which the name Hrr. halophilum sp. nov. is proposed. The type strain is B8T (=JCM 18963T = CECT 8278T).
Guo C, Liang F, Shah MW, Yan X. Hydrogen sulfide protected gastric epithelial cell from ischemia/reperfusion injury by Keap1 s-sulfhydration, MAPK dependent anti-apoptosis and NF-kappaB dependent anti-inflammation pathway. Eur J Pharmacol 2014 Jan 18. Abstract: Hydrogen sulfide (H2S) has been proposed as a novel gas-transmitter, which plays multiple physiological and pathological functions in various body systems, including gastrointestinal tract. The present study was undertaken to investigate the effects and mechanisms of H2S pharmacological preconditioning on gastric epithelial cells ischemia-reperfusion (I/R) injury. We report here that sodium hydrosulfide (NaHS), an H2S donor, concentration-dependently suppressed I/R-induced cellular injury and apoptotic cell death. This protection effect was also confirmed by endogenous over-producing H2S. Furthermore, NaHS also prevented I/R-induced oxidative stress and inflammatory responses, evidenced by increases in GSH level, decreases in MDA contents, reactive oxygen species generation and secretions of NO, IL-6 and TNF-alpha. NaHS also prevented I/R-induced p38- and c-Jun NH2-terminal kinase (JNK)-mitogen-activated protein kinase (MAPK) phosphorylation and NF-kappaB activation. H2S also induced Keap1 s-sulfhydration, and further Keap1/Nrf2 disassociation and Nrf2 activation. H2S exerted its protective effect through reactive oxygen species clearance, inhibition of p38 and JNK dependent cell apoptosis and NF-kappaB dependent inflammation pathway. Our results provide evidence that H2S may have potential therapeutic value in acute gastric mucosal lesion, which is often caused by ischemia/reperfusion.

Xing B, Wang GC. Insight into the general rule for the activation of the X-H bonds (X = C, N, O, S) induced by chemisorbed oxygen atoms. Phys Chem Chem Phys 2014 Jan 15;16(6):2621-9. Abstract: Density functional theory calculations are presented for adsorption and dissociation of NH3, H2O, CH3OH, H2S and C2H4 on clean and oxygen atom pre-adsorbed metal surfaces (Cu, Ag, Au, Ni, Pd, Pt, Rh, Ru, Os and Ir). The calculation results indicated that the oxygen-promotion effect depends both on the metallic activity and the character of the X-H bond. On the one hand, for a given reaction on a series metals, a good linear correlation was found between the energy barrier difference of X-H bond breaking on clean and oxygen atom pre-adsorbed metal surfaces and the binding strength of oxygen on metals, namely an oxygen-promotion effect was favorable to the less active metals but unfavorable to the more active metals. On the other hand, for a series of X-H bond breaking reactions on a given metal, it was found that the promotion effect follows the trend of O-H > N-H > C-H, that is, the O-H bond is most promoted by the oxygen atom. The possible reason is the O-H bond forms the strongest hydrogen bond in the transition state among the X-H bonds investigated in this work. Additionally, it was found that the oxygen coverage has little effect on the X-H bond scission.

Hu KD, Wang Q, Hu LY, Gao SP, Wu J, Li YH, et al. Hydrogen Sulfide Prolongs Postharvest Storage of Fresh-Cut Pears (Pyrus pyrifolia) by Alleviation of Oxidative Damage and Inhibition of Fungal Growth. PLoS One 2014 Jan 15;9(1):e85524. Abstract: Hydrogen sulfide (H2S) has proved to be a multifunctional signaling molecule in plants and animals. Here, we investigated the role of H2S in the decay of fresh-cut pears (Pyrus pyrifolia). H2S gas released by sodium hydrosulfide (NaHS) prolonged the shelf life of fresh-cut pear slices in a dose-dependent manner. Moreover, H2S maintained higher levels of reducing sugar and soluble protein in pear slices. H2S significantly reduced the accumulation of hydrogen peroxide (H2O2), superoxide radicals (*O2 (-)) and malondialdehyde (MDA). Further investigation showed that H2S fumigation up-regulated the activities of antioxidant enzymes ascorbate peroxidase (APX), catalase (CAT), and guaiacol peroxidase (POD); while it down-regulated those of lipoxygenase (LOX), phenylalanine ammonia lyase (PAL) and polyphenol oxidase (PPO). Furthermore, H2S fumigation effectively inhibited the growth of two fungal pathogens of pear, Aspergillus niger and Penicillium expansum, suggesting that H2S can be developed as an effective fungicide for postharvest storage. The present study implies that H2S is
involved in prolonging postharvest storage of pears by acting as an antioxidant and fungicide

Abstract: The neuroprotective properties for certain medical gases have been observed for decades, leading to extensive research that has been widely reported and continues to garner interest. Common gases including oxygen, hydrogen, carbon dioxide and nitric oxide, volatile anesthetics such as isoflurane, sevoflurane, halothane, enflurane and desflurane, non-volatile anesthetics such as xenon and nitrous oxide, inert gases such as helium and argon, and even gases classically considered to be toxic (e.g., hydrogen sulfide and carbon monoxide) have all been supported by the evidence alluding to their use as potential neuroprotective agents. A wide range of neural injury types such as ischemic/hemorrhagic, stroke, subarachnoid hemorrhage, traumatic brain injury, perinatal hypoxic-ischemic brain injuries, neurodegenerative disease as well as spinal cord ischemia have been used as platforms for studying the neuroprotective effects of these gases, yet until now, none of the gases has been widely introduced into clinical use specifically for protection against neural injury. Insufficient clinical data together with contradictory paradigms and results further hinders the clinical trials. However, preclinical models suggest that despite the various classes of gases and the broad range of injuries to which medical gases confer, protection, several underlying mechanisms for their neuroprotective properties are similar. In this review, we summarize the literature concerning the neuroprotective effect of each gas and its underlying mechanisms, extract common targets reported for the neuroprotective effects of different gases, highlight the conflicting observations from clinical trials and further discuss the possible hindrances impeding clinical applications in order to propose future research perspectives and therapeutic exploitations

Abstract: Homocysteine (Hcy) is a risk factor for Alzheimer's disease (AD). Hydrogen sulfide (H2S) acts as an endogenous neuromodulator and neuroprotectant. It has been shown that endoplasmic reticulum (ER) stress is involved in the pathological mechanisms of the learning and memory dysfunctions and that H2S exerts its neuroprotective role via suppressing ER stress. In the present work, we explored the effects of intracerebroventricular injection of Hcy on the formation of learning and memory, the generation of endogenous H2S, and the expression of ER stress in the hippocampus of rats. We found that intracerebroventricular injection of Hcy in rats leads to learning and memory dysfunctions in the Morris water maze and novel of object recognition test and decreases in the expression of cystathionine-beta-synthase, the major enzyme responsible for endogenous H2S generation, and the generation of endogenous H2S in the hippocampus of rats. We also showed that exposure of Hcy could up-regulate the expressions of glucose-regulated protein 78 (GRP78), CHOP, and cleaved caspase-12, which are the major mark proteins of ER stress, in the hippocampus of rats. Taken together, these results suggest that the disturbance of hippocampal endogenous H2S generation and the increase in ER stress in the hippocampus are related to Hcy-induced defect in learning and memory

Abstract: Hydrogen sulfide (H2S) has emerged as an important gaseous signaling molecule that is produced endogenously by enzymes in the sulfur metabolic network. H2S exerts its effects on multiple physiological processes important under both normal and pathological conditions. These functions include neuromodulation, regulation of
blood pressure and cardiac function, inflammation, cellular energetics and apoptosis. Despite the recognition of its biological importance and its beneficial effects, the mechanism of H2S action and the regulation of its tissue levels remain unclear in part owing to its chemical and physical properties that render handling and analysis challenging. Furthermore, the multitude of potential H2S effects has made it difficult to dissect its signaling mechanism and to identify specific targets. In this review, we focus on H2S metabolism and provide an overview of the recent literature that sheds some light on its mechanism of action in cellular redox signaling in health and disease. This article is part of a Special Issue entitled: Thiol-Based Redox Processes

Abstract: Because of the biological relevance of thiols and sulfides such as cysteine, homocysteine, glutathione and hydrogen sulfide, their detection has attracted a great deal of research interest. Fluorescent probes are emerging as a new strategy for thiol and hydrogen sulfide analysis due to their high sensitivity, low cost, and ability to detect and image thiols in biological samples. In this short review we have summarized recent advances in the development of thiol and hydrogen sulfide reactive fluorescent probes. These probes are compared and contrasted with regard to their designing strategies, mechanisms, photophysical properties, and/or reaction kinetics. Biological applications of these probes are also discussed. J. Cell. Biochem. 9999: XX-XX, 2014. (c) 2013 Wiley Periodicals, Inc

Abstract: Vanadium oxide cluster anions Vm16On- and Vm18On- were prepared by laser ablation and reacted with hydrogen sulfide (H2S) in a fast flow reactor under thermal collision conditions. A time-of-flight mass spectrometer was used to detect the cluster distributions before and after the interactions with H2S. The experiments suggest that the oxygen-for-sulfur (O/S) exchange reaction to release water was evidenced in the reactor for most of the cluster anions: VmOn- + H2S --> VmOn-1S- + H2O. For reactions of clusters VO3- and VO4- with H2S, consecutive O/S exchange reactions led to the generation of sulfur containing vanadium oxide cluster anions VO3-kSk- (k = 1-3) and VO4-kSk- (k = 1-4). Density functional theory calculations were performed for the reactions of VO3-4- with H2S, and the results indicate that the O/S exchange reactions are both thermodynamically and kinetically favorable, which supports the experimental observations. The reactions of VmOn+ cluster cations with H2S have been reported previously ( Jia , M.-Y. ; Xu , B. ; Ding , X.-L. ; Zhao , Y.-X. ; He , S.-G. ; Ge , M.-F. J. Phys. Chem. C 2012 , 116 , 9043 ), and this study of cluster anions provides further new insights into the transformations of H2S over vanadium oxides at the molecular level

Abstract: The epigenome is uniquely positioned as a point of convergence, integrating multiple intracellular signaling cascades into a cohesive gene expression profile necessary for long-term behavioral change. The last decade of neuroepigenetic research has primarily focused on learning-induced changes in DNA methylation and chromatin modifications. Numerous studies have independently demonstrated the importance of epigenetic modifications in memory formation and retention as well as Hebbian plasticity. However, how these mechanisms operate in the context of other forms of plasticity is largely unknown. In this review, we examine evidence for epigenetic regulation of Hebbian plasticity. We then discuss how non-Hebbian forms of plasticity, such as intrinsic plasticity and synaptic scaling, may also be involved in producing the cellular adaptations necessary for learning-related behavioral change. Furthermore, we consider the likely
roles for transcriptional and epigenetic mechanisms in the regulation of these plasticities. In doing so, we aim to expand upon the idea that epigenetic mechanisms are critical regulators of both Hebbian and non-Hebbian forms of plasticity that ultimately drive learning and memory. This article is part of a Special Issue entitled 'Neuroepigenetic disorders.'

(31) Fang T, Cao Z, Li J, Shen W, Huang L. Auxin-induced hydrogen sulfide generation is involved in lateral root formation in tomato. Plant Physiol Biochem 2014 Jan 10;76C:44-51. Abstract: Similar to auxin, hydrogen sulfide (H2S), mainly produced by l-cysteine desulphydrase (DES; EC 4.4.1.1) in plants, could induce lateral root formation. The objective of this study was to test whether H2S is also involved in auxin-induced lateral root development in tomato (Solanum lycopersicum L.) seedlings. We observed that auxin depletion-induced down-regulation of transcripts of Sides1, decreased DES activity and endogenous H2S contents, and the inhibition of lateral root formation were rescued by sodium hydrosulfide (NaHS, an H2S donor). However, No additive effects were observed when naphthalene acetic acid (NAA) was co-treated with NaHS (lower than 10 mM) in the induction of lateral root formation. Subsequent work revealed that a treatment with NAA or NaHS could simultaneously induce transcripts of Sides1, DES activity and endogenous H2S contents, and thereafter the stimulation of lateral root formation. It was further confirmed that H2S or HS-, not the other sulfur-containing components derived from NaHS, was attributed to the stimulative action. The inhibition of lateral root formation and decreased of H2S metabolism caused by an H2S scavenger hypotaurine (HT) were reversed by NaHS, but not NAA. Molecular evidence revealed that both NaHS- or NAA-induced modulation of some cell cycle regulatory genes, including the up-regulation of SICDKA;1, SYCA2;1, together with simultaneous down-regulation of SIKRP2, were differentially reversed by HT pretreatment. To summarize, above results clearly suggested that H2S might, at least partially, act as a downstream component of auxin signaling to trigger lateral root formation.

(32) Dussadee N, Reansuwan K, Ramaraj R. Potential development of compressed bio-methane gas production from pig farms and elephant grass silage for transportation in Thailand. Bioresour Technol 2014 Jan 9. Abstract: This research project evaluated biogas production using anaerobic co-digestion of pig manure and elephant grass silage in large scale to delivered transportation directly for cars. Anaerobic co-digestion was estimated in three full-scale continuously stirred tank reactors (CSTRs) at 40 degrees C. In the form of compressed bio-methane gas (CBG) production was 14,400m3/day (CH4 60-70%) amount of CBG was 9600m3/day. The procedure was enhanced by using molecular sieve, activated carbon for removal of moisture and CO2 membrane H2S and CO2 respectively. The results were demonstrated the amount of CO2, H2S gas was reduced along with CH4 was improved up to 90% by volume and compressed to 250bar tank pressure gauge to the fuel for cars. The CBG production, methane gas improvement and performance were evaluated before entering the delivered systems according to the energy standards. The production of CBG is advantageous to strengthen the Thailand biogas market.

(33) Jouki M, Yazdi FT, Mortazavi SA, Koocheki A, Khazaei N. Effect of quince seed mucilage edible films incorporated with oregano or thyme essential oil on shelf life extension of refrigerated rainbow trout fillets. Int J Food Microbiol 2014 Jan 9;174C:88-97. Abstract: The effects of quince seed mucilage film (QSMF) containing oregano (O) or thyme (T) essential oil on shelf life extension of rainbow trout (Oncorhynchus mykiss) fillets during refrigerated storage (4 degrees C) were evaluated over a period of 18days. Films were prepared in four different concentrations of essential oils, including 0, 1, 1.5 and 2%. The control and the wrapped fillet samples were analyzed periodically for microbiological (aerobic and psychrotrophic count, Pseudomonas spp., H2S-producing bacteria, lactic acid bacteria, and Enterobacteriaceae), chemical (TBA, TVB-N, TMA-N),
and sensory characteristics. Bacteria grew most quickly in trout fillets stored in air, followed by those wrapped with QSMF and the lowest counts were in wrapped samples with QSMF+2%T. Pseudomonas spp., Enterobacteriaceae and LAB counts were significantly lower in samples wrapped with QSMF+2%T. The lowest TBA value was obtained in fillets wrapped QSMF containing 2% oregano essential oil. The strong antioxidant activity of QSMF+2%O was related to the composition of oregano essential oil. The GC analysis of essential oil components revealed that carvacrol (81.85%) was the major component of oregano essential oil. TBA value varied for all treatments and remained lower than 2mg MDA/kg throughout storage. The formation of TVB-N, TMA-N increased with time of storage. TVB-N and TMA-N correlated well with the microbiological data, indicating that along with TVB-N, TMA-N may serve as a useful index for fillets spoilage. QSMF extended the microbial shelf life of rainbow trout fillets by 2 days, whereas the QSMF+1%O, QSMF+1.5%O, QSMF+2%O, QSMF+1%T, QSMF+1.5%T and QSMF+2%T resulted in a significant shelf life extension of the trout fillets by 3, 5, 9, 6, 10, and 11 days, respectively, as compared to the control samples.

Abstract: Alzheimer's disease (AD) is defined both by its progressive cognitive deterioration and hallmark increase in neuronal Abeta plaque formation. However, many of the underlying neurobiological facets of this disease are still being elucidated. Previous research has demonstrated that production of neuronal hydrogen sulfide (H2S) is significantly decreased in patients with AD. Moreover, systemic plasma H2S levels are negatively correlated with its severity. However, how a decrease in H2S production might be correlated with either the etiology or pathophysiology of AD remains unknown. To better understand the role of H2S in AD, we examined both levels of H2S and the expression and activity H2S-synthesizing enzyme (cystathionine beta synthase or CBS) in an APP/PS1 transgenic mouse line at 3, 6, 9, and 12 months. After intraperitoneal (i.p.) administration of an H2S donor (NaHS) into APP/PS1 mice, application of exogenous H2S resulted in improved spatial learning and memory acquisition in APP/PS1 mice. H2S administration also led to significant decrease in extracellular levels of Abeta40 and Abeta42, the expression of BACE1 and PS1, and a significant increase of ADAM17 expression. Similarly, an increase in non-amyloidogenic C83 fragment generation and a decrease in amyloidogenic C99 fragment generation were also observed. Thus, NaHS application resulted in a shift from the plaque-forming beta pathway to the non-plaque forming alpha pathway of APP cleavage in 6 and 12 month APP/PS1 mice. These results indicate the importance of H2S to AD severity and that administration of exogenous H2S can promote a non-amyloidogenic processing of APP.

Abstract: Biofouling on ships and boats, characterized by aquatic bacteria and small organisms attaching to the hull, is an important global issue, since over 80000 tons of antifouling paint is used annually. This biofilm, which can form in as little as 48 hours depending on water temperature, increases drag on watercraft, which greatly reduces their fuel efficiency. In addition, biofouling can lead to microbially induced corrosion (MIC) due to H2S formed by the bacteria, especially sulfate-reducing bacteria. When the International Maritime Organization (IMO) international convention banned the use of effective but environmentally damaging coatings containing tributyl tin in 2008, the development of clean and effective antifouling systems became more important than ever. New nonbiocidal coatings are now in high demand. Scientists have developed new polymers, materials, and biocides, including new elastomeric coatings that they have obtained by improving the original silicone (polydimethylsiloxane) formulation patented in 1975. However, the high cost of silicones, especially of fluoropolymer-modified silicones, has generally prevented their large-scale diffusion. In 2009, traditional antifouling
coatings using cuprous oxide formulated in copolymer paints still represented 95% of the global market volume of anti-fouling paints. The sol-gel nanochemistry approach to functional materials has emerged as an attractive candidate for creating low fouling surfaces due to the unique structure and properties of silica-based coatings and of hybrid inorganic-organic silicas in particular. Sol-gel formulations easily bind to all types of surfaces, such as steel, fiberglass, aluminum, and wood. In addition, they can cure at room temperature and form thin glassy coatings that are markedly different from thick silicone elastomeric foul-releasing coatings. Good to excellent performance against biofouling, low cure temperatures, enhanced and prolonged chemical and physical stability, ease of application, and the waterborne nature of sol-gel coatings all support the diffusion of these paints to efficiently reduce the accumulation of fouling layers on valued surfaces immersed in marine or fluvial waters. Furthermore, sol-gel glassy coatings are transparent and can be effectively applied to optical devices, windows, and solar panels used in lake, fluvial, or marine environments. Sol-gel technology is eminently versatile, and the first generation sol-gel paints have already shown good performance. Even so, vast opportunities still exist for chemists to develop novel sol-gel derived coatings to both prevent biofouling and enhance the hydrodynamic properties of boat and ship hulls. Moreover, researchers have prepared and applied multifunctional sol-gel coatings providing protection against both biofouling and corrosion. They have tested these in the marine environment with good preliminary results. In this Account, we discuss some of our new strategies for the controlled functionalization of surfaces for the development of efficient antifouling and foul-releasing systems and summarize the main achievements with biocidal and nonbiocidal sol-gel coatings. We conclude by giving insight into the marine coatings and sol-gel products markets, providing arguments to justify our conclusion that the sol-gel coatings technology is now a mature platform for the development of economically viable and environmentally friendly antifouling and foul-release formulations of enhanced performance.

Abstract: We investigated the cloning, catalytic activity and anion inhibition of the beta-class carbonic anhydrases (CAs, EC 4.2.1.1) from the bacterial pathogen Legionella pneumophila. Two such enzymes, LpCA1 and LpCA2, were found in the genome of this pathogen. These enzymes were determined to be efficient catalysts for CO2 hydration, with kcat values in the range of (3.4-8.3)x10^5s^-1 and kcat/KM values of (4.7-8.5)x10^7M^-1s^-1. A set of inorganic anions and small molecules was investigated to identify inhibitors of these enzymes. Perchlorate and tetrafluoroborate were not acting as inhibitors (KI >200mM), whereas sulfate was a very weak inhibitor for both LpCA1 and LpCA2 (KI values of 77.9-96.5mM). The most potent LpCA1 inhibitors were cyanide, azide, hydrogen sulfide, diethylthiocarbamate, sulfamate, sulfamide, phenylboronic acid and phenylarsonic acid, with KI values ranging from 6 to 94μM. The most potent LpCA2 inhibitors were diethylthiocarbamate, sulfamide, sulfamate, phenylboronic acid and phenylarsonic acid, with KI values ranging from 2 to 13μM. As these enzymes seem to be involved in regulation of phagosome pH during Legionella infection, inhibition of these targets may lead to antibacterial agents with a novel mechanism of action.

Abstract: Sepsis is a major cause of mortality, and dysregulation of the immune response plays a central role in this syndrome. H2S, a recently discovered gaso-transmitter, is endogenously generated by many cell types, regulating a number of physiologic processes and pathophysiologic conditions. We report that H2S increased survival after experimental sepsis induced by cecal ligation and puncture (CLP) in mice. Exogenous H2S decreased the systemic inflammatory response, reduced apoptosis in the spleen,
and accelerated bacterial eradication. We found that C/EBP homologous protein 10 (CHOP), a mediator of the endoplasmic reticulum stress response, was elevated in several organs after CLP, and its expression was inhibited by H2S treatment. Using CHOP-knockout (KO) mice, we demonstrated for the first time, to our knowledge, that genetic deletion of Chop increased survival after LPS injection or CLP. CHOP-KO mice displayed diminished splenic caspase-3 activation and apoptosis, decreased cytokine production, and augmented bacterial clearance. Furthermore, septic CHOP-KO mice treated with H2S showed no additive survival benefit compared with septic CHOP-KO mice. Finally, we showed that H2S inhibited CHOP expression in macrophages by a mechanism involving Nrf2 activation. In conclusion, our findings show a protective effect of H2S treatment afforded, at least partially, by inhibition of CHOP expression. The data reveal a major negative role for the transcription factor CHOP in overall survival during sepsis and suggest a new target for clinical intervention, as well potential strategies for treatment.

Abstract: Using a sol-gel method, SmMeOx/MCM-41 or SBA-15 (Me=Fe, Co and Zn) and corresponding unsupported sorbents were prepared. The desulfurization performance of these sorbents was evaluated over a fixed-bed reactor and the effects of reaction temperature, feed and sorbent composition on desulfurization performance were studied. Samarium-based sorbents used to remove H2S from hot coal gas were reported for the first time. The results of successive sulfidation/regeneration cycles revealed that SmFeO3/SBA-15 sorbent was suitable for desulfurization of hot coal gas in the chemical industry. The formation of elemental sulfur during both sulfidation and regeneration processes depended strongly on the catalytic action of Sm2O2S species, which was confirmed for the first time via high sensitive time of flight mass spectrometer (TOF-MS) using 6%vol18O2/Ar regeneration gas and can reduce markedly procedural complexity. The sorbents were characterized using N2-adsorption, high-resolution transmission electron microscopy (HRTEM), X-ray diffraction (XRD), temperature-programmed reduction of H2 (H2-TPR), thermogravimetry (TG) and time-of-flight mass spectrometry (TOF-MS) techniques.

Abstract: BACKGROUND: Diabetes and particularly high blood glucose levels are implicated in neurodegeneration. One of the hallmarks of neurodegeneration is protein aggregation. We investigated the presence of protein aggregation in the frontal brain of Zucker diabetic fatty (ZDF) rats, an animal model for diabetes. Further, the effect of NaHS in suppressing protein aggregation in cultured brain slices from ZDF was assessed. RESULTS: The levels of protein synthesis, protein/gene expression, autophagy and anti-oxidant defense were evaluated in ZDF and control (Lean) brains. Compared to Lean, ZDF brains displayed a significant increase in protein aggregates, p-tau, fibronectin expression and protein glycosylation. Increased phosphorylation of mTOR and S6 ribosomal protein in ZDF indicated higher protein synthesis, while the increase in ubiquitinated proteins and LC3-I in ZDF brains accompanied by lower LC3-II expression and LC3-II/LC3-I levels indicated the blockage of proteolytic pathways. CBS (cystathionine beta synthase) protein and mRNA expression and thiol group levels in ZDF brains were lower compared to Lean. ZDF brains show a higher level of reactive oxygen species. In vitro NaHS treatment normalized proteostasis while counteracting oxidative stress. CONCLUSION: Our data demonstrate increased protein synthesis and aggregation in the diabetic ZDF rat brain.
which was reversible by NaHS treatment. This is the first report on the potential use of NaHS as a novel strategy against protein aggregation in diabetic brain.

(40) Zhao W, Maeda K, Zhang F, Hisatomi T, Domen K. Effect of post-treatments on the photocatalytic activity of SmTiSO for the hydrogen evolution reaction. Phys Chem Chem Phys 2014 Jan 6. Abstract: The oxysulphide photocatalyst Sm2Ti2S2O5 was synthesized by sulphurizing an amorphous Sm2Ti2O7 prepared using a polymerized complex method under a H2S flow and was used as a H2 evolution photocatalyst in the sacrificial H2 evolution and Z-scheme water splitting reactions. The H2 evolution activity of Rh-loaded Sm2Ti2S2O5 was improved by annealing with sulphur powder and etching with nitric acid. Characterization using XRD, SEM, DRS and XPS suggested that annealing with sulphur decreased the density of the reduced Ti species in Sm2Ti2S2O5 and etching with nitric acid removed the amorphous phases and excessive sulphur species on the surface. After the two post-treatments, platinized Sm2Ti2S2O5 combined with rutile-type TiO2 and NaI showed activity for Z-scheme water splitting under UV irradiation. Although UV irradiation was necessary owing to the use of TiO2, this work provided the first evidence that an oxysulphide photocatalyst was applicable to Z-scheme water splitting.

(41) Zhu X, Xu L, Wu T, Xu A, Zhao M, Liu S. Continuous monitoring of bisulfide variation in microdialysis effluents by on-line droplet-based microfluidic fluorescent sensor. Biosens Bioelectron 2014 Jan 3;55C:438-45. Abstract: We demonstrate a novel fluorescent sensor for real-time and continuous monitoring of the variation of bisulfide in microdialysis effluents by using a nanoparticle-glutathione-fluorescein isothiocyanate (AuNP-GSH-FITC) probe coupled with on-line droplet-based microfluidic chip. The AuNP-GSH-FITC fluorescent probe was firstly developed and used for bisulfide detection in bulk solution by quantitative real-time PCR, which achieved a linear working range from 0.1μM to 5.0μM and a limit of detection of ~50nM. The response time was less than 2min. With the aid of co-immobilized thiol-polyethylene glycol, the probe exhibited excellent stability and reproducibility in high salinity solutions, including artificial cerebrospinal fluids (aCSF). By adding 0.1% glyoxal to the probe solution, the assay allowed quantification of bisulfide in the presence of cysteine at the micro-molarity level. Using the AuNP-GSH-FITC probe, a droplet-based microfluidic fluorescent sensor was further constructed for online monitoring of bisulfide variation in the effluent of microdialysis. By using fluorescence microscope-charge-coupled device camera as the detector, the integrated microdialysis/microfluidic chip device achieved a detection limit of 2.0μM and a linear response from 5.0μM to 50μM for bisulfide in the tested sample. The method was successfully applied for the on-line measurement of bisulfide variation in aCSF and serum samples. It will be a very useful tool for tracking the variation of bisulfide or hydrogen sulfide in extracellular fluids.

(42) Renard JF, Lecomte F, Hubert P, de L, X, Pirotte B. N-(3-Arylamino-pyridin-4-yI)alkanesulfonamides as pyridine analogs of nimesulide: Cyclooxygenases inhibition, anti-inflammatory studies and insight on metabolism. Eur J Med Chem 2014 Jan 3;74C:12-22. Abstract: Nimesulide, a COX-2 preferential inhibitor with a favorable gastric and cardiovascular safety profile, was responsible for some cases of acute liver failure attributed to the nitrobenzene ring. A series of analogs of nimesulide resulting from isosteric replacement of the nitrobenzene ring by the pyridine nucleus, was synthesized and their ability to inhibit both cyclooxygenases (COXs) isoforms was evaluated in vitro using a human whole blood model. Compounds 19c, 23b and 23c displayed an important inhibitory activity associated to a COX-2/COX-1 selectivity ratio similar to or higher than that of celecoxib. The anti-inflammatory activity and the ability of several compounds to decrease leukocyte infiltration were further evaluated in vivo in a model of a lambda carrageenan-induced pleurisy. Plasma assays were performed on blood samples collected from rats and allowed us to identify the 4-position of the phenyl ring as a major
metabolism site explaining the occasionally observed lack of correlation between in vitro and in vivo results.

Abstract: The ability to sense and adapt to changes in pO2 is crucial for basic metabolism in most organisms, leading to elaborate pathways for sensing hypoxia (low pO2). This review focuses on the mechanisms utilized by mammals and bacteria to sense hypoxia. While responses to acute hypoxia in mammalian tissues lead to altered vascular tension, the molecular mechanism of signal transduction is not well understood. In contrast, chronic hypoxia evokes cellular responses that lead to transcriptional changes mediated by the hypoxia inducible factor (HIF), which is directly controlled by post-translational hydroxylation of HIF by the non-heme Fe(II)/alphaKG-dependent enzymes FIH and PHD2. Research on PHD2 and FIH is focused on developing inhibitors and understanding the links between HIF binding and the O2 reaction in these enzymes. Sulfur speciation is a putative mechanism for acute O2-sensing, with special focus on the role of H2S. This sulfur-centered model is discussed, as are some of the directions for further refinement of this model. In contrast to mammals, bacterial O2-sensing relies on protein cofactors that either bind O2 or oxidatively decompose. The sensing modality for bacterial O2-sensors is either via altered DNA binding affinity of the sensory protein, or else due to the actions of a two-component signaling cascade. Emerging data suggests that proteins containing a hemerythrin-domain, such as FBXL5, may serve to connect iron sensing to O2-sensing in both bacteria and humans. As specific molecular machinery becomes identified, these hypoxia sensing pathways present therapeutic targets for diseases including ischemia, cancer, or bacterial infection.

Abstract: Adipose tissue hormone leptin induces endothelium-dependent vasorelaxation mediated by nitric oxide (NO) and endothelium-derived hyperpolarizing factors (EDHF). Previously it has been demonstrated that in short-term obesity the NO-dependent and the EDHF-dependent components of vascular effect of leptin are impaired and up-regulated, respectively. Herein we examined the mechanism of the EDHF-dependent vasodilatory effect of leptin and tested the hypothesis that alterations of acute vascular effects of leptin in obesity are accounted for by chronic hyperleptinemia. The study was performed in 5 groups of rats: (1) control, (2) treated with exogenous leptin for 1 week to induce hyperleptinemia, (3) obese, fed highly-palatable diet for 4 weeks, (4) obese treated with pegylated superactive rat leptin receptor antagonist (PEG-SRLA) for 1 week, (5) fed standard chow and treated with PEG-SRLA. Acute effect of leptin on isometric tension of mesenteric artery segments was measured ex vivo. Leptin relaxed phenylephrine-preconstricted vascular segments in NO- and EDHF-dependent manner. The NO-dependent component was impaired and the EDHF-dependent component was increased in the leptin-treated and obese groups and in the latter group both these effects were abolished by PEG-SRLA. The EDHF-dependent vasodilatory effect of leptin was blocked by either the inhibitor of cystathionine gamma-lyase, propargylglycine, or a hydrogen sulfide (H2S) scavenger, bismuth (III) subsalicylate. The results indicate that NO deficiency is compensated by the up-regulation of EDHF in obese rats and both effects are accounted for by chronic hyperleptinemia. The EDHF-dependent component of leptin-induced vasorelaxation is mediated, at least partially, by H2S.

Abstract: Nitrite was recognized as a potent vasodilator >130 years and has more recently emerged as an endogenous signaling molecule and modulator of gene
expression. Understanding the molecular mechanisms that regulate nitrite metabolism is essential for its use as a potential diagnostic marker as well as therapeutic agent for cardiovascular diseases. In this study, we have identified human cystathionine ss-synthase (CBS) as a new player in nitrite reduction with implications for the nitrite-dependent control of H2S production. This novel activity of CBS exploits the catalytic property of its unusual heme cofactor to reduce nitrite and generate NO. Evidence for the possible physiological relevance of this reaction is provided by the formation of ferrous-nitrosyl (Fe(II)-NO) CBS in the presence of NADPH, the human diflavin methionine synthase reductase (MSR) and nitrite. Formation of Fe(II)-NO CBS via its nitrite reductase activity inhibits CBS, providing an avenue for regulating biogenesis of H2S and cysteine, the limiting reagent for synthesis of glutathione, a major antioxidant. Our results also suggest a possible role for CBS in intracellular NO biogenesis particularly under hypoxic conditions. The participation of a regulatory heme cofactor in CBS in nitrite reduction is unexpected and expands the repertoire of proteins that can liberate NO from the intracellular nitrite pool. Our results reveal a potential molecular mechanism for cross-talk between nitrite, NO and H2S biology.

Abstract: Odor nuisance and sulfide corrosion in sewers carrying septic wastewater are accelerated at points of turbulence such as drops in manholes, but accurate methods or empirical expressions to evaluate the gas stripping rate at those particular sites are still missing. With the aim of improving the current knowledge on the influence of free-fall drops on the release of hydrogen sulfide gas, an experimental set-up was built allowing different free-fall drops heights and flows. Three types of experiments were carried out: reaeration tests without sulfide; sulfide oxidation tests; and hydrogen sulfide release tests. With the increase of the free-fall drop height or of the flow, a higher rate of air-to-water mass oxygen transfer was observed. Results regarding sulfide oxidation tests with reaeration through the free-fall have shown that the oxidation rate was correlated with flow. In the hydrogen sulfide release tests, the maximum concentration in the atmosphere reached 500 ppm. Results also showed that increasing the flow rate decreased the time at which the maximum concentrations in the atmosphere were observed.

Abstract: Odour abatement units are typically designed and maintained on H2S concentrations, but operational failures are reported in terms of overall odour removal, suggesting a wide range of malodorous compounds emitted from sewers that may not be efficiently removed by existing odour abatement processes. Towards providing greater insight into this issue, several activated carbon filters and biofilters treating odorous emissions from sewer systems in Sydney (Australia) were monitored by collecting and analysing gas samples before and after treatment. The monitoring studies were conducted by both olfactometric measurements and gas-chromatography-based chemical analysis. Single H2S assessment often failed to indicate the odour abatement performance for treatment systems in the abatement units studied, particularly when the incoming H2S concentrations were in the sub-ppm range (i.e. below H2S odour threshold). Chemical analysis indicated that some non-H2S odorous compounds were not removed efficiently during odour treatment. Additionally, when odour eliminations were correlated with the removal of individual compounds (Pearson's correlations) it was observed that the correlation (with a coefficient of 0.79) was best when the overall removal of all the measured odorous compounds that exceeded their odour threshold values was used for the analysis. These findings may help to further advance the design and operation of odour abatement processes to address the treatment of sewer odour emissions.

Abstract: Using the Lamb-dip technique, the hyperfine structure in the rotational spectra of H2 33S and 33SO2 has been resolved and the corresponding parameters—that is, the sulfur quadrupole-coupling and spin-rotation tensors—were determined. The experimental parameters are in good agreement with results from high-level coupled-cluster calculations, provided that up to quadruple excitations are considered in the cluster operator, sufficiently large basis sets are used, and vibrational corrections are accounted for. The 33S spin-rotation tensor for H2S has been used to establish a new sulfur nuclear magnetic shielding scale, combining the paramagnetic part of the shielding as obtained from the spin-rotation tensor with a calculated value for the diamagnetic part as well as computed vibrational and temperature corrections. The value of 716(5) ppm obtained in this way for the sulfur shielding of H2S is in good agreement with results from high-accuracy quantum-chemical calculations but leads to a shielding scale that is about 28 ppm lower than the one suggested previously in the literature, based on the 33S spin-rotation constant of OCS.


Abstract: Diabetic cardiomyopathy (DCM) has become a major cause of diabetes-related morbidity and mortality. Increasing evidences have proved that hydrogen sulfide (H2S) fulfills a positive role in regulating diabetic myocardial injury. The present study was designed to determine whether GYY4137, a novel H2S-releasing molecule, protected H9c2 cells against high glucose (HG)-induced cytotoxicity by activation of the AMPK/mTOR signal pathway. H9c2 cells were incubated in normal glucose (5.5 mM), 22, 33, and 44 mM glucose for 24 h to mimic the hyperglycemia in DCM in vitro. Then we added 50, 100, and 200 μM GYY4137, and measured the cell viability, lactate dehydrogenase (LDH) enzyme activity, and mitochondrial membrane potential (MMP). 0.5 mM 5-amino-4-imidazole-carboxamide riboside (AICAR, an AMPK activator) and 1 mM adenine 9-beta-D-arabinofuranoside (Ara-A, an AMPK inhibitor) were used to identify whether the AMPK/mTOR signal pathway was involved in GYY4137-mediated cardioprotection. We demonstrated that HG decreased cell viability and increased LDH enzyme activity in a concentration-dependent manner. 33 mM HG treatment for 24 h was chosen as our model group for further study. Both 100 and 200 μM GYY4137 treatments significantly attenuated HG-induced cell viability decrement, LDH enzyme activity increase, and MMP collapse. AICAR had similar effects to GYY4137 treatment while Ara-A attenuated GYY4137-mediated cardioprotection. Importantly, both GYY4137 and AICAR increased AMPK phosphorylation and decreased mTOR phosphorylation compared with the HG model group while Ara-A attenuated GYY4137-mediated AMPK phosphorylation increase and mTOR phosphorylation decrement. In conclusion, we propose that GYY4137 likely protects against HG-induced cytotoxicity by activation of the AMPK/mTOR signal pathway in H9c2 cells.


Abstract: OBJECTIVE: Nonsteroidal anti-inflammatory drugs (NSAIDs) represent a critically important class of medications useful in numerous musculoskeletal and inflammatory diseases. The focus of NSAID use has recently centered on gastrointestinal (GI) side effects and potential cardiovascular toxicity. Innovative new oral and intra-articular pharmaceutically engineered dosage forms are examined. We review recently developed intravenous NSAIDs and their potential advantages over oral products in the perioperative setting. DESIGN: Databases searched included PubMed, Google Scholar, Ovid, and Athens. We contacted key U.S. and Japanese manufactures who are developing new and innovative NSAID technologies for inclusion in this overview. Early
attempts at mitigating GI toxicity with oral agents combined with gastroprotective additives are outlined. RESULTS: Contemporary technologies coupled with uniquely advanced pharmaceutical manipulations to improve safety and efficacy are discussed including combined vasodilating agent naproxcinod as the prototypical cyclooxygenase-inhibiting nitric oxide (NO) donor; hydrogen sulfide-releasing compounds to protect GI mucosa; glycoscience technologies combining the intra-articular hyaluronic acid SI-613 combined with NSAIDs; and nano-formulated SoluMatrix submicron technologies that include diclofenac, indomethacin, naproxen, and meloxicam. CONCLUSIONS: New NSAIDs under development are intended to address GI and cardiovascular pitfalls inherent to current therapy options across the entire NSAID drug class. NO or hydrogen sulfide donating drugs, new reliable injectables for perioperative and inpatient use, novel intra-articular extended-release NSAIDs combined with IAHA, and nano-formulations of submicron NSAIDs featuring delivery of decreased doses without diminished efficacy promise to afford innovative technologies that likely will be the future of NSAID therapy.


Abstract: A bench-scale biotrickling filter was operated in the laboratory for the treatment of dimethyl sulphide (DMS). The biotrickling filter was packed with pre-sterilized polyurethane foam and seeded with biomass developed from garden soil enriched with DMS. The biotrickling filter was operated for the generation of process parameters. The biotrickling filter could remove an average removal efficiency of 40.95% at an effective bed contact time of 84 sec with an average loading rate of 0.56 mg/m3/h. Evaluation of microbiological status of the biotrickling filter indicated the presence of other bacterial cultures viz. Paenibacillus polymyxa, and Bacillus megaterium, besides Bacillus sphaericus.

Abstract: This review is devoted to the challenging problems of balneotherapeutics, such as the mechanisms of antihypertensive balneotherapy and its optimization. The experience of the authors with the practical application of chloride - sodium, iodine - bromide, and hydrogen sulfide mineral baths is analysed in comparison with the literature data. The role, dosage regimen, and duration of balneotherapeutic treatment as well as the effectiveness of its combination with medicamental therapy are considered. The authors hope that the discussion of these issues will be conducive to the solution of problems currently facing modern antihypertensive balneotherapy.

(54) [The effectiveness of the spa and health resort treatment for the pre-gravid preparation of the women at high risk of obstetric and perinatal pathology]. Vopr Kurortol Fizioter Lech Fiz Kult 2013 Sep;(5):36-9.
Abstract: Chronic recurrent inflammatory diseases of the small pelvis are known to be responsible for the development of the adhesive process and infertility. Therefore, they require surgical treatment and increase the risk of obstetric and perinatal pathology. The present study was focused on the assessment of therapeutic and prophylactic effectiveness of the application of natural and preformed physical factors for the pre-gravid preparation of the patients presenting with gynecological problems and pregnant women at high risk of obstetric and perinatal pathology based at the spa and health resort facilities of the Krasnodar Krai (region). The treatment included aero-, helio-, and thalassotherapy, transcranial electroneural stimulation, UHF therapy, hydrogen sulfide or iodine-bromine therapy. A total of 267 women were included in the study. Pregnancy was documented in 52% of the 144 patients who comprised the main group and underwent a
course of rehabilitative treatment; it developed within 3-5 months after therapeutic and prophylactic laparoscopic procedures. The frequency of obstetric and perinatal pathology in this group significantly decreased in comparison with that among the control patients which allowed to greatly reduce material and financial expenditures