
Abstract: In this report, CdS nanoparticles have been grown on the surface of CdWO4 nanorods via an in-situ approach and their high photocatalytic ability toward dye degradation and H2 evolution from H2S splitting under visible light has been demonstrated. The structural and optical properties as well as morphologies with varying amount of CdS to form CdS@CdWO4 have been investigated. Elemental mapping and high resolution transmission electron microscopy (HRTEM) analysis proved the sensitization of CdWO4 nanorods by CdS nanoparticles. A decrease in the PL emission of CdWO4 was observed with increasing amount of CdS nanoparticles loading possibly due to the formation of trap states. Considering the band gap in visible region, the photocatalytic study has been performed for H2 production from H2S and dye degradation under natural sunlight. The steady evolution of H2 was observed from an aqueous H2S solution even without noble metal. Moreover, the rate of photocatalytic H2 evolution over CdS modified CdWO4 is ca. 5.6 times higher than that of sole CdWO4 under visible light. CdS modified CdWO4 showed a good ability toward the photo-degradation of methylene Blue. The rate of dye degradation over CdS modified CdWO4 is ca. 7.4 times higher than that of pristine CdWO4 under natural sunlight. With increase in amount of CdS nanoparticle loading on CdWO4 nanorods the hydrogen generation was observed to be decreased where as dye degradation rate is increased. Such nano-heterostructures may have potential in other photocatalytic reactions


Abstract: The identification of the sources of contaminants present in groundwater at industrial sites is primordial to address environmental and industrial issues. However, available tools are often inadequate or expensive. Here, we present the data of stable isotopes (delta18O and delta2H) of the water molecule at an industrial site where electrochemistry plant occurs impacting the groundwater quality. High ClO3 and ClO4 contents and 2H enrichment have been measured in groundwater. Recharge of aquifer relates to infiltration of rainwater and by subsurface inflow. On-site, industrial products are generated by electrolysis. We show that the electrolysis process leads to a large 2H enrichment (+425 per thousand) in solutions. In the absence of hydrothermal water input containing H2S, we demonstrate that the relationship between delta18O and delta2H can be easily used in a way to trace the origin of the ClO3 and ClO4 in groundwater. Isotopes evidenced first a leakage from end-product storage tanks or during the production process itself. Then, an accumulation and release of ClO3 and ClO4 from soil is demonstrated. Our study successfully shows that stable isotopes are a powerful and low cost tool for tracing pollutant plumes in an industrial context using electrolysis process

(3) Saraiva C, Vasconcelos H, de Almeida JM. A chemometrics approach applied to Fourier transform infrared spectroscopy (FTIR) for monitoring the spoilage of fresh salmon (Salmo salar) stored under modified atmospheres. Int J Food Microbiol 2017 Jan
The aim of this work was to investigate the potential of Fourier transform infrared spectroscopy (FTIR) to detect and predict the bacterial load of salmon fillets (Salmo salar) stored at 3, 8 and 30 degrees C under three packaging conditions: air packaging (AP) and two modified atmospheres constituted by a mixture of 50%N2/40%CO2/10%O2 with lemon juice (MAPL) and without lemon juice (MAP). Fresh salmon samples were periodically examined for total viable counts (TVC), specific spoilage organisms (SSO) counts, pH, FTIR and sensory assessment of freshness. Principal components analysis (PCA) allowed identification of the wavenumbers potentially correlated with the spoilage process. Linear discriminant analysis (LDA) of infrared spectral data was performed to support sensory data and to accurately identify samples freshness. The effect of the packaging atmospheres was assessed by microbial enumeration and LDA was used to determine sample packaging from the measured infrared spectra. It was verified that modified atmospheres can decrease significantly the bacterial load of fresh salmon. Lemon juice combined with MAP showed a more pronounced delay in the growth of Brochothrix thermosphacta, Photobacterium phosphoreum, psychrotrophs and H2S producers. Partial least squares regression (PLS-R) allowed estimates of TVC and psychrotrophs, lactic acid bacteria, molds and yeasts, Brochothrix thermosphacta, Enterobacteriaceae, Pseudomonas spp. and H2S producer counts from the infrared spectral data. For TVC, the root mean square error of prediction (RMSEP) value was 0.78logcfug-1 for an external set of samples. According to the results, FTIR can be used as a reliable, accurate and fast method for real time freshness evaluation of salmon fillets stored under different temperatures and packaging atmospheres.


Abstract: Methyl jasmonate (MeJA), a vital cellular regulator, mediates diverse developmental processes and defense responses against environmental stresse. Recently, a novel gasotransmitter, hydrogen sulfide (H2S), was found to have similar functions, but the interactions between H2S and MeJA in the acquisition of cadmium (Cd) tolerance have not been reported. Treating foxtail millet with 1 microM MeJA not only enhanced Cd tolerance and alleviated growth inhibitions but also decreased the contents of hydrogen peroxide, malondialdehyde and Cd in seedlings under 200 microM of Cd stress. Exogenous application of MeJA inhibited the transcript levels of the Natural Resistance-Associated Macrophage Protein (NRAMP1 and NRAMP6) and intensified Cd-induced expression of the homeostasis-related genes (MTP1, MTP12, CAX2 and ZIP4, besides HMA3). In addition, treatment with MeJA induced the production of endogenous H2S. Fumigation with sodium hydrosulfide (H2S donor) significantly enhanced MeJA-induced Cd tolerance, but this ability was weakened when H2S biosynthesis was inhibited with hydroxylamine. These results suggest that pretreatment with MeJA alleviated Cd stress and that this improvement was mediated by H2S in foxtail millet.


Abstract: Herein we report the fabrication of an advanced sensor for the detection of hydrogen sulfide (H2 S) at room temperature, using thin films of rare-earth metal (RE)-based metal-organic framework (MOF) with underlying fcu topology. This unique MOF-based sensor is made via the in situ growth of fumarate-based fcu-MOF (fum-fcu-MOF) thin film on a capacitive interdigitated electrode. The sensor showed a remarkable detection sensitivity for H2 S at concentrations down to 100 ppb, with the lower detection limit around 5 ppb. The fum-fcu-MOF sensor exhibits a highly desirable
detection selectivity towards H2S vs. CH4, NO2, H2, and C7H8 as well as an outstanding H2S sensing stability as compared to other reported MOFs.

(6) Oechsle P, Florke U, Egold H, Paradies J. Heteroacene Synthesis through C-S Cross-Coupling/5-endo-dig Cyclization. Chemistry 2016 Dec 19;22(51):18559-63. Abstract: Highly efficient, one-step synthesis of sulfur-containing heteroacenes was achieved through palladium-catalyzed C-S cross-coupling of bis-alkynes with thioacetate as hydrogen sulfide surrogate. Heteroacenes consisting of three, five, and seven fused aromatic rings were obtained in a single catalytic step by four-, six-, and eightfold C-S bond formation.

(7) Petruci JF, Cardoso AA. Portable and Disposable Paper-Based Fluorescent Sensor for In Situ Gaseous Hydrogen Sulfide Determination in Near Real-Time. Anal Chem 2016 Dec 6;88(23):11714-9. Abstract: Hydrogen sulfide is found in many environments including sewage systems, petroleum extraction platforms, kraft paper mills, and exhaled breath, but its determination at ppb levels remains a challenge within the analytical chemistry field. Off-line methods for analysis of gaseous reduced sulfur compounds can suffer from a variety of biases associated with high reactivity, sorptive losses, and atmospheric oxidative reactions. Here, we present a portable, online, and disposable gas sensor platform for the in situ determination of gaseous hydrogen sulfide, employing a 470 nm light emitting diode (LED) and a microfiber optic USB spectrometer. A sensing layer was created by impregnating 2.5 μL (0.285 nmol) of fluorescein mercury acetate (FMA) onto the surface of a micropaper analytical device with dimensions of 5 x 5 mm, which was then positioned in the optical detection system. The quantitative determination of H2S was based on the quenching of fluorescence intensity after direct selective reaction between the gas and FMA. This approach enabled linear calibration within the range 17-67 ppb of H2S, with a limit of detection of 3 ppb. The response time of the sensor was within 60 s, and the repeatability was 6.5% (RSD). The sensor was employed to monitor H2S released from a mini-scale wastewater treatment tank in a research laboratory. The appropriate integration of optoelectronic and mechanical devices, including LED, photodiode, pumps, and electronic boards, can be used to produce simple, fully automated portable sensors for the in situ determination of H2S in a variety of environments.

(8) Guo H, Zhou Y, Jia Y, Tang X, Li X, Shen M, et al. Sulfur Cycling-Related Biogeochemical Processes of Arsenic Mobilization in the Western Hetao Basin, China: Evidence from Multiple Isotope Approaches. Environ Sci Technol 2016 Dec 6;50(23):12650-9. Abstract: The role of sulfur cycling in arsenic behavior under reducing conditions is not well-understood in previous investigations. This study provides observations of sulfur and oxygen isotope fractionation in sulfate and evaluation of sulfur cycling-related biogeochemical processes controlling dissolved arsenic groundwater concentrations using multiple isotope approaches. As a typical basin hosting high arsenic groundwater, the western Hetao basin was selected as the study area. Results showed that, along the groundwater flow paths, groundwater delta34SSO4, delta18OSO4, and delta13CDOC increased with increases in arsenic, dissolved iron, hydrogen sulfide and ammonium concentrations, while delta13CDIC decreased with decreasing Eh and sulfate/chloride. Bacterial sulfate reduction (BSR) was responsible for many of these observed changes. The delta34SSO4 indicated that dissolved sulfate was mainly sourced from oxidative weathering of sulfides in upgradient alluvial fans. The high oxygen-sulfur isotope fractionation ratio (0.60) may result from both slow sulfate reduction rates and bacterial disproportionation of sulfur intermediates (BDSI). Data indicate that both the sulfide produced by BSR and the overall BDSI reduce arsenic-bearing iron(III) oxyhydroxides, leading to the release of arsenic into groundwater. These results suggest that...
sulfur-related biogeochemical processes are important in mobilizing arsenic in aquifer systems.

(9) Wu C, Xu Z, Huang K. Effects of Dietary Selenium on Inflammation and Hydrogen Sulfide in the Gastrointestinal Tract in Chickens. Biol Trace Elem Res 2016 Dec;174(2):428-35. Abstract: Selenium (Se) is an essential trace element for humans and animals and is associated with many physiological functions. Previous studies have shown that low-Se diet may affect inflammatory cytokine productions and histology in the digestive system and that sulfide hydrogen (H2S) may contribute to the protection against tissue injury and the inhibition of inflammation in the gastrointestinal tract. In this study, we investigated the relationship between Se deficiency-induced inflammation and H2S production in the small intestine in chickens. One hundred twenty 1-day-old chickens were fed with diets with different Se concentrations (0.15 mg/kg in the control and 0.028 mg/kg in the low-Se-diet group). Chickens were euthanized and small intestinal tissues were extracted. We observed histology, measured H2S concentration, and evaluated the mRNA expression of H2S-producing enzymes cystathionine gamma-lyase (CSE), cystathionine beta-synthase (CBS), and 3-mercaptopropionate sulfurtransferase (3-MST), and inflammatory factors TNF-alpha, NF-kappaB p50, COX-2, and PTGES. Our results showed that chickens fed with low-Se diet exhibited histological changes, lower H2S production, and lower mRNA expression of H2S-producing enzymes (CSE, CBS, and 3-MST) whereas higher mRNA expression of intestinal inflammatory factors (TNF-alpha, NF-kappaB p50, COX-2, and PTGES) compared to controls. Our results indicate that low-Se diet could impact H2S, H2S-producing enzymes, and inflammatory factors in the small intestine, implying that Se is important in maintaining intestinal functions and H2S production is downregulated in Se deficiency-induced inflammation. The downregulation exacerbates the inflammation and impacts H2S-mediated intestinal functions.

(10) Ulloa G, Collao B, Araneda M, Escobar B, Alvarez S, Bravo D, et al. "Use of acidophilic bacteria of the genus Acidithiobacillus to biosynthesize CdS fluorescent nanoparticles (quantum dots) with high tolerance to acidic pH". Enzyme Microb Technol 2016 Dec;95:217-24. Abstract: The use of bacterial cells to produce fluorescent semiconductor nanoparticles (quantum dots, QDs) represents a green alternative with promising economic potential. In the present work, we report for the first time the biosynthesis of CdS QDs by acidophilic bacteria of the Acidithiobacillus genus. CdS QDs were obtained by exposing A. ferrooxidans, A. thiooxidans and A. caldus cells to sublethal Cd2+ concentrations in the presence of cysteine and glutathione. The fluorescence of cadmium-exposed cells moves from green to red with incubation time, a characteristic property of QDs associated with nanocrystals growth. Biosynthesized nanoparticles (NPs) display an absorption peak at 360nm and a broad emission spectra between 450 and 650nm when excited at 370nm, both characteristic of CdS QDs. Average sizes of 6 and 10nm were determined for green and red NPs, respectively. The importance of cysteine and glutathione on QDs biosynthesis in Acidithiobacillus was related with the generation of H2S. Interestingly, QDs produced by acidophilic bacteria display high tolerance to acidic pH. Absorbance and fluorescence properties of QDs was not affected at pH 2.0, a condition that totally inhibits the fluorescence of QDs produced chemically or biosynthesized by mesophilic bacteria (stable until pH 4.5-5.0). Results presented here constitute the first report of the generation of QDs with improved properties by using extremophile microorganisms.

(11) Magierowski M, Magierowska K, Hubalewska-Mazgaj M, Adamski J, Bakalarz D, Slawowski Z, et al. Interaction between endogenous carbon monoxide and hydrogen sulfide in the mechanism of gastroprotection against acute aspirin-induced gastric damage. Pharmacol Res 2016 Dec;114:235-50. Abstract: Acetylsalicylic acid (ASA) is mainly recognized as painkiller or anti-inflammatory drug. However, ASA causes serious side effects towards gastrointestinal (GI) tract which limits its usefulness. Carbon monoxide (CO) and hydrogen sulfide (H2S) have been
described to act as important endogenous messengers and mediators of gastroprotection but whether they can interact in gastroprotection against acute ASA-induced gastric damage remains unknown. In this study male Wistar rats were pretreated with 1) vehicle (saline, i.g.), 2) tricarbonyldichlororuthenium (II) dimer (CORM-2, 5mg/kg i.g.), 3) sodium hydrosulfide (NaHS, 5mg/kg i.g.), 4) zinc protoporphyrin (ZnP, 10mg/kg i.p.), 5) D,L-propargylglycine (PAG, 30mg/kg i.g.), 6) ZnP combined with NaHS, 7) PAG combined with CORM-2 or 8) 1H-[1,2,4]oxadiazolo[4,3-a]quinoxalin-1-one (ODQ, 10mg/kg i.p.) combined with CORM-2 or NaHS and 30min later ASA was administered i.g. in a single dose of 125mg/kg. After 1h, gastric blood flow (GBF) was determined by H2 gas clearance technique and gastric lesions were assessed by planimetry and histology. CO content in gastric mucosa and COHb concentration in blood were determined by gas chromatography and H2S production was assessed in gastric mucosa using methylene blue method. Protein and/or mRNA expression for cystathionine-gamma-lyase (CSE), cystathionine-beta-synthase (CBS), 3-mercaptopyruvate sulfurtransferase (3-MST), heme oxygenase (HO)-1, HO-2, hypoxia inducible factor-alpha (HIF)-1alpha, nuclear factor (erythroid-derived 2)-like 2 (Nrf-2), cyclooxygenase (COX)-1 and COX-2, inducible nitric oxide synthase (iNOS) and interleukin (IL)-1beta were determined by Western blot or real-time PCR, respectively. ASA caused hemorrhagic gastric mucosal damage and significantly decreased GBF, H2S production, CO content, mRNA or protein expression for CSE, 3-MST, HO-2 and increased mRNA and/or protein expression for CBS, HO-1, Nrf-2, HIF-1alpha, iNOS, IL-1beta, COX-2 in gastric mucosa and COHb concentration in blood. Pretreatment with CORM-2 or NaHS but not with PAG decreased ASA-damage and increased GBF. ZnP reversed protective and hyperemic effect of NaHS but PAG failed to affect CORM-2-induced gastroprotection. CORM-2 elevated CO content, mRNA or protein expression for HO-1, Nrf-2, and decreased expression of CBS, HIF-1alpha, COX-2, IL-1beta, iNOS, the H2S production in gastric mucosa and COHb concentration in blood. NaHS raised mRNA or protein expression for CSE, COX-1 and decreased mRNA expression for IL-1beta and COHb level in blood. We conclude that CO is involved in gastroprotection induced by H2S while beneficial protective action of CO released from CORM-2 in gastric mucosa seems to be H2S-independent. In contrast to H2S, CO ameliorates hypoxia, regulates Nrf-2 expression but similarly to H2S acts on sGC-dependent manner to restore gastric microcirculation and exhibit anti-inflammatory activity in gastric mucosa compromised by ASA.


Abstract: Inflammation plays a key role in tumor promotion and development. Indeed, cyclooxygenase-2 (COX-2) expression is strongly associated with different types of cancer. An emerging class of compounds with significant anti-inflammatory properties is the hydrogen sulfide-releasing non-steroidal anti-inflammatory drugs (H2S-NSAIDs). They consist of a traditional NSAID to which an H2S-releasing moiety is covalently attached. We have recently demonstrated that H2S donors inhibit melanoma cell proliferation. In the current study, we evaluated the potential beneficial effects of a new H2S-releasing derivative of naproxen, ATB-346 [2-(6-methoxynapthalen-2-yl)-propionic acid 4-thiocarbamoyl phenyl ester] which inhibits COX activity but also releases H2S. We used cell culture and a mouse melanoma model to evaluate the effect of ATB-346 on: i) in vitro growth of human melanoma cells; ii) in vivo melanoma development in mice. Cell culture studies demonstrated that ATB-346 reduced the in vitro proliferation of human melanoma cells and this effect was associated to induction of apoptosis and inhibition of NF-kappaB activation. Moreover, ATB-346 had novel Akt signaling inhibitory properties. Daily oral dosing of ATB-346 (43nmol/kg) significantly reduced melanoma development in vivo. This study shows that ATB-346, a novel H2S-NSAID, inhibits human melanoma cell proliferation by inhibiting pro-survival pathways associated with NF-kappaB and Akt.
activation. Furthermore, oral treatment with ATB-346 inhibits melanoma growth in mice. In conclusion, the combination of inhibition of cyclooxygenase and delivery of H2S by ATB-346 may offer a promising alternative to existing therapies for melanoma.

(13) Shen J, Peng H, Zhang Y, Trinidad JC, Giedroc DP. Staphylococcus aureus sqr Encodes a Type II Sulfide:Quinone Oxidoreductase and Impacts Reactive Sulfur Speciation in Cells. Biochemistry 2016 Nov 29;55(47):6524-34. Abstract: Recent studies implicate hydrogen sulfide (H2S) oxidation as an important aspect of bacterial antibiotic resistance and sulfide homeostasis. The cst operon of the major human pathogen Staphylococcus aureus is induced by exogenous H2S stress and encodes enzymes involved in sulfide oxidation, including a group I flavoprotein disulfide oxidoreductase sulfide:quinone oxidoreductase (SQR). In this work, we show that S. aureus SQR catalyzes the two-electron oxidation of sodium sulfide (Na2S) into sulfane sulfur (S0) when provided flavin adenine dinucleotide and a water-soluble quinone acceptor. Cyanide, sulfite, and coenzyme A (CoA) are all capable of functioning as the S0 acceptor in vitro. This activity requires a C167-C344 disulfide bond in the resting enzyme, with the intermediacy of a C344 persulfide in the catalytic cycle, verified by mass spectrometry of sulfide-reacted SQR. Incubation of purified SQR and S. aureus CstB, a known FeII persulfide dioxygenase-sulfurtransferase also encoded by the cst operon, yields thiosulfate from sulfide, in a CoA-dependent manner, thus confirming the intermediacy of CoASSH as a product and substrate of SQR and CstB, respectively. Sulfur metabolite profiling of wild-type, Deltasqr, and Deltasqr::pSQR strains reveals a marked and specific elevation in endogenous levels of CoASSH and inorganic tetrasulfide in the Deltasqr strain. We conclude that SQR impacts the cellular speciation of these reactive sulfur species but implicates other mechanisms not dependent on SQR in the formation of low-molecular weight thiol persulfides and inorganic polysulfides during misregulation of sulfide homeostasis.

(14) Song F, Li Z, Li J, Wu S, Qiu X, Xi Z, et al. Investigation of thiolysis of NBD amines for the development of H2S probes and evaluating the stability of NBD dyes. Org Biomol Chem 2016 Nov 29;14(47):11117-24. Abstract: In order to evaluate the thiolysis of NBD (7-nitro-1,2,3-benzoxadiazole) amines for development of H2S probes, herein we investigated the reactivity and selectivity of a series of NBD amines for the first time. The piperazinyl- and piperidyl-based NBD probes could react efficiently with micromolar H2S in buffer (pH 7.4), while such NBD(S) (nitrobenzothiadiazole) derivatives showed much slow thiolysis even in the presence of millimolar H2S. Low reactivity was also observed for thiolysis of these ethylamino-, ethanolamino- and anilino-based NBD probes. Therefore, almost all NBD amines used in bioimaging should be stable, in consideration of the presence of only micromolar endogenous H2S in vivo. Moreover, the piperezinyl-NBD derivatives could be efficient in the development of fluorescent H2S probes and for directly visualizing H2S by paper-based detection.

(15) Tian F, Ling Y, Chen Y, Wang Z. Effects of CCK-8 and Cystathionine gamma-Lyase/Hydrogen Sulfide System on Acute Lung Injury in Rats. Inflammation 2016 Nov 24. Abstract: Acute lung injury (ALI) is mainly characterized by diffusive injuries to lung epithelium and increased permeability of alveolar-capillary membranes caused by various factors, which leads to pulmonary edema and pulmonary closure. Lipopolysaccharide (LPS), which is the main component of the cell wall of gram-negative bacteria, is one of the most important factors causing pulmonary infection and ALI. More and more reports have indicated that hydrogen sulfide (H2S) is closely correlated with ALI and has anti-inflammation function, while the specific mechanism needs further investigation. Cholecystokinin-octapeptide (CCK-8), which is an important endogenous functional fragment belonging to CCK family, participates in anti-inflammatory and anti-endotoxic shock (ES). Whether CCK-8 plays important roles in curing ALI also needs further...
investigation. Herein, we concluded that CCK-8 alleviated the ALI induced by LPS via regulating the catalytic activity of cystathionine gamma-lyase (CSE) and the formation of H2S. This work provides new medicine-designed target for clinical doctor to prevent and cure ALI

Abstract: Glaucoma is an irreversible and blinding neurodegenerative disease of the eye, and is characterized by progressive loss of retinal ganglion cells (RGCs). Since endogenous hydrogen sulfide (H2S) was reported to be involved in neurodegeneration in the central nervous system, the authors aimed to develop a chronic ocular hypertension (COH) rat model simulating glaucoma and therein test the H2S level together with the retinal protein expressions of related synthases, and further investigated the effect of exogenous H2S supplement on RGC survival. COH rat model was induced by cross-linking hydrogel injection into anterior chamber, and the performance of the model was assessed by intraocular pressure (IOP) measurement, RGC counting and retinal morphological analysis. Endogenous H2S level was detected along with the retinal protein expressions of H2S-related synthases cystathionine beta-synthase (CBS), cystathionine gamma-lyase (CSE) and 3-mercaptopyruvate sulfurtransferase (3-MST) in the COH rats. Retinal H2S level and RGC survival were evaluated again after NaHS (a H2S donor) treatment in the COH rats. The results showed that the COH model succeeded in simulating glaucoma features, and retinal H2S level decreased significantly when the retinal protein expressions of CBS, CSE and 3-MST were downregulated generally in the COH rats. Furthermore, the decrease of retinal H2S level and loss of RGCs were both improved by NaHS treatment in experimental glaucoma, without obvious variation of IOP. Our study revealed that the intracameral injection of cross-linking hydrogel worked efficiently in modeling glaucoma, and H2S had protective effect on RGCs and might be involved in the pathological mechanism of glaucomatous neuropathy.

Abstract: Nephropathy develops in many patients with type 1 diabetes mellitus (T1DM). However, the specific mechanisms and therapies remain unclear. For this purpose we investigated the effects of hydrogen sulfide (H2S) on renal fibrosis in streptozotocin (STZ) induced diabetic rats and its underlying mechanisms. Experimental rats were randomly divided into four groups: Control group (normal rats), DM group (diabetes rats), DM + NaHS group [diabetes rats treated with sodium hydrosulfide (NaHS)], and NaHS group (normal rats treated with NaHS). The diabetic models were established by intraperitoneal injection of STZ. The NaHS-treated rats were injected with NaHS as an exogenous donor of H2S. At the same time, control group and DM group were administrated with equal doses of normal saline (NS). After eight weeks, the rats' urine samples were collected to measure the renal hydroxyproline content by basic hydrolysis method with a hydroxyproline detection kit. Collagen I and III content was detected by immunohistochemical method, and the pathology morphology of kidney was analyzed by Masson staining. Protein expressions of transforming growth factor beta 1 (TGF-beta1), ERK1/2, TIMP1, TIMP2, MMP-2, MMP-7, MMP-8, MMP-11, and MMP-14 were assessed by western blotting. The results showed that significant fibrosis occurred in the kidney of diabetes rats. NaHS treatment downregulated TGF-beta1, ERK1/2, TIMP1, TIMP2, MMP-2, MMP-7, MMP-8, MMP-11, and MMP-14 were assessed by western blotting. The results showed that significant fibrosis occurred in the kidney of diabetes rats. NaHS treatment downregulated TGF-beta1 signaling, and its mechanisms may be correlated with ERK1/2 expression and modulation of MMPs/TIMPs expression. Therefore, H2S may provide a promising option for defending against diabetic renal fibrosis through TGF-beta1 signaling, equilibrating the balance between profibrotic and antifibrotic mediators.
Abstract: A number of emerging studies suggest that air pollutants such as hydrogen sulfide (H2S) and ammonia (NH3) may cause a decline in spermatozoa motility. The impact and underlying mechanisms are currently unknown. Boar spermatozoa (in vitro) and peripubertal male mice (in vivo) were exposed to H2S and/or NH3 to evaluate the impact on spermatozoa motility. Na2S and/or NH4Cl reduced the motility of boar spermatozoa in vitro. Na2S and/or NH4Cl disrupted multiple signaling pathways including decreasing Na+/K+ ATPase activity and protein kinase B (AKT) levels, activating Adenosine 5'-monophosphate (AMP)-activated protein kinase (AMPK) and phosphatase and tensin homolog deleted on chromosome ten (PTEN), and increasing reactive oxygen species (ROS) to diminish boar spermatozoa motility. The increase in ROS might have activated PTEN, which in turn diminished AKT activation. The ATP deficiency (indicated by reduction in Na+/K+ ATPase activity), transforming growth factor (TGFbeta) activated kinase-1 (TAK1) activation, and AKT deactivation stimulated AMPK, which caused a decline in boar spermatozoa motility. Simultaneously, the deactivation of AKT might play some role in the reduction of boar spermatozoa motility. Furthermore, Na2S and/or NH4Cl declined the motility of mouse spermatozoa without affecting mouse body weight gain in vivo. Findings of the present study suggest that H2S and/or NH3 are adversely associated with spermatozoa motility.

Abstract: Copper hydroxide and copper hydroxyl nitrate were successfully synthesized from copper nitrate. A slight alteration of a base addition pathway led to entirely different chemical and crystal structures. Structural, morphological, and surface chemical features were analyzed using various physical and chemical methods. The copper hydroxide texture consists of self-assembled bundles of nanorods with a diameter between 15 and 40 nm. They are stack together forming platelet-like particles. In the case of the copper hydroxyl nitrate, platelet-like particles with a smooth surface were detected. The fully hydroxylated sample showed a considerably higher surface area and mesoporous volume than those of copper hydroxyl nitrate. Both synthesized materials were used as air desulfurization media at moist or dry conditions. The results indicate a supreme chemical adsorption of H2S on copper hydroxide. Moisture in air has a positive effect on the adsorption performance. In humid conditions, almost 0.9 mol H2S/mol of Cu(OH)2 was adsorbed. CuS with almost a stoichiometric ratio was a product of surface reactions. The color change of the powder from sapphire blue to dark brown during the adsorption can be used as a fast indication of the adsorbent exhaustion level.

Abstract: Intestinal microbial dysbiosis is associated with Crohn's disease (CD). However, the mechanisms leading to the chronic mucosal inflammation that characterizes this disease remain unclear. In this report, we use systems-level approaches to study the interactions between the gut microbiota and host in new-onset paediatric patients to evaluate causality and mechanisms of disease. We report an altered host proteome in CD patients indicative of impaired mitochondrial functions. In particular, mitochondrial proteins implicated in H2S detoxification are downregulated, while the relative abundance of H2S microbial producers is increased. Network correlation analysis reveals that Atopobium parvulum controls the central hub of H2S producers. A. parvulum induces pancolitis in colitis-susceptible interleukin-10-deficient mice and this phenotype requires the presence of the intestinal microbiota. Administering the H2S scavenger bismuth mitigates A. parvulum-induced colitis in vivo. This study reveals that host-microbiota...
interactions are disturbed in CD and thus provides mechanistic insights into CD pathogenesis

Abstract: Preeclampsia is a life-threatening vascular disorder of pregnancy due to a failing stressed placenta. Millions of women risk death to give birth each year and globally each year, almost 300,000 lose their life in this process and over 500,000 babies die as a consequence of preeclampsia. Despite decades of research, we lack pharmacological agents to treat it. Maternal endothelial oxidative stress is a central phenomenon responsible for the preeclampsia phenotype of high maternal blood pressure and proteinuria. In 1997, it was proposed that preeclampsia arises due to the loss of VEGF activity, possibly due to elevation in anti-angiogenic factor, soluble Flt-1 (sFlt-1). Researchers showed that high sFlt-1 and soluble endoglin (sEng) elicit the severe preeclampsia phenotype in pregnant rodents. We demonstrated that heme oxygenase-1 (HO-1)/carbon monoxide (CO) pathway prevents placental stress and suppresses sFlt-1 and sEng release. Likewise, hydrogen sulphide (H2S)/cystathionine-gamma-lyase (Cth) systems limit sFlt-1 and sEng and protect against the preeclampsia phenotype in mice. Importantly, H2S restores placental vasculature, and in doing so improves lagging fetal growth. These molecules act as the inhibitor systems in pregnancy and when they fail, preeclampsia is triggered. In this review, we discuss what are the hypotheses and models for the pathophysiology of preeclampsia on the basis of Bradford Hill causation criteria for disease causation and how further in vivo experimentation is needed to establish ‘proof of principle’. Hypotheses that fail to meet the Bradford Hill causation criteria include abnormal spiral artery remodelling and inflammation and should be considered associated or consequential to the disorder. In contrast, the protection against cellular stress hypothesis that states that the protective pathways mitigate cellular stress by limiting elevation of anti-angiogenic factors or oxidative stress and the subsequent clinical signs of preeclampsia appear to fulfil most of Bradford Hill causation criteria. Identifying the candidates on the roadmap to this pathway is essential in developing diagnostics and therapeutics to target the pathogenesis of preeclampsia

Abstract: BACKGROUND: The gutless marine worm Olavius algarvensis has a completely reduced digestive and excretory system, and lives in an obligate nutritional symbiosis with bacterial symbionts. While considerable knowledge has been gained of the symbionts, the host has remained largely unstudied. Here, we generated transcriptomes and proteomes of O. algarvensis to better understand how this annelid worm gains nutrition from its symbionts, how it adapted physiologically to a symbiotic lifestyle, and how its innate immune system recognizes and responds to its symbiotic microbiota. RESULTS: Key adaptations to the symbiosis include (i) the expression of gut-specific digestive enzymes despite the absence of a gut, most likely for the digestion of symbionts in the host's epidermal cells; (ii) a modified hemoglobin that may bind hydrogen sulfide produced by two of the worm's symbionts; and (iii) the expression of a very abundant protein for oxygen storage, hemerythrin, that could provide oxygen to the symbionts and the host under anoxic conditions. Additionally, we identified a large repertoire of proteins involved in interactions between the worm's innate immune system and its symbiotic microbiota, such as peptidoglycan recognition proteins, lectins, fibrinogen-related proteins, Toll and scavenger receptors, and antimicrobial proteins. CONCLUSIONS: We show how this worm, over the course of evolutionary time, has modified widely-used proteins and changed their expression patterns in adaptation to its symbiotic lifestyle and describe expressed components of the innate immune system in a marine oligochaete. Our results provide further support for the recent realization that
animals have evolved within the context of their associations with microbes and that their adaptive responses to symbiotic microbiota have led to biological innovations.

(23) Medcraft C, Bittner DM, Tew DP, Walker NR, Legon AC. Geometries of H2Scdots, three dots, centeredMI (M = Cu, Ag, Au) complexes studied by rotational spectroscopy: The effect of the metal atom. J Chem Phys 2016 Nov 21;145(19):194306. Abstract: Complexes formed between H2S and each of Cul, AgI, and AuI have been isolated and structurally characterised in the gas phase. The H2Scdots, three dots, centeredMI complexes (where M is the metal atom) are generated through laser vaporisation of a metal rod in the presence of a low concentration of H2S and CF3I in a buffer gas of argon undergoing supersonic expansion. The microwave spectra of six isotopologues of each of H2Scdots, three dots, centeredCuI, H2Scdots, three dots, centeredAgI and three isotopologues of H2Scdots, three dots, centeredAuI have been measured by chirped-pulse Fourier transform microwave spectroscopy. The spectra are interpreted to determine geometries for the complexes and to establish the values of structural parameters. The complexes have Cs symmetry at equilibrium and have a pyramidal configuration about the sulfur atom. The local C2 axis of the hydrogen sulfide molecule intersects the linear axis defined by the three heavy atoms at an angle, \( \varphi = 75.00(47) \) degrees for M = Cu, \( \varphi = 78.43(76) \) degrees for M = Ag, and \( \varphi = 71.587(13) \) degrees for M = Au. The trend in the molecular geometries is consistent with significant relativistic effects in the gold-containing complex. The force constant describing the interaction between the H2S and MI sub-units is determined from the measured centrifugal distortion constant, \( \Delta J \), of each complex. Nuclear quadrupole coupling constants, \( \chi_{aa}(M) \) and \( \chi_{aa}(I) \) (where M denotes the metal atom), are determined for H2Scdots, three dots, centeredCuI and H2Scdots, three dots, centeredAuI for the first time.

(24) Lajin B, Francesconi KA. The Association between the Urinary Excretion of Trimethylselenonium and Trimethylsulfonium in Humans. PLoS One 2016;11(11):e0167013. Abstract: Hydrogen sulfide is a signaling molecule that plays important roles in several physiological processes, and its methylation product trimethylsulfonium (TMS) is a natural constituent of human urine that could serve as a biomarker for hydrogen sulfide. In vitro studies showed that the enzyme indole-ethylamine N-methyltransferase (INMT) is responsible for the production of trimethylsulfonium as well as its selenium analogue trimethylselenonium (TMSe). Marked inter-individual variability in TMSe production is associated with genetic polymorphisms in the INMT gene, but it remains unclear whether these polymorphisms affect substrate specificity or general enzymatic activity. Therefore, we explore the association between the TMS and TMSe production phenotypes. Caucasian volunteers were recruited and grouped according to their TMSe status into "TMSe producers" and "TMSe non-producers", and morning urine samples were collected over 5 consecutive days from each volunteer. A total of 125 urine samples collected from 25 volunteers (13 TMSe producers and 12 TMSe non-producers) were analyzed for total selenium and total sulfur using inductively coupled plasma mass spectrometry (ICPMS), trimethylselenonium using HPLC/ICPMS, and trimethylsulfonium using HPLC/electrospray ionization-triple quadrupole-mass spectrometry (ESI-QQQ-MS). Although there was no correlation between TMS and TMSe urinary levels within the "TMSe producers" group, the "TMSe producers" had urinary levels of TMS 10-fold higher than those of the "TMSe non-producers" (P < 0.001). This result indicates that stratification according to TMSe status or genotype is crucial for the correct interpretation of urinary TMS as a possible biomarker for hydrogen sulfide body pools.

commonly used drugs for the treatment of pain, inflammation and fever. Although they are effective for a huge number of users, their analgesic properties are not sufficient for several patients and the occurrence of side effects still constitutes a big challenge during long term therapy. Areas covered: This review gives an overview about the first and second generations of NSAIDs (COX1/2 non-selective, COX-2 selective), and their main side effects which gave still an urgent need for safer drugs and for the establishment of novel treatment strategies (improved safety, tolerability, patient convenience). The current developments of a possible third generation NSAID class comprise changes in the formulation of already approved drugs, combination therapies, dual cyclooxygenase-lipoxygenase inhibitors, NO- and H2S-releasing NSAIDs, prostaglandin synthase inhibitors and EP receptor modulators, respectively. Literature search has been done with PubMed NCBI. Expert opinion: Currently, there is no newly developed drug that is superior to the already approved selective and non-selective NSAIDs. Several novel approaches show promising analgesic efficacy but side effects are still an important problem. Solutions might be constituted by combination therapies allowing administration of lower drug doses or by individualized therapies targeting molecules apart from COX, respectively


Abstract: AIM: The objective was to evaluate the effects of nitric oxide (NO) and hydrogen sulfide (H2S) donors and possible interactions between these two systems in modulating gastric function. METHODS: Mice received saline, sodium nitroprusside (SNP), or sodium hydrosulfite (NaHS), and after 1 h, the animals were killed for immunofluorescence analysis of CSE or eNOS expressions, respectively. Other groups received saline, SNP, NaHS, Lawesson's reagent (H2S donor), PAG + SNP, L-NAME, L-NAME + NaHS, or L-NAME + Lawesson's reagent. Then, the gastric secretions (mucous and acid), gastric blood flow, gastric defense against ethanol, and gastric motility (gastric emptying and gastric contractility) were evaluated. RESULTS: SNP and NaHS increased the expression of CSE or eNOS, respectively. SNP or Lawesson's reagent did not alter gastric acid secretion but increased mucus production, and these effects reverted with PAG and L-NAME treatment, respectively. SNP or NaHS increased gastric blood flow and protected the gastric mucosa against ethanol injury, and these effects reverted with PAG and L-NAME treatment, respectively. SNP or NaHS increased gastric blood flow and protected the gastric mucosa against ethanol injury, and these effects reverted with PAG and L-NAME treatments, respectively. SNP delayed gastric emptying when compared with saline, and PAG partially reversed this effect. NaHS accelerate gastric emptying, and L-NAME partially reversed this effect. SNP and NaHS alone induced gastric fundus and pylorus relaxation. However, pretreatment with PAG or L-NAME reversed these relaxant effects only in the pylorus but not in the gastric fundus. CONCLUSION: NO and H2S interact in gastric physiological functions, and this “cross-talk” is important in the control of mucus secretion, gastric blood flow, gastric mucosal defense, and gastric motility, but not in the control of basal gastric acid secretion


Abstract: OBJECTIVE: To investigate the roles and mechanisms of endogenous hydrogen sulfide (H2S) and endoplasmic reticulum (ER) stress in the development of diabetic cardiomyopathy (DCM). METHODS: Blood of DCM patients included in the study were collected. The model of DCM rats was established using streptozotocin (STZ) injection. Cardiac lipotoxicity in vitro models were established using 500μM palmitic acid (PA) treatment for 24h in AC16 cardiomyocytes. Endogenous H2S production in plasma, culture supernatant and heart was measured by sulphur ion-selective electrode assay. Cell viability was tested by using the cell counting kit-8 (CCK-8) kit. Glucose regulated protein (GRP78), CCAAT/enhancer binding protein homologous transcription factor (C/EBP) homologous protein (CHOP), caspase-3 and caspase-12 expressions
were measured using western blot analysis. Lipid droplet was evaluated by Oil Red O staining. Apoptosis in hearts of DCM rats was analyzed using terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) staining. RESULTS: H2S levels in serum of DCM patients and DCM rats were significant lower, H2S contents and cystathionine-gamma-lyase (CSE) expression in heart tissues of DCM rats were also markedly lower. H2S levels in supernatants of PA-treated AC16 cardiac cells were decreased. Cardiac lipotoxicity demonstrated by increase in TUNEL positive cells and lipid deposit in vivo and in vitro accompanied by a decrease of H2S levels. Pretreatment AC16 cells with 100umol/L of NaHS (a donor of H2S) could suppress the PA-induced myocardial injury similar to the effects of 4-phenylbutyric acid (4-PBA, an endoplasmic reticulum (ER) stress inhibitor), leading to an increase in cell viability and preventing lipid deposit. Meanwhile, administration diabetic rats with NaHS or 4-PBA alleviated cardiac lipotoxicity, as evidenced by decrease in TUNEL positive cells, cleaved caspase-3 expression and lipid accumulation. CONCLUSION: Deficiency of endogenous H2S was involved in lipotoxicity-induced myocardial injury. Exogenous H2S attenuates PA-induced myocardial injury though inhibition of ER stress

(28) Luna-Sanchez M, Hidalgo-Gutierrez A, Hildebrandt TM, Chaves-Serrano J, Barriocanal-Casado E, Santos-Fandila A, et al. CoQ deficiency causes disruption of mitochondrial sulfide oxidation, a new pathomechanism associated with this syndrome. EMBO Mol Med 2016 Nov 17. Abstract: Coenzyme Q (CoQ) is a key component of the mitochondrial respiratory chain, but it also has several other functions in the cellular metabolism. One of them is to function as an electron carrier in the reaction catalyzed by sulfide:quinone oxidoreductase (SQR), which catalyzes the first reaction in the hydrogen sulfide oxidation pathway. Therefore, SQR may be affected by CoQ deficiency. Using human skin fibroblasts and two mouse models with primary CoQ deficiency, we demonstrate that severe CoQ deficiency causes a reduction in SQR levels and activity, which leads to an alteration of mitochondrial sulfide metabolism. In cerebrum of Coq9R239X mice, the deficit in SQR induces an increase in thiosulfate sulfurtransferase and sulfite oxidase, as well as modifications in the levels of thiols. As a result, biosynthetic pathways of glutamate, serotonin, and catecholamines were altered in the cerebrum, and the blood pressure was reduced. Therefore, this study reveals the reduction in SQR activity as one of the pathomechanisms associated with CoQ deficiency syndrome

(29) Ziosi M, Di M, I, Kleiner G, Gao XH, Barca E, Sanchez-Quintero MJ, et al. Coenzyme Q deficiency causes impairment of the sulfide oxidation pathway. EMBO Mol Med 2016 Nov 17. Abstract: Coenzyme Q (CoQ) is an electron acceptor for sulfide-quinone reductase (SQR), the first enzyme of the hydrogen sulfide oxidation pathway. Here, we show that lack of CoQ in human skin fibroblasts causes impairment of hydrogen sulfide oxidation, proportional to the residual levels of CoQ. Biochemical and molecular abnormalities are rescued by CoQ supplementation in vitro and recapitulated by pharmacological inhibition of CoQ biosynthesis in skin fibroblasts and ADCK3 depletion in HeLa cells. Kidneys of Pdss2kd/kd mice, which only have ~15% residual CoQ concentrations and are clinically affected, showed (i) reduced protein levels of SQR and downstream enzymes, (ii) accumulation of hydrogen sulfides, and (iii) glutathione depletion. These abnormalities were not present in brain, which maintains ~30% residual CoQ and is clinically unaffected. In Pdss2kd/kd mice, we also observed low levels of plasma and urine thiosulfate and increased blood C4-C6 acylcarnitines. We propose that impairment of the sulfide oxidation pathway induced by decreased levels of CoQ causes accumulation of sulfides and consequent inhibition of short-chain acyl-CoA dehydrogenase and glutathione depletion, which contributes to increased oxidative stress and kidney failure

Abstract: Accumulating evidence suggests that gut bacteria play a role in homeostasis of the circulatory system in mammals. First, gut bacteria may affect the nervous control of the circulatory system via the sensory fibres of the enteric nervous system. Second, gut bacteria-derived metabolites may cross the gut-blood barrier and target blood vessels, the heart and other organs involved in the regulation of the circulatory system. A number of studies have shown that hydrogen sulfide (H(2)S) is an important biological mediator in the circulatory system. Thus far, research has focused on the effects of H(2)S enzymatically produced by cardiovascular tissues. However, some recent evidence indicates that H(2)S released in the colon may also contribute to the control of arterial blood pressure. Incidentally, sulfate-reducing bacteria are ubiquitous in mammalian colon, and H(2)S is just one among a number of molecules produced by the gut flora. Other gut bacteria-derived compounds that may affect the circulatory system include methane, nitric oxide, carbon monoxide, trimethylamine or indole. In this paper, we review studies that imply a role of gut microbiota and their metabolites, such as H(2)S, in circulatory system homeostasis.

Abstract: AIMS: The present study examined the role of cystathionine gamma-lyase (CSE) in CCl4-induced liver damage. RESULTS: A CSE gene knock-out and luciferase gene knock-in mouse model was constructed to study the function of CSE and trace its expression in living status. CCl4 or LPS markedly downregulated CSE expression in the liver of mice. CSE-deficient mice showed increased serum alanine aminotransferase and aspartate aminotransferase levels, and liver damage after CCl4 challenge, whereas albumin and endogenous H2S levels decreased significantly. CSE knockout mice showed increased serum homocysteine levels, upregulation of inflammatory cytokines, and increased autophagy and IkappaB-alpha degradation in the liver in response to CCl4 treatment. The increase in pro-inflammatory cytokines including TNF-alpha in CSE-deficient mice after CCl4 challenge was accompanied by a significant increase in liver tissue hydroxyproline and alpha-SMA and histopathologic changes in the liver. However, H2S donor pretreatment effectively attenuated most of these imbalances. INNOVATION: Here, a CSE knock-out and luciferase knock-in mouse model was established for the first time to study the transcriptional regulation of CSE expression in real-time in a non-invasive manner, providing information on the effects and potential mechanisms of CSE on CCl4-induced liver injury. CONCLUSION: CSE deficiency increases pro-inflammatory cytokines in the liver and exacerbates acute hepatitis and liver fibrosis by reducing H2S production from L-cysteine in the liver. The present data suggest the potential of an H2S donor for the treatment of liver diseases such as toxic hepatitis and fibrosis.

Abstract: Hydrogen sulfide is a colorless gas and has a strong odor of rotten eggs. It is absorbed by the upper respiratory tract mucosa, and it causes histotoxic hypoxemia and respiratory depression by exerting an inhibitory effect on cytochrome oxidase. To evaluate the role of toxicological data in distinguishing between the H2 S blood concentration secondary to lethal poisoning and the endogenous H2 S produced during putrefaction, we compared the postmortem H2 S concentrations of six fatal H2 S poisoning cases (8.7-28.6 mg/L) with the postmortem concentrations of endogenous H2 S of 12 subjects who died from other causes (traffic-related deaths) (2.2-32.7 mg/L). These results will be of interest to the forensic community as it underlines the importance of considering circumstantial evidence along with the toxicological and pathological findings in the identification of H2 S lethal poisoning.
Padovani D, Hessani A, Castillo FT, Liot G, Andriamihaja M, Lan A, et al. Sulfheme formation during homocysteine S-oxygenation by catalase in cancers and neurodegenerative diseases. Nat Commun 2016 Nov 16;7:13386. Abstract: Accumulating evidence suggests that abnormal levels of homocysteine are associated with vascular dysfunctions, cancer cell proliferation and various neurodegenerative diseases. With respect to the latter, a perturbation of transition metal homeostasis and an inhibition of catalase bioactivity have been reported. Herein, we report on some of the molecular bases for the cellular toxicity of homocysteine and demonstrate that it induces the formation of sulfcatalase, an irreversible inactive state of the enzyme, without the intervention of hydrogen sulfide. Initially, homocysteine reacts with native catalase and/or redox-active transition metal ions to generate thiyl radicals that mediate compound II formation, a temporarily inactive state of the enzyme. Then, the ferryl centre of compound II intervenes into the unprecedented S-oxygenation of homocysteine to engender the corresponding sulfenic acid species that further participates into the prosthetic heme modification through the formation of an unusual Fe(II) sulfonium. In addition, our ex cellulo studies performed on cancer cells, models of neurodegenerative diseases and ulcerative colitis suggest the likelihood of this scenario in a subset of cancer cells, as well as in a cellular model of Parkinson's disease. Our findings expand the repertoire of heme modifications promoted by biological compounds and point out another deleterious trait of disturbed homocysteine levels that could participate in the aetiology of these diseases.

Allen JF. A Proposal for Formation of Archaean Stromatolites before the Advent of Oxigenic Photosynthesis. Front Microbiol 2016;7:1784. Abstract: Stromatolites are solid, laminar structures of biological origin. Living examples are sparsely distributed and formed by cyanobacteria, which are oxigenic phototrophs. However, stromatolites were abundant between 3.4 and 2.4 Gyr, prior to the advent of cyanobacteria and oxigenic photosynthesis. Here I propose that many Archaean stromatolites were seeded at points of efflux of hydrogen sulfide from hydrothermal fields into shallow water, while their laminar composition arose from alternating modes of strictly anoxygenic photosynthetic metabolism. These changes were a redox regulatory response of gene expression to changing hydrogen sulfide concentration, which fluctuated with intermittent dilution by tidal action or by rainfall into surface waters. The proposed redox switch between modes of metabolism deposited sequential microbial mats. These mats gave rise to alternating carbonate sediments predicted to retain evidence of their origin in differing ratios of isotopes of carbon and sulfur and in organic content. The mats may have arisen either by replacement of microbial populations or by continuous lineages of protocyanobacteria in which a redox genetic switch selected between Types I and II photosynthetic reaction centers, and thus between photolithoautotrophic and photoorganoheterotrophic metabolism. In the latter case, and by 2.4 Gyr at the latest, a mutation had disabled the redox genetic switch to give simultaneous constitutive expression of both Types I and II reaction centers, and thus to the ability to extract electrons from manganese and then water. By this simple step, the first cyanobacterium had the dramatic advantage of emancipation from limiting supplies of inorganic electron donors, produced free molecular oxygen as a waste product, and initiated the Great Oxidation Event in Earth's history at the transition from the Archaean to the Paleoproterozoic.

Rose P, Moore PK, Zhu YZ. H2S biosynthesis and catabolism: new insights from molecular studies. Cell Mol Life Sci 2016 Nov 14. Abstract: Hydrogen sulfide (H2S) has profound biological effects within living organisms and is now increasingly being considered alongside other gaseous signalling molecules, such as nitric oxide (NO) and carbon monoxide (CO). Conventional use of pharmacological and molecular approaches has spawned a rapidly growing research field that has identified H2S as playing a functional role in cell-signalling and post-translational modifications. Recently, a number of laboratories have reported the use
of siRNA methodologies and genetic mouse models to mimic the loss of function of genes involved in the biosynthesis and degradation of H2S within tissues. Studies utilising these systems are revealing new insights into the biology of H2S within the cardiovascular system, inflammatory disease, and in cell signalling. In light of this work, the current review will describe recent advances in H2S research made possible by the use of molecular approaches and genetic mouse models with perturbed capacities to generate or detoxify physiological levels of H2S gas within tissues.

Abstract: The focus of this paper is the measurement and understanding of sulfur poisoning phenomena of Ni/gadolinium-doped ceria (CGO) based solid oxide fuel cells (SOFC). Cells with Ni/CGO10 and NiCu5/CGO40 anodes were characterized by means of impedance spectroscopy at different temperatures and H2/H2O fuel ratios. The short-time sulfur poisoning behavior was systematically investigated for varying temperatures of

Abstract: The recently described ‘gasomediator’ hydrogen sulfide (H2S) has been involved in pain mechanisms, but its effect on pruritus, a sensory modality that similarly to pain acts as a protective mechanism, is poorly known and controversial. The effects of the slow-releasing (GYY4137) and spontaneous H2S donors (Na2S and Lawesson's reagent, LR) were evaluated in histamine and compound 48/80 (C48/80)-dependent dorsal skin pruritus and inflammation in male BALB/c mice. Animals were intradermally (i.d.) injected with C48/80 (3mug/site) or histamine (1mumol/site) alone or co-injected with Na2S, LR or GYY4137 (within the 0.3-100nmol range). The involvement of endogenous H2S and KATP channel-dependent mechanism were also evaluated. Pruritus was assessed by the number of scratching bouts, whilst skin inflammation was evaluated by the extravascular accumulation of intravenously injected 125I-albumin (plasma extravasation) and myeloperoxidase (MPO) activity (neutrophil recruitment). Histamine or C48/80 significantly evoked itching behavior paralleled by plasma extravasation and increased MPO activity. Na2S and LR significantly ameliorated histamine or C48/80-induced pruritus and inflammation, although these effects were less pronounced or absent with GYY4137. Inhibition of endogenous H2S synthesis increased both Tyrode and C48/80-induced responses in the skin, whereas the blockade of KATP channels by glibenclamide did not. H2S-releasing donors significantly attenuate C48/80-induced mast cell degranulation either in vivo or in vitro. We provide first evidences that H2S donors confer protective effect against histamine-mediated acute pruritus and cutaneous inflammation. These effects can be mediated, at least in part, by stabilizing mast cells, known to contain multiple mediators and to be primary initiators of allergic processes, thus making of H2S donors a potential alternative/complementary therapy for treating inflammatory allergic skin diseases and related pruritus

Abstract: not applicable to an Editorial

Abstract: Sulphate-rich wastewaters can be generated due to (i) use of saline water as secondary-quality water for sanitation in urban environments (e.g. toilet flushing), (ii)
discharge of industrial effluents, (iii) sea and brackish water infiltration into the sewage and (iv) use of chemicals, which contain sulphate, in drinking water production. In the presence of an electron donor and absence of oxygen or nitrate, sulphate can be reduced to sulphide. Sulphide can inhibit microbial processes in biological wastewater treatment systems. The objective of the present study was to assess the effects of sulphide concentration on the anaerobic and aerobic physiology of polyphosphate-accumulating organisms (PAOs). For this purpose, a PAO culture, dominated by Candidatus Accumulibacter phosphatis clade I (PAO I), was enriched in a sequencing batch reactor (SBR) fed with acetate and propionate. To assess the direct inhibition effects and their reversibility, a series of batch activity tests were conducted during and after the exposure of a PAO I culture to different sulphide concentrations. Sulphide affected each physiological process of PAO I in a different manner. At 189 mg TS-S/L, volatile fatty acid uptake was 55% slower and the phosphate release due to anaerobic maintenance increased from 8 to 18 mg PO4-P/g VSS/h. Up to 8 mg H2S-S/L, the decrease in aerobic phosphorus uptake rate was reversible (Ic60). At higher concentrations of sulphide, potassium (>16 mg H2S-S/L) and phosphate (>36 mg H2S-S/L) were released under aerobic conditions. Ammonia uptake, an indicator of microbial growth, was not observed at any sulphide concentration. This study provides new insights into the potential failure of enhanced biological phosphorus removal sewage plants receiving sulphate- or sulphide-rich wastewaters when sulphide concentrations exceed 8 mg H2S-S/L, as PAO I could be potentially inhibited

Abstract: Discovery of novel biomarkers is critical for early diagnosis of acute coronary syndrome (ACS). Serum metabolite profiling of ST-elevation myocardial infarction (STEMI), unstable angina (UA) and healthy controls was performed using gas chromatography mass spectrometry (GC/MS), solid-phase microextraction coupled to gas chromatography mass spectrometry (SPME-GC/MS) and nuclear magnetic resonance (1H-NMR). Multivariate data analysis revealed a metabolic signature that could robustly discriminate STEMI patients from both healthy controls and UA patients. This panel of biomarkers consisted of 19 metabolites identified in the serum of STEMI patients. One of the most intriguing biomarkers among these metabolites is hydrogen sulfide (H2S), an endogenous gasotransmitter with profound effect on the heart. Serum H2S absolute levels were further investigated using a quantitative double-antibody sandwich enzyme-linked immunosorbent assay (ELISA). This highly sensitive immunoassay confirmed the elevation of serum H2S in STEMI patients. H2S level discriminated between UA and STEMI groups, providing an initial insight into serum-free H2S bioavailability during ACS. In conclusion, the current study provides a detailed map illustrating the most predominant altered metabolic pathways and the biochemical linkages among the biomarker metabolites identified in STEMI patients. Metabolomics analysis may yield novel predictive biomarkers that will potentially allow for an earlier medical intervention

Abstract: In this study, a sensitive and facile method with wide linear range and low detection limit for detecting hydrogen sulfide in rat brain microdialysate was developed. The design of the sensor is based on the competitive binding reaction principle, in which cysteine was self-assembly immobilized on the surface of gold electrode, and then the Cu2+ as the electrochemical probe was anchored to the cysteine film through coordination bonding with carboxyl (-COOH) and amino group (-NH2) to form the Cu2+/Cys/Au electrode. The Cu2+/Cys/Au electrode can serve as an electrochemical H2S sensor through a ligand exchange reaction, which may come from the greater
affinity of H2S than cysteine to the gold surface due to a steric hindrance reason. The hydrogen sulfide cuts off the S-Au bonds between cysteine and Au electrode and leads to the Cu2+ drop off from electrode, resulting in a decrease in the redox signal of Cu2+, thereby creating a current that is indirectly proportional to the logarithm of the concentration of H2S dissolved at the sensor surface. The current response, i.e., signal output, is in wide linearity to logarithm of the concentration of H2S in the range of 0.01-100.0 μM with ΔI/μA = 0.0857 lgCH2S(μM) + 0.124 and very low detection limit 5 nM (S/N = 3). The assay demonstrated here is highly selective with respect to alleviating the interference of other thiol-containing species such as glutathione (GSH), homocysteine (Hcy), and cysteine commonly existing in the brain. The basal level of H2S in the microdialysate from the hippocampus of rats is determined to be around 8.6 ±/ 3.2 μM. The method demonstrated here is facile but reliable and durable and is envisaged to be applicable to understanding the chemical essence involved in physiological and pathological events associated with H2S. Graphical abstract By rationally tailoring the gold electrode surface through the competitive binding interaction of gold electrode between cysteine and H2S, we have successfully designed a simple, highly sensitive, and selective method for electrochemical sensing of H2S in brain microdialysate.

Abstract: A hurricane can present unique hazards that exist long after the strong winds and heavy rains have subsided. These hazards may not only be physical, but chemical as well. Hydrogen sulfide (H2S) represents an important and potentially overlooked hazard that can be naturally produced in floodwaters following a hurricane. In August of 2012, in the wake of Hurricane Isaac, Plaquemines Parish, Louisiana was submerged under a blanket of floodwater. To remove floodwaters that had breached the levee system designed to keep water out, temporary drainage pump stations were installed at strategic locations throughout Plaquemines Parish. The transfer of floodwaters at these drainage stations resulted in the generation of elevated concentrations of airborne H2S at the pumping stations. The generation of H2S at these pumping stations represented a potential inhalation hazard for workers; thus, awareness for possible H2S exposure at these installations is crucial.

Abstract: The volatile transmitter hydrogen sulfide (H2S) is known for its various functions in vascular biology. This study evaluates the effect of the H2S-donor GYY4137 (GYY) on thrombus stability and microvascular thrombolysis. Human whole blood served for all in vitro studies and was analyzed in a resting state, after stimulation with thrombin-receptor activating peptide (TRAP) and after incubation with 10 or 30 mM GYY or its vehicle DMSO following TRAP-activation, respectively. As a marker for thrombus stability, platelet-leukocyte aggregation was assessed using flow cytometry after staining of human whole blood against CD62P and CD45, respectively. Furthermore, morphology and quantity of platelet-leukocyte aggregation were studied by means of scanning electron microscopy (scanning EM). Therefore, platelets were stained for CD62P followed by immuno gold labeling. In vivo, the dorsal skinfold chamber preparation was performed for light/dye induction of thrombi in arterioles and venules using intravital fluorescence microscopy. Thrombolysis was assessed 10 and 22 h after thrombus induction and treatment with the vehicle, GYY, or recombinant tissue plasminogen activator (rTPA). Flow cytometry revealed an increase of CD62P/CD45 positive aggregates after TRAP stimulation of human whole blood, which was significantly reduced by preincubation with 30 mM GYY. Scanning EM additionally showed a reduced platelet-leukocyte aggregation and a decreased leukocyte count within the aggregates after preincubation with GYY compared to TRAP stimulation alone. Further on,
morphological signs of platelet activation were found markedly reduced upon treatment with GYY. In mice, both GYY and rtPA significantly accelerated arteriolar and venular thrombolysis compared to the vehicle control. In conclusion, GYY impairs thrombus stability by reducing platelet-leukocyte aggregation and thereby facilitates endogenous thrombolysis.


Abstract: The role of endogenous H2S has been highlighted as a gaseous transmitter. The vascular smooth muscle inhibitory effects of H2S have been characterized in isolated aorta and mesenteric arteries in rats and mice. Our study was aimed at investigating the vascular effects of H2S on isolated mesenteric arteries and examining the underlying mechanisms involved. All experiments were performed on rings (4-8mm long) of human mesenteric arteries obtained from patients undergoing abdominal surgery. Ethical approval was obtained from the Ethics Committee of the University Hospital of the University of Florence (app. N. 2015/0024947). The effect of NaHS, an H2S donor, was determined using noradrenaline pre-contracted human isolated mesenteric rings. NaHS evoked a concentration-dependent relaxation (EC50 57μM). In contrast, homocysteine, an endogenous precursor of H2S, failed to affect human isolated mesenteric rings. Vasorelaxant response to NaHS was reduced by endothelium removal, application of the nitric oxide synthase inhibitor L-NAME and ODQ inhibitor of cyclic GMP. SQ 22536, an adenylate-cyclase inhibitor, failed to block NaHS-induced vasorelaxation. Inhibition of endogenous prostanoid production by indomethacin significantly reduced NaHS induced vasorelaxation. The role of potassium channels was also examined: blockers of the Ca2+ dependent potassium channel, charybdotoxin and apamin, failed to have any influence on the relaxant response to NaHS on this vascular tissue. In summary, H2S induced relaxation of isolated rings of human mesenteric arteries.

Endothelium-dependent related mechanisms with the stimulation of ATP-sensitive potassium channels represents important cellular mechanisms for H2S effect on human mesenteric arteries.


Abstract: Therapeutic manipulation of the gasotransmitter hydrogen sulfide (H2S) has recently been proposed as a novel targeted anticancer approach. Here we show that human lung adenocarcinoma tissue expresses high levels of hydrogen sulfide (H2S) producing enzymes, namely, cystathionine beta-synthase (CBS), cystathionine gamma lyase (CSE) and 3-mercaptopyruvate sulfurtransferase (3-MST), in comparison to adjacent lung tissue. In cultured lung adenocarcinoma but not in normal lung epithelial cells elevated H2S stimulates mitochondrial DNA repair through sulfhydration of EXOG, which, in turn, promotes mitochondrial DNA repair complex assembly, thereby enhancing mitochondrial DNA repair capacity. In addition, inhibition of H2S-producing enzymes suppresses critical bioenergetics parameters in lung adenocarcinoma cells. Together, inhibition of H2S-producing enzymes sensitize lung adenocarcinoma cells to chemotherapeutic agents via induction of mitochondrial dysfunction as shown in in vitro and in vivo models, suggesting a novel mechanism to overcome tumor chemoresistance.


Abstract: The pH of the majority of thermal springs in Yellowstone National Park (YNP) is from 1 to 3 and 6 to 10; relatively few springs (~5%) have a pH range of 4-5. We used 16S rRNA gene pyrosequencing to investigate microbial communities sampled from four pH 4 thermal springs collected from four regions of YNP that differed in their fluid.
temperature and geochemistry. Our results revealed that the composition of bacterial communities varied among the sites, despite sharing similar pH values. The taxonomic composition and metabolic functional potential of the site with the lowest temperature (55 degrees C), a thermal spring from the Seven Mile Hole (SMH) area, were further investigated using shotgun metagenome sequencing. The taxonomic classification, based on 372 Mbp of unassembled metagenomic reads, indicated that this community included a high proportion of Chloroflexi, Bacteroidetes, Proteobacteria, and Firmicutes. Functional comparison with other YNP thermal spring metagenomes indicated that the SMH metagenome was enriched in genes related to energy production and conversion, transcription, and carbohydrate transport. Analysis of genes involved in nitrogen metabolism revealed assimilatory and dissimilatory nitrate reduction pathways, whereas the majority of genes involved in sulfur metabolism were related to the reduction of sulfate to adenylylsulfate, sulfite, and H2S. Given that pH 4 thermal springs are relatively less common in YNP and thermal areas worldwide, they may harbor novel microbiota and the communities that inhabit them deserve further investigation.

(47) Ngo JP, Ow CP, Gardiner BS, Kar S, Pearson JT, Smith DW, et al. Diffusive shunting of gases and other molecules in the renal vasculature: physiological and evolutionary significance. Am J Physiol Regul Integr Comp Physiol 2016 Nov 1;311(5):R797-R810. Abstract: Countercurrent systems have evolved in a variety of biological systems that allow transfer of heat, gases, and solutes. For example, in the renal medulla, the countercurrent arrangement of vascular and tubular elements facilitates the trapping of urea and other solutes in the inner medulla, which in turn enables the formation of concentrated urine. Arteries and veins in the cortex are also arranged in a countercurrent fashion, as are descending and ascending vasa recta in the medulla. For countercurrent diffusion to occur, barriers to diffusion must be small. This appears to be characteristic of larger vessels in the renal cortex. There must also be gradients in the concentration of molecules between afferent and efferent vessels, with the transport of molecules possible in either direction. Such gradients exist for oxygen in both the cortex and medulla, but there is little evidence that large gradients exist for other molecules such as carbon dioxide, nitric oxide, superoxide, hydrogen sulfide, and ammonia. There is some experimental evidence for arterial-to-venous (AV) oxygen shunting. Mathematical models also provide evidence for oxygen shunting in both the cortex and medulla. However, the quantitative significance of AV oxygen shunting remains a matter of controversy. Thus, whereas the countercurrent arrangement of vasa recta in the medulla appears to have evolved as a consequence of the evolution of Henle's loop, the evolutionary significance of the intimate countercurrent arrangement of blood vessels in the renal cortex remains an enigma.

(48) Ivanciuc T, Sbrana E, Ansar M, Bazhanov N, Szabo C, Casola A, et al. Hydrogen Sulfide Is an Antiviral and Antiinflammatory Endogenous Gasotransmitter in the Airways. Role in Respiratory Syncytial Virus Infection. Am J Respir Cell Mol Biol 2016 Nov;55(5):684-96. Abstract: Hydrogen sulfide (H2S) is an endogenous gaseous transmitter whose role in the pathophysiology of several lung diseases has been increasingly appreciated. Our recent studies in vitro have shown, we believe for the first time, that H2S has an important antiviral and antiinflammatory activity in respiratory syncytial virus (RSV) infection, the leading cause of bronchiolitis and viral pneumonia in children. Our objective was to evaluate the therapeutic potential of GYY4137, a novel slow-releasing H2S donor, for the prevention and treatment of RSV-induced lung disease, as well as to investigate the role of endogenous H2S in a mouse model of RSV infection. Ten- to 12-week-old BALB/c mice treated with GYY4137, or C57BL/6J mice genetically deficient in the cystathionine gamma-lyase enzyme, the major H2S-generating enzyme in the lung, were infected with RSV and assessed for viral replication, clinical disease, airway hyperresponsiveness, and inflammatory responses. Our results show that intranasal delivery of GYY4137 to RSV-infected mice significantly reduced viral replication and markedly improved clinical disease parameters and pulmonary dysfunction compared
with the results in vehicle-treated control mice. The protective effect of the H2S donor was associated with a significant reduction of viral-induced proinflammatory mediators and lung cellular infiltrates. Furthermore, cystathionine gamma-lyase-deficient mice showed significantly enhanced RSV-induced lung disease and viral replication compared with wild-type animals. Overall, our results indicate that H2S exerts a novel antiviral and antiinflammatory activity in the context of RSV infection and represent a potential novel pharmacological approach for ameliorating virus-induced lung disease

Abstract: In this paper, rice straw was used as a raw material to produce biogas by anaerobic batch fermentation at 35 degrees C (mesophilic) or 55 degrees C (thermophilic). The hydrogen sulfide in biogas can be converted to S0 or sulfate and removed in-situ under micro-oxygen environment. Trace oxygen was conducted to the anaerobic fermentation tank in amount of 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, or 10.0 times stoichiometric equivalence, respectively, and the control experiment without oxygen addition was carried out. The results showed that the initial H2S concentrations of biogas are about 3235 +/- 185 mg/m3 (mesophilic) or 3394 +/- 126 mg/m3 (thermophilic), respectively. The desulfurization efficiency is 72.3 % (mesophilic) or 65.6 % (thermophilic), respectively, with oxygen addition by stoichiometric relation. When the oxygen fedeed in amount of 2 approximately 4 times, theoretical quantity demanded the removal efficiency of hydrogen sulfide could be over 92 %, and the oxygen residue in biogas could be maintained less than 0.5 %, which fit the requirement of biogas used as vehicle fuel or combined to the grid. Though further more oxygen addition could promote the removal efficiency of hydrogen sulfide (about 93.6 %), the oxygen residue in biogas would be higher than the application limit concentration (0.5 %). Whether mesophilic or thermophilic fermentation with the extra addition of oxygen, there were no obvious changes in the gas production and methane concentration. In conclusion, in-situ desulfurization can be achieved in the anaerobic methane fermentation system under micro-oxygen environment. In addition, air could be used as a substitute oxygen resource on the situation without strict demand for the methane content of biogas

Abstract: Both biogas desulfurization and wastewater denitrification can be achieved simultaneously, when nitrate/nitrite is used as the electron acceptor for H2S oxidation. The main objective of this study was to investigate the influence of the molar ratio of sulfide/nitrate (S/N) on biogas desulfurization performance in a biotrickling filter (BTF) and a biobubble column (BBC). The results show that with the decrease of the S/N ratios from 3.6 to 0.7, the removal efficiencies of H2S increased from about 66 to 100 %, while the removal of nitrate decreased from 100 to 70 % in the two bioreactors. The BTF has a better and more stable desulfurization performance than the BBC does, which could be attributed to their different gas-liquid contacting modes. With the increase of the S/N ratios from 1.0 to 2.5 in the BTFs, the removal of H2S in biogas was affected slightly, while the percentages of the produced sulfate decreased evidently. In addition, different supplying methods of nitrate wastewater, i.e., intermittent and continuous, did not affect the removal of H2S significantly, while the intermittent addition of nitrate wastewater increased the percentages of sulfate and denitrification performance

Abstract: Dimethylmonothioarsinic acid (DMMTAV) is a highly toxic, thiolated analogue of dimethylarsinic acid (DMAV). In comparison, a further thiolated analogue, dimethyldithioarsinic acid (DMDTA), and DMAV both exhibit lower toxicity. To
understand the environmental conditions responsible for forming DMMTAV, the kinetics of DMAV thiolation are examined. The thiolation of DMAV is pH-dependent and consists of two consecutive first-order reactions under excess sulfide conditions. The first thiolation of DMAV to form DMMTAV is faster than the second one to DMDTAV. DMMTAV is therefore an intermediate. The first reaction is first-order in H2S at pH 6.0 and 20 degrees C; therefore, the overall reaction is second-order and the rate coefficient in this condition is 0.0780 M⁻¹ s⁻¹. The rate coefficient significantly decreases at pH 8.0, indicating that H2S(aq) triggers the thiolation of DMAV. The second reaction rate is significantly decreased at pH 2.5; therefore, reaction under strongly acidic conditions leads to accumulation of highly toxic DMMTAV in the early stages of thiolation. The transformation of DMDTAV to DMMTAV is catalyzed in the presence of ferric iron. Formation of DMMTAV should be considered when assessing risk posed by arsenic under sulfidic or sulfate reducing conditions.

Abstract: Emission of odorous and toxic gases from stored livestock manure is well documented and poses a serious health risk to farmers and livestock. Hydrogen sulfide emissions have been sharply rising with increasingly intensive livestock production and are of particular concern because of the acute toxicity of this gas. Numerous strategies, technologies, and chemical treatments have been used to control hydrogen sulfide emissions, but none have worked particularly well because they are neither cost-effective nor environmentally sustainable, or they are too toxic for animals. The inhibitory effect of the sodium tetraborate decahydrate (i.e., borax) treatment to reduce hydrogen sulfide production using sulfate-reducing bacteria was examined in shallow manure pits in a starter-grower swine facility. Monitoring of air emissions and DNA analysis revealed that treatment of stored swine manure effectively reduced hydrogen sulfide production, and the reduction correlated to a decrease in the sulfate-reducing bacteria population in the stored swine manure

Abstract: INTRODUCTION: Halomonas hamiltonii is a Gram-negative, halophilic, motile, and nonspore-forming rod bacterium. Although most Halomonas sp. are commonly found in saline environments, it has rarely been implicated as a cause of human infection. Herein, the authors present a case report of continuous ambulatory peritoneal dialysis (CAPD)-related peritonitis attributed to H hamiltonii. CASE PRESENTATION: An 82-year-old male patient who had been receiving CAPD therapy presented to an emergency department with complaints of abdominal pain and cloudy dialysate that had persisted for 2 days. The peritoneal dialysate was compatible with CAPD peritonitis, with white blood cell count of peritoneal effluent of 810/mm and neutrophils predominated (60%). Two days after culture on blood agar medium, nonhemolytic pink mucoid colonies showed, with cells showing Gram-negative, nonspore-forming rods with a few longer and larger bacilli than usual were found. We also performed biochemical tests and found negative responses in K/K on the triple sugar iron test and H2S and equivocal (very weak) response in the motility test, but positive responses to catalase, oxidase, and urease tests. The partial sequence of the 16S rRNA gene of a bacterium detected by peritoneal fluid culture was utilized for a Basic Local Alignment Search Tool search, which revealed that the organism was H hamiltonii. Intraperitoneal antibiotics were administered for 21 days, and the patient was discharged without clinical problems. CONCLUSION: We present here the first case report of CAPD-related peritonitis caused by H hamiltonii, which was identified using molecular biological techniques. Although
guidelines do not exist for the treatment of infections caused by this organism, conventional treatment for Gram-negative organisms could be effective

Abstract: Beta-amyloid (Abeta) plaques and oxidative stress are associated with the pathogenesis of Alzheimer's disease (AD). Hydrogen sulfide (H2S) has been recognized as a cytoprotectant, which improves learning memory impairment and exerts antioxidant effects in neurodegenerative disorders, including AD. The experiment was projected to explore the effects of H2S on cognitive deficits, Abeta levels and possible antioxidant mechanisms. Here, APP/PS1 transgenic mice were injected sodium hydrosulfide (NaHS, a H2S donor, 2.8mg/kg) once a day for three months. It was found that APP/PS1 transgenic mice exhibited cognitive deficits and a large number of senile plaques, along with neurons decrease and Abeta increase. However, intraperitoneal (i.p.) injection of NaHS improved learning memory deficits, decreased the number of senile plaques, Abeta1-40 and Abeta1-42 levels, suppressed neurons loss, together with up-regulated the levels of cystathionine-beta-synthase (CBS) and 3-mercaptopropionate-sulfurtransferase (3MST). Furthermore, the protein levels of beta-amyloid precursor (APP) and beta-secretase 1 (BACE1) were dramatically restrained after administration of H2S. In addition, H2S exerted antioxidant effects via up-regulation nuclear factor erythroid-2-related factor 2 (Nrf2), heme oxygenase-1 (HO-1) and glutathione S-transferase (GST). Taken together, these findings suggest that H2S ameliorates learning memory impairment, decreases the number of senile plaques in APP/PS1 mice possibly through inhibition of Abeta production and activation of Nrf2/antioxidant response element (ARE) pathway

Abstract: The poisoning of H2S sensing material based on the mixture of acid-treated carbon nanotubes, CuO and SnO2 was investigated by exposing the material to high doses of H2S (1% in volume) and following the changes spectroscopically. The presence of metal sulfides (CuS and SnS2), sulfates and thiols was confirmed on the surface of this material as the result of H2S poisoning. Further study revealed that leaving this material in air for extended period of time led to reoxidation of metal sulfides back to metal oxides. The formation of thiols and sulfates directly on carbon nanotubes is not reversible under these conditions; however, the extent of the overall surface reaction in this case is substantially lower than that for the composite material

Abstract: INTRODUCTION: A suicide trend that involves mixing household chemicals to produce hydrogen sulfide or hydrogen cyanide, commonly referred to as a detergent, hydrogen sulfide, or chemical suicide is a continuing problem in the United States (U.S.). Because there is not one database responsible for tracking chemical suicides, the actual number of incidents in the U.S. is unknown. To prevent morbidity and mortality associated with chemical suicides, it is important to characterize the incidents that have occurred in the U.S. METHODS: The author analyzed data from 2011-2013 from state health departments participating in the Agency for Toxic Substances and Disease Registry's National Toxic Substance Incidents Program (NTSIP). NTSIP is a web-based chemical incident surveillance system that tracks the public health consequences (e.g., morbidity, mortality) from acute chemical releases. Reporting sources for NTSIP incidents typically include first responders, hospitals, state environmental agencies, and media outlets. To find chemical suicide incidents in NTSIP's database, the author queried open
text fields in the comment, synopsis, and contributing factors variables for potential incidents. RESULTS: Five of the nine states participating in NTSIP reported a total of 22 chemical suicide incidents or attempted suicides during 2011-2013. These states reported a total of 43 victims: 15 suicide victims who died, seven people who attempted suicide but survived, eight responders, and four employees working at a coroner's office; the remainder were members of the general public. None of the injured responders reported receiving HazMat technician-level training, and none had documented appropriate personal protective equipment. CONCLUSION: Chemical suicides produce lethal gases that can pose a threat to responders and bystanders. Describing the characteristics of these incidents can help raise awareness among responders and the public about the dangers of chemical suicides. Along with increased awareness, education is also needed on how to protect themselves.

Abstract: Emotional and olfactory processing is frequently shown to be closely linked both anatomically and functionally. Depression, a disease closely related to the emotional state of sadness, has been shown to be associated with a decrease in olfactory sensitivity. The present study focuses on the state of sadness in n = 31 healthy subjects in order to investigate the specific contribution of this affective state in the modulation of olfactory processing. A sad or indifferent affective state was induced using 2 movies that were presented on 2 separate days. Afterward, chemosensory-evoked potentials were recorded after stimulation with an unpleasant (hydrogen sulfide: "rotten eggs") or a pleasant (phenyl ethyl alcohol: "rose") odorant. Latencies of N1 and P2 peaks were longer after induction of the sad affective state. Additionally, amplitudes were lower in a sad affective state when being stimulated with the unpleasant odorant. Processing of olfactory input has thus been reduced under conditions of the sad affective state. We argue that the affective state per se could at least partially account for the reduced olfactory sensitivity in depressed patients. To our knowledge, the present study is the first to show influence of affective state on chemosensory event-related potentials. (PsycINFO Database Record)

Abstract: The primary aim of this study was to assess the usefulness of plasma hydrogen sulphide (H2S) level at admission as a predictor of severity of acute pancreatitis. The secondary aims were to examine whether the level of H2S after 48 h correlated with severity and whether level of H2S correlated with pulmonary, renal or infectious complications. Plasma hydrogen sulphide was measured within 24 h of admission and 48 h later, in patients with acute pancreatitis. Patients were classified as having mild or severe pancreatitis, and H2S levels in the two groups were compared. A total of 55 patients had H2S estimation carried out within 24 h of admission. H2S levels were similar in patients with mild (mean 31.8 +/- 18.8, range 7.1 to 81.4 micromol/L) and severe pancreatitis (mean 28.2 +/- 21.6, range 6.1 to 74.4 micromol/L; p = 0.339). There was no difference found between the groups after 48 h (mild n = 28, mean 26.8 +/- 19.4 micromol/L, and severe n = 20, mean 34.6 +/- 21.0 micromol/L; p = 0.127). There was also no difference in the levels between patients with or without lung injury, kidney injury or sepsis. Performing H2S estimation to predict severity in acute pancreatitis is not beneficial.

Abstract: Tungsten trioxide is the second most commonly used semiconducting metal oxide in gas sensors. Semiconducting metal oxide (SMOX)-based sensors are small, robust, inexpensive and sensitive, making them highly attractive for handheld portable...
medical diagnostic detectors. WO(3) is reported to show high sensor responses to several biomarkers found in breath, e.g., acetone, ammonia, carbon monoxide, hydrogen sulfide, toluene, and nitric oxide. Modern material science allows WO(3) samples to be tailored to address certain sensing needs. Utilizing recent advances in breath sampling it will be possible in the future to test WO(3)-based sensors in application conditions and to compare the sensing results to those obtained using more expensive analytical methods.


Abstract: Reducing hydrogen sulfide concentration in eutrophic marine sediments is crucial to maintaining healthy aquatic ecosystems. Managing fly ash, 750 million tons of which is generated annually throughout the world, is another serious environmental problem. In this study, we develop an approach that addresses both these issues by mixing coal fly ash from coal-fired power plants with blast furnace cement to remediate eutrophic sediments. The purpose of this study is to optimize the mixing ratio of coal fly ash and blast furnace cement to improve the rate of hydrogen sulfide removal based on scientific evidence obtained by removal experiments and XAFS, XRD, BET, and SEM images. In the case of 10 mg-S L-1 of hydrogen sulfide, the highest removal rate of hydrogen sulfide was observed for 87 wt% of coal fly ash due to decreased competition of adsorption between sulfide and hydroxyl ions. Whereas regarding 100 mg-S L-1, the hydrogen sulfide removal rate was the highest for 95 wt% of coal fly ash. However, for both concentrations, the removal rate obtained by 87 wt% and 95 wt% were statistically insignificant. The crushing strength of the mixture was over 1.2 N mm-2 when the coal fly ash mixing ratio was less than 95 wt%. Consequently, the mixing ratio of coal fly ash was optimized at 87 wt% in terms of achieving both high hydrogen sulfide removal rate and sufficient crushing strength.


Abstract: For a long time, hydrogen sulfide (H2S) has been considered as merely a toxic by product of cell metabolism, but nowadays is emerging as a novel gaseous signal molecule, which participates in seed germination, plant growth and development, as well as the acquisition of stress tolerance including cross-adaptation in plants. Cross-adaptation, widely existing in nature, is the phenomenon in which plants expose to a moderate stress can induce the resistance to other stresses. The mechanism of cross-adaptation is involved in a complex signal network consisting of many second messengers such as Ca2+, abscisic acid, hydrogen peroxide and nitric oxide, as well as their crosstalk. The cross-adaptation signaling is commonly triggered by moderate environmental stress or exogenous application of signal molecules or their donors, which in turn induces cross-adaptation by enhancing antioxidant system activity, accumulating osmolytes, synthesizing heat shock proteins, as well as maintaining ion and nutrient balance. In this review, based on the current knowledge on H2S and cross-adaptation in plant biology, H2S homeostasis in plant cells under normal growth conditions; H2S signaling triggered by abiotic stress; and H2S-induced cross-adaptation to heavy metal, salt, drought, cold, heat, and flooding stress were summarized, and concluded that H2S might be a candidate signal molecule in plant cross-adaptation. In addition, future research direction also has been proposed.


Abstract: PURPOSE: Oxidative stress has been implicated in the pathogenesis of various neonatal diseases involving the intestine. Hydrogen sulfide (H2S) has been shown to protect against oxidative stress. We hypothesized that administration of sodium hydrosulfide (NaHS), an H2S donor, to neonatal mice can decrease the intestinal epithelial injury associated with maternal separation (MS). METHODS: C57BL/6 mice
received either intraperitoneal phosphate buffered saline (PBS; n=10) or NaHS (1mg/kg/day; n=10), followed by MS for 3h daily between postnatal day P5 and P9. Control neonatal mice were untreated and were not exposed to MS (n=10). Proximal colon was harvested and analyzed for crypt length, goblet cell number per crypt, oxidative stress and inflammation. Groups were compared using one-way ANOVA with Bonferroni post-test. RESULTS: Compared to controls, MS+PBS mice had shorter crypt lengths, fewer goblet cells per crypt, reduced glutathione peroxidase activity, increased expression of thiobarbituric acid reactive substances and inducible nitric oxide synthase mRNA, as well as increased IL-6, TNFalpha and myeloperoxidase. Administration of NaHS significantly counteracted these negative effects of MS. CONCLUSIONS: H2S protects the colon from the epithelial damage, oxidative stress and inflammation caused by maternal separation. This study provides insights on the pathogenesis of neonatal bowel diseases and indicates the potential for a pharmacological intervention to rescue the colonic epithelium. LEVEL OF EVIDENCE: n/a - animal and laboratory study

(63) Wang P, Wu J, Di C, Zhou R, Zhang H, Su P, et al. A novel peptide-based fluorescence chemosensor for selective imaging of hydrogen sulfide both in living cells and zebrafish. Biosens Bioelectron 2016 Oct 24. Abstract: Hydrogen sulfide (H2S) plays an important role as a signaling compound (gasotransmitter) in living systems. However, the development of an efficient imaging chemosensor of H2S in live animals is a challenging field for chemists. Herein, a novel peptide-based fluorescence chemosensor L-Cu was designed and synthesized on the basis of the copper chelating with the peptide ligand (FITC-Ahx-Ser-Pro-Gly-His-NH2, L), and its H2S sensing ability has been evaluated both in living cells and zebrafish. The peptide backbone and Cu2+-removal sensing mechanism are used to deliver rapid response time, high sensitivity, and good biocompatibility. After a fast fluorescence quench by Cu2+ coordinated with L, the fluorescence of L is recovered by adding S2- to form insoluble copper sulfide in aqueous solution with a detection limit for hydrogen sulfide measured to be 31nM. Furthermore, the fluorescence chemosensor L-Cu showed excellent cell permeation and low biotoxicity to realize the intracellular biosensing, L-Cu has also been applied to image hydrogen sulfide in live zebrafish larvae. We expect that this peptide-based fluorescence chemosensor L-Cu can be used to study H2S-related chemical biology in physiological and pathological events

(64) Cao X, Bian JS. The Role of Hydrogen Sulfide in Renal System. Front Pharmacol 2016;7:385. Abstract: Hydrogen sulfide has gained recognition as the third gaseous signaling molecule after nitric oxide and carbon monoxide. This review surveys the emerging role of H2S in mammalian renal system, with emphasis on both renal physiology and diseases. H2S is produced redundantly by four pathways in kidney, indicating the abundance of this gaseous molecule in the organ. In physiological conditions, H2S was found to regulate the excretory function of the kidney possibly by the inhibitory effect on sodium transporters on renal tubular cells. Likewise, it also influences the release of renin from juxtaglomerular cells and thereby modulates blood pressure. A possible role of H2S as an oxygen sensor has also been discussed, especially at renal medulla. Alternation of H2S level has been implicated in various pathological conditions such as renal ischemia/reperfusion, obstructive nephropathy, diabetic nephropathy, and hypertensive nephropathy. Moreover, H2S donors exhibit broad beneficial effects in renal diseases although a few conflicts need to be resolved. Further research reveals that multiple mechanisms are underlying the protective effects of H2S, including anti-inflammation, anti-oxidation, and anti-apoptosis. In the review, several research directions are also proposed including the role of mitochondrial H2S in renal diseases, H2S delivery to kidney by targeting D-amino acid oxidase/3-mercaptopyruvate sulfurtransferase (DAO/3-MST) pathway, effect of drug-like H2S donors in kidney diseases and understanding the molecular mechanism of H2S. The completion of the studies in these
directions will not only improve our understanding of renal H2S functions but may also be critical to translate H2S to be a new therapy for renal diseases.

(65) Wang Y, Ge S, Zhang L, Yu J, Yan M, Huang J. Visible photoelectrochemical sensing platform by on situ generated CdS quantum dots decorated branched-TiO2 nanorods equipped with Prussian blue electrochromic display. Biosens Bioelectron 2016 Sep 29. Abstract: In this study, based on in situ generation of CdS quantum dots (QDs) on the surface of branched TiO2 (B-TiO2) nanorods, an solar innovative photoelectrochemical (PEC) sensing platform was constructed for real-time, and sensitive detection of cellular H2S. Specifically, B-TiO2 nanorods arrays consisting of TiO2 nanorods directly grown on fluorine-doped tin oxide (FTO) further using TiCl3 mediated surface treatment of TiO2 nanorods are designed and fabricated as a new type of photoelectrode. CdS quantum dots (QDs) was formed on the surface of B-TiO2 nanorods arrays through the reaction between Cd2+ and S2-. And a significant enhancement in the photocurrent was obtained that ascribed to the formation of CdS-B-TiO2 heterostructures, thus leading to sensitive PEC recording of the H2S level in buffer and cellular environments. By using Prussian blue (PB) a electrochromic material to capture the photoelectron generated from the photoelectrode, a new visual system was proposed due to the formation of Prussian white (PW), which could be used to visualize the quantum photoelectric effect. This novel PEC sensing platform not only achieved satisfied analysis results toward S2-, but also showed excellent sensitivity, selectivity, low cost, and portable features. The strategy through the in situ generation of semiconductor nanoparticles on the surface of wide band-gap semiconductor paves the way for the improvements of PEC analytical performance. Meanwhile, the quantitative read-out electrochromic display paves a facile avenue and initiates new opportunities for creation of cheap, miniaturization sensors for other relevant analytes.

(66) Park CS, Ha TH, Choi SA, Nguyen DN, Noh S, Kwon OS, et al. A near-infrared "turn-on" fluorescent probe with a self-immolative linker for the in vivo quantitative detection and imaging of hydrogen sulfide. Biosens Bioelectron 2016 Sep 28. Abstract: Hydrogen sulfide is a critical biological messenger, but few biologically compatible methods are available for its detection in vivo. Here, we describe the design and synthesis of a novel azide-functionalized near-infrared probe, NIR-Az, for a hydrogen sulfide assay in which a self-immolative linker is incorporated between the azide moiety and phenolic dihydroxanthene fluorophore from a cyanine dye. A large "turn-on" near-infrared fluorescence signal results from the reduction of the azide group of the fluorogenic moiety to an amine, in which the self-immolative linker also enhances the accessibility of NIR-Az to hydrogen sulfide. NIR-Az can select hydrogen sulfide from among 16 analytes, including cysteine, glutathione, and homocysteine. By exploiting the superior properties of NIR-Az, such as its good biocompatibility and rapid cell internalization, we successfully demonstrated its usefulness in monitoring both the concentration- and time-dependent variations of hydrogen sulfide in living cells and animals (detection limit less than 0.26μM), thereby providing a powerful approach for probing hydrogen sulfide chemistry in biological systems.

(67) Binversie EY, Ruiz-Moreno M, Carpenter AJ, Heins BJ, Crawford GI, DiCostanzo A, et al. Effects of dietary roughage and sulfur in diets containing corn dried distillers grains with solubles on hydrogen sulfide production and fermentation by rumen microbes in vitro. J Anim Sci 2016 Sep;94(9):3883-93. Abstract: Dried distillers grains with solubles (DDGS) have been used in production animal diets; however, overuse of DDGS can cause toxic concentrations of ruminal hydrogen sulfide gas (HS), resulting in polioencephalomalacia, a deleterious brain disease. Because HS gas requires an acidic rumen environment and diet can influence ruminal pH, it has been postulated that dietary manipulation could help mitigate HS production. The objective of this study was to assess the effect of dietary roughage and sulfur concentrations on HS production and rumen fermentation. In Exp. 1, 7 dual-flow
continuous culture fermenters were used in 4 consecutive 9-d periods consisting of 6 d of adaptation followed by 3 d of sampling. At the conclusion of each 9-d continuous culture period, adapted rumen fluid was used for inoculation of 24-h batch culture incubations for Exp. 2. For both experiments, 6 dietary treatments were formulated to consist of 0.3%, 0.4%, or 0.5% dietary sulfur (LS, MS, and HS, respectively) and 3% or 9% dietary roughage (LR and MR, respectively), using grass hay as the roughage source. A corn-based diet without DDGS was used as a control diet. Headspace gas was sampled to determine HS production and concentration. In Exp. 1, greater dietary roughage had no effect ( = 0.14) on HS production but did create a less acidic environment because of an increase ( < 0.01) in the in vitro pH. In Exp. 2, an increase in dietary sulfur caused an increase ( = 0.04) in ruminal HS production, but there was no direct effect ( = 0.25) of dietary roughage on HS production. Greater dietary roughage resulted in a less ( = 0.01) acidic final batch culture pH but a lower ( < 0.01) total VFA concentration. Further investigation is needed to determine a more effective way to mitigate ruminal HS production using dietary manipulation, which could include greater inclusion of dietary roughage or the use of different roughage sources.

Pogge DJ, Drewnoski ME, Snider D, Rumbeiha WK, Hansen SL. Effect of ferric ammonium citrate in feedlot diets with varying dried distillers' grains inclusion on ruminal hydrogen sulfide concentrations and steer growth. J Anim Sci 2016 Sep;94(9):3894-901. Abstract: Angus-cross steers ( = 128) were used to examine the effects of supplementing ferric ammonium citrate (FAC; 300 mg ferric Fe/kg DM) to diets of 20, 40, or 60% dried distillers' grains plus solubles (DDGS) on growth performance, liver mineral and ruminal hydrogen sulfide (HS) concentrations, and carcass traits of finishing steers. Steers were blocked by initial BW (436 +/- 10.6 kg) into pens of 4 and randomly assigned to 1 of 6 treatments ( = 5 or 6 pens per treatment) including a 20, 40, or 60% DDGS inclusion diet with (+) or without (-) 300 mg Fe/kg DM from FAC. Liver biopsies (d -9/-10 and 96) and HS measures (d 0, 7, 14, 21, and 95) were determined from 1 steer/pen. Steers were harvested on d 102 and carcass data were collected. A treatment x month effect ( </= 0.006) was noted for ADG and G:F, in which the 20-FAC ADG and feed efficiency were greater ( <= 0.02) between d 0 to 28 but lesser ( <= 0.04) from d 29 to 56 than that of the 20+FAC steers. Final BW linearly decreased ( < 0.01) as DDGS inclusion increased. Final BW tended to be greater ( = 0.10) in the 60+FAC steers than in the 60-FAC steers, whereas final BW was not different ( >= 0.32) due to FAC supplementation in the 20 or 40% DDGS diets. A quadratic effect was noted for DMI ( = 0.02), where 60% DDGS decreased DMI. Within the 20% DDGS diet FAC+ improved DMI ( = 0.03) but had no effect within 40 or 60% DDGS inclusion. Ruminal HS concentrations were not affected ( >= 0.25) by FAC, but increasing DDGS linearly increased ( < 0.01) ruminal HS values. Liver Cu was decreased ( < 0.01) by FAC across all DDGS inclusions and tended to linearly decrease ( = 0.06) with increasing DDGS inclusion, whereas liver Fe, Mn, and Zn were not altered ( >= 0.11) by DDGS inclusion. Liver Zn concentrations tended to be ( = 0.08) or were ( = 0.03) decreased by FAC supplementation within 20 and 40% DDGS, respectively. Increasing the inclusion of DDGS linearly decreased ( = 0.04) HCW and quadratically affected marbling score where the 40% DDGS had the greatest ( = 0.02) marbling scores. Supplementation of FAC within 60% DDGS improved ( <= 0.03) HCW and LM area. Marbling scores were greater ( <= 0.04) in 20+FAC and 40+FAC compared with 20-FAC and 40-FAC, respectively. In conclusion, although ruminal HS concentrations were not affected by FAC under the conditions of this study, supplementing FAC to diets containing 60% DDGS improved HCW and LM area, suggesting that FAC may be beneficial when dietary S concentrations exceed 0.5%

Meininger DJ, Arman HD, Tonzetich ZJ. Synthesis, characterization, and binding affinity of hydrosulfide complexes of synthetic iron(II) porphyrinates. J Inorg Biochem 2016 Aug 27. Abstract: The binding and reactivity of the hydrosulfide ion (HS-) to iron(II) porphyrinates has been examined for several synthetic meso-tetraphenylporphine (TPP) derivatives. In
all cases, HS- coordinates to the iron centers in a 1:1 stoichiometry with formation constants (Kf) that reflect the electronic characteristics of the porphyrinate ligands. In the case of the F8TPP ligand (F8TPP=dianion of 5,10,15,20-tetrakis(2,6-difluorophenyl)porphine), an intermediate complex proposed as the hydrosulfide bridged dimer, (Bu4N)[Fe2(mu-SH)(F8TPP)2], was identified by NMR spectroscopy en route to formation of (Bu4N)[Fe(SH)(F8TPP)]. A robust procedure is reported for the synthesis and isolation of the parent hydrosulfide adduct, (Bu4N)[Fe(SH)(TPP)], which has permitted a detailed examination of its spectroscopy and chemical reactivity. Electrochemical measurements demonstrate that [Fe(SH)(TPP)]- is oxidized reversibly at a potential of -0.832V (vs ferrocene/ferrocenium) consistent with other iron porphyrinates containing sulfur-based ligands. Despite this fact, chemical oxidation of (Bu4N)[Fe(SH)(TPP)] with ferrocenium tetrafluoroborate produced only [Fe(TPP)] indicating that the putative iron(III) hydrosulfide adduct, [Fe(SH)(TPP)], decomposes rapidly. Treatment of (Bu4N)[Fe(SH)(TPP)] with ferrocenium tetrafluoroborate produced only [Fe(TPP)] indicating that the putative iron(III) hydrosulfide adduct, [Fe(SH)(TPP)], decomposes rapidly. Treatment of (Bu4N)[Fe(SH)(TPP)] with ferrocenium tetrafluoroborate produced only [Fe(TPP)] indicating that the putative iron(III) hydrosulfide adduct, [Fe(SH)(TPP)], decomposes rapidly. Treatment of (Bu4N)[Fe(SH)(TPP)] with ferrocenium tetrafluoroborate produced only [Fe(TPP)] indicating that the putative iron(III) hydrosulfide adduct, [Fe(SH)(TPP)], decomposes rapidly. Treatment of (Bu4N)[Fe(SH)(TPP)] with ferrocenium tetrafluoroborate produced only [Fe(TPP)] indicating that the putative iron(III) hydrosulfide adduct, [Fe(SH)(TPP)], decomposes rapidly.


Abstract: Stroke is a kind of acute cerebrovascular disease characterized by the focal lack of neurological function, including ischemic stroke and hemorrhagic stroke. As society ages rapidly, stroke has become the second leading cause of disability and death, and also become the main threat to human health and life. In recent years, findings from increasing animal and clinical trials have supplied scientific evidences for the treatment of stroke. Hydrogen sulfide (H2S), which has always been seen as a toxic gas, now has been thought to be the third gaseous signaling molecule following nitric oxide and carbon monoxide. Accumulating evidences indicate that H2S plays an important role in stroke. Given that its neuroprotective effect is dose-dependent, only when its concentration is relatively low, H2S can yield the neuroprotection, while high dose may lead to neurotoxicity. All these study results suggest that H2S may offer a new promising application for the therapy of stroke. Here, our review will present the role of H2S in stroke from its mechanism to animal and clinical studies.


Abstract: Phenols are plant metabolites characterised by several interesting bioactive properties such as antioxidant and bactericidal activities. In this study the application of a phenols concentrate (PC) from olive vegetation water to two different fresh products - gilt-head seabream (Sparus aurata) and chicken breast - was described. Products were treated in a bath of PC (22 g/L; chicken breast) or sprayed with two different solutions (L1:0.75 and L2:1.5 mg/mL; seabream) and then stored under refrigeration conditions. The shelf life was monitored through microbiological analyses - quality index method for seabream and a specific sensory index for raw breast. The secondary products of lipid-peroxidation of the chicken breast were determined using the thiobarbituric acid reactive substances (TBARs) test on cooked samples. Multivariate statistical techniques were adopted to investigate the impact of phenols and microbiological data were fitted by DMfit software. In seabream, the levels of PC did not highlight any significant difference on microbiological and sensory features. DMfit models suggested an effect only on H2S producing bacteria with an increased lag phase compared to the control samples (C: 87 h vs L2: 136 h). The results on chicken breast showed that the PC bath clearly modified the
growth of Pseudomonas and Enterobacteriaceae. The phenol dipping was effective in limiting lipid-peroxidation (TBARs) after cooking. Treated samples disclosed an increase of shelf life of 2 days. These could be considered as preliminary findings suggesting the use of this concentrate as preservative in some fresh products


Abstract: BACKGROUND/AIMS: Development of effective therapeutic drugs for Parkinson's disease is in great need. During the progression of Parkinson's disease, Rho-associated protein kinase 2 (ROCK2) is activated to promote neurodegeneration. Hydrogen sulfide (H2S) has a neuroprotective effect during the neural injury of Parkinson's disease. However, the mechanisms that underlie the effects of ROCK2 and H2S remain ill-defined. In the current study, we addressed these questions. METHODS: We used a 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)-induced mouse subacute model of Parkinson's disease to study the effects of H2S on astrocytic activation in the mouse striatum, on the levels of tyrosine-hydroxylase (TH)-positive neuron loss, on the apomorphine-induced rotational behavior of the mice, and on the changes in ROCK2 and miR-135a-5p expression. Plasmid transfection was applied to modify miR-135a-5p levels in a neuronal cell line HCN-1A. Bioinformatics analysis was performed to predict the relationship between ROCK2 and miR-135a-5p in neuronal cells, and then was confirmed by luciferase reporter assay. RESULTS: H2S alleviated MPTP-induced astrocytic activation in the mouse striatum, alleviated the increases in TH-positive neuron loss, and improved the apomorphine-induced rotational behavior of the mice. H2S significantly attenuated the increases in ROCK2 and the decreases in miR-135a-5p by MPTP. MiR-135a-5p targeted the 3'-UTR of ROCK2 mRNA to inhibit its translation in neuronal cells. CONCLUSION: MiR-135a-5p-regulated ROCK2 may play a role in the protective effects of hydrogen sulfide against Parkinson's disease


Abstract: Aims. The study aimed to examine whether hydrogen sulfide (H2S) generation changed in the kidney of the ageing mouse and its relationship with impaired kidney function. Results. H2S levels in the plasma, urine, and kidney decreased significantly in ageing mice. The expression of two known H2S-producing enzymes in kidney, cystathionine gamma-lyase (CSE) and cystathionine-beta-synthase (CBS), decreased significantly during ageing. Chronic H2S donor (NaHS, 50 mumol/kg/day, 10 weeks) treatment could alleviate oxidative stress levels and renal tubular interstitial collagen deposition. These protective effects may relate to transcription factor Nrf2 activation and antioxidant proteins such as HO-1, SIRT1, SOD1, and SOD2 expression upregulation in the ageing kidney after NaHS treatment. Furthermore, the expression of H2S-producing enzymes changed with exogenous H2S administration and contributed to elevated H2S levels in the ageing kidney. Conclusions. Endogenous hydrogen sulfide production in the ageing kidney is insufficient. Exogenous H2S can partially rescue ageing-related kidney dysfunction by reducing oxidative stress, decreasing collagen deposition, and enhancing Nrf2 nuclear translocation. Recovery of endogenous hydrogen sulfide production may also contribute to the beneficial effects of NaHS treatment


Abstract: In the present study, we attempted to elucidate mechanisms for the regulation of intracellular calcium levels by H2S in primary rat medullary neurons. Our results showed that NaHS significantly increased the level of [Ca2+]i in rat medullary neurons in a concentration-dependent manner. L-Cysteine and SAM significantly raised the level of [Ca2+]i in the medullary neurons while HA and/or AOAA produced a reversal effect. In
addition, L-cysteine and SAM significantly increased but HA and/or AOAA decreased the production of H2S in the cultured neurons. The [Ca2+]i elevation induced by H2S was significantly diminished by EGTA-Ca2+-free solutions, and this elevation was also reduced by nifedipine or nimodipine and mibefradil, suggesting the role of L-type and/or T-type Ca2+ channels. Moreover, the effect of H2S on [Ca2+]i level in neurons was significantly attenuated by BAPTA-AM and thapsigargin, suggesting the source of Ca2+. Therefore, we concluded that both exogenous and endogenous H2S elevates [Ca2+]i level in primarily cultured rat medullary neurons via both increasing calcium influx and mobilizing intracellular Ca2+ stores from ER.