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(1) Sun X, Jiang G, Bond PL, Wells T, Keller J. A rapid, non-destructive methodology to
monitor activity of sulfide-induced corrosion of concrete based on H2S uptake rate. Water
Abstract: Many existing methods to monitor the corrosion of concrete in sewers are either
very slow or destructive measurements. To overcome these limitations, a rapid,
non-invasive methodology was developed to monitor the sulfide-induced corrosion
process on concrete through the measurement of the H2S uptake rates of concrete at
various corrosion stages. The H2S uptake rate for a concrete coupon was determined by
measuring the gaseous H2S concentrations over time in a temperature- and
humidity-controlled gas-tight reactor. The reliability of this method was evaluated by
carrying out repeated tests on different concrete coupons previously exposed to 50 ppm
of H2S, at 30 degrees C and 100% relative humidity for over 32 months. The H2S uptake
measurements showed good reproducibility. It was also shown that a severely corroded
coupon exhibited higher sulfide uptake rates than a less corroded coupon. This could be
explained by the corrosion layer in the more corroded coupon having a higher biological
sulfide oxidation activity than the less corroded coupon. Additionally, temperature
changes had a stronger effect on the uptake rate of the heavily corroded coupon
compared to the less corroded coupon. A corrosion rate of 8.9 +/- 0.5 mm/year,
estimated from the H2S uptake results, agreed well with the corrosion rate observed in
real sewers under similar conditions. The method could be applied to investigate
important factors affecting sulfide-induced concrete corrosion, particularly temperature,
fluctuating gaseous H2S concentrations, oxygen concentrations, surface pH and relative
humidity

(2) Ju X, Wu S, Zhang Y, Dong R. Intensified nitrogen and phosphorus removal in a novel
1;59:37-45.
Abstract: A novel electrolysis-integrated tidal flow constructed wetland (CW) system was
developed in this study. The dynamics of intensified nitrogen and phosphorus removal
and that of hydrogen sulphide control were evaluated. Ammonium removal of up to 80%
was achieved with an inflow concentration of 60 mg/L in wetland systems with and
without electrolysis integration. Effluent nitrate concentration decreased from 2 mg/L to
less than 0.5 mg/L with the decrease in current intensity from 1.5 mA/cm(2) to 0.57
mA/cm(2) in the electrolysis-integrated wetland system, thus indicating that the current
intensity of electrolysis plays an important role in nitrogen transformations. Phosphorus
removal was significantly enhanced, exceeding 95% in the electrolysis-integrated CW
system because of the in-situ formation of a ferric iron coagulant through the
electro-dissolution of a sacrificial iron anode. Moreover, the electrolyzed wetland system
effectively inhibits sulphide accumulation as a result of a sulphide precipitation coupled
with ferrous-iron electro-dissolution and/or an inhibition of bacterial sulphate reduction
under increased aerobic conditions

filamentation in fish pathogen Edwardsiella tarda leading to reduced invasion and
Abstract: Edwardsiella tarda is a rod-shaped Gram-negative pathogenic bacterium that
causes hemorrhagic septicemia in fish. Nucleoid-associated protein HU is a basic
DNA-binding protein with structural specificity in regulating genes expression. In wild-type
E. tarda EIB202, HU is composed of two subunits HUalpha (hupA) and HUbeta (hupB), and exists in homodimer or heterodimer forms. Different from the wild-type and Delta hupB mutant, Delta hupA mutant was found to be defective in cell growth, H2S production, acid adaptation, and exhibited abnormal cell division resulting in a filamentous phenotype in log phase bacteria. The qRT-PCR result showed that deletion of hupA significantly up-regulated the transcription levels of recA and sulA, which in turn stimulated RecA-dependent pathway to prevent cell division, resulting in filamentous morphology in E. tarda. Furthermore, the elongated Delta hupA cells showed a striking defect in EPC cell invasion, and the adhesion and internalization rates were reduced to 25% and 27% of the wild-type in log phase cultures. Confocal laser scanning microscopy revealed that filamentous bacteria failed to adhere to and could not be internalized into EPC. When some of the bacteria regained the rod-shape morphology in stationary cultures, the Delta hupA mutants showed increased adhesion and internalization rates into EPC. Moreover, Delta hupA mutant exhibited delayed mortalities (for two days) in zebrafish but the LD50 increased 17 folds. Immunohistochemical analysis showed that Delta hupA mutant reduced proliferation abilities in the muscle, liver and intestine of zebrafish. This study indicates that HU protein and strains morphology play essential roles in the virulence network of E. tarda

(4) Choi SJ, Fuchs F, Demadrille R, Grevin B, Jang BH, Lee SJ, et al. Fast Responding Exhaled-Breath Sensors Using WO Hemitubes Functionalized by Graphene-Based Electronic Sensitzizers for Diagnosis of Diseases. ACS Appl Mater Interfaces 2014 Jun 3. Abstract: Diagnostic sensing device using exhaled breath of human have critical advantages due to the noninvasive diagnosis and high potential for portable device with simple analysis process. Here, we report ultrafast as well as highly sensitive bumpy WO3 hemitube nanostructure assisted by O2 plasma surface modification with functionalization of graphene-based material for the detection of acetone (CH3COCH3) and hydrogen sulfide (H2S) which are biomarkers for the diagnosis of diabetes and halitosis, respectively. 0.1 wt % graphene oxide (GO) and 0.1 wt % thin layered graphite (GR)-WO3 hemitube composites showed response times of 11.5 +/- 2.5 s and 13.5 +/- 3.4 s to 1 ppm acetone as well as 12.5 +/- 1.9 s and 10.0 +/- 1.6 s to 1 ppm of H2S, respectively. In addition, low limits of detection (LOD) of 100 ppb (Rair/Rgas = 1.7 for acetone and Rair/Rgas = 3.3 for H2S at 300 degrees C) were achieved. The superior sensing properties were ascribed to the electronic sensitization of graphene based materials by modulating space charged layers at the interfaces between n-type WO3 hemitubes and p-type graphene based materials, as identified by Kelvin Probe Force Microscopy (KPFM). Rapid response and superior sensitivity of the proposed sensing materials following cyclic thermal aging demonstrates good potential for real-time exhaled breath diagnosis of diseases

(5) Liu F, Gao Y, Wang J, Sun S. Revers ible and selective luminescent determination of ClO(-)/H2S redox cycle in vitro and in vivo based on a ruthenium trisbipyridyl probe. Analyst 2014 Jun 3;139(13):3324-9. Abstract: A rapid and highly selective luminescent probe has been developed to determine the in vitro and in vivo ClO(-)/H2S redox cycle using a ruthenium tris-bipyridyl complex covalently linked with phenothiazine. The luminescence intensity was considerably enhanced upon the addition of ClO(-) due to the oxidation of the probe to its sulfoxide derivative, which quickly returned to the original level by the reaction with H2S due to the reconstitution of the probe. The redox cycle can be repeated at least 12 times. Under optimal conditions, the luminescence intensities are linear over the concentration range of 1 x 10(-9) to 1 x 10(-4) mol L(-1) for ClO(-) and 1 x 10(-9) to 1 x 10(-4) mol L(-1) for H2S, and the detection limits are 1.8 x 10(-11) mol L(-1) for ClO(-) and 1.2 x 10(-11) mol L(-1) for H2S, which are much lower than those obtained with other detection methods. The proposed method is simple in design and fast in operation, and is suitable for the reversible determination of ClO(-) and H2S in vitro and in vivo with high selectivity
(6) Tocmo R, Lin Y, Huang D. Effect of Processing Conditions on the Organosulfides of Shallot (Allium cepa L. Aggregatum Group). J Agric Food Chem 2014 Jun 2. Abstract: There is a growing account of the health benefits of H2S as an endogenous cell-signaling molecule. H2S from organic polysulfides, in particular, is increasingly gaining attention for their beneficial effects to cardiovascular health. Here, we studied shallot as a potential dietary source of organic polysulfides and examined the effects of processing conditions on its polysulfide profiles. Boiling, autoclaving, and freeze-drying were tested on whole and crushed shallot bulbs, analyzing their effect on the yield of organosulfides. Seventeen organosulfides, including disulfides, trisulfides, and cyclic polysulfides, were identified. Significant differences in the quantitative and qualitative profiles of organosulfides in the hydrodistilled and solvent extracted oils were observed. Freeze-drying retained the majority of the organosulfides, but the whole-autoclaved and whole-boiled shallots lost more than 95% of their organic polysulfides. Crushed-boiled and crushed-autoclaved shallot lost 76-80% of their organosulfides, likely due to the thermal sensitivity of these compounds. The organosulfide profiles are sensitive to the pH values of the processing media. In general, disulfides increased at basic pH (pH 9.0) while trisulfides and cyclic organosulfides are much higher at the acidic to neutral pH values (pH 3.0-5.0). Our results provide important information on the effects of processing conditions that are relevant for optimizing extraction of organosulfides from shallot for further studies evaluating their H2S-releasing activity.


(8) Zhang Q, Yuan L, Liu D, Wang J, Wang S, Zhang Q, et al. Hydrogen sulfide attenuates hypoxia-induced neurotoxicity through inhibiting microglial activation. Pharmacol Res 2014 Jun;84:32-44. Abstract: Endogenously produced hydrogen sulfide (H2S) may have multiple functions in the brain including potent anti-inflammatory effects. Activated microglia can secrete various pro-inflammatory cytokines and neurotoxic mediators, which may contribute to hypoxic injuries in the developing brain. The aim of this study is to investigate the potential role of H2S in altering hypoxia-induced neurotoxicity via its anti-inflammatory actions as examined in vitro and in vivo models. Using the BV-2 microglial cell line, we found that sodium hydrosulfide (NaHS), a H2S donor, significantly inhibited hypoxia-induced microglial activation and suppressed subsequent pro-inflammatory factor release. In addition, treating murine primary cortical neurons with conditioned medium (CM) from hypoxia-stimulated microglia induced neuronal apoptosis, an effect that was reversed by CM treated with NaHS. Further, NaHS inhibited phosphorylation of the p65 subunit of NF-kappaB, phosphorylation of ERK and p38 but not JNK MAPK in these hypoxia-induced microglia. When administered in vivo to neonatal mice subjected to hypoxia, NaHS was found to attenuate neuron death, an effect that was associated with suppressed microglial activation, pro-inflammatory cytokines and NO levels. Taken together, H2S exerts neuroprotection against hypoxia-induced neurotoxicity through its anti-inflammatory effect in microglia. This effect appears to be attributable to inhibition of iNOS, NF-kappaB, ERK and p38 MAPK signaling pathways. Our results suggest a potential therapeutic application of H2S releasing drugs in hypoxic brain damage treatment.

sulphide. Advantages of the probe NAP-1 include a low detection limit (110 nM), good selectivity, high sensitivity and excellent photostability. A linear relationship between the emission intensity ratios and sulphide concentrations was observed in PBS buffer and bovine serum, respectively. Our probe facilitates ratiometric determination and imaging of endogenous H2S in living cells. Furthermore, this probe was successfully applied to the measurement of endogenous sulphide in human plasma and mouse hippocampus. A significant reduction in sulphide levels and CBS mRNA expression was observed in the hippocampus of mouse models of lipopolysaccharide-induced neuroinflammation-related diseases, suggesting that decreased levels of endogenous H2S might be involved in the pathogenesis of neuroinflammation-related neurodegenerative diseases.

(10) Koziel M, Doherty P, Vandamme P, Corcoran GD, Sleator RD, Lucey B. Campylobacter corcagiensis sp. nov., isolated from faeces of captive lion-tailed macaques (Macaca silenus) in Ireland. Int J Syst Evol Microbiol 2014 May 29. Abstract: An investigation of the prevalence of Campylobacter ureolyticus in a variety of animals lead to the identification of the strain CIT 045T, in the faeces of captive lion-tailed macaques (Macaca silenus). Originally, believed to be Campylobacter ureolyticus based on the colony morphology and positive urease test, analysis of 16S rRNA and hsp60 gene sequences of this isolate revealed that the strain differs significantly from other Campylobacter spp. described to date. Species-specific primers for 16S rRNA and hsp60 genes were designed and used to identify two additional strains isolated from faeces samples from other macaques. Nucleotide sequence analysis of the 16S rRNA and hsp60 genes revealed <=95% and <= 82% sequence similarity to recognised Campylobacter species respectively. All three isolates formed a distinct group within the Campylobacter genus based on their 16S rRNA and hsp60 sequences and MALDI-TOF profiles. The unique species status was further supported by phenotypic characteristics of the isolates. All isolates were found to be oxidase, catalase and urease positive, they grow well at 37°C and 42oC and produce H2S on TSI (triple sugar iron) and SIM (sulfide indole motility) media. The name Campylobacter corcagiensis sp. nov. is proposed for this new species, with the strain CIT 045 as the type strain CIT 045T (= LMG 27932T, CCUG 64942T).

(11) Legon AC. A reduced radial potential energy function for the halogen bond and the hydrogen bond in complexes BXY and BHX, where X and Y are halogen atoms. Phys Chem Chem Phys 2014 May 28;16(24):12415-21. Abstract: It is shown by considering 76 halogen- and hydrogen-bonded complexes BXY and BHX (where B is a Lewis base N2, CO, C2H2, C2H4, H2S, HCN, H2O, PH3 or NH3 and X, Y are F, Cl, Br or I) that the intermolecular stretching force constants ks (determined from experimental centrifugal distortion constants via a simple model) and the intermolecular dissociation energies Ds (calculated at the CCSD(T)(F12*)/cc-pVDZ-F12 level of theory) are related by Ds = Cks, where Cks = 1.50(3) x 10(3) m(2) mol(-1). This suggests that one-dimensional functions implying direct proportionality of Ds and ks (e.g. a Morse or Rydberg function) might serve as reduced radial potential energy functions for such complexes.

(12) Guo K, Wen J, Zhao Y, Wang Y, Zhang Z, Li Z, et al. Optimal Packing of a Rotating Packed Bed for HS Removal. Environ Sci Technol 2014 May 27. Abstract: The existence of H2S in a system could lead to catalyst deactivation, pipeline corrosion, and environmental pollution. A rotating packed bed (RPB), a novel reactor with high mass transfer efficiency and small dimension, is employed in this study to remove H2S. For RPB, the most significant section for mass transfer is the end-effect zone of packing. A mathematical model for liquid flow in the packing is established to quantify the length of the end-effect zone. A simple and effective visual experimental method is then proposed to investigate the end-effect zone in the RPB. A gas-liquid mass transfer experiment is finally employed to confirm the validity of the proposed mathematical model. With the aid of this model, the length of packing of a RPB used for pilot-scale H2S removal can be optimised.
removal is optimized. The optimized RPB removes 99.8% of H2S (15 vol % to 0.03 vol %) from the system. The proposed model can help optimize the design of a RPB reactor


Abstract: Hydrogen sulfide (H2S) is a malodorous gasotransmitter synthesized in peripheral tissues by the enzyme cystathionine gamma-lyase (CSE). This gas has been documented to be involved in a wide variety of processes including inflammation and nociception. The aim of the present study was to investigate the role of the peripheral H2S pathway in nociceptive response to the orofacial formalin experimental model of pain. Orofacial pain was induced by subcutaneous injection of formalin (1.5%, 50microl) into the upper lip of rats, and the time spent rubbing the face was measured at 3-min intervals for 45min. Formalin induced a marked biphasic pain (first phase: 0-3min; second phase: 15-33min). Pretreatment with H2S donor (Na2S; 90micromol/kg), CSE inhibitor (propargylglycine; 26.5 and 88.4micromol/kg), or a preferential blocker of T-type Ca2+ channels (mibefradil; 0.28 and 2.81micromol/kg) attenuated the second phase of face rubbing when injected locally as well as systemically. Pretreatment with a selective blocker of K+ATP channels (glybenclamide; 2.81micromol/kg) suppressed the Na2S-mediated attenuation of the formalin-induced pain second phase. Taken together these results suggest that endogenously produced H2S plays a pronociceptive role probably via T-type Ca2+ channels, whereas exogenous H2S exerts antinociceptive effects mediated by K+ATP channels


Abstract: Hydrogen sulfide (H2S) is regarded as the third endogenous gaseous signaling molecule. Cystathioine gamma-lyase (CSE), one of the three enzymes in the transsulfuration pathway, is responsible for the production of endogenous H2S. The H2S/CSE signaling pathway is involved in the inflammation induced by lipopolysaccharides (LPS). Therefore, in this study, we investigated the effects of the binding site (on the CSE promoter) for the transcription factor, nuclear factor (NF)-kappaB, on the transcriptional regulation of the CSE gene in mammalian cells treated with LPS. For this purpose, HEK-293 and COS-7 cells were transfected with 5 microg pGL4.12-KM1478 or 5 microg pGL4.12-KM1478m (mutant) together with the pRL-CMV control vector (0.032 microg for the HEK-293 cells, 0.0032 microg for the COS-7 cells). Subsequently, the cells were treated with LPS for 6 h. The expression of CSE was measured by RT-qPCR. cDNA pooled from J774.1A and RAW264.7 cells treated with LPS for 6 h was used to estimate the quantity of the transcripts. Our results revealed that LPS markedly increased the mRNA and protein expression levels of the CSE gene in the J774.1A and RAW264.7 cells following treatment with LPS for 6 h. In addition, we found that the GGGACATTCC DNA sequence on the promoter of the CSE gene was closely associated with the transcriptional regulation of the CSE gene in the HEK-293 and COS-7 cells treated with LPS. Taken together, our data suggest that the NF-kappaB binding site on CSE promoter is critical for LPS-induced CSE expression in mammalian cells


Abstract: The pathogenesis of Crohn’s disease (CD) is still unknown, but the involvement of the olfactory system in CD appears possible. No study to date has systematically assessed the olfactory function in CD patients. We investigated the olfactory function in CD patients in active (n = 31) and inactive disease (n = 27) and in a control group of age- and sex-matched healthy subjects (n = 35). Subjective olfactory testing was applied using
the Sniffin' Sticks test. For olfactory testing, olfactory event-related potentials (OERPs) were obtained with a 4-channel olfactometer using phenyl ethyl alcohol (PEA) and hydrogen sulfide (H2S). Carbon dioxide (CO2) was employed as control stimulus, and chemosomatosensory event-related potentials (CSSERPs) were registered. Results of the Sniffin' Sticks test revealed significantly different olfactory hedonic judgment with increased olfactory hedonic estimates for pleasant odorants in CD patients in active disease compared with healthy subjects. A statistical trend was found toward lower olfactory thresholds in CD patients. In objective olfactory testing, CD patients showed lower amplitudes of OERPs and CSSERPs. Additionally, OERPs showed significantly shorter N1- and P2 latencies following stimulation of the right nostril with H2S in CD patients in inactive disease compared with controls. Our study demonstrates specific abnormalities of olfactory perception in CD patients.

(16) Montoya LA, Pluth MD. Hydrogen Sulfide Deactivates Common Nitrobenzofurazan-Based Fluorescent Thiol Labeling Reagents. Anal Chem 2014 May 23. Abstract: Sulfhydryl-containing compounds, including thiols and hydrogen sulfide (H2S), play important but differential roles in biological structure and function. One major challenge in separating the biological roles of thiols and H2S is developing tools to effectively separate the reactivity of these sulfhydryl-containing compounds. To address this challenge, we report the differential responses of common electrophilic fluorescent thiol labeling reagents, including nitrobenzofurazan-based scaffolds, maleimides, alkylating agents, and electrophilic aldehydes, toward cysteine and H2S. Although H2S reacted with all of the investigated scaffolds, the photophysical response to each scaffold was different. Maleimide-based, alkylating, and aldehydic thiol labeling reagents provided a diminished fluorescence response when treated with H2S. By contrast, nitrobenzofurazan-based labeling reagents were deactivated by H2S addition. Furthermore, addition of H2S to thiol-activated nitrobenzofurazan-based reagents reduced the fluorescence signal, thus establishing the incompatibility of nitrobenzofurazan-based thiol labeling reagents in the presence of H2S. Taken together, these studies highlight the differential reactivity of thiols and H2S toward common thiol-labeling reagents, and suggest that sufficient care must be taken when labeling or measuring thiols in cellular environments that produce H2S due to the potential for both false-positive and eroded responses.

(17) Lu Y, Shen H, Shi X, Feng S, Wang Z, Shi Y. Hydrogen Sulfide Ameliorates High-Glucose Toxicity in Rat Peritoneal Mesothelial Cells by Attenuating Oxidative Stress. Nephron Exp Nephrol 2014 May 22;126(3):157-65. Abstract: Background/Aims: Continuous exposure of the peritoneal membrane to high-glucose (HG) peritoneal dialysis fluids (PDFs) can produce peritoneal mesothelial cells (PMCs) injury. It has been demonstrated that hydrogen sulfide (H2S), the third endogenous gaseous mediator identified after nitric oxide and carbon monoxide, exhibits a potent protective effect on cell activity. We studied the toxic effects of HG PDFs and their reversal by H2S on cultures of rat PMCs. Methods: Synchronized confluent rat PMCs were incubated with 2.5% glucose PDFs with or without NaHS, an H2S donor. Cell viability was assessed by methyl thiazolyl tetrazolium assay and flow cytometry. The level of phospho-p38 mitogen-activated protein kinase (MAPK) was analyzed by immunoblotting. p53, Bax and Bcl-2 mRNA expressions by rat PMCs were detected by real-time PCR. The levels of reactive oxygen species (ROS), superoxide dismutase (SOD) activity and caspase-3 activity were measured. Results: Exposure of rat PMCs to 2.5% glucose PDFs for 24 h resulted in a significant induction of apoptosis, which was attenuated by NaHS. NaHS also restored the 2.5% glucose PDF-induced increase in phospho-p38 MAPK (indices of cellular toxicity). Further investigation of the apoptotic mechanisms in rat PMCs demonstrated that HG activated caspase-3 and upregulated Bax, while it downregulated Bcl-2. All the above responses were prevented by pretreatment with NaHS. Moreover, NaHS reversed the 2.5% glucose PDF-induced increase in ROS generation and decrease in SOD activity. Conclusions: These findings
suggest that HG PDFs significantly inhibit rat PMC viability, leading to peritoneal injury. H2S exhibits a potent anti-apoptotic ability by attenuating oxidative stress and inhibiting caspase-3 activation, which in turn restores peritoneal injury. (c) 2014 S. Karger AG, Basel

Abstract: Reactive sulfur species have received considerable attention due to their various biological functions. Among these molecules, hydrogen polysulfides (H2Sn, n > 1) are recently suggested to be the actual signaling molecules derived from hydrogen sulfide (H2S). Hydrogen polysulfides may also have their own biosynthetic pathways. The research on H2Sn is rapidly growing. However, the detection of H2Sn is still challenging. In this work we report a H2Sn-mediated benzodithiolone formation under mild conditions. Based on this reaction, specific fluorescent probes for H2Sn are prepared and evaluated. The probe DSP-3 shows good selectivity and sensitivity for H2Sn.

Abstract: INTRODUCTION: A number of drugs in clinical trials are discontinued due to potentially life-threatening airway obstruction. As some drugs may not cause changes in core battery parameters such as tidal volume (Vt), respiratory rate (RR) or minute ventilation (MV), including measurements of respiratory mechanics in safety pharmacology studies represents an opportunity for design refinement. The present study aimed to test a novel non-invasive methodology to concomitantly measure respiratory system resistance (Rrs) and conventional respiratory parameters (Vt, RR, MV) in conscious Beagle dogs and cynomolgus monkeys. METHODS: An Airwave Oscillometry system (tremoFlo; THORASYS Inc., Montreal, Canada) was used to concomitantly assess Rrs and conventional respiratory parameters before and after intravenous treatment with a bronchoactive agent. Respiratory mechanics measurements were performed by applying a short (i.e. 16s) single high frequency (19Hz) waveform at the subject's airway opening via a face mask. During measurements, pressure and flow signals were recorded. After collection of baseline measurements, methacholine was administered intravenously to Beagle dogs (n=6) and cynomolgus monkeys (n=4) at 8 and 68μg/kg, respectively. RESULTS: In dogs, methacholine induced significant increases in Vt, RR and MV while in monkeys, it only augmented RR. A significant increase in Rrs was observed after methacholine administration in both species with mean percentage peak increases from baseline of 88 (53)% for dogs and 28 (16)% for cynomolgus monkeys. CONCLUSION: Airwave Oscillometry appears to be a promising non-invasive methodology to enable respiratory mechanics measurements in conscious large animals, a valuable refinement in respiratory safety pharmacology.

Abstract: We present a high-throughput strategy for sensitive detection of H2S by using individual spherical Au-Ag core-shell plasmonic nanoparticles (PNPs) as molecular probes. This method is based on quantification of color variation of the single PNPs resulting from formation of Ag2S on the particle surface. The spectral response range of the 51 nm PNP was specifically designed to match the most sensitive region of color cameras. A high density of immobilized PNPs and rapid color RGB (red/green/blue) analysis allow a large number of individual PNPs to be monitored simultaneously, leading to reliable quantification of color change of the PNPs. A linear logarithmic dependence on sulfide concentrations from 50 nM to 100μM was demonstrated by using this
colorimetric assay. By designing PNPs with various surface chemistries, similar strategies could be developed to detect other chemically or biologically important molecules.

Abstract: The production of hydrogen sulfide (H2S) during yeast fermentation contributes negatively to wine aroma. We have mapped naturally occurring mutations in commercial wine strains that affect production of H2S. A dominant R310G mutant allele of MET2, which encodes homoserine O-acetyltransferase, is present in several wine yeast strains as well as in the main lab strain S288c. Reciprocal hemizygosity and allele swap experiments demonstrated that the MET2 R310G allele confers reduced H2S production. Mutations were also identified in genes encoding the two subunits of sulfite reductase, MET5 and MET10, which were associated with reduced H2S production. The most severe of these, an allele of MET10, showed five additional phenotypes: reduced growth rate on sulfate, elevated secretion of sulfite, and reduced production in wine of three volatile sulfur compounds: methionol, carbon disulfide and methylthioacetate. Alleles of MET5 and MET10, but not MET2, affected H2S production measured by colour assays on BiGGY indicator agar, but MET2 effects were seen when bismuth was added to agar plates made with Sauvignon blanc grape juice. Collectively, the data are consistent with the hypothesis that H2S production during wine fermentation results predominantly from enzyme activity in the sulfur assimilation pathway. Lower H2S production results from mutations that reduce the activity of sulfite reductase, the enzyme that produces H2S, or that increase the activity of L-homoserine-O-acetyltransferase, which produces substrate for the next step in the sulfur assimilation pathway.

Abstract: OBJECTIVE: To investigate the effect of hydrogen sulfide (H2S) on the proliferation and migration of human colon cancer SW480 cells and explore its molecular mechanisms. METHODS: The proliferation of SW480 cells exposed to different concentrations of NaHS for varying time lengths was analyzed by MTT assay, and the changes in cell migration was evaluated using wound-healing assay. The changes in the expression levels of MMP-2, MMP-9 and SIRT1 protein were detected by Western blotting in the exposed cells. RESULTS: Compared with the control cells, SW480 cells exposed to 50, 100, 200, or 400 micromol/L NaHS for 24, 48 and 72 h all showed increased proliferative activity. NaHS treatment at 100 micromol/L significantly promoted the cell migration (P<0.01) and enhanced the cellular expressions of MMP-2 (P<0.05) and MMP-9 (P<0.01) proteins; NaHS exposure (100 micromol/L) also resulted in up-regulation of SIRT1 expression in SW480 cells. CONCLUSIONS: H2S can promote proliferation and migration of SW480 cells in vitro, the mechanism of which may involve up-regulated expression of SIRT1.

Abstract: The microbial communities associated with deteriorating concrete corrosion fronts were characterized in 36 samples taken from wastewater collection and treatment systems in ten utilities. Bacterial communities were described using Illumina MiSeq sequencing of the V1V2 region of small subunit ribosomal RNA (SSU-rRNA) gene recovered from fresh corrosion products. Headspace gas concentrations (hydrogen sulfide, carbon dioxide, and methane), pore water pH, moisture content, and select mineralogy were tested for correlation to community outcomes and corrosion extent using pairwise linear regressions and canonical correspondence analysis. Corroding concrete was most commonly characterized by moisture contents greater than 10%, pore water...
pH below one, and limited richness (<10 taxa). Bacterial community composition was not correlated to geographic location when considered independently from other environmental factors. Corrosion was most severe in sites with high levels of hydrogen sulfide (>100 ppm) and carbon dioxide (>1%) gasses, conditions which also were associated with low diversity biofilms dominated by members of the acidophilic sulfur-oxidizer genus Acidithiobacillus.

Abstract: The purpose of this work was to evaluate the technical and economical feasibility of converting three chemical scrubbers in series to biotrickling filters (BTFs) for the simultaneous removal of H2S and volatile organic compounds (VOCs). The conversion of the full-scale scrubbers was based on previous conversion protocols. Conversion mainly required replacing the original carrier material and recycle pumps as well as modifying the controls and operation of the reactors. Complete removal of H2S and VOCs on a routine basis was reached at neutral pH in a longer period of time compared to previous conversions reported. Biotrickling filters operated at a gas contact time of about 1.4 s per reactor and at pH controlled between 6.5 and 6.8. Inlet average concentrations below 10 ppmv of H2S and below 5 ppmv for VOCs were often completely removed. The first and second bioreactors played a primary role in H2S removal. Year-round operation of the biotrickling filters proved the ability of the system to handle progressive load increases of H2S and VOCs. However, fast, sudden load changes often lead to reduced removal efficiencies. Odor analyses showed average removal efficiencies above 80%. Gas chromatography-mass spectrometry of selected samples showed that outlet odor concentration was due to limited removal of VOCs. The conversion showed was economically viable taking into account the theoretical consumption of chemicals needed for the absorption and oxidation of both H2S and VOCs.

Abstract: BACKGROUND AND PURPOSE: Many disparate studies have reported the ambiguous role of hydrogen sulfide (H2S) in cell survival. The present study investigated the effect of H2S on viability of cancer and non-cancer cells. EXPERIMENTAL APPROACH: Cancer and non-cancer cells were exposed to H2S (using sodium hydrosulfide, NaHS and GYY4137) and cell viability was examined by crystal violet assay. We then examined cancer cellular glycolysis process by in vitro enzymatic assays and pH regulator activity. Lastly, intracellular pH (pHi) was determined by ratiometric pHi measurement using BCECF staining. KEY RESULTS: Continuous, but not single, exposure to H2S decreased cell survival more effectively in cancer cells, as compared to non-cancer cells. Slow H2S-releasing donor, GYY4137, significantly increased glycolysis leading to overproduction of lactate. H2S also decreased anion exchanger and sodium/proton exchanger activity. The combination of increased metabolic acid production and defective pH regulation resulted in an uncontrolled intracellular acidification leading to cancer cell death. In contrast, no significant intracellular acidification or cell death was observed in non-cancer cells. CONCLUSIONS AND IMPLICATIONS: Low and continuous exposure to H2S targets metabolic processes and pH homeostasis in cancer cells, potentially serving as a novel and selective anti-cancer strategy.

(26) Li YJ, Shi ZQ, Gan LJ, Chen J. Hydrogen sulfide is a novel gasotransmitter with pivotal role in regulating lateral root formation in plants. Plant Signal Behav 2014 May 15;9.
Abstract: Hydrogen sulfide (H2S), the third gasotransmitter after nitric oxide (NO) and carbon monoxide (CO), is a critical neuromodulator in the pathogenesis of various
diseases from neurodegenerative diseases to diabetes or heart failure. The crosstalk between NO and H2S has been well established in mammalian physiology. In planta, NO is demonstrated to regulate lateral root formation by acting downstream of auxin. The recent reports revealed that H2S is a novel inducer of lateral root (LR) formation by stimulating the expression of cell cycle regulatory genes (CCRGs), acting similarly with NO, CO, and IAA. Interestingly, during the initiation of lateral root primordia, IAA is a potent inducer of endogenous H2S and CO, which is produced by L-cysteine desulfhydrase (LCD) and heme oxygenase-1 (HO-1), respectively. The increasing evidences suggest that H2S-promoted LR growth is dependent on the endogenous production of CO. In addition, our results indicate that the H2S signaling in the regulation of LR formation can be associated to NO and Ca2+. In this addendum, we advanced a proposed schematic model for H2S-mediated signaling pathway of plant LR development.

(27) Yi S, Xie J, Liu N, Li P, Xu X, Li H, et al. Emergence and prevalence of non-H2S-producing Salmonella enterica serovar Senftenberg isolates belonging to a novel sequence type 1751 in China. J Clin Microbiol 2014 May 14. Abstract: Salmonella enterica serovar Senftenberg is a common non-typhoidal Salmonella serotype which causes human Salmonella infections worldwide. In this study, 182 S. Senftenberg isolates including 17 atypical non-H2S-producing isolates were detected in China from 2005-2011. The microbiological and genetic characteristics of the non-H2S-producing and selected H2S-producing isolates were determined by using pulsed-field gel electrophoresis (PFGE), multilocus sequence typing (MLST), and clustered regularly interspaced short palindromic repeat (CRISPR) analysis. The phs operons were amplified and sequenced. The 17 non-H2S-producing and 36 H2S-producing isolates belonged to 7 sequence types (STs) including 3 new STs: ST1751, ST1757 and ST1758. Fourteen (14/17) of the non-H2S-producing isolates belonged to ST1751 and had the distinct PFGE patterns. All 17 non-H2S-producing isolates had a nonsense mutation at position 1621 of phsA. H2S-producing and non-H2S-producing S. Senftenberg were isolated from the same stool sample from three patients; isolates from the same patients displayed the same antimicrobial susceptibility, ST, and PFGE pattern, but could be discriminated based on CRISPR spacers. Non-H2S-producing S. Senftenberg isolates belonging to ST1751 have been prevalent in Shanghai, China. It’s possible that these emerging organisms will disseminate further because they are difficult to detect. Thus, we should strengthen the surveillance for the spread of this atypical S. Senftenberg variant.

(28) Burguera EF, Vela-Anero A, Magalhaes J, Meijide-Failde R, Blanco FJ. Effect of hydrogen sulfide sources on inflammation and catabolic markers on interleukin 1beta-stimulated human articular chondrocytes. Osteoarthritis Cartilage 2014 May 14. Abstract: OBJECTIVE: Hydrogen sulfide (H2S), the third gasotransmitter together with NO and CO, is emerging as a regulator of inflammation. To test if it might offer therapeutic value in the treatment of osteoarthritis (OA) we evaluated the effects of two exogenous sources of H2S, NaSH and GYY4137, on inflammation and catabolic markers that characterize OA. METHOD: Human chondrocytes (CHs) were isolated from OA tissue. Cells were stimulated with a pro-inflammatory cytokine (interleukin-1beta, IL1beta, 5 ng/ml) and the ability of the two H2S sources to ameliorate its effects on the cells was tested. Nitric oxide (NO) production was quantified through the Griess reaction. Protein levels of inducible NO synthase (NOS2) and matrix metalloproteinase 13 (MMP13) were visualized through immunocytochemistry (ICC). Relative mRNA expression was quantified with qRT-PCR. Prostaglandin-2 (PGE-2), interleukin 6 (IL6) and MMP13 levels were measured with specific ELAs. NFkappaB nuclear translocation was visualized with immunofluorescence. RESULTS: Both H2S sources led to significant reductions in NO, PGE-2, IL6 and MMP13 released by the cells and at the protein level. This was achieved by downregulation of relevant genes involved in the synthesis routes of these molecules, namely NOS2, cyclooxygenase-2 (COX2), prostaglandin E synthase (PTGES), IL6 and
MMP13. NFκB nuclear translocation was also reduced. CONCLUSION: NaSH and GYY4137 show anti-inflammatory and anti-catabolic properties when added to IL1beta activated osteoarthritic CHs. Supplementation with exogenous H2S sources can regulate the expression of relevant genes in OA pathogenesis and progression, counteracting IL1beta pro-inflammatory signals that lead to cartilage destruction in part by reducing NFκB activation.

(29) Palinkas Z, Furtmüller PG, Nagy A, Jakopitsch C, Pirker KF, Magierowski M, et al. Interactions of Hydrogen Sulfide with Myeloperoxidase. Br J Pharmacol 2014 May 13. Abstract: BACKGROUND AND PURPOSE: Increasing attention is devoted to the actions of hydrogen sulfide in human physiology. Although it was shown to be an essential mediator of many biological functions, the underlying molecular mechanisms of its actions are little understood. To contribute to the understanding of sulfide's role in inflammation we investigated its interactions with human myeloperoxidase (MPO), a major player in promoting inflammatory oxidative stress. EXPERIMENTAL APPROACH: The interactions of sulfide and MPO were investigated using electron paramagnetic resonance, electronic circular dichroism, UV-vis and stopped-flow spectroscopies. KEY RESULTS: We revealed favorable reactions between sulfide and the native-ferric-enzyme as well as the MPO redox intermediates, ferrous MPO, Compound I and Compound II. Kinetic experiments indicate that sulfide is a potent reversible inhibitor of MPO enzymatic activity with an IC50 of 1μM. In addition, the measured second-order rate constants for the reactions of sulfide with Compound I (k = 1.1x106 M⁻¹ s⁻¹) and Compound II (k = 2.0x105 M⁻¹ s⁻¹) suggest that sulfide is a potential substrate for MPO in vivo. CONCLUSION AND IMPLICATIONS: Our results predict that endogenous sulfide levels are likely to inhibit the activity of circulating and endothelium bound MPO. The fully reversible nature of inhibition suggests a mediatory role of sulfide on the oxidant producing function of the enzyme. Furthermore, the efficient HOCl oxidation of sulfide to give polysulfides (that are recently recognized major players in sulfide biology) together with MPO catalyzed sulfide oxidation and the lack of interaction between MPO and sulfide oxidation products predict a modulatory role of MPO in sulfide signaling.

(30) Toldo S, Das A, Mezzaroma E, Chau VQ, Marchetti C, Durrant D, et al. Induction of MicroRNA-21 with Exogenous Hydrogen Sulfide Attenuates Myocardial Ischemic and Inflammatory Injury in Mice. Circ Cardiovasc Genet 2014 May 13. Abstract: BACKGROUND: -Maintaining physiological levels of hydrogen sulfide (H2S) during ischemia is necessary to limit injury to the heart. Due to the anti-inflammatory effects of H2S, we proposed that the H2S donor, Na2S, would attenuate myocardial injury through upregulation of ‘protective’ microRNA (miR)-21 and suppression of the inflammasome, a macromolecular structure that amplifies inflammation and mediates further injury. METHODS AND RESULTS: -Na2S-induced miR-21 expression was measured by qPCR in adult primary rat cardiomyocytes and in the mouse heart. We measured inflammasome formation and activity in cardiomyocytes challenged with lipopolysaccharide (LPS) and adenosine-tri-phosphate (ATP) or simulated ischemia/reoxygenation; and in the heart following regional myocardial ischemia/reperfusion (I/R), in the presence or absence of Na2S. To assess the direct anti-inflammatory effects of H2S in vivo, we utilized a peritonitis model by way of intraperitoneal injection of zymosan A. Na2S attenuated inflammasome formation and activity - measured by counting cytoplasmic aggregates of the scaffold protein Apoptosis Speck-like protein containing a Caspase-recruitment domain (ASC; -57%) and caspase-1 activity (-50%) in isolated cardiomyocytes and in the mouse heart (all P<0.05). Na2S also inhibited apoptosis (-38%) and necrosis (-43%) in cardiomyocytes in vitro and reduced myocardial infarct size (-63%) following I/R injury in vivo (all P<0.05). These protective effects were absent in cells treated with antagomiR-21 and in miR-21 KO mice. Na2S also limited the severity of inflammasome-dependent inflammation in the model of peritonitis (P<0.05) in wild-type but not in miR-21 KO mice. CONCLUSIONS: -Na2S
induces cardioprotective effects through miR-21-dependent attenuation of ischemic and inflammatory injury in cardiomyocytes

Abstract: Hyperalgesia often occurs in opioid-induced withdrawal syndrome. In the present study, we found that three hourly injections of DAMGO (a mu-opioid receptor agonist) followed by naloxone administration at the fourth hour significantly decreased rat paw nociceptive threshold, indicating the induction of withdrawal hyperalgesia. Application of NaHS (a hydrogen sulfide donor) together with each injection of DAMGO attenuated naloxone-precipitated withdrawal hyperalgesia. RT-PCR and Western blot analysis showed that NaHS significantly reversed the gene and protein expression of up-regulated spinal calcitonin gene-related peptide (CGRP) in naloxone-treated animals. NaHS also inhibited naloxone-induced cAMP rebound and cAMP response element-binding protein (CREB) phosphorylation in rat spinal cord. In SH-SY5Y neuronal cells, NaHS inhibited forskolin-stimulated cAMP production and adenylate cyclase (AC) activity. Moreover, NaHS pre-treatment suppressed naloxone-stimulated activation of protein kinase C (PKC) alpha, Raf-1, and extracellular signal-regulated kinase (ERK) 1/2 in rat spinal cord. Our data suggest that H2S prevents the development of opioid withdrawal-induced hyperalgesia via suppression of synthesis of CGRP in spine through inhibition of AC/cAMP and PKC/Raf-1/ERK pathways.

Abstract: Populations that repeatedly adapt to the same environmental stressor offer a unique opportunity to study adaptation, especially if there are a priori predictions about the genetic basis underlying phenotypic evolution. Hydrogen sulphide (H2S) blocks the cytochrome-c oxidase complex (COX), predicting the evolution of decreased H2S susceptibility of the COX in three populations in the Poecilia mexicana complex that have colonized H2S-containing springs. Here, we demonstrate that decreased H2S susceptibility of COX evolved in parallel in two sulphide lineages, as evidenced by shared amino acid substitutions in cox1 and cox3 genes. One of the shared substitutions likely triggers conformational changes in COX1 blocking the access of H2S. In a third sulphide population, we detect no decreased H2S susceptibility of COX, suggesting that H2S resistance is achieved through another mechanism. Our study thus demonstrates that even closely related lineages follow both parallel and disparate molecular evolutionary paths to adaptation in response to the same selection pressure.

Abstract: In order to evaluate the potential adverse health effects of odor emissions from wastewater pump stations (WWPSs) to human, a health risk assessment was performed to study the odors emitted from an urban WWPS in a residential area, Tianjin (in North China). First, 15 types of volatile organic compounds in the WWPS were collected and analyzed using gas chromatography-mass spectrometry. Next, Monte Carlo probabilistic modeling was applied to evaluate the potential health effects of four odors (chlorobenzene, dichloromethane, hydrogen sulfide, and carbon disulfide), which had higher concentrations. The results revealed that the 95th percentile of the total non-carcinogenic risk was approximately 1.73, which poses a threat to human health. In addition, hydrogen sulfide had the highest non-carcinogenic risk value of the four; the hazard quotient of hydrogen sulfide was estimated to be 1.60 at the 95th percentile, higher than the upper confidence limit (1.0). The 95th percentile of the carcinogenic risk was approximately 5.47E-08, much lower than the maximum acceptable level (1.0E-06). Finally, the influence of the input variables on the output was evaluated using sensitivity...
analysis, and contaminant concentration, reference concentration, and inhalation unit risk were the most influential variables

Abstract: Biogas produced in an industrial-pilot scale sewage sludge reactor (5m3) was desulphurised by imposing microaerobic conditions. The H2S concentration removal efficiency was evaluated under various configurations: different mixing methods and O2 injection points. Biogas was entirely desulphurised under all the configurations set, while the O2 demand of the digester decreased over time. Although the H2S removal seemed to occur in the headspace, S0 (which was found to be the main oxidation product) was scarcely deposited there in the headspace. O2 did not have a significant impact on the digestion performance; the VS removal remained around 47%. Conversely, DGGE revealed that the higher O2 transfer rate to the sludge maintained by biogas recirculation increased the microbial richness and evenness, and caused an important shift in the structure of the bacterial and the archaeal communities in the long term. All the archaeal genera identified (Methanosaeta, Methanospirillum and Methanoculleus) were present under both anaerobic and microaerobic conditions

Abstract: Disentangling the effects of plasticity, genetic variation, and their interactions on organismal responses to environmental stressors is a key objective in ecological physiology. We quantified the expression of five candidate genes in response to hydrogen sulfide (H2S) exposure in fish (Poecilia mexicana, Poeciliidae) from a naturally sulfide-rich environment as well as an ancestral, non-sulfidic population to test for constitutive and environmentally dependent population differences in gene expression patterns. Common garden raised individuals that had never encountered environmental H2S during their lifetime were subjected to short or long term H2S exposure treatments or respective non-sulfidic controls. The expression of genes involved in responses to H2S toxicity (cytochrome c oxidase, vascular endothelial growth factor, and cytochrome P450-2J6), H2S detoxification (sulfide:quinone oxidoreductase), and endogenous H2S production (cystathionine gamma lyase) was determined in both gill and liver tissues by real time PCR. The results indicated complex changes in expression patterns that - depending on the gene - not only differed between organs and populations, but also on the type of H2S exposure. Populations differences, both constitutive and H2S exposure dependent (i.e., plastic), in gene expression were particularly evident for sulfide:quinone oxidoreductase, vascular endothelial growth factor, and to a lesser degree for cytochrome P450-2J6. Our study uncovered putatively adaptive modifications in gene regulation that parallel previously documented adaptive changes in phenotypic traits

Abstract: BACKGROUND: Arsenic toxicity is primarily based on its chemical speciation. While inorganic and methylated arsenic species are well characterized in terms of metabolism and formation in the human body, the origin of thiolated methylarsenicals is still unclear. OBJECTIVES: Here, we demonstrate that sulfate reducing bacteria (SRB) from the human gut are actively involved in the thiolation of monomethylarsonic acid (MMAV). METHODS: Human fecal and colon microbiota were incubated in batch and in a dynamic gut simulator with a dose of 0.5 mg MMAV in the absence or presence of sodium molybdate, an SRB inhibitor. We monitored the conversion of MMAV into monomethyl monothioarsonate (MMMTAV) and other As species by HPLC-ICP-MS
analysis. The SRB activity was monitored measuring the H2S production. Molecular
analysis was carried out to determine the dominant species of SRB responsible for
arsenic thiolation. RESULTS: In the absence of sodium molybdate, the SRB activity -
primarily derived from Desulfovibrio desulfuricans piger - was specifically and
proportionally correlated (p<0.01) to MMAV conversion into MMMTAV. Inactivating the
SRB with molybdate did not result in MMAV thiolation but interestingly, we showed the
microbiota from a dynamic gut simulator were capable of demethylating 4% of the
incubated MMAV into arsenous acid (iAsIII), the trivalent and more toxic form of arsenic
acid (iAsV). CONCLUSION: To our knowledge, this is the first time that SRB from human
gastrointestinal origin, through their ability to produce H2S, are found to be necessary
and sufficient to induce arsenic thiolation. The toxicological consequences of this
microbial As speciation change are not yet clear. However, given the efficient epithelial
absorption of thiolated methylarsenicals, we conclude that the gut microbiome, and SRB
activity in particular, should be incorporated into toxicokinetic analysis following As
exposure

A 2014 May 9.
Abstract: The dynamics of the Penning ionization of hydrogen sulfide molecules by
collision with helium and metastable neon atoms, occurring in the thermal energy range,
has been studied by analyzing the energy spectra of the emitted electrons obtained in our
laboratory in a crossed beam experiment. These spectra are compared with the
photoelectron spectra measured by using He(I) and Ne(I) photons under the same
experimental conditions. In this way we obtained the negative energy shifts for the
formation of H2S+ ions in the first three accessible electronic states by He*(23,1S1,0)
and Ne*(3P2,0) Penning ionization collisions: the 2b1 (X2B1) fundamental one, the first
5a1 (A2A1), and the second 2b2 (B2B2) excited states, respectively. The recorded
energy shifts indicate that in the case of He* and Ne*-H2S the autoionization dynamics
depends on the features of the collision complex and is mainly driven by an effective
global attraction that comes from a balance among several non covalent intermolecular
interaction components. This suggests that the Penning ionization should take place, in a
specific range of intermolecular distances, as we have already observed in the case of
Penning ionization of water molecules [Brunetti, B. G.; Candori, P.; Falcinelli, S.; Pirani,

Abstract: <i>Significance:</i> Although O<sub>2</sub> sensing cells and tissues have been known for decades, the identity of the O<sub>2</sub>-sensing mechanism has
remained elusive. Evidence is accumulating that O<sub>2</sub>-dependent metabolism of hydrogen sulfide (H<sub>2</sub>S) is this enigmatic O<sub>2</sub>-sensor.
<i>Recent Advances:</i> The elucidation of biochemical pathways involved in
H<sub>2</sub>S synthesis and metabolism have shown that reciprocal
H<sub>2</sub>S/O<sub>2</sub> interactions have been inexorably linked throughout
eukaryotic evolution, there are multiple foci whereby O<sub>2</sub>-controls
H<sub>2</sub>S inactivation, and the effects of H<sub>2</sub>S on downstream
signaling events are consistent with those activated by hypoxia.
H<sub>2</sub>S-mediated O<sub>2</sub>-sensing has been demonstrated in a variety of O<sub>2</sub>-sensing tissues in vertebrate cardiovascular and respiratory systems
including smooth muscle in systemic and respiratory blood vessels and airways, carotid
body, adrenal medulla and other peripheral as well as central chemoreceptors. <i>Critical
Issues:</i> Information is now needed on the intracellular location and stoichiometry of
these signaling processes and how and which downstream effectors are activated by
H<sub>2</sub>S and its metabolites. <i>Future Directions:</i> Development of specific
inhibitors of H<sub>2</sub>S metabolism and effector activation as well as cellular
organelle-targeted compounds that release H2S in a time- or environmentally-controlled
way will not only enhance our understanding of this signaling process but will provide direction for future therapeutic applications.

Abstract: Significance: Hydrogen sulfide (H2S) has been recognized as a signaling molecule as well as a cytoprotectant. It modulates neurotransmission, regulates vascular tone, and protects various tissues and organs, including neurons, the heart, and kidneys from oxidative stress and ischemia-reperfusion injury. H2S is produced from L-cysteine by cystathionine beta-synthase (CBS), cystathionine gamma-lyase (CSE), and 3-mercaptopropionate sulfurtransferase (3MST) together with cysteine aminotransferase. Recent Advances: In addition to these enzymes, we recently identified a novel pathway to produce H2S from D-cysteine, which involves D-amino acid oxidase (DAO) together with 3MST. These enzymes are localized in the cytoplasm, mitochondria, and peroxisomes. However, some enzymes translocate to organelles under specific conditions. Moreover, H2S-derived potential signaling molecules such as polysulfides and HSNO have been identified. Critical Issues: The physiological stimulations, which trigger the production of H2S and its derivatives and maintain their local levels, remain unclear. Future Directions: Understanding the regulation of the H2S production and H2S-derived signaling molecules and the specific stimuli that induce their release will provide new insight into the biology of H2S and therapeutic development in diseases involving these substances.

Abstract: The modification of titanate nanotubes (TiNT) with nitrogen (NTiNT) was accomplished through impregnation method. TiNT were synthesized via hydrothermal treatment of titanate powders in NaOH solution at 130 degrees C for 48 h. The obtained samples were characterized by UV-Vis absorption spectroscopy, Brunauer-Emmett-Teller (BET) surface area, XRD, TEM, XPS, and TG analysis. Structure, morphology, composition, and visible light absorption property of nitrogen-modified TiO2 nanotubes are found to depend on the nitrogen content and not on the calcination temperature for the range used in this work. The photocatalytic activity of these nanotubes was investigated for the degradation of methylethylketone (MEK) and hydrogen sulfide (H2S) under ultraviolet and solar light radiation. MEK is very resistant to photocatalytic degradation with the prepared materials;, however, the results show that modification of the TiNT with nitrogen in a proportion of 1 to 1 (TiNT to urea weight ratio) and calcination at 400 degrees C lead to materials with high photocatalytic activity under ultraviolet radiation and moderate photocatalytic activity under solar radiation for degradation of H2S.

Abstract: Hydrogen sulfide (H2S) is a prototype molecular system and a sister molecule of water (H2O). The phase diagram of solid H2S at high pressures remains largely unexplored arising from the challenges in dealing with the pressure-induced weakening of S-H bond and larger atomic core difference between H and S. Metallization is yet achieved for H2O, but it was observed for H2S above 96 GPa. However, the metallic structure of H2S remains elusive, greatly impeding the understanding of its metallicity and the potential superconductivity. We have performed an extensive structural study on solid H2S at pressure ranges of 10-200 GPa through an unbiased structure prediction method based on particle swarm optimization algorithm. Besides the findings of candidate structures for nonmetallic phases IV and V, we are able to establish stable metallic structures violating an earlier proposal of elemental decomposition into sulfur and hydrogen [R. Rousseau, M. Boero, M. Bernasconi, M. Parrinello, and K. Terakura, Phys.
Our study unravels a superconductive potential of metallic H2S with an estimated maximal transition temperature of approximately 80 K at 160 GPa, higher than those predicted for most archetypal hydrogen-containing compounds (e.g., SiH4, GeH4, etc.)

Abstract: Hydrogen sulfide has emerged as an important endothelium-dependent vasodilator, but its role in shear stress-mediated dilation of coronary arteries is unclear. We examined the role of H2S on shear stress-mediated dilation of isolated mouse coronary arteries. In these vessels, Na2S produced concentration-dependent dilation, which was significantly inhibited by iberiotoxin and by 4-aminopyridine. In addition, BK and Kv currents in mouse coronary smooth muscle cells were directly activated by Na2S, suggesting that H2S produced vasodilation through BK and Kv channel activation. Using a pressure servo controller system, freshly isolated mouse coronary arteries were subjected to physiological levels of shear stress (1 to 25 dynes/cm2) and produced graded dilatory responses, but such effects were diminished in the presence of 100 muM Na2S. Pre-incubation with the cystathionine gamma-lyase inhibitor, D,L-propargylglycine (PPG), resulted in a paradoxical augmentation of shear stress-mediated vasodilation. However, in the presence of L-NAME or in coronary arteries from eNOS knockout mice, PPG inhibited shear stress-mediated vasodilation, suggesting an interaction between NO and H2S signaling. Na2S inhibited eNOS activity in cultured mouse aortic endothelial cells and reduced the level of phospho-eNOS (serine 1177). These results suggest that both NO and H2S are important shear stress-mediated vasodilators in mouse coronary arteries but there is a complex interaction between these two signaling pathways that results in paradoxical vasoconstrictive effects of H2S through inhibition of NO generation.

Abstract: Indigenous oral bacteria in the tongue coating such as Veillonella have been identified as the main producers of hydrogen sulfide (H2S), one of the major components of oral malodor. However, there is little information on the physiological properties of H2S production by oral Veillonella such as metabolic activity and oral environmental factors which may affect H2S production. Thus, in the present study, the H2S-producing activity of growing cells, resting cells and cell extracts of oral Veillonella species and the effects of oral environmental factors including pH and lactate were investigated. Type strains of Veillonella atypica, Veillonella dispar and Veillonella parvula, were used. These Veillonella species produced H2S during growth in the presence of L-cysteine. Resting cells of these bacteria produced H2S from L-cysteine, and the cell extracts showed enzymatic activity to convert L-cysteine to H2S. H2S production by resting cells was higher at pH 6 - 7 and lower at pH 5. The presence of lactate markedly increased H2S production by resting cells (4.5 - 23.7-fold), while lactate had no effect on enzymatic activity in cell extracts. In addition to H2S, ammonia was produced in cell extracts of all the strains, indicating that H2S was produced by the catalysis of cystathionine gamma-lyase (EC 4.4.1.1). Serine was also produced in cell extracts of V. atypica and V. parvula, suggesting the involvement of cystathionine beta-synthase lyase (EC 4.2.1.22) in these strains. This study indicates that Veillonella produce H2S from L-cysteine and their H2S production can be regulated by oral environmental factors, pH and lactate.

Abstract: Carbon monoxide (CO) and hydrogen sulfide (H2S) used to be thought of simply as lethal and (for H2S) smelly gaseous molecules; now they are known to have important signaling functions in the gastrointestinal tract. CO and H2S, which are produced in the gastrointestinal tract by different enzymes, regulate smooth muscle...
membrane potential and tone, transmit signals from enteric nerves and can regulate the immune system. The pathways that produce nitric oxide (NO) H2S and CO interact—each can inhibit and potentiate the level and activity of the other. However, there are significant differences between these molecules, such as in half-lives; CO is more stable and therefore able to have effects distal to the site of production, whereas NO and H2S are short lived and act only close to sites of production. We review their signaling functions in the luminal gastrointestinal tract and discuss how their pathways interact. We also describe other physiologic functions of CO and H2S and how they might be used as therapeutic agents.

(45) Spencer RN, Carr DJ, David AL. Treatment of poor placentation and the prevention of associated adverse outcomes - what does the future hold? Prenat Diagn 2014 May 2. Abstract: Poor placentation, which manifests as pre-eclampsia and fetal growth restriction, is a major pregnancy complication. The underlying cause is a deficiency in normal trophoblast invasion of the spiral arteries, associated with placental inflammation, oxidative stress, and an antiangiogenic state. Peripartum therapies, such as prenatal maternal corticosteroids and magnesium sulphate, can prevent some of the adverse neonatal outcomes, but there is currently no treatment for poor placentation itself. Instead, management relies on identifying the consequences of poor placentation in the mother and fetus, with iatrogenic preterm delivery to minimise mortality and morbidity. Several promising therapies are currently under development to treat poor placentation, to improve fetal growth, and to prevent adverse neonatal outcomes. Interventions such as maternal nitric oxide donors, sildenafil citrate, vascular endothelial growth factor gene therapy, hydrogen sulphide donors, and statins address the underlying pathology, while maternal melatonin administration may provide fetal neuroprotection. In the future, these may provide a range of synergistic therapies for pre-eclampsia and fetal growth restriction, depending on the severity and gestation of onset. (c) 2014 The Authors. Prenatal Diagnosis published by John Wiley & Sons Ltd

(46) Hartle MD, Sommer SK, Dietrich SR, Pluth MD. Chemically Reversible Reactions of Hydrogen Sulfide with Metal Phthalocyanines. Inorg Chem 2014 May 1. Abstract: Hydrogen sulfide (H2S) is an important signaling molecule that exerts action on various bioinorganic targets. Despite this importance, few studies have investigated the differential reactivity of the physiologically relevant H2S and HS- protonation states with metal complexes. Here we report the distinct reactivity of H2S and HS- with zinc(II) and cobalt(II) phthalocyanine (Pc) complexes and highlight the chemical reversibility and cyclability of each metal. ZnPc reacts with HS-, but not H2S, to generate [ZnPc-SH]-, which can be converted back to ZnPc by protonation. CoPc reacts with HS-, but not H2S, to form [CoIPc]-, which can be reoxidized to CoPc by air. Taken together, these results demonstrate the chemically reversible reaction of HS- with metal phthalocyanine complexes and highlight the importance of H2S protonation state in understanding the reactivity profile of H2S with biologically relevant metal scaffolds.

(47) Huang YM, Xia JY, Jiang R. [Expressions of CSE and CBS in the penile corpus cavernosum of hyperglycemia rats and their implications]. Zhonghua Nan Ke Xue 2014 Apr;20(4):299-303. Abstract: OBJECTIVE: To investigate the impact of hyperglycemia on the hydrogen sulfide (H2S) signaling pathway in rat penile tissue and its relationship with erectile function. METHODS: Twenty healthy male Sprague Dawley (SD) rats aged 8 weeks were randomly divided into groups A (4-week healthy control), B (4-week diabetes mellitus model), C (6-week healthy control) and D (6-week diabetes mellitus model). The rats in groups B and D were injected intraperitoneally with streptozotocin at 50 mg/kg to induce diabetes mellitus, while those in groups A and C with the same volume of normal saline. The animals were killed at 4 (groups A and B) and 6 weeks (groups C and D) after treatment for measurement of the maximal intracavernous pressure/mean arterial blood pressure (ICP(max)/MAP) by electrostimulation, determination of the H2S concentration...
in the plasma and penile tissue, and detection of the expressions of cystathionine-beta-synthetase (CBS) and cystathionine-gamma-lyase (CSE) in the penile corpus cavernosum by immunohistochemistry and Western blot. RESULTS: With electrostimulation of the pelvic ganglia at 5V and 7 V, ICP(max)/MAP was significantly reduced in groups B (0.19 +/- 0.03 and 0.29 +/- 0.04) and D (0.14 +/- 0.04 and 0.25 +/- 0.04) as compared with A (0.46 +/- 0.07 and 0.68 +/- 0.09) and C (0.43 +/- 0.07 and 0.65 +/- 0.16) (P < 0.05). No statistically significant differences were found in the level of serum testosterone either between groups A and B ([469.19 +/- 126.46] ng/dl vs [359.08 +/- 60.06] ng/dl, P > 0.05) or between C and D ([470.44 +/- 209.28] ng/dl vs [297.01 +/- 96.58] ng/dl, P > 0.05). Groups B and D showed remarkable reduction in the H2S concentration (P < 0.05) and the expressions of CBS and CSE (P < 0.05) in comparison with A and C, and the CBS and CSE expressions were even more significantly decreased in D than in B (P < 0.05). CONCLUSION: The reduced concentration of H2S and decreased expressions of CBS and CSE in the penile corpus cavernosum of the diabetic rats suggested that the H2S signaling pathway might be involved in hyperglycemia-induced erectile dysfunction

(48) Jankowski J, Westhof T, Vaziri ND, Ingrosso D, Perna AF. Gases as uremic toxins: is there something in the air? Semin Nephrol 2014 Mar;34(2):135-50. Abstract: The field of uremic toxicity comprises the study of a large number of different substances, classified in relation to various characteristics, for example, protein-binding, dimensions, and so forth. The endogenous compounds of a gaseous nature have received much attention lately from the scientific community because of their increasingly recognized importance in health and disease. Among these substances, some are uremic toxins per se, others are related to uremic toxins, or can become toxic under some circumstances. We divided them into two broad categories: organic and inorganic compounds. Among the organic compounds are phenols, indols, 2-methoxyresorcinol, p-hydroxy hippuric acid and phenyl acetic acid, trimethylamine, and dimethylamine; among the inorganic solutes are ammonia, nitric oxide, carbon monoxide, and hydrogen sulfide. In this article, these substances are described in relation to the elements that they affect or by which they are affected in uremia, which are the blood, breath, stools, and the gastrointestinal tract. In addition, the effect of the dialysis procedure on exhaled gases are described


(50) Li XH, Guo HH, Yang LP, Zhu ZL, Sun XQ. [Study on dynamics of hydrogen sulfide and carbonyl sulfide emission fluxes from Suaeda salsa marsh in the Yellow River estuary]. Huan Jing Ke Xue 2014 Feb;35(2):786-91. Abstract: The H2S and COS emission fluxes from Suaeda salsa marsh in the Yellow River estuary were measured using the static chamber and Chromatogram method during the growth season (May to October), the results showed that the seasonal and diurnal variations of H2S and COS emission fluxes were obvious, and Suaeda salsa marsh in the Yellow River estuary was the sources for both H2S and COS during the growth time, and the mean H2S and COS emission fluxes from Suaeda salsa marsh were 4.97 microg x (m2 x h)(-1) and 0.92 microg x (m2 x h)(-1), respectively. Different environmental factors had different effects on the emission fluxes of H2S and COS from Suaeda salsa marsh, in which the SO4(2-) content and water content in the soil were the main factors that affected the H2S and COS emission fluxes, respectively. Sulfur gases emissions from Suaeda salsa marsh may be affected by many factors, such as plant, tide status and so on, so that should be further studied

Abstract: In order to improve H2 utilization efficiency and to reduce energy consumption during the hydrogenotrophic sulfate reduction process, a two-chambered microbial electrolysis system (MES) with a biocathode was constructed. The performance of MES in terms of sulfate removal and the electron utilization was studied. With an applied voltage of 0.8 V, biocathode removed about 109.8 mg x L(-1) of SO4(2-) from the wastewater within 36 h of operation, and average reductive rate reached 73.2 mg x (L x d)(-1). The highest current density obtained from the MES was 50-60 A x m(-2). The total coulomb efficiency achieved in a cycle was (43.3 +/- 10.7)% and around 90% of the effective electrons were used by the cathode bacteria for SO4(2-) reduction. During the operation of MES, the major products of SO4(2-) bio-reduction are sulfide and hydrogen sulfide. With an applied voltage of 0.4 V, both the SO4(2-) removal rate and electron output decreased compared with that of 0.8 V; however, the electric charge efficiency obtained by the MES increased and reached 70% when 0.4 V was applied. Meanwhile, ignorable H2 gas was detected at the end of the cycle, indicating bacteria might directly use cathode as the electron donor thus enhanced energy efficiency. The bacteria could use cathode of the MES as electron donor to reduce SO4(2-) effectively, which may provide a new method to lower energy consumption of the hydrogenotrophic sulfate reduction process, making advanced treatment for sulfate containing wastewater more affordable for practical applications.
Abstract: Hydrogen sulfide (H2S) is the second leading cause of toxin related death (after carbon monoxide) in the workplace. H2S is absorbed by the upper respiratory tract mucosa, and it causes histotoxic hypoxemia and respiratory depression. Cocktail method was used to evaluate the influences of acute H2S poisoning on the activities of cytochrome P450 isoforms CYP2B6, CYP2D6, CYP3A4, CYP1A2, CYP2C19, and CYP2C9, which were reflected by the changes of pharmacokinetic parameters of six specific probe drugs, bupropion, metoprolol, midazolam, phenacetin, omeprazole, and tolbutamide, respectively. The experimental rats were randomly divided into two groups, control group and acute H2S poisoning group (inhaling 300 ppm for 2 h). The mixture of six probes was given to rats by oral administration and the blood samples were obtained at a series of time points through the caudal vein. The concentrations of probe drugs in rat plasma were measured by LC-MS. The results for acute H2S poisoning and control groups were as follows: there was a statistically significant difference in the AUC and Cmax for bupropion, metoprolol, phenacetin, and tolbutamide, while there was no statistical pharmacokinetic difference for midazolam and omeprazole. Acute H2S poisoning could inhibit the activity of CYP2B6, CYP2D6, CYP1A2, and CYP2C9 in rats.


Abstract: BACKGROUND: This paper is based on the studies of the biogeochemical structure of the water column in the anoxic Fjord Hunnbunn (south-eastern Norway) performed in 2009, 2011 and 2012. This Fjord is an enclosed basin of brackish water separated by a narrow and shallow outlet to the sea with a permanently anoxic layer. We show how an oxygenated intrusion could lead to both positive and negative effects on the ecosystem state in Hunnbunn due to a change in the biogeochemical structure.

RESULTS: During the stratified periods in 2009 and 2012 the anoxic layer amounted to approximately 10% of the total water volume in the Fjord, while dissolved oxygen (DO) was present in 80-90% of the water. In the autumn of 2011 the water chemistry structure observed in Fjord Hunnbunn was clearly affected by a recent oxygenated intrusion defined by abnormal salinity patterns. This led to a shift of the DO boundary position to shallower depths, resulting in a thicker anoxic layer comprising approximately 40% of the total water volume, with DO present only in approximately 60% of the water. The oxygenated water intrusions led to a twofold decrease of the concentrations of hydrogen sulphide, ammonia, phosphate and silicate in the deep layers with a simultaneous increase of these nutrients and a decrease of the pH level in the surface layers. The concentrations of manganese, iron, and mercury species changed dramatically and in particular revealed a significant supply of iron and methylmercury to the water column.

CONCLUSIONS: Oxic water intrusions into anoxic fjords could lead not only to the flushing of the bottom anoxia, but to a dispersal of sulphidic and low oxygen conditions to the larger bottom area. The elevation of the hydrogen sulphide to the shallower layers (that can be rapidly oxidized) is accompanied by the appearance in the subsurface water of methylmercury, which is easily accumulated by organisms and can be transported to the surrounding waters, affecting the ecosystem over a larger area.


Abstract: BACKGROUND: The use of a boiling mixture of hydriodic acid, hypophosphorous acid, and hydrochloric acid to reduce any variety of sulfur compounds has been in use in various applications since the first appearance of this method in the literature in the 1920’s. In the realm of sulfur geochemistry, this method remains a useful, but under-utilized technique. Presented here is a detailed description of the distillation set-up and procedure, as well as an overview of potential applications of this method for marine sulfur biogeochemistry/isotope studies. The presented applications include the sulfur isotope analysis of extremely low amounts of sulfate from saline water, the conversion of radiolabeled sulfate into sulfide, the extraction of refractory sulfur from marine sediments, and the use of this method to assess sulfur cycling in Aarhus Bay.
RESULTS: The STRONGLY REDUCING HYDRIodic/hypoPhosphorous/hydrochloric acid (STRIP) reagent is capable of rapidly reducing a wide range of sulfur compounds, including the most oxidized form, sulfate, to hydrogen sulfide. Conversion of as little as approximately 5 micromole sulfate is possible, with a sulfur isotope composition reproducibility of 0.3 permil. CONCLUSIONS: Although developed many decades ago, this distillation method remains relevant for many modern applications. The STRIP distillation quickly and quantitatively converts sulfur compounds to hydrogen sulfide which can be readily collected in a silver nitrate trap for further use. An application of this method to a study of sulfur cycling in Aarhus Bay demonstrates that we account for all of the sulfur compounds in pore-water, effectively closing the mass balance of sulfur cycling.

Abstract: BACKGROUND: Cardiovascular complication due to diabetes has remained a major cause of death. There is an urgent need to intervene the cardiac complications in diabetes by nutritional or pharmacological agents. Thus the present study was designed to find out the effectiveness of garlic on cardiac complications in insulin-resistant diabetic rats. METHODS AND RESULTS: SD rats were fed high fructose (65%) diet alone or along with raw garlic homogenate (250 mg/kg/day) or nutrient-matched (65% corn starch) control diet for 8 weeks. Fructose-fed diabetic rats showed cardiac hypertrophy, increased NFkB activity and increased oxidative stress. Administration of garlic significantly decreased (p<0.05) cardiac hypertrophy, NFkB activity and oxidative stress. Although we did not observe any changes in myocardial catalase, GSH and GPx in diabetic heart, garlic administration showed significant (p<0.05) increase in all three antioxidant/enzymes levels. Increased endogenous antioxidant enzymes and gene expression in garlic treated diabetic heart are associated with higher protein expression of Nrf2. Increased myocardial H2S levels, activation of PI3K/Akt pathway and decreased Keap levels in fructose-fed heart after garlic administration might be responsible for higher Nrf2 levels. CONCLUSION: Our study demonstrates that raw garlic homogenate is effective in reducing cardiac hypertrophy and fructose-induced myocardial oxidative stress through PI3K/AKT/Nrf2-Keap1 dependent pathway.