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CONTACT US

subscribers@chemwatch.net
tel +61 3 9572 4700
fax +61 3 9572 4777

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

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CHEMICAL EFFECTS

Hydrochromic smart windows to remove harmful substances by mimicking Medieval European stained glasses

2020-04-08

Medieval European stained glass windows are known to display various splendid colors and remove harmful airborne substances. At present, the functions of medieval stained glass windows are imperative, from the environment, health, and energy perspectives, to develop multi-functional windows that report/control environmental conditions and remove harmful substances by utilizing visible-near-infrared light sources. Here, we suggest a strategy to mimic medieval European stained glasses for devising plasmonic-based multi-functional smart stained glass windows. The stained glass windows are prepared from the deposition of gold nanoparticles on a glass that is preliminarily coated with a responsive colloidal nanosheet. The temperature responsiveness of the nanosheet enables the effective control the gold nanoparticle density of the stained glasses. Therefore, the windows can display blue, violet, and cranberry colors. The colors become iridescent by introducing a photonic crystal monolayer. The stained glass windows are hydrochromic: they switch the colors (blue → cranberry) and modulate light transmittance depending on humidity conditions. Moreover, they can remove formaldehyde under the illumination of a low-power indoor light. These functions provide a new platform for the futuristic smart windows that clean indoor air for the human health and save energy.

Authors: Pyun SB, Song JE, Kim JY, Cho EC

Full Source: ACS applied materials & interfaces. 2020 Apr 8;12(14):16937-16945. doi: 10.1021/acsami.0c01719. Epub 2020 Mar 27.

Here, we suggest a strategy to mimic medieval European stained glasses for devising plasmonic-based multi-functional smart stained glass windows.

Efficiency and mechanisms of simultaneous removal of *Microcystis aeruginosa* and microcystins by electrochemical technology using activated carbon fiber/nickel foam as cathode material.

2020-03-05

The significant removal efficiency of *Microcystis aeruginosa* was presented using Pt/Ti anode and activated carbon fiber/nickel foam (ACF/Ni) cathode by addition of Fe²⁺ slightly in a wide range of initial pH (3-9). Results showed that about 93% of the *Microcystis aeruginosa* cells were removed

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within 15 min for Pt/Ti-ACF/Ni-Fe²⁺ system. Dosage of Fe²⁺, current density, and initial pH had remarkable effects on the removal efficiency of microcystis aeruginosa. The mechanism of algae removal in the Pt/Ti-ACF/Ni-Fe²⁺ electrochemical system was revealed by the comparison between Pt/Ti-ACF/Ni-Fe²⁺ process and classical Fenton process, the analysis on Microcystis aeruginosa and ACF/Ni by SEM, the specific surface area and pore size analysis of ACF, and the determination of UV254, OD620 and microcystin-LR (MC-LR). Results showed that the main mechanism of this system was the electro-Fenton process, which was accompanied by electro-adsorption, electro-floatation, and electro-coagulation process. And the cooperation mechanism on the electrochemical removal system was further speculated. With the breakdown of algal cells during the electrolysis, the MC-LR and other substances released from the cells were effectively degraded. Besides, the new cathode exhibited favorable and stable reusability. This study built up a high-efficiency algae removal system, which broke through the limits of narrow working pH range and large consumption of exogenous chemicals in electro-Fenton process.

Authors: Lian H, Xiang P, Xue Y, Jiang Y, Li M, Mo J

Full Source: Chemosphere. 2020 Mar 5;252:126431. doi: 10.1016/j.chemosphere.2020.126431. [Epub ahead of print]

Chrysin ameliorates hepatic steatosis induced by a diet deficient in methionine and choline by inducing the secretion of hepatocyte nuclear factor 4 α -dependent very low-density lipoprotein

2020-03-27

We investigated the effects of chrysin (CHR) on nonalcoholic fatty liver disease (NAFLD) in mice. The NAFLD mouse model was established using a diet deficient in methionine and choline (MCD). CHR was shown to attenuate MCD-induced hepatic fat accumulation, increase very low-density lipoprotein (VLDL) secretion, and decrease hepatic oxidative stress in NAFLD mice. Inhibition of oxidative stress or direct suppression of protein kinase C (PKC) by CHR significantly reduced PKC activity in the liver, leading to a decrease in inhibitory phosphorylation of hepatocyte nuclear factor 4 α (HNF4 α). The resulting activation of HNF4 α led to induced transcription of apolipoprotein B and VLDL secretion. Together, these results show that CHR effectively ameliorates MCD-induced fatty

The NAFLD mouse model was established using a diet deficient in methionine and choline (MCD).

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liver in NAFLD mice by targeting the hepatic oxidative stress/PKC/HNF4 α signaling pathway.

Authors: Song Y, Wu W, Sheng L, Jiang B, Li X, Cai K

Full Source: Journal of biochemical and molecular toxicology. 2020 Mar 27:e22497. doi: 10.1002/jbt.22497. [Epub ahead of print]

ENVIRONMENTAL RESEARCH

Do rainfall and tick burden affect the efficacy of pour-on formulations against *Rhipicephalus (Boophilus) microplus*?

2020-03-20

Rhipicephalus (Boophilus) microplus is the most important livestock tick, causing economical losses especially in tropical and subtropical regions. Pour-on formulations using synthetic chemicals, remain the most farmer friendly conventional form of tick control method. Misuse of acaricides can lead to the emergence of resistance, residual chemicals in animal products, the poisoning of vertebrates and environment contamination. Despite the increase in the use of pour-on formulations, little is known regarding the therapeutic and residual efficacy of these products after the treated animals are exposed to rainfall. Moreover, information is scanty on whether efficacy is modulated by different levels of tick burden. Three studies were conducted. In the two first experiments, we evaluated the therapeutic and residual efficacies of commercial pour-on products (fluazuron 2.5 mg/kg and fipronil 1.0 mg/kg, respectively) on cattle naturally infested with *R. (B.) microplus* under the condition of simulated rainfall. In the third study, we investigated whether tick burden affects the efficacy of the drugs used a chemical control method involving three different formulations (Day 0: cypermethrin 5.0 mg/kg + chlorpyrifos 7.0 mg/kg + citronellal 0.5 mg/kg; Day 7: fluazuron 3.0 mg/kg + abamectin 0.5 mg/kg and Day 56: fipronil 1.0 mg/kg + fluazuron 3.0 mg/kg). Tick counts were performed on different days to assess efficacy. It was observed that the residual efficacy of the commercial formulations was lower on animals that received simulated rain. In addition, therapeutic and residual efficacies of the products were reduced in the group of animals with a high tick burden of *R. (B.) microplus*. In conclusion, rainfall decreases

Pour-on formulations using synthetic chemicals, remain the most farmer friendly conventional form of tick control method.

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the efficacy of acaricides. Also, the tick burden must be considered when selecting a pour-on formulation.

Authors: Beltrán Zapa DM, Moteiro Couto LF, Heller L, de Asses Cavalcantre AS, Nicaretta JE, Cruvinel L, de Melo Júnior RD, Ferreira LL, Azeredo Bastots TS, Edesio Soares V, Sousa-Mello IA, Zanetti Lopes WD
Full Source: Preventative Veterinary Medicine. Mar 20;177:104950. doi: 10.1016/j.prevetmed.2020.104950. [Epub ahead of print]

Acidic seawater improved 5-hydroxymethylfurfural yield from sugarcane bagasse under microwave hydrothermal liquefaction.

2020-03-06

5-Hydroxymethylfurfural (HMF) as value-added platform chemical can be derived from biomass. This study used microwave hydrothermal liquefaction (MHTL) to obtain HMF from sugarcane bagasse in acidic seawater conditions. The key processing parameters including temperature, reaction time, and liquid-to-solid ratio (L/S) were evaluated and optimized. The highest HMF yield of 8.1 wt% was obtained at 149 °C with a reaction time of 4 min and a L/S value of 12:1, respectively. This yield is considerable and even higher than the yield derived from sugarcane molasses under similar microwave conditions in the absence of seawater. Hence, acidic seawater was found to promote the hydrolysis of sugarcane bagasse to give HMF precursor (i.e. fructose and glucose), while simultaneously inhibiting the conversion of HMF to levulinic acid under MHTL conditions, possibly explaining the high HMF yield. This method presents a new and sustainable means of transforming waste biomass to valuable substances using seawater or brine wastewater.

Authors: Shao Y, Tsang DCW, Shen D, Zhou Y, Jin Z, Zhou D, Lu W, Long Y
Full Source: Environmental research. 2020 May;184:109340. doi: 10.1016/j.envres.2020.109340. Epub 2020 Mar 6.

This study used microwave hydrothermal liquefaction (MHTL) to obtain HMF from sugarcane bagasse in acidic seawater conditions.

PHARMACEUTICAL/TOXICOLOGY

Eribulin mesylate-induced c-Fos upregulation enhances cell survival in breast cancer cell lines

2020-03-19

Anticancer agents are used for cancer therapy. Studies on the biological response to treatment with an agent facilitate its effective use. Eribulin mesylate (eribulin) is an anticancer agent. In this study, we found that c-Fos is upregulated in response to eribulin treatment in the triple-

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negative breast cancer cell lines MDA-MB-231 and HCC70, which have low eribulin sensitivity. c-Fos expression was not upregulated in other cell lines investigated, including high eribulin-sensitive cells. We hypothesized that c-Fos upregulation is involved in low eribulin sensitivity and thus used the c-Fos inhibitor, T-5224. In MDA-MB-231 and HCC70 cells, combined treatment with eribulin and T-5224 showed a stronger anticancer effect than treatment with eribulin alone in cell growth assays, cell death assays and a mouse xenograft tumor model, whereas T-5224 alone showed no anticancer effect. These results suggest that T-5224 may enhance the anticancer effect of eribulin. Our findings contribute to the improvement of cancer therapy.

Authors: Tanaka S, Ishii T, Sato F, Toi M, Itou J

Full Source: Biochemical and biophysical research communications. 2020 Mar 19. pii: S0006-291X(20)30521-0. doi: 10.1016/j.bbrc.2020.03.042. [Epub ahead of print]

High throughput in vivo phenotypic screening for drug repurposing: Discovery of MLR-1023 a novel insulin sensitizer and novel Lyn kinase activator with clinical proof of concept.

2020-05-01

Drug discovery requires the combination of medicinal chemistry and biology. In this article Chris Lipinski, the medicinal chemist, describes the chemical origins at Pfizer of Tolimidone¹ the starting point for the repurposed MLR-1023 (Ochman et al., 2012). Andrew Reaume, the biologist, describes his motivation to develop a high quality (i.e. in vivo model) phenotypic screening platform as an ideal drug repositioning platform.

Authors: Lipinski CA, Reaume AG

Full Source: Bioorganic and medicinal chemistry. 2020 May 1;28(9):115425. doi: 10.1016/j.bmc.2020.115425. Epub 2020 Mar 16.

Sigma receptor-induced heavy drinking in rats: Modulation by the opioid receptor system

2020-03-20

Alcohol use disorder (AUD) is a major cause of morbidity and mortality worldwide, for which new efficacious treatments are necessary. The opioid receptor system is a mediator of the rewarding effects of alcohol; in particular, while activation of μ opioid receptors enhances ethanol intake in rodents, opioid-receptor antagonists, such as naloxone and naltrexone,

Drug discovery requires the combination of medicinal chemistry and biology.

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reduce its pleasurable and reinforcing effects, thereby decreasing alcohol. Sigma receptors (Sig-Rs) have been proposed as modulators of the effects of alcohol and, therefore, as a potential new pharmacological target for AUD. Somewhat analogously to μ opioid ligands, SigR agonists increase, while SigR antagonists decrease alcohol intake in animal models of excessive alcohol drinking. However, a potential cross-talk between these two receptor systems in relation to alcohol consumption has so far not been investigated. Here, we addressed this question pharmacologically, by testing the effects of either activating or inhibiting opioid receptors on the heavy alcohol drinking induced by chronic stimulation of SigR in alcohol-preferring rats. We found that the opioid receptor agonist morphine, which per se increases ethanol intake, at a sub-threshold dose reduces the binge-like drinking induced by the repeated treatment with the SigR agonist 1,3-di-o-tolylguanidine (DTG); conversely, the opioid receptor antagonist naltrexone, which per se reduces ethanol intake, at a sub-threshold dose potentiates the DTG-induced binge-like drinking. Our data show a cross-talk between the opioid and SigR systems relevant to the modulation of alcohol drinking, which provides important insights into the neurobiology of AUD and may lead to the development of novel therapies, either standalone or in combination.

Authors: Valenza M, Blasio A, DiLeo A, Cottone P, Sabino V

Full Source: Pharmacology, biochemistry, and behavior. 2020

May;192:172914. doi: 10.1016/j.pbb.2020.172914. Epub 2020 Mar 20.

Are there differences between intradermal and intramuscular of Botulinum toxin on the forehead?

2020-03-17

BACKGROUND:

The intradermal technique to inject botulinum toxin is a popular procedure in upper facial rejuvenation to minimize side effects, such as brow ptosis, and can sometimes result in a lifting effect.

OBJECTIVE:

The present study investigated differences in effects according to injection modality.

METHODS AND MATERIALS:

Fifteen women received intradermal injections of botulinum toxin (total dose, 8U) into the forehead, and 14 women received intramuscular injections.

RESULTS:

The maximal antiwrinkle effect was recorded at Week 2, and the duration of the effect was the same in both groups. The brow position was lowered

The amount of maximal voluntary eyebrow movement was decreased at Weeks 2 and 4 and recovered at Week 16 in both groups.

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at Weeks 2 and 4 in the intramuscular injection group and was preserved in the intradermal injection group throughout the follow-up period. The amount of maximal voluntary eyebrow movement was decreased at Weeks 2 and 4 and recovered at Week 16 in both groups. The change in the electromyographic amplitude of the frontalis muscle was prolonged until Week 16 in both groups. Subjective satisfaction with wrinkles was similar in both groups. However, the intradermal injection was more painful.

CONCLUSION:

Intradermal injection of botulinum toxin is a safe and effective method to improve forehead rhytides.

Authors: Kim YJ, Lim OK, Choi WJ

Full Source: Dermatologic Surgery:official publication for the American Society for Dermatologic Surgery [et al.]. 2020 Mar 17. doi: 10.1097/DSS.0000000000002379. [Epub ahead of print]

Protocol for a prospective, observational, longitudinal study in paediatric patients with moderate-to-severe atopic dermatitis (PEDISTAD): study objectives, design and methodology.

2020-03-24

INTRODUCTION:

Atopic dermatitis (AD) is a chronic inflammatory skin disease often associated with atopic comorbidities and has significant impact on children and their families. There is a lack of robust and longitudinal long-term data on disease characteristics and typical clinical practice with currently available treatments in children with moderate-to-severe AD. Hence, an observational study is needed to evaluate AD characteristics and progression in paediatric patients with moderate-to-severe AD.

METHODS AND ANALYSIS:

Pediatric Study in Atopic Dermatitis (PEDISTAD) is a prospective, observational, longitudinal study in paediatric patients with moderate-to-severe AD who are currently receiving systemic or topical treatment and whose disease is not adequately controlled by topical prescription therapies or for whom those therapies are not medically advisable. 1300 children at 100-150 sites in approximately 20 countries worldwide will be enrolled and followed for 5 years. AD therapy is at the discretion of the investigator. Data collected will include: AD disease characteristics and comorbidities; current therapy for AD and initiation of new treatments/changes in current treatment; patient-reported/caregiver-reported outcomes; days missed from school/work for the patient/caregiver; healthcare professional visits; safety and biomarkers.

1300 children at 100-150 sites in approximately 20 countries worldwide will be enrolled and followed for 5 years

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ETHICS AND DISSEMINATION:

This study is conducted in accordance with the principles established by the 18th World Medical Assembly and all subsequent amendments and the guidelines for Good Epidemiology Practice. Each individual country assures that ethics approval has been received and local regulatory requirements are met. Ethics approval has been obtained in all countries currently participating in PEDISTAD. Study data will be disseminated in manuscripts submitted to peer-reviewed medical journals as well as in abstracts submitted to congresses and in the resulting posters and presentations.

Authors: Paller AS, Guttman-Yassky E, Irvine AD, Baselga E, de Bruin-Weller, Jayawardena S, Zhang A, Mina-Osorio P, Rizova E, Ozturk ZE
Full Source: BMJ Open. 2020 Mar 24;10(3):e033507. doi: 10.1136/bmjopen-2019-033507.

Burden of Menstrual Pain Measured by Heatmap Visualization of Daily Patient-Reported Data in Japanese Patients Treated with Ethinylestradiol/Drospirenone: A Randomized Controlled Study

2020-03-10

PURPOSE:

Dysmenorrhea negatively affects women's quality of life and poses a considerable economic burden. A recent study in Japanese patients with dysmenorrhea ([NCT01892904](#)) reported a significant reduction in the number of days with menstrual pain after treatment with a flexible extended regimen of ethinylestradiol (EE)/drospirenone (DRSP) compared with a cyclic regimen. However, individual patients' menstrual pain patterns and intensities were not indicated. Heatmapping was used to visualize menstrual pain patterns and intensities by re-evaluating the previously published data from [NCT01892904](#).

PATIENTS AND METHODS:

[NCT01892904](#) was a Phase III, multicenter, randomized, open-label, active-control study of 212 women aged ≥ 20 years randomized 1:1 to receive flexible extended or 28-day cyclic EE/DRSP treatment. Daily pain levels were recorded in patient diaries, and menstrual pain patterns and intensities were visualized using heatmapping. Patients were stratified by baseline dysmenorrhea scores and primary or secondary dysmenorrhea.

RESULTS:

The heatmap data demonstrated that EE/DRSP reduced the degree of menstrual pain. Regular peaks of menstrual pain were alleviated in the extended regimen group but were still observed in the cyclic regimen

Heatmapping was used to visualize menstrual pain patterns and intensities by re-evaluating the previously published data from [NCT01892904](#).

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group. While a decrease in the days with menstrual pain was observed in patients with higher baseline dysmenorrhea scores (5-6), those with lower baseline scores (3-4) were more likely to experience lower intensities of menstrual pain. Although pain relief was less likely in patients with secondary dysmenorrhea, those who had lower baseline dysmenorrhea scores (3-4) and received the flexible extended regimen experienced a greater reduction in the number of days with menstrual pain than those who received the cyclic regimen.

CONCLUSION:

Heatmapping effectively visualized the daily burden of menstrual pain in Japanese patients with dysmenorrhea. The analysis using heatmaps suggested that the flexible extended EE/DRSP treatment regimen was more likely to alleviate the regular occurrence of menstrual pain peaks compared with the cyclic regimen.

Authors: Momoeda M, Akiyama S, Yamamoto S, Kondo M, Fukai T

Full Source: International Journal of Women's Health. 2020 Mar 10;12:175-185. doi: 10.2147/IJWH.S242864. eCollection 2020.

OCCUPATIONAL

The association of silicosis severity with pectoralis major muscle and subcutaneous fat volumes, and the pulmonary artery/aorta ratio evaluated by CT.

2020-03-25

PURPOSE:

Silicosis is an incurable occupational disease that sometimes rapidly progresses with fatal outcomes. We aimed to evaluate the association between the severity of disease and the changes in the volumes of the pectoralis major muscle (PMV) and subcutaneous fat (SFV), and the pulmonary artery/aorta (P/Ao) ratio in patients with silicosis using computed tomography (CT).

METHODS:

The study included 41 male silicosis patients and 41 trauma patients with available chest CT images. Using dedicated software, we measured PMV and SFV from the axial CT images. We calculated the P/Ao ratio and obtained body mass index (BMI) and pulmonary function test (PFT) results from hospital records. We used the chest X-ray profusion score according to the International Labor Organization (ILO) classification to evaluate the severity of the silicosis.

RESULTS:

The mean age was 33.5 ± 4.4 and 34.7 ± 4.7 years in the silicotic and control groups, respectively.

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The mean age was 33.5 ± 4.4 and 34.7 ± 4.7 years in the silicotic and control groups, respectively. The mean BMI, PMV, SFV and P/Ao values significantly differed between the study and control groups (respectively p values: 0.0009, <0.0001 , <0.0001 , and 0.0029, respectively). According to the ILO classification, there were 12 silicosis patients in category 1, 13 in category 2, and 16 in category 3. A significant difference was found between disease categories in terms of PMV, SFV, P/Ao, BMI, and FEV1/FVC values ($p = 0.0425, 0.0341, 0.0002, 0.0492, \text{ and } 0.0004$, respectively).

CONCLUSION:

Disease severity was more strongly associated with decreased muscle and subcutaneous fat volume and increased P/Ao ratios than BMI in patients with silicosis caused by denim sandblasting. Thus, CT evaluation might be a useful indicator of disease severity.

Authors: Yılmaz Çankaya B, Karaman A, Albez FS, Polat G, Alper F, Akgün M
Full Source: Diagnostic and interventional radiology (Anakara, Turkey).
2020 Mar 25. doi: 10.5152/dir.2020.19534. [Epub ahead of print]

Diesel Exhaust Exposure during Farming Activities: Statistical Modeling of Continuous Black Carbon Concentrations

2020-03-27

OBJECTIVES:

Daily driving of diesel-powered tractors has been linked to increased lung cancer risk in farmers, yet few studies have quantified exposure levels to diesel exhaust during tractor driving or during other farm activities. We expanded an earlier task-based descriptive investigation of factors associated with real-time exposure levels to black carbon (BC, a surrogate of diesel exhaust) in Iowa farmers by increasing the sample size, collecting repeated measurements, and applying statistical models adapted to continuous measurements.

METHODS:

The expanded study added 43 days of sampling, for a total of 63 sample days conducted in 2015 and 2016 on 31 Iowa farmers. Real-time, continuous monitoring (30-s intervals) of personal BC concentrations was performed using a MicroAeth AE51 microaethelometer affixed with a micro-cyclone. A field researcher recorded information on tasks, fuel type, farmer location, and proximity to burning biomass. We evaluated the influence of these variables on log-transformed BC concentrations using a linear mixed-effect model with random effects for farmer and day and a first-order autoregressive structure for within-day correlation.

RESULTS:

Predicted geometric mean BC concentrations were highest during grain bin work, loading, and harvesting, and lower for soil preparation and planting.

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Proximity to diesel-powered equipment was observed for 42.5% of the overall sampling time and on 61 of the 63 sample days. Predicted geometric mean BC concentrations were highest during grain bin work, loading, and harvesting, and lower for soil preparation and planting. A 68% increase in BC concentrations was predicted for close proximity to a diesel-powered vehicle, relative to far proximity, while BC concentrations were 44% higher in diesel vehicles with open cabins compared with closed cabins. Task, farmer location, fuel type, and proximity to burning biomass explained 8% of within-day variance in BC concentrations, 2% of between-day variance, and no between-farmer variance.

CONCLUSION:

Our findings showed that farmers worked frequently near diesel equipment and that BC concentrations varied between tasks and by fuel type, farmer location, and proximity to burning biomass. These results could support the development of exposure models applicable to investigations of health effects in farmers associated with exposure to diesel engine exhaust.

Authors: Sauv  JF, Stapleton EM, O'Shaughnessy PT, Locke SJ, Josse PR, Altmaier RW, Silverman DT, Liu D, Albert PS, Beane Freeman LE, Hofmann JN, Thorne PS, Jones RR, Friesen MC

Full Source: *Annals of work exposures and health*. 2020 Mar 27. pii: wxaa032. doi: 10.1093/annweh/wxaa032. [Epub ahead of print]