

Bulletin Board

Contents

AUG. 25, 2023

(click on page numbers for links)

CHEMICAL EFFECTS

Reactive oxygen species, toxicity, oxidative stress, and antioxidants:
chronic diseases and aging 3

ENVIRONMENTAL RESEARCH

Air pollution trends and exceedances: ozone and particulate matter
outlook in Brazilian highly urbanized zones 4

Life cycle assessment to address the environmental impacts of
tourism in a Spanish tourist destination: The case of Rias Baixas
(Galicia) holidays..... 5

How environments can promote active aging: results from a case
study of two municipalities in Quebec, Canada 6

PHARMACEUTICAL/TOXICOLOGY

Bio-Functional Mesoporous Silica Nanoparticles as Nano-
Structured Carriers in Cancer Theranostic Review on Recent
Advancements 7

Bio-Functional Mesoporous Silica Nanoparticles as Nano-
Structured Carriers in Cancer Theranostic Review on Recent
Advancements 8

Nanobiopesticides: Are they the future of phytosanitary treatments
in modern agriculture?..... 9

OCCUPATIONAL

Predicting Groundwater PFOA Exposure Risks with Bayesian
Networks: Empirical Impact of Data Preprocessing on Model
Performance..... 10

Radiation exposure and leukaemia risk among cohorts of persons
exposed to low and moderate doses of external ionising radiation
in childhood 10

Genomic testing in voluntary workplace wellness programs in the
US: Evidence and challenges 11

CONTACT US

subscribers@chemwatch.net

tel +61 3 9572 4700

fax +61 3 9572 4777

1227 Glen Huntly Rd

Glen Huntly

Victoria 3163 Australia

Bulletin Board

Technical

AUG. 25, 2023

CHEMICAL EFFECTS

Reactive oxygen species, toxicity, oxidative stress, and antioxidants: chronic diseases and aging

2023-08-19

A physiological level of oxygen/nitrogen free radicals and non-radical reactive species (collectively known as ROS/RNS) is termed oxidative eustress or “good stress” and is characterized by low to mild levels of oxidants involved in the regulation of various biochemical transformations such as carboxylation, hydroxylation, peroxidation, or modulation of signal transduction pathways such as Nuclear factor- κ B (NF- κ B), Mitogen-activated protein kinase (MAPK) cascade, phosphoinositide-3-kinase, nuclear factor erythroid 2-related factor 2 (Nrf2) and other processes. Increased levels of ROS/RNS, generated from both endogenous (mitochondria, NADPH oxidases) and/or exogenous sources (radiation, certain drugs, foods, cigarette smoking, pollution) result in a harmful condition termed oxidative stress (“bad stress”). Although it is widely accepted, that many chronic diseases are multifactorial in origin, they share oxidative stress as a common denominator. Here we review the importance of oxidative stress and the mechanisms through which oxidative stress contributes to the pathological states of an organism. Attention is focused on the chemistry of ROS and RNS (e.g. superoxide radical, hydrogen peroxide, hydroxyl radicals, peroxy radicals, nitric oxide, peroxynitrite), and their role in oxidative damage of DNA, proteins, and membrane lipids. Quantitative and qualitative assessment of oxidative stress biomarkers is also discussed. Oxidative stress contributes to the pathology of cancer, cardiovascular diseases, diabetes, neurological disorders (Alzheimer’s and Parkinson’s diseases, Down syndrome), psychiatric diseases (depression, schizophrenia, bipolar disorder), renal disease, lung disease (chronic pulmonary obstruction, lung cancer), and aging. The concerted action of antioxidants to ameliorate the harmful effect of oxidative stress is achieved by antioxidant enzymes (Superoxide dismutases-SODs, catalase, glutathione peroxidase-GPx), and small molecular weight antioxidants (vitamins C and E, flavonoids, carotenoids, melatonin, ergothioneine, and others). Perhaps one of the most effective low molecular weight antioxidants is vitamin E, the first line of defense against the peroxidation of lipids. A promising approach appears to be the use of certain antioxidants (e.g. flavonoids), showing weak prooxidant properties that may boost cellular antioxidant systems and thus act as preventive anticancer agents. Redox metal-based enzyme mimetic compounds as potential pharmaceutical interventions and sirtuins as

A physiological level of oxygen/nitrogen free radicals and non-radical reactive species (collectively known as ROS/RNS) is termed oxidative eustress or “good stress” and is characterized by low to mild levels of oxidants involved in the regulation of various biochemical transformations such as carboxylation, hydroxylation, peroxidation, or modulation of signal transduction pathways such as Nuclear factor- κ B (NF- κ B), Mitogen-activated protein kinase (MAPK) cascade, phosphoinositide-3-kinase, nuclear factor erythroid 2-related factor 2 (Nrf2) and other processes.

Bulletin Board

Technical

AUG. 25, 2023

promising therapeutic targets for age-related diseases and anti-aging strategies are discussed.

Authors: Klaudia Jomova, Renata Raptova, Suliman Y Alomar, Saleh H Alwasel, Eugenie Nepovimova, Kamil Kuca, Marian Valko

Full Source: Archives of toxicology 2023 Aug 19. doi: 10.1007/s00204-023-03562-9.

Body of article

Authors: authors

Full Source:

ENVIRONMENTAL RESEARCH

Air pollution trends and exceedances: ozone and particulate matter outlook in Brazilian highly urbanized zones

2023-08-17

In Brazil, scarce air quality data hinders air pollutant chemical understanding and policy decisions regarding public health and environmental impacts. From this perspective, our study assessed the O₃, PM_{2.5}, and PM₁₀ yearly and seasonal trends and also the WHO Air Quality Guidelines 2021 exceedance trends at 40 air quality stations located in four highly urbanized zones in Brazil (Belo Horizonte, São Paulo, Rio de Janeiro, and Espírito Santo) from early 1990s up to 2019. We applied the Mann-Kendall test aligned with Sen’s Slope estimator to assess the trends and the Cox-Stuart test to verify the WHO AQG 2021 exceedances trends. Our findings pointed out that the current national legislation is outdated when compared to WHO AQG 2021 values, leading to multiple exceedances episodes. We also found out that 62% of São Paulo’s stations presented O₃ increasing trends, while in Rio de Janeiro 85.7% presented decreasing trends. The Cox-Stuart test pointed out that PM_{2.5} exceedance trends showcase positive values, and most of the significant values are located in São Paulo stations. Therefore, we endorse that the national legislation needs to be updated meanwhile the air monitoring network needs to expand its coverage.

Authors: Arthur Boari, Rizzieri Pedruzzi, Marcelo Vieira-Filho

Full Source: Environmental monitoring and assessment 2023 Aug 17;195(9):1058. doi: 10.1007/s10661-023-11654-3.

In Brazil, scarce air quality data hinders air pollutant chemical understanding and policy decisions regarding public health and environmental impacts.

Bulletin Board

Technical

AUG. 25, 2023

Life cycle assessment to address the environmental impacts of tourism in a Spanish tourist destination: The case of Rias Baixas (Galicia) holidays

2023-08-16

Tourism has grown steadily in recent decades, becoming a strategic sector for the economy in many countries. However, the environmental impacts associated with tourism have also experienced an upward trend. In this sense, innovation is needed in the tourism sector, to move towards new models and strategies that integrate environmental sustainability with the social aspects of the sector. In this study, a holistic assessment of the environmental impact of tourism has been carried out using the Life Cycle Assessment (LCA) method, considering all stages of tourism activity: transportation from the place of origin to destination and back, accommodation, catering, and activities conducted. For this purpose, a case study has been carried out based on a typical trip made from Madrid to Rías Baixas (Galicia), considering a four-night stay and the performance of two activities (music festival and cultural museum) at the destination. Two alternative transportation scenarios (train or plane) have been defined to analyze the influence of the type of transportation on the overall impact. Other touristic activities such as visiting gardens or thermal baths instead of visiting a cultural museum or attending a music festival have been analyzed and it has been found that the thermal baths and the museum have the greatest environmental impacts. Transportation was the biggest contributor to most of the environmental impacts in the selected categories. On the other hand, the stay at the destination has stood out due to the impact of the consumption of food and energy used at the accommodation facility. The impact of the activities conducted at the destination is also worth highlighting. Finally, alternative scenarios for transportation have shown that the mode of transportation selected is key for lowering the overall environmental impact of the stay at the destination, highlighting the public transportation alternative, such as the train, as the most environmentally friendly option.

Authors: Cristina Campos, María Gallego, Pedro Villanueva, Jara Laso, Ana Cláudia Dias, Paula Quinteiro, Sara Oliveira, Jaume Albertí, Pere Fullana-I-Palmer, Lela Mélon, Ilija Sazdovski, Mercè Roca, Ramon Xifré, María Margallo, Rubén Aldaco

Full Source: The Science of the total environment 2023 Aug 16;166242. doi: 10.1016/j.scitotenv.2023.166242.

Tourism has grown steadily in recent decades, becoming a strategic sector for the economy in many countries.

Bulletin Board

Technical

AUG. 25, 2023

How environments can promote active aging: results from a case study of two municipalities in Quebec, Canada

2023-08-17

Objectives: To address global aging, a paradigm shift is needed from disease prevention and treatment towards active aging, i.e., optimizing opportunities for health, participation, and security as people age. Little is known about how age-friendly environments promote active aging. This study thus aimed to explore how (through which mechanisms and in what contexts) environments can promote active aging and, specifically, positive health, social participation, and health equity.

Methods: Using a realist approach and semi-structured focus groups, a case study was used in two Quebec municipalities known for best fostering active aging. Data also included participants' logbooks, sociodemographic questionnaires, municipalities' sociodemographic profiles, and policy documents. A conceptual framework and thematic content analysis were carried out.

Results: A total of 24 participants (9 older adults, 4 health professionals, 3 community-based actors, 5 municipal employees, and 3 elected officials) took part in 5 focus groups. Regarding contexts, both cases were midsize municipalities having an income and education level higher to Quebec's averages with supportive active aging policies. Two main themes explained how the environments promoted active aging: (1) by ensuring proximity through built (urban planning), social (network structures), services (variety and availability of local and outreach resources), and organizational (active listening to older adults' needs for active aging) environments; and (2) by fostering transversality through built (universal accessibility, intergenerational spaces), social (intergenerational opportunities for social participation), and political/organizational (unified and complementary policies) environments.

Conclusion: To better promote active aging through age-friendly environments, practices should focus on fostering proximity and transversality, and act simultaneously on multiple environments.

Authors: Anne-Lou McNeil-Gauthier, David-Martin Milot, Mélanie Levasseur

Full Source: Canadian journal of public health = Revue canadienne de sante publique 2023 Aug 17. doi: 10.17269/s41997-023-00806-0.

Objectives: To address global aging, a paradigm shift is needed from disease prevention and treatment towards active aging, i.e., optimizing opportunities for health, participation, and security as people age.

Bulletin Board

Technical

AUG. 25, 2023

PHARMACEUTICAL/TOXICOLOGY

Bio-Functional Mesoporous Silica Nanoparticles as Nano-Structured Carriers in Cancer Theranostic Review on Recent Advancements

2023-08-17

Background: Cancer is a life-threatening disease worldwide, but proper treatment has not yet been developed. Many therapies are available to treat cancer disorders, like chemotherapy, surgery, hormone therapy, and immunotherapy. Chemotherapy often relies on a combination of harmful, highly toxic platinum-based compounds. Also, there are chances of poor distribution of chemotherapeutic agents and cytotoxic to most cells which leads to damage to other healthy cells, also, there are chances of resistance.

Objective: The main objective of this study is the development of mesoporous silica nanoparticles. Mesoporous silica nanoparticles are recognized as carriers with high drug loading capacity and significant functionalized surface area for targeted drug delivery. Mesoporous silica nanoparticles have shape, particle size, pore volume, higher surface area, and the possibility of surface modification. Hence results in thermally and chemically stable nanomaterials. For targeted drug delivery, MSN is conjugated with a variety of ligands, including monoclonal antibodies, hyaluronic acid, transferrin, folic acid, etc., that have a particular affinity for the receptors that are overexpressed on the surface of malignant cells, so using this nanocarrier reducing the dose related toxicity of normal cell.

Methods: This review focuses on different methods for synthesizing mesoporous silica nanoparticles. Sol-gel method and modified stobber method were used for the synthesis of this nanoparticle.

Results: Successfully synthesized mesoporous silica nanoparticle with particle size around 50-200 nm and drug loading efficiency was found to be around 71 %.

Conclusion: Mesoporous silica nanoparticles are great carriers for intracellular and targeted drug delivery systems.

Authors: Darshan Gevariya, Lipika Priya, Smit Mehta, Vishwas Patel, Dhara Bhuva, Drishti Panjwani, Shruti Patel, Priyanka Ahlawat, Abhay Dharamsi, Asha Patel

Full Source: Current drug targets 2023 Aug 17. doi: 10.2174/1389450124666230817103122.

Background: Cancer is a life-threatening disease worldwide, but proper treatment has not yet been developed.

Bulletin Board

Technical

AUG. 25, 2023

Bio-Functional Mesoporous Silica Nanoparticles as Nano-Structured Carriers in Cancer Theranostic Review on Recent Advancements

2023-08-17

Background: Cancer is a life-threatening disease worldwide, but proper treatment has not yet been developed. Many therapies are available to treat cancer disorders, like chemotherapy, surgery, hormone therapy, and immunotherapy. Chemotherapy often relies on a combination of harmful, highly toxic platinum-based compounds. Also, there are chances of poor distribution of chemotherapeutic agents and cytotoxic to most cells which leads to damage to other healthy cells, also, there are chances of resistance.

Objective: The main objective of this study is the development of mesoporous silica nanoparticles. Mesoporous silica nanoparticles are recognized as carriers with high drug loading capacity and significant functionalized surface area for targeted drug delivery. Mesoporous silica nanoparticles have shape, particle size, pore volume, higher surface area, and the possibility of surface modification. Hence results in thermally and chemically stable nanomaterials. For targeted drug delivery, MSN is conjugated with a variety of ligands, including monoclonal antibodies, hyaluronic acid, transferrin, folic acid, etc., that have a particular affinity for the receptors that are overexpressed on the surface of malignant cells, so using this nanocarrier reducing the dose related toxicity of normal cell.

Methods: This review focuses on different methods for synthesizing mesoporous silica nanoparticles. Sol-gel method and modified stobber method were used for the synthesis of this nanoparticle.

Results: Successfully synthesized mesoporous silica nanoparticle with particle size around 50-200 nm and drug loading efficiency was found to be around 71 %.

Conclusion: Mesoporous silica nanoparticles are great carriers for intracellular and targeted drug delivery systems.

Authors: Darshan Gevariya, Lipika Priya, Smit Mehta, Vishwas Patel, Dhara Bhuva, Drishti Panjwani, Shruti Patel, Priyanka Ahlawat, Abhay Dharamsi, Asha Patel

Full Source: Current drug targets 2023 Aug 17. doi: 10.2174/1389450124666230817103122.

Background: Cancer is a life-threatening disease worldwide, but proper treatment has not yet been developed.

Bulletin Board

Technical

AUG. 25, 2023

Nanobiopesticides: Are they the future of phytosanitary treatments in modern agriculture?

2023-08-18

The world's population is continuously increasing; therefore, food availability will be one of the major concerns of our future. In addition to that, many practices and products used, such as pesticides and fertilizers have been shown harmful to the environment and human health and are assumed as being one of the main factors responsible for the loss of biodiversity. Also, climate change could aggravate the problem since it causes unpredictable variation of local and regional climate conditions, which frequently favor the growth of diseases, pathogens and pest growth. The use of natural products, like essential oils, plant extracts, or substances of microbial-origin in combination with nanotechnology is one suitable way to outgrow this problem. The most often employed natural products in research studies to date include pyrethrum extract, neem oil, and various essential oils, which when enclosed shown increased resistance to environmental factors. They also demonstrated insecticidal, antibacterial, and fungicidal properties. However, in order to truly determine if these products, despite being natural, would be hazardous or not, testing in non-target organisms, which are rare, must start to become a common practice. Therefore, this review aims to present the existing literature concerning nanoformulations of biopesticides and a standard definition for nanobiopesticides, their synthesis methods and their possible ecotoxicological impacts, while discussing the regulatory aspects regarding their authorization and commercialization. As a result of this, you will find a critical analysis in this reading. The most obvious findings are that i) there are insufficient reliable ecotoxicological data for risk assessment purposes and to establish safety doses; and ii) the requirements for registration and authorization of these new products are not as straightforward as those for synthetic chemicals and take a lot of time, which is a major challenge/limitation in terms of the goals set by the Farm to Fork initiative.

Authors: Sofia Machado, Ruth Pereira, Rose Marie O F Sousa

Full Source: The Science of the total environment 2023 Aug 18;896:166401. doi: 10.1016/j.scitotenv.2023.166401.

The world's population is continuously increasing; therefore, food availability will be one of the major concerns of our future.

Bulletin Board

Technical

AUG. 25, 2023

OCCUPATIONAL

Predicting Groundwater PFOA Exposure Risks with Bayesian Networks: Empirical Impact of Data Preprocessing on Model Performance

2023-08-18

The plethora of data on PFASs in environmental samples collected in response to growing concern about these chemicals could enable the training of machine-learning models for predicting exposure risks. However, differences in sampling and analysis methods across data sets must be reconciled through data preprocessing, and little information is available about how such manipulations affect the resulting models. This study evaluates how data preprocessing influences machine-learned Bayesian network models of PFOA in groundwater. We link 19 years of PFOA measurements from Minnesota, USA, to publicly available information about potential PFOA sources and factors that may influence their environmental fate. Nine different preprocessing methods were tested, and the resulting data sets were used to train models to predict the probability of PFOA ≥ 35 ppt, the 2017 Minnesota health advisory level. Different preprocessing approaches produced varying model structures with significantly different accuracies. Nonetheless, models showed similar relationships between predictor variables and PFOA exposure risks, and all models were relatively accurate, distinguishing wells at high risk from those at low risk for 82.0% to 89.0% of test data samples. There was a trade-off between data quality and model performance since a stricter data screening strategy decreased the sample size for model training.

Authors: Runwei Li, Jacqueline MacDonald Gibson
Full Source: Environmental science & technology 2023 Aug 18. doi: 10.1021/acs.est.3c00348.

Radiation exposure and leukaemia risk among cohorts of persons exposed to low and moderate doses of external ionising radiation in childhood

2023-08-18

Background: Many high-dose groups demonstrate increased leukaemia risks, with risk greatest following childhood exposure; risks at low/moderate doses are less clear.

Methods: We conducted a pooled analysis of the major radiation-associated leukaemias (acute myeloid leukaemia (AML) with/without the inclusion of myelodysplastic syndrome (MDS), chronic myeloid leukaemia

The plethora of data on PFASs in environmental samples collected in response to growing concern about these chemicals could enable the training of machine-learning models for predicting exposure risks.

Bulletin Board

Technical

AUG. 25, 2023

(CML), acute lymphoblastic leukaemia (ALL)) in ten childhood-exposed groups, including Japanese atomic bomb survivors, four therapeutically irradiated and five diagnostically exposed cohorts, a mixture of incidence and mortality data. Relative/absolute risk Poisson regression models were fitted.

Results: Of 365 cases/deaths of leukaemias excluding chronic lymphocytic leukaemia, there were 272 AML/CML/ALL among 310,905 persons (7,641,362 person-years), with mean active bone marrow (ABM) dose of 0.11 Gy (range 0-5.95). We estimated significant ($P < 0.005$) linear excess relative risks/Gy (ERR/Gy) for: AML ($n = 140$) = 1.48 (95% CI 0.59-2.85), CML ($n = 61$) = 1.77 (95% CI 0.38-4.50), and ALL ($n = 71$) = 6.65 (95% CI 2.79-14.83). There is upward curvature in the dose response for ALL and AML over the full dose range, although at lower doses (<0.5 Gy) curvature for ALL is downwards.

Discussion: We found increased ERR/Gy for all major types of radiation-associated leukaemia after childhood exposure to ABM doses that were predominantly (for 99%) <1 Gy, and consistent with our prior analysis focusing on <100 mGy.

Authors: Mark P Little, Richard Wakeford, Lydia B Zablotska, David Borrego, Keith T Griffin, Rodrigue S Allodji, Florent de Vathaire, Choonsik Lee, Alina V Brenner, Jeremy S Miller, David Campbell, Mark S Pearce, Siegal Sadetzki, Michele M Doody, Erik Holmberg, Marie Lundell, Benjamin French, Michael Jacob Adams, Amy Berrington de González, Martha S Linet

Full Source: British journal of cancer 2023 Aug 18. doi: 10.1038/s41416-023-02387-8.

Genomic testing in voluntary workplace wellness programs in the US: Evidence and challenges

2023-08-17

Background: Workplace genetic and/or genomic testing (wGT) is one of many options that employers can offer within the scope of voluntary workplace wellness programs, though we know little about how many employers are offering this benefit, or what kinds of testing are included.

Methods: Our landscaping review sought to discover the prevalence and distribution of wGT within voluntary wellness programs among U.S. companies using three approaches: (1) analysis of publicly available information; (2) national surveys; and (3) interviews with company representatives.

Results: In total, 50/420 (11.9%) companies we investigated had publicly available data suggesting that they offer wGT to their employees. Survey data weighted to be representative of the type and distribution of

Bulletin Board

Technical

AUG. 25, 2023

U.S. companies suggest that ~1% of U.S. companies offer wGT to their employees.

Conclusion: Our research found little evidence of broad uptake of wGT among U.S. companies, though information gathering was challenging.

Authors: Betty Cohn, Kerry A Ryan, Katherine Hendy, Katherine Callahan, J Scott Roberts, Kayte Spector-Bagdady, Debra J H Mathews, INSIGHT @ Work Consortium, Drew Blasco, Nicole Crumpler, William Gregory Feero, Rebecca Ferber, Veda Giri, Anya E R Prince, Kunal Sanghavi, Wendy Uhlmann, Alyx Vogle, Charles Lee

Full Source: Molecular genetics & genomic medicine 2023 Aug 17;e2245. doi: 10.1002/mgg3.2245.

Background: Workplace genetic and/or genomic testing (wGT) is one of many options that employers can offer within the scope of voluntary workplace wellness programs, though we know little about how many employers are offering this benefit, or what kinds of testing are included.