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The comparison of sediment quality in the rivers of Eastern Slovakia by potential ecological risk index

Eva Singovszka and **Magdalena Balintova**
Institute of Environmental Engineering, Slovakia

The current pollution of sedimentary environment is very serious and exceeds load capacity limit and it is influenced by other external factors such as climate, hydrodynamic conditions, pH, salinity, Eh, temperature and other. This influences can cause the heavy metals are re-released from the sediments which were long-term accumulated what can lead to the deterioration of ecological environment and even pose a threat to the organisms through the food chain. Distribution, enrichment characteristics of heavy metals (such as lead, cadmium, copper, zinc, mercury and arsenic) in the sediments in the rivers of Eastern Slovakia, were measured and analyzed in 2017 and 2018. River sediment quality in the territory of East of Slovakia, representing the water basins of the rivers Hornad, Laborec, Poprad and Torysa, was investigated. Sampling points were selected based on the current surface water quality monitoring network. The potential harmful effects of these heavy metals were evaluated by Potential Ecological Risk Index Method (PERI) based on considering the specialty of the area and the applicability of evaluation methods, which could quantify the potential ecological risk levels of heavy metals. The aim of the study is to compare the sediment quality of monitored rivers between 2017 and 2018 by method PERI.

Biography

Eva Singovszká is working at the Institute of Environmental Engineering, Faculty of Civil Engineering at the Technical University of Košice as a researcher. She is an expert in the field of environmental engineering with a special regard to the environmental risks. Her research activities are focused on assessment the environmental risks in sediments. The results of her scientific-research work have been published in a large number of national and international journals and proceedings of national and international conferences (>90). She has published several papers in prestigious Current Contents journals, her scientific reputation is evident from a large number of citations to her work (>100).

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A human health risk assessment of perfluorononanoic acid using a physiologically - based pharmacokinetic model

Hea Young Cho[1] and **Yong Bok Lee**[2]

[1]Cha University, South Korea

[2]Chonnam National University, South Korea

Perfluorononanoic acid (PFNA) is a one of perfluoroalkyl and polyfluoroalkyl substances (PFASs) and is widely detected in the environment and humans. PFNA are known to effect on developmental toxicity and to associate with serum cholesterol, children's reading skill, and atopic dermatitis. The aim of this study was to develop and evaluate a physiologically-based pharmacokinetic (PBPK) model for PFNA in female rats, and apply to a human health risk assessment. The PBPK model of PFNA was established after the oral or intravenous administration of PFNA in female rats (at dose of 0.5-3 mg/kg). The biological samples (plasma, nine tissues, urine, and feces) were analyzed using ultra-liquid chromatography coupled tandem mass spectrometry. The tissue-plasma partition coefficient (Kp) was estimated as the ratio of concentration in tissue to that in plasma. The PBPK model of PFNA was fitted by WinNonlin (Ver. 6.4) and Berkeley Madonna software. The Kp values of PFNA in rats were increasing tendency in different tissues like spleen (0.025), heart (0.034), lung (0.056), kidney (0.247), liver (0.466) and other tissues were classified as rest of body. The key parameters were estimated at 800 μg/h of transport maximum, and 114428 μg/L of transport affinity constant. The PBPK model in rats was extrapolated to a human PBPK mode based on human physiological parameters. The reference dose of 4.5 μg/kg/day and external dose of 0.12 μg/kg/day for human risk assessment were estimated using Korean biomonitoring values. This study provides valuable insight into human health risk assessment regarding PFNA exposure.

Biography

Hea Young Cho is an Associate Professor of College of Pharmacy at CHA University. She received her PhD degrees in Biopharmaceutical Science from Chonnam National University. She had been served as a Postdoctoral fellow at the State University of New York at Buffalo, and Deputy Director of Clinical Trials Management Division at Korea Food & Drug Administration (KFDA). Her research interest involves the investigation about PK/PD modeling and ADMET. She is currently an Associate Editor of *Journal of Pharmaceutical Investigation* and a Scientific Chair of The Korean Society for Pharmaceutical Sciences and Technology.

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Development and evaluation of PBPK model of perfluorodecanoic acid: Application to human exposure assessment

Yong Bok Lee[1] and **Hea Young Cho**[2]

[1]Chonnam National University, South Korea

[2]CHA University, South Korea

The aim of present study was to develop a physiologically-based pharmacokinetic (PBPK) model of perfluorodecanoic acid (PFDA) in rats for applying its human exposure assessment. We constructed the PBPK model based on *in vivo* study after the oral or intravenous administration of PFDA in female rats (at dose of 1 mg/kg). The biological samples consisted of plasma, nine tissues (kidney, liver, lung, heart, spleen, adipose tissue, muscle, GI tract, and brain), urine, and feces were analyzed using UPLC-MS/MS with liquid-liquid extraction after protein precipitation. The PBPK model was fitted and simulated as changing the key parameters such as the transporter maximum (Tm), the transporter affinity constant (Kt), the rate constant to storage compartment (Kst), and the urinary elimination rate constant (Ku). The tissue-plasma partition coefficient was the highest in the liver (0.607), followed by kidney (0.233), lung (0.100), and spleen (0.052). The model simulation was fitted well with the observed values. The parameters of T_m, K_t, K_{st}, and K_u were 199.5 μg/h, 201.5 μg/L, 0.19 h^{-1}, and 0.13 h^{-1}, respectively. A PBPK model was extrapolated to humans by taking the interspecies differences in physiological parameters into account. The reference dose of 22.98 μg/kg/day and external dose of 5.54 ng/kg/day for human risk assessment were estimated using Korean biomonitoring values. The developed PBPK model in rats can be a foundation for the development of human model for PFDA and used as a tool in assessing human exposure of PFDA.

Biography

Yong Bok Lee is currently a Professor of the College of Pharmacy, the former Vice-President of Chonnam National University and the Ex-President of The Korean Society of Pharmaceutical Sciences and Technology. He received his PhD degree in Pharmaceutics from Seoul National University. His research interests are focused on the lymphatic delivery of immunosuppressants and the application of population PK/PD models associated with genetic differences in drug transporters and enzymes. He won many prestigious awards and honors including the KSPs Progress Prize and Academic Prize, the KFDC Academic Prize, the CNU Yongbong Academic Prize and the MEST official commendation.

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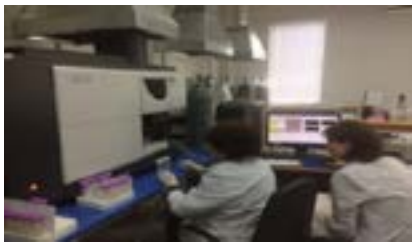
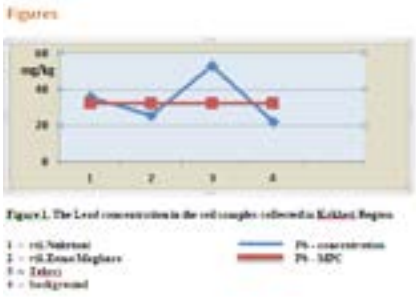
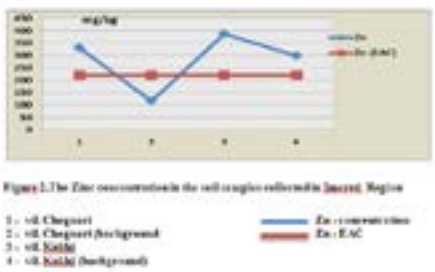
The chemical and microbiological analysis of the uncontrolled landfill sites in Georgia and its impact on the pollution of the surrounding areas

Nugzar Buachidze, Khatuna Chikviladze, Gulchina Kuchava and **Ekaterina Shubladze Georgia**
Institute of Hydrometeorology of the Georgian Technical University, Georgia

Presently, there are 56 official landfills for non-hazardous waste off which only 36 are operating. However, it should be noted that there is no official landfill for construction waste or an operational landfill for hazardous waste. There are many uncontrolled landfills in Georgia. They are near resided territories, in the gorges and near rivers. You can often meet hazardous waste on the landfills because Georgian legislation does not regulate hazardous waste management. Thus, uncontrolled landfills represent huge threat for regional population. Local governments in the regions, and especially in villages, cannot provide high-level cleaning service that results in different territories of accumulated dumped waste by years and amount. Often uncontrolled landfills are located near resided territories. Moreover, hazardous waste can also be dumped in the areas of uncontrolled landfills that may create a number of health-related problems for the population of the regions. In the framework of the study, the following types of work were carried out: inventory of uncontrolled landfills for several territories of Georgia; identification of the hottest spots in the study territories; identification of the list of pollutant ingredients common for landfills; in laboratory conditions analyzed samples (soil, water) were determined (heavy metals: Cu, Zn, As, Pb, Cd, Hg; and intestine bacteria: *E-coli,* total coliforms, fecal streptococci); the analysis of physical and chemical parameters (pH, temperature, electrical conductivity, salinity and oxygen dissolved in water) of the so-called field analysis on the first day were carried out with the use of the latest mobile device. The results obtained (as in the laboratory as well as field) have been evaluated by the study group members and have therefore concluded conclusions on the impact of uncontrolled landfills on the pollution of the surrounding territories and the health of people residing in the regions of their hazardous quality.







Biography

Nugzar Buachidze is a Doctor of Chemical Sciences. Over the years he has been working in the field of Ecology and is a Senior Scientist at the Hydrometeorological Institute of the Technical University of Georgia. He participates in the international forums and conferences, as well as the author of more than 100 scientific articles. He is also often invited as an expert in many international or local projects.

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Mobile toilets chemicals: Its influence on activated sludge microorganisms

Vitezova M[1], **Kopecka M**[1], **Vitez T**[2] and **Dokulilova T**[2]
[1]Masaryk University, Czech Republic
[2]Mendel University, Brno, Czech Republic

Our work focuses on the wastewater treatment process, especially on the activated sludge. The activated sludge is composed of varied groups of microorganisms which play the crucial role in the removal of the organic matter and nitrogenous substances from the wastewater. In the previous study we found out that the chemical substances used regularly as toilet chemistry negatively influence respirometric activity of the activated sludge. Regarding this fact, we decided to isolate different bacterial strains from the activated sludge to study the influence of the chemical substances on bacterial growth characteristics and mainly on the length of the lag phase. Lag phase is defined as the period where the individual bacteria are maturing and not yet able to divide. They adapt themselves to the new growth conditions. We isolated three bacterial strains from the activated sludge obtained from the municipal wastewater treatment plant in Modřice, Czech Republic (513.000 PE). The bacterial strains were cultivated on nitrate broth medium and on the basis of morphological features and Sanger´s sequencing of the DNA we have determined them as *Paracoccus aminophilus, Ralstonia pickettii* and *Psychrobacter* sp. The growth of these bacterial strains was measured by the microplate reader Tecan Sunrise™ (Tecan Trading AG, Switzerland). The samples examined contained inoculum of the strains mentioned above (*P. aminophilus, R. pickettii* and *Psychrobacter* sp.) and the pure chemical substances in the appropriate concentrations. The results were evaluated by equations of bacterial growth. The length of the lag phase differs depending on the nature of the chemical substances. Bronopol, a substance frequently used in mobile toilets, prolongs the lag phase very significantly. On the other hand, limonene or citric acid shortens the time of bacterial adaptation. The retention time of wastewater in the activation tank lies usually in the range of 6 to 8 hours. Regarding the extended lag phase the bacterial metabolism is insufficient for the properly treated wastewater.

Biography

Vitezova M graduated her PhD studies in Microbiology in 2000 and was habilitated in 2014. She works as Head of Section of Microbiology at Masaryk University in Brno. She established the Laboratory of Anaerobic Microorganisms. She focuses on the study of methanogenic archaea and sulfate reducing bacteria in the environment, wastewater treatment process and biogas production process.

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Evaluation of the influence of additives from different types of compost on the soil properties

Metodi Kirilov Mladenov
University of Chemical Technology and Metallurgy, Bulgaria

The current study presents the results of the performed analyzes and the comparison of the effects of additives of different types of compost on the soil properties. Three different compost types were obtained using different methods of production - home composting method for the production of two of the composts was applied and the industrial composting installation from the tunnel type for the third one was used. The results of experiments on the influence on the content of the basic nutrients (N, P, K), pH, conductivity, humus, porosity, etc. are presented. Various mixtures were used between the starting materials - compost and soil and pot experiments were carried out with an exsperimental plant culture. The choice of the experimental culture was made after a preliminary study and on the basis of the characteristics - a short growing season and reaching fruiting within six months of planting. The data obtained on the basis of the vascular experiments were analyzed and the respective conclusions were summarized in two directions: on the agri-ecological efficiency of the differnent types of composts; and on the most appropriate ratio (the respective mixture applied) for cultivation.

Biography

Metodi Kirilov Mladenov has successfully defended his dissertation in 2012 and obtained PhD in Technology for waste recovery and treatment from University of Chemical Technology and Metallurgy. In 2007 he completed his Master's degree in Ecology and Environmental Protection at the UCTM with excellent success. During the period 2006-2012, he worked as a Chemist in the Analytical Chemistry Section in the Institute of General and Inorganic Chemistry at the Bulgarian Academy of Sciences. In 2012 he was appointed as an Assistant to the Department of Engineering Ecology at the UCTM and in 2013 he was elected as a Assistant Professor to the same department.

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Heavy metals in the environment: Its influence on anaerobic sewage sludge stabilisation

Vitez T[1], Dokulilova T[1], Vitezova M[2] and **Kopecka M[2]**

[1]Mendel University, Czech Republic

[2]Masaryk University, Czech Republic

The work is focused on the impact of heavy metals on anaerobic sewage sludge stabilisation process, thus biogas production and quality. Primary source of heavy metals in urban wastewater is industry, which represents up to 50% of the total heavy metal content in sewage sludge. Domestic sources are mainly associated with leaching from plumbing materials, gutters and roofs, galvanised materials, the use of detergents and washing powders, and the use of body care products. Anaerobic sewage sludge stabilisation is a complex microbiological process involving various types of anaerobic and facultative anaerobic bacteria. This way of sludge treatment involves degradation and the stabilisation of organic matter, with reduction in odour, pathogens and the mass of solid organic material that requires further processing. This is accomplished by the biological conversion of organic matter to methane (CH_4) and carbon dioxide (CO_2). Sludge samples were collected directly from the anaerobic sewage sludge stabilisation tank located at the wastewater treatment plant (WWTP) in Brno, Czech Republic, population equivalent (PE) 513,000. Biogas production and quality was measured using batch anaerobic fermenters with the volume of 5 dm^3 at the temperature 38°C±0.2°C. Into fermenters five different amounts of heavy metals (Cu, Zn) were added. Cumulative biogas and methane production were used as the comparative parameters of tested metals inhibitory effect. Hypothesis, which predicts presence of inhibitory effect of zinc and copper on anaerobic microorganisms, mainly on methanogenic archaea, was confirmed. The lowest concentration of zinc and copper which causes significant inhibition of biogas production is 400 mg $Zn^{2+} \cdot l^{-1}$ and 1000 mg $Cu^{2+} \cdot l^{-1}$, which cause reduction of 10.3±2.0% and 82.8±1.1%, respectively.

Biography

Vitez T has completed his PhD in 2004 at Mendel University in Brno. He completed his Habilitation at 2014 at Mendel University in Brno and has specialization in Waste Management. He is Head of the National Biogas Laboratory, member of Czech Water Association. He is focused on waste management, anaerobic technology and wastewater treatment.

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The chemical and microbiological analysis of the uncontrolled landfill sites in Georgia and its impact on the pollution of the surrounding areas

Gulchina Kuchava, Khatuna Chikviladze, Nugzar Buachidze and **Ekaterina Shubladze**

N E A of Ministry of E protection and Agriculture of Georgia, Georgia

Presently, there are 56 official landfills for non-hazardous waste off which only 36 are operating. However, it should be noted that there is no official landfill for construction waste or an operational landfill for hazardous waste. There are many uncontrolled landfills in Georgia. They are near resided territories, in the gorges and near rivers. You can often meet hazardous waste on the landfills because Georgian legislation does not regulate hazardous waste management. Thus, uncontrolled landfills represent huge threat for regional population. Local governments in the regions, and especially in villages, cannot provide high-level cleaning service that results in different territories of accumulated dumped waste by years and amount. Often uncontrolled landfills are located near resided territories. Moreover, hazardous waste can also be dumped in the areas of uncontrolled landfills that may create a number of health-related problems for the population of the regions. In the framework of the study, the following types of work were carried out: inventory of uncontrolled landfills for several territories of Georgia; identification of the hottest spots in the study territories; identification of the list of pollutant ingredients common for landfills; in laboratory conditions analyzed samples (soil, water) were determined (heavy metals: Cu, Zn, As, Pb, Cd, Hg; and intestine bacteria: *E-coli,* total coliforms, fecal streptococci); the analysis of physical and chemical parameters (pH, temperature, electrical conductivity, salinity and oxygen dissolved in water) of the so-called field analysis on the first day were carried out with the use of the latest mobile device. The results obtained (as in the laboratory as well as field) have been evaluated by the study group members and have therefore concluded conclusions on the impact of uncontrolled landfills on the pollution of the surrounding territories and the health of people residing in the regions of their hazardous quality.

Biography

Gulchina Kutchava she has been working in the field of environment in National Environmental Agency, of Ministry of Environmental protection and Agriculture of Georgia and she is participates in the international forums and conferences, as well as author and supporting.

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A study on the calculation of eco toxicity potential of major construction waste in construction phase through life cycle assessment

Sungho Tae

Hanyang University, South Korea

As the importance of eco toxicity reduction in the construction industry has come to the fore, there is an increasing interest about life cycle assessment that comprehensively assesses environmental impact of buildings from production phase to demolition phase. As a part of this effort, eco-friendly production systems in construction phase are being presented to minimize eco toxicity potential from the life cycle perspective. As construction wastes are responsible for the most of overall wastes and rate of increase in wastes, management of construction wastes is more importantly required. However, practical management standards have not been established on construction wastes generated in construction phase.Accordingly, The purpose of this study is to calculation of eco toxicitiy potential of major construction waste in construction phase through life cycle assessment as part of an effort to develop an eco toxicitiy potential assessment program for buildings. To accomplish this, the amount of construction waste discharged in the construction phase was analyzed using loss rate and weight conversion factor in the Standard of Estimate for Construction Works. And the theoretical consideration of the life cycle assessment and environmental impact category was performed and the direction of the study was set up. The classification was performed about substance and impact index, such as Dichlorobenzene($C_6H_4Cl_2$) which is the base substance based on the impact indexes suggested by the CML2001. And the environmental impact of eco toxicity potential for the construction waste was calculated through the characterization. Meanwhile, the environmental impact of construction waste in the same category was analyze based on the characterization impact which was calculated in this study.

Biography

Prof. Tae has completed his PhD University of Tokyo in 2005. He has focussed his research on development of sustainable construction materials, structure LCA program, development of sustainable durability design system and structure optimum design technology. He has developed many Envionmental loads evaluation program such as SUSB-LCA, BEGAS and STEP-B. He is the main author of over 50 SCI papers. He is a director of Sustainable Building Research Center (ERC). And He is also a board member of the International Sustainability Council, Committee of Korea Industrial Standards Commission (ISO TC 184/SC 5), ISO/Fairness Committee, Journal Editorial Committee of Architectural Institute Korea, Green Store Institution Committee and Green Building Certificate Deliberation Committee of Korea Environmental Industry Technology Institute.

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Who is the most appropriate incentive object in waste cooking oil (WCO) supply chain? A case study of China

Tingting Liu, Yaru Liu and **Yufeng Wu**
Beijing University of Technology, China

Waste cooking oil (WCO) ranks one of the most promising feedstock for biodiesel production, due to the advantages in environment friendly, energy supply potential, edible oil safety and low recycling cost. Currently, the main roadblock in the way of developing WCO-based biodiesel in China is the fairly low enthusiasm in formal WCO supply chain. Chinese government has implemented a number of laws, regulations and incentive policies to improve WCO management and promote the use of biodiesel. However, many waste cooking oils are still collected by informal collectors and some of them are flowed back to "table". Our paper aims to find out the most appropriate incentive object and condition in WCO supply chain. We conducted a Stackelberg game model among catering enterprise, recycler, and biodiesel production enterprise. The results showed that catering enterprise was the most effective incentive target in WCO supply chain with a certain economic incentive. A simulation model was built to seek the best condition to incentive catering enterprise. There was a correlation between policy incentive effectiveness and catering enterprise's sensitivity to the collecting price of WCO. When the price sensitive degree is greater than 3.15, it is the most effective condition for government to implement economic incentive policies. To guarantee the effective operation of policy incentives, the support of law, policy guidelines and routine supervision should be provided.

Biography

Yaru Liu is a student of Institute of Circular Economy□Beijing University of Technology, this is her first year as a graduate student. She has completed her Bachelor of Management at the age of 22 from University of International Business and Economics. Now, she is servicing as an edit in We Chat public platform of RCR journal.

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Influence of coal as the energy source for household heating on PM10 concentrations in three neighboring cities located on mediterranean coast of turkey

Fusun Yalcin[1], **Ahmet Mustafa Tepe**[2], **Güray Doğan**[2] and **Nurfer Cizmeci**[1]

[1]Akdeniz University, Turkey

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Particulate matter less than 10 μm aerodynamic diameter (PM10) is inhalable and have adverse health effects. PM10 is associated with respiratory and cardiovascular morbidity and mortality from cardiovascular and respiratory diseases and from lung cancer. In this study, the effect of use of coal for household heating to ambient PM10 and SO2 concentrations in three neighboring cities, namely Antalya, Isparta and Burdur, located on the Mediterranean Coast of Turkey is investigated. In these three cities, both natural gas and coal can be used as winter season household heating. However, only in Antalya, air conditioners can be used as an alternative heating source because of higher winter temperatures. Air qualities of these cities are monitored by Ministry of Environment and Civilization. For this study, hourly and daily PM10 data of the year 2014 obtained from these monitoring stations are discussed. The annual PM10 concentrations for Antalya, Burdur and Isparta were 54 μg/m3, 46 μg/m3 and 75 μg/m3, respectively. These values were higher than the annual limit value set by EU directives. The winter season (October-March) PM10 concentrations were 1.7 to 2.7 times higher than the summer season (April-September) concentrations. Especially after evening rush hours, winter season PM10 concentrations were 3 to 4 times higher than those in summer season. Even there is an alternative clean energy source, use of coal as household heating together with radiation inversion had increased PM10 concentrations in the region.

Biography

PhD degree completed at Akdeniz University. Since 1997 she has taught at universities as a teaching assistant and as a doctoral assistant. More than 20 international symposia have participated.

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Research in the Development of Oxitec, A New Refractory

Rafal Kalbalczyk
Poland

The work has presented the research outcomes regarding the development of a composition for a new refractory used as furnace lining for fireplace inserts as well as for free-standing fireplaces. Ten different mixtures have been developed, compositions of which included the following raw materials: corundum, cement, bisque, andalusite and fireclay. The said mixtures have been concentrated with the relevant oxides, quantities of which have been respectively 2%, 5%, 8% and 10% of the entire sample weight. The total number of 440 items has been prepared and they have subsequently been subject to sensory assessment and examination with regards to their mechanical strength and thermal properties. The works have resulted in the selection of a composition for a new refractory called OXITEC. Figure 1. Samples under examination regarding their thermal properties and the prototype of a fireplace insert with OXITEC lining

Operational energy and emission examinations have been performed for a prototypical fireplace insert equipped with the standard lining and with the components made of OXITEC material. The relevant measurements have been carried out at a test stand in the internal laboratory of the company called Kratki.pl, based on the norm PN-EN 13229 Fireplace inserts together with solid-fuel open fireplaces – Requirements and examinations. The examination findings have been compared with the outcomes applicable to the hitherto used fireclay material. Owing to the new material, the increase in device efficiency and the decrease in carbon oxide emissions have been achieved.

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Evaluating the Adsorption Capacity of Heavy Metals by Hemp (Cannabis sativa L.)

Gautham Das, Philip Curtsmith, Katherine Asciutto, Samantha DeVincentis and Audrey Iodice
Wentworth Institute of Technology, USA

Hemp (Cannabis sativa L.) was used to examine its capability as a renewable resource to decontaminate heavy metals. Determination of heavy metal content was carried out by means of atomic absorption spectroscopy (AAS). The goal of this research was to evaluate the attenuation capacity of hemp. The results revealed heavy metals accumulation; cadmium and chromium in hemp. The analysis consisted of comparing linear, Langmuir and Freundlich isotherms. Langmuir isotherm resulted in the highest distribution coefficient (Kd) values of 5.6 L/g for Soil to Solution ratio of 1:10. Column testing results revealed that the concentrations of cadmium dropped from 1.0 to 0.3 mg/L within the first pore volume and by 15 pore volumes the concentration was close to zero mg/L. This indicated that hemp proved to be an effective adsorbent for the removal of cadmium ions in water.

Biography

Dr. Gautham Das is an Associate Professor in Wentworth Institute of Technology. Professor Das has 15 years of research and professional experience in the field of soil and water remediation. Philip Curtsmith is a research associate at Wentworth Institute of Technology since 2015. Katherine Asciutto, Samantha DeVincentis and Audrey Iodice are research assistants at Wentworth Institute of Technology. They are obtaining their Bachelor of Science in Civil Engineering and minoring in Environmental Engineering.

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Various ways of waste activated sludge recycling

Marina Vlasova, Abigail Parra Parra and **Veronica González Molina**
Autonomous University of the State of Morelos, Mexico

The recycling of waste activated sludge (WAS) formed in the process of biological purification of sewage is an urgent ecological problem. In the present work, we consider various technological schemes for the utilization of WAS, namely: obtaining carbon adsorbent in the framework of low-temperature carbonization of WAS; synthesis in the framework of low-temperature sintering of WAS- glass mixtures of composite adsorbent granules consisting from carbon and porous glass; low-temperature synthesis of foam glass from mixtures WAS-a fusible comminuted glass; synthesis of porous brick products in water-saving mode when using WAS with high humidity; production of porous carbonized ceramics using WAS and firing under oxygen deficiency conditions. The obtained results showed that on the basis of the developed technologies it is possible to obtain active adsorbents for water purification from dyes, for filtration of sewage from suspensions and brick products of various porosities with good mechanical properties.

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Biography

Marina Vlasova has completed her PhD in 1967 with a speciality in Solid State Physics. In 1996 she completed her DSc with a speciality in Chemical Sciences. Her major research interests lie in the region of synthesis of oxide and oxygen-free powders, their sintering, phase formation and study the properties of ceramic materials. She is a Research Professor in Autonomy University of State Morelos, CIICAp. She directs the Laboratory of Advanced ceramics. She has published more than 170 papers in reputed journals, seven inventor's certificate.

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Elimination of fluoride ions from aqueous solutions with unmodified bentonite clay in batch reactor

Jihane Assaoui, Abdelmoula Kheribech and **Zineb Hatim**
Chouaïb Doukkali University, Morocco

The presence of excess fluoride ions in wastewater generated by different industrial activities has been acknowledged as a major environmental problem worldwide. Groundwater is one the important sources of drinking water. The discharge of industrial wastewater containing such as pollutant into the surface water would lead to groundwater pollution. The consumption of this latter can be considered as the major path of human exposure. Various technologies have been reported in the literature for fluoride removal from wastewaters to conquer the hazardous impacts generated by fluoride ions on the environment and human health. In this study, the fluoride removal from wastewaters was carried out by adsorption on local available bentonite clay obtained from the Northern part of Morocco using batch equilibrium experiments. The main aim of this study was on the one hand, the evaluation of the adsorption potential of the unmodified bentonite clay for waste water defluoridation, and on the other hand, the identification of the mechanism involved in the fluoride adsorption process. The compositional, structural and textural characteristics of the natural bentonite clay were determined using accurate physicochemical and mineralogical characterizations. The contents of fluoride ions in wastewater were determined by the potentiometric method with a fluoride-specific ion electrode connected to a digital ion analyzer. Batch adsorption experiments were conducted at room temperature to optimize various operational parameters such as contact time, initial fluoride concentration, adsorbent dose and initial pH solution. It was observed that 30 min of contact time between the adsorbent and aqueous solution containing fluoride ions was sufficient for attaining equilibrium. The maximum wastewater defluoridation (52.2%) was obtained under acidic conditions (pH=2), and for 5 mg L^{-1} and 2 g L^{-1} of initial fluoride concentration and adsorbent dose, respectively. The experimental data followed pseudo-second-order and fitted well into Freundlich adsorption, indicating multilayer adsorption with heterogeneous energetic distribution of active sites and with interaction between adsorbed molecules.

Recent Publications

1. Bhatnagar A, Kumar E and Sillanpaa M(2011), Chemical Engineering Journal 171:811-840.
2. Vinati A, Mahanty B and Behera S K (2015) Applied Clay Science 114:340-348.
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Biography

Jihane Assaoui is a PhD candidate at Chouaïb Doukkali University (El Jadida, Morocco) and Graduate Scholar supported by the Ministry of Higher Education, Scientific Research and Professional Training (Enssup). Her research focuses on the treatment and purification of waste water by adsorption on synthetic and especially natural materials that are recently considered as ecological solutions whose importance seems to increase with the awareness of environmental protection. She completed her Master of Science degree in Analytical Chemistry, and a Bachelor of Physicochemical Analysis Methods from Chouaïb Doukkali University. She presented her research in many countries including France and Morocco.

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Marine Litter On The Beaches Of Durres And Lalzi Bays: A Preliminary Assessment Of Their Abundance, Composition And Sources

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Marine litter is a global concern, affecting all oceans and seas of the world. Every year, millions and millions of tonnes of litter end up in the coastal and marine environment worldwide, resulting in environmental, economic, health and safety impacts. The Durres county has a coastline of some 62 km along the Adriatic Sea, extending from Lalzi Bay till the area of Golem. The abundance, composition and sources of marine litter were determined on beaches in the eight sites located at the Bay of Durres and in two sites located in the protected area of the Lalzi Bay. All surveys performed followed the approach described by the EU MSFD TG10 "Guidance on Monitoring of Marine Litter in European Seas". A total of 3326 marine litter items was recorded, removed and classified during April 2018. 10 beach transects were surveyed, covering 24000 m2 and extending over 1000 m of coastline. The average beach litter density of 0.1365 items/m2 (average: 136 items/100m; range: 40-295 items/100m) was found within this study for the Durres Bay and the Lalzi Bay. The beaches investigated varied in terms of human-induced pressures, with their majority classified either as urban, semi-urban or semi-rural. The majority of marine litter items were artificial polymer materials accounting for 64.8% of all beach litter. The most abundant item was G208 (Glass or ceramic fragments >2.5cm) with 19.7%, followed by G27 (Cigarette butts and filters) with 17.9%. Litter from shoreline sources including poor waste management practices, tourism and recreational activities accounted for 64.5% of total litter items collected on all sites, while fly-tipping accounted for 20.8%of total litter items. When looking at the sea-based sources of litter (fisheries and aquaculture, shipping) these accounted for 0.8% of total litter items on all beach locations. The beach cleanliness of the surveyed locations was assessed through the Clean Coast Index.

Recent Publications

1. Gagan Matta and LauraGjyli (2016). Mercury, lead and arsenic: impact on environment and human health, Journal of Chemical and Pharmaceutical Sciences, JCPS Volume 9 Issue 2; 718-725; ISSN: Print 0974-2115, Online 2349-8552; Scopus index journal, International Scientific Indexing (ISI) and Impact factor 1.421;www.jchps.com
2. JerinaKolitari, Laura Gjyli, Pierluigi Carbonara (2016). Preliminary results and impact of marine litter in Albanian Adriatic area, Journal of Environmental Protection and Ecology (JEPE), 17, No 3, 922–931, ISSN 1311-5065, Scopus and Thomson Reuter index journal; Journal Impact Factor (2015) = 0.734; http://www.jepe-journal.info/
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Biography

Laura GJYLI obtained her PhD at the age of 33 years from the University of Tirana in the field of biotechnology, contributing to the identification of the presence of cyanobacterial species, for the first time in Albanian marine waters, based on the PCR amplification of 16-23S ribosomal DNA sequences. She is elected by the academic staff in the position of the Head of Department of Medicine, a position she held during the period 31.05.2016- 12.09.2017. Currently she is a lecturer in the Department of Applied and Natural Sciences, University "Aleksander Moisiu", Durres. Dr. Gjyli is the first author and co-author of more than 15 researcharticles published in international journals, she has referred in more than 20 international conferences andshe is the coordinator and creator of the student conference in biomedical fields. She is part of theeditorial board of the "International Journal for Environmental Rehabilitation andConservation".

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The "Circular Economy" for the Conversion and Incorporation of Residues of Edible Oils in the Composition of "Biodiesel" Fuel for Public Transport to Reduce Environmental Pollution in Chile

Tomas Gabriel BAS and **Lukas LEDEZMA.**
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Oil is a non-renewable energy, limited and whose costs related to refining are very high. It is extremely polluting and its use is completely linear, producing millions of tons of pollutants daily in the environment. On the other hand are the edible oils that end up contaminating underground layers and watercourses (one liter of edible oil, pollutes up to 40,000 liters of water, which is the equivalent of one person's annual water consumption (Gonzalez & Gonzalez, 2015). The circular economy is mainly based on being restorative and regenerative from its thinking and design, which has as its ultimate goal to maximize the efficiency of resources and minimize the production of waste in the framework of economic sustainability and social (Hu et al. 2011).Many authors analyze the problem of linear versus circular economies and the pollution with different perspectives. Jeon et al. (2009), display that in recent decades, there have been searches for methods and products that can replace the use of oil as a source of energy less polluting. Demshemino et al. (2013), look the biodiesel like an alternative fuel that is obtained from renewable resources that are burned in diesel engine with less environmental contaminants.Talebian-Kiakalaieh et al. (2013) analyze that used cooking oil could help reduce the cost of biodiesel production by 60-90%. Biodiesel could reduce the emission of unburned hydrocarbons (68%), carbon monoxide (44%), and sulfur oxide (100%). Alcantara et al. (2000) and Lam et al. (2011), reflect that from 2007 to 2010 the use of biodiesel represented a participation of more than 80% in transport in the total consumption of biofuels and 30.26% in the total consumption of fuels for road transport. More than 80% of the cooking oils used are produced in households, and the cost of their elimination they are enormous, among them is the elimination of used oil and the high cost of treatment of the water polluted. In Chile, according to the Decreto Supremo 11/08 of the Ministry of Economy of Chile, Biodiesel may only be mixed with diesel oil in 2% (class B2) or 5% (class B5). Circular No 30 of May 16, 2007 from Tax and Service of Chile exempt to bioethanol and biodiesel of the tax payment specific that affects gasoline and diesel. These are indications that the circular economy can be a tool that helps fight the pollution caused by oil and edible oils.

Biography

Tomas Gabriel BAS has completed his PhD from University of Quebec at Montreal (Canada) and postdoctoral studies from the same University. He is the director of MBA at Universidad Catolica del Norte (Coquimbo) Chile. He was the founder director of the Institute of Innovation based on Science and Director of Masters in Technology Management University of Talca (Chile). Manager founder and editor of the scientific journal (SciELO) "Journal of Technology Management & Innovation" (www.jotmi.org).. He has published more than 40 papers in reputed journals and 50 conferences.

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Notes:

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Household low temperature MS2 (ATCC15597-B1) virus and *E.coli* (ATCC 15597-B1) inactivation using a hot bubble column evaporator (HBCE)

A Garrido and **R M Pashley**
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The MS2 (ATCC15597-B1) virus and *E. coli* (ATCC 15597) were used as a surrogate to estimate the inactivation rates for enteric viruses and bacteria when using a hot bubble column evaporator (HBCE) system in the treatment of household wastewater. In this study, we have combined the use of 6 different gases (CO_2, N_2, O_2, Ar, air and combustion gas) with thermal inactivation rates, using an improved double layer plaque assay technique, in order to assess the efficiency of the HBCE process for virus and bacterial removal in water. When bubbling a continuous flow of dry air at 200°C, it only heats the aqueous solution in the bubble column to about 50°C. Virus and bacteria are not inactivated by this solution temperature, as confirmed separately from water bath heating experiments. Hence, the efficiency of the HBCE process for virus and bacteria removal in water appeared to be caused entirely by collisions between the hot air bubbles and the organisms. This new energy efficient treatment for water reuse applications can reduce the thermal energy requirement to only 25% (about 113.7 kJ/L) of that required for boiling (about 450 kJ/L).

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Spatial orientation of land use activities along Buffalo River Estuary, a study in Buffalo City Metropolitan Municipality, Eastern Cape South Africa

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South Africa is one of the developing countries rich in estuary ecosystem. Previous studies have identified many impacts of land use activities on the pollution status of the estuaries. These land use activity and related practices are often blamed for the many pollution problems affecting the estuaries. For example, the estuarine ecosystems on a global scale are experiencing vast transformations from anthropogenic influences; Buffalo River Estuary is one of the influenced estuaries whereby the sources of pollution are unknown. These problems consequently lead to the degradation of the estuaries. The aim of the research was to establish the factors that have the potential to impact pollution status of Buffalo river estuary. Study focuses on Identifying and mapping land use activities along Buffalo River Estuary. Questionnaire survey, structured interviews, direct observation, GPS survey and ArcGIS mapping were the methods used for data collection in the area, and results were analyzed and presented by ANOVA and Microsoft Excel statistical methods. The results showed that harbour is the main source of pollution, in Buffalo River Estuary, through Ballast water discharge. Therefore that requires more concern on protecting and cleaning the estuary.

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A quantitative analysis of the extent of anthropogenic influence on ground water pollution in douala, cameroon

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Groundwater is the earth's most important water resource. About two billion people depend directly on aquifers for drinking water, and 40 percent of the world's food is produced by irrigated agriculture, mostly of groundwater. Groundwater pollution is a major issue because aquifers are inherently susceptible to contamination from anthropogenic impacts (Thirumalaivasan et al., 2003). Because groundwater pollution takes decades or to manifest, it is difficult and expensive to technically remediate an aquifer once it is polluted (Morris *et al.,* 2003). Douala, the most populated city in Cameroon depends heavily on groundwater for livelihood. Basic sanitation in this city has not been matched by rapid urbanization within the last 2 decades (Eneke *et al.,* 2011). Only 2.16% of the 3 million inhabitants access pipe-borne water (Guévart *et al.,* 2006), making groundwater all the more important in Douala. This study aimed at evaluating the susceptibility of groundwater in Douala to pollutants from anthropogenic sources, with specific objectives to:

- Identify potential anthropogenic sources of groundwater pollution in the study area.
- Determine the chemical and microbial quality of groundwater in the study area.
- Propose suitable measures to reduce anthropogenic sources of groundwater pollution.

Methodology:

- Survey to identify potential waste sources, being Dump sites, various workshops, industrial and domestic effluent spots.
- Sampling of 50 randomly selected wells for chemical and microbial analysis to determine the quality of the water.

The research shows that 80% of the city's inhabited area is contaminated. The first step in the prevention of further pollution of groundwater from anthropogenic sources is participatory sensitization of pollution prevention.

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Co-application of biochars and zeolite to reduce Cd and Pb leaching to drinking water

A Fatemi[1], **S Zarei**[1] and **M Safaei Khorram**[2]

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Co-application of two biochar types and natural zeolite was investigated to reduce cadmium (Cd) and lead (Pb) leaching from downhill of municipal waste disposal soils. The study region is located above Sarab Ghanbar, one of the most important water resources in Kermanshah city, Iran. The biochars (BCs) were produced from apple tree wood chips (BC1 at 700°C) and sawdust (BC2, 400°C) through slow pyrolysis. Total Cd and Pb amounts were 8 and 141 mg kg^{-1} and 27 and 63 mg kg^{-1} for soil 1 and 2, respectively. According to National Standards of Iran, soil samples were Cd-polluted (total Cd>5 mg kg-1) while not Pb-polluted (total Pb<75 mg kg^{-1}). Therefore, soil 1 was polluted by Pb (500 mg kg^{-1} of soil) as Pb $(NO_3)_2$ as an extremely polluted condition of a soil with both pollutants. The results showed different amounts (i.e. 10% or 20% BCs) and different treatments reduced significantly (Tukey's HSD P<0.001) the leached Cd and Pb concentrations in comparison with untreated soils. For Cd, there were also significant differences between soils (P<0.001) as well as the interaction effect of soil × treatments was significant (P<0.001). For Pb, there was also significant difference between soils (P<0.01). However, the interaction effect of soil × treatments was not significant. Treatments with BCs addition resulted in significant change in Cd and Pb leaching. However, for Cd, 20% BCs and co-application of zeolite and biochars (10% zeolite + 10% BCs) were similar. This study revealed that application of 20% BCs is more efficient than zeolite applications whether solely or co-application with BCs to reduce Cd leaching from Cd-Pb-polluted soils to drinking water resource. Although, Pb concentration was significantly reduced by addition of 20% zeolite, there were no significant differences between 20% BCs and 10% zeolite + 10% BCs with 10% BC1.

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Impacts of oil spill hazards on vulnerable communities: a strategic framework to empower affected population

A Fatemi, S Zarei and M Safaei Khorram

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Statement of the problem: Our climate continues to change due to human induce activities such as: burning of fossil fuels, that is, Sulfur-dioxide emission from the combustion of fossil fuels like coal and petroleum products, pollutions from airplanes, trains and trucks. Hence, these issues of pollution have taken different growing trend as population and technology grows. However, climate change, climate control issues and environmental pollution awareness cannot be over emphasised rather strategic solutions and alternative livelihood support mechanisms needs to be discovered specifically for those suffering from any form of disasters, environmental pollution and damages to sources of livelihood. This study investigates the environmental pollution induced by oil spill hazards from petroleum activities on socio-economic and socio-cultural conditions, relating this to climatic change effect on agricultural activities and creating an alternative livelihood support structures for affected communities in the developing countries. This case study employed twenty key Individual Community Interviews, six environmental expertise representatives from the oil and gas sectors, six representatives from oil spill related agency to find out the various impacts, existing supportive strategies and solutions to the problems, as a means to reduce post environmental impacts on vulnerable populace. This study will propose an alternative scheme to empower communities affected by oil spill hazards and livelihood destructions.

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Optimization and degradation of chloroxylenol by free and immobilized *Klebsiella pneumoniae* D2

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Two samples from phenol contaminated soil and waste water were collected for the isolation of bacteria degrading chloroxylenol. Out of eleven isolates, isolate D2 was the most promising showing a degradation efficiency of 19.9%. The selected isolate was identified using 16S rDNA analysis as *Klebsiella pneumoniae* D2. Statistical designs were applied to optimize the medium composition and cultural conditions in favor of increasing the degradation efficiency of *K. pneumoniae* D2. The Plackett-Burman design was applied to determine the significant factors affecting chloroxylenol degradation. The degradation efficiency increased to 30.56%. Box-Behnken design was adopted to further investigate the mutual interactions between the variables and to identify their optimal values that would generate maximum chloroxylenol degradation. Under the optimized medium composition and culture conditions, *K. pneumoniae* D2 degraded 55.7% chloroxylenol after 24 hrs. Bacterial cells were adsorbed on different solid supports. The results showed that the degradation efficiency increased up to 88.3% on using 20 cubes of polyurethane foam. The degradation efficiency decreased by 10% on reusing adsorbed cells of *K. pneumoniae* D2 on polyurethane foam, upto 10 cycles. Immobilization accelerated the degradation. The time was reduced to nine hours reaching a degradation of 88.3% compared to free cells.

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The industrial use of microalgae for wastewater treatment and mitigation of environment degradation

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The industrial use of microalgae for wastewater purification based on their mixotrophic growth is alternative important approaches as microalgae has higher stability, which enables their application in more concentrated and toxic environment, with a higher purification level compared with activated sludge. In our experiment the separate use *Chlorella* microalgae for purification wastewater of phenylalanine manufacturing with high quantity of phenol was the sole decision for biological cleaning as activated sludge cannot help in such case. Generation of the symbiosis between bacteria of activated sludge and microalgae in wastewater treatment plant (WTP) aeration oxidation ponds must be also a general way of improving wastewater cleaning, as microalgae is also a cost effective flocculent, which allows the silts to settle more quickly, accumulates heavy metals, etc. On the development technology for Yerevan chemical reagents and vitamin plants industrial WTP, we recommended two phase biological purification: first phase by the use *Chlorella* with commercial production of biomass (only using of activated sludge was no sustainable due high concentration of organic components) and at second phase – transfer centrate with rest amount of microalgae cells to aero thanks with activated sludge aimed to formation bacteria-microalgae consortium. We offer also the addition of microalgae biomass in tailings ponds of Canadian oil sands operators aimed at the improvement of the microbial balance for the water speedily cleaning, recycling and reusing from arsenic, cyanide, naphthenic acids, mercury, sulphuric acid, carcinogenic polycyclic aromatic hydrocarbons with mitigation of GHG emission, etc. For this objective the use of microalgae biomass may be in the following variants: the use accounted volume of non-separated microalgae suspension produced by the use of food scraps, the centrate to inject into the tailing ponds for creating the microalgae-bacteria symbiosis.

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Top-down estimation of emissions from open waste burning in Nepal

Bhupendra Das[1, 2], **Prakash V Bhave**[2] and **Rejina Maskey Byanju**[1]

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[2]International Centre for Integrated Mountain Development, Nepal

Haphazard, open burning of municipal solid waste (MSW) is one of the most toxic sources of air pollution and is of growing concern in cities across South Asia. Recently, it was implicated as a major cause for soiling the Taj Mahal and impairing the health for Agra residents. Whereas a bottom-up approach for MSW burning estimation was successful in Delhi and Agra, similar methods have proven challenging in Nepal for a variety of reasons. Although the robust estimates of the MSW generation rate in Nepal have been documented by various studies, yet emission estimates from MSW burning remain highly uncertain. In this study, we attempt to calculate a top-down estimate of MSW burning in Nepal by obtaining best estimates for the amounts of MSW that are recycled, landfilled, and dumped illegally, and then calculating the burned MSW mass by difference. After multiplying the derived MSW burning rate by emission factors obtained from local (Nepal ambient monitoring and source testing experiment), regional and global, we obtain the most robust estimates of national emissions from MSW open burning for the base year 2011 and projected its emissions between 2005 and 2016. Substantial emissions of PM2.5 (6.3 Gg), CO (71.8 Gg), NMVOC (12.7 Gg), PM_{10} (6.8 Gg), CH_4 (3.4 Gg), BC (2.8 Gg), OC (65.5 Gg), NO_2 (0.9 Gg), NO (1.3 Gg), SO_2 (0.4 Gg), CO_2 (1358 Gg), and NH_3 (0.6 Gg) are estimated from this unregulated sector during the 2011 calendar year. Open burning of MSW especially during the winter months when the mixing height is lowest could lead to acute and chronic respiratory disease, burning eyes, headaches, nausea, fatigue, dizziness and an allergic hypersensitivity if the dose is high enough.

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Benthic communities as bio-indicators of organic and inorganic pollution in marine environment; case study of Tudor Creek, Mombasa County, Kenya

Wanjohi C[1], **Muthumbi W N A**[1], **Gichuki N**[1] and **Okuku E**[2]

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Benthic organisms (macrofauna and meiofauna) are vulnerable to pollution in marine ecosystems due to their prolonged exposure hence efficient bio-indicator of heavy metals and organic contamination. This study focused on Tudor Creek (polluted) and Mida Creek (unpolluted) as the control site. The main objective was to assess uses of benthic communities as bio indicators of marine pollution by determining their density, composition and distribution. Sampling was done during dry season (February) and wet season (May) by systematically laying two transects of 45 m in each site with four stations per transect at 0 m, 15 m, 30 m and 45 m intervals. Densities and diversity indices were calculated using past software. ANOVA was used to assess whether the differences in density and diversity of the meiofauna and macrofauna among the sampling sites and periods were significant. MANOVA was used to assess the density and diversity variability with environmental variables. MDS (multidimensional scaling) on community analysis was done on PRIMER software. There was a large difference in the assemblage composition, density and diversity of both macrofauna and meiofauna between the polluted and unpolluted sites as well as environmental parameters. Nematodes dominated in both sites indicating that they are pollution tolerant unlike copepods which were less in diversity and density in the polluted site. Communities in Mida Creek clustered together showing great similarity unlike in Tudor Creek.

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Benthic Communities As Bio-Indicators Of Organic And Inorganic Pollution In Marine Environment; Case Study Of Tudor Creek, Mombasa County, Kenya

Wanjohi C*.[1], Muthumbi W.N.A[1]. Gichuki N.[1], Okuku E.[2]

[1,2]School of Biological Sciences, University of Nairobi, Kenya

Benthic organisms (macrofauna and meiofauna) are vulnerable to pollution in marine ecosystems due to their prolonged exposure hence efficient bio-indicator of heavy metals and organic contamination. This study focused on Tudor creek(polluted) and Mida Creek (unpolluted) as the control site. The main objective was to assess uses of benthic communities as bio indicators of marine pollution by determining their density, composition and distribution. Sampling was done during dry season (February) and wet season (May) by systematically laying two transects of 45m in each site with four stations per transect at 0m, 15m, 30m and 45m intervals. Densities and diversity indices were calculated using past software. ANOVA was used to assess whether the differences in density and diversity of the meiofauna and macrofauna among the sampling sites and periods were significant. MANOVA was used to assess the density and diversity variability with environmental variables. MDS (Multidimensional scaling) on community analysis was done on PRIMER software (Clarke & Gorley 2001). The was a large difference in the assemblage composition, density and diversity of both macrofaunal and meifauna between the polluted and unpolluted sited as well as environmental parameters. Nematodes dominated in both sites indicating that they are pollution tolerant unlike copepods which were less in diversity and density in the polluted site. Communities in Mida creek clustered together showing great similarity unlike in Tudor creek.

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Hydrothermal liquefaction of waste activated sludge to bio-oil using a continuous flow reactor

Chunbao Charles Xu, Laleh Nazari, Zhongshun Yuan and **Madhumita B Ray**
University of Western Ontario, Canada

This work presents experimental and Aspen simulation results on hydrothermal liquefaction (HTL) of waste activated sludge (WAS) and co-feed of WAS and a woody biomass (rubber wood sawdust) in water-ethanol solvent (containing up to 30 wt% ethanol) in a continuous flow reactor. The continuous flow process with the (0.15:1, w/w) wood and sludge mixture at 310, 10 min hydraulic retention time and 12 wt% substrate concentration, produced a yield of 32 wt% bio-oil (dry ash-free basis). Comparison of the oil yields in the continuous flow reactor with those from a batch reactor showed a slight decrease in the yields. The HTL in water-ethanol mixed solvent led to a higher yield of bio-oil with a lower molecular weight, compared to the oil produced in water alone. HTL bio-oil from WAS had high percentages of alcohols, amine and esters. The oil from (WAS + wood) were found to be rich in phenols, attributed to the degraded lignin in the woody biomass. Thermal gravimetric analysis of bio-oils showed higher volatile matters (VM) content (approx. 90 wt%) from WAS than that from the co-feed of (WAS + wood) (VM content of approx. 78 wt%). Energy and mass balance calculations for the HTL process were performed using Aspen Plus software and the experimental results. Based on the simulation results, the energy requirements of the HTL process using co-feed of sludge and wood is slightly lower than that of the HTL of WAS alone. The energy demand of an HTL process could be partly compensated by utilizing the HTL by-products (e.g., char or solid residue).

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Rapid removal of phosphates, nitrates, lead, and cadmium from wastewater using fast pyrolysis biochar

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Magnetic biochar was prepared by magnetite (Fe_3O_4) precipitation onto the biochar's surface from an aqueous Fe^{3+}/Fe^{2+} solution upon NaOH treatment. The resulting magnetic and raw biochar was used to remove phosphates, nitrates, lead, and cadmium from water. The surface chemistry and composition of the biochars were examined by TEM, SEM, SEM-EDX, XPS, XRD, PZC, elemental analysis, and surface area measurements. Batch sorption studies were carried out from pH 2 to 10 using different adsorbate concentrations at 25, 35 and 45°C. Magnetic biochar was suspensions in the contaminated solutions were vortexed for two min and then magnetically removed. Remediated solutions were then analyzed using UV-Visible spectroscopy and AAS. Sorption studies were carried out at 25, 35 and 45°C was evaluated using the Langmuir, Freundlich, Sips, Redlich–Peterson, and Toth adsorption isotherm models. The fast adsorption kinetics and high adsorption capacities of biochar could be advantageously employed in filtration devices, columns, or as shown here, in batch operations with stirring to speed adsorption, followed by magnetic separation of the adsorbent for regeneration.

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Destabilization potential of Fe^{3+} and Al^{3+} chloride salts and af-PFCl of $Mg(OH)_2$ during the treatment of AMD

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The treated acid mine drainage (AMD) was collected from the western decant in Krugersdorp, South Africa and was investigated in a series of small-scale laboratory tests using 200 mL of AMD dosed with $FeCl_3$, $AlCl_3$ and a synthetic acid free (af) flocculent prepared by a mixture of $FeCl_3$ and $Mg(OH)_2$ (af-$PFCl_{Mg}$) respectively, the latter being to reduce the negative effect of the reagents ($FeCl_3$ and $Mg(OH)_2$) when dosed in pure form. Three treatment methods were employed such as a jar test, no mixing and a shaker. The speed of the equipment used for mixing and shaking was at 250 rpm for 2 mins and allowed to settle for 1 hour after which the pH, conductivity and turbidity were measured. The experimental results show that turbidity removal in the samples with $AlCl_3$ and a synthetic af-$PFCl_{Mg}$ is similarly identical but slightly higher than that of the samples with $FeCl_3$. The results showed that conductivity has an impact on the rate of hydrolysis. Comparative turbidity removal of the AMD sample between $AlCl_3$, $FeCl_3$ and af-PFCl indicates that the latter is an ideal replacement of a corrosive $FeCl_3$ and Alzheimer-associated $AlCl_3$. On the other hand, the optimal turbidity removal of the samples without mixing shows that destabilization-hydrolysis depends on the valence and electronegativity of the metal ions, which also indicates the insignificant effect of the pH adjustment. The SEM images show that the sludge in the samples with af-PFClMg dosage consists of a large cake-like structure, which is typical of optimal adsorption. The formation of the precipitates was found to be influenced by the ionic strength of the metal ion rather than by the pH of the solution.

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Synthetic waste water treatment by selected consortia of photosynthetic microorganisms alone or in co-culture with selected consortia of ammonia oxidizing and/or denitrifying microorganisms

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The biological treatment of different types of waste water involves the interaction of different types of microorganisms. In the last decade it has been a huge increase in: the use of photosynthetic microorganisms to treat domestic waste waters as well as; the use of activated sludge with improved specific activities (ammonia oxidation, denitrification etc.). In this paper are presented our results concerning the use of different selected populations of photosynthetic, ammonia oxidizing- and denitrifying microorganisms to clean synthetic waste waters. The untreated and biologically treated synthetic waste water were analyzed with respect to nitrate, nitrite, ammonia, orthophosphate, total nitrogen, total organic carbon, total inorganic carbon and total suspended solids. Microbiota was analyzed with respect to specific intracellular inclusions (polyphosphate, lipids droplets and polyhydroxybutyrate), extracellular transparent particles as well as the ratio between live cells and dead cells. The results obtained at laboratory level on synthetic waste water sustain the strong potential of using co-cultures of selected microorganisms for waste water treatment, being in general agreement with results already reported in the literature.

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Pathogenic *Escherichia coli* strains recovered from selected aquatic resources in the Eastern Cape, South Africa and its significance to public health

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The prevalence of pathogenic microorganisms as well as the proliferation of antimicrobial resistance is significant to public health, but the magnitude of impact of aquatic environs concerning the advent and propagation of resistance genes remains vague. *Escherichia coli* are widespread and encompass variety of strains ranging from non-pathogenic to highly pathogenic. This study reports on the incidence and antibiotic susceptibility profiles of *E. coli* strains recovered from the Nahoon beach and its canal waters in South Africa. A total of 73 out of 107 (68.2%) PCR-confirmed *E. coli* isolates were affirmative for at least one virulence factor these comprised enteropathogenic *E. coli* 11 (10.3%), enteroinvasive *E. coli* 14 (13.1%) and neonatal meningitis *E. coli* 48 (44.9%). The phenotypic antibiogram profiles of the confirmed isolates revealed that all 73 (100%) were resistant to ampicillin, whereas 67 (91.8%) of the pathotypes were resistant to amikacin, gentamicin and ceftazidime. About 61 (83.6%) and 51 (69.9%) were resistant to tetracycline and ciprofloxacin respectively. About 21.9% (16) demonstrated multiple antibiotic resistances with 100% exhibiting resistance to eight antibiotics. We conclude that the Nahoon beach and the canal waters are reservoirs of potentially virulent and antibiotic resistant *E. coli* strains thus, constitute a public health risk.

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Effect of organic amendments on phosphorus sorption isotherm in some calcareous fertilized soils

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In order to enhance crop production in arid and semi-arid regions, high amount of phosphorous (P) fertilizer and organic amendments (OAs) together are added to soils. Addition of OAs to P fertilized soil may alter P sorption and availability in soil. The high P concentration in soil solution can increase movement of P from soils to surface water increasing eutrophication of water. In order to study the effect of OAs with different ranges of total P and C/P ratios, Phosphorus sorption isotherm was investigated in five P fertilized calcareous soils treated with four types of OAs (vermicompost, grape waste, poultry and sheep manure) at rate of 20 g kg^{-1} for one month. Isotherm experiment in control (not treated) and treated soils were carried out by concentrations of P range from 0 to 200 mg l^{-1} in the presence of 10 mm $CaCl_2$. Sorption isotherms were characterized using Freundlich, linear and Langmuir equations. The grape waste had the highest (350) and vermicompost the lowest (15) C:P ratio. Average concentration of available P in control and treated soil with vermicompost, grape waste, poultry and sheep manure was 25.9, 628.4, 495.0, 553.3 and 577.1 mg kg^{-1}, respectively. Phosphorus sorption curves were well fitted to the Freundlich equation. Kf and an average values were in the following order: control > grape waste > poultry manure > vermicompost > sheep manure. The SPR (standard P requirement) average of control and treated soil with vermicompost, grape waste, poultry and sheep manure was, 121.3, 11.0, 14.5, 12.8 and 9.3 mg kg^{-1}, respectively. There was positive correlation between SPR with CEC and ECC percent of treated soils. Our study indicated that OAs with low C:P ratio and high total P had an important role in the sorption of P in calcareous soils.

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Molecular characterization of extended spectrum beta-lactamase producing *Escherichia coli* O157:H7 from three selected rivers in Osun State, Nigeria

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Escherichia coli O157:H7 is a known pathogenic microorganism associated with contaminated water and food. The pathogen is implicated in diseases with severe morbidity and increasing death rate and resistant of the bacteria to antibiotics such as cephalosporins have complicated health interventions. Water samples from three selected rivers were investigated as a potential reservoir for extended spectrum beta lactamase (ESBL) - producing *E. coli* O157:H7 using phenotypic (culture-based) and molecular methods. Antibiotic susceptibility was determined using Kirk Bauer double disc method. Double disc synergy test was determined between a disc of amoxicillin-clavulanate (20µg/10µg) (Augmentin) and a 30-µg disc of each third generation cephalosporin antibiotic. ESBL positive isolates were then subjected to specific Polymerase Chain Reaction (PCR). A total of 65 isolates were confirmed as *E. coli* O157: H7. Among these, 98% were resistant to cefixime, ofloxacin (93%), cefuroxime (87%), augmentin (86%), cefotaxime (80%) and ciprofloxacin (43%). Of the 64 isolates resistant to third generation cephalosporins, 58 were ESBL positive phenotypically while, but at least 2 genes coexisted in 6 of the isolates. Of the 52 isolates with confirmed ESBL genes, ESBL type *bla*SHV was found to be dominant (40%), *bla*TEM 36% and *bla*CTX 3%. The rivers sampled were identified to harbour resistant *E. coli* O157:H7 and therefore, strategies should be employed to reduce the dissemination of ESBL producing bacteria in the aquatic sources which may threaten human life, animal and surrounding environment.

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Quantifying the impacts of built environment and surface properties on temperature extremes

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Urbanization has created an increase in urban heat island (UHI) effect. UHI reflects an elevated temperature in cities as compared with nearby rural areas which is due to the change in landscape from grass covered and vegetative to concrete and asphalt with three-dimensional structures. Our on-site study revealed that mixed environments (grass, water, and concrete) result in different temperature profiles within specific ranges. Grass shows the coolest environment, water is the most temperate, and concrete has the highest peak temperatures during the day for the duration of the study. To further understand temperature extremes at fine temporal and spatial scales in complex urban settings and to minimize the thermal impact of structures on the surrounding environment, we plan on quantifying the impacts of built environment and surface properties on surrounding temperature through three specific tasks: 1) downscaling satellite infrared radiation brightness temperatures to identify hot spots within urban environments and introduction of a localized offset table concept to quantify the impact of various surface type on thermal anomalies, 2) understanding the behavior of common surface materials in the built environment in interaction with solar radiation and quantification of the vertical association between skin temperature and near surface air temperature for thermal mapping within urban microclimates, and 3) development of a conceptual framework for assessing environmental risk and vulnerability to temperature extremes by modeling the near surface air temperature profile of complex urban systems based on land surface properties and field measured data.

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Assessment of the effects of physical disturbances in simple micro-universes by measurement of DOC-levels

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An increasing problem with today's way of living is the rising of anthropologically influenced pollutions. Quite recently has research been directed towards the effects and consequences these disturbances may cause within freshwater environments, which has inspired this study. Hoping to assess the effects of different disturbances that are likely to occur in lakes, DOC-levels (dissolved organic carbon) were measured to get an idea of what might happen to the microbial ecology when these are introduced. The research was conducted by introducing a heavy reduction of bacteria, microplastics, SDS (sodium dodecyl sulfate) and microplastics and SDS together to enclosed environments. The purpose of this, and also the aim of this study is to find out of DOC-levels were affected, if a difference could be observed between exposure to microplastics +SDS versus microplastics and SDS alone, and to assess the recovery after each disturbance. Following exposure DOC-levels remained generally unchanged in the reduced bacteria and microplastics mesocosms, whereas these levels were heavily reduced after exposure to SDS. It was also found that SDS+ microplastics required a shorter exposure time before mortality was observed than SDS alone, and resulted in a much higher mortality rate than microplastics alone.

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Spatial orientation of land use activities along Buffalo River estuary, a study in Buffalo City Metropolitan Municipality, Eastern Cape, South Africa

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South Africa is one of the developing countries rich in estuary ecosystems. Previous studies have identified many impacts of land use activities on the pollution status of the estuaries. These land use activity and related practices are often blamed for many pollution problems affecting the estuaries. For example, the estuarine ecosystems on a global scale are experiencing vast transformations from anthropogenic influences; Buffalo River estuary is one of the influenced estuaries whereby the sources of pollution are unknown. These problems consequently lead to the degradation of the estuaries. The aim of the research was to establish the factors that have the potential to impact pollution status of Buffalo River estuary. Study focuses on identifying and mapping land use activities along Buffalo River estuary. Questionnaire survey, structured interviews, direct observation, GPS survey and ArcGIS mapping were the methods used for data collection in the area, and results were analyzed and presented by ANOVA and Microsoft Excel statistical methods. The results showed that harbour is the main source of pollution, in Buffalo River estuary, through ballast water discharge. Therefore that requires more concern on protecting and cleaning the estuary.

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A post treatment method for municipal wastewater treatment by the microalgae: A current review

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Owing to the rapid urbanization and expansion of urban populations, the municipal wastewater has generated in large volume. Wastewater from municipal wastewater treatment plants contains excessive inorganic nutrient such as nitrogen and phosphorus which contribute detrimental eutrophication in natural water bodies. Eutrophication is a severe ecological problem which may lead to long term adverse effects of the natural environment. Therefore, it is necessary to establish a post treatment method for municipal wastewater treatment before being discharged into natural water bodies. Various types of treatment methods have been used for the removal of inorganic nutrient (nitrogen and phosphorus) from municipal wastewater. Microalgae play a vital role in the post treatment of municipal wastewater considering economically viable and environmentally friendly. Treatment of wastewater using microalgae has been studied extensively and gained attention a positive result due to nutrient removal efficiency. The present literature review will provide helpful information the application of potential microalgae in post treatment of municipal wastewater treatment effectively, before discharged into natural water bodies. Future research should address the inorganic nutrient removal performance based on various species of microalgae, nutrient uptake capacity and microalgae culture mechanism.

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Spatial temporal analysis of groundwater quality: A case study of Islamabad

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Islamabad is a planned city of Pakistan. Over the years, due to economic growth it has been a hub for immigrants. Apart from Rawal and Simly Lakes, most of the city's water supply demand is met by the groundwater resources. However, urbanization and industrialization has brought these groundwater resources under high risks of contamination. This study assesses the groundwater pollution risk in Islamabad. The study demonstrated that GIS technology is an efficient environment for analyses of spatial data. The combined use of DRASTIC model and GIS was adopted to provide a spatial assessment of groundwater quality. Seven thematic maps of the DRASTIC model were developed in order to assess the vulnerability of groundwater to contamination and these include the depth to water table, recharge, aquifer media, soil media, topography, impact of vadose zone and hydraulic conductivity. The GIS software (ArcGIS) was used to create an integrated vulnerability map of Islamabad to demarcate vulnerable zones. Temporal monitoring of land cover areas were derived from classified land-cover maps. This was done to describe the relative degree of natural protection of the groundwater from contamination due to the physical characteristics of the land and subsurface. Most of the area of Islamabad lies within the moderate vulnerability which means that the increase in vulnerability from 2003 to 2010 has been from 5% to 8.5%. These results indicate that reforms are required by the government to protect this groundwater asset. Reforming these policies requires governments to implement far-reaching institutional change and promote technical innovation.

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Microbial diversity and physico-chemical attributes of glacier-fed Lake Satopanth, Garhwal Himalaya

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Satopanth Lake is a glacier-fed lake located in the Garhwal Himalaya of Uttarakhand at an altitude of 4,600 m a.s.l. in the midst of snow-capped peaks. The lake has religious significance to the native residents of Mana village, which is the last border village of India. The residents of this village immerse the ashes of their dead ones in this lake. The water of this lake is the only source of drinking water for the trekkers, sages, local inhabitants and wild life. Hence, it is the must to assess the water quality of this lake. A limited number of physico-chemical characteristics along with the microbial diversity (bacteria, actinomycetes and fungi) were recorded during the year 2014 and 2015 in the ice free period, as the lake was accessible only for a limited time span. The mean value of water temperature of the Satopanth Lake ranged from 0.1 to 0.3. The mean value of hydrogen ion concentration (pH) was recorded minimum (6.85) to a maximum (7.10). The mean value of dissolved oxygen concentration ranged from 5.0 mg. l^{-1} to 6.0 mg. l^{-1}. The mean value of total dissolved solids (TDS) ranged from 88.0 mg. l^{-1} to 89.5 mg. l^{-1}. However, the mean value of free carbon dioxide ranged from 8.40 mg. l^{-1} to 8.60 mg. l^{-1}. No faecal and total coliform has been found in the water sample of Satopanth Lake. A total of six species of bacteria, four species of actinomycetes and five species of fungi were isolated from the lake. The α-diversity of microbes in Satopanth Lake was found to be fifteen during the study period.

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Chronic exposure to low environmental concentrations and legal aquaculture doses of antibiotics cause systemic adverse effects in Nile tilapia (*Oreochromis niloticus*) and provoke differential human health risk

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Antibiotics used globally to treat human and animal diseases exist ubiquitously in the environment at low doses because of misuse, overdose and poor absorption after ingestion, coupled with their high-water solubility and degradation resistance. However, the systemic chronic effects of exposure to low environmental concentrations of antibiotics (LECAs) and legal aquaculture doses of antibiotics (LADAs) in fish and their human health risk are currently unknown. We investigated the *in vivo* chronic effects of exposure to LECAs and LADAs using oxytetracycline (OTC) and sulfamethoxazole (SMZ) in Nile tilapia, (*Oreochromis niloticus*) and their human health risk. Twenty *O. niloticus* weighing 27.73±0.81 g were exposed to water containing LECAs (OTC at 420 ng/L and SMZ at 260 ng/L) and diets supplemented with LADAs (OTC 80 mg/kg/day and SMZ 100 mg/kg/day) for twelve weeks. General physiological functions, metabolic activities, intestinal and hepatic health were systemically evaluated. The possible human health risks of the Nile tilapia fillets in adults and children were assessed by using risk quotient. After exposure, we observed retarded growth performance accompanied by reduced nutrients digestibility, feed efficiency, organ indices, and lipid body composition in treated fish. Antibiotics distorted intestinal morphological features subsequently induced microbiota dysbiosis and suppressed intestinal tight junction proteins. Exposure of fish to LECAs and LADAs induced oxidative stress, suppressed innate immunity, stimulated inflammatory and detoxification responses, concomitantly inhibited antioxidant capacity and caused lipid peroxidation in intestine and liver organs. Both LECAs and LADAs enhanced gluconeogenesis, inhibited lipogenesis and fatty acid beta oxidation in intestine and liver organs. The exposure of fish to LECAs and LADAs induced anaerobic glycolytic pathway and affected intestinal fat catabolism in intestine while halted aerobic glycolysis, increased hepatic fat catabolism, and induced DNA damage in liver. The hazard risk quotient in children for fish treated with OTCD was >1 indicating human health risk. Overall, both LECAs and LADAs impair general physiological functions, nutritional metabolism, and compromise fish immune system. Consumption of fish fed with legal OTC provokes health risk in children. Global stringent prohibition policy for use of antibiotics in aquaculture production and strategies to limit their release into the environment are urgently required to protect human health. .

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Novel chitosan derivatives for recovery of platinum and palladium from aqueous acidic solutions

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Platinum (Pt) and palladium (Pd) possess favorable physical and chemical properties for wide applications in many fields such as catalysts in industries, jewellery, fuel cells, and electronics. The market demand of Pt and Pd is increasing because of the natural reserves of these metals are limited and located in few regions of the world. Therefore, there is a great concern in recovery of Pt and Pd from secondary sources for sustainable use of these metals. Chitosan is a naturally occurring polymer which has been widely investigated by many researchers as a metal recovering agent. However, there are some limitations in the use of chitosan as a metal recovering agent including low acid stability and poor mechanical properties. In order to resolve these issues, three new chitosan derivatives were prepared in this work and employed for Pd (II) and Pt (IV) removal from acidic solution. The prepared derivatives are 1, 10-phenanthroline-2, 9-dicarbaldehyde cross-linked chitosan (Ch-PDC), [2, 2'-bipyridine]-5, 5'-dicarbaldehyde cross-linked chitosan (Ch-BPDC), and glutaraldehyde cross-linked chitosan followed by grafting with 8-hydroxyquinoline-2-carbaldehyde (Ch-GA-HQC). The adsorption was very fast and reaches equilibrium within 30 min. The adsorption better simulated by Langmuir isotherm compared to Freundlich isotherm. The maximum adsorption capacity of Pd (II) was found to be 262, 155 and 340 mg Pd/g of Ch-PDC, Ch-BPDC, Ch-GA-HQC, respectively. And, the maximum adsorption capacity of Pt (IV) was 114, 96 and 204 mg Pt/g of Ch-PDC, Ch-BPDC, Ch-GA-HQC, respectively. Compared to other adsorbents in literature, the adsorption capacity of the synthesized chitosan derivatives was relatively high. Therefore, these adsorbents are very promising for Pd (II) and Pt (IV) recovery from aqueous acidic solutions. Finally, the relevance of these adsorbents for Pd (II) adsorption in industrial setting was tested using palladium containing industrial wastewater.

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A core microbiome across six types of anaerobic digestion reactors aiming to extract biomethane out of organic wastes

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Microorganisms play a critical role in a biogas-producing system (BPS). Many BPSs have a microbiome consisting balanced proportions of archaea and bacteria. It has been reported that a BPS microbiome's functionality usually relied on its functional redundancy, particularly among the hydrolysers and fermenters. However, different conclusions have also been drawn based on single types of BPSs, especially from the ones under strong selective pressures, e.g. high temperature, high salinity, or recalcitrant substrates. The reasons behind remain unknown. A question that has long puzzled the academy is if functional redundancy always rules anaerobic digestion communities? Here we document a systematic study of the microbiome-functionality nexus based on 138 samples out of twenty well-profiled lab-scale BPSs in four major configurations running for up to two years. Pyrosequencing and qPCR were applied to support the microbial assembly analysis. Combined, these data sets comprise a total richness of 698 genera. Although various methanogens dominate different BPSs communities, it is striking to note a core bacterial microbiome prevailing in all BPS types, i.e. *Bacillus, Clostridium, Bacteroides, Eubacterium, Cytophaga, Anaerophaga and Syntrophomonas*. Their total relative abundance shows a correlation with the BPSs performance (R2=0.323±0.132, p=0.321±0.089) that is even comparable to the correlation between the performance and archaeal 16S ribosomal RNA genes (R2=0.332±0.181, p=0.021±0.023). Microbiome divergence appears on a large scale, expanding from different reactor configurations with the same mother seed to a millimetre level within a biofilm. The BPSs communities are neither functionally plastic nor functionally redundant. In other words, a high variety in communities usually exhibits a strong difference in performances.

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