Bulletin de veille du réseau d'écotoxicologie terrestre et aquatique N°48

Colette Bertrand, Christian Mougin, Annette Bérard, Céline Pelosi, Soizic Morin, Olivier Crouzet, Pascale Karmasyn-Veyrines

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Edito

Voici notre 48ème bulletin de veille, toujours riche en informations ! Nous initions avec ce bulletin une rubrique concernant les « plastiques » dans l'environnement.

Le séminaire trisannuel de notre réseau Ecotox s'est tenu en distanciel les lundi 16 et mardi 17 novembre. Plus d'une centaine de participants ont suivi les présentations et contribué aux discussions. Informations à venir (présentations…) sur la page dédiée de notre site ECOTOX :
https://www6.inrae.fr/ecotox/Manifestations/Seminaires-du-reseau/2020

Nous vous rappelons le lancement d'une Special Issue ECOTOX sans la revue Environmental Science and Pollution Research. Il est encore temps de nous contacter (celanim-ecotox@inrae.fr) si vous souhaitez soumettre un article, la date limite est fixée au 31 mars 2021.

Nous vous proposons dans ce bulletin une tribune présentant de nouveaux développements de la plateforme MOSAIC : MOSAIC - Analyse de données d'écotoxicité en ligne : quoi de neuf ?
Le texte est également disponible sous forme de fiche thématique en téléchargement sur notre site ECOTOX :
https://www6.inrae.fr/ecotox/Productions/Fiches-thematiques/Fiche-thematique-N-30-decembre-2020

N'oubliez pas de nous transmettre les informations que vous souhaitez diffuser, notamment vos publications que nous pourrions avoir oubliées.

L'équipe vous souhaite une bonne lecture de ce bulletin !

Contact : veille-ecotox@inrae.fr

SOMMAIRE

Tribune libre

MOSAIC - Analyse de données d'écotoxicité en ligne : quoi de neuf ?

L'écotoxicologie se doit aujourd'hui de diagnostiquer et prévoir efficacement les effets des substances chimiques sur les organismes vivants, notamment en tenant compte de situations d'exposition complexes (voies d'exposition, processus de biotransformation, effets cocktail, etc.). Parmi les outils supports, la modélisation apparaît en bonne place, depuis longtemps déjà avec les modèles dose-réponse (DR) pour déterminer les indicateurs de toxicité standard de type EC_x ou LC_x, ou plus récemment avec la montée en puissance des modèles toxicocinétiques-toxicodynamiques (TKTD) permettant d'inclure la dépendance au temps de l'exposition sur les traits d'histoire de vie individuels [1, 2]. Au quotidien, pour un écotoxicologue ou un évaluateur du risque, choisir le modèle le plus approprié peut s'avérer ardu, de même que sa mise en œuvre logicielle. D'ailleurs, beaucoup d'écotoxicologues et d'évaluateurs du risque s'accordent pour dire qu'il manque aujourd'hui d'un outil « clé en main » qui permette de réaliser ces différentes analyses de manière conviviale et sans avoir à se préoccuper de la technicité mathématique et statistique sous-jacente. C'est ce qu'offre la plate-forme web MOSAIC, acronyme de MOdeling and StAtistical tools for ecotoxICology : https://mosaic.univ-lyon1.fr/ [3], libre d'accès à travers un navigateur Internet.

MOSAIC permettait déjà plusieurs types d'analyses [4] : analyses dose-réponse (DR) pour des données binaires (*e.g.*, survie, mobilité, émergence) et des données discrètes de comptage (*e.g.*, reproduction) ; analyses GUTS (*i.e.*, TKTD pour la survie et la prise en compte d'une exposition variable au cours du temps) ; analyses de la distribution de sensibilité de plusieurs espèces (*i.e.*, analyses SSD). Aujourd'hui, deux nouveaux modules sont accessibles via MOSAIC : (i) $MOSAIC_{growth}$ (https://mosaic.univ-lyon1.fr/growth) pour des analyses dose-réponse relatives à des données quantitatives continues (*e.g.*, croissance d'organisme, taux de croissance des algues, etc.) et (ii) $MOSAIC_{bioacc}$ (https://mosaic.univ-lyon1.fr/bioacc) pour le calcul de facteurs de bioaccumulation des substances actives dans les organismes. Ces deux nouveaux modules intègrent un interpréteur embarqué pour les calculs et graphiques avec le logiciel de statistique R [5, 6] et le logiciel JAGS pour l'inférence Bayésienne [7], ainsi qu'une interface Shiny [8] pour la convivialité. Pour l'utilisation de ces deux nouveaux modules, l'utilisateur est guidé pas à pas grâce à une vidéo didactique et un tutoriel plus complet qui fournit tous les détails. Des jeux de données sont fournis pour tester l'interface. Ces deux nouveaux modules ont été conçus selon une philosophie propre à MOSAIC, à savoir de faciliter le travail quotidien des écotoxicologues et évaluateurs du risque, mais aussi de tout autre utilisateur désirant analyser des données d'écotoxicité.

Présentation de $MOSAIC_{growth}$

Mesurer la croissance d'organismes (*e.g.*, leur longueur, le poids sec de plantes, etc.) ou un taux de croissance (*e.g.*, algues, etc.) consiste à recueillir des données quantitatives continues qui vont pouvoir être analysées avec $MOSAIC_{growth}$ par l'ajustement d'un modèle DR, permettant d'obtenir une estimation de la valeur de la concentration effective à x %, typiquement une EC_x ou par exemple dans le domaine des plantes terrestres non-cibles une ER_x, pour x % « Effective Rate », intitulé choisi par défaut. $MOSAIC_{growth}$

permet d'analyser un ou plusieurs jeux de données (Figure 1.1), par défaut au dernier temps d'exposition, et d'obtenir divers résultats comme la distribution de probabilité de la dernière ER_x demandée (Figure 1.2) et un tableau de synthèse des estimations des ER_x si plusieurs x ont été demandés par l'utilisateur (Figure 1.2). Ce tableau comprend non seulement la médiane et l'intervalle de crédibilité à 95% des ER_x (pour les x choisis), mais également les valeurs des ER_x censurées, obtenues en tenant compte de l'incertitude sur l'estimation des ER_x relativement à la gamme des concentrations testées. Ces ER_x censurés peuvent ensuite être utilisées pour des analyses SSD avec le module $MOSAIC_{SSD}$ [9] (https://mosaic.univ-lyon1.fr/ssd).

Figure 1. Morceaux choisis de l'interface web $MOSAIC_{growth}$ lors de l'analyse dose-réponse avec le jeu de données exemple 'plant07' : (1) Saisie des données expérimentales et leur visualisation ; (2) Estimation des ER_x pour x = 5, 10, 25, 50, 75 et 90% obtenus à partir des résultats de l'ajustement du modèle DR et représentation graphique de la distribution de probabilité de l'ER_{90} ; (3) Modèle ajusté superposé aux données observées : courbe médiane (ligne orange en trait plein) et son incertitude (zone grisée délimitée par les lignes pointillés orange) et résumé des paramètres estimés ; (4) Exemple de deux critères d'ajustement du modèle fournis par l'interface (à gauche : 'Posterior Predictive Check' (PPC) ; à droite : priors et posteriors) ; (5) Téléchargement des résultats et (6) Exemples d'utilisation de l'outil de prédiction pour une série de concentrations (40, 80, 160, 320 et 640) ; à gauche : paramètres non distribués ; à droite : paramètres distribués obtenus lors d'une analyse DR antérieure effectuée avec $MOSAIC_{growth}$.

$MOSAIC_{growth}$ fournit également une visualisation de l'ajustement du modèle DR (ici un modèle log-logistique à 3 paramètres) aux données observées en fonction de la concentration et au temps d'exposition choisi (Figure 1.3). Un tableau résume les estimations de chaque paramètre du modèle DR avec sa valeur médiane et son intervalle d'incertitude à 95% (Figure 1.3). Par ailleurs, des critères de la qualité de l'ajustement du modèle sont automatiquement présentés (Figure 1.4), permettant d'un coup d'œil de juger la pertinence des résultats obtenus.

Afin d'assurer transparence et reproductibilité des analyses, $MOSAIC_{growth}$ offre la possibilité de télécharger différents types de document, dont l'intégralité du code R (Figure 1.5). Enfin, $MOSAIC_{growth}$ propose un outil de prédiction permettant de simuler un modèle DR pour prédire la relation entre une gamme de concentrations que l'utilisateur choisit et ce qu'il peut potentiellement obtenir comme effet au temps final prévu pour son expérience (Figure 1.6). Un tel outil peut être utile pour optimiser de futures expériences pour une combinaison espèce / substance donnée. Cet outil prédiction peut si besoin s'utiliser de manière indépendante à toute analyse DR préalable.

Présentation de $MOSAIC_{bioacc}$

Concernant les demandes d'autorisation de mise sur le marché pour les produits phytopharmaceutiques, la règlementation n° 283/2013 (UE) [10] fixe les exigences en matière de données pour les substances actives avec notamment un test de bioaccumulation sur poissons selon la ligne directrice 305 de l'OCDE, test qui consiste en une phase d'accumulation suivie d'une phase de dépuration [11]. La concentration interne dans les poissons est mesurée au cours du temps pendant les deux phases, ce qui permet ensuite d'estimer différents facteurs de bioaccumulation (BCF / BSAF / BMF) selon la voie d'exposition. $MOSAIC_{bioacc}$ est un nouveau module clé en main qui permet l'estimation de ces facteurs de bioaccumulation avec leur incertitude à partir de l'ajustement d'un modèle TK choisi automatiquement en fonction des données d'accumulation-dépuration saisies par l'utilisateur (Figure 2.1). D'un simple clic, l'utilisateur obtient les BCF / BSAF / BMF sous la forme d'une distribution de probabilité (Figure 2.2), résumée avec la médiane et l'intervalle de crédibilité à 95% (borné par les quantiles à 2.5% et 97.5% de la distribution, Figure 2.3). Les données entrées peuvent provenir de différents types d'expériences dans lesquelles différentes voies d'exposition sont envisagées (*e.g.*, l'eau de surface, l'eau interstitielle, le sédiment ou le sol, la nourriture), ainsi que différents processus d'élimination (*e.g.*, excrétion, biotransformation et croissance). Dans $MOSAIC_{bioacc}$, les facteurs de bioaccumulation et les paramètres cinétiques des modèles (*e.g.*, k_u et k_e) sont estimés par inférence Bayésienne pour une quantification plus efficace de l'incertitude. Les résultats de l'ajustement sont fournis soit sous forme graphique (Figure 2.4), soit sous forme de tableau présentant la valeur médiane et l'intervalle d'incertitude à 95% des paramètres estimés (Figure 2.5). Viennent ensuite un certain nombre de critères qui sont fournis automatiquement à l'utilisateur afin qu'ils vérifient la pertinence des résultats obtenus (Figure 2.6). Afin d'assurer la reproductibilité et la transparence des analyses, $MOSAIC_{bioacc}$ permet le téléchargement de tous les résultats sous différents formats, ainsi que le code R du modèle utilisé et des résultats de son ajustement aux données expérimentales, permettant si besoin la vérification de la totalité de l'analyse directement avec le logiciel R (Figure 2.7).

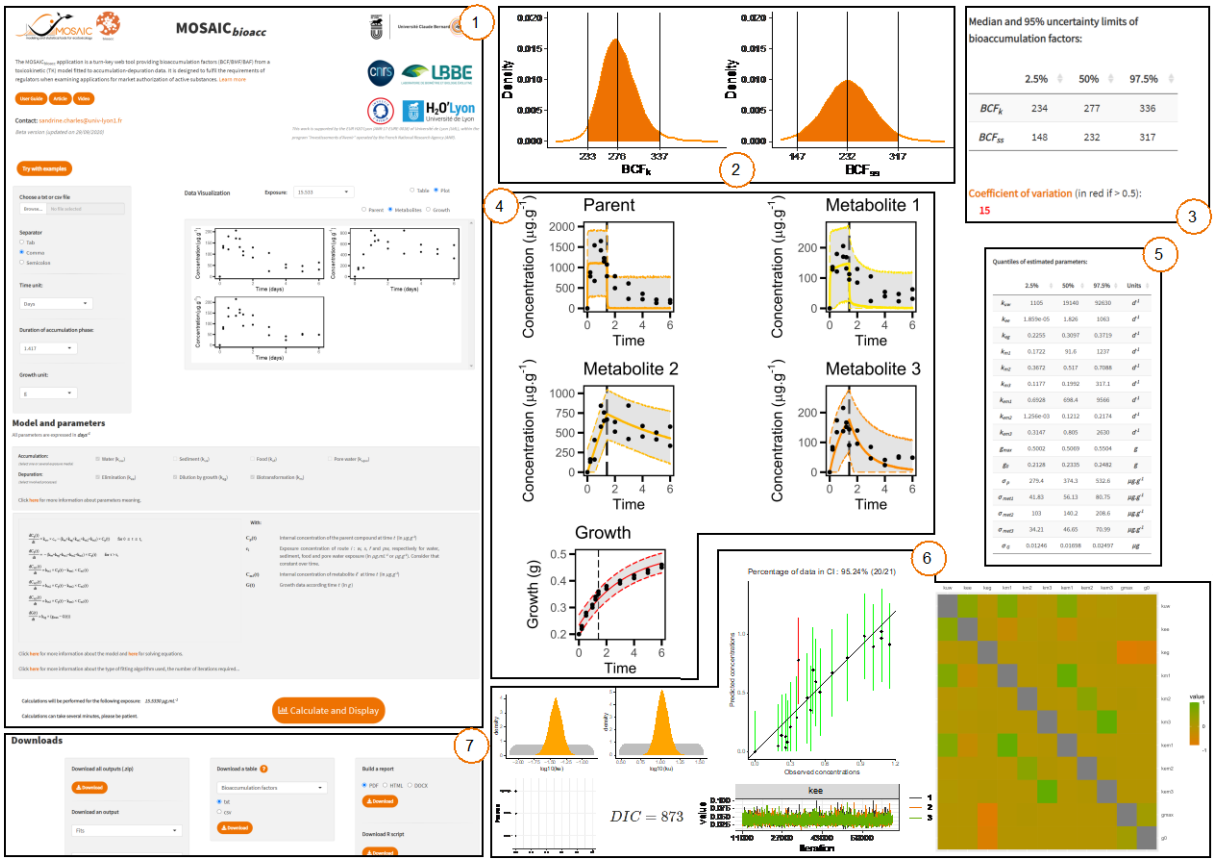

Figure 2. Morceaux choisis de l'interface web MOSAIC$_{bioacc}$ lors de l'analyse TK sur les deux jeux de données exemples 'Oncorhynchus_two' et 'Male_Gammarus_seanine' : (1) Saisie des données expérimentales et résumé simplifié du model TK et paramètres utilisés ; (2) Représentation graphique des facteurs de bioaccumulation (ici le BCF avec l'exemple 'Oncorhynchus_two') et (3) Les valeurs numériques correspondantes ; (4) Modèle TK (concentration dans l'organisme en fonction du temps) : courbe médiane (ligne de couleur en trait plein) et son incertitude (zone grisée délimitée par les lignes pointillés de couleur) ; (5) Estimation des paramètres du modèle ajusté aux données de bioaccumulation ; (6) Les différents critères d'ajustement du modèle et (7) Le téléchargement des résultats.

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Pour en savoir plus

https://mosaic.univ-lyon1.fr/
https://mosaic.univ-lyon1.fr/growth
https://mosaic.univ-lyon1.fr/bioacc
https://mosaic.univ-lyon1.fr/ssd

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ERA / PUBLICATIONS SCIENTIFIQUES / COMMUNAUTES MICROBIENNES AQUATIQUES

Exposure of the alga *Pseudokirchneriella subcapitata* to environmentally relevant concentrations of the herbicide metolachlor: Impact on the redox homeostasis

Authors: Machado MD, Soares EV

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207:111264, 2021, DOI: 10.1016/j.ecoenv.2020.111264

Abstract: This study investigated the effect of the herbicide metolachlor (MET) on the redox homeostasis of the freshwater green alga *Pseudokirchneriella subcapitata*. At low MET concentrations (≤40 μg L-1), no effects on algal cells were detected. The exposure of *P. subcapitata* to 45-235 μg L-1 MET induced a significant increase of reactive oxygen species (ROS). The intracellular levels of ROS were particularly increased at high (115 and 235 μg L-1) but environmentally relevant MET concentrations. The exposure of algal cells to 115 and 235 μg L-1 MET originated a decrease in the levels of antioxidants molecules (reduced glutathione and carotenoids) as well as a reduction of the activity of scavenging enzymes (superoxide dismutase and catalase). These results suggest that antioxidant (non-enzymatic and enzymatic) defenses were affected by the excess of MET. As consequence of this imbalance (ROS overproduction and decline of the antioxidant system), ROS inflicted oxidative injury with lipid peroxi-dation and damage of cell membrane integrity. The results provide further insights about the toxic modes of action of MET on a non-target organism and emphasize the relevance of toxicological studies in the assessment of the impact of herbicides in freshwater environments.

Accès au document

Effect of cadmium in the microalga *Chlorella sorokiniana*: A proteomic study

Authors: Leon-Vaz A, Romero LC, Gotor C, Leon R, Vigara J

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207:111301, 2021, DOI: 10.1016/j.ecoenv.2020.111301

Abstract: Cadmium is one of the most common heavy metals in contaminated aquatic environments and one of the most toxic contaminants for phytoplankton. Nevertheless, there are not enough studies focused on the effect of this metal in algae. Through a proteomic approach, this work shows how Cd can alter the growth, cell morphology and metabolism of the microalga Chlorella sorokiniana. Using the sequential window acquisition of all theoretical fragment ion spectra mass spectrometry (SWATH-MS), we concluded that exposure of *Chlorella sorokiniana* to 250 μM Cd2+ for 40 h caused downregulation of different metabolic pathways, such as photosynthesis, oxidative phosphorylation, glycolysis, TCA cycle and ribosomal proteins biosynthesis. However, photorespiration, anti-oxidant enzymes, gluconeogenesis, starch

catabolism, and biosynthesis of glutamate, cysteine, glycine and serine were upregulated, under the same conditions. Finally, exposure to Cd also led to changes in the metabolism of carotenoids and lipids. In addition, the high tolerance of Chlorella sorokiniana to Cd points to this microalga as a potential microorganism to be used in bioremediation processes.

Accès au document

Toxicity of the herbicides diuron, propazine, tebuthiuron, and haloxyfop to the diatom *Chaetoceros muelleri*

Authors: Thomas MC, Flores F, Kaserzon S, Reeks TA, Negri AP

Source: SCIENTIFIC REPORTS 10:19592, 2020, DOI: 10.1038/s41598-020-76363-0

Abstract: Conventional photosystem II (PSII) herbicides applied in agriculture can pose significant environmental risks to aquatic environments. In response to the frequent detection of these herbicides in the Great Barrier Reef (GBR) catchment area, transitions towards 'alternative' herbicides are now widely supported. However, water quality guideline values (WQGVs) for alternative herbicides are lacking and their potential ecological impacts on tropical marine species are generally unknown. To improve our understanding of the risks posed by some of these alternative herbicides on marine species under tropical conditions, we tested the effects of four herbicides on the widely distributed diatom Chaetoceros muelleri. The PSII herbicides diuron, propazine, and tebuthiuron induced substantial reductions in both 24 h effective quantum yields (Delta F/F-m') and 3-day specific growth rates (SGR). The effect concentrations, which reduced Delta F/F-m' by 50% (EC50), ranged from 4.25 µg L-1 diuron to 48.6 µg L-1 propazine, while the EC(50)s for SGR were on average threefold higher, ranging from 12.4 µg L-1 diuron to 187 µg L-1 tebuthiuron. Our results clearly demonstrated that inhibition of Delta F/F-m' in PSII is directly linked to reduced growth (R-2=0.95) in this species, further supporting application of Delta F/F-m' inhibition as a valid bioindicator of ecological relevance for PSII herbicides that could contribute to deriving future WQGVs. In contrast, SGR and Delta F/F-m ' of C. muelleri were nonresponsive to the non-PSII herbicide haloxyfop at the highest concentration tested (4570 µg L-1), suggesting haloxyfop does not pose a risk to *C. muelleri*. The toxicity thresholds (e.g. no effect concentrations; NECs) identified in this study will contribute to the derivation of high-reliability marine WQGVs for some alternative herbicides detected in GBR waters and support future assessments of the cumulative risks of complex herbicide mixtures commonly detected in coastal waters.

Accès au document

Competition Among Trivalent Elements (Al, Eu, Fe, Gd, Nd, Tm, and Y) for Uptake in Algae and Applicability of the Biotic Ligand Model

Authors: Aharc haou I, Bahloul F, Fortin C

Source: ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY Early Access, 2020, DOI: 10.1007/s00244-020-00786-z

Abstract: Rare earth elements (REE) are essential in many new technologies. While anthropogenic dispersion of REE into the environment are expected in the future, their biogeochemical fate and interactions at biological interfaces are still largely unexplored. Due to their chemical nature (generally trivalent and hard metals), REE can potentially compete among themselves or with other ubiquitous trivalent metals for uptake sites at the surface of aquatic organisms. In the current study, the bioavailability and uptake of gadolinium (Gd) was

assessed in the green alga, *Chlamydomonas reinhardtii*, while in the presence of various trivalent elements (Al, Eu, Fe, Nd, Tm, and Y). In the absence of competitors, Gd uptake was well described by a Michaelis-Menten equation with an affinity constant (K-Gd) of 10(7.1) and a maximum internalization flux (J(max)) of 1.95 +/- 0.09 x 10(-2) amol mu m(-2) min(-1). Neither Al(III) nor Fe(III) had notable effects on Gd uptake in the conditions tested; however, Gd uptake was reduced with increasing concentrations of other REE. These had binding constants with uptake sites very similar to that of Gd (K-Nd, K- Y,K- Tm,K- Eu = 10(7.0)). Our results suggest that the different REE likely share common transport sites and that the biotic ligand model (BLM) can be used to predict their uptake.

Accès au document

Effect of cadmium in the microalga *Chlorella sorokiniana*: A proteomic study

Authors: Leon-Vaz A, Romero LC, Gotor C, Leon R, Vigara J

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207:111301, 2021, DOI: 10.1016/j.ecoenv.2020.111301

Abstract: Cadmium is one of the most common heavy metals in contaminated aquatic environments and one of the most toxic contaminants for phytoplankton. Nevertheless, there are not enough studies focused on the effect of this metal in algae. Through a proteomic approach, this work shows how Cd can alter the growth, cell morphology and metabolism of the microalga *Chlorella sorokiniana*. Using the sequential window acquisition of all theoretical fragment ion spectra mass spectrometry (SWATH-MS), we concluded that exposure of Chlorella sorokiniana to 250 µM Cd2+ for 40 h caused downregulation of different metabolic pathways, such as photosynthesis, oxidative phosphorylation, glycolysis, TCA cycle and ribosomal proteins biosynthesis. However, photorespiration, anti-oxidant enzymes, gluconeogenesis, starch catabolism, and biosynthesis of glutamate, cysteine, glycine and serine were upregulated, under the same conditions. Finally, exposure to Cd also led to changes in the metabolism of carotenoids and lipids. In addition, the high tolerance of Chlorella sorokiniana to Cd points to this microalga as a potential microorganism to be used in bioremediation processes.

Accès au document

Microplastics as an emerging anthropogenic vector of trace metals in freshwater: Significance of biofilms and comparison with natural substrates

Authors: Guan JNA, Qi K, Wang JY, Wang WW, Wang ZR, Lu N, Qu J

Source: WATER RESEARCH 184:116205, 2020, DOI: 10.1016/j.watres.2020.116205

Abstract: Microplastics (MPs) are ubiquitous in freshwater environments, and represent an emerging anthropogenic vector for contaminants, such as trace metals. In this study, virgin expanded polystyrene (PS) particles were placed in a eutrophic urban lake and a reservoir serving as the resource of domestic water for 4 weeks, to develop biofilms on the surface. For comparison, natural adsorbents in the form of suspended particles and surficial sediment were also sampled from these waterbodies. The trace metal adsorption properties of anthropogenic (virgin and biofilm covered microplastics) and natural substrates were investigated and compared via batch adsorption experiments. The adsorption isotherms fitted the Langmuir model, revealed that biofilms could enhance the trace metal adsorption capacity of MPs. However,

natural substrates still had a greater adsorption capacity. Biofilms also alter the adsorption kinetics of trace metals onto MPs. The process of adsorption onto virgin MPs was dominated by intraparticle diffusion, whereas film diffusion governed adsorption onto biofilm covered microplastics and natural substrates. The trace metal adsorption of all the substrates was significantly dependent on pH and ionic strength. The adsorption mechanisms were further analyzed by SEM-EDS and FT-IR. The enhancement of adsorption was mainly attributed to complexation with functional groups contained in the biofilms, including carboxyl, amino, and phenyl-OH. Collectively, biofilm development intensifies the role of MPs in the migration and fate of trace metals in freshwater, since it does not give MPs an edge over natural substrates in adsorption.

Accès au document

Microplastic-associated biofilms in lentic Italian ecosystems

Authors: Di Pippo F, Venezia C, Sighicelli M, Pietrelli L, Di Vito S, Nuglio S, Rossetti S

Source: WATER RESEARCH 187:116429, 2020, DOI: 10.1016/j.watres.2020.116429

Abstract: In this study, 16S rRNA gene high throughput sequencing and Fluorescence In Situ Hybridization (FISH) combined with confocal laser scanning microscopy (CLSM) were used to assess for the first time biodiver-sity and structure of microplastic-associated biofilms (plastisphere) collected from Italian lentic ecosystems. The analysis revealed clear differences in microbial community composition among biofilms and corresponding planktonic populations indicating a selective adhesion on microplastics (MP). Although geographical variations in taxa composition were observed, a plastisphere core microbiome, composed by known biofilm formers found in freshwater ecosystems (e.g. Sphingorhabdus, Sphingomonas, Rhodobacter, Aquabacterium and Acidovorax genera) was found. Species composition of plastisphere did not substantially differ between the diverse polymers, while a clear link with the MP exposure time was found by Fourier Transform Infrared spectroscopy (FT-IR) and Scanning Electron Microscopy (SEM) analysis. Generalist planktonic taxa (e.g. members of the families Sphingomonadaceae and Rhodobacteraceae) were found on MPs with the lowest degradation level whereas the biodiversity increased with the increase of MP degradation. FISH-CLSM analysis confirmed the Burkolderiaceae dominance in most of the analyzed plastisphere samples and revealed a patchy microbial colonization and a complex biofilm architecture with bacterial micro-colonies and cyanobacterial aggregates occurring together with microalgae assemblages.

Accès au document

Glyphosate-Based Herbicide Toxicophenomics in Marine Diatoms: Impacts on Primary Production and Physiological Fitness

Authors: de Carvalho RC, Feijao E, Matos AR, Cabrita MT, Novais SC, Lemos MFL, Cacador I, Marques JC, Reis-Santos P, Fonseca VF, Duarte B

Source: APPLIED SCIENCES-BASEL 10:7391, 2020, DOI: 10.3390/app10217391

Abstract: Application of non-invasive bio-optical techniques to evaluate the ecotoxicity of glyphosate-based pesticide in marine diatoms with confirmation by classical biochemical tools.

Glyphosate is the main active component of the commercial formulation Roundup(R), the most widely used chemical herbicide worldwide. However, its potential high toxicity to the environment and throughout trophic webs has come under increasing scrutiny. The present study aims to investigate the application of bio-

optical techniques and their correlation to physiological and biochemical processes, including primary productivity, oxidative stress, energy balance, and alterations in pigment and lipid composition in *Phaeodactylum tricornutum*, a representative species of marine diatoms, using the case study of its response to the herbicide glyphosate-based Roundup(R) formulation, at environmentally relevant concentrations. Cultures were exposed to the herbicide formulation representing effective glyphosate concentrations of 0, 10, 50, 100, 250, and 500 μg L-1. Results showed that high concentrations decreased cell density; furthermore, the inhibition of photosynthetic activity was not only caused by the impairment of electron transport in the thylakoids, but also by a decrease of antioxidant capacity and increased lipid peroxidation. Nevertheless, concentrations of one of the plastidial marker fatty acids had a positive correlation with the highest concentration as well as an increase in total protein. Cell energy allocation also increased with concentration, relative to control and the lowest concentration, although culture growth was inhibited. Pigment composition and fatty acid profiles proved to be efficient biomarkers for the highest glyphosate-based herbicide concentrations, while bio-optical data separated controls from intermediate concentrations and high concentrations.

Accès au document

Aberrations in the microbiome of cyanobacteria from a tropical estuary polluted by heavy metals

Authors: Jasmin C, Anas A, Singh D, Purohit HJ, Gireeshkumar TR, Nair S

Source: MARINE POLLUTION BULLETIN 160:111575, 2020, DOI: 10.1016/j.marpolbul.2020.111575

Abstract: The effect of heavy metal pollution on the microbiome of cyanobacteria in Cochin estuary (CE) on the southwest coast of India is reported in the study. Statistically significant difference in heavy metal concentration was observed between water, suspended particulate matter (SPM) and sediment. The Zn, Cd, Cu, Ni and Cr were 2-6 times higher in the SPM compared with the sediment, while Pb was 10 to 25 times higher. Although nearly 60% of the species diversity of microbiome was common between cyanobacteria enriched from the upstream (S1S) and downstream (S11B), there was a difference in the major groups of heterotrophic bacterial associates. Proteobacteria was the dominant phylum (80%) in S1S, while it was second only (27.5%) after Planctomycetes (37.4%) in S11B. The results of the current study indicate that the pollution can influence an ecosystem at the micro-niche level.

Accès au document

The Combined Algae Test for the Evaluation of Mixture Toxicity in Environmental Samples

Authors: Glauch L, Escher BI

Source: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY Early Access, 2020, DOI: 10.1002/etc.4873

Abstract: The combined algae test is a 96-well plate-based algal toxicity assay with the green algae *Raphidocelis subcapitata* that combines inhibition of 24-h population growth rate with inhibition of photosynthesis detected after 2 and 24 h with pulse-amplitude modulated (PAM) fluorometry using a Maxi-Imaging PAM. The combined algae test has been in use for more than a decade but has had limitations due to incompatibilities of the measurements of the 2 biological endpoints on the same microtiter plates. These limitations could be overcome by increasing growth rates and doubling times on black, clear-bottom 96-well plates by application of dichromatic red/blue light-emitting diode illumination. Different robotic dosing approaches

and additional data evaluation methods helped to further expand the applicability domain of the assay. The combined algae test differentiates between nonspecifically acting compounds and photosynthesis inhibitors, such as photosystem II (PSII) herbicides. The PSII herbicides acted immediately on photosynthesis and showed growth rate inhibition at higher concentrations. If growth was a similar or more sensitive endpoint than photosynthesis inhibition, this was an indication that the tested chemical acted nonspecifically or that a mixture or a water sample was dominated by chemicals other than PSII herbicides acting on algal growth. We fingerprinted the effects of 45 chemicals on photosynthesis inhibition and growth rate and related the effects of the single compounds to designed mixtures of these chemicals detected in water samples and to the effects directly measured in water samples. Most of the observed effects in the water samples could be explained by known photosystem II inhibitors such as triazines and phenylurea herbicides. The improved setup of the combined algae test gave results consistent with those of the previous method but has lower costs, higher throughput, and higher precision.

Accès au document

Emerging environmental contaminants (silver nanoparticles) altered the catabolic capability and metabolic fingerprinting of microbial communities

Authors: Kusi J, Scheuerman PR, Maier KJ

Source: AQUATIC TOXICOLOGY 228:105633, 2020, DOI: 10.1016/j.aquatox.2020.105633

Abstract: Microbial community functional diversity enhances the degradation of organic matter and pollutants in the environment, but there is a growing concern that these ecosystem services may be altered by the introduction of emerging environmental contaminants including silver nanoparticles (AgNPs) into aquatic systems. We added 0, 25, 50, 75, 100, and 125 mg L-1 (nominal concentrations) of citrate-AgNP and polyvinylpyrrolidone-AgNP (PVP-AgNP) each to freshwater sediment and examined their antimicrobial effects on microbial communities using community-level physiological profiling. The results showed that citrate-AgNP decreased the overall microbial catabolic activity by 80% from 1.16 +/- 0.02 to 0.23 +/- 08 while PVP-AgNP decreased the catabolic activity by 51% from 1.25 +/- 0.07 to 0.61 +/- 0.19 at 125 mg L-1. Citrate-AgNP and PVP-AgNP caused a statistically significant reduction in substrate richness and substrate diversity that decreased microbial functional diversity. AgNPs decreased microbial catabolic capability and functional diversity at concentrations ranging from 0.12 + 0.04 to 0.43 +/- 0.07 mg Ag kg-1 which are lower than the predicted concentrations in freshwater sediment. To our knowledge, this is the first study to demonstrate inhibition of microbial functional diversity by citrate-AgNP and PVP-AgNP in a pathogen impaired stream. Citrate-AgNP caused greater inhibition of carbon substrate utilization but amino acids, carbohydrates, and carboxylic acids were the most affected carbon groups which led to a shift in the metabolic fingerprint pattern of the microbial community. AgNPs decreased the catabolic capability and the ability of the microbial community to degrade organic matter and a variety of pollutants in the environment.

Accès au document

Nematodes trophic groups changing via reducing of bacterial population density after sediment enrichment to ciprofloxacin antibiotic: Case study of Marine Mediterranean community

Authors: Nasri A, Allouche M, Hannachi A, Barkaoui T, Barhoumi B, Saidi I, D'Agostino F, Mahmoudi E, Beyrem H, Boufahja F

Source: AQUATIC TOXICOLOGY 228:105632, 2020, DOI: 10.1016/j.aquatox.2020.105632

Abstract: An experiment was carried out using microcosms to evaluate the impact of the fluoroquinolone antibiotic on nematode trophic groups structure and bacterial abundance. Sediment samples were experimentally enriched with four increasing doses of ciprofloxacin [D1 (50 ppm), D2 (100 ppm), D3 (200 ppm) and D4 (500 ppm)] and compared to non-enriched sediments (used as control). Ciprofloxacin changed the trophic composition of nematodes taxa where the relative abundance of microvores (M), epigrowth feeders (EF) and ciliate consumers (CF), raised in a control microcosm, was highly affected and significantly decreased in response to the increasing doses. Nevertheless, the abundance of deposit feeders (DF), optional predators (FP) and exclusive predators (Pr) showed a significant increase. Results from the multivariate analysis showed a clear impact of this antibiotic on nematode trophic assemblages. Microcosms treated with the three highest doses [D2, D3 and D4] were different from the control. The exceptions were those treated with the lowest dose, Dl, and which were grouped with the control. The SIMPER analysis results showed that the average dissimilarity continuously increased in the treated microcosms compared to the control. Furthermore, our results have shown that cipmfloxacin also leads to a significant decrease in bacterial density with the highest dose, which could explain the results obtained for nematode trophic groups distribution. Thus, the bacteriophages nematodes only use bacteria as a nutrition source and the lack or presence in small quantity of this food could induce a decrease in their abundance as well as changing of nematodes groups repartition.

Our work demonstrates that the nematode responses were dependent on sediment enrichment with cipmfloxacin and opens new perspectives on the potential impact of antibiotics on functional nematode diversity.

Accès au document

Impacts of anthropogenic disturbances on microbial community of coastal waters in Shenzhen, South China

Authors: Zhang R, Liu WC, Liu Y, Zhang HL, Zhao ZH, Zou LY, Shen YC, Lan WS

Source: ECOTOXICOLOGY Early Access, 2020, DOI: 10.1007/s10646-020-02297-y

Abstract: During the urbanization, human activities have brought great changes to marine biodiversity and microbial communities of coastal water. Shenzhen is a coastal city that has developed rapidly over the past four decades, but the microbial communities and metabolic potential in offshore water are still not well characterized. Here, 16S rRNA gene V4-V5 sequencing was conducted to determine the microbial components from coastal waters in twenty selected areas of Shenzhen. The results showed a significant difference on the microbial composition between the western and eastern waters. Samples from western coast had more abundant Burkholderiaceae, Sporichthyaceae, Aeromonadaceae, and Methylophilaceae compared to eastern coast, and at the genus level, Candidatus Aquiluna, Aeromonas, Arcobacter, Ottowia and Acidibacter were significantly higher in western waters. There was also a notable difference within the western

sample group, suggesting the taxa-compositional heterogeneity. Moreover, analysis of environmental factors and water quality revealed that salinity, pH and dissolved oxygen were relatively decreased in western samples, while total nitrogen, total phosphorus, chemical oxygen demand, and harmful marine vibrio were significantly increased compared to eastern waters. The results suggest the coastal waters pollution is more serious in western Shenzhen than eastern Shenzhen and the microbial communities are altered, which can be associated with anthropogenic disturbances.

Accès au document

The Combined Algae Test for the Evaluation of Mixture Toxicity in Environmental Samples

Authors: Glauch L, Escher BI

Source: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY Early Access, 2020, DOI: 10.1002/etc.4873

Abstract: The combined algae test is a 96-well plate-based algal toxicity assay with the green algae *Raphidocelis subcapitata* that combines inhibition of 24-h population growth rate with inhibition of photosynthesis detected after 2 and 24 h with pulse-amplitude modulated (PAM) fluorometry using a Maxi-Imaging PAM. The combined algae test has been in use for more than a decade but has had limitations due to incompatibilities of the measurements of the 2 biological endpoints on the same microtiter plates. These limitations could be overcome by increasing growth rates and doubling times on black, clear-bottom 96-well plates by application of dichromatic red/blue light-emitting diode illumination. Different robotic dosing approaches and additional data evaluation methods helped to further expand the applicability domain of the assay. The combined algae test differentiates between nonspecifically acting compounds and photosynthesis inhibitors, such as photosystem II (PSII) herbicides. The PSII herbicides acted immediately on photosynthesis and showed growth rate inhibition at higher concentrations. If growth was a similar or more sensitive endpoint than photosynthesis inhibition, this was an indication that the tested chemical acted nonspecifically or that a mixture or a water sample was dominated by chemicals other than PSII herbicides acting on algal growth. We fingerprinted the effects of 45 chemicals on photosynthesis inhibition and growth rate and related the effects of the single compounds to designed mixtures of these chemicals detected in water samples and to the effects directly measured in water samples. Most of the observed effects in the water samples could be explained by known photosystem II inhibitors such as triazines and phenylurea herbicides. The improved setup of the combined algae test gave results consistent with those of the previous method but has lower costs, higher throughput, and higher precision.

Accès au document

Combined effect of nanoscale zero-valent iron and linear alkylbenzene sulfonate (LAS) to the freshwater algae *Scenedesmus obliquus*

Authors: Cheng R, Liu YP, Chen YH, Shen LJ, Wu JJ, Shi L, Zheng X

Source: ECOTOXICOLOGY Early Access, 2020, DOI: 10.1007/s10646-020-02294-1

Abstract: With wide use of nanoparticles, co-exposure of aquatic organisms to nanoparticles and organic pollutants often takes place in the environment. However, the combined effects are still rarely understood. In this study, in order to study the interaction and biological effects of nanoscale zero-valent iron (nZVI) and linear alkylbenzene sulfonate (LAS), which acts as a typical surfactant, the freshwater algae

Scenedesmus obliquus was exposed to nZVI and LAS individually and in combination for 96 h. According to the inhibition rate of the algae, the toxic effects were investigated by dose-response analysis. Then the combined effect of nZVI and LAS was evaluated using three evaluation models including toxicity unit (TU), additional index (AI), and mixture toxicity index (MTI). The results showed that the 96 h IC50 of nZVI and LAS to Scenedesmus obliquus was 2.464 mmol L-1 and 0.332 mmol L-1, respectively. When nZVI coexisted with LAS at toxic ratio 1:1, the 96 h IC50 value was 1.658 mmol L-1 (shown with nZVI), and the partly additive effect of nZVI mixed with LAS was confirmed. However, when the toxic ratio of nZVI:LAS was 4:1, it showed synergistic effect. In addition, when nZVI mixed with LAS at toxic ratio 1:4, the joint effect is antagonistic effect. In addition, the content of chorophyll in *Scenedesmus obliquus*, especially the content of chlorophyll a, was decreased with the increase of mixture dose. However, the protein levels did not show significant changes at different mixture doses.

Accès au document

Metagenomic Analysis Reveals Bacterial and Fungal Diversity and Their Bioremediation Potential From Sediments of River Ganga and Yamuna in India

Authors: Behera BK, Chakraborty HJ, Patra B, Rout AK, Dehury B, Das BK, Sarkar DJ, Parida PK, Raman RK, Rao AR, Rai A, Mohapatra T

Source: FRONTIERS IN MICROBIOLOGY 11:556136, 2020, DOI: 10.3389/fmicb.2020.556136

Abstract: In this study, we report the presence of a microbial community of bioremediation potential in terms of relative abundance and taxonomic biodiversity in sediment samples of river Ganga and Yamuna, India at nine different sites. Metagenomic libraries were constructed using TruSeq Nano DNA Library Prep Kit and sequenced on NextSeq 500 by Illumina Next Generation Sequencing (NGS) technology. …. The study revealed that Proteobacteria was the most dominant bacterial flora, followed by Actinobacteria, Firmicutes, and Deinococcus-Thermus. PCA analysis revealed that bioremediation bacteria viz. *Streptomyces bikiniensis, Rhodococcus qingshengii, Bacillus aerophilus, Pseudomonas veronii*, etc., were more dominant in highly polluted river stretch as compared to less polluted river stretch. Similarly, the relative abundance of bioremediation fungi viz. *Phanerochaete chrysosporium and Rhizopus oryzae*, etc., were significantly correlated with the polluted Kanpur stretch of river Ganga. Several protein domains, which play a pivotal role in bioremediation in the polluted environments, including urea ABC transporter, UrtA, UrtD, UrtE, zinc/cadmium/mercury/lead-transporting ATPase, etc., were identified using protein domain analysis. The protein domains involved in pesticide biodegradation viz. P450, short-chain dehydrogenases/reductases (SDR), etc., were also discovered in river sediment metagenomics data. This is the first report on the richness of bioremediation microbial communities in the Ganga and Yamuna riverine ecosystems, highlighting their importance in aquatic pollution management.

Accès au document

Freshwater Sediment Microbial Communities Are Not Resilient to Disturbance From Agricultural Land Runoff

Authors: Beattie RE, Bandla A, Swarup S, Hristova KR

Source: FRONTIERS IN MICROBIOLOGY 11:539921, 2020, DOI: 10.3389/fmicb.2020.539921

Abstract: Microorganisms are critically important for the function of surface water ecosystems but are frequently subjected to anthropogenic disturbances at either acute (pulse) or long-term (press) scales. Response and recovery of microbial community composition and function following pulse disturbance is well-studied in controlled, laboratory scale experiments but is less well-understood in natural environments undergoing continual press disturbance. The objectives of this study were to determine the drivers of sediment microbial compositional and functional changes in freshwaters receiving continual press disturbance from agricultural land runoff and to evaluate the ability of the native microbial community to resist disturbance related changes as a proxy for freshwater ecosystem health. Freshwater sediments were collected seasonally over 1 year in Kewaunee County, Wisconsin, a region impacted by concentrated dairy cattle farming, manure fertilization, and associated agricultural runoff which together serve as a press disturbance. Using 16S rRNA gene amplicon sequencing, we found that sediments in locations strongly impacted by intensive agriculture contain significantly higher abundances ($p \leq 0.01$) of the genera Thiobacillus, Methylotenera, Crenotrhix, Nitrospira, and Rhodoferax compared to reference sediments, and functions including nitrate reduction, nitrite reduction, and nitrogen respiration are significantly higher ($p \leq 0.05$) at locations in close proximity to large farms. Nine species-level potential human pathogens were identified in riverine sediments […] Microbial community composition at locations in close proximity to intensive agriculture was not resistant nor resilient to agricultural runoff disturbance [...] From this data, we conclude that sediment microbial community composition is sensitive and shifts in response to chemical and microbial pollution from intensive agriculture, has a low capacity to resist infiltration by non-native, harmful bacteria and, overall, the natural buffering capacity of freshwater ecosystems is unable to fully resist the impacts from agricultural press disturbance.

Accès au document

Effects of atrazine and its two major derivatives on the photosynthetic physiology and carbon sequestration potential of a marine diatom

Authors: Yang LQ, Zhang YY

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 205:111359, 2020, DOI: 10.1016/j.ecoenv.2020.111359

Abstract: As one of the most commonly used and frequently detected herbicides in the coastal seawater, the ecotoxicity of atrazine to phytoplankton has been well demonstrated. However, little attention has been paid to the ecotoxicity of its two major hydrolysates (desisopmpylatrazine (DIA) and desethylatrazine (DEA)), which are also widely distributed in natural seawater. Here we present a comprehensive analysis of the photosynthetic physiology and chromophoric dissolved organic matter (CDOM) characteristics of the diatom *Phaeodactylum tricornutum* Pt-1 (CCMP 2561) under atrazine, DIA and DEA stress, respectively. The results showed that both atrazine and the two derivatives had significant negative effects on the concentration of chlorophyll a, maximum quantum efficiency (Fv/Fm) and relative electron transport rates (rETR) of *P. tricornutum* Pt-1. Furthermore, the CDOM pattern released by *P. tricornutum* Pt-1 cells also changed significantly after 7-day exposure. Compared with the control group, the fluorescence intensity (3D-EEM spectra) of protein-like components was obviously lower, while that of the humic acid-like components was higher. The findings of this study indicate that the ecotoxicity of atrazine might have been underestimated in previous investigations: both atrazine and its two major derivatives are not only phototoxic to microalgae but also influence the carbon sequestration potential in the coastal seawater.

Accès au document

Mechanisms of detoxification of high copper concentrations by the microalga *Chlorella sorokiniana*

Authors: Vojvodic S, Stanic M, Zechmann B, Ducic T, Zizic M, Dimitrijevic M, Lukovic JD, Milenkovic MR, Pittman JK, Spasojevic I

Source: BIOCHEMICAL JOURNAL 477, 2020, DOI: 10.1042/BCJ20200600

Abstract: Microalgae have evolved mechanisms to respond to changes in copper ion availability, which are very important for normal cellular function, to tolerate metal pollution of aquatic ecosystems, and for modulation of copper bioavailability and toxicity to other organisms. Knowledge and application of these mechanisms will benefit the use of microalgae in wastewater processing and biomass production, and the use of copper compounds in the suppression of harmful algal blooms. Here, using electron microscopy, synchrotron radiation-based Fourier transform infrared spectroscopy, electron paramagnetic resonance spectroscopy, and X-ray absorption fine structure spectroscopy, we show that the microalga *Chlorella sorokiniana* responds promptly to Cu2+ at high non-toxic concentration, by mucilage release, alterations in the architecture of the outer cell wall layer and lipid structures, and polyphosphate accumulation within mucilage matrix. The main route of copper detoxification is by Cu2+ coordination to polyphosphates in penta-coordinated geometry. The sequestrated Cu2+ was accessible and could be released by extracellular chelating agents. Finally, the reduction in Cu2+ to Cu1+ appears also to take place. These findings reveal the biochemical basis of the capacity of microalgae to adapt to high external copper concentrations and to serve as both, sinks and pools of environmental copper.

Accès au document

Persistent organic pollutants, metals, and the bacterial community composition associated with microplastics in Muskegon Lake (MI)

Authors: Steinman AD, Scott J, Green L, Partridge C, Oudsema M, Hassett M, Kindervater E, Rediske RR

Source: JOURNAL OF GREAT LAKES RESEARCH 46, 2020, DOI: 10.1016/j.jglr.2020.07.012

Abstract: Three different types of microplastics (MPs): low density polyethylene; polypropylene; and polyester, were incubated for one and three months at two sites (Channel and Lake) in Muskegon Lake (MI). After retrieval, MPs were analyzed for polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCs), […] Effect Concentration (PEC): the concentration in sediment above which adverse biological effects are likely to occur. In contrast, PCB levels were 4-6x greater on polyethylene than on polypropylene or polyester, although all plastic-associated PCB concentrations were at least one order of magnitude less than the PEC. Organochlorine pesticide concentrations were very low (<1 ppb) on all microplastics and at all sites. Metal concentrations also were well below their respective PEC levels. The most abundant bacterial groups as part of the plastisphere were Burkholderiales, Rhodocyclaceae, Comamonadaceae, and Pseudomonadaceae. Polyester microplastics contained a higher number of bacterial families and the relative abundance of those families were more evenly distributed compared to the other plastic types. Overall, our results indicate that persistent organic pollutants are capable of accumulating on MPs but the concentrations generally were low; feeding trials are needed to determine if these environmentally realistic concentrations of pollutants attached to microplastics result in impacts to aquatic biota.

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / ECOTOXICOLOGIE SPATIALE

Spatial and Temporal Distribution Characteristics of Triazine Herbicides in Typical Agricultural Regions of Liaoning, China

Authors: Wang, X. & Liu, Q

Source: Bull Environ Contam Toxicol **105,** 899-905, 2020, DOI: 10.1007/s00128-020-03049-8

Abstract: The aim of the current study was to track the composition, spatial and temporal distribution charactistics of triazine herbicides in arable soils and corns in typical agricultural regions of Liaoning Province, China. All samples were analyzed using high performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS).

Accès au document

Interactions among global change pressures act in a non-additive way on bumblebee individuals and colonies

Authors: Zaragoza-Trello C, Vilà M, Botías C, & Bartomeus I

Source: Functional Ecology, Early article, 2020, DOI: 10.1111/1365-2435.13703

Abstract: Through a cross-treatment field experiment with Bombus terrestris colonies, we analysed the joint effect of climate warming, exposure to pesticides and landscape transformation on bumblebee development variables related to individual and colony fitness.

Our experiment indicates that the interaction between global change pressures can be non-additive and that colony-level emergent properties of social species could buffer some of the individual impacts of these pressures. Hence, it is necessary to consider not only the joint effects of global change pressures but also the plasticity of the organisms' responses.

Accès au document

Impact of local and landscape complexity on the stability of field-level pest control

Authors: Larsen AE & Noack F

Source: NATURE SUSTAINABILITY 1-9, 2020, DOI: 10.1038/s41893-020-00637-8

Abstract: Agricultural landscapes have become more simplified as crop production has risen. This study finds that pesticide use rises with crop area and field size but falls with crop diversity.

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS

Indicator species and co-occurrence pattern of sediment bacterial community in relation to alkaline copper mine drainage contamination

Authors: Yuan QS, Wang PF, Wang C...

Source: ECOLOGICAL INDICATORS 120, 2021, DOI: 10.1016/j.ecolind.2020.106884

Abstract: Contamination of alkaline copper mine drainage (AlkCuMD) causes serious damages to riverine ecosystem. Sediment bacterial community, as the fundamental component of biogeochemical processes, has been applied as an effective ecological indicator for various pollutants, but little is known about its relation to AlkCuMD. In this study, the composition variation, indicator species, and co-occurrence pattern of sediment bacterial community were studied in the Jinsha River, a typical AlkCuMD polluted large river in southwestern China.

Accès au document

Effects of biochar on bacterial genetic diversity in soil contaminated with Cadmium

Authors: Zhang Q, Zhang YH, Zhang X, Shi J

Source: SOIL USE AND MANAGEMENT, 2021, DOI: 10.1111/sum.12678

Abstract: Biochar has various ecological effects on heavy metal-contaminated soils. Biochar can passivate the activity of heavy metals and improve environmental conditions for microbial growth. A greenhouse pot experiment was conducted to explore the diversity of microbes in red soil under cadmium (Cd) stress following the application of wheat straw biochar.

Accès au document

Profiling multiple heavy metal contamination and bacterial communities surrounding an iron tailing pond in Northwest China

Authors: Li S, Wu JL, Huo Y, Zhao X, Xue LG

Source: SCIENCE OF THE TOTAL ENVIRONMENT 752, 2021, DOI: 10.1016/j.scitotenv.2020.141827

Abstract: Northwest China is abundant in iron ore reserves and has become one of the important iron ore mining bases in China. However, the contamination and microbial community structure of iron tailing ponds in Northwest China have not been extensively investigated. In the present study, we characterized the main physicochemical properties, the multiple heavy metal contamination, and the bacterial community structure of the soils surrounding an iron tailing pond in Linze County, Zhangye city, Gansu Province.

Accès au document

A converging subset of soil bacterial taxa is permissive to the IncP-1 plasmid pKJK5 across a range of soil copper contamination

Authors: Song JX, Klumper U, Riber L...

Source: FEMS MICROBIOLOGY ECOLOGY 96(11), 2020, DOI: 10.1093/femsec/fiaa200

Abstract: Stressors like metals or antibiotics can affect bacterial community permissiveness for plasmid uptake, but there is little knowledge about long-term effects of such stressors on the evolution of community permissiveness. We assessed the effect of more than 90 years of soil Cu contamination on bacterial community permissiveness (i.e. uptake ability) toward a gfp-tagged IncP-1 plasmid (pKJK5) introduced via an Escherichia coli donor.

Accès au document

Effect of Co-contamination by PAHs and Heavy Metals on Bacterial Communities of Diesel Contaminated Soils of South Shetland Islands, Antarctica

Authors: Gran-Scheuch A, Ramos-Zuniga J, Fuentes E...

Source: MICROORGANISMS 8(11), 2020, DOI: 10.3390/microorganisms8111749

Abstract: Diesel oil is the main source of energy used in Antarctica. Since diesel is composed of toxic compounds such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals, it represents a constant threat to the organisms inhabiting this continent. In the present study, we characterized the chemical and biological parameters of diesel-exposed soils obtained from King George Island in Antarctica.

Accès au document

Characterization and comparison of the bacterial communities of rhizosphere and bulk soils from cadmium-polluted wheat fields

Authors: Song L, Pan ZZ, Dai Y...

Source: PEERJ 8, 2020, DOI: 10.7717/peerj.10302

Abstract: Cadmium pollution is becoming a serious problem due to its nondegradability and substantial negative influence on the normal growth of crops, thereby harming human health through the food chain. Rhizospheric bacteria play important roles in crop tolerance. However, there is little experimental evidence which demonstrates how various cadmium concentrations affect the bacterial community in wheat fields including rhizosphere microorganisms and nonrhizosphere (bulk) microorganisms. In this study, 16S rRNA amplicon sequencing technology was used to investigate bacterial communities in rhizosphere and bulk soils under different levels of pollution in terms of cadmium concentration.

Accès au document

Response of bacterial communities to mining activity in the alpine area of the Tianshan Mountain region, China

Authors: Yuan CY, Li FY, Yuan ZQ...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2021, DOI: 10.1007/s11356-020-11744-6

Abstract: Anthropogenic activities, such as mining, influence soil bacterial community composition and microbial distributions. In the current study, the patterns in microbial distribution and the environmental drivers shaping the soil bacterial community composition in the alpine mining area of the Tianshan Mountain region, China, were investigated, and the bacterial communities were analyzed using 16S rDNA pyrosequencing.

Accès au document

Interaction between a nano-formulation of atrazine and rhizosphere bacterial communities: atrazine degradation and bacterial community alterations

Authors: Zhai YJ, Monikh FA, Wu J...

Source: ENVIRONMENTAL SCIENCE-NANO 7(11):3372-3384, 2020, DOI: 10.1039/d0en00638f

Abstract: Nanotechnology can potentially revolutionize the agricultural industry by offering nano-formulations of pesticides, the so-called nano-pesticides, which can e.g. increase the efficacy and stability of the active ingredients of pesticides. However, it is unknown how a nano-formulation may modulate the interaction between the active ingredient and non-target soil (micro)organisms. Here, we show that long-term exposure to a high dosage of atrazine (ATZ) containing nano-pesticides (NPATZs), where ATZ is encapsulated in a biodegradable polymeric shell, significantly decreases the metabolic capacity of rhizosphere bacterial communities and alters their community structure and composition...

Accès au document

Sorption-desorption and biodegradation of sulfometuron-methyl and its effects on the bacterial communities in Amazonian soils amended with aged biochar

Authors: Alvarez DO, Mendes KF, Tosi M...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207, 2021, DOI: 10.1016/j.ecoenv.2020.111222

Abstract: Sulfometuron-methyl is a broad-spectrum herbicide, used throughout Brazil; however, its environmental impacts in biochar (BC) amended soils is not fully understood. Biochar is known to enhance soil quality but can also have undesired effects such as altering the bioavailability and behavior of herbicides. Microbial communities can degrade herbicides such as sulfometuron-methyl in soils; however, they are known to be affected by BC. Therefore, it is important to understand the tripartite interaction between these factors.

Accès au document

Lead contamination alters enzyme activities and microbial composition in the rhizosphere soil of the hyperaccumulator *Pogonatherum crinitum*

Authors: Hou XL, Han H, Tigabu M...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207, 2021, DOI: 10.1016/j.ecoenv.2020.111308

Abstract: *Pogonatherum crinitum* is a promising lead (Pb) hyperaccumulator; however, the

effects of Pb contamination on *P. crinitum* rhizosphere soil enzymatic activities and microbial composition remain largely unexplored. Thus, an indoor experiment was conducted by cultivating *P. crinitum* seedlings and exposing them to four Pb concentrations (0, 1,000, 2000 and 3000 mg/kg Pb). Protease, urease, acid phosphatase and invertase activities were determined using standard methods while soil bacterial composition was determined by 16 S rDNA sequencing.

Accès au document

Ecological impact of organochlorine pesticides consortium on autochthonous microbial community in agricultural soil

Authors: Egbe CC, Oyetibo GO, Ilori MO

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 207, 2021, DOI: 10.1016/j.ecoenv.2020.111319

Abstract: Organochlorine pesticides (OCPs) used in agricultural practices are of global concern due to their toxicological hazards on biomes of the impacted soil. Geochemistry and microbiome of OCPs-impacted (OW) soil was determined and compared with those of pristine (L1) soils.

Accès au document

Bacterial community diversity and functional roles in the rhizosphere of *Rinorea cf. bengalensis* and *Phyllanthus rufuschaneyi* under a nickel concentration gradient

Authors: Lopez S, Nkrumah PN, Echevarria G...

Source: PLANT AND SOIL 2020, DOI: 10.1007/s11104-020-04763-2

Abstract: Aims The tropical nickel (Ni) hyperaccumulator plants, *Rinorea cf. bengalensis* and *Phyllanthus rufuschaneyi*, are locally common on ultramafic soils in the Malaysian state of Sabah on the island of Borneo. The aim of this study was to determine whether the structure and diversity of *R. cf. bengalensis* rhizosphere microbial communities were dependant on the Ni concentrations in the different rhizosphere soils studied. Methods *Rinorea cf. bengalensis* and *Phyllanthus rufuschaneyi* were subjected to a randomized block design experiment in which four Ni dose levels were applied (0, 60, 240, 600 mg Ni kg(-1)) x 5 replicates per level for 12 months cultivation. At the end of the trial foliar elemental concentrations were measured. In addition, rhizosphere soils were collected for elemental and microbial analyses. The microbial analysis consisted of measuring microbial enzymatic activities and a diversity analysis based on Illumina sequencing. Results The Illumina sequencing analysis yielded 2,649,138 sequences grouped under 2430 different Operational Taxonomic Units (OTUs) belonging to 25 phyla. No impact of the Ni amendments was shown for the four microbial enzymatic activities tested, even at the highest Ni dose level (600 mg Ni kg(-1)). Higher microbial enzymatic activities were found in the rhizosphere of *R. cf. bengalensis* relative to P. rufuschaneyi. Nickel concentrations appeared to have a high impact on the *P. rufuschaneyi* rhizosphere soils, whereas no effect was found for the rhizosphere bacterial community diversity of *R. cf. bengalensis*. Conclusions There may be a significant role of rhizodeposits associated with *R. cf. bengalensis* that protect and preserve the microbial communities in the rhizosphere, regardless of the prevailing nickel concentrations.

Accès au document

Ecological responses of soil microbial abundance and diversity to cadmium and soil properties in farmland around an enterprise-intensive region

Authors: Liu HK, Wang C, Xie YL...

Source: JOURNAL OF HAZARDOUS MATERIALS 392, 2020, DOI: 10.1016/j.jhazmat.2020.122478

Abstract: Microorganisms play a vital role in soil biochemical process in contaminated managed ecosystems. In the present study, a field investigation was conducted in farmland around an industrial intensive region contaminated with cadmium, and the changes of microbial assemblages in contaminated soils were assessed by 16S rRNA sequencing and the further statistical analysis. The results revealed obvious variations in microbial richness between referenced and contaminated soils, with Proteobacteri, Chloroflexi, Actinobacteria, Acidobacteria and Nitrospirae dominating the studied communities around the industrial intensive region. Redundancy analysis and Spearman correlation heatmap revealed that about 68.95 % of overall variation in microbial community composition was explained by soil physiochemical properties and Cd existence, among which pH, soil total phosphorus, total nitrogen, organic carbon (OC) and available Cd were identified as dominant factors. No significant difference was found in the similarities and Beta-diversity analysis among different groups. In conclusion, this study revealed the ecological effects of physiochemical parameters and Cd stress on the diversity and abundance of microbial communities, and these findings provided the detailed and integrated correlation between the main factors and microbial indexes in Cd contaminated farmland around the industrial intensive region.

Accès au document

Tillage, Glyphosate and Beneficial Arbuscular Mycorrhizal Fungi: Optimising Crop Management for Plant-Fungal Symbiosis

Authors: Wilkes TI, Warner DJ, Davies KG, Edmonds-Brown V

Source: AGRICULTURE-BASEL 10, 11, 2020, DOI: 10.3390/agriculture10110520

Abstract: Zero till cropping systems typically apply broad-spectrum herbicides such as glyphosate as an alternative weed control strategy to the physical inversion of the soil provided by cultivation. Glyphosate targets 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase in plants. There is growing evidence that this may have a detrimental impact on non-target organisms such as those present in the soil microbiome. Species of commercial importance, such as arbuscular mycorrhizal (AM) fungi that form a symbiotic relationship with plant roots are an important example. This study investigates the impact of soil cultivation and glyphosate application associated with conventional tillage (CT) and zero tillage (ZT) respectively on AM fungi populations under field and glasshouse conditions. [...] Under glasshouse conditions root arbuscules were consistently higher in wheat grown in ZT field extracted soils ($P = 0.01$) compared to CT. Glyphosate application however inhibited fungal biomass in both the ZT ($P \leq 0.00001$) and CT ($P \leq 0.001$) treatments. In the absence of glyphosate, the number of stained root arbuscules increased significantly. Ergosterol levels, used as a proxy for fungal biomass, remained lower in the soil post glyphosate application. The results suggest that CT has a greater negative impact on AM fungal growth than ZT and glyphosate, but that glyphosate is also detrimental to AM fungal growth and hinders subsequent population recovery.

Accès au document

Soil Microbial Communities Associated With Biodegradable Plastic Mulch Films

Authors: Bandopadhyay S, Gonzalez JRLY, Henderson KB...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.587074

Abstract: Agricultural plastic mulch films provide a favorable soil microclimate for plant growth, improving crop yields. Biodegradable plastic mulch films (BDMs) have emerged as a sustainable alternative to widely used non-biodegradable polyethylene (PE) films. BDMs are tilled into the soil after use and are expected to biodegrade under field conditions. However, little is known about the microbes involved in biodegradation and the relationships between microbes and plastics in soils. In order to capture the consortium of soil microbes associated with (and thus likely degrading) BDMs, agriculturally-weathered plastics from two locations were studied alongside laboratory enrichment experiments to assess differences in the microbial communities associated with BDMs and PE films. Using a combination of amplicon sequencing and quantitative PCR (qPCR), we observed that agriculturally-weathered plastics hosted an enrichment of fungi and an altered bacterial community composition compared to the surrounding soil. Notably, Methylobacterium, Arthrobacter, and Sphingomonas were enriched on BDMs compared to non-biodegradable PE. In laboratory enrichment cultures, microbial consortia were able to degrade the plastics, and the composition of the microbial communities was influenced by the composition of the BDMs. Our initial characterization of the microbial communities associated with biodegradable plastic mulch films, or the biodegradable "plastisphere," lays the groundwork for understanding biodegradation dynamics of biodegradable plastics in the environment.

Accès au document

Soil Bacterial Community Structure in Turfy Swamp and Its Response to Highway Disturbance

Authors: He YY, Xu Y, Lv, Y...

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 17(21), 2020, DOI: 10.3390/ijerph17217822

Abstract: In recent years, the construction and development of highways in turfy swamp areas has been very common. When highways pass through turfy swamps, they can change the local soil, vegetation and hydrological environment, but the impact on soil microorganisms is unclear. We studied the impact of highways on soil microbial communities and diversity in three turfy swamps. Soil samples were collected in the affected area (distance from the expressway 10 m) and control area (distance from the expressway 500-1000 m), and the soil properties, heavy metal content and microbial composition were measured. Subsequent statistical analysis showed that soil organic carbon (SOC), total nitrogen (TN), Cd, Cr, Zn, Cu, density and especially water table (WT) are the main driving forces affecting the composition of microorganisms. The WT and density can also be used to predict the change trend of the ratio of proteobacteria to acid bacteria, reflecting the soil nutrient status. In general, the composition of soil microorganisms in turfy swamp is mainly affected by road drainage and heavy metal emissions. This research provides new insights into the impact of highways on turfy swamps from the perspective of bacterial diversity and community composition, and it also provides a basis for the restoration of the wetland ecological environment.

Accès au document

Arbuscular mycorrhizal fungi in heavy metal highly polluted soil in the Riachuelo river basin

Authors: Colombo RP, Benavidez ME, Bidondo LF...

Source: REVISTA ARGENTINA DE MICROBIOLOGIA 52(2):145-149, 2020, DOI: 10.1016/j.ram.2019.05.001

Abstract: The Riachuelo river basin (RRB) is considered one of the most polluted environments in the world. Knowledge of arbuscular mycorrhizal fungi (AMF) adapted to this extremely polluted environment is important for the establishment of future soil restoration projects. This work aims to make a first list of AMF species present on the RRB. Soil and root samples were randomly taken in an area of approximately 1500 m(2), mycorrhization percentages were evaluated. AMF species were detected by molecular and morphological techniques. Sixteen AMF morphological species and 64 molecular species were reported in this work. *Dominikia iranica, Funneliformis constrictum, Funnelifarmis mosseae, Rhizophagus intraradices, Rhizophagus irregularis* and *Septoglomus viscosum* were detected by both techniques while Claroideoglomus sp. was only detected by pyrosequencing. The list of species reported in this work represents the first description of the RRB AMF community.

Accès au document

Effects of heavy metals on microbial communities in sediments and establishment of bioindicators based on microbial taxa and function for environmental monitoring and management

Authors: Li CC, Quan Q, Gan YD...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 749, 2020, DOI: 10.1016/j.scitotenv.2020.141555

Abstract: Heavy metals have always been a research hotspol clue to their persistence, hazard and bioaccumulation. Microorganisms are highly sensitive to heavy metal pollution and play an important role in the material cycling and energy flow of the ecosystem. In order to further explore the influence of heavy metals on the diversity, composition, and function of microbial communities in the wetland sediment ecosystem, and to find suitable indicators to reflect heavy metal pollution status, we collected sediments [...]. We found that: the contamination status of the study area stood at a moderate level evaluated by the pollution load index (PL1); heavy metals explained more of microbial community variation than the sediment physicochemical properties; in particular, Cr and Mn negatively affected microbial u-diversity; heavy metals significantly affected the structure of microbial communities, elements Cr, Pb, and Zn showed uniformly negative associations with the relative abundance of bacteria Nitrospirae (including class Nitrospira and order Nitrospirales), Bacteroidetes (including class Bucteroidiu), and Verracomicrobia; moreover, heavy metals affected predicted functions of microbial communities, including metabolic functions, genetic information processes, and functions related to the carbon cycle and the nitrogen cycle. Based on the relative abundance of sensitive microbial taxa and predicted functions, bioindicators [Bacteroidial, 1; Nitrospiral, 1/fNitnficationl, and 1/l-Aerobic nitrite oxidation; were established to reflect and predict the contamination status of heavy metals in sediments. Our in-depth research on the effects of heavy metals on microorganisms and the establishment of bioindicators provide references and new perspectives for environmental monitoring and management.

Accès au document

Physicochemical properties, metal availability and bacterial community structure in heavy metal-polluted soil remediated by montmorillonite-based amendments

Authors: Qin CC, Yuan XZ, Xiong T...

Source: CHEMOSPHERE 261, 2020, DOI: 10.1016/j.chemosphere.2020.128010

Abstract: Clay materials are commonly used in remediation techniques for heavy metal contaminated soil. In this study, a magnesium (Mg(OH)(2)/MgO)-montmorillonite was proposed to be utilized for heavy metals immobilization in contaminated soil, with the remediation efficiency evaluated through the toxicity characteristic leaching procedure (TCLP) and the community bureau of reference sequential extraction procedure (BCR). The addition of magnesium-montmorillonite resulted in lower TCLP extractability for the heavy metals (Cu, Pb, Zn and Cd) [...] Meanwhile, MM raised the soil pH and water-soluble organic carbon (WSOC). It was demonstrated that the immobilization of heavy metal in the presence of magnesium-montmorillonite was primarily induced by electrostatic attraction, precipitation and chelation with water-soluble organic carbon. Interestingly, a decreased bacterial community diversity was observed in soil treated by magnesium-montmorillonite (MM). The presence of pure magnesium-montmorillonite promoted the relative abundance of Proteobacteria, Actinobacteria and Firmicutes but reduced that of Bacteroides and Acidobacteria. Our results suggest that integrating the biochar into montmorillonite-based amendments can alleviate the damage to soil microorganisms by weakening the negative correlation between the two factors (content clay and WSOC in soil) and soil bacteria.

Accès au document

Spatial Distribution of Toxic Metal(loid)s and Microbial Community Analysis in Soil Vertical Profile at an Abandoned Nonferrous Metal Smelting Site

Authors: Yang JJ, Wang SQ, Guo ZW...

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 17(19), 2020, DOI: 10.3390/ijerph17197101

Abstract: In this study soils at different depths were collected in a Zn smelting site located in Zhuzhou City, China, in order to understand toxic metal(loid)s distribution and microbial community in vertical soil profile at a smelting site. […] The results showed that the content of As, Pb, Cu, Cd, Zn, and Mn was relatively high in top soil in comparison to subsoil, while the concentration of Cr in subsoil was comparable with that in top soil due to its relative high background value in this soil layer. The bioavailability of Cd, Mn, Zn, and Pb was relative higher than that of As, Cr, and Cu. The diversity of soil microbial communities decreased with increasing depth, which might be ascribed to the decrease in evenness with increase in depth duo to the influence by environmental conditions, such as pH, TK (total potassium), CEC (cation exchange capacity), ORP (oxidation reduction potential), and Bio-Cu (bioavailable copper). The results also found Acidobacteria, Proteobacteria, Firmicutes, and Chloroflexi were dominant phyla in soil samples. At the genus level, Acinetobacter, Pseudomonas, and Gp7 were dominant soil microorganism. Besides, Environmental factors, such as SOM (soil organic matter), pH, Bio-Cu, Bio-Cd (bioavailable cadmium), and Bio-Pb (bioavailable lead), greatly impacted microbial community in surface soil (1-3 m), while ORP, TK, and AN concentration influenced microbial community in the subsoil (4-10 m).

Accès au document

Impact of Atrazine Exposure on the Microbial Community Structure in a Brazilian Tropical Latosol Soil

Authors: Fernandes AFT, Wang P, Staley C...

Source: MICROBES AND ENVIRONMENTS 35(2), 2020, DOI: 10.1264/jsme2.ME19143

Abstract: Atrazine is a triazine herbicide that is widely used to control broadleaf weeds. Its widespread use over the last 50 years has led to the potential contamination of soils, groundwater, rivers, and lakes. Its main route of complete degradation is via biological means, which is carried out by soil microbiota using a 6-step pathway. The aim of the present study was to investigate whether application of atrazine to soil changes the soil bacterial community. We used 16S rRNA gene sequencing and qPCR […] and assess the abundance of the atrazine degradation genes atzA, atzD, and trzN in a Brazilian soil. The results obtained showed that the relative abundance of atzA and trzN, encoding triazinc-initiating metabolism in Gram-negative and -positive bacteria, respectively, increased in soil during the first weeks following the application of atrazine. In contrast, the abundance of atzD, encoding cyanuric acid amidohydrolase -the fourth step in the pathway- was not related to the atrazine treatment. Moreover, the overall soil bacterial community showed no significant changes after the application of atrazine. Despite this, we observed increases in the relative abundance of bacterial families in the 4th and 8th weeks following the atrazine treatment, which may have been related to higher copy numbers of atzA and trzN, in part due to the release of nitrogen from the herbicide. The present results revealed that while the application of atrazine may temporarily increase the quantities of the atz4 and trzN genes in a Brazilian Red Latosol soil, it does not lead to significant and long-term changes in the bacterial community structure.

Accès au document

Analysis of Soil Fungal Community Structure on the Surface of Buried Polyethylene Terephthalate

Authors: Hirota Y, Naya M, Tada M...

Source: JOURNAL OF POLYMERS AND THE ENVIRONMENT, 2020, DOI: 10.1007/s10924-020-01960-z

Abstract: This study investigated communities that develop on the surface of polyethylene terephthalate (PET) while buried in situ. PET samples prepared with file or alkali were buried in mountain soils for up to 9 months. The composition of fungal communities in native soil and on the surface of buried PET was compared using denaturing gradient gel electrophoresis (DGGE). DGGE and subsequent cluster analyses based on band patterns demonstrated the variability of fungal communities between native soil and PET surfaces. Burial for 3 months reduced diversity indices of soil on the surface of filed PET, yet soil on the surface of alkali-treated PET retained high diversity index. Cluster analyses show that fungal community structure was initially dependent on the difference in microstructure after surface treatment. This dependence later switched to macrostructure-the shape of PET samples. Principal component analysis (PCA) was performed to assess relationships between the surface structure of PET sheets and fungal diversity. Results show that hydrophilicity of PET contributed to differences in structures between alkali-treated PET and other PET samples.

Accès au document

Response of soil bacterial communities to high petroleum content in the absence of remediation procedures

Authors: Galitskaya P, Biktasheva L, Kuryntseva P, Selivanovskaya S

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-11290-1

Abstract: Oil spills are events that frequently lead to petroleum pollution. This pollution may cause stress to microbial communities, which require long adaption periods. Soil petroleum pollution is currently considered one of the most serious environmental problems […]. It was found that the total petroleum hydrocarbon content did not decrease during this time; however, the proportion of petroleum fractions was altered. Petroleum pollution led to a short-term decrease in the bacterial 16S rRNA gene copy number. On the basis of amplicon sequencing analysis, it was concluded that bacterial community successions were similar in the three soils investigated. Thus, the phyla Actinobacteria and Proteobacteria and candidate TM7 phylum (Saccaribacteria) were predominant with relative abundances ranging from 35 to 58%, 25 to 30%, and 15 to 35% in different samples, respectively. The predominant operational taxonomic units (OTUs) after pollution belonged to the genera Rhodococcus and Mycobacterium, families Nocardioidaceae and Sinobacteraceae, and candidate class T\M7-3. Genes from the alkIII group encoding monoxygenases were the most abundant […]. The bacterial community structure after a high level of petroleum pollution changed because of proliferation of the cells that initially were able to decompose hydrocarbons, and in the second place, because proliferation of the cells that received these catabolic genes through horizontal transfer.

Accès au document

Bacterial diversity on an abandoned, industrial wasteland contaminated by polychlorinated biphenyls, dioxins, furans and trace metals

Authors: Girardot F, Allegra S., Pfendler S...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 748, 2020, DOI: 10.1016/j.scitotenv.2020.141242

Abstract: Most former industrial sites are contaminated by mixtures of trace elements and organic pollutants. Levels of pollutants do not provide information regarding their biological impact, bioavailability and possible interactions between substances. There is genuine interest in combining chemical analyses with biological investigations. We studied a brownfield where several industrial activities were carried out starting in the 1970s, (incineration of pyralene transformers, recovery of copper by burning cables in the open air). Four representative plots showing different levels of polychlorobiphenyls were selected. Organic and trace metal levels were measured together with soil pedological characteristics. […] Thus, the highest biological activity and the greatest bacteriological richness were observed in the plot that was less contaminated with trace metals, despite the high level of organic pollutants in the plot. Moreover, trace element pollution was associated with a relatively low presence of Actinobacteria and Rhizobia. The plot with the highest metal contamination was rich in metal-resistant bacteria such as Sphingomonadales, Geodermatophilaceae and KD4-96 (Chloroflexi phylum). Acidobacteria and Sphingomonadales, capable of resisting trace metals and degrading persistent organic pollutants, were dominant in the plots that had accumulated metal and organic contamination, but bacterial activity was lower in these plots than in the other plots.

Accès au document

On-line monitoring of repeated copper pollutions using sediment microbial fuel cell based sensors in the field environment

Authors: Liu L, Lu Y, Zhong WH, Meng L, Deng H

Source: SCIENCE OF THE TOTAL ENVIRONMENT 748, 2020, DOI: 10.1016/j.scitotenv.2020.141544

Abstract: Most microbial fuel cells (MFCs) based sensors rely on exoelectrogenic bacteria to sense contaminants. However, these sensors cannot monitor repeated pollutions unless the exoelectrogenic bacteria are recovered or reinoculated. To overcome this drawback, a novel sediment microbial fuel cell (SMFC) based sensor was developed for online and in situ monitoring of repeated Cu2+ [...] Results show that the SMFC sensor generates one voltage peak in less than 20 s after each Cu2+ shock, regardless of the seasons and weather conditions, and the voltage increments frombaseline to peak exhibit linear correlation (R-2 > 0.92) with the logarithm of Cu2+ concentrations. Repeated Cu2+ pollutions do not decrease the baseline voltage, indicating that the activity of exoelectrogenic bacteriawas not significantly inhibited. Soil adsorbed and inactivated approximately 99% of total Cu2+. Only1% of total Cu2+ was the toxic exchangeable fraction, of which the concentrations were 0.73, 0.23, and 0.22 mg kg(-1) in the surface (0-3 cm), middle (3-6 cm), and bottom (6-11 cm) layers, respectively. The abundance of 16S rRNA gene transcripts of exoelectrogenic bacteria-associated genera is the lowest in the surface layer (2.86 x 10(11) copies g(-1)) and the highest in the bottom layer (7.99 x 10(11) copies g(-1)). Geobacter, Clostridium, Anaeromyxobacter, and Bacillus are the most active exoelectrogenic bacteria-associated genera in the soil. This study suggests that the SMFC sensor could be applied inwetlands to monitor the repeated discharge of Cu2+ and other heavy metals.

Accès au document

Effects of residual S-metolachlor in soil on the phyllosphere microbial communities of wheat (*Triticum aestivum* L.)

Authors: Xu NH, Qu Q, Zhang ZY...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 748, 2020, DOI: 10.1016/j.scitotenv.2020.141342

Abstract: S-metolachlor (S-ME) is a widely used chiral herbicide that can cause potential ecological risks via long-term usage. In this work, we chose a model plant, wheat, as the test material to determine the effects of applying 10 mg/kg S-ME to soil on its fresh weight, chlorophyll and malondialdehyde (MDA) content, and superoxide dismutase (SOD) activity and the diversity and structural composition of the phyllosphere microorganisms after 7 and 14 days of exposure. Our work showed that this concentration of residual S-ME in soil only slightly decreased plant biomass and had little effect on lipid peroxida don, the antioxidant enzyme system and chlorophyll content. Interestingly, although the test concentration of S-ME did not exert strong inhibitory effects on the physiological activities of wheat, it decreased the diversity of phyllosphere microbial communities and changed their structure, indicating that microorganisms were more sensitive stress indicators. S-ME reduced the colonization by some beneficial bacteria related to plant nitrogen fixation among the phyllosphere microorganisms, which influenced the growth and yield of wheat because these bacteria contribute to plant fitness. In addition, S-ME affected the association between the host and the composition of the phyllosphere microbial communities under different growth conditions. Our work provides insights into the ecological implications of the effects of herbicides on the phyllosphere microbiome.

Accès au document

Impact of Atrazine Exposure on the Microbial Community Structure in a Brazilian Tropical Latosol Soil

Authors: Fernandes AFT, Wang P, Staley C...

Source: MICROBES AND ENVIRONMENTS 35(2), 2020, DOI: 10.1264/jsme2.ME19143

Abstract: Atrazine is a triazine herbicide that is widely used to control broadleaf weeds. Its widespread use over the last 50 years has led to the potential contamination of soils, groundwater, rivers, and lakes. Its main route of complete degradation is via biological means, which is carried out by soil microbiota using a 6-step pathway. The aim of the present study was to investigate whether application of atrazine to soil changes the soil bacterial community. We used 16S rRNA gene sequencing and qPCR to elucidate the microbial community structure and assess the […]. The results obtained showed that the relative abundance of atzA and trzN, encoding triazinc-initiating metabolism in Gram-negative and -positive bacteria, respectively, increased in soil during the first weeks following the application of atrazine. In contrast, the abundance of atzD, encoding cyanuric acid amidohydrolase -the fourth step in the pathway- was not related to the atrazine treatment. Moreover, the overall soil bacterial community showed no significant changes after the application of atrazine. Despite this, we observed increases in the relative abundance of bacterial families in the 4th and 8th weeks following the atrazine treatment, which may have been related to higher copy numbers of atzA and trzN, in part due to the release of nitrogen from the herbicide. The present results revealed that while the application of atrazine may temporarily increase the quantities of the atz4 and trzN genes in a Brazilian Red Latosol soil, it does not lead to significant and long-term changes in the bacterial community structure.

Accès au document

Lichen-forming fungi in postindustrial habitats involve alternative photobionts

Authors: Osyczka P, Lenart-Boron A, Boron Pi, Rola K

Source: MYCOLOGIA, 2020, DOI: 10.1080/00275514.2020.1813486

Abstract: Mycobionts of many lichen genera appear to demonstrate strong selectivity in the choice of algal partner. The biological properties of a photobiont and its availability in an environment significantly determine the habitat requirements of lichens. […] Photobionts Asterochloris and Trebouxia were identified in the studied lichen species; however, the presence of Trebouxia was directly related to anthropogenic sites with technogenic substrates, and the proportion of lichen specimens with these algae clearly depended on the level of heavy-metal soil pollution and the habitat type. The total number of algal haplotypes increased with increasing soil pollution, and the richness was associated more with soil pollution than with a given lichen species. Additionally, a large number of lichen individuals bearing multiple algal genotypes at polluted sites were recorded. Although *Cladonia lichens* were previously thought to be restricted to Asterochloris, they are able to start the relichenization process with Trebouxia under specific habitat conditions and to establish a stable association with these algae when colonization of disturbed sites takes place. Comparative analysis of the internal transcribed spacer (ITS) rDNA sequences revealed as many as 13 haplotypes of Trebouxia, and phylogenetic analysis grouped them into two different clades. Such a high level of genetic diversity indicates that Trebouxia is well adapted to metal pollution and could be an alternative photosynthetic partner for certain lichens, especially in polluted sites.

Accès au document

Antibiotics increased host insecticide susceptibility via collapsed bacterial symbionts reducing detoxification metabolism in the brown planthopper, *Nilaparvata lugens*

Authors: Tang T, Zhang YH, Cai TW...

Source: JOURNAL OF PEST SCIENCE, 2020, DOI: 10.1007/s10340-020-01294-8

Abstract: Symbionts participate in various physiological activities of their insect hosts, including detoxification metabolism. Emerging evidence has revealed that the bacterial symbiont Arsenophonus is involved in insecticide detoxification metabolism of *Nilaparvata lugens*, which harbors diverse symbionts. However, it is still unknown whether other bacterial symbionts have a functional role in this process. This study showed that pretreatment with antibiotics significantly increased *N. lugens* susceptibility to imidacloprid, chlorpyrifos, and clothianidin, and the detoxifying enzyme activities of the cytochrome P450 enzyme (P450) and glutathione S-transferase (GST) were significantly inhibited. Notably, the P450 genes NlCYP6ER1 and NlCYP4CE1, which are related to imidacloprid metabolism, were dramatically downregulated in ciprofloxacin- and tetracycline-pretreated N. lugens, respectively. Furthermore, the expression levels of various detoxifying genes (GSTs and P450s) were significantly positively correlated with Wolbachia, Arsenophonus, Acinetobacter, and Staphylococcus. These results indicated that bacterial symbionts may affect insecticide metabolism by regulating the expression of the insect host's GST and P450 genes, and provide a foundation for further study on the mechanism of symbiont-mediated host detoxification metabolism in insect pests.

Accès au document

Response of ammonia-oxidizing archaea and bacteria to sulfadiazine and copper and their interaction in black soils

Authors: Liu XJ, Shao YF, Dong YP...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-11356-0

Abstract: [...] copper (Cu) and sulfadiazine (SDZ), were selected as target pollutants to evaluate the toxicity and interaction of antibiotics and heavy metals on ammonia oxidizers diversity, potential nitrification rate (PNR), and enzymatic activity in black soils. The results showed that soil enzyme activity was significantly inhibited by single Cu pollution, but the toxicity could be reduced by introducing low-concentration SDZ (5 mg center dot kg(-1)), which showed an antagonistic effect between Cu and SDZ (5 mg center dot kg(-1)), while the combined toxicity of high-concentration SDZ (10 mg center dot kg(-1)) and Cu were strengthened compared with the single Cu contamination on soil enzymes. In contrast, soil PNR was more sensitive to single Cu pollution and its combined pollution with SDZ than the enzyme activity. Real-time fluorescence quota PCR and Illumina Hiseq/Miseq sequencing results showed that ammonia-oxidizing archaea (AOA) was decreased in C2 (200 mg center dot kg(-1) Cu treatment) and ammonia-oxidizing bacteria (AOB) was obviously stimulated in soil contaminated in C2, while in S5 (5 mg center dot kg(-1) SDZ treatment), AOB was decreased; both AOA and AOB were significantly decreased at gene level in soils with combined pollutants (C2S5, 200 mg center dot kg(-1) Cu combined with 5 mg center dot kg(-1) SDZ). So, it can be concluded that combined pollution can cause more serious toxicity on the enzymatic activity, PNR, and ammonia-oxidizing microorganisms in soil through the synergistic effect between heavy metals and antibiotics pollutants.

Accès au document

The recruitment of bacterial communities by the plant root system changed by acid mine drainage pollution in soils

Authors: Li Y, Yuan L, Xue S...

Source: FEMS MICROBIOLOGY LETTERS 367(15), 2020, DOI: 10.1093/femsle/fnaa117

Abstract: This study aims to better understand the relationship between the response to acid mine drainage (AMD) stress of tolerant plants and changes in root-related bacterial communities. […]. The results showed that the effect of AMD pollution on root-associated bacterial communities was greater than that of rhizo-compartments. Proteobacteria were dominant across the rhizo-compartments between treatments. The microbiomes of unpolluted treatments were enriched by Alphaproteobacteria and Betaproteobacteria and depleted in Gammaproteobacteria ranging from the rhizoplane into the endosphere. However, the opposite trend was observed in the AMD pollution treatment, namely, Gammaproteobacteria were enriched, and Alphaproteobacteria and Deltaproteobacteria were mostly depleted. In addition, endophytic microbiomes were dominated by Comamonadaceae and Rhodocyclaceae in the unpolluted treatment and by Enterobacteriaceae in the AMD-polluted soils. PICRUSt showed that functional categories associated with membrane transport, metabolism and cellular processes and signaling processes were overrepresented in the endosphere of the AMD-polluted treatment. In conclusion, our study reveals significant variation in bacterial communities colonizing rhizo-compartments in two soils, indicating that plants can recruit functional bacteria to the roots in response to AMD pollution.

Accès au document

Transition management for organic agriculture under citrus cultivation favors fungal diversity in soil

Authors: Scotton JC, Homma SK, Costa WLF...

Source: RENEWABLE AGRICULTURE AND FOOD SYSTEMS 35(2):120-127, 2020, DOI: 10.1017/S1742170518000352

Abstract: The present international scenario recognizes organic agriculture as an innovative solution […]. This work investigated the influence of transitional management - TM (from conventional to organic agriculture) on the soil fungal community under citrus, in dry and rainy periods. From 2012 to 2015 on, an area in Mogi Guacu, SP, Brazil was selected, and two treatments were installed: a conventional management (CM) system based on farming practices with agrochemicals and fertilizers use, and another, transition management (TM) based on a 25% reduction per year of the chemical substances used in CM, with soil conditioner bokashi introduced. The performance of the transition system was evaluated in the context of soil fertility and diversity index of fungal taxa, by plate culture isolation, through the richness of Margalef (D-mg), diversity of Shannon (H ') and reverse Simpson (D). Differences in the occurrence and frequency of Paecilomyces, greater under CM and Penicillium, greater under TM, highlighted the influence of the management system employed. Richness and diversity indices were higher under TM. Principal component analysis revealed that 49.9% of the differences in fungal diversity was due to the management system. Only 16.5% was a result of the season of sampling. Four years of reduction/replacement of chemical practices in TM was sufficient to modify and favor some soil fungal taxa and consequently their activity. This research brings promising results to organic agriculture initiatives with relevant results for a tropical climate area.

Accès au document

Impact of TiO2 and ZnO Nanoparticles on Soil Bacteria and the Enantioselective Transformation of Racemic-Metalaxyl in Agricultural Soil with Lolium perenne: A Wild Greenhouse Cultivation

Authors: Zhou Q, Zhang X, Wu Z

Source: JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY 68(40):11242-11252, 2020, DOI: 10.1021/acs.jafc.0c03959

Abstract: The effects of TiO2 and ZnO nanoparticles on soil bacteria and enantioselective transformation of racemic-metalaxyl (rac-metalaxyl) in agricultural soil with or without *Lolium perenne* were investigated in an outdoor greenhouse. After a 70-day exposure to 2% ZnO, microbial biomass carbon decreased by 66% and bacterial community composition significantly changed. Meanwhile, ZnO decreased chlorophyll cumulation in *L. perenne* by 34%. […]. TiO2 showed similar effects but to a lesser extent. *L. perenne* promoted the transformation of rac-metalaxyl and ingested TiO2 and ZnO. *L. perenne* changed the bacterial co-occurrence networks and biomarkers in native soil and soil exposed to TiO2 and ZnO. *L. perenne* reduced the inhibition effects of TiO2 and ZnO on the transformation of rac-metalaxyl. The decrease in the relative abundance of soil keystone taxa such as Acidobacteria and Gemmatimonas might respond to the corresponding slow transformation of rac-metalaxyl in soils exposed to TiO2 and ZnO, regardless of *L. perenne*. Our results demonstrated the existence of mutual interactions among the impact of engineered nanoparticles on different components (microbes, plants, and coexisting pollutants) in the terrestrial ecosystem.

Accès au document

Vegetation drives the structure of active microbial communities on an acidogenic mine tailings deposit

Authors: Gagnon V, Rodrigue-Morin M, Tremblay J...

Source: PEER J 8, 2020, DOI: 10.7717/peerj.10109

Abstract: […] In order to decipher how environmental conditions on a mine site can influence the dynamics of microbial communities, we characterized the rhizosphere soil microbial communities associated with paper birch, speckled alder, and spruce that had naturally colonized an acidogenic mine tailings deposit containing heavy metals. The study site, which had been largely undisturbed for five decades, had highly variable vegetation density; with some areas remaining almost barren, and others having a few stands or large thickets of mature trees. Using Illumina sequencing and ordination analyses (redundancy analysis and principal coordinate analysis), our study showed that soil bacterial and fungal community structures correlated mainly with vegetation density, and plant species. Tailings without any vegetation were the most different in bacterial community structure, compared to all other areas on the mine site, as well as an adjacent natural forest (comparison plot). […] Furthermore, alder rhizosphere showed a greater relative abundance of *Bradyrhizobium* sp. (in comparison with birch and spruce) as well as Haliangium sp. (in comparison with birch). In contrast, fungal community structures were similar across the tailings deposit regardless of vegetation density, showing a greater relative abundance of *Hypocrea* sp. Tailings deposit fungal communities were distinct from those found in boreal forest soils. Alder rhizosphere had greater relative abundances of *Hypocrea* sp. and *Thelephora* sp., while birch rhizosphere were more often associated with Mollisia sp. Our

results indicate that, with increasing vegetation density on the mine site, the bacterial communities associated with the individual deciduous or coniferous species studied were increasingly similar to the bacterial communities found in the adjacent forest. In order to properly assess and restore disturbed sites, it is important to characterize and understand the plant-microbe associations that occur since they likely improve plant fitness in these harsh environments.

Accès au document

The effect of the pesticide delivery method on the microbial community of field soil

Authors: Prudnikova S, Streltsova N, Volova T

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-11228-7

Abstract: The study deals with the effects of herbicides (metribuzin, tribenuron-methyl, fenoxaprop-P-ethyl) and fungicides (tebuconazole, epoxiconazole, azoxystrobin) applied to soil as free pesticides or as slow release formulations embedded in a biodegradable composite matrix on the structure of the soil microbial community. The matrix consisted of a natural biopolymer poly-3-hydroxybutyrate [P(3HB)] and a filler-one of the natural materials (peat, clay, and wood flour). The soil microbial community was characterized, including the major eco-trophic groups of bacteria, dominant taxa of bacteria and fungi, […]. The addition of free pesticides adversely affected the abundance of soil microorganisms; the decrease varied from 1.4 to 56.0 times for different types of pesticides. The slow release pesticide formulations, in contrast to the free pesticides, exerted a much weaker effect on soil microorganisms, no significant inhibition in the abundance of saprotrophic bacteria was observed, partly due to the positive effects of the composite matrix (polymer/natural material), which was a supplementary substrate for microorganisms. The slow release fungicide formulations, like the free fungicides, reduced the total abundance of fungi and inhibited the development of the phytopathogens Fusarium and Alternaria. Thus, slow release formulations of pesticides preserve the bioremediation potential of soil microorganisms, which are the main factor of removing xenobiotics from the biosphere.

Accès au document

Interactions between Hg and soil microbes: microbial diversity and mechanisms, with an emphasis on fungal processes

Authors: Durand A, Maillard F, Foulon J, Chalot M

Source: APPLIED MICROBIOLOGY AND BIOTECHNOLOGY, 2020, DOI: 10.1007/s00253-020-10795-6

Abstract: Mercury (Hg) is a highly toxic metal with no known biological function, and it can be highly bioavailable in terrestrial ecosystems. Although fungi are important contributors to a number of soil processes including plant nutrient uptake and decomposition, little is known about the effect of Hg on fungi. Fungi accumulate the largest amount of Hg and are the organisms capable of the highest bioaccumulation of Hg. While referring to detailed mechanisms in bacteria, this mini-review emphasizes the progress made recently on this topic and represents the first step towards a better understanding of the mechanisms underlying Hg tolerance and accumulation in fungal species and hence on the role of fungi within the Hg cycle at Hg-contaminated sites.

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS / ANTIBIOTIQUES ET ANTIBIORESISTANCES

Cyanobacterial blooms contribute to the diversity of antibiotic-resistance genes in aquatic ecosystems

Authors: Zhang Q, Zhang ZY, Lu T...

Source: COMMUNICATIONS BIOLOGY 3(1), 2020, DOI: 10.1038/s42003-020-01468-1

Abstract: Cyanobacterial blooms are a global ecological problem that directly threatens human health and crop safety. Cyanobacteria have toxic effects on aquatic microorganisms, which could drive the selection for resistance genes. The effect of cyanobacterial blooms on the dispersal and abundance of antibiotic-resistance genes (ARGs) of concern to human health remains poorly known. We herein investigated the effect of cyanobacterial blooms on ARG composition in Lake Taihu, China.

Accès au document

Impacts of cadmium addition on the alteration of microbial community and transport of antibiotic resistance genes in oxytetracycline contaminated soil

Authors: Guo HH, Xue SH, Nasir M...

Source: JOURNAL OF ENVIRONMENTAL SCIENCES 99:51-58, 2021, DOI: 10.1016/j.jes.2020.04.015

Abstract: The large-scale development in livestock feed industry has increased the chances of antibiotics and heavy metals contamination in the soil. The fate of antibiotic resistance genes (ARGs) and microbial community in heavy metals and antibiotic contaminated soil is still unclear. In this study, we investigated the effect of cadmium (Cd) addition on the transport of ARGs, microbial community and human pathogenic bacteria in oxytetracycline (OTC) contaminated soil. Results showed that the addition of OTC significantly increased the abundance of ARGs and intI1 in the soil and lettuce tissues. The addition of Cd to OTC treated soil further increased the abundance and translocation of ARGs and intI1. Moreover, Cd promoted the transfer of potential human pathogenic bacteria (HPB) into lettuce tissues. Compared with O10 treatment, the addition of Cd decreased the concentration of OTC in soil and lettuce tissue, but slightly increased the fresh weight of lettuce tissues. Redundancy analysis indicated that bacterial community succession is a major factor in ARGs variation. Network analysis indicated that the main host bacteria of ARGs were mainly derived from Proteobacteria. Correlation analysis showed that intI1 was significantly correlated with tetG, tetC, sul1, sul2, ermX, and ermQ. Meanwhile, potential HPB (Clostridium, and Burkholderia) was significantly correlated with intI1 and eight ARGs (tetG, tetC, tetW, tetX, sul1, sul2, ermX, and ermQ.). The findings of this study suggest that the addition of heavy metals to agricultural fields must be considered in order to reduce the transfer of ARGs in the soil and crops. (C) 2020 The Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences.

Accès au document

Impacts of cadmium addition on the alteration of microbial community and transport of antibiotic resistance genes in oxytetracycline contaminated soil

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Abstract: The large-scale development in livestock feed industry has increased the chances of antibiotics and heavy metals contamination in the soil. [...] In this study, we investigated the effect of cadmium (Cd) addition on the transport of ARGs, microbial community and human pathogenic bacteria in oxytetracycline (OTC) contaminated soil. Results showed that the addition of OTC significantly increased the abundance of ARGs and intI1 in the soil and lettuce tissues. The addition of Cd to OTC treated soil further increased the abundance and translocation of ARGs and intI1. Moreover, Cd promoted the transfer of potential human pathogenic bacteria (HPB) into lettuce tissues. Compared with O10 treatment, the addition of Cd decreased the concentration of OTC in soil and lettuce tissue, but slightly increased the fresh weight of lettuce tissues. Redundancy analysis indicated that bacterial community succession is a major factor in ARGs variation. Network analysis indicated that the main host bacteria of ARGs were mainly derived from Proteobacteria. Correlation analysis showed that intI1 was significantly correlated with tetG, tetC, sul1, sul2, ermX, and ermQ. Meanwhile, potential HPB (Clostridium, and Burkholderia) was significantly correlated with intI1 and eight ARGs (tetG, tetC, tetW, tetX, sul1, sul2, ermX, and ermQ.). The findings of this study suggest that the addition of heavy metals to agricultural fields must be considered in order to reduce the transfer of ARGs in the soil and crops.

Accès au document

Antibiotic resistance genes and bacterial community on the surfaces of five cultivars of fresh tomatoes

Authors: Sun YM, Guo G, Tian F...

Source: ECOTOXICOLOGY 2020, DOI: 10.1007/s10646-020-02303-3

Abstract: Antibiotic resistance genes and bacteria (ARGs and ARB) in vegetable or fruit pose risks to ecological environment health. However, the assessment of ARGs and ARB from one popular vegetable, fresh tomato, has not been carried out before. In this study, high-throughput quantitative PCR and 16S rRNA gene Illumina sequencing technology were used to explore the antibiotic resistance characteristics of bacteria on five common cultivars of fresh tomatoes from supermarket. A total of 191 ARGs and 10 mobile genetic elements (MGEs) were detected on the tomato surfaces. The distribution profile of ARGs and MGEs was different among samples, with the organic tomatoes showing more ARGs and MGEs number and relative abundance. Aminoglycoside resistance genes strA and strB, sulfonamide resistance gene sul1, and multidrug resistance gene qac Delta 1-01 were the predominant ARGs. Dominant MGEs were transposase genes, which might promote horizontal gene transfer (HGT) of ARGs. Network analysis indicated that fifteen bacterial families might be the potential hosts of ARGs, and the detected MGEs might have positive correlation with ARGs. These results revealed the bacterial ARGs and MGEs from fresh tomato, which might help guide human to pay more attention to ecological environment impacts of ARGs and ARB on the surfaces of vegetable or fruit.

Accès au document

Nematodes trophic groups changing via reducing of bacterial population density after sediment enrichment to ciprofloxacin antibiotic: Case study of Marine Mediterranean community

Authors: Nasri A, Allouche M, Hannachi A...

Source: AQUATIC TOXICOLOGY 228, 2020, DOI: 10.1016/j.aquatox.2020.105632

Abstract: An experiment was carried out using microcosms to evaluate the impact of the fluoroquinolone antibiotic on nematode trophic groups structure and bacterial abundance. Sediment samples were experimentally enriched with four increasing doses of ciprofloxacin [...]. Ciprofloxacin changed the trophic composition of nematodes taxa where the relative abundance of microvores (M), epigrowth feeders (EF) and ciliate consumers (CF), [...] was highly affected and significantly decreased in response to the increasing doses. Nevertheless, the abundance of deposit feeders (DF), optional predators (FP) and exclusive predators (Pr) showed a significant increase. Results from the multivariate analysis showed a clear impact of this antibiotic on nematode trophic assemblages. Microcosms treated with the three highest doses [D2, D3 and D4] were different from the control. [...] The SIMPER analysis results showed that the average dissimilarity continuously increased in the treated microcosms compared to the control. Furthermore, our results have shown that cipmfloxacin also leads to a significant decrease in bacterial density with the highest dose, which could explain the results obtained for nematode trophic groups distribution. Thus, the bacteriophages nematodes only use bacteria as a nutrition source and the lack or presence in small quantity of this food could induce a decrease in their abundance as well as changing of nematodes groups repartition.

Accès au document

Heavy metals and antibiotics resistance of bacteria isolated from Marchica lagoon: biodegradation of anthracene on submerged aerated fixed bed reactor

Authors: Benghait Y, Blaghen M

Source: ENVIRONMENTAL TECHNOLOGY, 2020, DOI: 10.1080/09593330.2020.1839133

Abstract: Heavy metals resistant and polyaromatic hydrocarbon (PAH)-degrading bacteria isolated from Marchica lagoon. Six isolates, *Pseudomonas putida*, *Orchobactrum antropi*, *Staphylococus epidermidis*, *Brevundimonas diminuta*, *Serratia ficaria* and *Bacillus anthracis* were characterized on the basis of biochemical and 16S rDNA. The strains that showed high resistance to heavy metals were also studied for their antibiotics resistance and growth kinetics. The minimal inhibitory concentrations (MIC) of metals at variant concentrations (10-38 mM) were determined in liquid and solid medium. Strains were showed an extreme resistance against metals with the MIC values of Cu (9 mM), Cd (6.25 mM), Cr (2.5 mM), Ag (0,625), and Hg (0,156). Furthermore, growth rates were decreased in the presence of metals (compared to the control). The anthracene elimination from synthetic wastewater was determined in a submerged aerobic fixed-film reactor. Optimal conditions for bacterium growth and biodegradation of anthracene are determined as: temperature of 37 degrees C, pH 7, and initial anthracene concentration of 20 mg/l. It emerged that at anthracene concentrations 5-40 mg/l, COD removal efficiency were 84.62%; 90.62%; 91.36% and 71.4% respectively.

Accès au document

Fate of integrons, antibiotic resistance genes and associated microbial community in food waste and its large-scale biotreatment systems

Authors: Wang P, Qiao Z, Li XN...

Source: ENVIRONMENT INTERNATIONAL 144, 2020, DOI: 10.1016/j.envint.2020.106013

Abstract: [...] Here, we investigated the initial and biologically treated FW in two major FW treatment systems of aerobic fermentation (AF) and anaerobic co-digestion (AcoD) processes. The total relative abundances of integrons and ARGs significantly increased from initial FW to treated FW. Among targeted ARGs, ermB and strB were predominant ARGs, which accounted for 52.58-95.28% of total abundance across all samples. Mantel test indicated that integrons (intl1 and intl2) were positively and significantly correlated with detected ARGs (Mantel test, r = 0.24, p < 0.05), suggesting integrons display significant contributions on driving ARG alteration during FW treatment processes. RDA results indicated that blaOXA, strB and blaTEM were more likely to be proliferated by potential host of Firmicutes (96.55-99.77%) in initial FW, while blaCTX- M and mefA were potentially enriched by Proteobacteria (17.12-49.82%) in AF system and ermB, sul1, aadA and tetQ were possibly enhanced by Bacteroidetes (27.43-43.71%) in AcoD system. Consideration of the higher enriched abundance of total ARGs (66.88 +/- 87.34 times) and the used inoculum sludge in AcoD-treated system, the resource utilization of anaerobically digested products should draw our more attentions. These findings would deepen our understanding of prevalence and proliferation of ARGs in FW treatment systems and serve as a foundation for guiding the application of biologically treated FW.

Accès au document

Response of *Cyperus involucratus* to sulfamethoxazole and ofloxacin-contaminated environments: Growth physiology, transportation, and microbial community

Authors: Xu JM, Liu XH, Lv Ya...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 206, 2020, DOI: 10.1016/j.ecoenv.2020.111332

Abstract: Plant-microbe is a complementary coupling system for antibiotics removing in constructed wetlands (CWs), [...]. Thus, the response of the plant-microbe coupling system to different levels of antibiotics (sulfamethoxazole (SMZ) and ofloxacin (OFL)) was investigated. The results showed that two antibiotic stressors have hormetic effects on plant growth, physiology, and microbial community evolution, and the antibiotic toxic effects presented as SMZ + OFL > SMZ > OFL. Antibiotic accumulation in the plants was in the order of roots > stems > leaves. Notably, the root attachments affected antibiotic transportation. The accumulation of antibiotics in the under-ground parts affected the rhizosphere microbial community structure, and the microorganisms were more sensitive to SMZ + OFL than the plants, with inflection points of 0.5 mg L-1 and 1 mg L-1, respectively. Pseudomonas was highly resistant to antibiotics, while Acid-ovorax and Devosia may play a role in antibiotic degradation. Correlation analysis and network analysis showed that antibiotic enrichment and the bacterial community contributed significantly to the abundance of antibiotic-resistant genes (ARGs), further revealing the co-occurrence of intl, ARGs, and the potential bacterial hosts.

Accès au document

Synergetic effect of antibiotic mixtures on soil bacterial N2O-reducing communities

Authors: Roose-Amsaleg C, David V, Alliot F, Guigon E, Crouzet O, Laverman AM

Source: ENVIRONMENTAL CHEMISTRY LETTERS, 2020, DOI: 10.1007/s10311-020-01117-3

Abstract: Antibiotics released in agricultural soils alter soil bacterial communities, inducing antimicrobial resistance and, in turn, canceling the efficiency of antibiotic drugs used for human and animal health. In soils, antibiotic impact on nitrogen cycling is poorly known, notably when antibiotic mixtures are applied. We hypothesized that the impact of antibiotic mixtures would have higher effects on denitrification. We exposed soil denitrifying bacteria enrichments to tetracycline, ofloxacin, sulfamethoxazole and tylosin, either applied single or as mixture of three antibiotics, during 7 days under denitrifying conditions. We measured the minimum inhibitory concentration of the N2O-reducing capacity of the bacterial enrichment, we deduced the half maximal effective concentration (EC50) from the experimental data and from the concentration addition hypothesis, and we quantifiednosZgene abundances. Results show that single antibiotic exposure inhibited N2O-reduction only for tetracycline at 64 mg/L. Inhibition by antibiotic mixtures always exceeded the modeled inhibition calculated by concentration addition. At high-antibiotic exposure, nosZgene clade I denitrifiers remained abundant, of 10(7)-10(8) copies/ng DNA.NosZgene clade II denitrifiers increased with antibiotic concentrations. Our findings reveal for the first time the synergistic effects of antibiotic mixtures on soil nitrogen cycling.

Accès au document

Deciphering the toxic effects of metals in gold mining area: Microbial community tolerance mechanism and change of antibiotic resistance genes

Authors: Yan CC, Wang F, Liu H...

Source: ENVIRONMENTAL RESEARCH 189, 2020, DOI: 10.1016/j.envres.2020.109869

Abstract: Mine tailing dumps represent significant threats to ecological environments due to the presence of toxic substances. The present work investigated the relationship among microbial activity, the community, antibiotic resistance genes (ARGs) and trace metals in soil surrounding gold mine tailings. Using microbial metabolic activity and high-throughput sequencing analysis, we found the trace metals Cd and Hg could be main factors influencing the microbial community. According to bacterial co-occurrence pattern analysis, the effects of total cadmium and total mercury on bacterial diversity are potentially mediated by influencing bacteria community in the keystone module II. Additionally, most of metal-resistant bacteria belong to Actinobacteria and Proteobacteria, and the metal tolerance suggested to be linked with various functions including replication, recombination and repair, as well as inorganic ion transport and metabolism based on PICRUSt2 analysis. We also found that metals generated by mining activity may trigger the co-selection of antibiotic resistance in the phyla Actinobacteria and Proteobacteria due to co-resistance or cross resistance. Additionally, PLS-PM analysis revealed that metals could indirectly affect ARGs by influencing bacterial diversity in gold mining areas.

Accès au document

Antibiotic-Resistant Bacteria in Hydroponic Lettuce in Retail: A Comparative Survey

Authors: Lam KL, Kong WP, Ling PY...

Source: FOODS 9, 9, 2020, DOI: 10.3390/foods9091327

Abstract: Hydroponic produce is gaining popularity due to its suitability for urban agriculture. The general public also considers that hydroponic produce is free from microbiological contamination. In this study, we compared the frequency and abundance of tetracycline-resistant and sulphadiazine-resistant bacteria and the minimal inhibitory concentration (MIC) of these isolates in conventional, organic, and hydroponic lettuce sold in retail. We also determined the frequency of samples carrying tetB, tetX, sul1, sul2, andint1 genes by PCR and further quantified the copy number of tetX, sul1, and int1 genes in samples positive for these genes using qPCR. As expected, the number of resistant bacteria and the MICs of these isolates were lowest in hydroponic lettuce and highest in organic lettuce. All tested resistant genes, exceptint1, were detected in samples of all three production methods, but no significant difference was observed between the three groups in the frequency of samples carrying the resistance genes examined or in their copy number. To the best of our knowledge, it is the first study directly reporting the existence of antibiotic-resistant bacteria and resistance genes in hydroponic vegetables sold in retail. The result highlights that the risk of antibiotic-resistant bacteria contamination in hydroponic produce should be further investigated.

Accès au document

Bacterial Community Tolerance to Tetracycline Antibiotics in Cu Polluted Soils

Authors: Santas-Miguel V, Arias-Estevez M, Diaz-Ravina M...

Source: AGRONOMY-BASEL 10(9), 2020, DOI: 10.3390/agronomy10091220

Abstract: The increase of bacterial community tolerance to Cu, and of cotolerance to the antibiotics tetracycline (TC), oxytetracycline (OTC) and chlortetracycline (CTC), was studied in three soils spiked with six different Cu concentrations (resulting in 0, 125, 250, 500, 750 and 1000 mg kg(-1)into soils) in a laboratory experiment, after 42 days of incubation. The results show significant increases of bacterial community tolerance to the metal when soil Cu concentrations were between 125 and 500 mg kg(-1). Moreover, Cu soil pollution also caused cotolerance to the three antibiotics studied but for higher Cu concentrations (1000 mg kg(-1)).

Accès au document

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Resistance to degradation and effect of the herbicide glyphosate on the bacterioplankton community of a large river system dominated by agricultural activities

Authors: Piccini C, Fazi S, Perez G…

Source: MARINE AND FRESHWATER RESEARCH 71, 8:1026-1032, 2020, DOI: 10.1071/MF19079

Abstract: Glyphosate-based herbicides are widely used for several crops, such as transgenic soybean and forestry. The aim of this study was to determine the effect of glyphosate on the community structure of riverine bacterioplankton and to evaluate the potential of bacterioplankton to degrade the herbicide. River water to which C-13-labelled glyphosate (10, 100 mu g L-1) was added or not (control) was incubated for 6 days at the temperature measured in situ (20 degrees C).

Accès au document

Novel aroA of Glyphosate-Tolerant Bacterium *Pseudomonas sp*. Strain HA-09 Isolated from Roundup-Contaminated Garden Soils in Iran

Authors: Ghaderitabar H, Mousavi A, Salmanian AH, Hadi F

Source: IRANIAN JOURNAL OF BIOTECHNOLOGY 18(3):80-87, 2020, DOI: 10.30498/IJB.2020.204133.2597

Abstract: Isolation and analysis of the epsps (aroA) gene responsible for glyphosate-tolerance in bacteria from Roundup-contaminated soils was the aim of this study.../...The genus of bacterium was identified as *Pseudomonas sp*. strain HA-09. The isolated aroA(HA-09) gene from this bacterium was approximately 2.2 kb in size. Bioassay of *E. coli* expressing this gene showed high tolerance to glyphosate (up to 300 mM).

Accès au document

Beneficial bacteria associated with *Mimosa pudica* and potential to sustain plant growth-promoting traits under heavy metals stress

Authors: Abdullahi S, Haris H, Zarkasi KZ...

Source: BIOREMEDIATION JOURNAL, 2021, DOI: 10.1080/10889868.2020.1837724

Abstract: The study was carried out to isolate and screen indigenous rhizobacteria associated with Mimosa pudica in ex-tin mining soil with the potential to sustain plant growth-promoting (PGP) traits under heavy metals (HM) stress condition.

Accès au document

The Aromatic Plant Clary Sage Shaped Bacterial Communities in the Roots and in the Trace Element-Contaminated Soil More Than Mycorrhizal Inoculation - A Two-Year Monitoring Field Trial

Authors: Raveau R, Fontaine J, Hijri M, Sahraoui, ALH

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.586050

Abstract: To cope with soil contamination by trace elements (TE), phytomanagement has attracted much attention as being an eco-friendly and cost-effective green approach. In this context, aromatic plants could represent a good option not only to immobilize TE, but also to use their biomass to extract essential oils, resulting in high added-value products suitable for non-food valorization. However, the influence of aromatic plants cultivation on the bacterial community structure and functioning in the rhizosphere microbiota remains unknown. Thus, the present study aims at determining in TE-aged contaminated soil (Pb - 394 ppm, Zn - 443 ppm, and Cd - 7ppm, respectively...) the effects of perennial clary sage (*Salvia sclarea* L.) cultivation, during two successive years of growth and inoculated with arbuscular mycorrhizal fungi, on rhizosphere bacterial diversity and community structure.

Accès au document

A novel pathway for initial biotransformation of dinitroaniline herbicide butralin from a newly isolated bacterium *Sphingopyxis* sp. strain HMH

Authors: Ghatge S, Yang Y, Moon S...

Source: JOURNAL OF HAZARDOUS MATERIALS 402, 2021, DOI: 10.1016/j.jhazmat.2020.123510

Abstract: Butralin (N -secButyl-4-tert-butyl-2,6-dinitroaniline) is a highly persistent dinitroaniline herbicide frequently detected in the environment. In this study, butralin-degrading soil bacterium, Sphingopyxis sp. strain HMH was isolated from agricultural soil samples. [...] The metabolites from butralin degradation by strain HMH and purified NfnB were identified using ultra performance liquid chromatography high resolution mass spectrometry (UPLC-HRMS), and a novel mechanism of butralin degradation was proposed.

Accès au document

Statistical evaluation of the bioremediation performance of *Ochrobactrum thiophenivorans* and *Sphingomonas melonis* bacteria on Imidacloprid insecticide in artificial agricultural field

Authors: Erguven GO, Demirci U

Source: JOURNAL OF ENVIRONMENTAL HEALTH SCIENCE AND ENGINEERING 18(2):395-402, 2020, DOI: 10.1007/s40201-019-00391-w

Abstract: Background Pesticides are applied directly on the soil or on the vegetation, and thus, they can reach the receiving environment easily. In this way, environmental damage that stems from pesticides also affects public health and the natural habitat. Pesticides are one of the most harmful pollutant groups in terms of human health, fauna and the environment. They

penetrate the application field and the applicator right after the application and start to show adverse effects. Methods The bioremediation of the Imidacloprid (C9H(10) ClN(5)O(2)) insecticide, which is used commonly in Mediterranean climate, was compared with some soil bacteria in artificially prepared fields.

Accès au document

Intra- and intersexual interactions shape microbial community dynamics in the rhizosphere of *Populus cathayana* females and males exposed to excess Zn

Authors: Liu M, Wang YT, Liu XC...

Source: JOURNAL OF HAZARDOUS MATERIALS 402, 2021, DOI: 10.1016/j.jhazmat.2020.123783

Abstract: In this study, we intended to investigate the responses of rhizospheric bacterial communities of Populus cathayana to excess Zn under different planting patterns. The results suggested that intersexual and intrasexual interactions strongly affect plant growth and Zn extraction in both sexes, as well as rhizosphere-associated bacterial com-munity structures.../...These results indicated that the sex of neighboring plants affected sexual differences in the choice of specific bacterial colonizations for phytoextraction and tolerance to Zn-contaminated soils, which might regulate the spatial segregation and phytoremediation potential of P. cathayana females and males under heavy metal contaminated soils.

Accès au document

Arbuscular mycorrhizal fungi-induced mitigation of heavy metal phytotoxicity in metal contaminated soils: A critical review

Authors: Riaz M, Kamran M, Fang YZ...

Source: JOURNAL OF HAZARDOUS MATERIALS 402, 2021, DOI: 10.1016/j.jhazmat.2020.123919

Abstract: This review summarized the current knowledge regarding AMF assisted remediation of heavy metals and some of the strategies used by mycorrhizal fungi to cope with stressful environments. Moreover, this review provides the information of both molecular and physiological responses of mycorrhizal plants as well as AMF to heavy metal stress which could be helpful for exploring new insight into the mechanisms of HMs remediation by utilizing AMF.

Accès au document

Effective Remediation Strategy for Xenobiotic Zoxamide by Pure Bacterial Strains, *Escherichia coli*, *Streptococcus pyogenes*, and *Streptococcus pneumoniae*

Authors: Ahmad KS, Sajid A, Gul MM, Ali D

Source: BIOMED RESEARCH INTERNATIONAL 2020, DOI: 10.1155/2020/5352427

Abstract: Zoxamide, a class IV hazardous fungicide, is perilous for the environment due to its highly persistent nature. Up till the current date, there are no reports on the biodegradation of zoxamide. The scarcity of knowledge in this domain led to the present research to evaluate the biodegradation of this benzamide fungicide by three bacterial strains, *Escherichia coli* (EC), *Streptococcus pyogenes* (SPy), and *Streptococcus pneumoniae* (SP).

Accès au document

Alleviation of lead toxicity and phytostimulation in perennial ryegrass by the Pb-resistant fungus *Trichoderma asperellum* SD-5

Authors: Sun X, Sun MJ, Chao Y...

Source: FUNCTIONAL PLANT BIOLOGY, 2021, DOI: 10.1071/FP20237

Abstract: Lead (Pb), a highly toxic metal ion, is detrimental to plants and humans. Existing botanical techniques for Pb-contaminated soil remediation are limited in their efficiency. Here, we investigated the use of the fungus *Trichoderma asperellum* Samuels, Lieckf & Nirenberg SD-5, which we identified previously as being Pb-resistant, for phytoremediation and for its effects on plant growth, Pb adsorption, and physiological responses in perennial ryegrass (*Lolium perenne* L. 'Lark').

Accès au document

Effect of riboflavin on active bacterial communities and arsenic-respiring gene and bacteria in arsenic-contaminated paddy soil

Authors: Qiao JT, Li XM, Li FB...

Source: GEODERMA 382, 2021, DOI: 10.1016/j.geoderma.2020.114706

Abstract: Riboflavin (RF) is a widely distributed micronutrient secreted by many bacteria and can serve as a redox mediator to facilitate extracellular electron transfer. [...] In this study, anaerobic microcosms were established with arsenic-contaminated paddy soil amended with RF and lactate. Arsenic and iron transformation showed that microbial As(V) and Fe(III) reduction took place principally within the first 12 days of incubation, when both occurred simultaneously and were substantially enhanced by RF. Dynamics of the active bacterial community (16S rRNA gene based) revealed that RF mainly increased the relative abundance of Geobacter, Clostridium, and Pelobacteraceae on days 0-12 and that of Dechloromonas on days 12-40, whereas RF had no influence on bacterial diversity. A transcript clone library of arrA gene was constructed to profile the dynamic shift of As(V)-respiring bacteria stimulated by RF, which indicated that As(V)-respiring Geobacter spp. dominated in the RF and lactate microcosms during the incubation period. Quantitative reverse transcription-PCR (RT-qPCR) analyses revealed that the transcription of arrA gene and Geobacter spp. predominantly increased during the first 5 days and was substantially enhanced by RF relative to microcosms with lactate alone. Co-occurrence network analysis indicated a positive correlation between the transcript abundance of arrA gene/Geobacter spp. and dissolved As (V) in the presence of RF and lactate. Our results demonstrate that RF stimulates the activity of indigenous dominant metal-reducing bacteria; moreover, it increases transcription of the As (V)-respiring gene and bacteria to facilitate arsenic reduction and release in arsenic-contaminated paddy soil.

Accès au document

Isolation, Characterization and Identification of Organophosphate Pesticide Degrading Bacterial Isolates and Optimization of their Potential to Degrade Chlorpyrifos

Authors: Ambreen S, asmin A

Source: INTERNATIONAL JOURNAL OF AGRICULTURE AND BIOLOGY 24(4):699-706, 2020, DOI: 10.17957/IJAB/15.1489

Abstract: Current study was aimed to isolate indigenous organophosphate (OP) degrading soil bacteria from agricultural soils of Mochh, district Mianwali, Pakistan. Among a large number of bacterial isolates obtained, four best bacterial isolates (MB490, MB497, MB498 and MB504) were selected based on their tolerance against multiple OP pesticides (Chlorpyrifos, Triazophos and Dimethoate), for further analyses to optimize their potential to degrade Chlorpyrifos (CPF). These isolates could tolerate 0.8-8 g L-1 of Chlorpyrifos, 2-4 g L-1 of Triazophos and 0.22-4 g L-1 of Dimethoate. These bacteria showed multiple heavy metal resistance and possessed enzymes like Nitrate reductase, Oxidase and Catalase needed for biodegradation. When analyzed for CPF degradation by HPLC, these isolates exhibited 67.22 to 99.48% degradation of CPF (200 mg L-1) in M-9 broth under wide range of pH (6, 7 and 8) and temperatures (25, 30 and 37.C). Strain MB490 displayed maximum CPF degradation at pH 6, while other three isolates were best at alkaline pH 8. Isolates MB490 and MB498 were best degraders of CPF at 37.0 in comparison to MB497 and MB504, which showed highest degradation at 30.C. These four strains were identified as *Pseudomonas kilonensis* MB490, *Bacillus thuringiensis* MB497, *Pseudomonas kilonensis* MB498 and *Pseudomonas sp*. MB504 based on 16S rRNA analysis. The above findings suggest that these novel isolates can be used efficiently under a wide range of temperature and pH for remediation of Chlorpyrifos polluted agricultural soils and water resources under local conditions.

Accès au document

Bioremediation potential of *Ganoderma lucidum* (Curt:Fr) P. Karsten to remove toxic metals from abandoned battery slag dumpsite soil and immobilisation of metal absorbed fungi in bricks

Authors: Ipeaiyeda AR, Adenipekun CO, Oluwole O

Source: COGENT ENVIRONMENTAL SCIENCE 6(1), 2020, DOI: 10.1080/23311843.2020.1847400

Abstract: Open disposal of battery slag is a major cause of heavy metals (HMs) pollution in soil. The current decontamination option is soil washing with chemicals whose efficiency is limited owing to high cost of reagents. This prompted the need for an environmentally friendly approach to remediate the contaminated soil. Therefore, the potential of Ganoderma lucidum to remediate heavy metals from an abandoned battery slag was investigated in this study. The heavy metals absorbed fungi were immobilised in bricks. The battery slag contaminated and control soil samples were analysed for HM concentrations before and after incubation with G. lucidium for 1-3 months. The harvested rice straw and mycelia were processed and analysed for HMs concentrations. For immobilizing heavy metals absorbed in mycelia, 5 to 30 g of pulverized mycelia were homogenized with a virgin soil, extruded into moulds and fired in a tunnel kiln for making bricks. The leachability of HMs from the bricks was carried out using TLCP. The concentrations (mg/kg) of Pb(4490 +/- 14), Zn(147 +/- 11), Ni(27.7 +/- 0.2), Cu(19.4 +/- 0.1) and Cd(2.18 +/- 0.06) in dumpsite soil were significantly higher than the corresponding concentrations in the control soil samples. The G. lucidum inoculated on contaminated soil accumulated 138, 29.8, 3.48, 3069 and 1.01 mg/kg of Pb, Zn, Ni, Cu and Cd, respectively. This reveals the strong affinity of G. lucidum for toxic metals. The Pb, Zn, Ni, Cu and Cd immobilised after leaching procedure ranged from 45.3 to 98.10%. Immobilisation of toxic metals hosted by G. lucidum in red bricks can reduce environmental contamination by metals.

Accès au document

Immobilization of exchangeable Cd in soil using mixed amendment and its effect on soil microbial communities under paddy upland rotation system

Authors: Gong LD, Wang JW, Abbas T...

Source: CHEMOSPHERE 262, 2021, DOI: 10.1016/j.chemosphere.2020.127828

Abstract: [...] In this study, we mixed lime, zeolite, calcium magnesium phosphate fertilizer, and biochar in a mixture ratio of 71:23:5:1 to form a mixed amendment. Field and laboratory experiments were conducted to study the effects of the mixed amendment on soil exchangeable Cd content, plant Cd accumulation, and soil microbial community. It was found that the application of 0.5% mixed amendment decreased exchangeable soil Cd by more than 85% and 64% in wheat and rice season, respectively, compared with control (CK), without increasing pH. Moreover, the application of 0.5% mixed amendment decreased Cd accumulation in grains by 22.9% and 41.2% in wheat and rice season, respectively, compared to CK. The result of phospholipid fatty acids (PLFAs) shows that the level of soil microbial diversity and species richness under mixed amendment treatments were higher than in lime treatment, indicating more copiotrophic conditions and faster rate of nutrient turnover in mixed amendment than pure lime treatment. Hence, it concluded that the mixed amendment has a strong effect on fixing exchangeable soil Cd and reducing the accumulation of Cd in crops. Finally, it was observed that the mixed amendment improved the soil microbial community structure and accelerate the rate of nutrient turnover by microbes under this favorable condition comparative to individual treatments.

Accès au document

Application of fungal laccase for heavy metals precipitation using tannin as a natural mediator

Authors: Ahmadi Khozani M, Emtiazi G, Aghaei S...

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY 2020, DOI: 10.1007/s13762-020-02992-7

Abstract: Nowadays, natural compounds have generated innovative attention for metal removal and precipitation; here, a fungus was isolated from soil samples in tannin media for metal removal. The isolate was identified as 'Albifimbria viridis & apos; by morphology and amplification of specific sequence. The isolate produced high activities of laccase when induced with tannin. The cell-free supernatant with 50 U/ml laccase activities could remove nickel, cobalt, cadmium, and copper nitrate salts by 59.69%, 59.75%, 46.97%, and 66.79%, respectively, while the precipitation of crude enzyme and metal salts by Fourier transform infrared spectroscopy analyses showed that only 2 metal salts (Cobalt and Copper nitrate) are precipitated in oxide form. Tannin was used as a mediator for metal removal, and the data were supported using a zymogram with partially purified laccase and metal precipitation on polyacrylamide gel electrophoresis. A 66 KDa laccase can remove metals and tannin. The metal interaction by this isolated compared with Phanerochaete chrysosporium and Aspergillus niger. All studied fungi could biodegrade the tannin as sole carbon source; however, for maximum activities, the new isolate Albifimbria viridis was selected in further study. The purified fungus in this study is a herbicide and has a high activity of laccase. The precipitation of metals by the enzyme of grown fungus in tannic acid is reported for the first time, which promoted the functional importance of this fungus.

Accès au document

Microalgae effects on the biochemical parameters of barley grown on soil contaminated with petroleum products

Authors: Koleva-Valkova L, Petrov V, Harizanova A, Sevov A

Source: SCIENTIFIC PAPERS-SERIES A-AGRONOMY 63(1): 688-695

Abstract: A strategy to alleviate soil toxicity, which is gaining popularity in the last years, is bioremediation by inoculation with specific microorganisms. In the present study, we tested the influence of a mixture of four microalgae strains (*Scenedesmus incrassatulus, Trachydiscus minutus, Chlorella* sp. and *Phormidium* sp.) on some biochemical parameters of barley plants cultivated on soil contaminated with petroleum products. The aim was to evaluate the effect of microalgae suspension treatment on soil health and on the potential for phytoremediation. For the purpose, the nitrogen assimilation capacity, the levels of oxidative stress as well as the state of both enzymatic and non-enzymatic antioxidant systems in plants were measured. The results clearly show that petroleum-contaminated soil adversely affects the growth and development of the model culture, while treating the soil with the microalgae suspension significantly mitigates the negative impact. This is supported by the lower levels of stress markers and the increasing of some antioxidants in the plants grown on microalgae-treated soil. Therefore, the application of microalgae is an environmentally friendly strategy for improving soil health in areas affected by petroleum pollution.

Improving soybean growth under arsenic stress by inoculation with native arsenic-resistant bacteria

Authors: Oller ALW, Regis S, Armendariz AL...

Source: PLANT PHYSIOLOGY AND BIOCHEMISTRY 155:85-92, 2020, DOI: 10.1016/j.plaphy.2020.07.015

Abstract: Certain metal (loid)-resistant bacteria that inhabit the rhizosphere have shown to improve plant growth and tolerance under toxic metal stress. In this study, we tested if six native, arsenic-resistant and plant growth promoting bacteria (PGPB) were able to enhance soybean (*Glycine max* L.) growth and modulate arsenic (As) uptake. As a previous work, we tested all single isolates and all possible binary combinations without arsenic stress to identify the combinations that would have the greatest plant growth promoting effect. In this study, a screening assay was performed with only five inoculation options selected after first stage (*Pseudomonas* sp. AW4, *Pseudomonas* sp. AW6, AW4+AW6, *Rhodococcus* sp. AW3+ *Pseudomonas* sp. AW5 and *Enterobacter* sp. AW1+AW6). In both stages, inoculation was implemented by imbibition of soybean seeds with bacterial suspensions, and plant growth was carried out in pots using perlite as substrate in a chamber with controlled conditions. In the third stage, we performed similar assays, under As stress, using the three most promising inoculation options (AW4, AW6 and AW3+AW5). Treatments were performed by irrigation with 25 mu M arsenite (As3+), 25 µM arsenate (As5+), 25 µM equimolar As3+/As5+ solution or water (control). Biometric and biochemical parameters indicated that inoculation with *Pseudomonas* sp. AW4 significantly promoted soybean growth under As3+/As5+ treatment and did not modified As accumulation pattern. Further field studies are needed to determine if some of these inoculation options are useful to improve in situ soybean growth under arsenic stress and could become a tool for the development of sustainable agriculture in As-impacted environments.

Accès au document

Characterizing the bacterial consortium ASDF capable of catabolic degradation of fluoranthene and other mono- and poly-aromatic hydrocarbons

Authors: Vaidya SS, Patel AB, Jain K...

Source: BIOTECH 10(11), 2020, DOI: 10.1007/s13205-020-02478-w

Abstract: In this study, a bacterial consortium ASDF was developed, capable of degrading fluoranthene (a non-alternant poly-aromatic hydrocarbon). It comprised of three bacterial strains: *Pseudomonas* sp. ASDF1, *Burkholderia* sp. ASDF2 and *Mycobacterium* sp. ASDF3 capable of degrading 100 mg/L of fluoranthene under experimentally defined and optimum conditions (37 degrees C, pH 7.0, 150 rpm) within 7 days. […]. Fluoranthene degradation is an aerobic process, therefore with increasing the gyratory shaking from 50 to 150 rpm, degradation was concurrently enhanced by 7.1-fold. The synthetic surfactants SDS and CTAB had antagonistic effect on fluoranthene degradation (decreased up to 2.8-fold). The proficiency of consortium was assessed for its inherent ability to degrade seven other hydrocarbons both individually as well as in mixture. The degradation profile was studied using HPLC and the detection of two degraded intermediates (salicylic acid and derivatives of phthalic acid) suggested that fluoranthene degradation might have occurred via ortho- and meta-cleavage pathways. The competency of consortium was further validated through simulated microcosm studies, which showed 96% degradation of fluoranthene in soil ecosystem under the ambient conditions. Hence, the study suggested that the consortium ASDF has an inherent potential for its wide applicability in bioremediation of hydrocarbon-contaminated sites.

Accès au document

Response of soil bacterial communities to high petroleum content in the absence of remediation procedures

Authors: Galitskaya P, Biktasheva L, Kuryntseva P...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2020, DOI: 10.1007/s11356-020-11290-1

Abstract: […] In the present work, processes occurring in the bacterial communities of three soil samples with different physicochemical characteristics, artificially polluted with 12% of crude oil, were investigated in 120-day laboratory experiment. It was found that the total petroleum hydrocarbon content did not decrease during this time; however, the proportion of petroleum fractions was altered. Petroleum pollution led to a short-term decrease in the bacterial 16S rRNA gene copy number. […]. The predominant operational taxonomic units (OTUs) after pollution belonged to the genera Rhodococcus and Mycobacterium, families Nocardioidaceae and Sinobacteraceae, and candidate class T\M7-3. Genes from the alkIII group encoding monoxygenases were the most abundant compared with other catabolic genes from the alkI, alkII, GN-PAH, and GP-PAH groups, and their copy number significantly increased after pollution. The copy numbers of expressed genes involved in the horizontal transfer of catabolic genes, FlgC, TraG, and OmpF, also increased after pollution by 11-33, 16-63, and 11-71 times, respectively. The bacterial community structure after a high level of petroleum pollution changed because of proliferation of the cells that initially were able to decompose hydrocarbons, and in the second place, because proliferation of the cells that received these catabolic genes through horizontal transfer.

Accès au document

A core seed endophytic bacterial community in the hyperaccumulator *Noccaea caerulescens* across 14 sites in France

Authors: Durand A, Sterckeman T, Gonnelli C...

Source: PLANT AND SOIL 2020, DOI: 10.1007/s11104-020-04743-6

Abstract: […] This work aims to characterize the endophytic bacterial communities associated with hyperaccumulating seeds collected from their native ecosystems (nonmetalliferous or calamine soils). Methods Using 16S rRNA metabarcoding, endophytic bacterial communities were characterized for seeds from 14 Noccaea caerulescens populations. Plant genomes and environmental properties of the sites had previously been described. Results In all plant populations the metabarcoding revealed a large SEB core microbiome composed of the main phyla and sub-phyla: gamma-Proteobacteria (56.56%) > alpha-Proteobacteria (32.23%) > Actinobacteria (7.93%) > Firmicutes (3.78%). According to the literature, some operational taxonomic units (OTUs) found in the core microbiome may be related to "plant growth promoting endophytes" (PGPE). The changes in the relative abundance of phyla/subphyla were correlated to altitude, pH, and soil exchangeable elements (Al, Mg, Cd, Mn, Zn), yet the main parameters observed to drive SEB diversity were the plants' genetics. Conclusion The distinction between populations based on calamine soils and nonmetalliferous soils failed to explain the SEB communities' structural dissimilarities. In fact, the factor that best explained these dissimilarities was the plant's genetic subunit. Future research, based on transcriptomic approaches, should study the ecological roles of the SEB communities and their involvement in the adaptation of hyperaccumulators to metalliferous soils.

Accès au document

Investigating critical parameters for bioremoval of heavy metals from computer printed circuit boards using the fungus *Aspergillus niger*

Authors: Arshadi M, Esmaeili A, Yaghmaei S

Source: HYDROMETALLURGY 197, 2020, DOI: 10.1016/j.hydromet.2020.105464

Abstract: In this article, bioleaching of computer printed circuit boards (CPCBs) was examined using *Aspergillus niger* with one-step, two-step, and spent-medium bioleaching methods. […] Under optimal conditions - pH of 5.15, pulp density of 10 g/l, 1E + 007 spores of *A. niger*, and 4.5 days for the sample adding time - 97% and 74% of Cu and Ni were recovered, respectively. Two-step bioleaching and spent medium bioleaching were respectively identified as the best methods for maximizing Cu and Ni recovery. Fungi deteriorate the sample mainly by it is chemical action like producing acids. Surface morphology results confirmed the metabolites produced by the fungus-corrosive chemicals-eroded the particles of the e-waste sample during the bioleaching time. The mapping and energy dispersive X-ray (EDAX) of the initial sample and the processed sample validated that bioleaching was quite effective. The overall results indicate that Cu and Ni from e-waste can be recovered through the bioleaching process using *A. niger*. The addition time (day) of the sample to the solution plays an important role in metal recovery using *A. niger*. Acid production by the fungi increases the metal recovery, while biocrystallization of heavy metals decreases the recovery. This paper proved the great potential of the biohydrometallurgical route mediate by Aspergillus niger strain for recovering heavy metals from electronic wastes under defined optimal condition, two-step process, 30 degrees C, and shaking rate of 130rpm.

Accès au document

Identification of Bacterial and Fungal Communities in the Roots of Orchids and Surrounding Soil in Heavy Metal Contaminated Area of Mining Heaps

Authors: Bohmer M, Ozdin D, Racko M...

Source: APPLIED SCIENCES-BASEL 10(20), 2020, DOI: 10.3390/app10207367

Abstract: Orchids represent a unique group of plants that are well adapted to extreme conditions. In our study, we aimed to determine if different soil contamination and pH significantly change fungal and bacterial composition. We identified bacterial and fungal communities from the roots and the surrounding soil of the family Orchidaceae growing on different mining sites in Slovakia. These communities were detected from the samples of Cephalanthera longifolia and Epipactis pontica from Fe deposit Sirk, E. atrorubens from Ni-Co deposit Dobsina and Pb-Zn deposit Jasenie and Platanthera bifolia by 16S rRNA gene and ITS next-generation sequencing method. A total of 171 species of fungi and 30 species of bacteria were detected from five samples of orchids. In summary, slight differences in pH of the initial soils do not significantly affect the presence of fungi and bacteria and thus the presence of the studied orchids in these localities. Similarly, the toxic elements in the studied localities, do not affect the occurrence of fungi, bacteria, and orchids. Moreover, Cortinarius saturatus, as a dominant fungus, and Candidatus Udaeobacter as a dominant bacterium were present in all soil samples and some root samples. Finally, many of these fungal and bacterial communities have the potential to be used in the bioremediation of the mining areas.

Accès au document

Microbial Community and Atrazine-Degrading Genetic Potential in Deep Zones of a Hypersaline Lake-Aquifer System

Authors: Espin Y, Aranzulla G, Alvarez-Orti M, Gomez-Alday JJ

Source: APPLIED SCIENCES-BASEL 10(20), 2020, DOI: 10.3390/app10207111

Abstract: [...] Atrazine degradation pathways are mediated by biological processes performed by microorganisms with adapted metabolic mechanisms that make in situ bioremediation possible. To evaluate the presence of such microorganisms in the unconfined aquifer, groundwater was collected from a flowing 37.9 m deep piezometer. DNA was extracted, and the bacterial 16S rRNA gene was amplified and cloned. Later, 93 clones were sequenced, providing the first molecular assessment of bacterial community structure in the deep zones of the aquifer. Some of these bacteria have been previously described to be involved in atrazine degradation. In addition, 14 bacteria were isolated from the groundwater samples and identified by 16S rRNA gene sequencing. DNA from these bacteria was subjected to PCR assays with primers designed for the genes involved in the atrazine degradation pathway. Positive results in the amplification were found in at least three of these bacteria (*Arthrobacter* sp., *Nocardioides* sp. and *Pseudomonas* sp.). The atrazine-degrading genetic potential was shown to be dependent on the trzN and atzA,B,C gene combination. These results suggest for the first time the adaptation of the bacterial population present in deep aquifer zones to atrazine exposure, even after more than 15 years of its ban in Spain. In addition, this study provides the baseline data about the bacterial communities found in deep aquifer zones from the hypersaline lake-aquifer system.

Accès au document

Microbial degradation of organophosphorus pesticides using whole cells and enzyme extracts

Authors: Santillan J Y, Muzlera A, Molina M...

Source: BIODEGRADATION 31(4-6):423-433, 2020, DOI: 10.1007/s10532-020-09918-7

Abstract: The use of microbial phosphotriesterases in the degradation of organophosphorus compounds employed as pesticides, plasticizers and petroleum additives is a sustainable alternative for bioremediation of water and soils, decontamination of particular foods and as poisoning antidote. Whole cells of six wild type microorganisms-Streptomyces phaeochromogenes, Streptomyces setonii, Nocardia corynebacterioides, Nocardia asteroides and two Arthrobacter oxydans-selected in our lab as phosphotriesterase sources, were further tested as biocatalysts in the hydrolysis of paraoxon, methyl paraoxon, methyl parathion, coroxon, coumaphos, dichlorvos and chlorpyrifos, highlighting 98% conversion of chlorpyrifos into its hydrolysis products using whole cells of S. phaeochromogenes at pH 8 and 40 degrees C. Immobilized whole cells and enzyme extracts were also assessed, observing as a general trend, that there is no significant variation in hydrolytic activity between them. These results suggest that according to the circumstances, immobilized whole cells (avoiding cellular disruption and centrifugation) or enzyme extracts (which can be handled more easily) could be used.

Accès au document

Evaluation of direct and biochar carrier-based inoculation of *Bacillus sp.* on As- and Pb-contaminated technosol: effect on metal(loid) availability, *Salix viminalis* growth, and soil microbial diversity/activity

Authors: Lebrun M, Miard F, Bucci A...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-11355-1

Abstract: Phytomanagement manipulates the soil-plant system to lower the risk posed by contaminated soils. In this process, the addition of amendments, such as biochar, and bacteria can improve the fertility of poor contaminated soils and consequently ameliorate plant growth. A number of studies based on the inoculation of soil with microorganisms of the genus Bacillus, previously isolated from contaminated sites, revealed positive effects on soil properties and plant growth. Furthermore, when the Bacillus isolates were used in association with biochar, better results were obtained, as biochar can ameliorate soil properties and serve as habitat for microorganisms. Accordingly, a mesocosm study was set-up using a mining technosol amended with biochar and inoculated with an endogenous Bacillus isolate, to evaluate the effect of inoculation on soil properties, metal(loid) immobilization, and *Salix viminalis* growth. Two inoculation methods were compared: (1) direct inoculation of bacteria (*Bacillus* sp.) and (2) inoculation using biochar as a carrier. Results showed that the Bacillus isolate modified soil properties and ameliorated plant growth, while having a reduced effect on metal(loid) accumulation. The microbial activity was also stimulated, and the community composition was shifted, more importantly when biochar was used as a carrier. In conclusion, this research revealed an improvement of the plant growth and microbial activity after the addition of the endogenous bacterium to the analyzed former mining soil, with better results recorded when a carrier was used.

Accès au document

Speciation, toxicity, microbial remediation and phytoremediation of soil chromium contamination

Authors: Guo SY, Xiao CQ, Zhou N, Chi R

Source: ENVIRONMENTAL CHEMISTRY LETTERS, 2020, DOI: 10.1007/s10311-020-01114-6

Abstract: Contamination of soil by toxic chromium (Cr) is a rising health issue due to over-exploitation and industrial production. Toxicity can be decreased by bioremediation because some microorganisms are able to convert highly toxic hexavalent chromium Cr(VI) into less toxic trivalent chromium Cr(III) by secreting chromate reductase. Moreover, microorganisms are able to remove Cr by adsorption on microbial cell walls. Plants can also be used for phytoremediation by uptaking Cr from soil into plant organs. Here, we review the speciation of Cr in soil, remediation methods to remove Cr, bioremediation challenges, and remaining ecological impacts after bioremediation. We present the mechanisms of microbial remediation, phytoremediation and plant-microbial combined remediation and applications.

Accès au document

Herbicide Glyphosate: Toxicity and Microbial Degradation

Authors: Singh S, Kumar V, Gill JPK...

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 17, 20, 2020, DOI: 10.3390/ijerph17207519

Abstract: Glyphosate is a non-specific organophosphate pesticide, which finds widespread application in shielding crops against the weeds. Its high solubility in hydrophilic solvents, especially water and high mobility allows the rapid leaching of the glyphosate into the soil leading to contamination of groundwater and accumulation into the plant tissues, therefore intricating the elimination of the herbicides. Despite the widespread application, only a few percentages of the total applied glyphosate serve the actual purpose, dispensing the rest in the environment, thus resulting in reduced crop yields, low quality agricultural products, deteriorating soil fertility, contributing to water pollution, and consequently threatening human and animal life. This review gives an insight into the toxicological effects of the herbicide glyphosate and current approaches to track and identify trace amounts of this agrochemical along with its biodegradability and possible remediating strategies. Efforts have also been made to summarize the biodegradation mechanisms and catabolic enzymes involved in glyphosate metabolism.

Accès au document

Assessment of Soil and Fungal Degradability of Thermoplastic Starch Reinforced Natural Fiber Composite

Authors: Behera AK, Mohanty C, Pradhan SK, Das N

Source: JOURNAL OF POLYMERS AND THE ENVIRONMENT, 2020, DOI: 10.1007/s10924-020-01944-z

Abstract: High water absorption capacity and low biodegradation of fiber reinforced composites are the major drawbacks, which limit their applications in different sectors. Development of composites with complete biodegradability is challenging as biodegradability may be incomplete by lowering of its water adsorption capacity. In this work, a series of thermoplastic starch (TPS) reinforced jute (10-40 wt%) composites were developed by compression molding and measured by their

mechanical properties. The composite with 30% jute showed the maximum tensile strength (27.3 MPa). Contact angle, and water absorption measurements exposed that composites are moderately hydrophobic in nature. Both soil burial and fungal degradation testing showed biodegradability of composites. Characterizations of optimized composite before and after biodegradation test, were carried out by FTIR, SEM and optical microscope. The present study showed promise on feasible applications of jute-starch composites in packaging, automobile sector, cutlery, indoor furnishing, etc. as a substitute of plastic-based composites.

Accès au document

Coal-Degrading Bacteria Display Characteristics Typical of Plant Growth Promoting Rhizobacteria

Authors: Titilawo Y, Masudi WL, Olawale JT...

Source: PROCESSES 8(9), 2020, DOI: 10.3390/pr8091111

Abstract: Coal mining produces large quantities of discard that is stockpiled in large dumps. This stockpiled material, termed coal discard, poses an environmental threat emphasising the need for appropriate bioremediation. Here, metagenomic analysis of the 16S rRNA from ten coal-degrading strains previously isolated from coal slurry from discard dumps and from the rhizosphere of diesel-contaminated sites was used to establish genetic relatedness to known plant growth-promoting (PGP) bacteria in the NCBI database. Measurement of indole and ammonium production and solubilisation of P and K were used to screen bacteria for PGP characteristics. BLAST analysis revealed ≥ 99% homology of six isolates with reference PGP strains ofBacillus, Escherichia, Citrobacter, Serratia, ExiguobacteriumandMicrobacterium, while two strains showed 94% and 91% homology withProteus. The most competent PGP strains wereProteusstrain ECCN 20b, Proteusstrain ECCN 23b andSerratiastrain ECCN 24b isolated from diesel-contaminated soil. In response to L-trp supplementation, the concentration of indolic compounds (measured as indole-3-acetic acid) increased. Production of ammonium and solubilisation of insoluble P by these strains was also apparent. OnlySerratiastrain ECCN 24b was capable of solubilising insoluble K. Production of indoles increased following exposure to increasing aliquots of coal discard, suggesting no negative effect of this material on indole production by these coal-degrading bacterial isolates and that these bacteria may indeed possess PGP characteristics.

Accès au document

Potential role of plant growth-promoting bacteria in *Miscanthus x giganteus* phytotechnology applied to the trace elements contaminated soils

Authors: Pidlisnyuk V, Mamirova A, Pranaw K...

Source: INTERNATIONAL BIODETERIORATION & BIODEGRADATION 155, 2020, DOI: 10.1016/j.ibiod.2020.105103

Abstract: The second-generation energy crop *Miscanthus x giganteus (M. xgiganteus)* is a perspective plant for phytoremediation of contaminated lands and the production of biomass. The excellent quality biomass can be ensured by adding soil amendments or inoculation of the plant by plant growth-promoting bacteria (PGPB). The main goal of the current study was to research the influence of PGPB Bacillus altitudinis strain KP-14 isolated from the post-mining aged contaminated soil in Vseborice dump, Usti nad Labem to the phytoremediation parameters and biomass production of *M. x giganteus*. The experiment

was done in the greenhouse conditions using the initial aged soil contaminated by the following trace elements (TEs): V, Cr, Mn, Ni, Cu, Zn, Sr, Pb and the same aged soil, additionally artificially contaminated by Pb. The results showed that PGPB treatment increased the growth process and leaves, stems, and roots biomass at harvest by 49%, 86%, and 76%, respectively. In the presence of B. altitudinis strain KP-14, the translocation factor decreased, the uptake index of TEs remained low and the process can be classified as phytostabilization. The finding showed that the application of PGPB strain could be used in the sustainable production of M. xgiganteus at the TEs contaminated soil.

Accès au document

Comparison of culture-independent and dependent approaches for identification of native arsenic-resistant bacteria and their potential use for arsenic bioremediation

Authors: Altowayti WAH, Almoalemi H, Shahir S, Othman N

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 205, 2020, DOI: 10.1016/j.ecoenv.2020.111267

Abstract: […] Microbial cultures are commonly used in bio-treatment; however, it is not established whether the structure of the cultured isolates resembles the native microbial community from arsenic-contaminated soil. In this milieu, a culture-independent approach using Illumina sequencing technology was used to profile the microbial community in situ. This was coupled with a culture-dependent technique, that is, isolation using two different growth media, to analyse the microbial population in arsenic laden tailing dam sludge based on the culture-independent sequencing approach, 4 phyla and 8 genera were identified in a sample from the arsenic-rich gold mine. Firmicutes (92.23%) was the dominant phylum, followed by Proteobacteria (3.21%), Actinobacteria (2.41%), and Bacteroidetes (1.49%). The identified genera included Staphylococcus (89.8%), Pseudomonas (1.25), Corynebacterium (0.82), Prevotella (0.54%), Megamonas (0.38%) and Sphingomonas (0.36%). The Shannon index value (3.05) and Simpson index value (0.1661) indicated low diversity in arsenic laden tailing. The culture dependent method exposed significant similarities with culture independent methods at the phylum level with Firmicutes, Proteobacteria and Actinobacteria, being common, and Firmicutes was the dominant phylum whereas, at the genus level, only Pseudomonas was presented by both methods. It showed high similarities between culture independent and dependent methods at the phylum level and large differences at the genus level, highlighting the complementarity between the two methods for identification of the native population bacteria in arsenic-rich mine. As a result, the present study can be a resource on microbes for bio-treatment of arsenic in mining waste.

Accès au document

Combined biochar and metal-immobilizing bacteria reduces edible tissue metal uptake in vegetables by increasing amorphous Fe oxides and abundance of Fe- and Mn-oxidising Leptothrix species

Authors: Cheng C, Luo WW, Wang QX...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 206, 2020, DOI: 10.1016/j.ecoenv.2020.111189

Abstract: In this study, a highly effective combined biochar and metal-immobilizing bacteria (Bacillus megaterium H3 and Serratia liquefaciens CL-1) (BHC) was characterized for its effects on solution Pb and Cd immobilization and edible tissue biomass and Pb and Cd accumulation in Chinese cabbages and radishes and the mechanisms involved in metal-polluted soils. In the metal-containing solution treated with BHC, the Pb and Cd concentrations decreased, while the pH and cell numbers of strains H3 and CL-1 increased over time. BHC significantly increased the edible tissue dry weight by 17-34% and reduced the edible tissue Pb (0.32-0.46 mg kg(-1)) and Cd (0.16 mg kg(-1)) contents of the vegetables by 24-45%. In the vegetable rhizosphere soils, BHC significantly decreased the acid-soluble Pb (1.81-2.21 mg kg(-1)) and Cd (0.40-0.48 mg kg(-1)) contents by 26-47% and increased the reducible Pb (18.2-18.8 mg kg(-1)) and Cd (0.38-0.39 mg kg(-1)) contents by 10-111%; while BHC also significantly increased the pH, urease activity by 115-169%, amorphous Fe oxides content by 12-19%, and relative abundance of gene copy numbers of Fe- and Mn-oxidising Leptothrix species by 28-73% compared with the controls. These results suggested that BHC decreased edible tissue metal uptake of the vegetables by increasing pH, urease activity, amorphous Fe oxides, and Leptothrix species abundance in polluted soil. These results may provide an effective and eco-friendly way for metal remediation and reducing metal uptake in vegetables by using combined biochar and metal-immobilizing bacteria in polluted soils.

Accès au document

Potential for bifenthrin removal using microalgae from a natural source

Authors: Weis L, Schneider RDD, Hoeltz M...

Source: WATER SCIENCE AND TECHNOLOGY 82(6):1131-1141, 2020, DOI: 10.2166/wst.2020.160

Abstract: The accumulation of environmental pesticides can cause problems in aquatic ecosystems and adverse effects in humans. These compounds can be found in water due to runoff from agricultural, industrial and domestic applications. In Southern Brazil, tobacco cultivation is one of the most important economic agricultural activities. The bifenthrin pesticide, classified as having moderate toxicity (class II), is commonly used as an insecticide in this culture. In this context, the present research aimed to study the performance of microalgae-induced bioremediation processes. Microalgae were isolated from a natural water source in the city of Santa Cruz do Sul, RS, Brazil, which is an artificial reservoir used for public water supply. For this purpose, biodegradation, biosorption, influence of pH, percentage of inoculum and photoperiod were evaluated in batch experiments for 20 cultivation days. After the phycoremediation process, the bifenthrin pesticide (m/z = 181) was quantified by gas chromatography with mass spectrometry (GC-MS). The results indicated that microalgae isolated from the water of the lake were able to contribute to the removal of approximately 99% of bifenthrin through biodegradation and biosorption processes. Photodegradation was identified (>77%) and the best condition for the phycoremediation was 20% inoculum with a photoperiod of 18:6 h.

Accès au document

Fe-Modified Common Reed Biochar Reduced Cadmium (Cd) Mobility and Enhanced Microbial Activity in a Contaminated Calcareous Soil

Authors: Moradi N, Karimi A

Source: JOURNAL OF SOIL SCIENCE AND PLANT NUTRITION, 2020, DOI: 10.1007/s42729-020-00363-2

Abstract: The immobilization of soil cadmium (Cd) by biochar and modified biochar is an eco-friendly and cost-effective strategy. In the current study, the effect of raw biochar (BC) and iron-modified biochar (Fe-BC) derived from common reed on the fractionation and mobility of Cd was evaluated, as was its effect on soil microbial activity in contaminated calcareous soil. Treatments involved a combination of two factors: type of biochar (CK: Control, BC, and Fe-BC) and soil Cd concentration (0, 15, and 30 mg kg(-1)). Treatments were applied to the soil and incubated for 90 days. The application of both biochars increased soil pH and soil organic carbon content (16.6-48.0%), microbial biomass carbon (40.5-75.1%), basal respiration (16.6-48.0%), substrate-induced respiration (12.4-41.9), and dehydrogenase activity (25.5-102.1%), while it reduced diethylene-triamine pentaacetic acid (DTPA)-extractable Cd (22.1-39.5%). The addition biochars, particularly Fe-BC, prominently decreased the concentration of exchangeable and carbonate fractions and increased the concentration of Fe-MnOx, as well as the organic and residual fractions of Cd in the soil. Moreover, relative to the control treatment, the incorporation of raw and Fe-modified biochar into 30 mg kg(-1) Cd-spiked soil significantly decreased the Cd mobility factor (MF) value by 14.5 and 21.8%, respectively. Fe-modified biochar had a more significant impact than raw biochar on the immobilization of Cd in the soil, and its improved soil microbial activity to a greater extent. Overall, the findings indicate that Fe-modified biochar derived from common reed can immobilize Cd and improve soil microbial attributes in contaminated calcareous soil. Therefore, it can be used as an eco-friendly amendment for restoring Cd-contaminated calcareous soil.

Accès au document

Improved Short-Term Microbial Degradation in Circulating Water Reducing High Stagnant Atrazine Concentrations in Subsurface Sediments

Authors: Liu XX, Hui N, Kontro MH

Source: WATER 12(9), 2020, DOI: 10.3390/w12092507

Abstract: […] The aim of this study was to investigate whether water circulation, or circulation combined with bioaugmentation (Pseudomonassp. ADP, or four isolates from atrazine-contaminated sediments) alone or with biostimulation (Na-citrate), could enhance atrazine dissipation […] Atrazine was rapidly degraded to 53-64 mg L(-1)in the slurries, and further to 10-18 mg L(-1)in the circulating water, by the inherent microbes of sediments collected from 13.6 m in an atrazine-contaminated aquifer. Bioaugmentation without or with biostimulation had minor effects on atrazine degradation. The microbial number simultaneously increased in the slurries from 1.0 x 10(3)to 0.8-1.0 x 10(8)cfu mL(-1), and in the circulating water from 0.1-1.0 x 10(2) to 0.24-8.8 x 10(4)cfu mL(-1). In sediments without added atrazine, the cultivable microbial numbers remained low at 0.82-8.0 x 10(4)cfu mL(-1)in the slurries, and at 0.1-2.8 x 10(3)cfu mL(-1)in the circulating water. The cultivated microorganisms belonged to the nine generaAcinetobacter, Burkholderia, Methylobacterium, Pseudomonas, Rhodococcus, Sphingomonas, Streptomyces, Variovorax and Williamsia ; i.e., biodiversity was low. Water flow through the sediments released adsorbed and complex-bound atrazine for microbial degradation, though the residual concentration of 10-64 mg L (-1) was high and could contaminate large groundwater volumes from a point source, e.g., during heavy rain or flooding.

Accès au document

Phytoremediation of a Highly Arsenic Polluted Site, Using *Pteris vittata* L. and Arbuscular Mycorrhizal Fungi

Authors: Cantamessa S, Massa N, Gamalero E, Berta G

Source: PLANTS-BASEL 9(9), 2020, DOI: 10.3390/plants9091211

Abstract: Phytoremediation is a promising green technique for the restoration of a polluted environment, but there is often a gap between lab and field experiments. The fern, *Pteris vittata* L., can tolerate a high soil arsenic concentration and rapidly accumulate the metalloid in its fronds. Arbuscular mycorrhizal fungi (AMF) are mutualistic fungi that form a symbiosis with most land plants' roots, improve their growth, and induce stress tolerance. This paper reports the results obtained using *P. vittata* inoculated with AMF, to extract Arsenic (As) from an industrial site highly contaminated also by other pollutants. Two experiments have been performed. In the first one, AMF colonized ferns were grown for two years under controlled conditions in soil coming from the metallurgic site. Positive effects on plant health and As phytoextraction and accumulation were detected. Then, considering these results, we performed a three year in situ experiment in the industrial site, to assess the remediation of As at two different depths. Our results show that the colonization of P. vittata with AMF improved the remediation process of As with a significant impact on the depth 0-0.2 m.

Accès au document

Impact of Plant Growth Promoting Bacteria on *Salicornia ramosissima* Ecophysiology and Heavy Metal Phytoremediation Capacity in Estuarine Soils

Authors: Mesa-Marin J, Perez-Romero JA, Redondo-Gomez S...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.553018

Abstract: [...] In this work, we studied a microbe-assisted phytoremediation strategy under greenhouse conditions. We inoculated plant growth promoting (PGP) and heavy metal resistant bacteria in pots with *S. ramosissima* and natural non-polluted and polluted sediments collected from Spanish estuaries. Then, we analyzed plant ecophysiological and metal phytoaccumulation response. Our data suggested that inoculation in polluted sediments improved *S. Ramosissima* plant growth in terms of relative growth rate (RGR) (32%) and number of new branches (61%). *S. ramosissima* photosynthetic fitness was affected by heavy metal presence in soil, but bacteria inoculation improved the photochemical apparatus integrity and functionality, as reflected by increments in net photosynthetic rate (21%), functionality of PSII (F(m)and F-v/F-m) and electron transport rate, according to OJIP derived parameters. Beneficial effect of bacteria in polluted sediments was also observed by augmentation of intrinsic water use efficiency (28%) and slightly water content (2%) in inoculatedS. ramosissima. Finally, our results demonstrated that *S. ramosissima* was able to accumulate great concentrations of heavy metals, mostly at root level, up to 200 mg Kg (-1) arsenic, 0.50 mg Kg(-1) cadmium, 400 mg Kg(-1) copper, 25 mg Kg(-1) nickel, 300 mg Kg(-1)lead, and 300 mg Kg(-1) zinc. Bioaugmentation incremented *S. ramosissima* heavy metal phytoremediation potential due to plant biomass increment, which enabled a greater accumulation capacity. Thus, our results suggest the potential use of heavy metal resistant PGPB to ameliorate the capacity of *S. ramosissima* as candidate for phytoremediation of salty polluted ecosystems.

Accès au document

Organophosphorus compounds biodegradation by novel bacterial isolates and their potential application in bioremediation of contaminated water

Authors: Santillan JY, Rojas NL, Ghiringhelli PD...

Source: BIORESOURCE TECHNOLOGY 317, 2020, DOI: 10.1016/j.biortech.2020.124003

Abstract: Organophosphorus compounds (OPs), the major pesticides used worldwide, comprise an environmental hazard due to their harmful toxicity. Aimed to develop a bioreactor to remediate OPs contaminated wastewater, bacteria isolated from contaminated soils were identified and their ability to degrade OPs assessed, resulting in two main isolates, *Sphingomonas* sp. and *Brevundimonas* sp. Their OP degrading activities were characterized in terms of temperature, pH and substrates acceptance, resulting in high degradation rates at 60 degrees C, pH 10 and towards bulky OPs such as coroxon, coumaphos, and chlorpyrifos. *Sphingomonas* sp. cells were immobilized and 75.4% degradation of 0.15 mM chlorpyrifos was achieved after 21 days by immobilized cells in batch system, while this OP was completely degraded within 17 h when the biocatalyst is settled in a packed bed bioreactor, with a reusability of 8 cycles. These results suggest the potential application of this system in the bioremediation of contaminated wastewater.

Accès au document

Bacterial compatibility and immobilization with biochar improved tebuconazole degradation, soil microbiome composition and functioning

Authors: Sun T, Miao JB, Saleem M...

Source: JOURNAL OF HAZARDOUS MATERIALS 398, 2020, DOI: 10.1016/j.jhazmat.2020.122941

Abstract: Tebuconazole is a widely used fungicide that may impair soil health. Presently, limited information is available on the bioremediation of tebuconazole-contaminated soil using biochar as a carrier for bacteria. In this study, we firstly isolated a tebuconazole-degrading strain and identified it as Alcaligenes faecalis WZ-2. Then, we used wheat straw-derived biochar as carrier to capture strain WZ-2 to assemble microorganism-immobilized composite. Finally, we investigated the effects of strain WZ-2 and biochar-immobilized WZ-2 on tebuconazole biodegradation, microbial enzyme activities and community composition in the contaminated soil. Results showed that, as compared to control, the strain WZ-2 and biochar-immobilized WZ-2 accelerated the degradation of tebuconazole, while reducing the half-life of tebuconazole from 40.8 to 18.7 and 13.3 days in soil, respectively. However, biochar alone than control slightly retarded the degradation of tebuconazole in soil. Though tebuconazole (10 mg/kg) negatively affected the soil enzyme activities (urease, dehydrogenase, and invertase) and microbiome community structure, the biochar-immobilized WZ-2 not only accelerated the degradation of tebuconazole but also restored native soil microbial enzyme activities and microbiome community composition. Our results suggest that a compatible combination of bacteria with biochar is an attractive and efficient approach for remediation of pesticide-contaminated soil and improvement of soil biological health.

Accès au document

In-situ remediation of acid mine drainage from abandoned coal mine by filed pilot-scale passive treatment system: Performance and response of microbial communities to low pH and elevated Fe

Authors: Chen HY, Xiao TF, Ning ZP...

Source: BIORESOURCE TECHNOLOGY 317, 2020, DOI: 10.1016/j.biortech.2020.123985

Abstract: A field pilot-scale passive treatment system was developed for in-situ bioremediation of acid mine drainage (AMD). The microbial community and its variation were analyzed. The data proved that 93.7% of total soluble Fe and 99% of soluble Fe(II) could be removed by the system. Principal coordinates analysis (PCoA) showed that a low pH and an elevated Fe concentration within the system created a unique microbial community that was dominated by acidophilic iron-oxidizing bacteria and iron-reducing bacteria. Canonical correlation analysis (CCA) indicated that the pH, iron content and total sulfur jointly determined the composition of the microbial communities. Species of Ferrovum, Delftia, Acinetobacter, Metallibacterium, Acidibacter and Acidiphilium were highly enriched, which promoted the removal of iron. Furthermore, the results revealed important data for the biogeochemical coupling of microbial communities and environmental parameters. These findings are beneficial for further application of in-situ field bioreactors to remediate AMD.

Accès au document

Fungal Community, Metabolic Diversity, and Glomalin-Related Soil Proteins (GRSP) Content in Soil Contaminated With Crude Oil After Long-Term Natural Bioremediation

Authors: Galazka A, Grzadziel J, Galazka R...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.572314

Abstract: [...] The aim of the study was to evaluate the mycobiome and functional diversity of fungi in long-term crude-oil contaminated soils as the potential bioremediators of oil contaminated sites. Samples were taken from three historical oil wells (over a century old) at two distances: within a 0.5 m radius of the oil wells (OWP1, OWP2, and OWP3) and within a 3 m radius from the oil wells as the controls (OW1, OW2, and OW3). Next generation sequencing (for the ITS region) was accompanied with determination of the functional fungal community based on Biolog FFPlates, glomalin related soil protein (GRSP) content, trace element and PAHs concentration. The research hypothesis assumed that long-term natural bioremediation of crude oil contaminated soils can contribute to intensive development of a unique fungal community adapted to the contamination conditions. [...] The total glomalin-related soil proteins (T-GRSP) and easily-extractable glomalin-related soil proteins (EE-GRSP) contents were lower in soil samples taken directly from the crude oil well. The control soil (OW) subjected to a long-term natural remediation may already have sufficient conditions for the growth and development of mycorrhizal fungi. The mycobiome of the soils collected directly from the oil wells (OWP1, OWP2, and OWP3) was characterized by a 35% share of PAH-degrading candidates, compared to the soil collected at the 3 m distance from the oil wells (OW1, OW2, and OW3) at ≤ 5%. [...] These results may indicate that more effective degradation processes occur closer to the oil wells.

Accès au document

Bacterial-induced mineralization (BIM) for soil solidification and heavy metal stabilization: A critical review

Authors: Han LJ, Li JS, Xue Q...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 746, 2020, DOI: 10.1016/j.scitotenv.2020.140967

Abstract: Solidification and stabilization (S/S) treatment via cement is common and effective for improving soil strength and stabilizing heavy metals in contaminated soils, but has certain drawbacks, such as high fossil energy consumption, big carbon footprint, poor chemical compatibility, and ambiguous long-term stability. This paper innovatively proposes bacterial-induced mineralization (BIM) as an eco-friendly and efficient S/S method. In the BIM-S/S treatment, life activities of bacteria produce minerals to cement the soil particles and fix the heavy metals. This review firstly summarizes the basic theories of BIM technology followed by the evaluation on remediation effects and long-term stability in terms of soil solidification and heavy metal stabilization. Then the factors in BIM-S/S application are reviewed. Emphasis is put on the comparison of the BIM-S/S effect with that of cement-based-S/S technology. It is concluded that BIM-S/S technology is promising with outstanding performance in sustainability. On the other hand, current limitations and deficiencies with this technology are identified finally, hereby the directions for future research are pointed to make a major advancement in the BIM-S/S technology.

Accès au document

Degradation of Hydrocarbons and Heavy Metal Reduction by Marine Bacteria in Highly Contaminated Sediments

Authors: Dell'Anno F, Brunet C, van Zyl LJ...

Source: MICROORGANISMS 8(9), 2020, DOI: 10.3390/microorganisms8091402

Abstract: Investigations on the ability of bacteria to enhance removal of hydrocarbons and reduce heavy metal toxicity in sediments are necessary to design more effective bioremediation strategies. In this study, five bacterial strains, Halomonassp. SZN1, Alcanivoraxsp. SZN2, Pseudoalteromonassp. SZN3, Epibacteriumsp. SZN4, andVirgibacillussp. SZN7, were isolated from polluted sediments from an abandoned industrial site in the Gulf of Naples, Mediterranean Sea, and tested for their bioremediation efficiency on sediment samples collected from the same site. These bacteria were added as consortia or as individual cultures into polluted sediments to assess biodegradation efficiency of polycyclic aromatic hydrocarbons and heavy metal immobilisation capacity. Our results indicate that these bacteria were able to remove polycyclic aromatic hydrocarbons, with a removal rate up to ca. 80% for dibenzo-anthracene. In addition, these bacteria reduced arsenic, lead, and cadmium mobility by promoting their partitioning into less mobile and bioavailable fractions. Microbial consortia generally showed higher performance toward pollutants as compared with pure isolates, suggesting potential synergistic interactions able to enhance bioremediation capacity. Overall, our findings suggest that highly polluted sediments select for bacteria efficient at reducing the toxicity of hazardous compounds, paving the way for scaled-up bioremediation trials.

Accès au document

Biodegradation of the fungicide Pyraclostrobin by bacteria from orange cultivation plots

Authors: Birolli WG, da Silva BF, Rodrigues-Filho E

Source: SCIENCE OF THE TOTAL ENVIRONMENT 746, 2020, DOI: 10.1016/j.scitotenv.2020.140968

Abstract: [...] In this work, biodegradation studies of the strobilurin fungicide Pyraclostrobin by bacteria from orange cultivation plots were performed aiming to contribute with the development of a bioremediation method. [...] The strains were evaluated in liquid nutrient medium containing 100 mg L-1 of Pyraclostrobin, and decreased concentrations of 61.5 to 100.5 mg L-1 were determined after 5 days at 37 degrees C and 130 rpm, showing the importance of strain selection. When the five most efficient strains (*Bacillus* sp. CSA-13, *Paenibacillus alvei* CBMAI2221, *Bacillus* sp. CBMAI2222, *Bacillus safensis* CBMAI2220 and *Bacillus aryabhattai* CBMAI2223) were used in consortia, synergistic and antagonistic effects were observed accordingly to the employed combination of bacteria, resulting in 64.2 +/- 3.9 to 95.4 +/- 4.9 mg L-1 residual Pyraclostrobin. In addition, the formation of 1-(4-chlorophenyl)-1H-pyrazol-3-ol was quantified (0.59-0.01 mg L-1), and a new biodegradation pathway was proposed with 15 identified metabolites. Experiments were also performed in soil under controlled conditions (30 degrees C, 0-28 days, 100 mg kg(-1) pesticide), and the native microbiome reduced the pesticide concentration to 70.4 +/- 2.3 mg L-1, whereas the inoculation of an efficient bacterial consortium promoted clearly better results, 57.2 +/- 3.9 mg L-1 residual Pyraclostrobin. This suggests that the introduction of these strains in soil in a bioaugmentation process increases decontamination. However, the native microbiome is important for a more efficient bioremediation.

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Combined effects of arbuscular mycorrhizae fungus and composted pig manure on the growth of ryegrass and uptake of Cd and Zn in the soil from an e-waste recycling site

Authors: Meng J, Cui ZH, Zhang HL...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-11215-y

Abstract: Little attention has been paid to the combined effects of arbuscular mycorrhizae (AM) fungus and composted manure on heavy metal bioavailability and its uptake by plants grown in heavy metal-contaminated soils [...]. A greenhouse pot experiment was conducted to investigate the effects of AM fungus, composted pig manure (CM) and AM fungus + CM (ACM) on the growth of ryegrass and uptake of Cd and Zn in the soil collected from an e-waste recycling site. The calcium chloride (CaCl2) and Tessier sequential extraction procedure were adopted to evaluate the bioavailability and chemical speciation of Cd and Zn in the soil. Results showed that the application of CM and ACM significantly increased the pH but decreased the CaCl2-extractable Cd and Zn concentrations in the rhizosphere and bulk soils. ACM treatment significantly shifted Cd from exchangeable fraction to other more stable fractions, and transformed the exchangeable Zn fraction to the carbonate-bound and reducible iron and manganese-bound fractions. Furthermore, the application of ACM can enhance the growth of plant shoots, and decrease the uptake of Cd and Zn in the ryegrass plants. This work suggests that AM fungus in combination with CM amendment may be a potential method for not only remediation of soil Cd and Zn pollution, but also reduction of Cd and Zn uptake by ryegrass grown in the soil from e-waste recycling sites.

Accès au document

Microbial catabolism of lindane in distinct layers of acidic paddy soils combinedly affected by different water managements and bioremediation strategies

Authors: Chuang SC, Wang BZ, Chen K...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 746, 2020, DOI: 10.1016/j.scitotenv.2020.140992

Abstract: [...] Here, we conducted laboratory experiments to investigated lindane biodegradation in different layers of typical acidic paddy soils under different water managements and bioremediation strategies, together with the changes of functional bacterial consortium, key genes and metabolic pathways. It was found that under flooded conditions, lindane spiking significantly stimulated the growth of some bacterial genera with potential anaerobic catabolic functions in both top- (0-20 cm depth) and subsoil (20-40 cm depth), leading to the shortest half-life of lindane with 7.6-9.0 d in the topsoil. In contrary, lindane spiking dramatically stimulated the growth of bacterial members with aerobic catabolic functions under drained conditions, [...] Functional genes involved in lindane degradation and retrieved from metagenomic data further supported the anaerobic and aerobic biodegradation of lindane under flooded and drained conditions, respectively. Moreover, the integrated network analysis suggested water management and organic matter were the primary factors shaped the assembly of functional bacteria in lindane degradation, among which Clostridium and Rhodanobacter were the key anaerobic and aerobic functional genera, respectively. Taken together, our study provides a comprehensive understanding of lindane biodegradation in distinct layers of acidic paddy soils that were combinedly affected by different water managements and bioremediation strategies.

Accès au document

The communities of ectomycorrhizal fungal species associated with *Betula pendula* Roth and *Pinus sylvestris* L. growing in heavy-metal contaminated soils

Authors: Bierza W, Bierza K, Trzebny A...

Source: PLANT AND SOIL, 2020, DOI: 10.1007/s11104-020-04737-4

Abstract: [...] This is facilitated by ectomycorrhizal fungi colonizing tree roots. Thus, we evaluated the ectomycorrhizal fungal (EMF) communities of *B. pendula* and *P. sylvestris* growing in HM-contaminated soils compared to non-contaminated soils. We also studied the effect of HMs and soil properties on EMF communities and soil fungal biomass. Methods Roots of *B. pendula* and *P. sylvestris* were collected from three HM-contaminated sites and from two non-contaminated sites located in Poland. EMF species were identified using DNA barcoding. Soil fungal biomass was determined by soil ergosterol. Results *B. pendula* and *P. sylvestris* growing in HM-contaminated soils had similar EMF communities, where Scleroderma, Rhizopogon and Russula as well as ectomycorrhizae of the long-distance exploration type dominated. Among all of the examined soil factors studied, toxicity index (TITotal) was the most significant factor shaping the composition of EMF communities. Despite significant differences in the structure of the EMF communities of trees growing in HM-contaminated sites compared to control sites, no differences in overall diversity were observed. Conclusions Only well-adapted EMF species can survive toxic conditions and form ectomycorrhizal symbiosis with encroaching trees facilitating the forest succession on contaminated soils.

Accès au document

Arbuscular mycorrhizal fungi: an ecological accelerator of phytoremediation of metal contaminated soils

Authors: Tiwari J, Ma Y, Bauddh K

Source: ARCHIVES OF AGRONOMY AND SOIL SCIENCE, 2020, DOI: 10.1080/03650340.2020.1829599

Abstract: In recent decades, contamination of soil with toxic metals has become a severe environmental problem. Although phytoremediation has emerged as a promising environment-friendly remediation technology, an exclusively derived process by plants alone is time-consuming and is restricted by their limited metal tolerance and accumulation capacity. As a natural bio-accelerator, arbuscular mycorrhizal fungi (AMF) are considered as a significant component of phytoremediation systems, due to their intrinsic ability to mitigate metal toxicity (bioalleviation), stimulate plant growth (biofertilization) as well as alter the nutrients and heavy metals (HMs) bioavailability in soil ecosystem. In the present review, considerable efforts have been made to elucidate the role of AMF in phytoremediation and the mechanisms used by AMF to change plant metal uptake through various biogeochemical processes, like metal detoxification, metal mobilization or immobilization, accumulation, transformation, and translocation. Moreover, we present a summary of the findings of various studies showing the benefits of AMF for metal phytoremediation.

Accès au document

How microbial community composition, sorption and simultaneous application of six pharmaceuticals affect their dissipation in soils

Authors: Kodesova R, Chronakova A, Grabicova K...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 746, 2020, DOI: 10.1016/j.scitotenv.2020.141134

Abstract: [...] Standard laboratory batch degradation and sorption experiments were performed using soil samples obtained from the top horizons of seven different soil types and 6 pharmaceuticals (carbamazepine, irbesartan, fexofenadine, clindamycin and sulfamethoxazole), which were applied either as single-solute solutions or as mixtures (not for sorption). The highest dissipation half-lives were observed for citalopram (average DT50, S for a single compound of 152 +/- 53.5 days) followed by carbamazepine (106.0 +/- 17.5 days), irbesartan (24.4 +/- 3.5 days), fexofenadine (23.5 +/- 20.9 days), clindamycin (10.8 +/- 4.2 days) and sulfamethoxazole (9.6 +/- 2.0 days). The simultaneous application of all compounds increased the half-lives (DT50,M) of all compounds (particularly carbamazepine, citalopram, fexofenadine and irbesartan), which is likely explained by the negative impact of antibiotics (sulfamethoxazole and clindamycin) on soil microbial community. However, this trend was not consistent in all soils. In several cases, the DT50, S values were even higher than the DT50, M values. Principal component analyses showed that while knowledge of basic soil properties determines grouping of soils according sorption behavior, knowledge of the microbial community structure could be used to group soils according to the dissipation behavior of tested compounds in these soils. The derived multiple linear regression models for estimating dissipation half-lives (DT50,S) for citalopram, clindamycin, fexofenadine, irbesartan and sulfamethoxazole always included at least one microbial factor (either amount of phosphorus in microbial biomass or microbial biomarkers derived from phospholipid fatty acids) that deceased half-lives (i.e., enhanced dissipations). Equations for citalopram, clindamycin,

fexofenadine and sulfamethoxazole included the Freundlich sorption coefficient, which likely increased half-lives (i.e., prolonged dissipations).

Accès au document

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Effects of agricultural pesticides on the reproductive system of aquatic wildlife species, with crocodilians as sentinel species

Authors: Tavalieri YE, Galoppo GH, Canesini G, Luque EH, Muñoz-de-Toro MM

Source: Molecular and Cellular Endocrinology 518:110918, 2020, DOI: 10.1016/j.mce.2020.110918

Abstract: Agricultural pesticides represent a significant class of endocrine-disrupting chemicals (EDCs) to which non-target organisms around the world are constantly exposed. Laboratory studies have found strong evidence showing the endocrine-disruptive potential (...) this review aims to provide an update on the effects of two agricultural pesticides that act as EDCs: atrazine and endosulfan. We will focus mainly on the effects on crocodilians due to their worldwide occurrence (...) Crocodilian reproductive tissues are highly sensitive to the effects of END and ATZ (...) Transgenerational consequences of ATZ and END exposure could be expected. (...)

Accès au document

Egg Overspray with Herbicides and Fungicides Reduces Survival of Red-Legged Partridge Chicks

Authors: Ortiz-Santaliestra ME, Alcaide V, Camarero PR, Mateo R, Mougeot F

Sources: Environ Sci Technol 54(19):12402-12411, DOI: 10.1021/acs.est.0c04203

Abstract: [...] pesticide registration in the European Union (EU), avian reproductive toxicity is characterized after exposing adults. However, eggs of ground-nesting species can be exposed when pesticide applications occur during laying or incubation. We simulated environmentally realistic exposure of red-legged partridge (Alectoris rufa) eggs to an herbicide (2,4-D) and a fungicide (tebuconazole) applied to winter cereal crops during the breeding season of most farmland birds. (...)

Accès au document

A review on contaminants of emerging concern in European raptors (2002–2020)

Authors: González-Rubio S, Ballesteros-Gómez A, Asimakopoulos AG, Jaspers VLB

Source: Science of The Total Environment 143337, 2020, DOI: 10.1016/j.scitotenv.2020.143337

Abstract: Raptors (birds of prey and owls) have been widely used as suitable bioindicators of environmental pollution. (...) Whereas raptors played a critical role in developing awareness of and policy for chemical pollution, they have thus far played a much smaller role in current research on contaminants of emerging concern (CECs [...] 37 studies on CECs in raptors in Europe (2002–2020) were reviewed. PFASs and NFRs were the most studied CECs in eggs,

feathers and plasma. Less studied CECs: bisphenols, UV-filters, neonicotinoids, paraffins, parabens (...)

Accès au document

Opinion: Neonicotinoids pose undocumented threats to food webs

Authors: Frank SD, Tooker JF

Source: Proc Natl Acad Sci U S A. 2020, DOI: 10.1073/pnas.2017221117

Abstract: One of the main lessons that emerged from *Silent Spring* is that we overuse pesticides at our own peril because human and natural environments are unquestionably linked. It is time to revisit these lessons given current use patterns of neonicotinoid insecticides. [...]

Accès au document

Characterizing imidacloprid and metabolites in songbird blood with applications for diagnosing field exposures

Authors: Eng ML, Hao C, Watts C, Sun F, Morrissey CA

Source: Science of The Total Environment 2020, DOI: 10.1016/j.scitotenv.2020.143409.

Abstract: Neonicotinoids are the most widely used insecticides globally, but their rapid metabolism in vertebrates makes diagnosing wildlife exposure challenging. More detailed information on the pattern of imidacloprid metabolites over time could be used to better approximate the timing and level of exposure. Here, we (...) measured imidacloprid (IMI) parent compound along with an expanded suite of metabolites (5-OH-IMI, IMI-olefin, desnitro-IMI, IMI-urea, 6-chloronicotinic acid, 5-AMCP, 6-OH nicotinic acid) and six other neonicotinoids in adult red-winged blackbirds (Agelaius phoeniceus) that were experimentally exposed to one of two field-realistic concentrations of imidacloprid (0.8 or 6.9 mg/kg bw).

Accès au document

Measuring the exposure of Songbird Nestlings to Neonicotinoids in Natural and Agricultural Nest Sites

Authors: Chaudhry T

Source: York University, https://yorkspace.library.yorku.ca/xmlui/handle/10315/36260

Abstract: [...] Field research was conducted to test the presence of IMI in Savannah Sparrow (SAVS) nestlings and their insect food supply at agricultural and non-agricultural nests. Using urine samples from Tree Swallows (TRES) dosed with IMI, an HP LC-MS was used to determine the concentration of IMI its metabolite 6-chloronicotinic acid (6-CN) at 0, 3 and 6 hours after exposure. (...)

Accès au document

Effects of imidacloprid on the echolocation system of insectivorous bats.

Authors: Wu CH, Lin CL, Wang SE, Lu CW

Source: Pesticide Biochemistry and Physiology 163:94-101, DOI: 10.1016/j.pestbp.2019.10.010

Abstract: An invertebrate insect prey with neonicotinoid toxicity can adversely affect insectivores, such as echolocating bats. The aim of the current study was to examined whether imidacloprid toxicity may interfere echolocation system such as vocal, auditory, orientation, and spatial memory systems in the insectivorous bat.

By comparing the ultrasound spectrum, auditory brainstem-evoked potential, and flight trajectory, we found that imidacloprid toxicity may interfere functions in vocal, auditory, orientation, and spatial memory system of insectivorous bats (Hipposideros armiger terasensis). As suggested from immunohistochemistry and western blots evidences, we found that (...)

Accès au document

Sublethal and Lethal Methods to Detect Recent Imidacloprid Exposure in Birds with Application to Field Studies

Authors: Roy CL, Jankowski MD, Ponder J, Chen D

Source: Environ Toxicol Chem 39:1355-1366, 2020, DOI: 10.1002/etc.4721

Abstract: We used domestic chickens (*Gallus gallus domesticus*) as a model for granivorous birds to identify methods to detect recent imidacloprid exposure in wild birds. We conducted dosing experiments of 1, 5, 10, and 20% of a reported median lethal dose (equating to 1.04, 5.2, 10.4, and 20.8 mg/kg/d) by using repeated daily exposures over 7 d. We examined the parent compound and metabolites in serial collections of feces and blood during exposures and for 15 d after exposures. We also collected liver, kidney, brain, muscle, and spleen at the experiment end. (...)

Accès au document

Determination of neonicotinoids and butenolide residues in avian and insect pollinators and their ambient environment in Western Canada (2017, 2018)

Authors: Bishop C.A., Woundneh M.B., Maisonneuve F., Common J., Elliott J.E., Moran, A.J. 2020

Source: Science of The Total Environment 737:139386, 2020, DOI: 10.1016/j.scitotenv.2020.139386.

Highlights: In western Canada (2017, 2018; n=39 sites), neonicotinoid concentrations were the highest in hummingbird, honey bee nectar, water and sediment from sites closest to sprayed blueberry fields. We report the first measurement of flupyradifurone, a new butenolide insecticide, in wildlife at concentrations of 4.58 ng/mL in hummingbird cloacal fluid and 2.18 ng/g in honey bee nectar. Imidacloprid in honey bee nectar at one of four sites exceeded concentrations (1 ng/g) which sublethally affect worker bee foraging efficiency. Imidacloprid in water at one of 18 sites exceeded Canadian guidelines (230 ng/mL) for the protection of aquatic invertebrates.

Accès au document

Neonicotinoids and decline in bird biodiversity in the United States

Authors: Li Y, Miao R & Khanna M

Source: Nature Sustainability 2020, DOI: 10.1038/s41893-020-0582-x

Abstract: Neonicotinoid insecticides are being widely used [...] However, there has been no large-scale, generalizable study on their impact on biodiversity of avian species in the United States. Here we show, using a rich dataset on breeding birds and pesticide use in the United States, that the increase in neonicotinoid use led to statistically significant reductions in bird biodiversity between 2008 and 2014 relative to a

counterfactual without neonicotinoid use, particularly for grassland and insectivorous birds [...].

Accès au document

Sub-lethal effects of permethrin exposure on a passerine: implications for managing ectoparasites in wild bird nests

Authors: Bulgarella M, Knutie SA, Voss MA…

Source: Conservation Physiology 8, coaa076, 2020, DOI: 10.1093/conphys/coaa076

Abstract: Permethrin is increasingly used for parasite control in bird nests, including nests of threatened passerines. We present the first formal evaluation of the effects of continued permethrin exposure on the reproductive success and liver function of a passerine, the zebra finch (Taeniopygia guttata), for two generations. We experimentally treated all nest material with a 1% permethrin solution or a water control and provided the material to breeding finches for nest building. (...) Overall, results from exposing adults, eggs and nestlings across generations to permethrin-treated nest material suggest negative effects on finch breeding success, but not on liver function. For threatened bird conservation, the judicious application of this insecticide to control parasites in nests can result in lower nestling mortality (...)

***Note de l'expert** : Article qui pose question quant aux stratégies interventionnistes pour la conservation de la Nature, via des stratégies "d'apprentis sorciers" pas toujours bien évaluées. Outres les aspects ecotox, quelles conséquences à long terme sur la sélection naturelle de caractères propres à la lutte antiparasitaire et plus largement l'immunité et donc la santé des populations ?*

Ne faut-il pas mieux utiliser cette énergie pour lutter contre les causes anthropiques conduisant au déclin des espèces, plutôt que de vouloir réparer avec des rustines ce que l'on ne comprend pas encore assez ?

Accès au document

Multi-level analysis of exposure to triazole fungicides through treated seed ingestion in the red-legged partridge

Authors: Fernández-Vizcaíno E, Fernández de Mera IG, Mougeot F, Mateo R, Ortiz-Santaliestra M.E

Source: ENVIRONMENTAL RESEARCH 189, 109928, 2020, DOI:10.1016/j.envres.2020.109928

Abstract: Triazole fungicides are the most widely used products to treat cereal seeds. Granivomus birds, such as red-legged partridges (*Alectoris rufa*), which consume seeds left on the surface of fields after sowing, have a high risk of exposure. As triazole fungicides can affect sterol synthesis, we tested the hypothesis that treated seed consumption could alter the synthesis of sex hormones and reduce the reproductive capacity of partridges. We exposed adult partridges to seeds treated with four different formulations containing triazoles as active ingredients (flutriafol, prothioconazole, tebuconazole, and a mixture of the latter two) simulating a field exposure during the late autumn sowing season. [...]

Accès au document

Trophic magnification of legacy persistent organic pollutants in an urban terrestrial food web

Authors: Fremlin KM, Elliott JE, Green DJ, Drouillard KG, Harner T, Eng A, Gobas, FAPC

Source: SCIENCE OF THE TOTAL ENVIRONMENT 714:136746, 2020, DOI: 10.1016/j.scitotenv.2020.136746

Abstract: Legacy persistent organic pollutants (POPs), including organochlorinepesticides (OCPs), polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs), persist for generations in the environment and often negatively impact endocrine functions in exposed wildlife. Protocols to assess the bioaccumulation potential of these chemicals within terrestrial systems are far less developed than for aquatic systems [...] studies have shown that some chemicals that are not bioaccumulative in aquatic food webs can biomagnify in terrestrial food webs. Thus, [...] we examined trophic magnification of hydrophobic POPs in an urban terrestrial food web that included [...] 100 samples collected from various trophic levels of the food web including hawk eggs, songbirds, invertebrates, and berries (...)

Accès au document

High prevalence of the neonicotinoid clothianidin in liver and plasma samples collected from gamebirds during autumn sowing

Authors: Lennon RJ, Shore RF, Pereira MG, Peach WJ…

Source: Science of The Total Environment 742:140493, 2020, DOI: 10.1016/j.scitotenv.2020.140493.

Highlights: Gamebird carcasses analysed for clothianidin in plasma/liver and health parameters. Detectable residues of clothianidin rose from 6% pre-sowing, to 89% post-sowing. Detection frequency decreased over 30 days for plasma but not for liver. Faecal parasite load positively associated with clothianidin residue in livers only. Implications for future biomonitoring studies and agrochemical risk assessments

Accès au document

Concentration and origin of lead (Pb) in liver and bone of Eurasian buzzards (*Buteo buteo*) in the United Kingdom

Authors: Taggart MA, Shore RF, Pain DJ…

Sources: Environmental Pollution 267:115629, 2020, DOI: 10.1016/j.envpol.2020.115629

Highlights: Within-year variation in buzzard liver Pb matched the UK gamebird hunting season. Pb isotope ratios in high-concentration buzzard livers matched shotgun ammunition. 89% of the mass of Pb in livers of buzzards with acute exposure was from ammunition. Pb isotope ratios differed among commercial shotgun cartridge brands.

Accès au document

Lead contamination in raptors in Europe: A systematic review and meta-analysis

Authors: Monclus L, Shore RF, Krone O

Source: Science of The Total Environment 748:141437, 2020, DOI: 10.1016/j.scitotenv.2020.141437

Abstract: [...] a meta-analysis, determined if there was evidence for differences in exposure across feeding traits, geographical regions, between hunting and non-hunting periods, and changes over time. We also reviewed the impact of lead on raptors and the likely main source of exposure. [...] We examined 114 studies (1983-2019) [...] reported data for 39 raptor species but very few species were widely monitored across Europe. [...] We found a lack of homogenization in the monitoring schemes around Europe. Lead concentrations varied across feeding traits and between sampling seasons. Evidence for high occurrence of lead contamination was found, especially in scavengers. We urge studies relating lead exposure to quantitative impacts on European raptors.

Accès au document

A three-year large scale study on the risk of honey bee colony exposure to blooming sunflowers grown from seeds treated with thiamethoxam and clothianidin neonicotinoids

Authors: Flores JM, Gámiz V, Gil-Lebrero S, Rodríguez I, Navas FJ…

Source: Chemosphere 262,:127735, 2020, DOI: 10.1016/j.chemosphere.2020.127735.

Highlights: This is a field realistic trials with 180 honey bee colonies and 10 replicates. Bees were exposed to sunflower blooms treated with thiamethoxam and clothianidin. No important effects, due to the neonicotinoids, were found. Honey bee colonies were the main factor for the result variability. Cohen'F test could explain the differences among laboratory and field researchs.

Accès au document

Wildlife consumption of neonicotinoid-treated seeds at simulated seed spills

Authors: Roy CL & Coy PL

Source: Environmental Research 190:109830, 2020, DOI: 10.1016/j.envres.2020.109830

Abstract: The most likely route of exposure to high concentrations of neonicotinoids (...) in birds and mammals is consumption of treated seeds. We placed trail cameras at simulated seed spills to document wildlife consuming treated seeds during the spring planting season. We simulated 4 types of spills, corn treated with 2 concentrations of clothiandin (0.50 or 0.25 mg/seed), corn treated with thiamethoxam (0.25 mg/seed), and soybean treated with imidacloprid (0.15 mg/seed). We documented 16 species of birds and 14 species of mammals eating neonicotinoid-treated seeds at spills. (...)

Accès au document

Effects of parental exposure to glyphosate-based herbicides on embryonic development and oxidative status: a long-term experiment in a bird model

Authors: Ruuskanen S, Rainio MJ, Uusitalo M…

Source: Scientific Reports **10:**6349, 2020, DOI: 10.1038/s41598-020-63365-1

Abstract: [...] However, the potential for GBH-related parental effects are poorly understood. [...] GBHs may be transferred directly from mothers to eggs, or they may indirectly influence offspring performance by altered maternal resource allocation to eggs. We experimentally exposed a parental generation of Japanese quails (*Coturnix japonica*) to GBHs (200 mg/kg feed) or respective controls. Glyphosate residues were

found in eggs (ca 0.76 kg/mg). Embryonic development tended to be poorer in the eggs of GBH-exposed parents (76% of eggs showed normal development) compared to control parents (89% normal eggs). Embryonic brain tissue from GBH-exposed parents tended to express more lipid damage (20% higher), yet other biomarkers showed no apparent differences. (...)

Accès au document

Female Preference and Adverse Developmental Effects of Glyphosate-Based Herbicides on Ecologically Relevant Traits in Japanese Quails

Authors: Ruuskanen S, Rainio MJ, Kuosmanen V, Laihonen M, Saikkonen K, Saloniemi I, Helander M

Source: Environmental Science & Technology 54(2):1128-1135, 2020, DOI: 10.1021/acs.est.9b07331

Abstract: [...] An increasing number of studies have identified GBH residues in soil, water, and even human food that may expose nontarget organisms including wildlife, [...] Thus, decision makers urgently need scientific evidence on GBH residues and their possible effects on ecosystems. [...] Here, using Japanese quails (*Coturnix japonica*) as our model, we show that females preferred GBH-contaminated food compared to control food. In females, exposure to GBHs caused delayed plumage development, and GBH residues were present in eggs, muscles, and liver. [...] further studies are needed to understand the risks of such residues in the food chain.

Accès au document

Glyphosate-based herbicides influence antioxidants, reproductive hormones and gut microbiome but not reproduction: A long-term experiment in an avian model

Authors: Ruuskanen S, Rainio MJ, Gómez-Gallego C, Selenius O, Salminen S, Carmen Collado M, Saikkonen K, Saloniemi I, Helander M

Source: Environmental Pollution 266:115108, 2020, DOI: 10.1016/j.envpol.2020.115108.

Highlights: We performed the first long-term experiment (from the age of 10 days–52 weeks) on the most used and controversial herbicide, glyphosate, on Japanese quail females and males (Coturnix japonica). GBH exposure decreased the activity of hepatic antioxidant biomarkers and male testosterone in all ages. GBH exposure did not influence reproduction. Our results are important in predicting potential GBH effects on wild populations and poultry industry and in wild galliforms

Accès au document

Good, the Bad, and the Risky: Can Birds Be Incorporated as Biological Control Agents into Integrated Pest Management Programs?

Authors: Garcia K, Olimpi EM, Karp DS, Gonthier DJ

Source: Journal of Integrated Pest Management 11(11), 2020, DOI: 10.1093/jipm/pmaa009

Abstract: Some bird species often benefit farmers by suppressing invertebrate crop pests,

yet birds are rarely considered in integrated pest management (IPM) strategies. [...] understanding when birds are most likely to enhance crop production (and when they are most likely to depress it) is crucial for designing effective IPM strategies. Here, we briefly review the literature on birds in agricultural systems, discuss examples of how birds can provide services and disservices to crops, examine factors that influence the net effects of birds,(...)

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / PESTICIDES/CLIMAT et VdT/ENCHY

Effect of temperature on the toxicity of imidacloprid to *Eisenia andrei* and *Folsomia candida* in tropical soils

ENVIRONMENTAL POLLUTION 267, 2020, DOI: 10.1016/j.envpol.2020.115565

The influence of temperature on the chronic toxicity and risk of imidacloprid to soil non-target species was assessed in tropical soils. Earthworms Eisenia andrei and collembolans Folsomia candida were exposed to a tropical artificial soil (TAS) and two natural tropical soils from Brazil (Entisol and Oxisol) with increasing concentrations of imidacloprid under atmospheric temperatures of 20, 25 and 28 degrees C. (...)

Accès au document

The responses of the growth, cytochrome P450 isoenzymes activities and the metabolomics in earthworms to sublethal doses of dichlorvos in soil

ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY, 2021, DOI: 10.1016/j.ecoenv.2020.111547

In this paper, earthworms (*Eisenia fetida*) were exposed to sublethal doses of dichlorvos (spiked concentration of 0.1, 1.0, 10 mg/kg) in soil for 14 days, the metabolomics and activities of cytochrome P450 (CYP) isoenzymes (CYP1A2, CYP2C9 and CYP3A4) of earthworms were analyzed aiming to identify sensitive biomarkers and reveal possible mode of toxic action. (...)

Accès au document

Oxidative stress, growth inhibition, and DNA damage in earthworms induced by the combined pollution of typical neonicotinoid insecticides and heavy metals

SCIENCE OF THE TOTAL ENVIRONMENT, 2021, DOI: 10.1016/j.scitotenv.2020.141873

Heavy metals pollution of soil and widespread application of neonicotinoid insecticides have caused environmental problems worldwide. To evaluate ecological toxicity resulting from the combined pollution of neonicotinoids and heavy metals, typical representatives of neonicotinoid insecticides (imidacloprid, thiamethoxam, dinotefuran) and heavy metals (cadmium, copper, zinc) were selected as soil pollutants; earthworms were used as test organisms. (...)

Accès au document

Elucidating pesticide sensitivity of two endogeic earthworm species through the interplay between esterases and glutathione S-transferases

[...] little is known on their pesticide metabolic capacities. We firstly compared the baseline activity of B-esterases and glutathione-5-transferase in *Allolobophora chlorotica* and Aporrectodea caliginosa. Secondly, vulnerability of these species to pesticide exposure was assessed by in vitro trials using the organophosphate (OP) chlorpyrifosethyl-oxon (CPOx) and ethyl-paraoxon (POx), and by short-term (7 days) in vivo metabolic responses in soil contaminated with pesticides.

Accès au document

Soil persistence and environmental risk assessment of chlorpyrifos under different organic manuring in the tropical sugarcane ecosystem

INTERNATIONAL JOURNAL OF ENVIRONMENTAL ANALYTICAL CHEMISTRY

[...] The organic manures may have some impact on the persistence of chlorpyrifos in the soil. Hence, the persistence of chlorpyrifos in the manurial soils was studied by employing the single-step sample preparation method and GC-ECD. [...]

Accès au document

Residues of currently used pesticides in soils and earthworms: A silent threat?

Critical knowledge gaps about environmental fate and unintentional effects of currently used pesticides (CUPs) hamper the understanding and mitigation of their global impacts on ecological processes. We investigated the exposure of earthworms to 31 multiclass CUPs in an arable landscape in France. (...)

Accès au document

Mechanistic Effect Modeling of Earthworms in the Context of Pesticide Risk Assessment: Synthesis of the FORESEE Workshop

Earthworms are important ecosystem engineers, and assessment of the risk of plant protection products toward them is part of the European environmental risk assessment (ERA). In the current ERA scheme, exposure and effects are represented simplistically and are not well integrated, resulting in uncertainty when the results are applied to ecosystems. Modeling offers a powerful tool to integrate the effects observed in lower tier laboratory studies with the environmental conditions under which exposure is expected in the field.

Accès au document

Combined effects of mulch film-derived microplastics and atrazine on oxidative stress and gene expression in earthworm (*Eisenia fetida*)

With the wide use of mulch film and pesticides, mulch film-derived microplastics are very likely to produce combined effects with pesticides in agricultural soil. However, little is known about their combined toxicity on terrestrial organisms. This study aimed to investigate the combined toxicity of unused or farmland residual transparent low-density polyethylene mulch film-derived microplastics (MPs and MPs-aged, respectively) (550-1000 μm) and atrazine (ATZ; 0.02 and 2.0 mg/kg) on the earthworm (Eisenia fetida).

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / PLASTIQUES

Synergistic biodegradation of aromatic-aliphatic copolyester plastic by a marine microbial consortium

Authors: Meyer-Cifuentes IE, Werner J, Jehmlich N...

Source: NATURE COMMUNICATIONS 11(1), 2020, DOI: 10.1038/s41467-020-19583-2

Abstract: The degradation of synthetic polymers by marine microorganisms is not as well understood as the degradation of plastics in soil and compost. Here, we use metagenomics, metatranscriptomics and metaproteomics to study the biodegradation of an aromatic-aliphatic copolyester blend by a marine microbial enrichment culture.

Accès au document

Biodeterioration of Untreated Polypropylene Microplastic Particles by Antarctic Bacteria

Authors: Habib S, Iruthayam A, Abd Shukor MY...

Source: POLYMERS 12(11), 2020, DOI: 10.3390/polym12112616

Abstract: Microplastic pollution is globally recognised as a serious environmental threat due to its ubiquitous presence related primarily to improper dumping of plastic wastes. While most studies have focused on microplastic contamination in the marine ecosystem, microplastic pollution in the soil environment is generally little understood and often overlooked. This study evaluates the growth and biodegradation potential of the Antarctic soil bacteria *Pseudomonas* sp. ADL15 and *Rhodococcus* sp. ADL36 on the polypropylene (PP) microplastics in Bushnell Haas (BH) medium for 40 days.

Accès au document

Responses of bacterial communities and resistance genes on microplastics to antibiotics and heavy metals in sewage environment

Authors: Zhao YF, Gao JF, Wang ZQ...

Source: JOURNAL OF HAZARDOUS MATERIALS 402, 2021, DOI: 10.1016/j.jhazmat.2020.123550

Abstract: In present study, copper (Cu), zinc (Zn), tetracycline (TC) and ampicillin (AMP) were selected to study the in-dividual and synergistic

effects of antibiotics and heavy metals on the microbial communities and resistance genes on polyvinyl chloride microplastics (PVC MPs) and surrounding sewage after 28 and 84 days.

Accès au document

Insights into the Fungal Community and Functional Roles of Pepper Rhizosphere Soil under Plastic Shed Cultivation

Authors: Yao S, Li XN, Cheng H...

Source: DIVERSITY-BASEL 12(11), 2020, DOI: 10.3390/d12110432

Abstract: The rhizosphere fungal community is essential for determining plant health and improving crop productivity. The fungal community structure and functional roles in the plastic shed soils were explored using high throughput sequencing and FUNGuild in this study.

Accès au document

Soil Microbial Communities Associated With Biodegradable Plastic Mulch Films

Authors: Bandopadhyay S, Gonzalez JELY, Henderson KB...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.587074

Abstract: Agricultural plastic mulch films provide a favorable soil microclimate for plant growth, improving crop yields. Biodegradable plastic mulch films (BDMs) have emerged as a sustainable alternative to widely used non-biodegradable polyethylene (PE) films. BDMs are tilled into the soil after use and are expected to biodegrade under field conditions. However, little is known about the microbes involved in biodegradation and the relationships between microbes and plastics in soils. In order to capture the consortium of soil microbes associated with (and thus likely degrading) BDMs, agriculturally-weathered plastics from two locations were studied alongside laboratory enrichment experiments to assess differences in the microbial communities associated with BDMs and PE films.

Accès au document

DROIT ET POLITIQUE DE L'ENVIRONNEMENT

MEPs approve deal on tap water and demand that EU water legislation be respected

Europarl 01/12/20

The Environment Committee today approved the deal on the drinking water directive and adopted a resolution demanding EU legislation on water be correctly implemented.

The agreement with member states on the drinking water directive was approved with 73 votes to 2 and 5 abstentions. The new rules will improve the quality of tap water by tightening the maximum limits for certain pollutants such as lead and harmful bacteria. They also aim to cut plastic litter by encouraging the use of tap water. This could be done by providing water free of charge in public buildings or for a low service fee, and to customers in restaurants, canteens, and catering services. [...]

Accès au document

REGLEMENTATION / DROIT

Groupe de substances 4-(1,1,3,3-tétraméthylbutyl) phénol, éthoxylé

RÈGLEMENT (UE) 2020/2160 DE LA COMMISSION du 18 décembre 2020 modifiant l'annexe XIV du règlement (UE) n° 1907/2006 du Parlement européen et du Conseil en ce qui concerne le groupe de substances 4-(1,1,3,3-tétraméthylbutyl)phénol, éthoxylé (couvrant les substances bien définies et les substances de composition inconnue ou variable, les produits de réaction complexes ou les matériaux biologiques, les polymères et homologues)

Numéro officiel : UE/2020/2160

Date de signature : 18/12/2020

Liens juridiques : Modification Règlement CE/1907/2006 18/12/2006

Accès au document

Demandes d'autorisations de mise sur le marché de produits phytopharmaceutiques : composition des dossiers

Arrêté du 11 décembre 2020 modifiant l'arrêté du 30 juin 2017 fixant la composition et les modalités de présentation des dossiers de demandes relatives à des autorisations de mise sur le marché et à des permis d'expérimentation et de commerce parallèle de produits phytopharmaceutiques, de leurs adjuvants ou de produits mixtes

Numéro officiel : AGRG2035034A

Date de signature : 11/12/2020

Liens juridiques : Modification Arrêté 30/06/2017 NOR AGRG1710934A

Accès au document

Teneurs maximales en résidus de pesticides dans et sur les denrées alimentaires : programme de contrôle de l'Union 2021 à 2023

RÈGLEMENT D'EXÉCUTION (UE) 2020/585 DE LA COMMISSION du 27 avril 2020 concernant un programme de contrôle, pluriannuel et coordonné, de l'Union pour 2021, 2022 et 2023, destiné à garantir le respect des teneurs maximales en résidus de pesticides dans et sur les denrées alimentaires d'origine végétale et animale et à évaluer l'exposition du consommateur à ces résidus

Numéro officiel : UE/2020/585

Date de signature : 27/04/2020

Historique : Modification le 01/01/2021 par Règlement d'exécution UE/2020/2041 11/12/2020

Accès au document

Liste des substances actives de la famille des néonicotinoïdes ou présentant des modes d'action identiques

Décret n° 2020-1601 du 16 décembre 2020 fixant la liste des substances actives de la famille des néonicotinoïdes ou présentant des modes d'action identiques à ceux de ces substances interdites en application de l'article L. 253-8 du code rural et de la pêche maritime

Numéro officiel : 2020-1601 / AGRG2035048D

Date de signature : 16/12/2020

Liens juridiques : Modification Code rural et de la pêche maritime

Accès au document

Mise sur le marché de certains produits phytopharmaceutiques en cas de danger sanitaire pour les betteraves sucrières

LOI n° 2020-1578 du 14 décembre 2020 relative aux conditions de mise sur le marché de certains produits phytopharmaceutiques en cas de danger sanitaire pour les betteraves sucrières (1)

Numéro officiel : 2020-1578 / AGRS2021912L

Date de signature : 14/12/2020

Liens juridiques : Modification Code rural et de la pêche maritime

Accès au document

Autorisation refusée par l'Union pour la famille de produits biocides «Peroxyde d'hydrogène Contec»

DÉCISION D'EXÉCUTION (UE) 2020/2124 DE LA COMMISSION du 9 décembre 2020 concernant le refus d'une autorisation de l'Union pour la famille de produits biocides «Peroxyde d'hydrogène Contec»

Numéro officiel : UE/2020/2124

Date de signature : 09/12/2020

Accès au document

Non-renouvellement de l'approbation de la substance active «mancozèbe»

RÈGLEMENT D'EXÉCUTION (UE) 2020/2087 DE LA COMMISSION du 14 décembre 2020 portant sur le non-renouvellement de l'approbation de la substance active «mancozèbe», conformément au règlement (CE) n° 1107/2009 du Parlement européen et du Conseil concernant la mise sur le marché des produits phytopharmaceutiques, et modifiant l'annexe du règlement d'exécution (UE) n° 540/2011 de la Commission

Numéro officiel : UE/2020/2087

Date de signature : 14/12/202

Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Substances chimiques et restrictions (REACH), substances cancérogènes, mutagènes ou toxiques pour la reproduction (CMR), polluants organiques persistants

RÈGLEMENT (UE) 2020/2096 DE LA COMMISSION du 15 décembre 2020 modifiant l'annexe XVII du règlement (CE) no 1907/2006 du Parlement européen et du Conseil concernant l'enregistrement, l'évaluation et l'autorisation des substances chimiques, ainsi que les restrictions applicables à ces substances (REACH), en ce qui concerne les substances cancérogènes, mutagènes ou toxiques pour la reproduction (CMR), les dispositifs relevant du règlement (UE) 2017/745 du Parlement européen et du Conseil, les polluants organiques persistants, certaines substances ou certains

mélanges liquides, le nonylphénol et les méthodes d'essai pour les colorants azoïques

Numéro officiel : UE/2020/2096

Date de signature : 15/12/2020

Liens juridiques : Modification Règlement CE/1907/2006 18/12/2006

Accès au document

Renouvellement de l'approbation de la substance active «kieselgur (terre à diatomées)»

RÈGLEMENT D'EXÉCUTION (UE) 2020/2101 DE LA COMMISSION du 15 décembre 2020 portant renouvellement de l'approbation de la substance active «kieselgur (terre à diatomées)» conformément au règlement (CE) n° 1107/2009 du Parlement européen et du Conseil concernant la mise sur le marché des produits phytopharmaceutiques, et modifiant l'annexe du règlement d'exécution (UE) n° 540/2011 de la Commission

Numéro officiel : UE/2020/2101

Date de signature : 15/12/2020

Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Approbation de la substance active «étoxazole» en tant que substance dont on envisage la substitution

RÈGLEMENT D'EXÉCUTION (UE) 2020/2105 DE LA COMMISSION du 15 décembre 2020 renouvelant l'approbation de la substance active «étoxazole» en tant que substance dont on envisage la substitution, conformément au règlement (CE) n° 1107/2009 du Parlement européen et du Conseil concernant la mise sur le marché des produits phytopharmaceutiques, et modifiant l'annexe du règlement d'exécution (UE) n° 540/2011 de la Commission

Numéro officiel : UE/2020/2105

Date de signature : 15/12/2020

Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Prolongation de la période d'approbation des substances actives

RÈGLEMENT D'EXÉCUTION (UE) 2020/2007 DE LA COMMISSION du 8 décembre 2020 modifiant le règlement d'exécution (UE) n° 540/2011 en ce qui concerne la prolongation de la période d'approbation des substances actives «1-décanol», «1,4-diméthylnaphthalène», «6-benzyladénine», «acéquinocyl», «acide L-ascorbique», «acide S-abscissique», «Adoxophyes orana granulovirus», «amisulbrom», «Aureobasidium pullulans (souches DSM 14940 et DSM 14941)», «azadirachtine», «Bacillus pumilus QST 2808», «bénalaxyl-M», «bixafen», «bupirimate», «Candida oleophila souche O», «chlorantraniliprole», «dithianon», «dodine», «émamectine», «flubendiamide», «fluométuron», «fluxapyroxad», «flutriafol», «hexythiazox», «huile essentielle d'orange», «imazamox», «ipconazole», «isoxabène», «Paecilomyces fumosoroseus souche FE 9901», «pendiméthaline», «penflufène», «penthiopyrade», «phosphonate de disodium», «phosphonates de potassium», «phosphure de zinc», «polysulfure de calcium», «prosulfuron», «Pseudomonas sp. souche DSMZ 13134», «pyridalyl», «pyriofénone», «pyroxsulam», «quinmérac», «sedaxane», «sintofen», «sulfate d'aluminium», «spinetoram», «spirotetramat», «Streptomyces lydicus souche WYEC 108», «tau-fluvalinate», «tebufenozide», «tembotrione»,

«thiencarbazone», «thiosulfate de sodium et d'argent» et «valifénalate»

Numéro officiel : UE/2020/2007

Date de signature : 08/12/2020

Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Actions standardisées d'économie de produits phytopharmaceutiques

Arrêté du 27 novembre 2020 portant modification de l'arrêté du 9 mai 2017 définissant les actions standardisées d'économie de produits phytopharmaceutiques

Numéro officiel : manquant

Date de signature : 27/11/2020

Liens juridiques : Modification Arrêté 09/05/2017 NOR AGRGl711537A

Accès au document

Approbation refusée du chlorophène en tant que substance active existante destinée à être utilisée dans des produits biocides du type 2

DÉCISION D'EXÉCUTION (UE) 2020/1765 DE LA COMMISSION du 25 novembre 2020 refusant l'approbation du chlorophène en tant que substance active existante destinée à être utilisée dans des produits biocides du type 2

Numéro officiel : UE/2020/1765

Date de signature : 25/11/2020

Accès au document

Limites maximales applicables aux résidus d'azinphos-méthyl, de bentazone, de diméthomorphe, de fludioxonil, de flufénoxuron, d'oxadiazon, de phosalone, de pyraclostrobine, de la substance «répulsifs: tallol» et de téflubenzuron

RÈGLEMENT (UE) 2020/1633 DE LA COMMISSION du 27 octobre 2020 modifiant les annexes II, III, IV et V du règlement (CE) n° 396/2005 du Parlement européen et du Conseil en ce qui concerne les limites maximales applicables aux résidus d'azinphos-méthyl, de bentazone, de diméthomorphe, de fludioxonil, de flufénoxuron, d'oxadiazon, de phosalone, de pyraclostrobine, de la substance «répulsifs: tallol» et de téflubenzuron, présents dans ou sur certains produits

Numéro officiel : UE/2020/1633

Date de signature : 27/10/2020

Liens juridiques : Modification le 25/05/2021 Règlement CE/396/2005 23/02/2005

Accès au document

Période d'approbation des substances actives «phosphure de calcium», «benzoate de dénatonium», «haloxyfop-P», «imidacloprid», «pencycuron» et «zéta-cyperméthrine»

RÈGLEMENT D'EXÉCUTION (UE) 2020/1643 DE LA COMMISSION du 5 novembre 2020 modifiant le règlement d'exécution (UE) n° 540/2011 en ce

qui concerne la période d'approbation des substances actives «phosphure de calcium», «benzoate de dénatonium», «haloxyfop-P», «imidacloprid», «pencycuron» et «zéta-cyperméthrine»

Numéro officiel : UE/2020/1643

Date de signature : 05/11/2020

Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

PUBLICATIONS DU RESEAU ECOTOX

Adsorption and degradation of the herbicide nicosulfuron in a stagnic Luvisol and Vermic Umbrisol cultivated under conventional or conservation agriculture

Authors: Cueff S, Alletto L, Dumeny V, Benoit P, Pot V

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early access, 2020, DOI: 10.1007/s11356-020-11772-2

Abstract: […] However, conservation agriculture practices can increase the risk of contamination by pesticides, mainly through vertical transfer via water flow. Better understanding of their sorption and degradation processes is thus needed in conservation agriculture as they control the amount of pesticide available for vertical transfer. The purpose of our study was to investigate the sorption and degradation processes of nicosulfuron in soil profiles (up to 90 cm deep) of a Vermic Umbrisol and a Stagnic Luvisol managed either in conventional or in conservation agriculture. Two laboratory sorption and incubation experiments were performed. Low sorption was observed regardless of the soil type, agricultural management or depth, with a maximum value of 1.3 +/- 2.0 L kg(-1). By the end of the experiment (91 days), nicosulfuron mineralisation in the Vermic Umbrisol was similar for the two types of agricultural management and rather depended on soil depth (29.0 +/- 2.3% in the 0-60-cm layers against 7.5 +/- 1.4% in the 60-90 cm). In the Stagnic Luvisol, nicosulfuron mineralisation reached similar value in every layer of the conservation agriculture plot (26.5% +/- 0.7%). On the conventional tillage plot, mineralisation decreased in the deepest layer (25-60 cm) reaching only 18.4 +/- 6.9% of the applied nicosulfuron. Regardless of the soil type or agricultural management, non-extractable residue formation was identified as the main dissipation process of nicosulfuron (45.1 +/- 8.5% and 50.2 +/- 7.0% under conventional and conservation agriculture respectively after 91 days). In our study, nicosulfuron behaved similarly in the Vermic Umbrisol regardless of the agricultural management, whereas the risk of transfer to groundwater seemed lower in the Stagnic Luvisol under conservation agriculture.

Accès au document

Hydro-climatic drivers of land-based organic and inorganic particulate micropollutant fluxes: The regime of the largest river water inflow of the Mediterranean Sea

Authors: Delile H, Masson M, Miege C, Le Coz J, Poulier G, Le Bescond C, Radakovitch O, Coquery M

Source: WATER RESEARCH 185:116067, 2020, DOI: 10.1016/j.watres.2020.116067

Abstract: Land-based micropollutants are the largest pollution source of the marine

environment acting as the major large-scale chemical sink. Despite this, there are few comprehensive datasets for estimating micropollutant fluxes released to the sea from river mouths. Hence, their dynamics and drivers remain poorly understood. Here, we address this issue by continuous measurements throughout the Rhone River basin (similar to 100,000 km(2)) of 1) particulate micropollutant concentrations (persistant organic micropollutants: polychlorobiphenyls [PCBi] and polycyclic aromatic hydrocarbons [PAHs]; emerging compounds: glyphosate and aminomethylphosphonic acid [AMPA]; and trace metal elements [TME]), 2) suspended particulate matter [SPM], and 3) water discharge. From these data, we computed daily fluxes for a wide range of micropollutants (n = 29) over a long-term period (2008-2018). We argue that almost two-thirds of annual micropollutant fluxes are released to the Mediterranean Sea during three short-term periods over the year. The watershed hydro-climatic heterogeneity determines this dynamic by triggering seasonal floods. Unexpectedly, the large deficit of the inter-annual monthly micropollutant fluxes inputs (tributaries and the Upper Rhone River) compared to the output (Beaucaire station) claims for the presence of highly contaminated missing sources of micropollutants in the Rhone River water-shed. Based on a SPM-flux-averaged micropollutant concentrations mass balance of the system and the estimates of the relative uncertainty of the missing sources concentration, we assessed their location within the Rhone River catchment. We assume that the potential missing sources of PAHs, PCBi and TME would be, respectively, the metropolitan areas, the alluvial margins of the Rhone River valley, and the unmonitored Cevenol tributaries. (C) 2020 Elsevier Ltd. All rights reserved.

Accès au document

Ozonation of 47 organic micropollutants in secondary treated municipal effluents: Direct and indirect kinetic reaction rates and modelling

Authors: Mathon B, Coquery M, Liu Z, Penru Y, Guillon A, Esperanza M, Miege C, Chouber, JM

Source: CHEMOSPHERE 262:127969, 2021, DOI: 10.1016/j.chemosphere.2020.127969

Abstract: […] We designed an innovative experimental protocol combining batch experiments and a study of a full-scale WWTP to understand and predict the removal via ozonation of typical micropollutants present in secondary treated effluents. First, the direct and indirect ozonation of 47 organic micropollutants was scrutinized, then a model was developed and calibrated to simulate the ozone transfers and the oxidation of the selected micropollutants. […] We classified the micropollutants into low- (k(O3) between 1.50 and 4.47 x 10(2) L mol(-1).s(-1)), medium- (k(O3) between 1.31 x 10(3) and 4.92 x 10(3) L mol(-1).s(-1)) and high-oxidizable groups (k(O3) between 9.44 x 10(4) and 8.18 x 10(6) L mol(-1).s(-1)) according to their reactivity with ozone, and identified the major degradation pathways for all 47 micropollutants. Micropolluants of the low- and mediumoxidizable groups were largely eliminated by the indirect pathway, at 96% and 84% on average, respectively. In contrast, micropollutants of high-oxidizable group were largely eliminated by the direct pathway, at 98% on average. The model successfully simulated the direct and indirect ozonation of the 47 micropollutants in batch experiments and confirmed the predominant pathways for each group. Finally, the model was applied to the full-scale ozonation process operated at an ozone dose ranging from 0.5 to 1.6 gO(3).gDOC(-1). The model was found to reliably simulate the ozonation-process removal efficiencies for 4 micropollutants (imidacloprid, fenofibric acid, metronidazole and ketoprofen). (C) 2020 Elsevier Ltd. All rights reserved.

Accès au document

Transfer of persistent organic pollutants in food of animal origin - Meta-analysis of published data

Authors: Amutova F, Delannoy M, Baubekova A, Konuspayeva G, Jurjanz S

Source: CHEMOSPHERE 262:128351, 2021, DOI: 10.1016/j.chemosphere.2020.128351

Abstract: The transfer of POPs in food of animal origin has been studied by a meta-analysis of 28 peer-reviewed articles using transfer rate (TR) for milk and eggs and bioconcentration factors (BCF) for eligible tissues after establishing an adapted methodology. TRs of the most toxic PCDD/Fs into milk were generally elevated and even higher into eggs. BCFs in excreting adult animals varied widely between studies complicating to hierarchize tissues or congeners, even if liver and fat seemed to bioconcentrate more than lean tissues. Short time studies have clearly shown low BCFs contrarily to field studies showing the highest BCFs. The BCFs of PCDD/Fs in growing animals were higher in liver than in fat or muscle. In contrast to easily bioconcentrating hexachlorinated congeners, octa- and heptachlorinated congeners barely bioconcentrate. PCB transfer into milk and eggs was systematically high for very lipophilic congeners. Highly ortho-chlorinated PCBs were transferred >50% into milk and eggs and even >70% for congeners 123 and 167 into eggs. BCFs of the most toxic PCBs 126 and 169 were significantly higher than for less toxic congeners. BCFs seem generally low in PBDEs except congeners 47, 153 and 154. DDT and its metabolites showed high bioconcentration. Differences between tissues appeared but were masked by a study effect. In addition to some methodologic recommendations, this analysis showed the high transfer of POPs into eggs, milk and liver when animals were exposed justifying a strong monitoring in areas with POP exposure. (C) 2020 Elsevier Ltd. All rights reserved.

Accès au document

A 3D ecotoxi-topological profile: Using concentration-time-response surfaces to show peroxidase activity in *Zea mays* (L.) exposed to aluminium or arsenic in hydroponic conditions

Authors: Engel F, Cotelle S, Somensi CA, Testolin RC, Correa R, Toumi H, Ferard JF, Radetski CM

Source: CHEMOSPHERE 262:127647, 2021, DOI: 10.1016/j.chemosphere.2020.127647

Abstract: This study sought to use concentration-time-response surfaces to show the effects of exposure to toxic (semi-)metals on peroxidase activity in higher plants as a function of exposure-concentration and exposure-time. Maize (*Zea mays* L.) seedlings (i.e., leaves and roots) were exposed to arsenic (as As3+) or aluminium (as Al3+) under hydroponic conditions, and their biomass and peroxidase enzyme responses were assessed at different concentration-time-exposures. The 3D ecotoxi-profile generated with these data showed two distinct regions: the first region is formed by exposures (i.e., points for time-concentration pairings) that were not statistically different from the results of the control points (i.e., zero toxicant concentration and all exposure-times), whereas the second region is formed by exposure pairings with results that were statistically different to those obtained from control pairings. Overall, the data show that enzyme activity increased over a shorter exposure-time when there was an increase in the exposure-concentration of the toxicant, which can be seen on a 3-D toxicity profile. We propose that quantitative relationship ratios from different assessed endpoints (e.g., biomass and enzyme activity) and enzymatic concentration-time-response surfaces could be helpful in the field of environmental-policy management. (C) 2020 Elsevier Ltd. All rights reserved.

Accès au document

Elucidating pesticide sensitivity of two endogeic earthworm species through the interplay between esterases and glutathione S-transferases

Authors: Jouni F, Brouchoud C, Capowiez Y, Sanchez-Hernandez JC, Rault M

Source: CHEMOSPHERE 262:127724, 2021, DOI: 10.1016/j.chemosphere.2020.127724

Abstract: Earthworms are common organisms in soil toxicity-testing framework, and endogeic species are currently recommended due to their ecological role in agroecosystem. However, little is known on their pesticide metabolic capacities. We firstly compared the baseline activity of B-esterases and glutathione-5-transferase in Allolobophora chlorotica and *Aporrectodea caliginosa*. Secondly, vulnerability of these species to pesticide exposure was assessed by in vitro trials using the organophosphate (OP) chlorpyrifosethyl-oxon (CPOx) and ethyl-paraoxon (POx), and by short-term (7 days) in vivo metabolic responses in soil contaminated with pesticides. Among B-esterases, acetylcholinesterase (AChE) activity was abundant in the microsomal fraction (80% and 70% of total activity for A. caliginosa and A. chlorotica, respectively). Carboxylesterase (CbE) activities were measured using three substrates to examine species differences in isoenzyme and sensitivity to both in vitro and in vivo exposure. CbEs were mainly found in the cytosolic fraction (80% and 60% for *A. caliginosa* and *A. chlorotica* respectively). GST was exclusively found in the soluble fraction for both species. Both OPs inhibited B-esterases in a concentration-dependent manner. In vitro trials revealed a pesticide-specific response, being *A. chlorotica* AChE more sensitive to CPOx compared to POx. CbE activity was inhibited at the same extent in both species. The 7d exposure showed *A. chlorotica* less sensitive to both OPs, which contrasted with outcomes from in vitro experiments. This non-related functional between both approaches for assessing pesticide toxicity suggests that other mechanisms linked with in vivo OP bioactivation and excretion could have a significant role in the OP toxicity in endogeic earthworms. (C) 2020 Elsevier Ltd. All rights reserved.

Accès au document

Monitoring of pesticides in ambient air: Prioritization of substances

Authors: Hulin M, Leroux C, Mathieu A, Gouzy A, Berthet A, Boivin A, Bonicelli B, Chubilleau C, Hulin A, Garziandia EL, Mamy L, Millet M, Pernot P, Quivet E, Scelo AL, Merlo M, Ruelle B, Bedos C

Source: SCIENCE OF THE TOTAL ENVIRONMENT 753:141722, 2020, DOI: 10.1016/j.scitotenv.2020.141722

Abstract: Despite the richness of data collected on pesticide concentrations in ambient air in France, knowledge on this topic remains partial and heterogeneous in the absence of specific regulations. The population exposure remains thus difficult to estimate; therefore it was necessary to define modalities for implementing national monitoring of pesticides in ambient air in metropolitan France and in the overseas territories. The objective of this work was to identify which active substances (a.s.) have to be monitored in priority. As part of a collective expertise, a group of multidisciplinary experts has developed a method to rank active substances authorised as plant protection products, biocides and antiparasitic agents, which were available on the French market in 2015. A 3-steps approach has been developed. The first step consisted of a theoretical approach based on a hierarchy of substances according to four criteria: (a) national uses, (b) emission potential to the air, (c) persistence in the air, and (d) chronic toxicity. The three first criteria give information on their potential to be present in the atmosphere, and the fourth criterion

allows to consider their potential of hazard. The second step was an observational approach based on existing database on pesticide air measurements in France. In the third step, both approaches were combined using decision trees to select priority pesticides. Among the 1316 a.s. first identified from the EU Pesticides database, 90 were selected, among which 43 required metrological and/or analytical development. The experts recommended confirming the relevance of performing a longer term monitoring of these a.s. after a one-year exploratory campaign. The proposed method is reproduceable, transparent, easy to update (e.g. in the light of a change in product authorization), and can be adapted to other agricultural and geographical conditions, and objectives (e.g. monitoring of the ecotoxicological effects of pesticides). (C) 2020 Published by Elsevier B.V.

Accès au document

Academic expertise in assisting private companies in the fields of environment and environmental toxicology: the role of individual expertise

Authors: Mougin C, Campbell PGC, Couderchet M, Denefle P, Martin-Laurent F, Roland P, Slaveykova VI, Vincent T, Delaunay D

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2020, DOI: 10.1007/s11356-020-11631-0

Abstract: The scientific knowledge produced by academic research can be valued in all sectors of human activity, including private sector. The ROVALTAIN Foundation organized a round-table during its scientific day in 2019. It crossed the points of view of academic scientists and industrial partners, addressing five main topics. The first one concerned the validation of a common definition of the academic research/private partners interface. Then, the group discussed the place for academic expertise in the corporate world; the advantages of involving academic researchers in expertise for the private sector; and the limits of this model. To conclude, the need of a third party, like the ROVALTAIN Foundation, as a catalyzer in building the interface between academic research and private partners has been discussed.

Accès au document

Ecotoxicological assessment of commercial boron nitride nanotubes toward *Xenopus laevis* tadpoles and host-associated gut microbiota

Authors: Evariste L, Flahaut E, Baratange C, Barret M, Mouchet F, Pinelli E, Galibert AM, Soula B, Gauthier L

Source: NANOTOXICOLOGY Eraly access, 2020, DOI: 10.1080/17435390.2020.1839137

Abstract: Despite the growing interest for boron nitride nanotubes (BNNT) due to their unique properties, data on the evaluation of the environmental risk potential of this emerging engineered nanomaterial are currently lacking. Therefore, the ecotoxicity of a commercial form of BNNT (containing tubes, hexagonal-boron nitride, and boron) was assessed in vivo toward larvae of the amphibian *Xenopus laevis*. Following the exposure, multiple endpoints were measured in the tadpoles as well as in bacterial communities associated to the host gut. Exposure to BNNT led to boron accumulation in host tissues and was not associated to genotoxic effects. However, the growth of the tadpoles increased due to BNNT exposure. This parameter was associated to remodeling of gut microbiome, benefiting to taxa from the phylum Bacteroidetes. Changes in relative abundance of this phylum were positively correlated to larval growth. The obtained results support the finding that BNNT are biocompatible as indicated by the

absence of toxic effect from the tested nanomaterials. In addition, byproducts, especially free boron present in the tested product, were overall beneficial for the metabolism of the tadpoles.

Accès au document

Reduction of chlordecone environmental availability by soil amendment of biochars and activated carbons from lignocellulosic biomass

Authors: Ranguin R, Jean-Marius C, Yacou C, Gaspard S, Feidt C, Rychen G, Delannoy M

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 27(33):41093-41104, 2020, DOI: 10.1007/s11356-019-07366-2

Abstract: Chlordecone (kepone or CLD) was formerly used in French West Indies as an insecticide. Despite its formal ban in 1993, high levels of this pesticide are still found in soils. As such, sequestering matrices like biochars or activated carbons (ACs) may successfully decrease the bioavailability of halogenated compounds like CLD when added to contaminated soils. The present study intends (i) to produce contrasted sequestering matrices in order to (ii) assess their respective efficiency to reduce CLD environmental availability. Hence, the work was designed following two experimental steps. The first one consisted at producing different sequestering media (biochars and ACs) via pyrolysis and distinct activation processes, using two lignocellulosic precursors (raw biomass): oak wood (*Quercus ilex*) and coconut shell (*Cocos nucifera*). The chemical activation was carried out with phosphoric acid while physical activation was done with carbon dioxide and steam. In the second step, the CLD environmental availability was assessed either in an OECD artificial soil or in an Antillean contaminated nitisol (i.e., 2.1(-1)mu g CLD per g of soil dry matter, DM), both amended with 5 wt% of biochar or 5 wt% of AC. These both steps aim to determine CLD environmental availability reduction efficiency of these media when added (i) to a standard soil material or (ii) to a soil representative of the Antillean CLD contamination context. Textural characteristics of the derived coconut and oak biochars and ACs were determined by nitrogen adsorption at 77 K. Mixed microporous and mesoporous textures consisting of high pore volume (ranging from 0.38 cm(3).g(-1) to 2.00 cm(3).g(-1)) and specific (BET) surface areas from 299.9 m(2).g(-1) to 1285.1 m(2).g(-1) were obtained. Overall, soil amendment with biochars did not limit CLD environmental availability (environmental availability assay ISO/DIS 16751 Part B). When soil was amended with ACs, a significant reduction of the environmental availability in both artificial and natural soils was observed. AC soil amendment resulted in a reduced CLD transfer by at least 65% (P < 0.001) for all lignocellulosic matrices (excepted for coconut sample activated with steam, which displayed a 47% reduction). These features confirm that both pore structure and extent of porosity are of particular importance in the retention process of CLD in aged soil. Owing to its adsorptive properties, AC amendment of CLD-contaminated soils appears as a promising approach to reduce the pollutant transfer to fauna and biota.

Accès au document

Linear toxicokinetic of chlordecone in ewe's serum

Authors: Saint-Hilaire M, Rychen G, Thome JP, Joaquim-Justo C, Le Roux Y, Feidt C, Fournier A

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 27(33):40963-40970, 2020, DOI: 10.1007/s11356-019-05800-z

Abstract: Chlordecone (CLD) is an organochlorine pesticide used in banana fields of the French West Indies between 1972 and 1993. This use resulted in a long-term pollution of soils and the possible contamination of farm animals. Indeed, after involuntary ingestion of soil, CLD is

absorbed and consequently leads to contaminated animals. The aim of this study was the determination of CLD half-life and the establishment of the linearity of CLD disappearance kinetics in non-lactating adult's ewes. Chlordecone diluted in cremophor was intravenously administrated to ewes at different doses: 0.04, 0.2, or 1 mg kg(-1) body weight (n = 5 for each dose). Blood samples were collected from time t = 0 to time t = 84 days. Serum samples were extracted with a solid-phase extraction and analyzed by electron capture detection gas chromatography. A two-compartmental model was applied to the serum CLD kinetics. An additional statistical analysis was applied to the observed elimination parameters in serum according to the administrated dose, and no significant differences were detected. The linear elimination of CLD between 0.04 and 1 mg kg(-1) body weight allowed the possibility of ewe's extrapolation half-life in this dose range. The estimated mean CLD half-life in ewes was 24 days. Overall, the results of this study will be useful to establish decontamination strategies in small ruminants reared in contaminated CLD areas.

Accès au document

Physical limitation of pesticides (chlordecone) decontamination in volcanic soils: fractal approach and numerical simulation

Authors: Woignier T, Rangon L, Clostre F, Mottes C, Cattan P, Primera J, Jannoyer M

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 27(33):40980-40991, 2020, DOI: 10.1007/s11356-019-05899-0

Abstract: In the French West Indies, the chlordecone (organochloride pesticide) pollution is now diffuse becoming new contamination source for crops and environment (water, trophic chain). […] These physical limitations are related to the poor physical accessibility to the pesticides in soils because of the peculiar structural properties of the contaminated clays (pore volume, transport properties, permeability, and diffusion). Some volcanic soils (andosols), which represent the half of the contaminated soils in Martinique, contain nanoclay (allophane) with a unique structure and porous properties. Andosols are characterized by pore size distribution in the mesoporous range, a high specific surface area, a large pore volume, and a fractal structure. Our hypothesis is that the clay microstructure characteristics are crucial physico-chemical factors strongly limiting the remediation of the pesticide. Our results show that allophane microstructure (small pore size, hierarchical microstructure, and tortuosity) favors accumulation of chlordecone, in andosols. Moreover, the clay microporosity limits the accessibility of microorganisms and chemical species able to decontaminate because of poor transport properties (permeability and diffusion). We model the transport properties by two approaches: (1) we use a numerical model to simulate the structure of allophane aggregates. The algorithm is based on a cluster-cluster aggregation model. From the simulated data, we derived the pore volume, specific surface area, tortuosity, permeability, and diffusion. We show that transport properties strongly decrease because of the presence of allophane. (2) The fractal approach. We characterize the fractal features (size of the fractal aggregate, fractal dimension, tortuosity inside allophane aggregates) and we calculate that transport properties decrease of several order ranges inside the clay aggregates. These poor transport properties are important parameters to explain the poor accessibility to pollutants in volcanic soils and should be taken into account by future decontamination process. We conclude that for andosols, this inaccessibility could render inefficient some of the methods proposed in the literature.

Accès au document

ARPEGES: A Bayesian Belief Network to Assess the Risk of Pesticide Contamination for the River Network of France

Authors: Piffady J, Carluer N, Gouy V, le Henaff G, Tormos T, Bougon N, Adoir E, Mellac K

Source: INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT Early access, 2020, DOI: 10.1002/ieam.4343

Abstract: […] Water quality assessments are also challenged by contrasting pesticide behaviors (e.g., mobility, half-life time, solubility) in different environmental contexts. Furthermore, monitoring networks are not well adapted to the pesticide media transfer dynamics and therefore fail at providing a reliable assessment of pesticides. We present here a Bayesian belief network that was developed in a cooperative process between researchers specializing in Bayesian modelling, soil sciences, agronomy, and diffuse pollutants to provide a tool for stakeholders to assess surface water contamination by pesticides. It integrates knowledge on dominant transfer pathways according to basin physical context and climate for different pesticides properties, such as half-life duration and affinity to organic C, to develop an assessment of risks of contamination for every watershed in France. The resulting model, ARPEGES (Analyse de Risque PEsticide pour la Gestion des Eaux de Surface; trans. Risk analysis of contamination by pesticides for surface water management), was developed in R. A user-friendly R interface was built to enable stakeholders to not only obtain ARPEGES' results, but also freely use it to test management scenarios. Though it is applicable to any chemical, its results are illustrated for S-Metolachlor, a pesticide that was widely used on cereals crops worldwide. In addition to providing contamination potential, ARPEGES also provides a way to diagnose its main explaining factors, enabling stakeholders to focus efforts in the most potentially affected basins, but also on the most probable cause of contamination. In this context, the Bayesian belief network allowed us to use information at different scales (i.e., regional contexts for climate, pedology at the basin scale, pesticide use at the municipality scale) to provide an expert assessment of the processes driving pesticide contamination of streams and the associated uncertainties. Integr Environ Assess Manag 2020;00:1-14. (c) 2020 SETAC

Accès au document

Removal efficiency of emerging micropollutants in biofilter wastewater treatment plants in tropical areas

Authors: Devault DA, Amalric L, Bristeau S, Cruz J, Tapie N, Karolak S, Budzinski H, Levi Y

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early access, 2020, DOI: 10.1007/s11356-020-10868-z

Abstract: We studied the removal of 61 emerging micropollutants, including illicit drugs, in a biofilter wastewater treatment plant located in the French Indies (Martinique). Raw wastewater concentrations were the highest for paracetamol followed by caffeine, naproxen, ibuprofen, its metabolite 2-hydroxyibuprofen, atenolol, ketoprofen, furosemide, methylparaben, cocaine, benzoylecgonine, and 11-nor-delta-9-carboxytetrahydrocannabinol (THC-COOH). The calculated removals were better than those reported in the literature, while the cumulative removal efficacy (i.e., removal of the total mass load) was estimated to be 92 +/- 4%. However, this good performance may be partly explained by the removal of paracetamol (also named acetaminophen) and caffeine, which represented 86.4% of the total mass load. Our results point to the adsorption of some molecules on sludge, […].

Accès au document

Development of a simple multiresidue extraction method for the quantification of a wide polarity range list of pesticides and transformation products in eggs by liquid chromatography and tandem mass spectrometry

Authors: Dufour V, Wiest L, Slaby S, Cor FL, Auger L, Cardoso O, Curtet L, Pasquini L, Dauchy X, Vulliet E, Banas D

Source: JOURNAL OF CHROMATOGRAPHY A 1628:461447, 2020, DOI: 10.1016/j.chroma.2020.461447

Abstract: […] This study was conducted to develop a single sensitive and robust analytical method for the monitoring of 2 fungicides, 15 herbicides, 3 insecticides and 24 transformation products in wild bird eggs. One of the major challenges addressed was the characterization of chemicals with large logP range (from-1.9 to 4.8). A total of 11 different extraction parameters were tested in triplicate to optimize the extraction protocol, on generic parameters, buffer addition and use of clean-up steps. Quantification was based on matrix-match approach with hen eggs as reference matrix (34 analytes with r2 > 0.99). Particular attention was payed to matrix effects (-28% on average), quantification limits (0.5 to 25 ng.g(-1) dry mass / 0.2 to 7.5 ng.g(-1) fresh mass) and extraction yields (46 to 87% with 25 analytes up to 70%) to ensure the relevance of the method and its compatibility with ultra-trace analysis. It led to a simple solid/liquid low temperature partitioning extraction method followed by LC-MS/MS. Analysis of 29 field samples from 3 waterfowl species revealed that eggs were slightly contaminated with pesticides as only one egg presented a contamination (terbutryn, herbicide, 0.7 ng.g(-1)) and confirmed the relevance of the method. (c) 2020 Elsevier B.V. All rights reserved.

Accès au document

Residues of currently used pesticides in soils and earthworms: A silent threat?

Authors: Pelosi C, Bertrand C, Daniele G, Coeurdassier M, Benoit P, Nelieu S, Lafay F, Bretagnolle V, Gaba S, Vulliet E, Fritsch C

Source: AGRICULTURE ECOSYSTEMS & ENVIRONMENT 305:107167, 2020, DOI: 10.1016/j.agee.2020.107167

Abstract: Critical knowledge gaps about environmental fate and unintentional effects of currently used pesticides (CUPs) hamper the understanding and mitigation of their global impacts on ecological processes. We investigated the exposure of earthworms to 31 multiclass CUPs in an arable landscape in France. We highlighted the presence of at least one pesticide in all soils (n = 180) and 92 % of earthworms (n = 155) both in treated crops and nontreated habitats (hedgerows, grasslands, and cereals under organic farming). Mixtures of at least one insecticide, one herbicide, and one fungicide (> limit of quantification) contaminated 90 % of soils and 54 % of earthworms at levels that could endanger these nontarget beneficial soil organisms. A high risk of chronic toxicity to earthworms was found (46 % of samples) both in treated winter cereals and nontreated habitats considered as refuges. This may alter biodiversity, hinder recovery, and impair ecosystem functions. These results provide essential insights for sustainable agriculture and CUP regulation, and highlight the potential of pesticides as agents of global change.

Accès au document

Changes in plant growth, Cd partitioning and xylem sap composition in two sunflower cultivars exposed to low Cd concentrations in hydroponics

Authors: Cornu JY, Bussiere S, Coriou C, Robert T, Maucourt M, Deborde C, Moing A, Nguyen C

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 205:111145, 2020, DOI: 10.1016/j.ecoenv.2020.111145

Abstract: This study characterizes sunflower response to the levels of Cd encountered in moderately Cd-polluted soils. Two sunflower cultivars differing in their ability to sequestrate Cd in roots were exposed to low concentrations of Cd (0.5 nM or 100 nM) in hydroponics and sampled after 18 days (258 degree-days) when ten leaves were fully expanded. Plant growth, Cd uptake and partitioning among organs were monitored along with the ionomic (ICP-MS) and the metabolic (H-1-NMR) composition of the xylem sap. Sunflower tolerance to Cd differed between the two cultivars. The cultivar with the highest ability to sequestrate Cd in roots (Kapllan) was more tolerant to Cd than the one with the lowest ability (ES RICA). The 23% penalization of plant growth observed at 100 nM in cultivar ES RICA was associated with reduced xylem loading fluxes of soluble sugars, perhaps pointing to disruption of carbohydrate metabolism. Retention of Cd in the stem was higher at 100 nM than at 0.5 nM in the Cd-sensitive cultivar ES RICA, which can be seen as a sunflower strategy to restrict the amount of Cd delivered to the leaves under Cd stress. No direct connection was found between the speciation of Cd in the xylem sap and the Cd translocation efficiency, although significant changes in the free ionic fraction of Cd were observed between the two cultivars at 0.5 nM. […]

Accès au document

Effects of DEHP on the ecdysteroid pathway, sexual behavior and offspring of the moth *Spodoptera littoralis*

Authors: Aviles A, Cordeiro A, Maria A, Bozzolan F, Boulogne I, Dacher M, Goutte A, Alliot F, Maibeche M, Massot M, Siaussat D

Source: HORMONES AND BEHAVIOR 125:104808, 2020, DOI: 10.1016/j.yhbeh.2020.104808

Abstract: […] Few studies have focused on the effects of DEHP on insects, although DEHP is found almost everywhere in their natural habitats, particularly in soils and plants. Here, we investigated the effects of DEHP on the sexual behavior and physiology of a pest insect, the noctuid moth *Spodoptera littoralis*. In this nocturnal species, olfaction is crucial for sexual behavior, and ecdysteroids at the antennal level have been shown to modulate sex pheromone detection by males. In the present study, larvae were fed food containing different DEHP concentrations, and DEHP concentrations were then measured in the adults (males and females). Hemolymphatic ecdysteroid concentrations, the antennal expression of genes involved in the ecdysteroid pathway (nuclear receptors EcR, USP, E75, and E78 and calmodulin) and sexual behavior were then investigated in adult males. The success and latency of mating as well as the hatching success were also studied in pairs consisting of one DEHP male and one uncontaminated female or one DEHP female and one uncontaminated male. We also studied the offspring produced from pairs involving contaminated females to test the transgenerational effect of DEHP. Our results showed the general downregulation of nuclear receptors and calmodulin gene expression associated with the higher concentrations of DEHP, suggesting peripheral olfactory disruption. We found some effects on male behavior but without an alteration of the mating rate. Effects on offspring mortality and developmental rates in the N + 1 generation were also found at the higher doses of DEHP. Taken together, the

results of the study show for the first time that larval exposure to DEHP can induce delayed endocrine-disruptive effects in the adults of a terrestrial insect as well as effects on the next generation. To date, our study is also the first description of an impact of endocrine disrupter on olfaction in insects.

Accès au document

Physical properties of epilithic river biofilm as a new lead to perform pollution bioassessments in overseas territories

Authors: Monti D, Hubas C, Lourenco X, Begarin F, Haouisee A, Romana L, Lefrancois E, Jestin A, Budzinski H, Tapie N, Risser T, Mansot JL, Keith P, Gros O, Lopez PJ, Lauga B

Source: SCIENTIFIC REPORTS 10(1):17309, 2020, DOI: 10.1038/s41598-020-73948-7

Abstract: Chlordecone (CLD) levels measured in the rivers of the French West Indies were among the highest values detected worldwide in freshwater ecosystems, and its contamination is recognised as a severe health, environmental, agricultural, economic, and social issue. In these tropical volcanic islands, rivers show strong originalities as simplified food webs, or numerous amphidromous migrating species, making the bioindication of contaminations a difficult issue. The objective of this study was to search for biological responses to CLD pollution in a spatially fixed and long-lasting component of the rivers in the West Indies: the epilithic biofilm. Physical properties were investigated through complementary analyses: friction, viscosity as well as surface adhesion were analyzed and coupled with measures of biofilm carbon content and exopolymeric substance (EPS) production. Our results have pointed out a mesoscale chemical and physical reactivity of the biofilm that can be correlated with CLD contamination. We were able to demonstrate that epilithic biofilm physical properties can effectively be used to infer freshwater environmental quality of French Antilles rivers. The friction coefficient is reactive to contamination and well correlated to carbon content and EPS production. Monitoring biofilm physical properties could offer many advantages to potential users in terms of effectiveness and ease of use, rather than more complex or time-consuming analyses.

Accès au document

Mechanistic Effect Modeling of Earthworms in the Context of Pesticide Risk Assessment: Synthesis of the FORESEE Workshop

Authors: Forbes VE, Agatz A, Ashauer R, Butt KR, Capowiez Y, Duquesne S, Ernst G, Focks A, Gergs A, Hodson ME, Holmstrup M, Johnston AS, Meli M, Nickisch D, Pieper S, Rakel KJ, Reed M, Roembke J, Schafer RB, Thorbek P, Spurgeon DJ, van den Berg E, Van Gestel CA, Zorn MI, Roeben V

Source: INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT Early access, 2020, DOI: 10.1002/ieam.4338

Abstract: [...] This paper provides a summary of the (In)Field Organism Risk modEling by coupling Soil Exposure and Effect (FORESEE) Workshop held 28-30 January 2020 in Dusseldorf, Germany. This workshop focused on toxicokinetic-toxicodynamic (TKTD) and population modeling of earthworms in the context of ERA. The goal was to bring together scientists from different stakeholder groups to discuss the current state of soil invertebrate modeling and to explore how earthworm modeling could be applied to risk assessments, in particular how the different model outputs can be used in the tiered ERA approach. In support of these goals, the workshop aimed at addressing the requirements and concerns of the different stakeholder groups to support further model development. The

modeling approach included 4 submodules to cover the most relevant processes for earthworm risk assessment: environment, behavior (feeding, vertical movement), TKTD, and population. Four workgroups examined different aspects of the model with relevance for risk assessment, earthworm ecology, uptake routes, and cross-species extrapolation and model testing. Here, we present the perspectives of each workgroup and highlight how the collaborative effort of participants from multidisciplinary backgrounds helped to establish common ground. In addition, we provide a list of recommendations for how earthworm TKTD modeling could address some of the uncertainties in current risk assessments for plant protection products.Integr Environ Assess Manag2020;00:1-12. (c) 2020 SETAC

Accès au document

Ecological factors governing distribution of gammarid species and their metal bioaccumulation abilities at the Seine basin scale

Authors: Lebrun JD, Uher E, Urien N, Tales E

Source: ECOLOGICAL INDICATORS 118:106726, 2020, DOI: 10.1016/j.ecolind.2020.106726

Abstract: Although gammarid species are promising bioindicators of metal bioavailability in freshwaters, interspecies variability is still rarely assessed in situ. Besides, ambient environmental conditions inherent to the species' occurrence are likely to affect metal bioavailability, hence hampering the interpretation of field bioaccumulation data. The study aimed to assess the relevance of using common gammarid species for biomonitoring water quality at the scale of a river basin. Gammarids were collected at 20 sites of the Seine basin during three consecutive years to establish geographical distribution patterns of the species and their metallic contamination levels. The sites were characterised in terms of physiography, physicochemistry, hydrothermal regime and land use to identify ecological factors explaining the absence or presence of species. Bioaccumulation abilities of Cd, Co, Cu, Mn, Pb and Zn were compared between species as a function of the exposure levels and environmental characteristics of their occurrence. Statistical analyses indicated that the occurrence of Gammarus fossarum and Gammarus pulex, as native species of the Seine basin, is governed by a combination of entangled environmental factors. By contrast, Echinogammarus berilloni as a naturalized species tolerated larger ranges of environmental conditions and related-land use pressures. At some sites, the absence of gammarid species was associated with unfavourable conditions, e.g. eutrophication, urbanisation. Unlike Pb, bioaccumulation abilities appeared to be comparable among species for Cd, Cu, Mn and Zn, and only between both native species for Co, when local physicochemical conditions were considered. For further, the generic responsiveness to exposure levels supported that metal contents in gammarids provide reliable information on metal bioavailability whatever physicochemistry of freshwaters and ecological zonation of these common species of the Seine basin.

Accès au document

Mercury cycling in freshwater systems - An updated conceptual model

Authors: Branfireun BA, Cosio C, Poulain AJ, Riise G, Bravo AG

Source: SCIENCE OF THE TOTAL ENVIRONMENT 745:140906, 2020,DOI: 10.1016/j.scitotenv.2020.140906

Abstract: The widely accepted conceptual model of mercury (Hg) cycling in freshwater lakes (atmospheric deposition and runoff of inorganic Hg, methylation us bottom sediments and subsequent bioaccumulation and biomagnification in biota) is practically accepted

as common knowledge. There is mounting evidence that the dominant processes that regulate inputs, transformations, and bioavailability of Hg in many lakes may be missing from this picture, and the fixation on the temperate stratified lake archetype is impeding our exploration of understudied, but potentially important sources of methylmercury to freshwater lakes. In this review, the importance of understudied biogeochemical processes and sites of methylmercury production are highlighted, induding the complexity of redox transformations of Hg within the lake system itself, the complex assemblage of microbes found in biofilms and periphyton (two vastly understudied important sources of methylmercury in many freshwater ecosystems), and the critical role of autochthonous and allochthonous dissolved organic matter which mediates the net supply of methylmercury from the cellular to catchment scale. A conceptual model of lake Hg in contrasting lakes and catchments is presented, highlighting the importance of the autochthonous and allochthonous supply of dissolved organic matter. bioavailable inorganic mercury and methylmercury and providing a framework for future convergent research at the lab and field scales to establish more mechanistic process-based relationships within and among critical compartments that regulate methylmercury concentrations in freshwater ecosystems. (C) 2020 Elsevier B.V. All rights reserved.

Accès au document

Special Issue on Bioconversion, Bioaccumulation and Toxicity of Mercury in a Changing World

Author: Cosio C

Source: APPLIED SCIENCES-BASEL 10(18):6548, 2020, DOI: 10.3390/app10186548

Content: 1. Mercury in a Changing World. Mercury (Hg) is recognized as a persistent global chemical contaminant that accumulates in biota, thus being an ecological hazard, as well as a health risk to fish consumers. Human past and current activities play a predominant role in the emission and mobilization of Hg in the environment. Elemental Hg (Hg0) and inorganic Hg (IHg) emitted in the environment are constantly cycled and recycled through Hg biogeochemical cycle, among which bioconversion by microorganisms into mono-methyl-Hg (MMHg), bioaccumulation (MMHg and IHg) and biomagnification (MMHg) in food webs is a critical aspect for Hg toxicity to biota, as well as for humans. Despite decades of research, global Hg pollution requires a deeper understanding of specific toxicity mechanisms for Hg compounds and of the mechanisms underlying its transport and accumulation in biota. Indeed, the entrance of Hg into food webs is not fully understood. In light of the above, this Special Issue was introduced to collect the latest research on relevant topics, and more importantly to address present challenging issues with the cycling of Hg in complex systems. The accepted papers addressed various topics, mainly on bioaccumulation, food web transfer, effect and development of new methods in these contexts....

Accès au document

Ecotoxicology, revisiting its pioneers

Authors: Vasseur P, Masfaraud JF, Blaise C

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access oct, 2020, DOI: 10.1007/s11356-020-11236-7

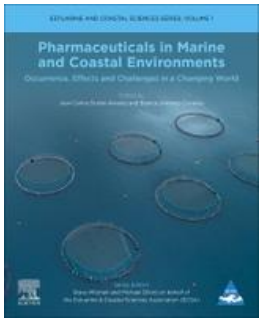
Abstract: Ecotoxicology is a discipline resulting from pollution events that harmed human and environmental health by the mid-twentieth century. Environmental considerations were simply inexistent at this time, and inevitably deleterious effects and environmental disasters followed. These historical events, like Clear Lake

disaster in California, will be recalled, as well as new concepts developed, and scientists involved in these findings. A special tribute is given to Professor Jean-Michel Jouany who conceptualized newly acquired knowledge into an emerging discipline, which he named "ecotoxicology" in the 1960s, and understood to be "toxicology in an ecological perspective." However, Rene Truhaut is considered as the "father of ecotoxicology" by posterity, while his young mentor Jouany was shadowed by the latter. It is timely to "open the book" as concerns these two exceptional personalities and their working relationships, first to set the record straight and second to give credit where credit is due.

Accès au document

OUVRAGES / RAPPORTS / ACTES DE CONGRES

Pharmaceuticals in Marine and Coastal Environments, Volume 1, 1st Edition: Occurrence, Effects and Challenges in a Changing World



Editors: Juan Duran-Alvarez Blanca Jimenez-Cisneros

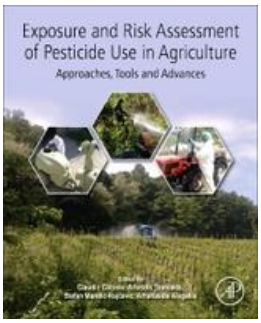
Elsevier, 1st June 2021, 800 p.

Paperback ISBN: 9780081029718

Pharmaceuticals in Marine and Coastal Environments: Occurrence, Effects and Challenges in a Changing World is divided into three sections that address a) coastal areas as the main entrance of pharmaceuticals into the ocean, b) the occurrence and distribution of pharmaceuticals in the environmental compartments of the ocean media, and c) the effects that such pollutants may cause to the exposed marine organisms. With its comprehensive discussions, the book provides a wide depiction of the current state-of-the-art on these topics in an effort to open new sources of investigation and find suitable solutions.

Accès au document

Exposure and Risk Assessment of Pesticide Use in Agriculture - 1st Edition: Approaches, Tools and Advances



Exposure and Risk Assessment of Pesticide Use in Agriculture: Approaches, Tools and Advances offers an overview of the different methods available in toxicology for pesticide exposure and risk assessment, ranging from the regulatory field, to in-field research studies. The book provides technical background on each method, describing known and grounded tools, new uses of tools and development prospects. This book is ideal for researchers in pesticide toxicology, exposure toxicology, toxicologic risk assessment, occupational hygiene and medicine, and pesticide toxicology as well as occupational

health and industrial hygiene practitioners, regulatory experts of corporate and public bodies, and advanced students.

Academic Press, **Published** 26th November 2020, 412 p.

Accès au document

Encyclopedia of aquatic ecotoxicology BeL-Inra (Bibliothèques en Ligne à l'Inrae)

With its 104 chapters, this Encyclopedia of aquatic ecotoxicology reveals the diversity of issues, problems and challenges that have faced, and are facing today, receiving environments. It also indicates ways by which tools, strategies and future investigations can contribute to correct, minimize, solve and prevent water quality degradation.

Structured homogeneously, the chapters convey salient information on historical background, features, characteristics, uses and/or applications of treated topics, often complemented by illustrations and case studies, as well as by conclusions and prospects. This work is most suitable for teaching purposes. Academics, for example, could literally deliver comprehensive lectures to students simply based on chapter outlines and contents.

https://link.springer.com/referencework/10.1007%2F978-94-007-5704-2

Accès au document

Air Pollution, Climate and Health - 1st Edition

Air Pollution, Climate and Health integrates the current understanding of the issues of air pollution, climate change and human health. The book provides a comprehensive overview of these issues to help readers gain a better understanding of how they interact and impact air quality and public health. Regional examples from across the globe include issues related to PM 2.5, haze, winter pollution, heat related mortality and aerosols. These issues are addressed utilizing current research and laboratory-based, observation-based, and modeling-based analysis. This is an essential resource for all professionals investigating the impacts of climate change or air pollution on human health.

Editors: Meng Gao, Zifa Wang, Gregory Carmichael, Elsevier, 1st April 2021; 430 p.

ISBN: 9780128201237

Accès au document

India's countryside offers no refuge from filthy air: Research Highlights

Urban outdoor air pollution in the developing world, mostly due to particulate matter with diameters smaller than 2.5 μm (PM2.5), has been highlighted in recent years. It leads to millions of premature deaths. Outdoor air pollution has also been viewed mostly as an urban problem. We use satellite-derived demarcations to parse India's population into urban and nonurban regions, which agrees with the census data. We also use the satellite-derived surface PM2.5 levels to calculate the health impacts in the urban and nonurban regions. We show that outdoor air pollution is just as severe in nonurban regions as in the urban regions of India, with implications to monitoring, regulations, health, and policy.

PNAS first published November 2, 2020; https://doi.org/10.1073/pnas.2007236117

Accès au document

REVUE DE PRESSE / ASSOCIATIONS

Scientists turned toxic pesticide into treatment against antibiotic-resistant bacteria

EurekAlert! 29/12/20

N-Aryl-C-nitroazoles are an important class of heterocyclic compounds. They are used as pesticides and fungicides. However, these substances could be toxic to humans and cause mutations. As they are not frequently used, there is little data about them in the medicinal chemistry literature. However, it has been suggested recently that the groups of compounds that are traditionally avoided can help to fight pathogenic bacteria. Yet, to reduce toxic effects, a great amount of work must be carried out at the molecular level, accurate optimization of the molecular environment of the nitro-heteroaromatic "warhead". The validity of this approach was demonstrated in the early 2000s through the development of anti-tuberculosis drugs delamanid and pretomanid, currently approved for medical use. They act like prodrugs, that is, the substance itself is inactive, but acquires new properties when it enters the human body.[...]

Accès au document

Farmworkers and Conservationists Ask Court to Remove Monsanto's Roundup from the Market

Beyond Pesticides, December 22, 2020

Opening arguments and evidence were filed by a coalition of farmworkers, farmers, and conservationists last week in litigation challenging the U.S. Environmental Protection Agency's (EPA) re-approval of glyphosate, best known as the active ingredient in Monsanto's "Roundup" pesticides. The lawsuit charges that the Trump Administration unlawfully ignored cancer risks and ecological damage of glyphosate. [...]

Accès au document

Action en justice inédite pour demander le retrait immédiat de pesticides contenant des toxiques cachés aux utilisateurs.

Générations futures 01/12/20

Et si le danger des pesticides ne venait pas que des matières déclarées actives (glyphosate, chlorpyriphos, etc.) ? Une étude scientifique dévoilée fin octobre démontre la présence de toxiques cachés par les fabricants dans 14 pesticides, pourtant présentés comme des alternatives au glyphosate. Le 1er décembre, 9 associations lancent une action en justice inédite, et une campagne citoyenne "Secrets Toxiques", pour exiger le retrait de 14 pesticides du marché européen et surtout la remise en cause du système d'évaluation de ces produits en France et en Europe. [...]

Accès au document

Trump Administration Pushing Ahead with Two Toxic Pesticides during Transition: Bee-toxic Flonicamid, Carcinogenic Disinfectant Ethylene Oxide

Beyond Pesticides, December 3, 2020

As the Trump administration winds down, it appears that it will continue to push through decisions that build on its formidable record of weakening environmental and public health protection. Ignoring documented threats to pollinators, the U.S. Environmental Protection Agency (EPA) could finalize its interim approval for flonicamid, a bee-toxic pesticide. Separately, EPA may reapprove the disinfectant ethylene oxide (EtO), despite concerns over carcinogenicity. NYU Law is tracking these and other last-minute federal environmental decisions on its webpage Midnight Watch. [...]

Accès au document

Avis aux agriculteurs : la parole présidentielle est-elle fiable ?

Alerte-environnement 26/11/20

Et si la nomination de Julien Denormandie était en fait un miroir aux alouettes ? Le Ministre de l'agriculture plait au monde agricole et ce dernier l'applaudit. Mais la parole présidentielle est-elle fiable ? D'un côté le Ministre dit de beau discours, de l'autre, le président et son administration n'en font qu'à leur tête. Deux exemples pris dans l'actualité hors agricoles du jour sont particulièrement instructifs. [...]

Accès au document

Researchers develop a new test to better assess environmental impact of substances

Phys.org 20/11/20

Cadmium is used in the production of fertilizers and batteries and currently pops up in a negative way as a water pollutant. Scientists of the Senckenberg Biodiversity and Climate Research Center and the LOEWE Center for Translational Biodiversity Genomics (LOEWE-TBG) have investigated whether concentrations of this substance that are generally deemed realistic in nature can cause germ-line mutations in multicellular organisms. Such changes in the genetic material of cells are long-term consequences with an extensive reach, since they are inheritable. Contrary to this, concentrations of a substance that are toxic primarily affect the single organism that is directly exposed to the substance. [...]

Accès au document

Actualité -Alimentation bio - Les gros consommateurs moins sujets au diabète

Que Choisir 20/11/20

Un risque 35 % moins élevé de diabète de type 2 chez les plus gros consommateurs de bio. Voilà la dernière observation réalisée grâce à l'étude de la cohorte française NutriNet. Un bénéfice qui pourrait s'expliquer par une moindre exposition aux pesticides, même s'il reste à confirmer.

Les arguments continuent de s'accumuler en faveur d'un bénéfice de la consommation de bio pour la santé. Après avoir démontré que la consommation de ce type de produits était liée à un moindre risque de cancer, mais aussi de prise de poids (1) et de perturbation du métabolisme (2), une équipe de chercheurs français (3) vient cette fois de publier une étude suggérant un possible effet protecteur de l'alimentation bio contre le diabète de type 2 (4). [...]

Accès au document

La présidence allemande de l'UE va-t-elle saboter la stratégie de la ferme à l'assiette ?

Générations futures 19/11/20

Avant une réunion d'experts des États membres de l'UE pour discuter de la mise en œuvre de la «Directive sur l'utilisation durable des pesticides» (SUD) [1], PAN Europe alerte sur le fait que les plans nationaux de réduction de l'utilisation des pesticides ne sont pas seulement insuffisants, mais qu'ils pourraient également rendre totalement caduque la stratégie de la ferme à l'assiette dans certains des objectifs sont pourtant intéressants. [...]

Accès au document

Is FAO in the Pocket of the Pesticide Industry?

PANNA 19/11/20

This is a repost of a blog by Keith Tyrell, originally published by our partners at PAN UK.

A few weeks ago, Qu Dongyu, the Director General of the UN Food and Agriculture Organization (FAO) announced his intention to develop a new partnership with CropLife (the pesticide industry trade body) to transform agri-food systems. This marks a major departure for FAO, which has carefully guarded its impartiality and resisted the industry's overtures in the past.

It seems that FAO is hoping that the deal will provide capital and new technologies for its work, but there is little objective scientific evidence that CropLife's pesticides help farmers or contribute to food security. On the other hand, there is plenty of – and growing – evidence that these chemicals are having a devastating impact on biodiversity and human health. [...]

Accès au document

Lawsuit and Report Challenges EPA's Failure to Protect People and the Environment from the Endocrine-Disrupting Herbicide Atrazine

Beyond Pesticides, November 18, 2020

The herbicide atrazine is likely to adversely affect over half of endangered species listed in the United States, according to a report released by the U.S. Environmental Protection Agency (EPA) as part of a legal agreement with the Center for Biological Diversity (CBD). Based on both adverse human health and environmental threats, Beyond Pesticides joined with Center for Food Safety, CBD, and other public-interest groups in October to sue EPA over its decision to reapprove atrazine, an endocrine-disrupting herbicide banned across much of the world. These actions follow the agency's recent reapproval of atrazine, which reduced a number of safeguards for public health and the environment, and it's enactment of rules that limit endangered species reviews. See (Lawsuit Challenges EPA Reapproval of Endocrine-Disrupting Pesticide Atrazine: Agency Slashes Protections for Children, Waterways.) Although advocates are hopeful that the next administration will shift toward an EPA that lives up to its namesake, there is considerable ground to make up. [...]

Accès au document

Environmental Poisoning by Pesticides—Household Chemical Products, and Medications Impact Domestic Pet Populations

Beyond Pesticides, November 12, 2020

A new report from the University of Milan and Poison Control Center (CVA) in Milan, Italy suggests that domestic animals experience frequent environmental poisoning by household toxicants. This research highlights the significance of investigating methods to classify diseases shared across multiple species to reduce the adverse effects of toxicant exposure. Researchers note, “These findings can provide useful information for the identification and monitoring of known and emerging toxicants, with positive repercussions on human, animal, and environmental health.” [...]

Acces au document

NIST researchers advance efforts to accurately measure glyphosate pesticide in oats

EurekAlert! 02/11/20

Pesticides help farmers increase food production, reduce costly damage to crops, and even prevent the spread of insect-borne diseases, but since the chemicals can also end up in human food, it's essential to ensure that they are safe. For a commonly used pesticide known as glyphosate, concerns exist over how high a level is safe in food as well as the safety of one of its byproducts, known as AMPA. Researchers at the National Institute of Standards and Technology (NIST) are advancing efforts to measure glyphosate and AMPA accurately in the oat-based food products where they frequently appear by developing reference materials. [...]

Accès au document

UE : Stop à l’exportation et l’importation de pesticides interdits !

Générations futures 05/11/20

Plus de 70 ONG européennes et internationales écrivent ce jour aux Commissaires européens en charge de l’environnement, de la santé et de l’agriculture, pour leur demander d’interdire l’exportation de pesticides interdits, fabriqués au sein de l’UE, et l’importation d’aliments produits hors UE avec ces produits chimiques.

Dans un courrier adressé ce jour notamment au vice-président Frans Timmermans en charge du Green Deal pour l’UE, les ONG signataires dont Générations Futures, s’appuient en particulier sur un rapport publié en juillet par des experts de l’ONU dénonçant cette pratique déplorable qui consiste à produire dans l’UE et exporter des produits chimiques, dont beaucoup de pesticides, pourtant interdits d’usage sur ce territoire, à destination de pays tiers où les règlementations sont plus faibles. Elles précisent en outre dans ce courrier qu’in fine ces produits reviennent au sein de l’UE par l’importation de denrées alimentaires susceptibles de contenir des résidus de ces pesticides interdits dans l’Union. [...]

Accès au document

Action UFC-Que Choisir - Deux ans après la promulgation de la loi EGalim -Ses ambitions sont définitivement enterrées !

Que Choisir 04/11/20

Deux ans après l’adoption de la loi EGalim1, un collectif de 28 syndicats et associations publie un bilan dont le constat d’échec est sans appel : la quasi-totalité des indicateurs est au rouge et des reculs sont à noter. Presque aucune des

ambitions et bonnes intentions déclarées en grande pompe n'ont été suivies d'effet. […]

Les ambitions en matière de réduction de pesticides ont été revues à la baisse, avec un recul notable : le retour des néonicotinoïdes.

La protection des riverains contre les pesticides n'a pas avancé, l'Etat se défausse en livrant cette protection au rapport de forces sur les territoires. […]

Accès au document

Lawsuit Launched Against EPA Approval of Toxic Herbicide Atrazine

Beyond Pesticides, November 6, 2020

Beyond Pesticides joined health and environmental groups suing the U.S. Environmental Protection Agency (EPA) late last month over its decision to reapprove the endocrine disrupting herbicide atrazine with fewer protections for children's health. Despite the chemical being banned across much of the world, EPA continues to make decisions that benefit chemical industry executives. "EPA's failure to remove atrazine represents a dramatic failure of a federal agency charged with safeguarding the health of people, wildlife, and the environment," said Jay Feldman, executive director of Beyond Pesticides. "We seek to uphold the agency's duty to act on the science, in the face of viable alternatives to this highly toxic weedkiller." [...]

Accès au document

Pesticide Exposure Increases the Risk of Developing Gene-Specific and Sporadic Parkinson's Disease Incidences

Beyond Pesticides, November 5, 2020

Research at the University of California San Francisco (UCSF) finds that pesticide exposure increases the risk of developing Parkinson's disease (PD), regardless of whether disease onset is idiopathic (spontaneous) or genetic (GBA genetic risk variant). Although the exact etiology of PD remains unknown, epidemiological and toxicological research repeatedly identifies exposure to pesticides, as well as specific gene-pesticide interactions, as significant adverse risk factors that contribute to PD. Furthermore, this study, "Gene Variants May Affect PD Risk After Pesticide Exposure," suggests that environmental triggers like occupational exposure to pesticides can prompt PD in individuals with or without the genetic precursor. [...]

Accès au document

After Court Rules Herbicide "Would Tear the Social Fabric of Farming Communities," Dicamba in Genetically Engineered Crops Given Go-Ahead by EPA

Beyond Pesticides, November 4, 2020

Despite a recent court ruling voiding the registration of drift-prone dicamba herbicides on genetically engineered (GE) cotton and soybeans, EPA has renewed the registration of these chemicals. The court's ruling stated that EPA, "substantially understated risks that it acknowledged and failed entirely to acknowledge other risks," in regards to the herbicides XtendiMax and Eugenia (dicamba), produced by agrichemical corporations Bayer and BASF for their genetically engineered (GE) crops. In announcing the decision, Administrator Andrew Wheeler said the agency made its decision "[a]fter reviewing substantial amounts of new information, conducting scientific assessments based on the best available science, and

carefully considering input from stakeholders." Yet, it is evident that the most important stakeholders for EPA continues to be chemical corporations. [...]

Accès au document

EPA Finalizes Industry Friendly Rules Weakening Pesticide Buffer Zones

Beyond Pesticides, November 3, 2020

The U/S. Environmental Protection Agency (EPA) last week finalized rules that weaken requirements regarding protective buffer areas around pesticide applications for farmworkers and bystanders. By finalizing the rule, the Trump administration has provided another win to the pesticide industry at the expense of worker health. [...]

Application Exclusion Zones (AEZs) are buffer zones where individuals are not permitted to enter during a pesticide application, as doing so would put one at risk of dangerous exposure. EPA proposed, and has now finalized, a number of changes to the way AEZs work. The agency is: i) removing responsibility for chemical-intensive farms to keep bystanders out of off-site spray areas; ii) allowing pesticide applications to stop and start when individuals enter and exit AEZs (rather than establish set safety requirements); iii) exempting on-farm families from AEZ protections, allowing dangerous pesticide applications to take place near buildings and other shelters where family members residue within an AEZ ("rather than compelling them to leave even when they feel safe remaining inside," the agency notes in a disturbingly unscientific fashion), and; iv) "simplifies" or weakens criteria around determining the appropriate buffer size for an AEZ. [...]

Accès au document

REVUE DE PRESSE / RECHERCHE ET MEDIAS

A scientific project studies the pollution pathways of the Mediterranean coastal lagoons

EurekAlert! 23/12/20

Researchers from the ICTA-UAB and the UPCT will analyze the entry routes of nutrients, trace metals and pollutants caused by human activity into the Mar Menor

A scientific project led by the Institute of Environmental Science and Technology of the Universitat Autònoma de Barcelona (ICTA-UAB) and the Universidad Politécnica de Cartagena (UPCT) will study the major pathways delivering nutrients, trace metals and pollutants originated from human activity into coastal lagoons of the Mediterranean. It will use the analysis of the Mar Menor (Spain) as a model, the largest coastal lagoon in the Iberian Peninsula and one of the most ecologically degraded. [...]

Accès au document

Plastic is blowing in the wind

EurekAlert! 23/12/20

As the plastic in our oceans breaks up into smaller and smaller bits without breaking down chemically, the resulting microplastics are becoming a serious ecological problem. A new study at the Weizmann Institute of Science reveals a troubling aspect of microplastics - defined as particles smaller than 5 mm across. They are swept up into the atmosphere and carried on the wind to far-flung parts of the ocean, including those that appear to be clear. Analysis reveals that such minuscule fragments

can stay airborne for hours or days, spreading the potential to harm the marine environment and, by climbing up the food chain, to affect human health. [...]

Accès au document

Stockage : l'usage d'insecticides en sursis

Agri-mutuel 29/12/20

Déjà bannis dans certaines filières de niche, les insecticides de stockage pourraient bien, sous la pression sociétale, être délaissés à terme au profit de pratiques plus écologiques. Certains agriculteurs et organismes stockeurs s'y préparent ou ont déjà ajusté leurs moyens de lutte, pour conserver des grains issus de filières de qualité. [...]

Accès au document

La directive Abeilles doit coller aux réalités du terrain

Avenir52 24/12/20

Christian Durlin, vice-président de la Commission environnement de la FNSEA, alerte sur les conséquences pour la profession agricole si la révision de l'arrêté « Abeilles » était publié en l'état.

Afin d'enrayer le déclin des insectes pollinisateurs (abeilles domestiques et sauvages, bourdons, mouches, ...) et en contrepartie de la réintroduction des néonicotinoïdes, le Gouvernement a lancé, il y a quelques mois, un plan de protection des pollinisateurs. Il a mis en place un "groupe de travail" interministériel qui entend réviser l'arrêté "Abeilles" de 2003 dont une nouvelle version doit être publiée dans les prochaines semaines. La profession agricole alerte contre les conséquences, qui pourraient être désastreuses, si cet arrêté était publié en l'état. [...]

Accès au document

Les producteurs d'oléoprotéagineux demandent le maintien de cet insecticide

Agri-mutuel 22/12/20

Les producteurs d'oléoprotéagineux, et notamment de colza, souhaitent le maintien d'un insecticide, le Phosmet, dont l'approbation doit être réexaminée prochainement par Bruxelles, indique lundi une fédération agricole spécialisée.

Ce produit est pour l'instant sans alternative « efficace et crédible », notamment contre des insectes qui mettent les cultures en péril à l'automne, affirme la Fop dans un communiqué. « À l'heure où la France doit faire part à la Commission européenne de sa décision sur la ré-autorisation du Phosmet, la Fop alerte (…) sur les conséquences dramatiques pour les producteurs de colza qu'aurait une position de leur part en faveur du retrait de ce produit qui protège le colza des ravages de certains insectes », poursuit le syndicat agricole, affilié à la FNSEA. [...]

Accès au document

La révision des directives sur la qualité de l'air ambiant est en consultation

Actu-environnement 21/12/20

La Commission européenne lance jusqu'au 14 janvier 2021 une consultation sur la révision de la réglementation de l'UE relative à la qualité de l'air ambiant en se fondant sur une évaluation réalisée en 2019. Cette règlementation est constituée de la directive du 15 décembre 2004, concernant l'arsenic, le cadmium, le mercure, le nickel et les hydrocarbures aromatiques polycycliques dans l'air ambiant, et de la

directive du 21 mai 2008 concernant la qualité de l'air ambiant et un air pur pour...

Accès au document

La justice britannique reconnaît un lien entre la pollution de l'air et la mort d'un enfant

Actu-environnement 17/12/20

Une juridiction britannique a reconnu le 16 décembre que la pollution atmosphérique était l'une des causes du décès d'Ella Kissi-Debrah. Une fillette de 9 ans morte en février 2013 d'une insuffisance respiratoire aiguë suite à une grave crise d'asthme survenue après une trentaine de visites à l'hôpital.

La Coroner Court a constaté que les niveaux de dioxydes d'azote à proximité du domicile de la victime, qui vivait à moins de 30 mètres du périphérique de Londres, dépassaient les valeurs limites nationales et européennes. Quant aux particules, leur concentration dépassait les directives de l'Organisation mondiale de la santé (OMS). La juridiction britannique a considéré que le fait de ne pas avoir réduit cette pollution, dont la principale source est le trafic automobile, avait pu contribuer au décès. Elle a également incriminé le défaut d'information de la mère de la victime sur le lien entre asthme et pollution de l'air.

Cette reconnaissance constitue une première au Royaume-Uni et peut-être dans le monde. [...]

Accès au document

La liste des substances soumises à la redevance pour pollutions diffuses en 2021 est publiée

Actu-environnement 14/12/20

L'arrêté qui actualise pour 2021 la liste des substances soumises à la redevance pour pollutions diffuses est publié. Les modifications devront être prises en compte dès le 1er janvier 2021. Cette redevance est perçue par les agences et les offices de l'eau lors de l'achat de produits phytopharmaceutiques. Le projet de texte en consultation proposait un certain nombre d'évolutions par rapport à la précédente liste. Ainsi le Coumafène (ou Warfarin) et le cuivre du sulfate de cuivre...

Accès au document

Glyphosate : une étude de l'Anses interroge sur le rôle des coformulants

Actu-environnement 14/12/20

Des chercheurs de l'agence de sécurité sanitaire (Anses) ont exposé, pendant dix mois, des truites arc-en-ciel au glyphosate pur et à deux formulations commerciales d'herbicides à base de glyphosate, dans des concentrations comparables à celles trouvées dans la nature (1 µg par litre environ). « Cette exposition n'a pas eu d'incidence sur leur survie, leur reproduction ou leur métabolisme. En revanche, des modifications ponctuelles de leur réponse immunitaire ont été observées »

Accès au document

Sortie du glyphosate : un rapport parlementaire confiant sur la dynamique engagée

Actu-environnement 16/12/20

Après deux ans de travaux, une mission parlementaire se dit plutôt confiante sur la dynamique engagée vers une sortie du glyphosate. Un accompagnement renforcé des

agriculteurs s'avère cependant nécessaire, selon les rapporteurs.

La mission d'information parlementaire sur le suivi de la stratégie de sortie du glyphosate a publié, le 15 décembre, son rapport final. Et les conclusions sont plutôt positives, à rebours des nombreuses critiques regrettant un recul de la part du Gouvernement sur une sortie définitive du glyphosate fin 2020. [...]

Accès au document

Le suivi des émissions françaises de polluants est désormais disponible tous les mois

Actu-environnement 17/12/20

Le Citepa propose désormais de suivre mois après mois les émissions de gaz à effet de serre et d'autres polluants de la France. Cet organisme public, chargé de préparer les décomptes officiels que la France doit rendre à différentes institutions, veut gagner en réactivité. Cela vise surtout à s'affranchir des bilans annuels qui « imposent un décalage de plus d'un an entre l'année en cours de publication et l'année de bilan ». [...]

Accès au document

Restriction des microplastiques : l'Echa va soumettre sa proposition à la Commission européenne

Actu-environnement 11/12/20

Les deux comités scientifiques de l'agence européenne des produits chimiques (Echa) ont désormais rendu leur avis sur la proposition de restriction des microplastiques ajoutés intentionnellement, à l'échelle de l'Union européenne.

Chaque année, environ 42 000 tonnes de microplastiques se retrouvent dans l'environnement. Selon l'Echa, la plus grande source de pollution est constituée par le matériau de remplissage granulaire utilisé pour les terrains de sport en gazon artificiel.

En janvier dernier, l'Echa a proposé un dossier de restriction pour ces polluants et l'a soumis à consultation publique ainsi qu'à l'examen par les comités. [...]

Accès au document

Néonicotinoïdes : l'Europe va examiner les dérogations déposées par dix États membres

Actu-environnement 10/12/20

L'Autorité européenne de sécurité des aliments (Efsa) va examiner, à la demande de la Commission européenne, les autorisations d'urgence accordées par les États membres pour l'utilisation de néonicotinoïdes dans la culture de betterave sucrière en 2020. Vingt-et-une dérogations vont être examinées au total. Elles portent sur la clothianidine, l'imidaclopride, le thiaméthoxame et le thiaclopride. Elles ont été délivrées par l'Autriche, la Belgique, la Croatie, le Danemark, l'Espagne, la...

Accès au document

La Commission européenne lance un Observatoire pour surveiller la santé des sols

Actu-environnement 09/12/20

Le 4 décembre, la Commission européenne a lancé l'Observatoire européen des sols. Cette

plateforme web de données permet de suivre les progrès accomplis dans la réalisation des objectifs européens en matière de santé des sols. « Le nouvel Observatoire européen des sols permettra d'enrichir les données existantes et de renforcer la surveillance. Il s'agit d'une première étape concrète vers la mise en œuvre de la mission proposée dans le domaine de la santé des sols et de l'alimentation », a déclaré Mariya Gabriel, commissaire européenne chargée de l'innovation. Cette mission, proposée au titre du programme Horizon Europe, vise l'objectif ambitieux de faire en sorte que 75 % des sols soient sains d'ici à 2030. [...]

Accès au document

Glyphosate : un crédit d'impôt pour les agriculteurs s'engageant à ne plus utiliser l'herbicide

Actu-environnement 08/12/20

Dans le cadre du projet de loi de finances, les sénateurs ont adopté, le 5 décembre avec un avis favorable du Gouvernement, un amendement mettant en place un crédit d'impôt de 2 500 € en soutien aux agriculteurs s'engageant à ne plus utiliser de produits phytosanitaires à base de glyphosate. Cette aide devrait être mise en place de manière temporaire, en 2021 et 2022, et ne pourra pas être cumulée avec les crédits d'impôt pour l'agriculture biologique ou la Haute valeur environnementale...

Accès au document

Glyphosate : Générations futures saisit la justice pour faire annuler cinq autorisations

Actu-environnement 08/12/20

L'association Générations futures annonce déposer des recours contre cinq autorisations délivrées en octobre par l'agence de sécurité sanitaire (Anses) pour des produits phytosanitaires contenant du glyphosate (Gallup 360 K, Krypt 540 , Kyleo, Touchdown foret et Touchdown system 4). En octobre, l'Anses a présenté les résultats de ses travaux sur le glyphosate, afin de ne délivrer des autorisations que pour les usages ne disposant pas encore d'alternative non chimique au fameux herbicide. [...]

Accès au document

Pollution de l'air : les particules automobiles « hors échappement » prennent le dessus

Actu-environnement 08/12/20

Les émissions de particules des freins, des pneus et du revêtement routier vont progressivement prendre le dessus sur celles liées aux moteurs. Ce constat interroge sur la place des véhicules électriques, notamment en ville.

Actuellement, les politiques publiques ne prennent pas en considération les émissions de particules fines liées à l'usure des freins, des pneus et des revêtements routiers, constate un rapport de l'OCDE publié ce lundi 7 décembre. Le déploiement des véhicules électriques ne réduira pas ces émissions, contrairement aux rejets de particules à l'échappement. « Ces sources "hors échappement" pourraient représenter la majeure partie des émissions de particules du trafic routier [...]

Accès au document

New report details links between widespread ocean pollution and human health risks

EurekAlert 04/12/20

Ocean pollution is widespread and getting worse, and when toxins in the oceans make landfall they imperil the health and well-being of more than 3 billion people, according to a new report by an international coalition of scientists led by Boston College's Global Observatory on Pollution on Health and the Centre Scientifique de Monaco, supported by the Prince Albert II of Monaco Foundation.

Atop the proposals to remediate ocean pollution, the researchers recommend: banning coal combustion and the production of single-use plastics, controlling coastal pollution, and expanding marine protected areas.

The study is the first comprehensive examination of the impacts of ocean pollution on human health. It was published in today's online edition of the Annals of Global Health and released at the Monaco International Symposium on Human Health & the Ocean in a Changing World, convened in Monaco and online by the Prince Albert II de Monaco Foundation, the Centre Scientifique de Monaco and Boston College. [...]

Accès au document

'Message in a bottle' tracks plastic pollution

EurekAlert 02/12/20

Electronic tags released in the Ganges river show plastic pollution can travel thousands of kilometres in just a few months.

Researchers put GPS and satellite tags in plastic bottles in the Ganges and the Bay of Bengal.

The maximum distance tracked was 2,845km (1,768 miles) in 94 days.

The study, led by researchers from the University of Exeter and ZSL (the Zoological Society of London), was conducted as part of the National Geographic Society's Sea to Source: Ganges expedition. [...]

Accès au document

Les agriculteurs en meilleure santé que le reste de la population

Agri-Mutuel 04/12/20

Les agriculteurs souffrent globalement moins de cancers que le reste de la population, mais certains cancers peuvent être liés à l'usage de pesticides, selon une vaste étude épidémiologique consultée vendredi par l'AFP.

L'enquête Agrican, portant depuis 2005 sur plus de 180.000 affiliés à la Mutualité sociale agricole (MSA), se présente comme « la plus grande étude au monde conduite sur les cancers en milieu professionnel agricole ».

Premier constat: « Toutes causes confondues, les hommes et les femmes de la cohorte ont une mortalité inférieure de 25% à celle de la population générale » des départements dont ils sont issus, selon le « bulletin n°3 » de l'étude conduite notamment par l' Inserm, communiqué fin novembre aux participants à cette cohorte. [...]

Accès au document

La Coordination rurale s'inquiète des baisses de production potentielles

Agri-Mutuel 03/12/20

Dans une lettre ouverte envoyée au chef de l'État, aux ministres et commissaires européens concernés par le sujet de la Pac, la Coordination rurale s'inquiète des scénarios prospectifs

réalisés pour la commission agriculture du Parlement européen, et par le ministère de l'agriculture américain. Car si l'on se conforme aux stratégies européennes « De la ferme à la fourchette » et « Biodiversité », la baisse de production sera significative, avec potentiellement un impact sur les prix mondiaux. [...]

Accès au document

Le mancozèbe interdit, les arboriculteurs en pâtissent

Anjou-Agricole 03/12/20

La décision a été prise fin octobre par les instances européennes : le mancozèbe sera interdit de commercialisation dès le 31 janvier 2021. Ce fongicide est très utilisé en arboriculture et viticulture. D'après les données de la Banque nationale des ventes de produits phytopharmaceutiques (BNVD), ce fongicide est l'une des molécules les plus vendues en quantité, juste derrière le glyphosate et le prosulfocarbe, soit 2 045,8 tonnes en 2017. Son utilisation restera possible durant l'année 2021 avec un délai restant à fixer par chaque État, de façon à écouler les stocks. [...]

Accès au document

Centre Val-de-Loire Les élus écologistes demandent la suspension de l'herbicide prosulfocarbe

Terre-Net 03/12/20

Les élus écologistes du conseil régional de Centre Val-de-Loire ont demandé mercredi de suspendre l'autorisation du prosulfocarbe, un herbicide extrêmement volatil utilisé notamment par les producteurs de céréales, que les Verts accusent de contaminer les cultures avoisinantes.

Selon un rapport de la direction générale de l'alimentation (DGAL) publié le 18 novembre et qui fait suite à des contrôles réalisés en 2019, « près de 30 % des analyses menées sur des fines herbes ne sont pas conformes à la réglementation en matière de produits phytosanitaires », rapportent les élus Charles Fournier et Benoît Faucheux.

« Ces contrôles ciblés prouvent que le prosulfocarbe, produit extrêmement volatil, continue à occasionner des pollutions et contaminations sur les cultures avoisinantes », poursuivent-ils en s'appuyant sur les mesures dans l'air réalisées à l'automne par Lig'Air, le réseau de surveillance de la qualité de l'air dans la région. [...]

Accès au document

Journal officiel Le fonds d'indemnisation des victimes de produits phytos mis en oeuvre

Terre-Net 30/11/20

Le nouveau fonds d'indemnisation pour les victimes de maladies professionnelles liées aux produits phytopharmaceutiques, qui vise notamment à mieux dédommager les exploitants agricoles, est entré en vigueur, aux termes d'un décret gouvernemental. (Article mis à jour à 18h11).

Le nouveau dispositif concernera les « demandes déposées à compter du 1er janvier 2020 ou en cours d'instruction à cette date ». Ce texte, paru vendredi 27 novembre 2020 au Journal officiel et entré en vigueur le lendemain, fixe le régime des indemnisations et les conditions de fonctionnement de ce fonds, dont la création avait été votée dans le cadre du budget 2020 de la Sécurité sociale. Le nouveau dispositif étend notamment l'indemnisation aux victimes professionnelles jusqu'alors non couvertes, comme les non-salariés agricoles ayant pris leur retraite ou les enfants exposés pendant la

période prénatale « du fait de l'activité professionnelle de l'un de leurs parents ». [...]

Accès au document

Des ONG demandent de tenir la promesse de sortie du glyphosate

Agri-mutuel 27/11/20

Trois ans après la promesse d'Emmanuel Macron de sortir du glyphosate, abandonnée en chemin, les associations lui demandaient vendredi de tenir sa promesse initiale, tandis que la France pourrait renvoyer la question au niveau européen.

En novembre 2017, le président de la République s'engageait dans un tweet « pour que l'utilisation du glyphosate soit interdite en France dès que des alternatives auront été trouvées, et au plus tard dans trois ans », au grand dam du principal syndicat agricole, la FNSEA.

En janvier 2019, autre discours : la France ne parviendra pas à se passer du glyphosate « à 100 % » en trois ans. « Pas faisable et ça tuerait notre agriculture », estimait le président. Depuis, la France s'est fixé pour objectif de sortir de l'essentiel des usages du glyphosate en 2021, avant une interdiction totale en 2023. [...]

Accès au document

Glyphosate : la CJUE rejette le pourvoi de la région Bruxelles-Capitale

Actu-environnement 04/12/20

Par un arrêt du 3 décembre 2020, la Cour de justice de l'Union européenne (CJUE) a rejeté le pourvoi de la région Bruxelles-Capitale qui contestait le règlement européen du 12 décembre 2017 renouvelant l'approbation du glyphosate pour cinq ans. En mars 2018, la collectivité avait formé en recours en annulation contre le règlement devant le Tribunal de l'Union européenne. En février 2019, ce dernier avait jugé ce recours irrecevable pour défaut de qualité à agir. [...]

Accès au document

Micropolluants en sortie de station d'épuration : premiers pas vers une évaluation de l'impact global

Actu-environnement 04/12/20

Une étude à l'initiative du Synteau et réalisée par l'Inrae s'est penchée sur l'impact global des micropolluants présents dans les eaux usées traitées sur les écosystèmes aquatiques et la santé humaine. Détails de l'approche.

L'objectif de l'étude du Synteau et de l'Inrae ? Evaluer de manière globale l'impact des micropolluants sur le nombre d'espèces qui pourraient disparaître par kilogramme de substance rejetée et le nombre d'années de vie potentiellement perdues. [...]

Accès au document

Cohorte Agrican : certains cancers sont plus fréquents chez les agriculteurs

Actu-environnement 02/12/20

Lymphomes, cancers de la prostate ou encore maladie de Parkinson touchent davantage les agriculteurs que la population générale, révèle l'étude Agrican, menée auprès de professionnels agricoles. Les expositions à risque sont passées à la loupe.

L'équipe de chercheurs Agrican a publié, en novembre, le troisième bulletin de la cohorte, présentant les résultats issus de l'analyse des

questionnaires remplis par des professionnels agricoles entre 2015 et 2017, affiliés à la Mutualité sociale agricole (MSA). Depuis 2005, cette cohorte étudie les expositions professionnelles agricoles qui peuvent avoir une influence sur la survenue de cancers. « Cette étude vise à contribuer à améliorer les actions de prévention et de réparation des maladies professionnelles », explique le bulletin. [...]

Accès au document

Risques sanitaires et environnementaux : huit établissements de recherche s'ouvrent à la société civile

Actu-environnement 02/12/20

Le 27 novembre, huit établissements publics de recherche ont signé une charte d'ouverture à la société pour apporter aux citoyens « une meilleure compréhension » des risques sanitaires et environnementaux ainsi que les moyens de les prévenir et de les réduire. Les signataires de la charte sont : l'Agence nationale de sécurité sanitaire (Anses), le Bureau de recherches géologiques et minières (BRGM), l'Institut français de recherche pour l'exploitation de la mer (Ifremer), l'Institut national de l'environnement industriel et des risques (Ineris), l'Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (Inrae), l'Institut de radioprotection et de sûreté nucléaire (IRSN), l'Université Gustave Eiffel et Santé publique France. [...]

Accès au document

Toxicité des pesticides : dépôt d'une plainte pour fraude à l'étiquetage

Actu-environnement 01/12/20

Neuf associations ont déposé, le 1er décembre, une plainte contre X pour fraude à l'étiquetage, mise en danger de la vie d'autrui et atteinte à l'environnement, en matière de pesticides. Déposée auprès du pôle santé du tribunal judiciaire de Paris, la plainte est associée à une seconde déposée contre l'État français pour carence fautive.

Par cette action, les associations veulent démontrer que l'évaluation des risques conduite au niveau européen puis national, pour les substances actives puis les produits mis sur le marché, n'est pas suffisante. [...]

Accès au document

Glyphosate 1 - France 0 : et maintenant, que fait-on ?

Actu-environnement 27/11/20

Trois ans après un fameux tweet d'Emmanuel Macron promettant la sortie du glyphosate d'ici novembre 2020, le résultat n'est pas au rendez-vous. Le président change de stratégie et veut entraîner l'Europe, mais pour le pire ou le meilleur ?

[...]. Le programme de réduction de l'usage de ces produits chimiques en agriculture baptisé Ecophyto enchaîne les désillusions. Sur Twitter, le 25 novembre 2017, Emmanuel Macron affirmait "avoir demandé au Gouvernement de prendre les dispositions nécessaires pour que l'utilisation du glyphosate soit interdite en France dès que des alternatives auront été trouvées et au plus tard dans trois ans". Nous sommes trois ans plus tard, jour pour jour, et le constat est décevant. [...]

Accès au document

Le lien entre pollution et virus respiratoires bénéficie à un arrêté anti-pesticides

Actu-environnement 01/12/20

Par un jugement du 27 novembre 2020, le juge des référés du tribunal administratif de Montreuil a rejeté la requête du préfet de la Seine-Saint-Denis visant à suspendre un arrêté anti-pesticides. Cet arrêté avait été pris par le maire de Clichy-sous-Bois le 20 septembre 2019 pour interdire l'utilisation du glyphosate et « d'autres substances chimiques visant à lutter contre des organismes considérés comme nuisibles » sur l'ensemble du territoire de la commune. [...]

Accès au document

Les règles de fonctionnement du fonds d'indemnisation des victimes de pesticides sont fixées

Actu-environnement 01/12/20

Le décret fixant les règles de fonctionnement du fonds d'indemnisation des victimes des pesticides a été publié. L'instruction des premières demandes d'indemnisation a déjà démarré, précise le ministère de l'Agriculture.

Le décret relatif au fonds d'indemnisation des victimes de pesticides a été publié au Journal officiel du 29 novembre. Il détaille les modalités d'organisation et de fonctionnement du fonds et les modalités d'instruction des demandes et règles d'indemnisation des victimes. [...]

Accès au document

La qualité de l'air s'améliore mais cause toujours 400 000 décès prématurés en Europe chaque année

Actu-environnement 25/11/20

La qualité de l'air s'est améliorée en Europe au cours de la dernière décennie mais le nombre de décès prématurés liés à la pollution s'élève toujours à quelque 400 000 chaque année. Telle est la principale conclusion du rapport 2020 sur la qualité de l'air publié le 23 novembre par l'Agence européenne de l'environnement.

Les données traitées par l'Agence ont été relevées en 2018 par plus de 4 000 stations de surveillance de toute l'Europe. Les améliorations, qui concernent les différents polluants atmosphériques, sont principalement constatées dans le domaine des transports et de l'approvisionnement énergétique, alors que les progrès dans le secteur des bâtiments et de l'agriculture sont lents.

La majeure partie des décès prématurés est imputable aux particules fines (379 000 décès), suivies de loin par le dioxyde d'azote (NO2, 54 000 décès) et l'ozone (O3, 19 000 décès). [...]

https://www.actu-environnement.com/media/pdf/36559-air-quality-report-2020.pdf

Accès au document

L'exposition aux perturbateurs endocriniens pourrait aggraver la Covid-19

Actu-environnement 26/11/20

« Notre nouvelle étude révèle que l'exposition à des produits chimiques qui dérèglent le système endocrinien (les perturbateurs endocriniens ou PE) pourrait interférer avec différents signaux biologiques du corps humain jouant un rôle important dans la sévérité de la Covid-19 », révèle Karine Audouze du laboratoire T3S de l'Université de Paris – Inserm.

Selon cette étude, publiée le 19 novembre dans la revue Environment International, une relation est possible entre la gravité de la maladie et la détérioration de l'environnement par les produits chimiques. Pour mieux comprendre les relations entre les perturbateurs endocriniens et l'augmentation du risque de Covid-19 sévère, les chercheurs indiquent avoir utilisé une approche bio-informatique. [...]

Accès au document

Protection intégrée des cultures : vers un réseau européen de fermes de démonstration

Actu-environnement 26/11/20

L'Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (Inrae) va piloter un programme européen, visant à mettre en place un réseau d'agriculteurs mettant en place des stratégies de protection intégrée des cultures, pour réduire l'usage des pesticides. Sur le modèle du réseau français des fermes Dephy, le projet H2020 IPMWORKS regroupe 31 partenaires de 16 pays européens pour une durée de quatre ans. Il bénéficie d'un budget de 6 millions d'euros. [...]

Accès au document

Variétés tolérantes aux herbicides : le Gouvernement va procéder par ordonnance

Actu-environnement 24/11/20

Le projet de loi de programmation de la recherche pour les années 2021 à 2030, adopté le 17 novembre, habilite le Gouvernement à prendre une ordonnance pour « modifier le code de l'environnement, le code rural et de la pêche maritime et le code de la consommation afin de prévoir les modalités de traçabilité et les conditions de l'utilisation des semences des variétés rendues tolérantes aux herbicides [VrTH] et des produits issus ». [...]

Accès au document

Moins de rejets de produits phytosanitaires dans les eaux thurgoviennes

Centre Ecotox 20/11/20

En Thurgovie, les autorités et de nombreux agriculteurs travaillent ensemble à une réduction des rejets de produits phytosanitaires dans le milieu aquatique. Les biotests réalisés avec des échantillons d'eau et de sédiment montrent que l'état écotoxicologique des cours d'eau est encore fortement altéré.

En Suisse, les petits ruisseaux contiennent encore des quantités trop élevées de produits phytosanitaires (PPh). C'est ce qu'a montré, l'an passé, l'Observation nationale de la qualité des eaux superficielles (NAWA). Dans le canton de Thurgovie, l'Eschelisbach et la Salmsacher Aach étaient particulièrement pollués. Ces deux ruisseaux présentaient des concentrations de PPh très supérieures au seuil de 0,1 µg/l fixé par l'Ordonnance sur la protection des eaux et dépassant également les valeurs critiques pour les petits organismes aquatiques. Ces résultats montrent que les PPh continuent de se déverser dans les cours d'eau malgré l'usage raisonné et prudent qu'en font les agriculteurs. [...]

Accès au document

Biomonitoring des produits phytosanitaires en Suisse

Centre Ecotox 17/11/20

[...]

En septembre 2017, le Conseil fédéral a adopté un plan d'action visant à la réduction des risques et à l'utilisation durable des produits phytosanitaires (PPh). Ses objectifs sont de réduire de moitié les risques dus aux PPh dans les dix ans à venir et de proposer des alternatives à la protection chimique des cultures et des végétaux. Pour que ces buts soient atteints, de nombreuses mesures ont été décidées. L'une d'elles est de mettre en place un programme de surveillance des résidus de PPh dans les sols agricoles d'ici 2027. [...]

Accès au document

A filter for environmental remediation

EurekAlert! 19/11/20

Scientists at Osaka University create seaweed-shaped sodium titanate mats made of nanofibers that can remove cobalt ions from water, which may help provide a source of safe, recycled drinking water by removal of heavy metals and radionuclides

A team of researchers at Osaka University has developed a nanopowder shaped like seaweed for a water filter to help remove toxic metal ions (Fig. 1). Made of layered sodium titanate, the randomly oriented nanofibers increase the efficacy of cobalt-II (Co^{2+}) ion capture. This work might lead to cheaper and more effective solutions for filtering water that is currently unusable due to hazardous heavy metals or radioactive fallout. [...]

Accès au document

Antibiotic resistance genes in three Puerto Rican watersheds after Hurricane Maria

EurekAlert! 18/11/20

In the aftermath of Hurricane Maria, a category 5 hurricane that made landfall in September 2017, flooding and power outages caused some wastewater treatment plants (WWTPs) to discharge raw sewage into waterways in Puerto Rico. Six months later, researchers monitored antibiotic resistance genes (ARGs) in three Puerto Rican watersheds, finding that the abundance and diversity of ARGs were highest downstream of WWTPs. They report their results in ACS' Environmental Science & Technology. [...]

Accès au document

Microbial remedies target chemical threats in the environment

EurekAlert! 17/11/20

Across America, hazardous waste sites pose an ongoing threat to human and environmental health. The most severe cases are known as Superfund sites, of which over a thousand currently exist. Some 50 million Americans live within three miles of one of these zones, potentially placing them at increased risk for cancer and other serious diseases.

While decontamination of such sites is a public health priority, the technical challenges are daunting. Of particular concern are a pair of chlorinated chemicals known as TCE and perchlorate. TCE was widely used as a degreasing agent and perchlorate is used in the manufacture of propellants. Due to the widespread reliance on these chemicals in the past and their improper disposal, they have often found their way into the environment, posing significant risks to human health and surrounding ecosystems. [...]

In a new study, researchers at the Biodesign Swette Center for Environmental Biotechnology explored new ways to rid the environment of these co-occurring toxic chemicals. To accomplish this, Fe0 in combination with microbial cultures containing an unusual microbe known as Dehalococcoides mccartyi were added

to soil and groundwater samples from a contaminated Superfund site in Goodyear, Arizona. The contaminated site had formerly been involved in defense and aerospace manufacturing. [...]

Accès au document

Environmental scientists' new ozonation method treats water from antibiotic residues

EurekAlert! 17/11/20

Clean drinking water is considered to be one of the earth's most precious and threatened resources. Recent studies show that increasing concentrations of pharmaceuticals can be found in surface waters, which can end up in drinking water. TalTech environmental scientists are looking for ways to treat drinking water from hazardous pharmaceutical residues.

TalTech research group of the Laboratory of Environmental Technology led by Senior Researcher Niina Dulova published an article in the journal Environmental Research titled "Individual and simultaneous degradation of sulfamethoxazole and trimethoprim by ozone, ozone/hydrogen peroxide and ozone/persulfate processes: A comparative study". [...]

Accès au document

An epidemic outbreak of Mesoamerican Nephropathy in Nicaragua linked to nickel toxicity

EurekAlert! 13/11/20

For more than 20 years, an epidemic of chronic kidney disease (CKD) of unknown origin has severely affected specific coastal communities along South America's Pacific coastline from Mexico to Panama leading to more than 50,000 deaths. The condition, known as Mesoamerican Nephropathy (MeN), has a perplexing clinical presentation. Unlike traditional forms of CKD, it affects healthy young working-age individuals who do not have other traditional risk factors for kidney disease, such as diabetes or hypertension. The underlying cause of this devastating public health crisis has remained a mystery.

A "CSI-style" scientific investigation led by Dr. Kristy Murray, professor of pediatrics, immunology and microbiology at Baylor College of Medicine and Texas Children's Hospital, revealed evidence for nickel toxicity as the underlying cause of this disease in a Nicaraguan "hotspot," which is among the worst-hit areas in the continent. The study provides new, compelling evidence that low-dose exposure to nickel can cause systemic inflammation, anemia and kidney injury - hallmarks of acute MeN that progresses to chronic kidney disease in around 90% of the patients. The study appeared in PLoS ONE this week. [...]

Accès au document

Pesticides commonly used as flea treatments for pets are contaminating English rivers

EurekAlert! 20/11/20

Researchers at the University of Sussex have found widespread contamination of English rivers with two neurotoxic pesticides commonly used in veterinary flea products: fipronil and the neonicotinoid imidacloprid. The concentrations found often far exceeded accepted safe limits.

These chemicals are banned for agricultural use due to the adverse environmental effects, but there is minimal environmental risk assessment for pesticides used on domestic cats and dogs. This is due to the assumption that there are likely to be fewer environmental impacts due to the amount of product used. [...]

Accès au document

Glyphosate may affect human gut microbiota

EurekAlert! 20/11/20

Glyphosate is the most commonly used broad-spectrum herbicide. Researchers from the University of Turku in Finland have developed a new bioinformatics tool to predict if a microbe, e.g. a human gut bacterium, is sensitive to glyphosate.

"Glyphosate targets an enzyme called EPSPS in the shikimate pathway. This enzyme is crucial to synthesizing three essential amino acids. Based on the structure of the EPSPS enzyme, we are able to classify 80-90% of microbial species into sensitive or resistant to glyphosate," says Docent Pere Puigbò, developer of the new bioinformatics tool. [...]

Accès au document

Does air pollution affect mental health later in life?

EurekAlert! 18/11/20

In a study of women aged 80 years and older, living in locations with higher exposures to air pollution was associated with increased depressive symptoms. The findings are published in the Journal of the American Geriatrics Society. When looking at individual air pollutants, a team led by investigators from of the University of Southern California found that long-term exposure to nitrogen dioxide or fine particulate air pollution was associated with increased depressive symptoms, but with only a small effect. Results also suggested that depressive symptoms might play a role in linking long-term air pollution exposure to memory decline more than 10 years after the exposure. [...]

Accès au document

Plastic pollution is everywhere. Study reveals how it travels

EurekAlert! 14/11/20

VIDEO: Research has shown how plastics, depicted here as green particles, travel long distances in soil and other substances through a process of repeatedly getting stuck and then released.

Plastic pollution is ubiquitous today, with microplastic particles from disposable goods found in natural environments throughout the globe, including Antarctica. But how those particles move through and accumulate in the environment is poorly understood. Now a Princeton University study has revealed the mechanism by which microplastics, like Styrofoam, and particulate pollutants are carried long distances through soil and other porous media, with implications for preventing the spread and accumulation of contaminants in food and water sources. [...]

Accès au document

Crop Diversity in Commercial Agriculture Decreases Pest Populations and Pesticides Use while Stabilizing Biodiversity

Beyond Pesticides, November 19, 2020

A new study by researchers at the University of California, Santa Barbara (UCSB) finds that crop diversity in commercial agriculture is just as essential to supporting a stable biological system as plant diversity on non-commercial landscapes. Furthermore, less diverse crop areas lead to higher, more intensive pesticide use, indicating a threat to environmental and human health, as well as food security. This research highlights the need to develop policies that facilitate a

decrease in overall pesticide use by helping farmers and global leaders make more knowledgeable decisions about crop area size and diversity to sustain biodiversity. Researchers note, “While [crop] complexity increases stability and reduces high deviations in insecticide use, accounting for crop and farmer-specific characteristics is crucial for statistical inference and sound scientific understanding. [...]

Accès au document

Légumes Enquête sur un trafic de produits à base de dichloropropène

Terre-Net 20/11/20

La justice enquête sur un trafic qui a permis l'importation illégale d'Espagne de 80 tonnes de produits phytosanitaires interdits et répandus dans le secteur de Créances (Manche) réputé pour ses carottes, a annoncé jeudi le parquet de Coutances.

Ces 80 tonnes de produits à base de dichloropropène, ont été importées depuis 2018, date de l'interdiction de cette substance en France « pour des raisons environnementales », a précisé dans un communiqué le parquet qui a ouvert une enquête préliminaire. Vingt-trois tonnes de produits phytosanitaires ont été par ailleurs saisies, selon la même source. [...]

Accès au document

Deux châteaux condamnés en appel après des épandages de fongicides

Agri-mutuel 18/11/20

Deux châteaux du Bordelais ayant procédé en 2014 à l'épandage de fongicides près d'une école où des élèves et une enseignante avaient été pris de malaises ont été condamnés mercredi en appel à 5 000 euros d'amende avec sursis, a-t-on appris auprès d'avocats.

Le parquet général avait fait appel de la relaxe prononcée par le tribunal correctionnel de Libourne en avril 2019 au profit des châteaux Castel La Rose et Escalette (appellation Côtes de Bourg) qui étaient poursuivis notamment par la Sepanso (affiliée à France Nature Environnement) pour « utilisation inappropriée de produits phytopharmaceutiques ». [...]

Accès au document

Biocontrôle : une stratégie nationale pour doubler le nombre de solutions d'ici 2025

Actu-environnement 18/11/20

Le ministère de l'Agriculture décline, dans une stratégie nationale, les mesures mises en place pour accélérer le déploiement des solutions de biocontrôle. Innovation, simplification réglementaire et diffusion sur le terrain sont au cœur de ce plan.

Le ministère de l'Agriculture a publié, le 10 novembre, la stratégie nationale de déploiement du biocontrôle. Prévue par la loi Egalim de 2018, cette stratégie doit organiser la montée en puissance des solutions de biocontrôle sur la période 2020-2025. Ces solutions, qui reposent sur l'utilisation d'organismes (insectes, acariens, champignons, bactéries), de médiateurs chimiques (phéromones sexuelles par exemple) et de substances naturelles, constituent un des leviers pour réduire l'usage de...

Accès au document

Bactéries antibiorésistantes : le rôle de la pollution difficile à cerner

Actu-environnement 19/11/20

L'antibiorésistance se présente comme un des enjeux sanitaires de demain. Lors de la journée dédiée à ce sujet, l'Anses a dévoilé les derniers résultats des stratégies pour contenir le risque. La connaissance sur les effets de la pollution avance peu.

Comprendre les mécanismes mis en œuvre dans l'environnement dans l'apparition et la diffusion des résistances bactériennes : c'est en suivant cet objectif que l'Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses) a réalisé un état des lieux de la connaissance sur la contamination des milieux par ces polluants et la dissémination de l'antibiorésistance. La question est sensible. Avec une consommation en moyenne 30% supérieure de celle des...

Accès au document

Quatre pour 1 000 : le Cirad, l'Inrae et l'IRD lancent une étude dans les territoires ultra-marins

Actu-environnement 16/11/20

Ce lundi 16 novembre, le Centre de coopération internationale en recherche agronomique pour le développement (Cirad), l'Institut national de la recherche agronomique (Inrae) et l'institut de recherche pour le développement (IRD) annoncent le lancement de la première étude « 4 pour 1 000 » dans les territoires ultra-marins. Soutenue par l'Agence de la transition écologique (Ademe), l'étude portera sur sept territoires : Guyane, Martinique, Guadeloupe, Réunion, Mayotte, Saint Barthélémy et [...].

Accès au document

Santé au travail : les travaux exposant à la silice cristalline désormais inscrits comme cancérogènes

Actu-environnement 02/11/20

Un arrêté interministériel, publié le 1er novembre au Journal officiel, inscrit les travaux exposant à la poussière de silice cristalline comme cancérogènes au titre du code du travail à compter du 1er janvier 2021. Cette inscription implique pour l'employeur des exigences supplémentaires en matière d'évaluation des risques, de mise en œuvre de moyens de prévention, de contrôle de l'exposition des travailleurs, d'information et de formation [...]

Accès au document

Pourquoi le Conseil constitutionnel pourrait reconnaître le principe de non-régression environnementale

Actu-environnement 13/11/20

Saisi par des députés, des sénateurs et nourris de contributions extérieures, les sages pourraient constitutionnaliser le principe de non-régression environnementale à l'occasion du contrôle de la loi néonicotinoïdes.

Le Conseil constitutionnel est-il en passe de consacrer le principe de non-régression environnementale ? La réponse est entre ses mains mais une opportunité sans précédent s'offre à lui à l'occasion du contrôle de constitutionnalité de la loi autorisant des dérogations à l'interdiction des pesticides néonicotinoïdes. Les gardiens de la Constitution font l'objet d'une double saisine de plus de 60 députés et plus de 60 sénateurs […].

Accès au document

La consultation publique sur le plan d'action européen « zéro pollution » est ouverte

Actu-environnement 13/11/20

La Commission a lancé une consultation publique jusqu'au 10 février sur le plan d'action « Vers une ambition zéro pollution pour l'air, l'eau et les sols – construire une planète plus saine pour des populations plus saines ».

« Malgré d'importantes améliorations au cours des dernières décennies, la pollution continue de nuire aux citoyens et aux écosystèmes. Elle provoque de multiples maladies physiques et mentales et est l'un des cinq principaux facteurs de perte de biodiversité, indique-t-elle. La pollution a un prix élevé pour la société et les écosystèmes, y compris les coûts liés à la santé (…), les rendements réduits (…), les coûts de dépollution (…) et la perte de services écosystémiques (…) ». [...]

Accès au document

69 eurodéputés exhortent la Commission de stopper les exportations de pesticides interdits hors UE

Actu-environnement 13/11/20

Soixante-neuf eurodéputés de tous bords appellent Ursula Von der Leyen, présidente de la Commission européenne, à interdire l'exportation de pesticides qui ont été prohibés dans l'Union européenne (UE), « en raison de leurs effets néfastes sur la santé et l'environnement ». Ils lui demandent aussi de cesser d'importer des denrées alimentaires « produites avec ces substances dangereuses en dehors de l'UE ».

La semaine dernière, soixante-seize ONG ont fait la même requête auprès du vice-président de la Commission et des commissaires européens concernés. [...]

Accès au document

Néonicotinoïdes : la liste des substances interdites en France mise à jour

Actu-environnement 12/11/20

Au lendemain de l'adoption définitive du projet de loi permettant des dérogations à l'interdiction des néonicotinoïdes, le ministère de l'Agriculture met en consultation, jusqu'au 26 novembre, un projet de décret mettant à jour la liste des substances actives néonicotinoïdes (ou présentant des modes d'action identiques) interdites en France. La France a interdit, en septembre 2018, cinq substances : l'imidaclopride, la clothianidine, le thiaméthoxame, l'acétamipride et le thiaclopride. [...]

Accès au document

Un nouvel indicateur pour évaluer l'effet cocktail des pesticides dans les lagunes

Actu-environnement 12/11/20

L'Ifremer, l'agence de l'eau RMC et l'Université de Bordeaux se sont penchés sur un nouvel indicateur qui révèle le risque écologique lié au cumul de pesticides dans les lagunes méditerranéennes. Huit sites sur dix présentent un risque fort.

« Nous avons évalué pour la première fois le risque lié au cumul de pesticides : même présents en-deçà de leurs valeurs-seuils individuelles, les pesticides peuvent voir leurs effets s'additionner et nuire au fonctionnement des écosystèmes lagunaires et aux organismes qui y vivent : à leur reproduction, leur développement ou encore leur immunité »,

pointe Dominique Munaron, chercheur en chimie de l'environnement à l'Ifremer, Sète. [...]

Accès au document

Néonicotinoïdes : les élus de l'opposition saisissent le Conseil constitutionnel

Actu-environnement 12/11/20

Des députés de l'opposition, représentant les groupes de la Gauche démocrate et républicaine, de La France insoumise, les Socialistes et apparentés et le collectif Écologie Démocratie Solidarité ont déposé, ce mardi 10 novembre, un recours devant le Conseil constitutionnel contre le projet de loi permettant le recours aux néonicotinoïdes à titre dérogatoire. Le projet de loi ouvrant la voie à ces dérogations a été adopté définitivement par le Parlement le 4 novembre dernier.

Accès au document

Pollution aux particules fines : la justice européenne condamne l'Italie

Actu-environnement 12/11/20

Par une décision rendue ce mardi 10 novembre, la Cour de justice de l'Union européenne (CJUE) condamne l'Italie pour non-respect de la directive sur la qualité de l'air ambiant, en ce qui concerne la pollution aux particules fines. De quoi interpeller notre gouvernement alors que la France vient d'être renvoyée pour la même raison devant cette même juridiction par la Commission européenne. Les valeurs limites pour les concentrations de particules PM10 ont été dépassées de manière systématique...

Accès au document

ITEM ALCOVE : AgricuLture bioContrôle biOfertilisant ViticolEs

IMBE 09/11/20

Ce projet a pour but de développer de nouvelles pratiques agricoles respectueuses de la santé humaine, de la biodiversité des agrosystèmes à la base de la durabilité du fonctionnement de ces milieux, reposant sur une économie circulaire et associant les acteurs aux changements de pratiques. En ce sens, il s'inscrit dans la démarche de la transition environnementale : nécessité d'un changement de paradigme et élaboration de solutions intégratives innovantes pour notre société. Ainsi, notre étude s'attachera à optimiser la production et tester l'efficacité et l'innocuité d'un cocktail de produits de biocontrôle (PBC) et d'un biofertilisant conçu à partir de savoir-faire connus basés sur des fermentations en milieu solide (FMS) des sous-produits de l'agriculture. A l'heure actuelle, il existe encore très peu de solutions de remplacement à l'utilisation de pesticides ou du sulfate de cuivre dans le contexte viticole, alors que l'Union Européenne a encore réduit les seuils de concentrations en CuSO4 par ha et par an. Ainsi, la production de PBC et d'un biofertilisant, dont l'innocuité serait contrôlée, valorisant des sous-produits agricoles dans le cadre d'une économie circulaire, locale et autonome, est importante à promouvoir. [...]

Accès au document

Bringing drugs to the brain with nanoparticles to treat neurodegenerative diseases

EurekAlert! 09/11/20

Researchers from the Institut national de la recherche scientifique (INRS) have shown that nanoparticles could be used to deliver drugs to the brain to treat neurodegenerative diseases.

The blood-brain barrier is the main obstacle in treating neurodegenerative diseases such as Alzheimer and Parkinson. According to a recent study conducted by Jean-Michel Rabanel, a postdoctoral researcher under the supervision of Professor Charles Ramassamy, nanoparticles with specific properties could cross this barrier and be captured by neuronal cells. Researchers are confident that these results will open important prospects for releasing drugs directly to the brain. This breakthrough finding would enable improved treatment for neurodegenerative diseases affecting more than 565,000 Canadians, including 141,000 Quebecers. [...]

Accès au document

Reduction of environmental pollutants for prevention of cardiovascular disease

EurekAlert! 06/11/20

In a current opinion article "Reduction of environmental pollutants for prevention of cardiovascular disease: it's time to act", published in the European Heart Journal this week, a group of international environmental researchers from the University Medical Center of Mainz (Thomas Münzel and Andreas Daiber), from the University/BHF Centre for Cardiovascular Sciences, University of Edinburgh, United Kingdom (Mar Miller), the Diet, Genes and Environment, Danish Cancer Society Research Center, Copenhagen, Denmark (Mette Sørensen), the Max Planck Institute for Chemistry, Atmospheric Chemistry Department, Mainz, Germany (Jos Lelieveld) and the Harrington Heart and Vascular Institute, University Hospitals Cleveland Medical Center and School of Medicine, Cleveland, OH, USA (Sanjay Rajagopalan) summarized the epidemiologic and mechanistic evidence in support of an association between noise and air pollution with cardiovascular and metabolic disease, and recommended comprehensive mitigation measures. [...]

Accès au document

Hydrogen bonds may be key to airborne dicamba

EurekAlert! 05/11/20

Dicamba has been the subject of lawsuits across the country, with landowners contending the herbicide, when used by neighboring growers, has blown onto their property, killing valuable non-resistant crops.

Dicamba is sprayed in a formulation that contains an amine, a chemical agent that is supposed to keep the herbicide in place, preventing it from going airborne. Ongoing reports of crop damage despite these measures have previously shown, however, that it may not be working as it should, particularly when the dicamba/amine formulation is sprayed with the most commonly used herbicide in the world, glyphosate, the main component of Roundup.

Washington University in St. Louis researchers in the lab of Kimberly Parker, assistant professor in the Department of Energy, Environmental & Chemical Engineering in the McKelvey School of Engineering, have proposed a mechanism that describes how dicamba volatility is controlled by amines.

The finding was published in October in Environmental Science & Technology. [...]

Accès au document

Effects of the Neonicotinoid Acetamiprid in syrup on *Bombus impatiens* (Hymenoptera: Apidae) Microcolony Development

EPA 04/11/20

Impact/Purpose:

In recent decades, neonicotinoid pesticide use has dramatically increased, as have concerns regarding the safety of these chemicals for pollinator health. Here we assessed the toxicity of the neonicotinoid acetamiprid to the bumble bee Bombus impatiens. We examined effects on nest growth, development and productivity of bumble bee microcolonies fed acetamiprid. Acetamiprid delivered in syrup can negatively impact B. impatiens nest development and productivity, however only at concentrations above which would be expected in the environment when used according to label rates.

Citation:

Camp, A., W. Williams, B. Eitzer, R. Koethe, AND D. Lehmann. Effects of the Neonicotinoid Acetamiprid in syrup on Bombus impatiens (Hymenoptera: Apidae) Microcolony Development. PLoS ONE

. Public Library of Science, San Francisco, CA, 15(10):e0241111, (2020). https://doi.org/10.1371/journal.pone.0241111

Accès au document

A new lead for disarming antibiotic-resistant bacteria

EurekAlert! 03/11/20

A virus can stop bacteria from sharing genes for antibiotic resistance among themselves, Texas A&M AgriLife researchers have discovered. The results hint at new ways to treat infections and describe a new feature of a highly diverse, largely unexplored part of the biosphere.

The study, published recently in Proceedings of the National Academy of Sciences, was led by Lanying Zeng, Ph.D., associate professor in the Texas A&M College of Agriculture and Life Sciences Department of Biochemistry and Biophysics. [...]

Accès au document

More plant diversity, less pesticides

EurekAlert! 06/11/20

Increasing plant diversity enhances the natural control of insect herbivory in grasslands. Species-rich plant communities support natural predators and simultaneously provide less valuable food for herbivores. This was found by a team of researchers led by the German Centre for Integrative Biodiversity Research (iDiv), who conducted two analogous experiments in Germany and the USA. Their results were published in Science Advances and show that increasing plant biodiversity could help reduce pesticide inputs in agricultural systems by enhancing natural biological control. [...]

Accès au document

Metal pollution in British waters may be threatening scallops, study reveals

EurekAlert! 05/11/20

Metal pollution from historic mining appears to be weakening scallop shells and threatening marine ecosystems in an area off the coast of the Isle of Man, a major new study suggests.

The research, led by an interdisciplinary team at the University of York, suggests that the contamination of seabed sediments with zinc, lead and copper from the mining of these metals, which peaked on the island in the late 19th century, is causing the shells of king scallops to become significantly more brittle.

The thinning and weakening of shells threatens the species by leaving them more exposed to the crushing claws of crabs and lobsters, and, in turn, threatens the marine ecosystem because of the important functions, such as water filtration, that molluscs like scallops carry out. [...]

Accès au document

Pesticides : 76 ONG demandent à Bruxelles de mettre fin aux exportations hors UE de substances interdites

Actu-environnement 06/11/20

Soixante-seize ONG ont écrit à l'exécutif européen pour demander que soient « prohibées l'exportation de pesticides dangereux interdits dans l'Union européenne (EU), ainsi que l'importation de produits alimentaires et agricoles produits en dehors de l'UE avec ces pesticides ». Le courrier, daté du 5 novembre, a été adressé aux commissaires européens en charge de l'agriculture, de l'environnement, et de l'alimentation et de la santé, ainsi qu'au vice-président de la Commission...

Accès au document

Insecticides : Les néonicotinoïdes de nouveau autorisés pour la seule betterave sucrière

Terre-Net 06/11/20

Le Parlement a autorisé mercredi, via un ultime vote du Sénat, le retour temporaire des néonicotinoïdes pour « sauver » la filière betterave, un texte « difficile », de l'aveu du gouvernement, dénoncé à gauche comme un « recul environnemental ».

Le projet de loi autorise, à titre dérogatoire, les producteurs de betteraves à sucre à utiliser jusqu'en 2023 des semences traitées avec des pesticides de la famille des néonicotinoïdes, interdits depuis 2018.

Pour la filière, qui représente près de 46 000 emplois, il y a urgence : les dérogations devraient en effet être effectives au plus tard en décembre, pour laisser le temps aux industriels de produire les semences nécessaires au semis de mars. En cause, un puceron vert qui transmet à la betterave la jaunisse, une maladie qui affaiblit la plante, conduisant à une perte importante de rendement. [...]

Accès au document

Annonce de Julien Denormandie : 7 M€ pour accélérer la recherche sur les alternatives au glyphosate

Terre-Net 06/11/20

Le gouvernement va débloquer une enveloppe de sept millions d'euros pour accélérer la recherche sur les alternatives aux herbicides à base de glyphosate, a annoncé jeudi le ministre de l'agriculture Julien Denormandie, devant des parlementaires. (Article mis à jour le 6/11/20 à 8h51)

La France s'est fixé pour objectif de sortir de l'essentiel des usages du glyphosate en 2021, avant une interdiction totale en 2023. Décidé à « mettre le paquet pour identifier les solutions face aux éléments de blocage qui sont devant nous aujourd'hui », Julien Denormandie a dit vouloir consacrer « dès le budget de cette année sept millions d'euros supplémentaires à la recherche dans les alternatives au glyphosate ».

Cette enveloppe vient s'ajouter aux plans existants comme le plan Écophyto II+, qui vise à réduire de 50 % les usages de produits phytopharmaceutiques dans leur ensemble d'ici 2025. [...]

Accès au document