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Bulletin de veille du réseau d'écotoxicologie terrestre et aquatique

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Edito

Voici notre 46ème bulletin de veille, encore riche en informations !
Nous vous rappelons le séminaire trisannuel de notre réseau Ecotox, qui se tiendra cette année les lundi 16 novembre après midi, et la journée du mardi 17, sous la forme d'un webinaire. Le thème retenu cette année est « L'écotoxicologie du continuum sol-eau, opportunités suite à la fusion INRA-Irstea ». Pour tout renseignement et pour participer au webinaire, vous trouverez les informations utiles sur la page de notre site ECOTOX :
https://www6.inrae.fr/ecotox/Manifestations/Seminaires-du-reseau/2020

Nous vous proposons dans ce bulletin une tribune portant sur l'expertise académique à destination des entreprises dans les domaines de l'Environnement et de la Santé. 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-28-aout-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 !

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Tribune libre

L'expertise académique à destination des entreprises dans les domaines de l'Environnement et de la Santé

Ce texte rapporte des éléments de discussion abordés lors de la table-ronde « L'expertise académique au service des entreprises » qui s'est tenue dans le cadre de la journée de la Fondation Rovaltain du 15 novembre 2019 à Alixan. Cette table-ronde, focalisée sur l'expertise académique à destination du monde de l'entreprise, a mobilisé des intervenants des deux secteurs pour un regard croisé sur les avantages et les limitations rencontrées dans ce cadre de collaboration. Leurs propos ont été recueillis par Christian Mougin (INRAE), Delphine Delaunay (Fondation ROVALTAIN) et Tatiana Vincent (journaliste et réalisatrice).

L'interface recherche académique/partenaires privés : une relation de confiance, une vision commune !

L'expertise scientifique est définie comme « l'expression d'une connaissance formulée en réponse à une demande de ceux qui ont une décision à prendre, en sachant que cette réponse est destinée à être intégrée à un processus de décision » (INRA, 2011 ; Roqueplo, 1997). Dans ce contexte, les connaissances scientifiques produites par la recherche académique peuvent fréquemment être valorisées dans tous les secteurs de l'activité humaine, grâce aux nombreuses interfaces avec le monde de l'industrie. Dans un modèle de type « push-pull », l'expertise académique est essentielle à ce transfert, et revêt plusieurs formes. Institutionnalisée ou collective, elle peut le plus souvent apporter un éclairage scientifique sur un sujet donné à partir de l'analyse critique et de la synthèse de la littérature scientifique internationale. L'expertise peut aussi être menée à titre individuel et, dans ce cas, met en relation un scientifique du secteur académique avec un partenaire privé, pour répondre à un besoin identifié. Du côté industriel, la vision applicative des travaux de recherche fondamentale de même que la maîtrise des étapes techniques et commerciales sont des garants de la création de valeur.

Lors de la table ronde a été précisée la place importante que devrait prendre l'expertise individuelle dans les relations entre recherche académique et partenaires privés ces prochaines années. Mener à bien tout projet entre des partenaires d'origine et de compétences diverses nécessite de rompre son isolement afin de trouver des solutions collaboratives. Le recours à une expertise académique individuelle permet la rencontre d'un domaine de connaissance approfondi et des savoir-faire industriels ou sociétaux. Elle permet une meilleure connaissance des contraintes et attentes de chacune des parties. « Il faut formuler la bonne question pour trouver la bonne solution ». Souvent, les entreprises, encapsulées dans des silos étanches identifient le problème à résoudre mais peinent à poser les bonnes questions pour le résoudre. De même les chercheurs académiques n'ont pas toujours des idées très claires sur le potentiel applicatif de leurs travaux. Aider et accompagner les entreprises pour formuler les bonnes questions et développer des réponses créatives revient à co-construire une vision commune entre recherche académique et privée. Cette co-construction ne se restreint pas aux notions de sachant/créateur ou d'apprenant-payeur, ni même à une relation client/fournisseur mais résulte d'un véritable travail coopératif pour aboutir à une solution unique et originale conduisant à l'enrichissement des deux parties.

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Une avancée dans le « chemin d'innovation » s'appuie alors sur une véritable interface reposant sur l'expertise et les connaissances partagées. Il faut toutefois rappeler qu'une entreprise, plus qu'un partenaire académique, recherche un bénéfice à plus ou moins long terme et pourra retenir une partie des informations tant qu'elle n'est pas certaine de recevoir ce bénéfice. Pour régler ce problème, un accord de confidentialité peut être signé dès le début de l'expertise, ce qui est vivement conseillé, et ensuite, un contrat de recherche et de développement stipulera de manière explicite les closes de propriété intellectuelle. Malgré ces aspects contractuels, il est important d'augmenter la confiance réciproque.

Quelle place pour une expertise académique dans le monde de l'entreprise ?

L'expertise académique trouve toute sa place lorsqu'elle permet de répondre à une question précise, ponctuelle, pour laquelle l'entreprise n'a pas forcément de moyens mobilisables en interne. Elle permet aussi d'explorer des pistes plus prospectives, par exemple en amont de la règlementation, pour anticiper si besoin ses évolutions. Lorsqu'un décalage existe entre la règlementation en vigueur ou à venir et la connaissance, par exemple des composés chimiques (substances) concernés, il est important que l'entreprise, dont le savoir-faire est au cœur de sa stratégie et donc a recours à une veille stratégique portant sur tous les champs technologiques et réglementaires, puisse être assistée sur la mise en place de la réglementation en apportant des données scientifiques à l'appui de son raisonnement. De nombreux industriels sont aujourd'hui directement concernés par l'impact de leurs activités sur l'environnement et sur la Santé et souhaitent se faire accompagner dans la mise en place de plans d'actions sur le long terme. Il n'est pas rare que l'expertise individuelle se transforme en une collaboration sur le long terme entre des industriels et des chercheurs de différents laboratoires.

L'expertise académique trouve également sa place dans le monde de l'entreprise en apportant des compétences rares. C'est ainsi souvent le cas dans le secteur médical, où la nécessité d'indépendance réduit le choix d'experts externes compétents. Un excès de prudence dans l'exercice du principe de précaution visant à éviter tout conflit d'intérêt potentiel peut ainsi amener des agences réglementaires à demander des avis à des référents situés hors de la pratique de soin, ce qui conduit à des situations absurdes, notamment lors de crises sanitaires. Là encore, il faut faire confiance aux chercheurs experts dans leur capacité à donner des avis éclairés tout en encadrant avec plus de transparence les actions des lobbys.

Quels avantages à une implication des chercheurs académiques dans une expertise vers le secteur privé ?

Un chercheur académique est parfois amené à valoriser son expertise scientifique dans une carrière académique. Toutefois, l'intérêt d'une activité d'expertise en lien avec le monde de l'entreprise est différemment perçu selon l'ancienneté (ou l'âge de l'expert) ou le pays. En effet, lorsqu'ils deviennent experts, les scientifiques se retrouvent à travailler selon des règles et dans des contextes différents que lorsqu'ils réalisent leur activité de chercheurs académiques (Maxim et Arnold, 2012). Aujourd'hui, dans les instituts de recherches, réaliser une expertise pour des organismes à vertu réglementaire (agences gouvernementales : ANSES ; structures de normalisation : AFNOR) est reconnu par les instances d'évaluation. Faire partie d'un groupe de travail ou d'expertise au niveau national ou international apparait prestigieux et valorise un parcours scientifique. Cette reconnaissance est beaucoup moins vraie, lorsqu'on parle d'expertise scientifique académique envers les entreprises du secteur privé. Au Québec, l'expérience d'expert académique est considérée comme un service à la collectivité et elle est comptabilisée ainsi dans les évaluations professorales. Cela fait partie intégrante du cursus académique. Contrairement à beaucoup de pays européens, les

pays nord-américains ont complètement intégré la valeur et l'importance de la contribution de l'expertise scientifique des chercheurs académiques au développement industriel.

Par ailleurs, les bénéfices perçus sont réciproques. Il ne faut pas oublier que ce type d'expertise permet au chercheur académique de se confronter aux préoccupations du monde socio-économique, et de « sortir de sa tour d'ivoire ». Cette expérience parfois déstabilisante mais enrichissante est alors un atout qui peut et doit être transféré vers les étudiants en formation, qui peuvent ainsi constater des retombées finalisées des travaux académiques. Les liens tissés avec l'industriel peuvent, dans un second temps, être pérennisés et conduire à des projets scientifiques plus conséquents qui peuvent être l'occasion de mettre en place de bourses de thèse CIFRE. Ces collaborations outrepassent les frontières entre les secteurs académique et privé et facilitent les transitions d'un secteur à l'autre pour les jeunes diplômés. Comme la recherche privée, la recherche académique est tenue d'innover. Le financement de l'innovation peut également passer par un partenariat avec le secteur privé.

Malgré tout, si certains outils scientifiques, par exemple regroupés dans des Infrastructures de Recherche (nationales et internationales) sont par définition ouvert à des partenariats avec le secteur privé, il faut toutefois faire attention à ne pas limiter la recherche académique à des programmes de recherche avec le secteur privé, celle-ci doit rester en capacité de travailler de façon libre, autonome, et posséder ses propres voies de recherche. Des activités de recherche financées sans contrepartie (mécénat) peuvent être envisagées lorsque l'argent public fait défaut mais les partenariats scientifiques ou une activité de co-création doivent systématiquement être préférés, notamment aux contrats de prestations de services. Les indicateurs les plus fiables de l'activité de co-création sont le pourcentage de co-propriété des brevets ou la co-signature des articles scientifiques éventuels.

Quelles limites à une implication du monde académique dans une expertise vers le secteur privé ?

Pour de multiples raisons, la culture scientifique de la société (française) reste souvent assez faible, étant cantonnée dans les « sphères de sachant » du secteur académique et privé. La connaissance percole peu ou mal vers les différentes composantes de la société (citoyens, élèves, politiques…). De nombreux médias, en recherche de scoop, les « fake news » et thèses complotistes sur les réseaux sociaux, les choix « stratégiques » faits par le pouvoir politique, trop souvent en mode de gestion de crise, peuvent être des freins à une implication du secteur académique hors de sa sphère habituelle. (Note : quelques mois après la tenue de cette table ronde, la crise du Covid-19 a montré la réalité de cette situation). Le mélange des deux cultures, académique et privée, trouve aussi des limites en raison du positionnement suspicieux de la société envers les chercheurs académiques, dès lorsqu'ils interagissent avec une société privée. Ce partenariat génère souvent une suspicion de perte d'indépendance, voire de conflit d'intérêt, qui se traduit par une perte de confiance et de considération…) qui peut être relayée par les pairs. A l'inverse, en Allemagne, ou aux USA, il est possible de travailler comme expert pour des industriels sans que son intégrité soit remise en question. Comme nous l'avons vu plus haut, l'excès d'usage du principe de précaution peut conduire à un véritable problème de disponibilité des experts compétents dits « indépendants » dans l'évaluation d'un projet de partenariat par des autorités.

En outre, ce partenariat conduit à titre individuel peut générer des freins à communication et publication scientifique (clauses de confidentialité, embargos sur les données), ce qui peut poser des problèmes non seulement pour la carrière des scientifiques mais aussi (et surtout) pour celle des étudiants impliqués (doctorants et post-doctorants) qui ont besoin de publier rapidement pour étoffer leur CV afin d'être en mesure d'embrasser une carrière scientifique.

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Quel rôle pour la Fondation ROVALTAIN dans la construction de l'interface recherche académique/partenaires privés ?

Une tierce structure comme la Fondation Rovaltain en écotoxicologie/toxicologie peut intervenir comme catalyseur pour réduire les barrières d'énergie (souvent culturelles) dans le partenariat recherche académique/secteur privé pour conduire l'évaluation du risque a priori et a posteriori de différentes activités anthropiques sur la santé de l'environnement et de l'Homme. En se positionnant comme pilote de réseau, facilitateur et guichet unique, et par sa connaissance du monde académique et du secteur privé, elle peut aider à la définition des problématiques de l'entreprise, faciliter la communication entre les acteurs, proposer les experts les plus pertinents, contribuer à mobiliser des financements et proposer des incubateurs qui vont accélérer le processus d'interaction. Elle peut également contribuer à l'accompagnement administratif des dossiers.

Participants à la table ronde

Vera Slaveykova (Professeure, Université de Genève, Suisse)

Peter Campbell (Professeur, INRS, Québec)

Michel Couderchet (Professeur, Université de Reims, France)

Patrice Denèfle (Ancien Directeur Général de l'Institut Roche, Adjunct-Professor à Paris Descartes et ParisTech et Senior Advisor chez Links-Consulting Europe, France)

Fabrice Martin-Laurent (Directeur de Recherche, INRAE, France)

Philippe Rolland (Responsable IMDS et substances, Renault Automobiles, France)

Modérateur de la table ronde : Christian Mougin (Directeur de Recherche, INRAE, France)

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FONDATION ROVALTAIN
SCIENCE & ÉQUILIBRE

Bibliographie

INRA. 2011. Charte INRA de l'Expertise Scientifique Institutionnelle. https://www.inrae.fr/sites/default/files/pdf/885e2467ea09c7f4ee05f928003d3c51.pdf

Maxim L. et Arnold G. 2012. Entre recherche académique et expertise scientifique : des mondes de chercheurs. Hermès, La Revue 2012/3 (64), 9-13.

Roqueplo P. 1997. Entre savoir et décision, l'expertise scientifique. Collection Sciences en Question, Editions Quae, 112 pages, EAN13 9782738007131

ERA / PUBLICATIONS SCIENTIFIQUES / COMMUNAUTES MICROBIENNES AQUATIQUES

Advances in characterizing microbial community change and resistance upon exposure to lead contamination: Implications for ecological risk assessment

Authors: George SE, Wan YS

Source: CRITICAL REVIEWS IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY 50:2223-2270, 2020, DOI: 10.1080/10643389.2019.1698260

Abstract: Recent advancement in molecular techniques has spurred numerous studies on responses of microorganisms to lead exposure, leveraging detailed phylogenetic analyses and functional gene identification to discern the effects of lead toxicity on microbial communities. A comprehensive review of recent research is provided on (1) lead resistance mechanisms of microorganisms; (2) microbial community changes in contaminated aquatic sediments and terrestrial soils; and (3) lead resistance genes applied to lead biosensor development. Ample evidence in the literature, including both in vitro and in situ studies, indicates that exposure to lead inhibits microbial activities (such as respiration and metabolism), reduces biomass and alters microbial community structure. Even at sites where microbial communities do not vary compositionally with contaminant levels, functional differences between microbial communities are evident. The main mechanisms of lead resistance involve extracellular and intracellular biosorption, precipitation, complexation, and/or efflux pumps. The suites of genes associated with lead resistance mechanisms can serve, when considered with phylogenetic information, as indicators of lead contamination. This holds potential for development of next generation lead biosensors. To promote applications of advanced knowledge, molecular techniques, and lead biosensor technology, perspectives on using microbial indicators for site ecological assessment are presented.

Accès au document

Polystyrene nanoplastics cause growth inhibition, morphological damage and physiological disturbance in the marine microalga *Platymonas helgolandica*

Authors: Wang SY, Liu MH, Wang JM, Huang JS, Wang J

Source: MARINE POLLUTION BULLETIN 158:111403, 2020, DOI: 10.1016/j.marpolbul.2020.111403

Abstract: Effects of nanoplastics at low level on the marine primary producer are largely unclear. To assess the potential risk of nanoplastic pollution, this study exposed marine green microalgae *Platymonas helgolandica* to 20, 200, and 2000 μg/L 70-nm polystyrene nanoplastics for 6 days. Nanoplastics significantly inhibited the growth of *P. helgolandica* during the first 4 days of exposure, and elevated heterocyst frequency was observed in 200 and 2000 μg/L exposure groups in the early exposure stage. Exposure to 200 and 2000 μg/L nanoplastics for 4 days increased the membrane permeability and mitochondrial membrane potential, and decreased light energy used in photochemical processes of microalgae. Moreover, clear morphological changes, including surface folds, fragmentation, aggregation cluster, and rupture, in the microalgae exposed to nanoplastics were observed under scanning electron microscope and transmission electron microscope. These results demonstrate that nanoplastics could reduce the microalgal vitality by the damage on cell morphology and organelle function.

Accès au document

Effects of humic acids on biotoxicity of tetracycline to microalgae *Coelastrella* sp.

Authors: Tong MY, Li X, Luo Q, Yang CP, Lou W, Liu HY, Du C, Nie LJ, Zhong YY

Source: ALGAL RESEARCH-BIOMASS BIOFUELS AND BIOPRODUCTS 50:101962, 2020, DOI: 10.1016/j.algal.2020.101962

Abstract: The release of antibiotics into aquatic environments would induce adverse effects on organisms, so the environmental impact and fate of antibiotics must be paid close attention. In this paper, the effects of tetracycline on the growth of microalgae *Coelastrella* sp. in the presence of humic acids were investigated at various tetracycline concentrations ranging from 0.5 to 10 mg/L in Blue-Green medium, and the underlying mechanisms were also discussed. Results revealed that the microalgae growth showed a hormesis dose-response phenomenon under tetracycline stress with stimulation at low levels (> 2 mg/L) while inhibition at higher levels (2 mg/L). More importantly, tetracycline biotoxicity to Coelastrella sp. decreased significantly due to the increase in humic acids concentration, as evidenced by the increased biomass, chlorophyll-a and total proteins contents, as well as the reduced oxidative stress response in *Coelastrella* sp. cells. The strong complexation between tetracycline and humic acids was responsible for the reduced tetracycline biotoxicity. These findings are helpful for better understanding the environmental risk of antibiotics in eutrophic waters.

Accès au document

Correlating the influence of biochemical parameters in environment with pesticide tolerance of non-target algae

Authors: Chanu NK, Mandal MK, Chaurasia N

Source: BIOLOGIA: Early Access, 2020, DOI: 10.2478/s11756-020-00568-x

Abstract: The present study demonstrates that the environment play a vital role in the development of tolerance in the local algal isolates towards alpha-cypermethrin. The isolates collected from rice fields (*Scenedesmus ecornis* NC-M9 and Tetradesmus dimorphus NC-K2) showed significantly higher tolerance than the isolates collected from freshwater bodies far from the rice fields. Also, significant reduction in Malondialdehyde (MDA) content was noticed in S. ecornis NC-M9 after fourth and seventh day exposure to alpha-cypermethrin compared to first day exposure. However, the Superoxide Dismutase (SOD) and Peroxidase (POD) contents of S. ecornis NC-M9 enhanced at 4th and 7th day exposure to alpha-cypermethrin compared to 1st day exposure. Further, biochemical studies of all isolates show that *Graesiella emersonii* NC-M1 (the isolate from freshwater bodies near to rice field) possesses higher contents of Chlorophylla (Chla), carotenoid and lipid (5.59 ± 0.36 mg/L, 2.5 ± 0.024 mg/L and 28 ± 2.5% Dry Cell Weight (DCW), respectively) compared to other. This variation in biochemical parameters present in different field areas as collected and tested could be further used as potential substrates for production of bioactive compounds which have many health and environmental benefits.

Accès au document

Nanosilver impacts on aquatic microbial decomposers and litter decomposition assessed as pollution-induced community tolerance (PICT)

Authors: Batista D, Tlili A, Gessner MO, Pascoal C, Cassio F

Source: ENVIRONMENTAL SCIENCE-NANO 7:2130-2139, 2020, DOI: 10.1039/d0en00375a

Abstract: The growing proliferation of silver nanoparticles (AgNPs) calls for detailed information on ecotoxicological effects, particularly on diverse communities and key ecosystem processes where impacts remain poorly known. This includes the decomposition of plant litter by fungi and bacteria in streams. Impacts are likely to depend on community composition, because species vary in their sensitivities to stressors. Therefore, our goal was to determine if shifts in microbial communities triggered by chronic exposure to low concentrations of nano (< 200 µg/L) and ionic (20 µg/L) silver increase community tolerance to

these contaminants, as described in the pollution-induced community tolerance (PICT) concept. We used stream microbial decomposers associated with leaf litter in microcosms to assess the applicability of this concept by determining tolerance acquisition towards AgNP and ionic Ag in short-term inhibition assays. Endpoints included fungal sporulation, bacterial production, microbial respiration and the potential activity of a protein-degrading enzyme, leucine aminopeptidase. Analyses of microbial communities showed that chronic exposure to the highest AgNP concentrations led to similar communities, and that these were distinct from the control communities. Most important, chronic exposure of fungi and bacteria to both AgNP and ionic Ag also increased tolerance of the microbes, as revealed by notably reduced adverse effects on bacterial production. Overall, our results demonstrate the usefulness of applying the PICT concept to litter decomposers and decomposition as an approach to assess the risks posed by nano and ionic silver to freshwater ecosystems.

Accès au document

Impacts of chemical contamination on bacterio-phytoplankton coupling

Authors: Pringault O, Bouvy M, Carre C, Fouilland E, Meddeb M, Mejri K, Leboulanger C, Hlaili AS

Source: CHEMOSPHERE 257:127165, 2020, DOI: 10.1016/j.chemosphere.2020.127165

Abstract: Phytoplankton and bacterioplankton are the key components of the organic matter cycle in aquatic ecosystems, and their interactions can impact the transfer of carbon and ecosystem functioning. The aim of this work was to assess the consequences of chemical contamination on the coupling between phytoplankton and bacterioplankton in two contrasting marine coastal ecosystems: lagoon waters and offshore waters. Bacterial carbon demand was sustained by primary carbon production in the offshore situation, suggesting a tight coupling between both compartments. In contrast, in lagoon waters, due to a higher nutrient and organic matter availability, bacteria could rely on allochthonous carbon sources to sustain their carbon requirements, decreasing so the coupling between both compartments. Exposure to chemical contaminants, pesticides and metal trace elements, resulted in a significant inhibition of the metabolic activities (primary production and bacterial carbon demand) involved in the carbon cycle, especially in offshore waters during spring and fall, inducing a significant decrease of the coupling between primary producers and heterotrophs. This coupling loss was even more evident upon sediment resuspension for both ecosystems due to the important release of nutrients and organic matter. Resulting enrichment alleviated the toxic effects of contaminants as indicated by the stimulation of phytoplankton biomass and carbon production, and modified the composition of the phytoplankton community, impacting so the interactions between phytoplankton and bacterioplankton.

Accès au document

The use of epilithic biofilms as bioaccumulators of pesticides and pharmaceuticals in aquatic environments

Authors: Fernandes G, Bastos MC, de Vargas JPR, Le Guet T, Clasen B, dos Santos DR

Source: ECOTOXICOLOGY: Early Access, 2020, DOI: 10.1007/s10646-020-02259-4

Abstract: Biofilms are a consortium of communities of organisms that live in syntrophic relationships and present a higher organization level than that of individual cells. Biofilms dominate microbial life in streams and rivers, enable crucial ecosystem processes, contribute to global biogeochemical flows and represent the main active bacterial life form. Epilithic biofilms are the main biomass found in rivers; their exposure to contaminants can lead to changes in their structure and composition. The composition of these communities is influenced by physicochemical factors, temperature, light and prior exposure to pollutants, among other factors, and it can be used for water quality monitoring purposes. The heterogenous composition of biofilms enables them to accumulate compounds in an integrative manner. Moreover, the availability of several sorption sites and their likely saturation can contribute to

bioaccumulation. In aquatic environments, biofilms are also susceptible to the acquisition of antibiotic resistance genes and participate in their dissemination. Anthropic pressure intensification processes continuously expose water resources and, consequently, biofilm communities to different contamination sources. Therefore, the use of biofilms to indicate environmental pollution is reinforced by the progress of studies on the subject. Biofilm communities' response to pollutants in aquatic environments can be mainly influenced by the presence of different organisms, which may change due to community development or age. The current research aims to review studies about biofilm contamination and highlight the importance of biofilm use to better evaluate and maintain the quality of water bodies.

Accès au document

Aquatic toxicity and mode of action of CdS and ZnS nanoparticles in four microalgae species

Authors: Pikula K, Mintcheva N, Kulinich SA, Zakharenko A, Markina Z, Chaika V, Orlova T, Mezhuev Y, Kokkinakis E, Tsatsakis A, Golokhvast K

Source: ENVIRONMENTAL RESEARCH 186:109513, 2020, DOI: 10.1016/j.envres.2020.109513

Abstract: This study reports the differences in toxic action between cadmium sulfide (CdS) and zinc sulfide (ZnS) nanoparticles (NPs) prepared by recently developed xanthate-mediated method. The aquatic toxicity of the synthesized NPs on four marine microalgae species was explored. Growth rate, esterase activity, membrane potential, and morphological changes of microalgae cells were evaluated using flow cytometry and optical microscopy. CdS and ZnS NPs demonstrated similar level of general toxicity and growth-rate inhibition to all used microalgae species, except the red algae P. purpureum. More specifically, CdS NPs caused higher inhibition of growth rate for *C. muelleri* and *P. purpureum*, while ZnS NPs were more toxic for A. ussuriensis and H. akashiwo species. Our findings suggest that the sensitivity of different microalgae species to CdS and ZnS NPs depends on the chemical composition of NPs and their ability to interact with the components of microalgal cell-wall. The red microalga was highly resistant to ZnS NPs most likely due to the presence of phycoerythrin proteins in the outer membrane bound Zn2+ cations defending their cells from further toxic influence. The treatment with CdS NPs caused morphological changes and biochemical disorder in all tested microalgae species. The toxicity of CdS NPs is based on their higher photoactivity under visible light irradiation and lower dissociation in water, which allows them to generate more reactive oxygen species and create a higher risk of oxidative stress to aquatic organisms. The results of this study contribute to our understanding of the parameters affecting the aquatic toxicity of semiconductor NPs and provide a basis for further investigations.

Accès au document

Microalgal ecotoxicity of nanoparticles: An updated review

Authors: Nguyen MK, Moon JY, Lee YC

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 201:110781, 2020, DOI: 10.1016/j.ecoenv.2020.110781

Abstract: Nowadays, nanotechnology and its related industries are becoming a rapidly explosive industry that offers many benefits to human life. However, along with the increased production and use of nanoparticles (NPs), their presence in the environment creates a high risk of increasing toxic effects on aquatic organisms. Therefore, a large number of studies focusing on the toxicity of these NPs to the aquatic organisms are carried out which used algal species as a common biological model. In this review, the influences of the physio-chemical properties of NPs and the response mechanisms of the algae on the toxicity of the NPs were discussed focusing on the "assay" studies. Besides, the specific algal toxicities of each type of NPs along with the NP-induced changes in algal cells of these NPs are also assessed. Almost all commonly-used NPs exhibit algal toxicity. Although the algae have similarities in the symptoms under NP exposure, the sensitivity and variability of each algae species to the inherent properties of each NPs are quite different. They depend strongly on the concentration, size, characteristics of NPs, and biochemical nature of

algae. Through the assessment, the review identifies several gaps that need to be further studied to make an explicit understanding. The findings in the majority of studies are mostly in laboratory conditions and there are still uncertainties and contradictory/inconsistent results about the behavioral effects of NPs under field conditions. Besides, there remains unsureness about NP-uptake pathways of microalgae. Finally, the toxicity mechanisms of NPs need to be thoughtfully understood which is essential in risk assessment.

Accès au document

Primary production of freshwater microbial communities is affected by a cocktail of herbicides in an outdoor experiment

Authors: Lozano VL, Dohle SA, Vera MS, Torremorell A, Pizarro HN

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 201:110821, 2020, DOI: 10.1016/j.ecoenv.2020.110821

Abstract: Primary production (PP) is a key variable to evaluate the quality of the ecological services provided by freshwater bodies because it gives information on the amount of oxygen and organic matter incorporated into the system. We analysed the impact of a mixture of commercial formulations of glyphosate- and 2,4-D-based herbicides (Roundup Max (R) and AsiMax 50 (R), respectively) on freshwater primary production. Primary production was studied through the oxygen exchange method. Four measurements were made during a 23-day experiment in outdoor mesocosms using the light and dark bottle method. High and low concentrations of the active ingredients were assayed to evaluate a concentration-dependent effect. Our results indicated that the mixture of Roundup Max (R) and AsiMax 50 (R) acted mostly additively on gross and net primary production. Moreover, we found a concentration-dependent effect of each herbicide on PP. Thus, AsiMax 50 (R) at low and Roundup Max (R) at high concentration induced a significant early decrease in respiration and gross primary production 4 h after application, attributable to physiological responses. Besides, significant increases in primary production were simultaneously recorded with increases in chlorophyll a concentration and micro + nano-phytoplankton abundance 7 days after the application of Roundup Max (R) at high concentration. This study contributes to the knowledge of the impact of widely used herbicides on freshwater ecosystems.

Accès au document

Transcriptomic analysis suggests the inhibition of DNA damage repair in green alga *Raphidocelis subcapitata* exposed to roxithromycin

Authors: Guo JH, Bai Y, Chen Z, Mo JZ, Li Q, Sun HT, Zhang Q

Source: Ecotoxicology and Environmental Safety 2020, DOI: 10.1016/j.ecoenv.2020.110737

Abstract: Macrolide antibiotics are common contaminants in the aquatic environment. They are toxic to a wide range of primary producers, inhibiting the algal growth and further hindering the delivery of several ecosystem services. Yet the molecular mechanisms of macrolides in algae remain undetermined. The objectives of this study were therefore to: 1. evaluate whether macrolides at the environmentally relevant level inhibit the growth of algae; and 2. test the hypothesis that macrolides bind to ribosome and inhibit protein translocation in algae, as it does in bacteria. In this study, transcriptomic analysis was applied to elucidate the toxicological mechanism in a model green alga Raphidocelis subcapitata treated with 5 and 90 μg L-1 of a typical macrolide roxithromycin (ROX). While exposure to ROX at 5 μg L-1 for 7 days did not affect algal growth and the transciptome, ROX at 90 μg L-1 resulted in 45% growth inhibition and 2306 (983 up- and 1323 down-regulated) DEGs, which were primarily enriched in the metabolism of energy, lipid, vitamins, and DNA replication and repair pathways. Nevertheless, genes involved in pathways in relation to translation and protein translocation and processing were dysregulated. Surprisingly, we found that genes involved in the base excision repair process were mostly repressed, suggesting that ROX may be genotoxic and cause DNA damage in R. subcapitata. Taken together, ROX was unlikely to pose a threat to green algae in the environment and the mode of action of macrolides in bacteria

may not be directly extrapolated to green algae.
Accès au document

Caffeine reduces the toxicity of albendazole and carbamazepine to the microalgae *Raphidocelis subcapitata* (Sphaeropleales, Chlorophyta)

Authors: Diniz V, Reyes GM, Rath S, Cunha DGF

Source: INTERNATIONAL REVIEW OF HYDROBIOLOGY Early Access, 2020, DOI: 10.1002/iroh.201902024

Abstract: Pharmaceutically active compounds (PhACs) are emerging contaminants that have been widely detected in water bodies in the last decades, with ecological effects toward aquatic biota that have not been fully elucidated. Most studies concerning their toxicity to microalgae have only considered short-term individual PhAC exposure, rather than combined exposure to several compounds for longer time periods. In this study, we investigated the effects of albendazole (ABZ) (anthelmintic) and carbamazepine (antiepileptic), alone and in combination with caffeine, on the growth and production of chlorophyll-a of the microalgaeRaphidocelis subcapitata, during 16 days of exposure. ABZ alone had a more significant effect than carbamazepine alone on the growth rate and maximum cell density of the microalgae ($p < 0.05$; analysis of variance). These results were probably related to the effect of ABZ in inhibiting enzyme complexes and cell membrane proteins related to adenosine triphosphate synthesis, which is important for cell growth. The presence of caffeine lowered the toxicities of ABZ and carbamazepine to the microalgae, probably due to its antioxidant properties, positively affecting chlorophyll-a production, growth rate, and maximum cell density. Thus, caffeine had an antagonistic interaction with the studied PhACs. The results reinforce the importance of ecotoxicological assays that compare individual and combined PhAC exposure conditions. Our findings highlighted that caffeine can be a relevant factor influencing such assays, considering its widespread occurrence in impacted water bodies.

Accès au document

Physiological and morphological response of marine diatom *Cylindrotheca closterium* (Bacillariophyceae) exposed to cadmium

Authors: Radic TM, Cackovic A, Penezic A, Dautovic J, Loncar J, Omanovic D, Juraic K, Ljubesic Z

Source: EUROPEAN JOURNAL OF PHYCOLOGY Early Access, 2020, DOI: 10.1080/09670262.2020.1758347

Abstract: The impact of the heavy metal cadmium on the lightly silicified marine diatom *Cylindrotheca closterium* was studied with regard to growth dynamics, organic matter production and morphological characteristics. *C. closterium* cultures were able to sustain positive growth in the tested range of 0–1000 µg Cd l-1 with a significant decrease in specific growth rate in the exponential growth phase at the highest tested Cd concentration. The concentrations of both dissolved (DOCcell) and particulate organic carbon per cell (POCcell) in *C. closterium* cultures exposed to 500 and 1000 µg l-1 Cd more than doubled compared with the control culture. Enhanced organic matter production as a feedback response to Cd exposure may thus contribute to cell detoxification, supported by the electrochemical data showing that Cd was not significantly accumulated by or associated with diatom cells except for the culture exposed to 1000 µg Cd l-1. In order to gain more insight into the effects of cadmium on diatom morphological features, the cell surface of *C. closterium* was characterized at the nanoscale on a single cell level using atomic force microscopy (AFM). Changes induced by Cd were observed as irregular patterns of silica spheres on more silicified parts of the cell, girdle band and around the raphe. These changes clearly show that beside the physiological response, *C. closterium* also showed a morphological response which is probably due to the interference of Cd with the diatom biosilification process. This study overall contributes to better understanding of the effects of cadmium on diatoms and shows that

morphological characteristics assessed by AFM may be a valuable indicator for metal contamination.

Accès au document

Influence of Temperature and Nickel on Algal Biofilm Fatty Acid Composition

Authors: Fadhlaoui M, Laderriere V, Lavoie I, Fortin C

Source: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY: Early Access, 2020, DOI: 10.1002/etc.4741

Abstract: Freshwater biofilms play an important role in aquatic ecosystems and are widely used to evaluate environmental conditions. Little is known about the effects of temperature and metals on biofilm fatty acid composition. In the present study, we exposed a natural biofilm cultured in mesocosms to a gradient of nickel (Ni) concentrations at 15 and 21 degrees C for 28 d. Metal bioaccumulation, algal taxonomic composition, and biofilm fatty acid profiles were determined. At both temperatures, bioaccumulated Ni increased with Ni exposure concentration and reached the highest values at 25 µM Ni, followed by a decrease at 55 and 105 µM Ni. In control biofilms, palmitic acid (16:0), palmitoleic acid (16:1n7), oleic acid (18:1n9), linoleic acid (18:2n6), and linolenic acid (18:3n3) were the dominant fatty acids at 15 and 21 degrees C. This composition suggests a dominance of cyanobacteria and green algae, which was subsequently confirmed by microscopic observations. The increase in temperature resulted in a decrease in the ratio of unsaturated to saturated fatty acids, which is considered to be an adaptive response to temperature variation. Polyunsaturated fatty acids (PUFAs) tended to decrease along the Ni gradient, as opposed to saturated fatty acids which increased with Ni concentrations. Temperature and Ni affected differently the estimated desaturase and elongase activities (product/precursor ratios). The increase in PUFAs at 15 degrees C was concomitant to an increase in Delta 9-desaturase (D9D). The estimated activities of D9D, Delta 12-desaturase, and Delta 15-desaturase decreased along the Ni gradient and reflected a decline in PUFAs. The elevated estimated elongase activity reflected the observed increase in saturated fatty acids at the highest Ni exposure concentration (105 µM). Our results suggest that fatty acids could be used as an endpoint to evaluate environmental perturbations.

Accès au document

Polystyrene microplastics decrease accumulation of essential fatty acids in common freshwater algae

Authors: Guschina IA, Hayes AJ, Ormerod SJ

Source: ENVIRONMENTAL POLLUTION 263:114425, 2020, DOI: 10.1016/j.envpol.2020.114425

Abstract: Despite growing concern about the occurrence of microplastics in aquatic ecosystems there is only rudimentary understanding of the pathways through which any adverse effects might occur. Here, we assess the effects of polystyrene microplastics (PS-MPs; <70 mu m) on a common and widespread algal species, *Chlorella sorokiniana*. We used laboratory exposure to test the hypothesis that the lipids and fatty acids (FAs) are important molecules in the response reactions of algae to this pollutant. Cultivation with PS-MPs systematically reduced the concentration of essential linoleic acid (ALA, C18:3n-3) in *C. sorokiniana*, concomitantly increasing oleic acid (C18:1n-9). Among the storage triacylglycerols, palmitoleic and oleic acids increased at the expenses of two essential fatty acids, linoleic (LIN, C18:2n-6) and ALA, while PS-MPs had even more pronounced effects on the fatty acid and hydrocarbon composition of waxes and steryl esters. The FA composition of two major chloroplast galactolipids, monogalactosyldiacylglycerol (MGDG) and digalactosyldiacylglycerol (DGDG), were affected implying changes in the conformational structure of photosynthetic complexes in ways that can impair the photosynthesis. These data reveal how exposure to polystyrene microplastics can modify the concentrations of lipid molecules that are important intrinsically in cell membranes, and hence the lipid bilayers that could form an important barrier between algal cellular compartments and plastics in the aquatic environment. Changes in lipid synthesis and fatty acid composition in algae could also have

repercussions for food quality, growth and stressor resistance in primary consumers. We advocate further studies of microplastics effects on the lipid composition of primary producers, and of their potential propagation through aquatic food webs.

Accès au document

The influence of nanoplastics on the toxic effects, bioaccumulation, biodegradation and enantioselectivity of ibuprofen in freshwater algae *Chlorella pyrenoidosa*

Authors: Wang F, Wang B, Qu H, Zhao WX, Duan L, Zhang YZ, Zhou YT, Yu G

Source: ENVIRONMENTAL POLLUTION 263:114593, 2020, DOI: 10.1016/j.envpol.2020.114593

Abstract: Plastic pollution has become a pressing issue due to its persistence in the environment. Smaller plastics are more easily ingested, potentially exerting greater influences on organisms. In this study, the effects of polystyrene nanoplastics (NP) on the toxic effects, bioaccumulation, biodegradation and enantioselectivity of ibuprofen (IBU) in algae *Chlorella pyrenoidosa* were explored. The influences on the growth rate, chlorophyll a, total antioxidant capacity (T-AOC), reactive oxygen species (ROS) and lipid peroxidation (MDA) were evaluated after 96 h of exposure to a combination of polystryene NP (1 mg L-1) and IBU (5-100 mg L-1). The results indicated that the inhibitory effect of IBU on *C. pyrenoidosa* growth was alleviated in the presence of NP. For instance, the 96 h-IC50 value for rac-IBU in the treatment lacking NP was 45.7 mg L-1, and the corresponding value in the treatment containing NP was 63.9 mg L-1. The co-exposure of NP led to a significant enhancement of T-AOC and slight reduction of ROS and MDA compared with the individual exposure (IBU) group, suggesting a decreased oxidative stress. In addition, treatment with NP led to a decreased bioaccumulation and accelerated biodegradation of IBU in *C. pyrenoidosa* and enhanced removal in the medium. The enantioselective toxicity, bioaccumulation and biodegradation of IBU were observed both in the absence and presence of NP. S-IBU exhibited a greater toxicity, and R-IBU was preferentially accumulated and degraded in C. pyrenoidosa. No interconversion of the two enantiomers occurred regardless of the presence of NP. This consequence implied that the influence of coexistent NP should be considered in the environmental risk assessment of pharmaceuticals and personal care products in aquatic environments.

Accès au document

Effect of norfloxacin on algae-cladoceran grazer-larval damselfly food chains: Algal morphology-mediated trophic cascades

Authors: Wan LL, Long YY, Hui J, Zhang H, Hou ZY, Tan JX, Pan Y, Sun SC

Source: CHEMOSPHERE 256:127166, 2020, DOI: 10.1016/j.chemosphere.2020.127166

Abstract: Antibiotic norfloxacin (NOR) has recently been demonstrated to affect the swimming behavior of zooplankton species and phytoplankton-zooplankton interactions, which may further affect trophic cascades. To test this hypothesis, two food chains (*Scenedesmus quadricauda-Daphnia magna*-larval damselfly and *Chlorella vulgaris-D. magna*-larval damselfly) were used to examine the effect of NOR concentrations (0, 0.5, 5, and 25 mg L-1) on trophic cascades. In the absence of NOR, larval damselflies reduced grazer density and increased algal density, regardless of algal species. In the presence of NOR, increasing NOR concentration strengthened the positive effect of larval damselflies on the growth of *C. vulgaris* because larval damselflies suppressed grazer density more efficiently resulting from reduced swimming ability in the grazers. Conversely, increasing NOR concentration reduced the positive effect on the growth of *S. quadricauda* due to inhibited grazer-induced colony formation in *S. quadricauda*. Therefore, exposure to NOR altered the direction and strength of trophic cascades and showed species-specific differences, depending on algal morphology-mediated indirect interactions. These findings provide novel insights into how NOR affects

aquatic food chains and reveal the importance of algal traits in determining trophic cascades.

Accès au document

Effects of carbon nanotubes on the toxicities of copper, cadmium and zinc toward the freshwater microalgae *Scenedesmus obliquus*

Authors: Sun C, Li W, Xu YF, Hu NT, Ma J, Cao WX, Sun SQ, Hu CW, Zhao YJ, Huang QG

Source: AQUATIC TOXICOLOGY 224:105504, 2020, DOI: 10.1016/j.aquatox.2020.105504

Abstract: Due to their unique structure and properties, carbon nanotubes (CNTs) released into the aquatic environment can potentially influence the behavior of other coexisting pollutants, thereby altering their toxicity to aquatic organisms. In this study, the toxicities of multi-walled CNTs and three heavy metals, copper (Cu), cadmium (Cd) and zinc (Zn) were determined individually. Following this, CNTs with low concentrations (1 and 5 mg/L) were co-exposed with Cu, Cd or Zn to the microalgae Scenedesmus obliquus, to investigate the effects and underlying mechanisms of CNTs on metal toxicity. Results showed that CNTs, especially at a concentration of 5 mg/L, promoted algae growth and enhanced photosynthetic efficiency via increasing exciton trap efficiency and quantum yield for electron transport. Introduction of CNTs appeared to alleviate the adverse effects of Cu, Cd or Zn on microalgae, indicated by algae growth, total chlorophyll content and photosynthetic indices. However, these effects differed greatly for different metals, depending on both the toxicity of each metal and the exposure period (4 day and 8 day). Enhancement of photosynthesis and interference of metal uptake by CNTs, have a crucial role in the effects of CNTs on metal toxicity.

Accès au document

Multiple Stressors Determine Community Structure and Estimated Function of River Biofilm Bacteria

Authors: Romero F, Acuna V, Sabater S

Source: APPLIED AND ENVIRONMENTAL MICROBIOLOGY 86:e00291-20, 2020, DOI: 10.1128/AEM.00291-20

Abstract: Freshwater ecosystems are exposed to multiple stressors, but their individual and combined effects remain largely unexplored. Here, we investigated the response of stream biofilm bacterial communities to warming, hydrological stress, and pesticide exposure. We used 24 artificial streams on which epilithic (growing on coarse sediments) and epipsammic (growing on fine sediments) stream biofilms were maintained. Bacterial community composition and estimated function of biofilms exposed during 30 days to individual and combined stressors were assessed using 165 rRNA gene metabarcoding. Among the individual effects by stressors, hydrological stress (i.e., a simulated low-flow situation) was the most relevant, since it significantly altered 57% of the most abundant bacterial taxa (n = 28), followed by warming (21%) and pesticide exposure (11%). Regarding the combined effects, 16% of all stressor combinations resulted in significant interactions on bacterial community composition and estimated function. Antagonistic responses prevailed (57 to 89% of all significant interactions), followed by synergisms (11 to 43%), on specific bacterial taxa, indicating that multiple-stressor scenarios could lead to unexpected shifts in the community composition and associated functions of riverine bacterial communities.

Accès au document

Inclusion of seasonal variation in river system microbial communities and phototroph activity increases

https://doi.org/10.15454/9HM9-3C17

environmental relevance of laboratory chemical persistence tests

Authors: Southwell RV, Hilton SL, Pearson JM, Hand LH, Bending GD

Source: SCIENCE OF THE TOTAL ENVIRONMENT 733:139070, 2020, DOI: 10.1016/j.scitotenv.2020.139070

Abstract: Regulatory tests assess crop protection product environmental fate and toxicity before approval for commercial use. Although globally applied laboratory tests can assess biodegradation, they lack environmental complexity. Microbial communities are subject to temporal and spatial variation, but there is little consideration of these microbial dynamics in the laboratory. Here, we investigated seasonal variation in the microbial composition ofwater and sediment from a UK river across a two-year time course and determined its effect on the outcome of water-sediment (OECD308) and water-only (OECD309) biodegradation tests, using the fungicide isopyrazam.These OECD tests are performed under dark conditions, so test systems incubated under non-UV light:dark cycles were also included to determine the impact on both inoculum characteristics and biodegradation. Isopyrazam degradation was faster when incubated under non-UV light at all collection times in water-sediment microcosms, suggesting that phototrophic communities can metabolise isopyrazam throughout the year. Degradation rate varied seasonally between inoculum collection times only in microcosms incubated in the light, but isopyrazam mineralisation to 14CO2 varied seasonally under both light and dark conditions, suggesting that heterotrophic communities may also play a role in degradation. Bacterial and phototroph communities varied across time, but there was no clear link between water or sediment microbial composition and variation in degradation rate. During the test period, inoculum microbial community composition changed, particularly in non-UV light incubated microcosms. Overall, we show that regulatory test outcome is not influenced by temporal variation in microbial community structure; however, biodegradation rates from higher tier studies with improved environmental realism, e.g. through addition of non-UV light, may be more variable. These data suggest that standardised OECD tests can provide a conservative estimate of pesticide persistence end points and that additional tests including non-UV light could help bridge the gap between standard tests andfield studies.

Accès au document

Characteristics of spatial and seasonal bacterial community structures in a river under anthropogenic disturbances

Authors: Ouyang L, Chen HR, Liu XY, Wong MH, Xu FF, Yang XW, Xu W, Zeng QH, Wang WM, Li SF

Source: ENVIRONMENTAL POLLUTION 264:114818, 2020, DOI: 10.1016/j.envpol.2020.114818

Abstract: In this study, the seasonal characteristics of microbial community compositions at different sites in a river under anthropogenic disturbances (Maozhou River) were analyzed using Illumina HiSeq sequencing. Taxonomic analysis revealed that Proteobacteria was the most abundant phylum in all sites, followed by Actinobacteria, Bacteroidetes, Chloroflexi, Acidobacteria and Firmicutes. The variations of the community diversities and compositions between the seasons were not significant. However, significant differences between sites as well as water and sediment samples were observed. These results indicated that sites under different levels of anthropogenic disturbances have selected distinct bacterial communities. pH, dissolved oxygen (DO), concentrations of total nitrogen (TN) and heavy metals were the main factors that influence the diversity and the composition of bacterial community. Specifically, the relative abundance of Proteobacteria was negatively correlated with pH and DO and positively correlated with TN, while Actinobacteria and Verrucomicrobia showed the opposite pattern. Moreover, positive correlations between the relative abundances of Firmicutes and Bacteroidetes and the concentration of heavy metals were also found. Results of functional prediction analysis showed no significant differences of the carbon, nitrogen and phosphorus metabolism across the sites and seasons. Potential pathogens such as Vibrio, Arcobacter, Acinetobacter and Pseudomonas were found in these samples, which may pose potential risks for environment and human health. This study reveals the effect of

anthropogenic activities on the riverine bacterial community compositions and provides new insights into the relationships between the environmental factors and the bacterial community distributions in a freshwater ecosystem under anthropogenic disturbances.

Accès au document

Sulfonamides-induced oxidative stress in freshwater microalga *Chlorella vulgaris*: Evaluation of growth, photosynthesis, antioxidants, ultrastructure, and nucleic acids

Authors: Chen S, Wang LQ, Feng WB, Yuan MZ, Li JY, Xu HT, Zheng XY, Zhang W

Source: SCIENTIFIC REPORTS 10, 2020, DOI: 10.1038/s41598-020-65219-2

Abstract: Sulfadiazine (SD), sulfamerazine (SM1), and sulfamethazine (SM2) are widely used and disorderly discharged into surface water, causing contamination of lakes and rivers. However, microalgae are regard as a potential resource to alleviate and degrade antibiotic pollution. The physiological changes of *Chlorella vulgaris* in the presence of three sulfonamides (SAs) with varying numbers of -CH3 groups and its SA-removal efficiency were investigated following a 7-day exposure experiment. Our results showed that the growth inhibitory effect of SD (7.9-22.6%), SM1 (7.2-45.9%), and SM2 (10.3-44%) resulted in increased proteins and decreased soluble sugars. Oxidative stress caused an increase in superoxide dismutase and glutathione reductase levels but decreased catalase level. The antioxidant responses were insufficient to cope-up with reactive oxygen species (hydrogen peroxide and superoxide anion) levels and prevent oxidative damage (malondialdehyde level). The ultrastructure and DNA of SA-treated algal cells were affected, as evident from the considerable changes in the cell wall, chloroplast, and mitochondrion, and DNA migration. *C. vulgaris*-mediated was able to remove up to 29% of SD, 16% of SM1, and 15% of SM2. Our results suggest that certain concentrations of specific antibiotics may induce algal growth, and algal-mediated biodegradation process can accelerate the removal of antibiotic contamination.

Accès au document

Investigation of the toxic effects of different polystyrene micro-and nanoplastics on microalgae *Chlorella vulgaris* by analysis of cell viability, pigment content, oxidative stress and ultrastructural changes

Authors: Hazeem LJ, Yesilay G, Bououdina M, Perna S, Cetin D, Suludere Z, Barras A, Boukherroub R

Source: MARINE POLLUTION BULLETIN 156:111278, 2020, DOI: 10.1016/j.marpolbul.2020.111278

Abstract: Plastics of different sizes (micro- and nano-sized) are often identified in aquatic environments. Nevertheless, their influence on marine organisms has not been widely investigated. In this study, the responses of the microalga *Chlorella vulgaris* to micro- and nanoplastics exposure were examined using long term toxicity test. The plastics tested were carboxyl-functionalized and non-functionalized polystyrene of 20, 50 and 500 nm in diameter. A reduction in algal cell viability and chlorophyll a concentration has been observed after exposure to the small sizes (20 and 50 nm) of plastics. Lactate dehydrogenase activity and reactive oxygen species concentration/production were significantly higher after exposure to the 20 nm nanoplastics than that of control confirming the stress condition. Fourier transform infrared (FTIR) spectroscopy analysis proved the attachment of nanoplastics to microalgae and rearrangement of extracellular polymeric substances. The cellular stress appeared as increased cell size, deformed cell wall and increased volume of starch grains.

Accès au document

Adverse effects of levo floxacin and oxytetracycline

https://doi.org/10.15454/9HM9-3C17

on aquatic microbial communities

Authors: Zhou ZG, Zhang ZY, Feng L, Zhang JF, Li Y, Lu T, Qian HF

Source: SCIENCE OF THE TOTAL ENVIRONMENT 734:139499, 2020, DOI: 10.1016/j.scitotenv.2020.139499

Abstract: The widespreaduse of levofloxacin (LEV) and oxytetracycline (OTC) inhospitals and farms inevitably contributes to water pollution through waste disposal processes, municipal wastewater treatment, and manure application to farmlands, which adversely affects aquatic microorganisms. Here, we evaluated the toxicity of LEV and OTC to cyanobacteria and eukaryotic algae monocultures and freshwater microcosms. Three test cyanobacteriawere inhibited by both LEV and OTC at all examined concentrations. The growth of the eukaryotic organisms *C. vulgaris* and *Monoraphidium* sp. was only inhibited by high concentrations of OTC ranging from 1000 to 10,000μg/L; however, they were less sensitive to LEV and OTC than cyanobacteria. In the aquatic microcosms, 5μg/L of LEV and OTC did not affect the alpha diversity of prokaryotic and eukaryotic communities or the composition of the eukaryotic microbial communities after 14 d of exposure. However, this concentration of LEV andOTC significantly changed the prokaryotic microbial community structure at the genus level, and different antibiotics affected the prokaryotic microbial community differently, suggesting that different antibiotics affect prokaryotes through different molecular mechanisms, thereby leading to differences in prokaryotic microbial growth patterns. Moreover, the changes in the prokaryotic microbial community composition suggested that low antibiotic concentrations in water could disturb prokaryotic microbial communities and cause ecological risks.

Accès au document

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The effects of biochar and AM fungi (*Funneliformis mosseae*) on bioavailability Cd in a highly contaminated acid soil with different soil phosphorus supplies

Authors: Zhang HW, Zhen HY, Huang CD...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-10363-5

Abstract: Due to the increase of cadmium (Cd)-contaminated land area worldwide, effective measures should be taken to minimize the Cd bioavailability in crops. A study was performed to explore the effectiveness of biochar pyrolyzed from rice straw at 400 degrees C alone or combined with AM fungi (*Funneliformis mosseae*) on the corn growth and Cd uptake in corn in Cd-contaminated soil with different levels of phosphorus supplies. The results showed that biochar significantly reduced 66% and 38% of Cd uptake in shoot and root respectively ($P < 0.001$) attributed to the increase of soil pH and dissolved organic matter. In contrast, AM fungi inoculation of corn plants had little effect on Cd bioavailability due to the AM was suppressed by the highly contaminated acid soil (31.76 mg/kg), and had neither synergistic effect with biochar on decreasing the Cd bioavailability with high or low phosphorus supplies. This study demonstrated that biochar application could be a promising method to immobilize Cd in the contaminated soil to ensure the safety of agro-product while high Cd-contaminated soil would suppress the growth of mycorrhizae, so this remains an open question to be further studied.

Accès au document

Advances in characterizing microbial community change and resistance upon exposure to lead contamination: Implications for ecological risk assessment

https://doi.org/10.15454/9HM9-3C17

Authors: George SE, Wan YS

Source: CRITICAL REVIEWS IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY 50, 21:2223-2270, 2020, DOI: 10.1080/10643389.2019.1698260

Abstract: Recent advancement in molecular techniques has spurred numerous studies on responses of microorganisms to lead exposure, leveraging detailed phylogenetic analyses and functional gene identification to discern the effects of lead toxicity on microbial communities. A comprehensive review of recent research is provided on (1) lead resistance mechanisms of microorganisms; (2) microbial community changes in contaminated aquatic sediments and terrestrial soils; and (3) lead resistance genes applied to lead biosensor development. Ample evidence in the literature, including bothin vitroandin situstudies, indicates that exposure to lead inhibits microbial activities (such as respiration and metabolism), reduces biomass and alters microbial community structure. Even at sites where microbial communities do not vary compositionally with contaminant levels, functional differences between microbial communities are evident. The main mechanisms of lead resistance involve extracellular and intracellular biosorption, precipitation, complexation, and/or efflux pumps. The suites of genes associated with lead resistance mechanisms can serve, when considered with phylogenetic information, as indicators of lead contamination. This holds potential for development of next generation lead biosensors. To promote applications of advanced knowledge, molecular techniques, and lead biosensor technology, perspectives on using microbial indicators for site ecological assessment are presented.

Accès au document

Environmental drivers of shifts on microbial traits in sites disturbed by a large-scale tailing dam collapse

Authors: Batista ER, Carneiro JJ, Pinto FA...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 738, 2020, DOI: 10.1016/j.scitotenv.2020.139453

Abstract: This study aimed to assess the most affected traits related to microbial ecophysiology and activity and investigate its relationships with environmental drivers in mine tailings spilled from the Fundao dam at disturbed sites across Gualaxo do Norte river, Minas Gerais, Brazil. The mine tailings are characterized by increased pH value, silt percentage, and bulk density, while clay percentage, organic carbon (C-org), total nitrogen (Nt), and moisture contents are reduced. Microbial biomass, enzymatic activities (arylsulfatase, beta-1,4-glucosidase, acid and alkaline phosphatases), and the total microbial activity potential (FDA hydrolysis) were generally lower in tailings compared to undisturbed reference soil (Und). Enzyme-based indexes (GMea, WMean, and IBRv2) showed microbial communities with significantly lower degradative efficacy in the tailings than Und in all sites ($R2 \geq 0.94$, $p < 0.001$). Non metric multidimensional scaling and distance-based redundancy analysis revealed that microbial communities exhibited significant differentiation (R-2 adjusted = 0.73, p = 0.0001) between mine tailings and Und over the different studied sites, which was strongly influenced by changes on physicochemical properties (pH, C-org and Nt contents, the predominance of small-sized particles of silt, and bulk density) and the presence of Se, Cr, Fe, and Ni, even at low concentrations. Our study suggests that the physicochemical properties and the presence of low bioavailable concentrations of heavy metals in dam tailings promote shifts on microbial communities through reductions in the C storage and biogeochemical cycling of nutrients by these communities compared to those in undisturbed reference soils surrounding and, therefore, has negative implications for the ecosystem functioning.

Accès au document

Naphthalene exerts non-target effects on the abundance of active fungi by stimulating basidiomycete abundance

Authors: Lan LY, Zhang L, Shen Y...

Source: JOURNAL OF MOUNTAIN SCIENCE 17, 8:2001-2010, 2020, DOI: 10.1007/s11629-020-5985-7

Abstract: As an arthropod biocide, naphthalene has been used in studies of the ecological functions of soil fauna for decades. However, its potential non-target effects on soil microorganisms may affect soil mineralization and litter decomposition processes. Therefore, we conducted an experiment with naphthalene adding to soil surface at a rate of 100 g center dot m(-2)per month to examine the potential non-target effects of this treatment on soil fungal phospholipid fatty acids (PLFAs), 18S rDNA gene copy numbers and community diversity in a subalpine forest of western Sichuan, China. The results showed that naphthalene addition significantly increased fungal PLFAs but did not significantly alter fungal gene copy numbers. A total of 16 phyla, 62 genera and 147 Operational taxonomic units (OTUs) were identified through Illumina MiSeq sequencing analysis. Basidiomycota and Ascomycota were the most abundant phyla in both the control and naphthalene addition plots. Naphthalene addition did not affect the diversity or structure of the soil fungal community, but the increase in some genera of Basidiomycota might contribute to the increase in fungal PLFAs in the naphthalene addition plots. These results suggest that naphthalene exerts non-target effects on the active fungal abundance by stimulating the abundance of specific taxa in subalpine forest soils. The non-target effects of naphthalene on the fungal community should be taken into consideration when it is used to exclude soil fauna.

Accès au document

Assessment of heavy metal pollution and the effect on bacterial community in acidic and neutral soils

Authors: Ma YL, Wang YT, Chen Q...

Source: ECOLOGICAL INDICATORS 117, 2020, DOI: 10.1016/j.ecolind.2020.106626

Abstract: Mining activities have caused heavy metal pollution in Xikuangshan (XKS), China. This work aims to assess heavy metal ecological risk in XKS using a potential ecological risk (PER) index and detect the responses of the soil bacterial community under heavy metal stress at different pH levels. The PER index indicated that antimony (Sb), cadmium (Cd), and arsenic (As) posed the most serious ecological risk at the sampling sites. We compared the effects of heavy metals on the structure of the microbial community under acidic and neutral conditions. Our results suggested significant differences between microbial community responses to heavy metals in acidic and neutral soils. Zinc (Zn) and lead (Pb) were the main heavy metal factors affecting the bacterial community under acidic conditions, whereas the effect of Sb, As, and chromium (Cr) exceeded them in neutral soils. This was possibly due to the different characteristics of heavy metals and their interactions with soil properties. The main genus were positively correlated with Sb, As, Zn, Pb, and Cd in both acidic and neutral soils, which may due to increasing resistance under conditions of long-time pollution. The results of our structural equation modeling indicated that the variations in the bacterial community structure were mainly explained by heavy metals in acidic and neutral soils. The soil nutrients and pH also had significant direct influences on the bacterial community under neutral conditions, as well as indirect effects due to their impact on heavy metals in neutral and acidic soils. Several heavy metal-resistant bacteria can be used for remediation under acid and neutral conditions.

Accès au document

CuO Nanoparticles Alter the Rhizospheric Bacterial Community and Local Nitrogen Cycling for Wheat Grown in a Calcareous Soil

Authors: Guan XY, Gao XY, Avellan A...

https://doi.org/10.15454/9HM9-3C17

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY 54, 14:8699-8709, 2020, DOI: 10.1021/acs.est.0c00036

Abstract: The application of nanoparticles (NPs) to soils, as either fertilizers or fungicides (e.g., CuO NPs), has been proposed to improve the sustainability of agriculture. The observed effects could result directly from the NP-plant interactions or indirectly through effects on the soil microbiome. The objective of this study was to assess the effects of CuO NPs on the changes in the bacterial community structure and nitrogen-cycling-associated functions in a high pH soil and to correlate these changes with nitrate accumulation, soil parameter changes, and plant growth over 28 days. Triticum aestivum seedlings were exposed to 50 mg/kg CuO NPs, 50 mg/kg CuSO4, or 0.5 mg/kg CuSO4 in a standard soil (Lufa 2.1 soil, pH adjusted to 7.6). While Cu treatments reduced nitrate accumulation in the bulk soil, the effects were opposite in the rhizosphere (the soil influenced by root exudates). While nitrate accumulation in bulk soil negatively correlated with total Cu concentration, part of the nitrate concentration in the rhizosphere was explained by root uptake during plant growth, the rest being modulated by Cu treatments. The abundance of genes involved in the nitrogen cycle in the rhizosphere soil correlated with the ionic copper concentration. The increased nitrate concentration in the rhizosphere correlated with an increase of the gene abundance related to the nitrogen fixation and a decrease of denitrification gene abundance. Microbial diversity in bulk or rhizosphere soil under the different treatments alone could not explain these variations, while differences in the assemblages of bacteria associated with these functional gene abundances gave good insights. This study highlights the complexity of microbial N-related function in the rhizosphere and the need to characterize the rhizosphere soil, plant growth and root activity, NP (bio)transformations, along with microbial networks, to understand the impact of agrochemicals (here CuO NPs) on soil fertility.

Accès au document

Relative importance of soil properties and heavy metals/metalloids to modulate microbial community and activity at a smelting site

Authors: Bai XT, Wang JiC, Dong HL...

Source: JOURNAL OF SOILS AND SEDIMENTS, 2020, DOI: 10.1007/s11368-020-02743-8

Abstract: Purpose Heavy metals/metalloids have adverse effects on soil microorganisms, but the underlying environmental controls remain unclear. This study aims to investigate the influences of multiple heavy metal/metalloid contaminations on soil microbial communities, as well as the effects of soil properties. Materials and methods Soil samples were collected from a typical Pb/Zn smelter in China. Ecological drivers including soil properties and heavy metal/metalloid contents were determined to evaluate their effects on soil microbial biomass, activity, and community. Results and discussion heavy metals/metalloids had adverse effects on soil microorganisms, as reflected by significant decreases of soil microbial biomass, activity, and bacterial alpha-diversity with increased contamination levels. The Mantel test and variation partition analysis (VPA) revealed that heavy metals/metalloids strongly affected the bacterial community structure, while soil properties contribute mostly to the variation of microbial activity. Additionally, the influences of soil properties (e.g., total nitrogen, available phosphorus, pH) on microbial biomass, activity, and alpha-diversity were significant, and stronger than the effects of heavy metals/metalloids. Notably, the interactions between heavy metals/metalloids and soil properties were significant and could explain 61.08% and 33.05% variation of the bacterial community structure and microbial activity, respectively. Conclusions These findings demonstrate that the overall effects across soil properties and heavy metals/metalloids are interactive, suggesting that evaluation of the effects of heavy metals/metalloids should also take into account the soil properties.

Accès au document

Changes of Enzymatic Activities, Substrate Utilization Pattern, and

Microbial Community Diversity in Heavy Metal-Contaminated Soils

Authors: Sun YB, Zheng SA, Wang L...

Source: WATER AIR AND SOIL POLLUTION 231, 8, 2020, DOI: 10.1007/s11270-020-04798-2

Abstract: Globally, heavy metal (HM) pollution of soil is a serious problem that can lead to long-term toxic effects on soil. In this milieu, the present study investigated the eco-toxicological effects of three trace elements, e.g., cadmium (Cd), copper (Cu), and lead (Pb), on enzyme activities and microbial function and structural diversity in phaeozem and red soil samples. Hormesis effects of Cd, Cu, and Pb on catalase and invertase activities were observed in phaeozem soil, while for red soil, there was an inhibitory effect on the activities of catalase and invertase under Cu- and Pb-contaminated soils. The utilization of carbon sources was inhibited in Cd- and Pb-treated phaeozem soil, but higher utilization of polymers and amines exhibited in Cu-contaminated soil. Although the substrates under the contamination of Cd, Cu, and Pb had high average well color development values across incubation time, the utilization of various substrates did not exhibit a regular trend under different treatments with HMs. The denaturing gradient gel electrophoresis (DGGE) analysis showed that the HMs led to marginal changes in the number and species of soil microbes, while the similarity indices decreased in HM-treated samples, varying from 66.2 to 77.3% in phaeozem soil and from 62.8 to 66.7% in red soil. However, the sequence analysis showed that there existed metal-resistant microbial communities such asBacillales, Bacillus, andMassiliaand so on under the stress of HMs.

Accès au document

Effects of microplastic and microglass particles on soil microbial community structure in an arable soil (Chernozem)

Authors: Wiedner K, Polifka S

Source: SOIL 6(2):315-324, 2020, DOI: 10.5194/soil-6-315-2020

Abstract: Microplastic and microglass particles from different sources enter aquatic and terrestrial environments. The complexity of their environmental impact is difficult to capture, and the consequences for ecosystem components, for example, the soil microorganisms, are virtually unknown. To address this issue, we performed an incubation experiment by adding 1 % of five different types of impurities ≥ µm) to an agriculturally used soil (Chernozem) and simulating a worst-case scenario of contamination The impurities were made of polypropylene (PP), low-density polyethylene (LDPE), polystyrene (PS), polyamide 12 (PA12) and microglass. After 80 d of incubation at 20 degrees C, we examined the soil microbial community structure by using phospholipid fatty acids (PLFAs) as markers for bacteria, fungi and protozoa. The results showed that soil microorganisms were not significantly affected by the presence of microplastic and microglass. However, PLFAs tend to increase with LDPE (28 %), PP (19 %) and microglass (11 %) in treated soil in comparison with untreated soil, whereas PLFAs in PA12 (32 %) and PS (11 %) in treated soil decreased. Interestingly, PLFAs revealed significant differences in PA12 (-89 %) and PS (-43 %) in comparison with LDPE. Furthermore, variability of bacterial PLFAs was much higher after microplastic incubation, while fungi seemed to be unaffected from different impurities after 80 d of incubation Similar results were shown for protozoa, which were also more or less unaffected by microplastic treatment as indicated by the minor reduction in PLFA contents compared to the control group. In contrast, microglass seems to have an inhibiting effect on protozoa because PLFAs were under the limit of determination. Our study indicated that high amounts of different microplastics may have contrary effects on soil microbiology. Microglass might have a toxic effect for protozoa.

Accès au document

Estimation of Hg(II) in Soil Samples by Bioluminescent Bacterial Bioreporter *E. coli* ARL1, and the Effect of

https://doi.org/10.15454/9HM9-3C17

Humic Acids and Metal Ions on the Biosensor Performance

Authors: Branyikova I, Lucakova S, Kuncova G...

Source: SENSORS 20, 11, 2020, DOI: 10.3390/s20113138

Abstract: Mercury is a ubiquitous environmental pollutant of dominantly anthropogenic origin. A critical concern for human health is the introduction of mercury to the food chain; therefore, monitoring of mercury levels in agricultural soil is essential. Unfortunately, the total mercury content is not sufficiently informative as mercury can be present in different forms with variable bioavailability. Since 1990, the use of bioreporters has been investigated for assessment of the bioavailability of pollutants; however, real contaminated soils have rarely been used in these studies. In this work, a bioassay with whole-cell bacterial bioreporter Escherichia coli ARL1 was used for estimation of bioavailable concentration of mercury in 11 soil samples. The bioreporter emits bioluminescence in the presence of Hg(II). Four different pretreatments of soil samples prior to the bioassay were tested. Among them, laccase mediated extraction was found to be the most suitable over water extraction, alkaline extraction, and direct use of water-soil suspensions. Nevertheless, effect of the matrix on bioreporter signal was found to be severe and not possible to be completely eliminated by the method of standard addition. In order to elucidate the matrix role, influences of humic acid and selected metal ions present in soil on the bioreporter signal were tested separately in laboratory solutions. Humic acids were found to have a positive effect on the bioreporter growth, but a negative effect on the measured bioluminescence, likely due to shading and Hg binding resulting in decreased bioavailability. Each of the tested metal ions solutions affected the bioluminescence signal differently; cobalt (II) positively, iron (III) negatively, and the effects of iron (II) and nickel (II) were dependent on their concentrations. In conclusion, the information on bioavailable mercury estimated by bioreporter *E. coli* ARL1 is valuable, but the results must be interpreted with caution. The route to functional bioavailability bioassay remains long.

Accès au document

Phytohormone up-regulates the biochemical constituent, exopolysaccharide and nitrogen metabolism in paddy-field cyanobacteria exposed to chromium stress

Authors: Tiwari S, Patel A, Prasad SM

Source: BMC MICROBIOLOGY 20, 1, 2020, DOI: 10.1186/s12866-020-01799-3

Abstract: BackgroundCyanobacteria are well known for their inherent ability to serve as atmospheric nitrogen fixers and as bio-fertilizers; however, increased contaminants in aquatic ecosystem significantly decline the growth and function of these microbes in paddy fields. Plant growth regulators play beneficial role in combating the negative effects induced by heavy metals in photoautotroph. Current study evaluates the potential role of indole acetic acid (IAA; 290nm) and kinetin (KN; 10nm) on growth, nitrogen metabolism and biochemical constituents of two paddy field cyanobacteria Nostoc muscorum ATCC 27893 and Anabaena sp. PCC 7120 exposed to two concentrations of chromium (Cr-VI; 100 mu M and 150 mu M).ResultsBoth the tested doses of Cr-VI declined the growth, ratio of chlorophyll a to carotenoids (Chl a/Car), contents of phycobiliproteins; phycocyanin (PC), allophycocyanin (APC), and phycoerythrin (PE), protein and carbohydrate associated with decrease in the inorganic nitrogen (nitrate; NO3- and nitrite; NO2-) uptake rate that results in the decrease in nitrate and ammonia assimilating enzymes; nitrate reductase (NR), nitrite reductase (NiR), glutamine synthetase (GS), glutamate synthase (GOGAT) except glutamate dehydrogenase (GDH). However, exogenous supplementation of IAA and KN exhibited alleviating effects on growth, nitrogen metabolism and exopolysaccharide (EPS) (first protective barrier against metal toxicity) contents in both the cyanobacteria, which probably occurred as a result of a substantial decrease in the Cr uptake that lowers the damaging effects.ConclusionOverall result of the present study signifies affirmative role of the phytohormone in minimizing the toxic effects induced by chromium by stimulating the growth of cyanobacteria thereby enhancing its ability as bio-fertilizer that improved fertility and

productivity of soil even in metal contaminated condition.

Accès au document

Effects of Long-Term exposure to Heavy Metals upon Rhizosphere Bacteria from Baia Mare Area (Maramures County, Romania)

Authors: Farkas A, Mereuti F, Butiuc-Keul A...

Source: GEOMICROBIOLOGY JOURNAL, 2020, DOI: 10.1080/01490451.2020.1795319

Abstract: The aim of this study was to investigate the extent of heavy metal (HM) pollution and its effect on microorganisms from rhizosphere soil in Baia Mare area (Maramures County, Romania). Two sites with different contamination degrees were included in the study: one with a long history of mining activities and one within a drinking water safeguard zone. Rhizosphere soil samples were characterized with respect to physico-chemical parameters and the Cd, Cu, Pb and Zn contents. Native bacteria were investigated for HM tolerance and biofilm formation under toxic exposure by the microdilution assay. The most resistant strains were identified and the minimum inhibitory concentrations for HMs were determined. Cd, Cu, Pb and Zn exceeded the intervention threshold in Bozanta tailings site, while Pb content exceeded the intervention level within the area of the drinking water treatment plant. Cd showed a very high potential ecological risk in Bozanta area. The long-term exposure to HMs contributed to the selection of HM-tolerant and weakly adherent strains. Biofouling was significantly reduced under the influence of copperions. *Arthrobacter*, *Rhodococcus* and *Acidovorax* strains with exceptional resistant profiles were isolated from the tailings site, indicating the important role of native microorganisms in rhizosphere ecosystems of contaminated sites.

Accès au document

Soil microbial communities in the rhizosphere of *Robinia pseudoacacia* L. after being exposed to elevated atmospheric CO2 and cadmium for 4 years

Authors: Jia X, Wang L, Zhao YH...

Source: APPLIED SOIL ECOLOGY 154, 2020, DOI: 10.1016/j.apsoil.2020.103661

Abstract: Elevation of atmospheric CO2 combined with heavy metals can affect rhizosphere soil characteristics by altering the allocation of roots and its availability in the rhizosphere to the microbial community. The aim of study was to investigate the community structure of bacteria, fungi, ammonia oxidizing bacteria (AOB), and ammonia oxidizing archaea (AOA) in the rhizosphere of *Robinia pseudoacacia* L. seedlings after being exposed to elevated CO2 and cadmium (Cd) for 4 years. Elevated CO2 increased pH, total carbon, water-soluble organic carbon, and the carbon-to-nitrogen ratio under Cd exposure relative to Cd alone and led to a decrease in total and soluble Cd contents in rhizosphere soils. Elevated CO2 increased the richness of bacterial and AOA communities estimated by Abundance-based Coverage Estimator index by 17.463.2% and by 1.42.8%, respectively, and decreased fungal communities by 2.212.0% under Cd exposure. Elevated CO2 combined with Cd at 1.0 mg Cd kg(-1) dry soil increased the diversity of bacterial, fungi, AOB, and AOA communities estimated by Shannon indexes, while at 5.0 mg Cd kg(-1) dry soil, the diversity of these taxa decreased with the exception of bacterial. Elevated CO2 led to increased abundance of phyla Acidobacteria, Chloroflexi, Ascomycota, and Thaumarchaeota and to decreased abundance of phyla Proteobacteria and Actinobacteria in rhizosphere soils under Cd exposure; and the abundance of dominant taxa changed dramatically. NMDS and heat-map analysis of the relative abundance of genera indicated that elevated CO2 had a greater effect on microbial community structure when combined with Cd exposure. Additionally, elevated CO2 significantly affected microbial communities by increasing pH, TC, WSOC, and the C/N ratio and by decreasing total and soluble Cd contents in rhizosphere soils. Overall, elevated CO2 combined with Cd exposure

increased the abundance of most microorganisms and changed microbial diversity in gene level as a result of increased nutrients in rhizosphere soils.

Accès au document

Heavy metal concentrations in Brazilian port areas and their relationships with microorganisms: can pollution in these areas change the microbial community?

Authors: Zampieri BD, Andrade VD, Chinellato RM...

Source: ENVIRONMENTAL MONITORING AND ASSESSMENT 192, 8, 2020, DOI: 10.1007/s10661-020-08413-z

Abstract: The objectives of this study were to analyze the difference in ways in which metals polluting Brazilian port areas influence bacterial communities and the selection of resistant strains. The hypothesis tested was that port areas would have microbial communities significantly different from a pristine area, mainly due to a greater load of metals found in these areas. Sediment samples were collected in two port areas (Santos and SAo SebastiAo) and one pristine area (Ubatuba). Total DNA was extracted and MiSeq sequencing was performed. A hundred strains were isolated from the same samples and were tested for metal resistance. The community composition was similar in the two port regions, but differed from the pristine area. Microbial diversity was significantly lower in the port areas. The phyla Proteobacteria, Cyanobacteria, and Thermodesulfobacteria exhibited positive correlations with copper and zinc concentrations. Chloroflex, Nitrospirae, Planctomycetes, and Chlorobi exhibited negative correlations with copper, chromium, and zinc. Cr and Zn had higher concentrations at port areas and were responsible to select more metal-resistant strains. Some genera were found to be able to easily develop metal resistance. The most isolated genera were Bacillus, Vibrio, and Pseudomonas. This type of study can illustrate, even in very complex natural environments, the influence of pollution on the community as a whole and the consequences of these changes.

Accès au document

Microbial Activities Response to Contamination in Soil and Sediments Rich in As Surrounding an Industrial Gold Mine

Authors: Sabadini-Santos E, Castilhos ZC, Bidone ED

Source: WATER AIR AND SOIL POLLUTION 231, 7, 2020, DOI: 10.1007/s11270-020-04734-4

Abstract: Gold mines are widely recognized as important sources of arsenic (As) pollution and this work proposes the use of in situ microbial community enzymatic response to assess the risk of As in soil and sediments surrounding "Morro do Ouro," the largest industrial gold mine in Brazil. Bacterial community exposed to high metals concentrations deviates energy from growth to cell maintenance modifying enzymatic activity response. Even if the number of bacterial cells presented in soil and sediment samples was in the same order of 10(7) cell cm (-3), it declines in sediment samples closer to a mining area. Dehydrogenase activity (DHA) showed the same trend, suggesting inhibition by toxic effect of metals, while esterase activities (EST) behaved in the opposite way, representative of increasing energy demand by the community under environmental stress. The Quality Ratio (QR) index for environmental risk assessment was applied to integrate geochemical (grain size, total organic carbon contents, and metals as indicators of complex contamination) and microbial parameters (DHA-energy production into cell and EST-hydrolase organic matter outside the cell membrane). QR indicated that the risk associated with soil and sediment is driven by As levels and decreases from the mine facilities.

Accès au document

The responses of soil enzyme activities, microbial biomass and microbial community

structure to nine years of varied zinc application rates

Authors: Liu YM, Cao WQ, Chen XX...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 737, 2020, DOI: 10.1016/j.scitotenv.2020.140245

Abstract: Zinc (Zn) fertilizer application can certainly improve the production and nutritional quality of cereal crops. However, Zn accumulation in the soil may lead to some deleterious environmental impacts in agroecosystems. The effects of long-term Zn application on soil microbial properties remain unclear, but it is imperative to understand such effects. In this study, we collected soil samples from a nine-year field experiment in a wheat-maize system that continuously received Zn applied at various rates (0, 2.3, 5.7,11.4, 22.7 and 34.1 kg ha(-1)) to evaluate the soil enzymes, microbial biomass and microbial community structure. The results showed that Zn application at the rate of 5.7 kg ha(-1) significantly increased the activities of urease, invertase, alkaline phosphatase and catalase in the soil, while the rate of 34.1 kg ha(-1) significantly decreased the evaluated enzyme activities. The microbial biomass carbon (C) and nitrogen (N) were not affected by Zn application rates, although an increase in the microbial biomass C was observed in the 11.4 kg ha(-1) treatment. Moreover, the alpha diversity of the bacterial and fungal communities did not vary among the nil Zn, optimal Zn (5.7 kg ha(-1)) and excess Zn (34.1 kg ha(-1)) treatments. However, the bacterial communities in the soil receiving the optimal and excess Zn application rates were slightly changed. Compared to the nil Zn treatment, the other Zn application rates increased the relative abundances of the Rhodospirillales, Gaiellales and Frankiales orders and decreased the abundance of the Latescibacteria phylum. The redundancy analysis further indicated that the soil bacterial community composition significantly correlated with the concentrations of soil DTPA-Zn and total Zn. These results highlight the importance of optimal Zn application in achieving high production and high grain quality while concurrently promoting soil microbial activity, improving the bacterial community and further maintaining the sustainability of the agroecological environment.

Accès au document

Alkaline amendments improve the health of soils degraded by metal contamination and acidification: Crop performance and soil bacterial community responses

Authors: Lu HL, Wu YX, Liang PX...

Source: CHEMOSPHERE 257, 2020, DOI: 10.1016/j.chemosphere.2020.127309

Abstract: Soil degradation due to heavy metal contamination and acidification has negative effects on soil health and crop growth. Many previous studies have tried to improve the growth of crops and decrease their metal uptake. The recovery of soil health, however, has rarely been focused in soil remediation. In this study, a pot trial was conducted with lettuce (*Lactuca sativa* L.) growing in heavy metal contaminated and acidic soils, to examine the effects of alkaline amendments (limestone, LS; calcium magnesium phosphate fertilizer, Pcm) and organic amendments (cow manure compost, CMC; biochar, BC) on the growth of lettuce and on the availability of heavy metals, enzyme activities, and bacterial community structures in the soils. The results showed that, in comparison with the CMC and BC treatments, LS and Pcm were more effective at improving lettuce growth and reducing metal concentrations in shoots. Urease and catalase activities in LS and Pcm amended soils were consistently higher than in those with CMC and BC. Additionally, the alkaline amendments dramatically improved the bacterial diversity and shaped more favorable bacterial community structures. Proteobacteria and Gemmatimonadetes were predominant in soils amended with alkaline treatments. The beneficial bacterial genera Gemmatimonas and f_Gemma-timonadaceae, which are vital for phosphate dissolution, microbial nitrogen metabolism, and soil respiration, were also enriched. The results suggest that alkaline amendments were superior to organic amendments, and thus may be useful for the future recovery of soil functions and health under heavy metal contamination and low pH.

Accès au document

Acute glyphosate exposure does not condition the response of microbial communities to a dry-rewetting disturbance in a soil with a long history of glyphosate-based herbicides

Authors: Allegrini M, Gomez E, Zabaloy MC

Source: SOIL 6(2): 291-297, 2020, DOI: 10.5194/soil-6-291-2020

Abstract: Dry-rewetting perturbations are natural disturbances in the edaphic environment and particularly in dryland cultivation areas. The interaction of this disturbance with glyphosate-based herbicides (GBHs) deserves special attention in the soil environment due to the intensification of agricultural practices and the acceleration of climate change with an intensified water cycle. The objective of this study was to assess the response of microbial communities in a soil with a long history of GBHs to a secondary imposed perturbation (a single dry-rewetting event). A factorial microcosm study was conducted to evaluate the potential conditioning effect of an acute glyphosate exposure on the response to a following dry-rewetting event. A respiratory quotient (RQ) based on an ecologically relevant substrate (p-coumaric acid) and basal respiration was used as a physiological indicator. Similarly, DNA-based analyses were considered, including quantitative PCR (qPCR) of functional sensitive microbial groups linked to cycles of carbon (Actinobacteria) and nitrogen (ammonia-oxidizing microorganisms), qPCR of total bacteria and denaturing gradient gel electrophoresis (DGGE) of ammonia-oxidizing bacteria (AOB). Significant effects of herbicide and of dry-rewetting perturbations were observed in the RQ and in the copy number of the amoA gene of AOB, respectively. However, no significant interaction was observed between them when analyzing the physiological indicator and the copy number of the evaluated genes. PCR- DGGE results were not conclusive regarding a potential effect of dry-rewetting x herbicide interaction on AOB community structure, suggesting further analysis by deep sequencing of the amoA gene. The results of this study indicate that the perturbation of an acute glyphosate exposure in a soil with a long history of this herbicide does not have a conditioning effect on the response to a subsequent dry-rewetting disturbance according to a physiological indicator or the quantified bacterial/archaeal genes. This is particularly relevant for the sustainability of soils in rainfed agriculture, where frequent exposure to GBHs along with intensification of hydrological cycles are expected to occur. Further studies considering multiple dry-rewetting disturbances and in different soil types should be conducted to simulate those conditions and to validate our results.

Accès au document

The effect of salinity gradient and heavy metal pollution on arbuscular mycorrhizal fungal community structure in some Algerian wetlands

Authors: Sidhoum W, Bahi K, Fortas Z

Source: ACTA BOTANICA CROATICA 79(1): 3-14, 2020, DOI: 10.37427/botcro-2020-001

Abstract: Algerian natural wetlands suffer from anthropogenic disturbances due to industrial development and urbanization. This study was designed to draw attention to arbuscular mycorrhizal fungi (AMF) distribution and community assemblages following heavy metal and salinity concentrations in two wetlands subjected to domestic and industrial effluents. Rhizospheric soil and roots of 18 plant species were collected in two wetlands along a decreasing salinity gradient. The results showed that 72.72% of plant species exhibit an association within arbuscular mycorrhizas (AM), and 36.36% a dual association between AM and dark septate endophytes (DSE). A total of 33 AMF morphospecies were distinguished on the basis of morphological criteria dominated by taxa belonging to Glomeraceae and Acaulosporaceae. Soil contamination was investigated by determining metallic trace elements (MTE) (Cd, Cu, Ni, Pb, Cr and Zn) using an atomic absorption spectrophotometer. Values of the pollution index revealed wetlands that were particularly polluted by lead. Two-way ANOVA showed significant variations in metal content among

sampling locations and transects. Principal component analysis showed that species richness, and mycorrhizal frequency were slightly affected by MTE. This opens possibilities for their utilization in polluted soil remediation.

Accès au document

Effects of sulfonylurea herbicides chlorsulfuron and sulfosulfuron on enzymatic activities and microbial communities in two agricultural soils

Authors: Medo J, Hricakova N, Makova J...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2020, DOI: 10.1007/s11356-020-10063-0

Abstract: Sulfonylurea herbicides are widely used for weed control in agriculture, and they are suspected to alter microbial communities and activities in the soil. This study investigates the impact of two sulfonylurea herbicides chlorsulfuron and sulfosulfuron on microbial community and activity in two different soils taken from two sites in west part of the Slovak Republic. The soil from the Malanta site was silt-loam luvisol with pH((H2O))5.78 while the soil from the Stefanov site was sandy-loam regosol with pH((H2O))8.25. These soils were not treated by sulfonylurea herbicides at least for 2 years prior to the study. In laboratory assay, the herbicides were applied to soil in their maximal recommended doses 26 and 25 g per hectare of chlorsulfuron and sulfosulfuron, respectively. Their effect was evaluated on the 3rd, 7th, 14th, 28th, 56th, and 112th day after application to soil. Illumina high-throughput amplicon sequencing of the 16S rRNA gene and ITS region was used to monitor changes on prokaryotic and fungal community composition. Enzymatic activity was evaluated using 11 substrates. Physiological profile of microbial community was analyzed using Biolog (c) ecoplates. Significant changes in enzymatic activity caused by the application of herbicides were found during the first 28 days. The application of herbicides altered the activity of cellobiohydrolase, arylsulphatase, dehydrogenase, phosphatase, and FDA hydrolase. Chlorsulfuron caused a more varying response of enzymatic activity than sulfosulfuron, and observed changes were not the same for both soils. In Malanta soil, chlorsulfuron decreased dehydrogenase activity while it was increased in the Stefanov soil. Phosphatase activity was decreased in both soils on 7th and 14th day. There were only minor changes in prokaryotic or fungal community or physiological profiles regarding pesticide application. Differences between soils and incubation time explained most of the variability in these parameters. Diversity indices, physiological parameters, and enzymatic activity decreased over time. The results have shown that chlorsulfuron and sulfosulfuron can affect the function and activity of the soil microbial community without significant change in its composition.

Accès au document

Effects of Dimethylpentalin on Enzyme Activity and Microbial Diversity in Sorghum Soil

Authors: Bai WB, Hao JP, Zhang JH...

Source: INTERNATIONAL JOURNAL OF AGRICULTURE AND BIOLOGY 24(3): 538-544, 2020, DOI: 10.17957/IJAB/15.1471

Abstract: To explore the effects of different concentrations of dimethylpentyl on soil enzyme activity and microbial community influence, the changes of soil invertase, urease, catalase, polyphenol oxidase, alkaline phosphatase, bacterial number, fungal number, bacterial and fungal community diversity under the two treatments (indoor potted and field environment) were studied. The results showed that the activity of soil enzyme was activated by dimethylpentylene, and there was no obvious concentration effect relationship. The community of soil bacteria and fungi was sensitive to the change of concentration of dimethylpentylene forest, which changed with the change of application concentration. (C) 2020 Friends Science Publishers

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Synergistic interaction of a consortium of the brown-rot

https://doi.org/10.15454/9HM9-3C17

fungus *Fomitopsis pinicola* and the bacterium *Ralstonia pickettii* for DDT biodegradation

Authors: Purnomo AS, Sariwati A, Kamei I

Source: HELIYON 6, 6, 2020, DOI: 10.1016/j.heliyon.2020.e04027

Abstract: 1,1,1-Trichloro-2,2-bis (4-chlorophenyl) ethane (DDT) is a toxic and recalcitrant pesticide that has been greatly used to eradicate malaria mosquitos since the 1940s. However, the US Environmental Protection Agency banned and classified DDT as priority pollutants due to its negative impact on wildlife and human health. Considering its negative effects, it is necessary to develop effective methods of DDT degradation. A synergistic interaction of a consortium consisting of the brown-rot fungus *Fomitopsis pinicola* and the bacterium *Ralstonia pickettii* was adopted to degrade DDT For the microbial consortia, *F. pinicola* was mixed with *R. pickettii* at 1, 3, 5, 7 and 10 ml (1 ml approximate to 1.44 10^{13} CFU) in a potato dextrose broth (PDB) medium to degrade DDT throughout the seven days incubation period. The degradation of DDT by only the fungus *F. pinicola* was roughly 42%, while by only *R. pickettii* was 31%. The addition of 3 ml of *R. pickettii* into F. pinicola culture presented appropriate optimization for efficient DDT degradation at roughly 61%. The DDT transformation pathway by co-inoculation of *F. pinicola* and *R. pickettii* showed that DDT was converted to 1,1-dichloro-2,2-bis(4-chlorophenyl) ethane (DDD), further transformed to 1,1-dichloro-2,2-bis(4-chlorophenyl) ethylene (DDE), and then ultimately transformed to 1-chloro-2,2-bis(4-chlorophenyl) ethylene (DDMU). These metabolites are less toxic than DDT. This research showed that R. picketti synergistically interacts with F. pinicola by enhancing DDT degradation.

Accès au document

Assessment of Changes on Rhizospheric Soil Microbial Biomass, Enzymes Activities and Bacterial Functional Diversity under Nickel Stress in Presence of Alfafa Plants

Authors: Helaoui S, Mkhinini M, Boughattas I...

Source: SOIL & SEDIMENT CONTAMINATION, 2020, DOI: 10.1080/15320383.2020.1771276

Abstract: Anthropic activities and agricultural practices have increased the rate of pollutants in ecosystems. Consequently, this can alter soil chemical properties, biological functioning, and fertility. Our work aimed to evaluate the impact of nickel (Ni) contamination on rhizospheric soil's physico-chemical properties and microbiological activities in the presence of alfalfa plants. For this purpose, five concentrations of Ni (0, 50, 150, 250, and 500 mg.kg (-1)) were applied to Tunisian agricultural soils cultured withMedicago sativa. At the end of the experiment, the physico-chemical properties of these soils and the Ni uptake by alfalfa plants were analyzed. Additionally, soil enzyme activities were assessed. Finally, the microbial biomass and functional diversity of microbial communities were determined using SIR (Substrate-induced respiration) and Biolog Ecoplates (TM) techniques, respectively. The results revealed that Ni accumulation was dose-dependent, with a significant amount of Ni being translocated from the roots to the shoots. With respect to the physico-chemical properties of soil, the most important Ni concentration led to the lowest organic matter content and cation-exchange capacity (CEC). Our data also showed a decrease in soil enzyme activities following Ni contamination. However, a crucial increase on microbial biomass of soils was revealed with the high Ni contamination. Moreover, the microbial functional diversity index and substrate utilization pattern were observed to increase in soils exposed to the most potent Ni concentrations. Our data provided evidence regarding the apparent toxicity of Ni and the fact that enzymatic activities and microbial biomass could be exploited as Ni-stress bioindicators.

Accès au document

Distribution of Endocrine Disruptor Chemicals and Bacteria in Saline Petrola Lake (Albacete, SE Spain)

Protected Area is Strongly Linked to Land Use

Authors: Menchen A, Espin Y, Valiente N...

Source: APPLIED SCIENCES-BASEL 10, 11, 2020, DOI: 10.3390/app10114017

Abstract: Saline lakes are subject to numerous environmental impacts related to human activities, changing the chemical and biological natural conditions of the ecosystem. Sustainable development depends on the conservation of such delicate saline ecosystems, which may hold distinctive biodiversity. (…) Microbially mediated redox processes exert a fundamental control on nutrient turnover and contaminant removal. This study examines the influence of land use on the distribution of endocrine disrupting chemicals as well as on the microbial community composition in lacustrine sediments from Petrola saline Lake (SE Spain). The lake is impacted by anthropogenic activities (agriculture, farming, mining and urban wastewater spills). Applying chemical and molecular tools (sequencing of 16S rRNA gene) showed a clear influence of land use on the chemistry and bacterial abundance of the lake sediments. The sampling points closer to wastewater outflows and mining ponds (2635, 2643 and 2650) showed fewer numbers and types of endocrine disrupting chemicals as well as a smaller number of families in the microbial community. These findings improve our understanding of how land use affects both water chemistry and the abundance of organisms responsible for biogeochemical cycles.

Accès au document

Life in mine tailings: microbial population structure across the bulk soil, rhizosphere, and roots of boreal species colonizing mine tailings in northwestern Quebec

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

Source: ANNALS OF MICROBIOLOGY 70, 1, 2020, DOI: 10.1186/s13213-020-01582-9

Abstract: Mining activities have negative effects on soil characteristics and can result in low pH, high heavy metal content, and limited levels of essential nutrients. A tailings storage area located in northwestern Quebec showed natural colonization by plants from the adjacent natural environment. The objective of the study was to determine the main edaphic parameters that structured microbial populations associated with the indigenous woody plants that had naturally colonized the site. Microbial populations were studied in the bulk soil, the rhizosphere, and inside plant roots using Illumina sequencing, ordination analysis (i.e., redundancy analysis (RDA) and principal coordinates analysis (PCoA)), ternary plotting, and statistical analysis (MANOVA). The main variables that drove the microbial community patterns were plant species and the tailings pH. Indeed, the main bacterial classes were Gammaproteobacteria and Deltaproteobacteria in both the rhizosphere and root endosphere. Analysis revealed that some dominant operational taxonomic units (e.g., *Pseudomonas* sp., *Acinetobacter* sp., and *Delftia* sp.) were present in increased proportions in roots for each plant species under study. This study also revealed that many of the most abundant fungal genera (e.g., Claussenomyces, Eupenicillium, and Trichoderma) were more abundant in the rhizosphere than in the root endosphere. This comprehensive study of the microbial community dynamics in the bulk soil, rhizosphere, and root endosphere of boreal trees and shrubs could be beneficial in facilitating the rehabilitation of disturbed ecosystems.

Accès au document

Soil Saprobic Fungi Differ in Their Response to Gradually and Abruptly Delivered Copper

Authors: Golubeva P, Ryo M, Muller LAH...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.01195

Abstract: The overwhelming majority of studies examining environmental change deliver treatments abruptly, although, in fact, many important changes are gradual. One example of a gradually increasing environmental stressor is heavy metal contamination. Essential heavy metals, such as copper, play an important role

within cells of living organisms but are toxic at higher concentrations. In our study, we focus on the effects of copper pollution on filamentous soil fungi, key players in terrestrial ecosystem functioning. We hypothesize that fungi exposed to gradually increasing copper concentrations have higher chances for physiological acclimation and will maintain biomass production and accumulate less copper, compared to fungi abruptly exposed to the highest copper concentration. To test this hypothesis, we conducted an experiment with 17 fungal isolates exposed to gradual and abrupt copper addition. Contrary to our hypothesis, we find diverse idiosyncratic responses, such that for many fungi gradually increasing copper concentrations have more severe effects (stronger growth inhibition and higher copper accumulation) than an abrupt increase. While a number of environmental change studies have accumulated evidence based on the magnitude of changes, the results of our study imply that the rate of change can be an important factor to consider in future studies in ecology, environmental science, and environmental management.

Accès au document

Monoammonium Phosphate Effects on Glyphosate in Soils: Mobilization, Phytotoxicity, and Alteration of the Microbial Community

Authors: Kulikova NA, Zhelezova AD, Voropanov, MG...

Source: EURASIAN SOIL SCIENCE 53(6): 787-797, 2020, DOI: 10.1134/S106422932006006X

Abstract: Application of monoammonium phosphate has been demonstrated to re-immobilize glyphosate sorbed by soil under model laboratory experiment conditions. This effect was most pronounced in the gray forest soil (Haplic Phaeozem), where the concentration of herbicide in the presence of fertilizer was 3.6 times higher than in its absence. For soddy-podzolic soil (Albic Retisol) and leached Chernozem (Luvic Chernozem), this ratio was 1.5 and 2.8, respectively. Thus, the introduction of monoammonium phosphate into soils contaminated with glyphosate may result in an increase of the risk of herbicide migration into the neighboring environments. The estimated number of functional genes of bacteria responsible for glyphosate degradation by means of the C-P bond cleavage did not show statistically significant effect of the fertilizer on the number of copies of thephnJgene, encoding the C-P lyase of alpha- and gamma-proteobacteria. The release of glyphosate was not accompanied by any adverse effects on the length and biomass of wheat plants.

Accès au document

Effect of lignin and plant growth-promoting bacteria (*Staphylococcus pasteuri*) on microbe-plant Co-remediation: A PAHs-DDTs Co-contaminated agricultural greenhouse study

Authors: Zheng XH, Aborisade MA, Wang H...

Source: CHEMOSPHERE 256, 2020, DOI: 10.1016/j.chemosphere.2020.127079

Abstract: Due to the ecological toxicity and environmental residues, how to remove the persistent organic pollutants (POPs), especially of polycyclic-aromatic-hydrocarbons (PAHs) and dichloro-diphenyl-trichloroethanes (DDTs), from agricultural soil has captured the attention of scholars for a long time. To develop an effective and low-cost in situ co-remediation technique, five independent but complementary treatments were used on an over-standard PAHs-DDTs co-contaminated soil in an agricultural greenhouse. Experimental results identified that the combination of microbe (*Bacillus methylotrophicus*) - plant (*Brassica rapa*) could remove rhamnolipid activated PAHs and DDTs effectively after enhanced by Staphylococcus pasteuri. Also, the Benzoapyrene and total DDTs residue in *Brassica rapa* was up to the standard of National (China) food safety. The lignin enhanced the removal of high-rings PAHs and p-p' DDE but reduced soil microbial biomass carbon and soil enzymes activity (polyphenol oxidase, invertase and acid phosphatase). Pearson correlation analysis showed that polyphenol oxidase activity was significantly related to the PAHs/DDTs dissipation rate. Our research suggested a new amendment that could remediate PAHs/DDTs co-contaminated agricultural soil without interrupting crop

production, and the polyphenol oxidase activity should be considered as a micro-ecological indicator in this process.

Accès au document

Effective passivation of lead by phosphate solubilizing bacteria capsules containing tricalcium phosphate

Authors: Zhang KY, Teng ZD, Shao W...

Source: JOURNAL OF HAZARDOUS MATERIALS 397, 2020, DOI: 10.1016/j.jhazmat.2020.122754

Abstract: Phosphate solubilizing bacteria (PSBs) shows high potential to be used for lead passivation in sediments due to the abilities of releasing phosphate and the subsequent formation of insoluble Pb-phosphate compounds. In this research, microbial capsules implemented with sodium alginate and CaCl2, containing Leclercia adecarboxylata L15 (a lead resistant PSB) and Ca-3(PO4)(2), were developed and the performance on lead passivation under different conditions was examined. The optimal concentrations of sodium alginate and CaCl2 for formulating the capsules were determined to be 0.3% and 10%, respectively. The removal efficiency of Pb2+ by capsules containing L15 and Ca-3(PO4) (2) was up to 98% with a capsule dosage of 2%, initial Pb2+ concentration of 1mM and pH of 3.0, which was better than that of free L15 (18%) and capsules containing only L15 (34%). Lead was immobilized via the formation of Pb-3(PO4)(3)Cl on the surface and Pb-3(PO4)(2) in the interior of the capsules. The simulated sediment remediation experiments showed that the acid soluble fraction of lead reduced from 28% to 14% and transformed into more stable fractions after 10 days. The experiment results indicated that PSBs capsules coupled with phosphate materials have a great promise for application in remediation of lead contaminated sediments.

Accès au document

The effect of biochar on soil-plant-earthworm-bacteria system in metal(loid) contaminated soil

Authors: Wang HT, Ding J, Chi QQ...

Source: ENVIRONMENTAL POLLUTION 263, B, 2020, DOI: 10.1016/j.envpol.2020.114610

Abstract: Increasing biochar is applied to the metal(loid) contaminated soil. However, effects of biochar on the soil-plant-earthworm-bacteria ecosystem, especially on the gut microbes of soil animals, remain largely unknown and require further research. Here, sewage sludge biochar (SSBC) and rice straw biochar (RSBC) were used in metal(loid) contaminated soils to investigate the available metal(loid) change in soils and the impact on the metal(loid) bioaccumulation in the plant and earthworm. Moreover, effects of biochar amendments on the gut bacteria of earthworms were determined by using high throughput sequencing. Our results showed that RSBC amendments had a significant suppression on the availability of cadmium, but significantly increased arsenic availability in soils ($P < 0.05$). Compared with the control, the significant reduction of arsenic and cadmium accumulation was observed in plant with biochar amendments. High metal(loid) concentrations were observed in the body tissues of earthworms, in which the highest bioaccumulation factor of cadmium was 18.12 in *Metaphire californica*. The earthworm gut bacteria, with high abundances of Firmicutes (39.36%), Actinobacteria (23.69%) and Proteobacteria (13.02%), was significantly different from the microbe from the soil. RSBC had more significant effect on the bacterial community of earthworm gut than SSBC. Taken together, this work indicated thatbiochar amendments could decrease concentrations of arsenic and cadmium in plant, reduce the potential risk of metal(loid)s into the food chain, and shed light on the biogeochemical behaviour of biochar in the soil-plant-earthworm-bacteria ecosystems.

Accès au document

Vertical distribution of microbial communities and their response to metal(loid)s along the vadose zone-aquifer sediments

Authors: Zhong S, Chen Q, Hu J...

Source: JOURNAL OF APPLIED MICROBIOLOGY, 2020, DOI: 10.1111/jam.14742

Abstract: This study attempted to demonstrate the vertical shift in bacterial, archaeal and fungal communities along the vadose zone-aquifer sediments and their respective responses to environmental factors. We collected samples from the vadose zone and three aquifer sediments along a 42 center dot 5 m bore of a typical agricultural land. The results showed that the bacterial community shifted greatly with depth. The classes of Actinobacteria (19 center dot 5%) and NC10 (11 center dot 0%) were abundant in the vadose zone while Alphaproteobacteria (22 center dot 3%) and Gammaproteobacteria (20 center dot 1%) were enriched in the aquifer. Archaeal and fungal communities were relatively more homogeneous with no significant trend as a function of depth. Process analyses further indicated that selection dominated in the bacterial community, whereas stochastic processes governed archaeal and fungal communities. Moreover environment-bacteria interaction analysis showed that metal(loid)s, especially alkali metal, had a closer correlation with the bacterial community than physicochemical variables. Depth strongly affected bacterial rather than archaeal and fungal communities. Metal(loid)s prevailed over physicochemical variables in shaping the bacterial community in the vadose zone-aquifer continuum. Significance and Impact of the Study Our study provides a new perspective on the structure of microbial communities from the vadose zone to the deep aquifers.

Accès au document

Rhizosphere Soil Fungal Communities of Aluminum-Tolerant and -Sensitive Soybean Genotypes Respond Differently to Aluminum Stress in an Acid Soil

Authors: Shi QH, Liu YT, Shi AQ...

Source: FRONTIERS IN MICROBIOLOGY 11, 2020, DOI: 10.3389/fmicb.2020.01177

Abstract: Different soybean genotypes can differ in their tolerance toward aluminum stress depending on their rhizosphere-inhabiting microorganisms. However, there is limited understanding of the response of fungal communities to different aluminum concentrations across different genotypes. Here, we used metabarcoding of fungal ribosomal markers to assess the effects of aluminum stress on the rhizosphere fungal community of aluminum-tolerant and aluminum-sensitive soybean genotypes. Shifts in fungal community structure were related to changes in plant biomass, fungal abundance and soil chemical properties. Aluminum stress increased the difference in fungal community structure between tolerant and sensitive genotypes. Penicillium, Cladosporium and Talaromyces increased with increasing aluminum concentration. These taxa associated with the aluminum-tolerant genotypes were enriched at the highest aluminum concentration. Moreover, complexity of the co-occurrence network associated with the tolerant genotypes increased at the highest aluminum concentration. Collectively, increasing aluminum concentrations magnified the differences in fungal community structure between the two studied tolerant and sensitive soybean genotypes. This study highlights the possibility to focus on rhizosphere fungal communities as potential breeding target to produce crops that are more tolerant toward heavy metal stress or toxicity in general.

Accès au document

Diagnosing bioremediation of crude oil-contaminated soil and related geochemical processes at the field scale through microbial community and functional genes

Authors: Cai PP, Ning Z, Liu YC...

Source: ANNALS OF MICROBIOLOGY 70, 1, 2020, DOI: 10.1186/s13213-020-01580-x

Abstract: Purpose Bioremediation is widely considered the most desirable procedure for remediation of oil-contaminated soil. Few studies have focused on the relationships among microbial community, functional genes of biodegradation, and geochemical processes

during field bioremediation, which provide crucial information for bioremediation. Methods In the current study, the microbial community and functional genes related to hydrocarbon and nitrogen metabolism, combined with the soil physico-chemical properties, were used to diagnose a set of bioremediation experiments, including bioaugmentation, biostimulation, and phytoremediation, at the field scale. Result The results showed that the added nutrients stimulated a variety of microorganisms, including hydrocarbon degradation bacteria and nitrogen metabolism microorganisms. The functional genes reflected the possibility of aerobic denitrification in the field, which may be helpful in biodegradation. Biostimulation was found to be the most suitable of the studied bioremediation methods in the field. Conclusion We offer a feasible approach to obtain useful bioremediation information and assist with the development of appropriate remediation procedures. The findings improve our knowledge of the interactions between microorganisms and edaphic parameters.

Accès au document

Use of biomass ash to reduce toxicity affecting soil bacterial community growth due to tetracycline antibiotics

Authors : Santas-Miguel V, Fernandez-Sanjurjo MJ, Nunez-Delgado A...

Source: JOURNAL OF ENVIRONMENTAL MANAGEMENT 269, 2020, DOI: 10.1016/j.jenvman.2020.110838

Abstract: Tetracycline antibiotics (TA) used in veterinary medicine reach terrestrial ecosystems mostly via the repeated applications of animal manures and slurries on agricultural soils, where they may cause toxic effects on bacterial communities. In the current work, we studied the efficacy of adding doses of 0, 6, 24 and 48 g kg (-1) of biomass ash (BA) to four different soils to reduce potential negative effects of tetracycline antibiotics. Specifically, soil samples were polluted with different concentrations of tetracycline, oxytetracycline or chlortetracycline, and the bacterial community growth was estimated using the H-3 leucine incorporation technique. Soil amendment with BA increased soil pH (1.3-4.8 units), total carbon (0.7-5.8 g kg (-1)) and Fe and Al oxides concentrations (0.25-3.98 g kg(-1)), as well as bacterial activity (1-9 times compared to the control). In addition, BA amendment at high doses (24 or 48 g kg (-1)) resulted in a similar toxicity decrease for the three antibiotics, but with variations among soils. The reductions in antibiotics toxicity were very variable, ranging between 5% and 100% (total recovery). In view of that, the spreading of BA could be interesting as management practice to reduce risks of soil pollution and subsequent toxicity on bacterial communities due to tetracycline antibiotics.

Accès au document

Additive effects of metal excess and superoxide, a highly toxic mixture in bacteria

Authors: Steunou AS, Babot M, Bourbon L

Source: MICROBIAL BIOTECHNOLOGY, 2020, DOI: 10.1111/1751-7915.13589

Abstract: Heavy metal contamination is a serious environmental problem. Understanding the toxicity mechanisms may allow to lower concentration of metals in the metal-based antimicrobial treatments of crops, and reduce metal content in soil and groundwater. Here, we investigate the interplay between metal efflux systems and the superoxide dismutase (SOD) in the purple bacteriumRubrivivax gelatinosusand other bacteria through analysis of the impact of metal accumulation. Exposure of the Cd2+-efflux mutant Delta cadAto Cd (2+)caused an increase in the amount and activity of the cytosolic Fe-Sod SodB, thereby suggesting a role of SodB in the protection against Cd2+. In support of this conclusion, inactivation ofsodBgene in the Delta cadAcells alleviated detoxification of superoxide and enhanced Cd (2+) toxicity. Similar findings were described in the Cu+-efflux mutant with Cu+. Induction of the Mn-Sod or Fe-Sod in response to metals in other bacteria, includingEscherichia coli, *Pseudomonas aeruginosa*, *Pseudomonas putida*, *Vibrio cholera* and *Bacillus subtilis*, was also shown. Both excess Cd (2+) or Cu(+)and superoxide can damage [4Fe-4S] clusters. The additive effect of metal and superoxide on the [4Fe-4S] could

therefore explain the hypersensitive phenotype in mutants lacking SOD and the efflux ATPase. These findings underscore that ROS defence system becomes decisive for bacterial survival under metal excess.

Accès au document

Enhancing the plants growth and arsenic uptake from soil using arsenite-oxidizing bacteria

Authors: Debiec-Andrzejewska K, Krucon TT, Piatkowska K, Drewniak L

Source: ENVIRONMENTAL POLLUTION 264, 2020, DOI: 10.1016/j.envpol.2020.114692

Abstract: Plants that naturally inhabit arsenic-contaminated areas may be used for effective arsenic-uptake from soil. The efficiency of this process may be increased by the reducing arsenic phytotoxicity and stimulating the activity of indigenous soil microbiota. As we showed, it can be achieved by the bioaugmenting of soil with arsenite-oxidizing bacteria (AOB). This study aimed to investigate the influence of soil bioaugmentation with AOB on the structure, quantity, and activity of the indigenous soil microbiota as well as to estimate the effect of such changes on the morphology, growth rate, and arsenic-uptake efficiency of plants. Plants-microbes interactions were investigated using the effective arsenites oxidizer Ensifer sp. M14 and the native plant alfalfa. The experiments were performed both in potted garden soil enriched with arsenic and in highly arsenic polluted, natural soil. The presence of M14 strain in soil contributed to the increase both in plants growth intensity and arsenic-uptake efficiency with regard to the soil without M14. After 40 days of plants culture, their average biomass increased by about 60% compared to nonbioaugmented soil, while the arsenic accumulation increased more than two times. The soil bioaugmentation contributed also to the increase in the quantity and activity of soil microorganisms without disturbing the natural microbial community structure. In the bioaugmented soil, the noticable increase in the quantity of heterotrophic, denitrifying, nitrifying and cellulolytic bacteria as well as in the activity of dehydrogenases and cellulases were observed. Soil bioaugmentation with M14 enables the application of native and commonly occurring plant species for enhancing the treatment of arseniccontaminated soil. This in situ strategy may constitute a valuable alternative both to the chemical and physical methods of arsenic removal from soil and to the biological ways based on the arsenic hyperaccumulating plants and/or the arsenic mobilizing bacteria.

Accès au document

Lead and cadmium-resistant bacterial species isolated from heavy metal-contaminated soils show plant growth-promoting traits

Authors: Abdollahi S, Golchin A, Shahryari F

Source: INTERNATIONAL MICROBIOLOGY, 2020, DOI: 10.1007/s10123-020-00133-1

Abstract: Application of metal-resistant rhizobacteria is a promising approach for detoxification and bioremediation of contaminated soils. In order to isolate, identify, and characterize lead and cadmium-resistant bacteria, nearly 30 soil samples were collected from heavy metal-contaminated sites, and five resistant bacterial strains were isolated and identified based on their cultural, physiological, biochemical, and molecular characteristics asEnterobacter cloacae, *Enterobacter kobei*, *Bacillus cereus*, *Rhizobium pusense*, and *Agrobacterium tumefaciens*. The nucleotide information of these strains is available in GenBank under the accession numbers of MH327251, MH327252, MH327253, MH327254, and MK123361, respectively. The minimum inhibitory concentrations (MICs) against lead and cadmium differed for each isolate and the isolates showed higher MIC against lead (3500 mu g ml(-1)) than cadmium (100 mu g ml(-1)). Assessment of the heavy metal degradation capacity of the species showed 10-60% and 5-40% reduction in concentrations of lead and cadmium, respectively. The highest ability for P-solubilization was measured for the *R. pusense*, A. *tumefaciens*, and *B. cereus* species, while the *R. pusense* and *B. cereus* species had the capability to solubilize potassium. The studied species also had the ability to produce indole acetic acid (IAA) and/or hydrogen cyanide production (HCN). Inoculation of ornamental

cabbage cultivated in a heavy metal-contaminated soil with the isolated species significantly increased biomass and Pb and Cd uptake of the plant. With respect to plant growth promoting and heavy metal-resistant traits of the studied species, it is concluded that these species can have great significance in bioremediation and management of environmental pollution.

Accès au document

Application of rapeseed residue increases soil organic matter, microbial biomass, and enzyme activity and mitigates cadmium pollution risk in paddy fields

Authors: Yang WT, Zhou H, Gu JF…

Source: ENVIRONMENTAL POLLUTION 264, 2020, DOI: 10.1016/j.envpol.2020.114681

Abstract: Rapeseed (*Brassica napus* L.) is a winter oil crop and biodiesel resource that has been widely cultivated in the southern part of China. Applying rapeseed residue (RSD) to summer rice fields is a common agricultural practice under rice-rapeseed double cropping systems. However, in Cd-contaminated paddy fields, the influence mechanisms of this agricultural practice on the migration and distribution of Cd fractions in soil are not clear. Therefore, a field experiment was carried out to analyse the changes in soil pH, organic matter (OM), microbial biomass carbon (MBC) and nitrogen (MBN), enzyme activity (urease (UA), acid phosphatase (ACP), and dehydrogenase (DH)), Cd distribution fractions, and Cd concentration in rice tissues after RSD application. The results showed that RSD treatment significantly increased the soil OM and MBC concentrations and UA, ACP, and DH activities, decreased the soil acetic acid-extractable fraction of Cd (ACI-Cd), and increased the reducible fraction of Cd (Red-Cd). The formation of stable organic complexes and chelates upon application of RSD is a result of the high affinity of Cd for soil OM. The activities of soil ACP, DH and MBC can well reflect Cd ecotoxicity in soil, particularly the DH activity. In addition, RSD application was helpful in inducing iron plaque formation. The "barrier" effect of iron plaque resulted in reduced Cd accumulation in different tissues of rice. The health risk of rice consumption also decreased as a result of RSD application; it decreased by 0.89-30.0% and 24.1-51.7% in the two tested fields. Overall, the application of RSD was increased soil OM, microbial biomass, and enzyme activity, and these changes was instrumental in reduce the risk of cadmium pollution in rice fields.

Accès au document

The guanidine thiocyanate-high EDTA method for total microbial RNA extraction from severely heavy metal-contaminated soils

Authors: Pei YX, Mamtimin T, Ji J...

Source: MICROBIAL BIOTECHNOLOGY, 2020, DOI: 10.1111/1751-7915.13615

Abstract: Molecular analyses relying on RNA, as a direct way to unravel active microbes and their functional genes, have received increasing attention from environmental researchers recently. However, extracting sufficient and high-quality total microbial RNA from seriously heavy metal-contaminated soils is still a challenge. In this study, the guanidine thiocyanate-high EDTA (GTHE) method was established and optimized for recovering high quantity and quality of RNA from long-term heavy metal-contaminated soils. Due to the low microbial biomass in the soils, we combined multiple strong denaturants and intense mechanical lysis to break cells for increasing RNA yields. To minimize RNAase and heavy metals interference on RNA integrity, the concentrations of guanidine thiocyanate and EDTA were increased from 0.5 to 0.625 ml g(-1) soil and 10 to 100 mM, respectively. This optimized GTHE method was applied to seven severely contaminated soils, and the RNA recovery efficiencies were 2.80 similar to 59.41 mu g g (-1)soil. The total microbial RNA of non-Cr(VI) (NT) and Cr(VI)-treated (CT) samples was utilized for molecular analyses. The result of qRT-PCR demonstrated that the expressions of two tested genes, chrAandyieF, were respectively upregulated 4.12- and 62.43-fold after Cr(VI) treatment. The total microbial RNA extracted from NT and CT samples, respectively,

reached to 26.70 mu g and 30.75 mu g, which were much higher than the required amount (5 mu g) for metatranscriptomic library construction. Besides, ratios of mRNA read were more than 86%, which indicated the high-quality libraries constructed for metatranscriptomic analysis. In summary, the GTHE method is useful to study microbes of contaminated habitats.

Accès au document

The response of arsenic bioavailability and microbial community in paddy soil with the application of sulfur fertilizers

Authors: Tang X, Li LY, Wu C...

Source: ENVIRONMENTAL POLLUTION 264, 2020, DOI: 10.1016/j.envpol.2020.114679

Abstract: Arsenic (As) has been recognized as one of the most toxic metalloids present in the surface soil contaminating food chain and posing threat to human life. Sulfur (S) fertilizer is often supplied in paddy soil for rice growth, but its impact on As mobility and related bacteria remains poorly understood. In this study, a pot experiment was set up with two different types of sulfur treatments (element sulfur and Na2SO4) to evaluate the effect of sulfur fertilizers on As speciation in porewater, As fractions in soil, As accumulation in rice plants. Besides, rhizosphere bacterial composition and functional genes that might influence As mobility were also studied. The results revealed that the addition of 150 mg/kg Na2SO4 decreased As (III) and As(V) concentrations in soil porewater at maturation stage by 77% and 64%, respectively. With the same sulfur content, Na2SO4 was more effective than element sulfur. The addition of sulfur fertilizers promoted rice growth and reduced As accumulation in shoots, further reduced As translocation from root to above-ground parts by 39-59%. The addition of sulfur fertilizers had little effect on genes involved in As metabolism. However, the relative abundance of Fe(III) and sulfate reduction related genera increased with the addition of 150 mg/kg Na2SO4, consistent with the increase of Fe(III) reducing bacteria Geobacteraceae and sulfate reducing gene dsrA. The phenomenon likely influenced the decrease of As concentrations in soil porewater and rice uptake. The outcomes indicate that promoting Fe- and S- reducing bacteria in the rhizosphere by sulfur fertilizers may be one way to reduce As risk in the soil-rice system.

Accès au document

Richness and metallo-tolerance of cultivable fungi recovered from three high altitude glaciers from Citlaltepetl and Iztaccihuatl volcanoes (Mexico)

Authors: Calvillo-Medina RP, Gunde-Cimerman N, Escudero-Leyva E...

Source: EXTREMOPHILES 24, 4: 625-636, 2020, DOI: 10.1007/s00792-020-01182-0

Abstract: In Mexico little is known about high-altitude glacial psychrotolerant or psychrophilic fungal species, with most glacial fungi isolated from polar environments or Alpine glaciers. It has been documented that some of these species may play an important role in bioremediation of contaminated environments with heavy metals. In the present study, 75 fungi were isolated from glaciers in Citlaltepetl (5675 masl) and Iztaccihuatl (5286 masl) volcanoes. Combining morphological characteristics and molecular methods, based on ITS rDNA, 38 fungi were partially identified to genus level, 35 belonging toAscomycotaand three toMucoromycota. The most abundant genera wereCladosporium, followed byAlternariaandSordariomycetesorder. All isolated fungi were psychrotolerant, pigmented and resistant to different concentrations of Cr(III) and Pb(II), while none tolerated Hg(II). Fungi most tolerant to Cr(III) and Pb(II) belong to the generaStemphylium, CladosporiumandPenicilliumand to a lesser extentAureobasidiumandSordariomycetes.To our knowledge, this is the first report on cultivable mycobiota richness and their Cr and Pb tolerance. The results open new research possibilities about fungal diversity and heavy metals myco-remediation. Extremophilic fungal communities should be further investigated before global warming causes permanent changes and we miss the opportunity to describe these sites in Mexico.

Accès au document

https://doi.org/10.15454/9HM9-3C17

Effect of depleted uranium on a soil microcosm fungal community and influence of a plant-ectomycorrhizal association

Authors: Fomina M, Hong JW, Gadd GM

Source: FUNGAL BIOLOGY 124, 5:289-296, 2020, DOI: 10.1016/j.funbio.2019.08.001

Abstract: Fungi are one of the most biogeochemically active components of the soil microbiome, becoming particularly important in metal polluted terrestrial environments. There is scant information on the mycobiota of uranium (U) polluted sites and the effect of metallic depleted uranium (DU) stress on fungal communities in soil has not been reported. The present study aimed to establish the effect of DU contamination on a fungal community in soil using a culture-independent approach, fungal ribosomal intergenic spacer analysis (F-RISA). Experimental soil microcosms also included variants with plants (Pinus silvestris) and P. silvestris/Rhizopogon rubescens ectomycorrhizal associations. Soil contamination with DU resulted in the appearance of RISA bands of the ITS fragments of fungal metagenomic DNA that were characteristic of the genus Mortierella (Mortierellomycotina: Mucoromycota) in pine-free microcosms and for ectomycorrhizal fungi of the genus Scleroderma (Basidiomycota) in microcosms with mycorrhizal pines. The precise taxonomic affinity of the ITS fragments from the band appearing for non-mycorrhizal pines combined with DU remained uncertain, the most likely being related to the sub-phylum Zoopagomycotina. Thus, soil contamination by thermodynamically unstable metallic depleted uranium can cause a significant change in a soil fungal community under experimental conditions. These changes were also strongly affected by the presence of pine seedlings and their mycorrhizal status which impacted on DU biocorrosion and the release of bioavailable uranium species. (C) 2019 British Mycological Society.

Accès au document

Catchment-scale export of antibiotic resistance genes and bacteria from an agricultural watershed in central Iowa

Authors: Neher TP, Ma L, Moorman TB, Howe AC, Soupir ML

Source: PLOS ONE, 15, 1, 2020, DOI: 10.1371/journal.pone.0227136

Abstract: Antibiotics are administered to livestock in animal feeding operations (AFOs) for the control, prevention, and treatment of disease. Manure from antibiotic treated livestock contains unmetabolized antibiotics that provide selective pressure on bacteria, facilitating the expression of anti-microbial resistance (AMR). Manure application on row crops is an agronomic practice used by growers to meet crop nutrient needs; however, it can be a source of AMR to the soil and water environment. This study in central Iowa aims to directly compare AMR indicators in outlet runoff from two adjacent (221 to 229 ha) manured and non-manured catchments (manure comparison), and among three catchments (600 to 804 ha) with manure influence, no known manure application (control), and urban influences (mixed land use comparison). Monitored AMR indicators included antibiotic resistance genes (ARGs) ermB, ermF (macrolide), tetA, tetM, tetO, tetW (tetracycline), sul1, sul2 (sulfonamide), aadA2 (aminoglycoside), vgaA, and vgaB (pleuromutilin), and tylosin and tetracycline resistant enterococci bacteria. Results of the manure comparison showed significantly higher (p< 0.05) tetracycline and tylosin resistant bacteria from the catchment with manure application in 2017, but no differences in 2018, possibly due to changes in antibiotic use resulting from the Veterinary Feed Directive. Moreover, the ARG analysis indicated a larger diversity of ARGs at the manure amended catchment. The mixed land use comparison showed the manure amended catchment had significantly higher ($p < 0.05$) tetracycline resistant bacteria in 2017 and significantly higher tylosin resistant bacteria in 2017 and 2018 than the urban influenced catchment. The urban influenced catchment had significantly higher ermB concentrations in both sampling years, however the manure applied catchment runoff consisted of higher relative abundance of total ARGs. Additionally, both

https://doi.org/10.15454/9HM9-3C17

catchments showed higher AMR indicators compared to the control catchment. This study identifies four ARGs that might be specific to AMR as a result of agricultural sources (tetM, tetW, sul1, sul2) and optimal for use in watershed scale monitoring studies for tracking resistance in the environment.

Accès au document

ERA / PUBLICATIONS SCIENTIFIQUES / PESTICIDES ET FAUNE SAUVAGE

A National-Scale Assessment of Mercury Bioaccumulation in United States National Parks Using Dragonfly Larvae As Biosentinels through a Citizen-Science Framework

Authors: Eagles-Smith CA, Willacker JJ, Nelson SJ, Flanagan Pritz CM, Krabbenhoft DP, Chen CY, Ackerman JT, Grant EH, Pilliod D

Source: Environ Sci Technol 54(14):8779-8790, 2020, DOI: 10.1021/acs.est.0c01255

Abstract: We conducted a national-scale assessment of mercury (Hg) bioaccumulation in aquatic ecosystems, using dragonfly larvae as biosentinels, by developing a citizen-science network to facilitate biological sampling. (...) We assessed the variation in dragonfly Hg concentrations across > 450 sites spanning 100 United States National Park Service units and examined intrinsic and extrinsic factors associated with the variation in Hg concentrations. (...) this continental-scale study demonstrates the utility of dragonfly larvae (...)

Accès au document

Identifying agricultural pesticides that may pose a risk for birds

Authors: Tassin de Montaigu C, Goulson D

Source: Peer J 8:e9526, 2020, DOI: 10.7717/peerj.9526

Abstract: In this study, we analyze changing patterns of pesticide use in agriculture in Great Britain over the 1990–2016 period, with respect to the risk they pose to birds. (...) In this analysis, we estimate the annual 'toxic load' of agricultural pesticide use in Great Britain for birds, measured as the total number of LD50 doses for corn buntings, *Emberiza calandra*. We have previously performed similar analyses for bees, for which the total toxic load increased six-fold during this period. In contrast, for birds the total toxic load fell by 80.5%, (...) The decrease in toxicity is largely due to declining use of highly toxic organophosphates in recent years. (...).

Accès au document

Risk Assessment of Cd, Cu, and Pb from the consumption of hunted meat: red-legged partridge and wild rabbit

Authors: Sevillano-Morales JS, Sevillano-Caño J, Cámara-Martos F…

Source: Biol Trace Elem Res 2020, DOI: 10.1007/s12011-020-02290-w

Abstract: The objective was to assess that potential health risk from Cd, Cu, and Pb, through the consumption of hunted red-legged partridge and wild rabbit meat, (...) The data show that exposure to these metals from eating red-legged partridge and wild rabbit meat from a hunting provenance is relatively low (...) However, a high Pb content in the meat of these species and a high consumption may pose a greater health risk to hunters.

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, Cardoso O…

Source: Journal of Chromatography A, 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. (...)

Extraction recoveries were superior to 50 % even for the most polar TP. (...) Inter-day precision relative standard deviations were inferior to 22 % at LOQ (...)

Accès au document

Avian eggshell thickness in relation to egg morphometrics, embryonic development, and mercury contamination

Authors: Peterson SH, Ackerman JT, Herzog MP…

Source: Ecology and Evolution 2020, DOI: 10.1002/ece3.6570

Abstract: Eggshell thickness is important for physiological, ecological, and ecotoxicological studies on birds; however, empirical eggshell thickness measurements for many species and regions are limited. We measured eggshell thickness at the equator and the egg poles for 12 avian species and related eggshell thickness to egg morphometrics, embryonic development, egg status, and mercury contamination. (...) Within species, eggshell thickness was related to egg width and egg volume for six of the 12 species but was not related to egg length for any species. (...) Using three species (...) whose nests were carefully monitored, eggshell thickness did not differ among (...) total mercury concentrations of the egg content; (...)

Accès au document

Endocrine Disruption: Current approaches for regulatory testing and assessment of plant protection products are fit for purpose

Authors: Day P, Green RM, Gross M, Weltje L, Wheeler JR

Source: TOXICOLOGY LETTERS 296:10-22, 2018, DOI: 10.1016/j.toxlet.2018.07.011

Abstract: The ongoing debate concerning the regulation of endocrine disruptors, has increasingly led to questions concerning the current testing of chemicals and whether this is adequate for the assessment of potential endocrine disrupting effects. This paper describes the current testing approaches for plant protection product (PPP) active substances in the European Union and the United States and how they relate to the assessment of endocrine disrupting properties for human, wildlife and environmental health. (...)

Accès au document

The influence of natural variation and organohalogenated contaminants on physiological parameters in white-tailed eagle (Haliaeetus albicilla) nestlings from Norway

Authors: Loseth ME, Flo J, Sonne C, Krogh AKH, Nygard T, Bustnes JO, Jaspers VLB…

Source: ENVIRONMENTAL RESEARCH 177, 2019, DOI: 10.1016/j.envres.2019.108586

Abstract: (...) Plasma and feather samples were obtained from 70 nestlings at two archipelagos in Norway in 2015 and 2016. The selected physiological parameters were plasma concentrations of thyroid hormones (...), plasma proteins (...) and selected blood clinical chemical parameters (BCCPs) associated with liver and kidney functioning. Feather concentrations of corticosterone (CORTf) were also included to investigate the overall stress level of the nestlings. (...) Most of the variation in each studied physiological parameter was explained by variation between nests, which is most likely due to natural physiological variation of nestlings in these nests. (...) indicates a potential for OHC-induced effects on thyroid hormones, CORTf, prealbumin and BCCPs, which could be of concern in birds exposed to higher OHC concentrations than the present white-tailed eagle nestlings.

Accès au document

Environment and food web structure interact to alter the trophic magnification of persistent chemicals across river ecosystems

Authors: Windsor FM, Pereira MG, Morrissey CA, Tyler CR, Ormerod SJ

Source: SCIENCE OF THE TOTAL ENVIRONMENT 717, 2020, DOI: 10.1016/j.scitotenv.2020.137271

Abstract: Legacy organic pollutants persist in freshwater environments, but there is limited understanding of how their trophic transfer and effects vary across riverine ecosystems with different land use, biological communities and food webs. Here, we investigated the trophic magnification of POPs (...) across nine riverine food webs in contrasting hydrological catchments across South Wales (United Kingdom). (...) data highlight interactions between pollutant properties, environmental conditions and biological network structure in the transfer and biomagnification of POPs (...)

Accès au document

Agrochemicals and neurogenesis

Authors: Rossetti MF, Stoker C, Ramos JG

Source: MOLECULAR AND CELLULAR ENDOCRINOLOGY 2020, DOI: 10.1016/j.mce.2020.110820

Abstract: (...) most of pesticides also act as environmental estrogens, anti-estrogens and/or antiandrogenic chemicals. (...) This review focuses on the most commonly used agrochemicals in Argentina and their effects on the hippocampal neurogenesis of mammals. It also discusses the disruption of hormone synthesis and action as a possible mechanism through which these chemical compounds could alter the brain functions. (...) propose some lines of research to study the potential endocrine mechanisms involved in the effects of agrochemicals on human health and biodiversity.

Accès au document

A sublethal dose of the neonicotinoid insecticide acetamiprid reduces sperm density in a songbird

Authors: Humann-Guilleminot S, Tassin de Montaigu C, Sire J...

Source: Environ Res. 177:108589, 2019, DOI: 10.1016/j.envres.2019.108589

Abstract: Farmland bird species are particularly exposed to pesticides through various pathways. Among pesticides, neonicotinoids insecticides are commonly used in agriculture, but their influence on bird reproductive capacities is poorly understood. In this study, we experimentally tested the effects of the neonicotinoid acetamiprid on House sparrows' sperm quality and oxidative status following ingestion of a low and field-realistic dose of the compound. (...) Birds that received oral doses of acetamiprid suffered a significant decline in their sperm density compared to control birds. (...) These results provide the first evidence of sublethal toxicity of acetamiprid in a songbird and suggest that passerine birds' fertility may be

negatively affected by very small doses of neonicotinoids in the wild.

Accès au document

Bioaccumulation of organochlorine pesticides in the Western Sandpiper (*Calidris mauri*) during the wintering season in Sinaloa, Mexico

Authors: Cruz-Acevedo E, Betancourt-Lozano M, Castillo-Guerrero JA…

Source: Environ Monit Assess 192, 475, 2020, DOI: 10.1007/s10661-020-08458-0

Abstract: The Western Sandpiper, *Calidris mauri*, is one of the most abundant migratory shorebirds in the Western Hemisphere. (...) We described the presence and concentration of 16 organochlorine pesticides (OCPs) in Western Sandpiper muscle and liver tissues collected (...) during the wintering (December–January) and premigration (March–April) periods of 2010 and 2011, respectively. The individual OCP concentrations varied from 0.003 to 0.127 μg/g dry weight (dw) and were lower than the established thresholds for either acute or chronic effects. Western Sandpipers in SM-Premigration had the highest frequency of OCPs (39.3%), followed by EP-Winter (32.1%) and SM-Winter (28.5%). The frequency of occurrence of all OCPs in the liver presented differences between sites during the wintering period as well as between the wintering and premigration periods in SM. (...)

Accès au document

Mercury exposure to swallows breeding in Canada inferred from feathers grown on breeding and non-breeding grounds

Authors: Kardynal KJ, Jardine TD, Génier CSV…

Source: Ecotoxicology, 2020, DOI: 10.1007/s10646-020-02249-6

Abstract: Aerial insectivorous birds such as swallows have been the steepest declining groups of birds in North America over the last 50 years but whether such declines are linked to contaminants has not been examined. We sampled feathers from five species of swallow at multiple locations to assess total mercury [THg] exposure for adults during the non-breeding season, and for juveniles on the breeding grounds. We assessed Hg exposure to juvenile birds in crop- and grass-dominated landscapes to determine if land-use practices influenced feather [THg]. We assayed feathers for stable isotopes (δ2H, δ13C, δ15N) as proxies for relative habitat use and diet to determine their potential influence on feather [THg]. Feather [THg] was highest in adult bank swallows (Riparia riparia) and purple martins (Progne subis) from Saskatchewan and adult cliff swallows (Petrochelidon pyrrhonota) from western regions, indicating differential exposure to Hg on the non-breeding grounds. Juvenile bank, barn (Hirundo rustica) and tree (Tachycineta bicolor) swallows had lower feather [THg] in crop-dominated landscapes than grass-dominated landscapes in Saskatchewan, potentially resulting from lower use of wetland-derived insects due to wetland drainage and intensive agriculture. Feather [THg] was related to juvenile feather stable isotopes for several species, suggesting complex interactions with diet and environmental factors. Many individuals had feather [THg] values 2 μg/g, a threshold at which deleterious effects may occur. Our findings indicate differential Hg exposure among species of swallow, regions and land-uses and highlight the need for additional research to determine dietary and finer-scale land-use impacts on individual species and populations.

Accès au document

A novel use of the leukocyte coping capacity assay to assess the immunomodulatory effects of organohalogenated contaminants in avian wildlife

Authors: Hansen E, Huber N, Bustnes JO, Herzke D, Bårdsen BJ, Eulaers I, Johnsen TV, Bourgeon S

Source: Environment International, 142, 2020, DOI: 10.1016/j.envint.2020.105861

Abstract: Leukocyte Coping Capacity LCC is a functional real-time measure of innate immunity. Higher OHC exposure resulted in a reduced LCC, regardless of OHC concentrations. Our results suggest immunomodulatory effects of both legacy and emerging OHCs. We propose LCC as a relevant assay to expand the toolbox of wildlife ecotoxicology. (...)

Accès au document

Levels and distribution pattern of organochlorine pesticide residues in eggs of 22 terrestrial birds from Tamil Nadu, India

Authors: Venugopal D, Subramanian M, Rajamani J, Palaniyappan J, Samidurai J, Arumugam A

Source: Environ Sci Pollut Res Int 2020, DOI: 10.1007/s11356-020-09978-5

Abstract: Long-term monitoring is essential to assess the patterns and distribution of the residues of organochlorine pesticides (OCPs) in biota. Bird eggs have several advantages than other environmental matrixes, which have been used extensively to portray the accumulation and distribution of OCPs. (...) Eggs found abandoned were collected during nest monitoring between 2001 and 2008 and analyzed for the presence of organochlorine pesticide residues.

The results showed that

- the mean concentrations of total hexachlorohexane (ΣHCHs), total dichlorodiphenyltrichloroethane (ΣDDTs), heptachlor epoxide, and dieldrin ranged from non-detectable (nd) to 2800 ng/g, nd to1000 ng/g, nd to 700 ng/g, and nd to 240 ng/g on a wet mass (wm) basis, respectively.

- The variation in magnitude of contamination among the species and feeding guilds were not significantly different (p > 0.05). (...)Hence, this study indicates the need for continued monitoring and further systematic ecotoxicological investigation of these compounds not only in eggs but also in other environmental media.

Accès au document

Mortality and Cholinesterase Inhibition in Butterflies Following Aerial Naled Applications for Mosquito Control on the National Key Deer Refuge

Authors: Bargar TA, Anderson C, Sowers A

Source: Arch Environ Contam Toxicol 2020, DOI: 10.1007/s00244-020-00745-8

Abstract: Natural resource managers are concerned about the impacts of aerial ultra-low volume spray (ULV) of insecticides for mosquito control (i.e., mosquito adulticides) and seek science-driven management recommendations that reduce risk but allow vector control for nearby human populations. Managers at the National Key Deer Refuge (Florida Keys, FL) are concerned for ULV effects upon conservation efforts for imperiled butterflies (Florida leafwing [Anaea troglodyta floridalis] and Bartram's hairstreak [Strymon acis bartrami] butterflies). (...) To address this uncertainty, cholinesterase activity (ChE) and mortality were monitored for caged butterflies gulf fritillary [Agraulis vanilla] and great southern white [Ascia monuste]) deployed on the Refuge during three aerial ULV applications of the insecticide naled. Residue samplers also were deployed to estimate butterfly exposure. (...) Data from the present study reflect the inconsistent effectiveness of no-spray zones on the Refuge using standard methods employed at the time by the vector control agency in the Florida Keys (...)

Accès au document

Micro QuEChERS-based method for the simultaneous biomonitoring in whole blood of 360 toxicologically relevant pollutants for wildlife

Authors: Rial-Berriel, C; Acosta-Dacal, A; Zumbado, M; Luzardo, OP

Source: Science of The Total Environment 736:139444, 2020, DOI: 10.1016/j.scitotenv.2020.139444

Abstract: This work presents the optimization, validation, and verification of a miniaturized method for the determination of 360 environmental pollutants that are of toxicological concern for wildlife. The method implies a one-step QuEChERS-based extraction of 250 µl whole blood using acidified acetonitrile, followed by two complementary analyses by LC–MS/MS and GC–MS/MS. The optimized conditions allow the simultaneous determination of the major persistent organic pollutants, a wide range of plant protection products, rodenticides, pharmaceuticals, and a suite of metabolites that can be used as biomarkers of exposure. (...) The method was applied to a series of 148 samples of nocturnal and diurnal wild raptors collected during field ecological studies in 2018 and 2019. (...), the results clearly demonstrated that the approach developed (...) makes it very useful to obtain valuable data in biomonitoring studies with only small amounts of sample.

Accès au document

Blood concentrations of 50 elements in Eagle owl (Bubo bubo) at different contamination scenarios and related effects on plasma vitamin levels - ScienceDirect

Authors: Sanchez VP, León-Ortega M, Calvo J, Camarero P…

Source: Environmental Pollution 265:115012, 2020, DOI: 10.1016/j.envpol.2020.115012

Abstract: Some metals and metalloids (e.g. Pb, Hg, Cd and As) are well-known for their bioaccumulation capacity and their toxic effects on birds, but concerns on other minor elements and rare earth elements (ME and REE) are growing due to their intensive use in modern technology and potential toxicity. Vitamins and carotenoids play essential roles in nestling growth and proper development, and are known to be affected by the metals classically considered as toxic. (...) The main goals of this study are: (i) to assess the exposure to 50 elements (i.e. classic toxic elements, trace elements, REE and ME) in nestling Eagle owls (Bubo bubo) inhabiting three differently polluted environments (mining, industrial and control areas) in southeastern Spain, and (ii) to evaluate how element exposure affects plasma vitamin and carotenoid levels, hematocrit and body measurements (mass and wing length) of the individuals.

Our results show that local contamination in the mining area contributes to increased blood concentrations of Pb, As and Tl in nestlings, while diet differences between control and mining/industrial areas may account for the different levels of Mn, Zn, and Sr in blood, and lutein in plasma. Plasma tocopherol levels were increased in the mining-impacted environment, which may be a mechanism of protection to prevent toxic element-related oxidative stress. (...)

Accès au document

Physiological effects of toxic elements on a wild nightjar species

Authors: Espín S, Sánchez-Virosta P, Zamora-Marí JM…

Source: Environmental Pollution 114568, 2020, DOI: 10.1016/j.envpol.2020.114568.

Abstract: Nightjars are considered human-tolerant species due to the population densities reached in strongly managed landscapes. (...) The main aim of this study was to evaluate how metal exposure affects physiology and condition in red-necked nightjar populations inhabiting three different environments in southeastern Spain: agricultural-urban area (n = 15 individuals), mining area (n = 17) and control area (n = 16).

(...) Blood concentrations of toxic metals (As, Pb, Cd and Hg) were negatively associated with calcium, phosphorus, magnesium, ALP, total proteins and body condition index. This could lead to metal-related disorders in mineral metabolism and ALP activity that may potentially increase the risk of skeletal pathologies and consequent risk of fractures in the long term, compromising the survival of individuals.

Accès au document

The effects of climate, habitat, and trophic position on methylmercury bioavailability for breeding New York songbirds

Authors: Adams EM, Sauer AK, Lane O…

Source: Ecotoxicology 2020, DOI: 10.1007/s10646-019-02151-w

Abstract: Mercury (Hg) is a global pollutant that affects songbird populations across a variety of ecosystems following conversion to methylmercury (MeHg)—a form of Hg with high potential for bioaccumulation and bioavailability. (...) Using songbirds as an indicator of MeHg bioavailability in terrestrial ecosystems, we evaluated the role of habitat, climate, and trophic level in dictating MeHg exposure risk across a variety of ecosystems. (...) we found that wetland habitat area within 100 m of capture location, 50-year average of summer maximum temperatures, and trophic position inferred using stable isotope analysis were all correlated with songbird blood Hg concentrations statewide. Moreover, these patterns had a large degree of spatial variability suggesting that the drivers of MeHg bioavailability differed significantly across the state. (...)

Accès au document

Nest-boxes for raptors as a biological control system of vole pests: High local success with moderate negative consequences for non-target species

Authors: Paz Luna A, Bintanel H, Viñuela J, Villanúa D

Source: Biological Control 146, 2020, DOI: 10.1016/j.biocontrol.2020.104267

Abstract: Biological control of rodents in agricultural areas, increasing avian predator abundance by nest-box provisioning, has been proposed during the last decades in several regions around the world as an alternative to the widespread use of anticoagulant rodenticides (AR) to protect crops. (...) Here we test the effectiveness of providing nest-boxes to common kestrels (Falco tinnunculus) and barn owls (*Tyto alba*) in reducing the abundance of two different vole species using indirect index methods to estimate rodent abundance in late spring (May). We monitored the abundance of both vole species in a treatment (with nest boxes) and control (without nest boxes) areas during three years in alfalfa fields, using a BACI design.

Our results showed a clear-cut reduction in the abundance of the two vole species, the common vole (Microtus arvalis) and the mediterranean-pine vole (Microtus duodecimcostatus) in the experimental area after applying the treatment (nest box installation) in alfalfa crops. We also found a significant decrease in the presence of both species of voles on fruit-tree plantations and alfalfa crops but we did not find significant effects in the cereal fields, where voles were in general very scarce. These results suggest higher efficacy of biological control in this study area than in some areas of NW Spain, what could be explained by several non-exclusive hypotheses presented in the discussion.

Accès au document

Mediation of Oxidative Stress Toxicity Induced by Pyrethroid Pesticides in Fish

Authors: Yang C, Lim W, Song G

Source: Comp Biochem Physiol C Toxicol Pharmacol. 234:108758, 2020, DOI: 10.1016/j.cbpc.2020.108758

Abstract: In this review, we examine the occurrence of pyrethroid pesticides in the aquatic environment and oxidative stress-induced toxicity in fish exposed to pyrethroids. Organophosphate and organochlorine pesticides are banned in most countries because they cause high toxicity and bioaccumulation in non-target organisms. However, pyrethroids are approximately 1000 times more toxic to fish than to mammals and birds. Fish-specific organs such as the gills and their late metabolic action against this type of pesticide make fish highly susceptible to the toxicity of pyrethroid pesticides. Oxidative stress plays an important role in the neurological, reproductive, and developmental toxicity caused by pyrethroids. Deltamethrin, cypermethrin, and lambda-

cyhalothrin are representative pyrethroid pesticides (...)

Accès au document

Toxic Elements in Blood of Red-Necked Nightjars (*Caprimulgus Ruficollis*) Inhabiting Differently Polluted Environments

Authors: Espín S, Sánchez-Virosta P, Zamora-Marín JM...

Source: Environ Pollut. 262:114334, 2020, DOI: 10.1016/j.envpol.2020.114334

Abstract: (...) rare earth elements (REE) and other minor elements (ME) are becoming a new threat due to their use in modern technology. (...) The order Caprimulgiformes is among the most understudied groups of birds (...) we sampled 48 red-necked nightjars (Caprimulgus ruficollis) inhabiting three different scenarios of contaminant exposure (agricultural-urban area, n = 15; mining area, n = 17; and control area, n = 16) in southeastern Spain, and report for the first time concentrations of 50 elements (i.e. trace elements, ATSDR's list toxic elements, REE and ME) (...). Concentrations of As, Cd, Pb and Mn were significantly higher in individuals captured at the mining area compared to the other sites. Lead levels in the mine site were of particular concern since it was in the range of blood concentrations related to subclinical/clinical effects in other species, (...) Moreover, additive effects related to metal cocktail exposure in the mining area could be expected. (...) most REE and ME concentrations were close to the LOQ, (...).

Accès au document

Longitudinally Monitored Lifetime Changes in Blood Heavy Metal Concentrations and Their Health Effects in Urban Birds

Authors: Bauerová P, Krajzingrová T, Těšický M...

Source: Sci Total Environ 723:138002, 2020, DOI: 10.1016/j.scitotenv.2020.138002

Abstract: Urban heavy metal pollution can impair the health of humans and other organisms inhabiting cities. While birds are suggested as one of the appropriate bioindicators for essential and non-essential trace element monitoring, the process of particular elements' accumulation in blood and its possible adverse health effects during ageing of individuals remain unexplored. We have investigated lifetime changes in blood lead (Pb), cadmium (Cd), arsenic (As) and zinc (Zn) concentrations and searched for links to health-related traits in sub-urban free-living great tit (Parus major) population (...) This study demonstrates the suitability of avian blood for actual heavy metal spatial and temporal biomonitoring even in situations when the precise age of the individuals remains unknown.

Accès au document

From seeds to plasma: Confirmed exposure of multiple farmland bird species to clothianidin during sowing of winter cereals

Authors: Lennon Rosie J, Peach Will J, Dunn Jenny C, Shore Richard F, Brown Colin D...

Source: Science of The Total Environment 723, 2020, DOI: 10.1016/j.scitotenv.2020.138056

Abstract: (...)little is known about the extent to which farmland birds are exposed to the neonicotinoid compounds during standard agricultural practices. This study uses winter cereal, treated with the neonicotinoid clothianidin, as a test system to examine patterns of exposure in farmland birds during a typical sowing period. The availability of neonicotinoid-treated seed was recorded post-sowing at 39 fields (25 farms) (...) avian blood samples were collected from 11 species of farmland bird from a further six capture sites to quantify the prevalence and level of clothianidin exposure associated with seed treatments. (...) Exposure was confirmed in 32% of bird species observed in treated fields and 50% of individual birds post-sowing ; the median concentration recorded in positive samples was 12 ng/mL. Results here provide clear evidence that a variety of farmland birds are subject to neonicotinoid exposure following normal

agricultural sowing of neonicotinoid-treated cereal seed. Furthermore, the widespread availability of seeds at the soil surface was identified as a primary source of exposure.

Accès au document

Assessment of the effects of early life exposure to triphenyl phosphate on fear, boldness, aggression, and activity in Japanese quail (*Coturnix japonica*) chicks

Authors: Hanas AK, Guigueno MF, Fernie KJ, Letcher RJ, Chamberland FSM, Head A

Source: Environmental Pollution 258, 2020, DOI: 10.1016/j.envpol.2019.113695.

Abstract: Triphenyl phosphate (TPHP) is an organophosphate ester (OPE) used as a flame retardant (FR) and plasticizer. (...) this is the first study on the behavioural effects of TPHP in birds. Early life stage Japanese quail (Coturnix japonica) were exposed to nominal doses of 0 ng/g (vehicle-control), 5 ng/g (low dose), 50 ng/g (mid dose), and 100 ng/g (high dose) TPHP, both as embryos (via air cell injection prior to incubation) and as chicks (via daily gavage until 5 days post-hatch). The low dose reflects TPHP levels recorded in wild avian eggs, but actual environmental exposure levels may be higher given that TPHP is known to be rapidly metabolized in birds. (...) high-TPHP chicks exhibited less neophobia than vehicle-controls, and low-TPHP chicks exhibited more aggression towards conspecifics. No differences were observed in the responses of Japanese quail chicks to activity or tonic immobility (fear response) tests.

Accès au document

Organochlorine pesticides in feathers of three raptor species in southern Brazil

Authors: Aver GF, Espín S, Dal Corno RDB…

Source: Environ Sci Pollut Res 27, 5971–5980, 2020, DOI: 10.1007/s11356-019-07370-6

Abstract: In this study, we determined the presence of organochlorine pesticides (OCPs) in back feathers from three raptor species, Phalcoboenus chimango, Milvago chimachima and Caracara plancus. Samples were obtained from live animals and ten OCPs were detected: alpha-HCH, beta-HCH and gamma-HCH (lindane), heptachlor, heptachlor epoxide, aldrin, endosulfan I, endosulfan II, endosulfan sulfate and p,p'-DDE. The concentrations found were higher than those reported in other raptor species, and C. plancus showed greater values (...) This is the first study reporting OCPs in back feathers of these species in Brazil, (...).

Accès au document

Trace element distribution in tissues and risk of exposure of ruddy shelduck wintering in Nanhaizi Wetland, Baotou, China

Authors: Liu L, Du C, Sun Y…

Source: Environ Sci Pollut Res 27:6429–6437, 2020, DOI: 10.1007/s11356-019-07132-4

Abstract: (...) The Yellow River receives a significant amount of industrial and agricultural wastewater. Therefore, the environmental quality of NHZW directly affects the survival of migratory birds in the Baotou region. We aimed to determine the trace element distribution in tissues and risk of exposure in ruddy shelduck (...) Trace element concentration was greatest in feathers, followed by the kidneys, liver, and muscle, in descending. There was no significant difference in trace element accumulation between sexes. Exposure doses of Hg in water ; Cr, Pb, and Cu in soil ; and Pb, Cu, and Hg in corn were higher than the tolerable daily intake and may adversely affect ruddy shelduck. The calculated hazard quotients (HQ) for trace elements were ranked as follows: Hg Cr Pb Zn Cu As, where Hg and Cr were at high risk levels (HQ 1).

Accès au document

Uptake, Metabolism, and Elimination of Fungicides from Coated Wheat Seeds in

https://doi.org/10.15454/9HM9-3C17

Japanese Quail (*Coturnix japonica*)

Authors: Gross MS, Bean TG, Hladik ML, Rattner BA, Kuivila KM

Source: Journal of Agricultural and Food Chemistry 2020 68(6):1514-1524, DOI: 10.1021/acs.jafc.9b05668

Abstract: Pesticides coated to the seed surface potentially pose an ecological risk to granivorous birds (...). To assess the toxicokinetics of seeds treated, Japanese quail (*Coturnix japonica*) were orally dosed with commercially coated wheat seeds. (...) The high detection frequencies observed in fecal samples potentially offer a non-invasive matrix to monitor pesticide exposure. With the summation of total body burden across plasma, tissue, and fecal samples, less than 9% of the administered dose was identified as the parent fungicide, demonstrating the importance to monitor both active ingredients and their metabolites in biological samples.

Accès au document

Oxidative state of the frugivorous bat *Sturnira lilium* (Chiroptera: Phyllostomidae) in agricultural and urban areas of southern Brazil

Authors: Oliveira FW, Schindler MSZ, Corá DH…

Source: Environ Sci Pollut Res 2020, DOI: 10.1007/s11356-020-09552-z

Abstract: (...) bats have been used to indicate environmental contaminants in urban and agricultural environments, since they are extremely sensitive to changes in the ecosystem and easily accumulate waste in their body tissues. (...) In this study, we aimed to evaluate the oxidative state of *S. lilium* individuals in agricultural and urban areas in southern Brazil. (...) Parameters of the superoxide dismutase (SOD) and catalase (CAT) enzyme activity, non-protein thiols (NPSH), and lipid peroxidation (TBARS) were determined based on liver tissue. (...) The present findings suggest that the species S. lilium, which are widely distributed and abundant in Brazil in urban and agricultural areas, can usefully be employed in biomonitoring programs. (...)

Accès au document

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

Grassland management effects on earthworm communities under ambient and future climatic conditions

Authors: Jaswinder Singh, Erin Cameron, Thomas Reitz, Martin Schädler, Nico Eisenhauer

Source: European Journal of Soil Science 2020, DOI: 10.1111/ejss.12942

Abstract: The impacts of climate change on biodiversity can be modulated by other changing environmental conditions (e.g. induced by land-use change). The potential interactive effects of climate change and land use have rarely been studied for soil organisms. To test the effects of changing climatic conditions and land use on soil invertebrates, we examined earthworm communities across different seasons in different grassland-use types (intensively managed grassland, extensively managed meadow and extensively managed sheep pasture). (...)

Accès au document

Impacts on reproduction of Enchytraeus crypticus in fertilized soils with chicken litter treated with synthetic and natural insecticide

Authors: ManuelaTesta, Aleksandro S.da Silva, Julia Corá Segat, Carolina R.D.Maluche-Baretta, Dilmar Baretta

Source: Environmental Toxicology and Pharmacology 78:103386, 2020, DOI: 10.1016/j.etap.2020.103386

Abstract: Poultry litter is used as a fertilizer due to the high concentration of nutrients. However, this material receives application of medicines, whether they are used to treat animals or the litter itself. Thus, the objective was to evaluate if the application in soils of poultry litter doses treated with two insecticides (cypermethrin and cinnamon oil) used to control of the Alphitobius diaperinus, affect the reproduction of Enchytraeus crypticus, and the insecticides effects over time, trough of ecotoxicological tests using soils with different textural classes an Entisol and an Oxisol.

Accès au document

Alternative Evaluation to Earthworm Toxicity Test in Polychlorinated Biphenyls Spiked and Remediated Soils

Authors: Chungui Yu, Congkai Zhang, Zhe Ye, Xianjin Tang, Jixing Wan, Chaofeng Shen

Source: Bulletin of Environmental Contamination and Toxicology 105:250–254, 2020, DOI: 10.1007/s00128-020-02939-1

Abstract: Polychlorinated biphenyls (PCBs) are a class of persistent organic pollutants that pose a threat to environment and human health. Aiming at predicting PCBs risk in actual soil ecosystem, this study was conducted by chemical and biological methods to assess the bioavailability of PCBs in spiked soil, and in field-contaminated soils before or after remediation. The three chemical methods were Soxhlet, n-butanol and hydroxypropyl-beta-cyclodextrin (HPCD).

Accès au document

Evaluation of certain important biochemical parameters of four tropical earthworms in response to soil moisture and temperature variations

Authors: Acharya P, Mishra CSK

Source: J Environ Biol 41:788-795, 2020, DOI: 10.22438/jeb/41/4/MRN-1257

Abstract: The aim of this study was to evaluate the variation in certain biochemical parameters of the earthworms, Drawida willsi (Sp1), Glyphidrilus tuberosus (Sp2), Lampito mauritii (Sp3) and Perionyx excavates (Sp4) in response to seasonal soil moisture and temperature alterations.

Accès au document

Bioaccumulation and toxic effects of penconazole in earthworms (*Eisenia fetida*) following soil exposure

Authors: Li R, Meng Z, Sun W…

Source: Environmental Science and Pollution Research 2020, DOI: 10.1007/s11356-020-09815-9

Abstract: As an agricultural fungicide, penconazole (PEN) is widely used and has adverse effects on various organisms. In order to evaluate the ecological safety risks of PEN, the bioaccumulation and toxic effects of PEN in

https://doi.org/10.15454/9HM9-3C17

earthworms were studied. (...)In general, exposure to PEN caused oxidative stress and metabolic profile disorders of earthworms. The results of this study will be helpful for further evaluation of soil ecological security of PEN.

Accès au document

Biochemical Toxicity and Potential Detoxification Mechanisms in Earthworms *Eisenia fetida* Exposed to Sulfamethazine and Copper

Authors: Rong H, Wang C, Liu H...

Source: Environ Contam Toxicol 105:255-260, 2020, DOI: 10.1007/s00128-020-02927-5

Abstract: The present study investigated the biochemical toxicity and potential detoxification mechanisms in earthworms *Eisenia fetida* exposed to sulfamethazine (SMZ) (7.5, 15 and 30 mg kg-1) either alone or in combination with Copper (Cu) (100 mg kg-1) in soil.(...)

Accès au document

Novel understanding of toxicity in a life cycle perspective - The mechanisms that lead to population effect - The case of Ag (nano) materials

Authors: Rodrigues NP, Scott-Fordsmand JJ, Amorim MJB

Source: ENVIRONMENTAL POLLUTION 2020, DOI: 10.1016/j.envpol.2020.114277

Abstract: Silver (Ag) is amongst the most well studied nanomaterials (NMs), although most studies have only dealt with a single AgNM at a time and one biological endpoint. We here integrate the results of various testing-tools (endpoints) using a terrestrial worm, the standard ecotoxicological model organism Enchytraeus crypticus. (...) Ag affects the GABAergic system hence organisms were not able to efficiently avoid and became intoxicated, this caused impacts in terms of survival and reproduction.

Accès au document

Evaluation of joint toxicity of heavy metals and herbicide mixtures in soils to earthworms (*Eisenia fetida*)

Authors: Xuzhi Li, Meie Wang, Rong Jiang, Liping Zheng, Weiping Chen

Source: JOURNAL OF ENVIRONMENTAL SCIENCES 2020, DOI: 10.1016/j.jes.2020.03.055

Abstract: It is widely acknowledged that a simplified and robust approach to evaluating thecombined effects of chemical mixtures is critical for ecological risk assessment (ERA) of contaminated soil. The earthworm (Eisenia fetida) was used as a model to study the combined effects of polymetallic contamination and the herbicide siduron in field soil using a microcosm experiment. (...)

Accès au document

Use of integrated biomarker response for evaluating antioxidant stress and DNA damage of earthworms (*Eisenia fetida*) in decabromodiphenyl ethane-contaminated soil

Authors: Zhao Y, Sun L, Li Q, Yan X, Li Z, Liu B, Li G

Source: Environ Pollut 264:114706, 2020, DOI: 10.1016/j.envpol.2020.114706

https://doi.org/10.15454/9HM9-3C17

Abstract: Decabromodiphenyl ethane (DBDPE) is a new and popular type of brominated flame retardant (BFR) with high bromine content, strong thermal stability, and ultraviolet resistance. To evaluate the potential toxicity of this new BFR to soil ecosystem, different concentrations of DBDPE were used to observe effects on earthworms (*Eisenia fetida*) in artificial soil. (...)

Accès au document

DROIT ET POLITIQUE DE L'ENVIRONNEMENT

Plan Ecophyto 2 : lancement d'un nouvel appel à projets national

Actu-environnement 20/08/20

L'Office français de la biodiversité (OFB) et les ministères en charge de l'agriculture et de l'écologie lancent un nouvel appel à projets national dans le cadre du plan Ecophyto 2. Celui-ci vise une réduction de 25 % de l'usage des produits phytopharmaceutiques en 2020 puis de 50 % en 2025. Le plan prévoit aussi d'accompagner 30 000 exploitations dans leur transition vers l'agro-écologie.

Le premier volet de cet appel à projets 2020-2021 est doté d'une enveloppe globale minimum de 2,5 millions d'euros. [...]

Les porteurs de projets pourront déposer leurs lettres d'intention au plus tard le 11 octobre prochain. Puis une seconde phase de dépôt de dossiers complets pour les lettres d'intention sélectionnées est fixée au plus tard le 11 janvier 2021. La liste des projets lauréats sera rendue publique sur les sites Internet de l'OFB et des ministères concernés au plus tard le 31 mars 2021.

Accès au document

REGLEMENTATION / DROIT

Entrée relative à l'acide perfluorooctane sulfonique et ses dérivés (SPFO) : annexe I du règlement (UE) 2019/1021 modifiée

RÈGLEMENT DÉLÉGUÉ (UE) 2020/1203 DE LA COMMISSION du 9 juin 2020 modifiant l'annexe I du règlement (UE) 2019/1021 du Parlement européen et du Conseil en ce qui concerne l'entrée relative à l'acide perfluorooctane sulfonique et ses dérivés (SPFO)

Numéro officiel : UE/2020/1203, Date de signature : 09/06/2020

Liens juridiques : Modification Règlement UE/2019/1021 20/06/2019

Accès au document

Modification de l'annexe I du règlement (UE) 2019/1021 du Parlement européen et du Conseil en ce qui concerne l'inscription du dicofol

RÈGLEMENT DÉLÉGUÉ (UE) 2020/1204 DE LA COMMISSION du 9 juin 2020 modifiant l'annexe I du règlement (UE) 2019/1021 du Parlement européen et du Conseil en ce qui concerne l'inscription du dicofol

https://doi.org/10.15454/9HM9-3C17

Numéro officiel, UE/2020/1204, Date de signature : 09/06/2020

Liens juridiques : Modification Règlement UE/2019/1021 20/06/2019

Accès au document

Liste de vigilance relative aux substances soumises à surveillance à l'échelle de l'Union dans le domaine de la politique de l'eau en vertu de la directive 2008/105/CE

Décision d'exécution (UE) 2020/1161 de la Commission du 4 août 2020 établissant une liste de vigilance relative aux substances soumises à surveillance à l'échelle de l'Union dans le domaine de la politique de l'eau en vertu de la directive 2008/105/CE du Parlement européen et du Conseil [notifiée sous le numéro C (2020) 5205] (Texte présentant de l'intérêt pour l'EEE)

Accès au document

Produit biocide unique dénommé «ClearKlens product based on IPA» autorisé par l'Union

RÈGLEMENT D'EXÉCUTION (UE) 2020/1147 DE LA COMMISSION du 31 juillet 2020 accordant une autorisation de l'Union pour le produit biocide unique dénommé «ClearKlens product based on IPA»

Numéro officiel : UE/2020/1147, Date de signature : 31/07/2020

Accès au document

Conditions d'importation de denrées alimentaires et d'aliments pour animaux originaires des pays tiers à la suite de l'accident survenu à la centrale nucléaire de Tchernobyl

RÈGLEMENT D'EXÉCUTION (UE) 2020/1158 DE LA COMMISSION du 5 août 2020 relatif aux conditions d'importation de denrées alimentaires et d'aliments pour animaux originaires des pays tiers à la suite de l'accident survenu à la centrale nucléaire de Tchernobyl

Numéro officiel : UE/2020/1158, Date de signature : 05/08/2020

Liens juridiques : Abrogation Règlement CE/1635/2006 06/11/2006

Abrogation Règlement CE/1609/2000 24/07/2000

Accès au document

Approbation prolongée des substances actives sulfate d'ammonium et d'aluminium, silicate d'aluminium, farine de sang, carbonate de calcium, dioxyde de carbone...

RÈGLEMENT D'EXÉCUTION (UE) 2020/1160 DE LA COMMISSION du 5 août 2020 modifiant le règlement d'exécution (UE) n° 540/2011 en ce qui concerne la prolongation de la validité de l'approbation des substances actives sulfate d'ammonium et d'aluminium, silicate d'aluminium, farine de sang, carbonate de calcium, dioxyde de carbone, extrait de l'arbre à thé, résidus de distillation de graisses, acides gras de C7 à C20, extrait d'ail, acide gibbérellique, gibbérellines, protéines hydrolysées, sulfate de fer, kieselgur (terre à diatomées), huiles végétales/huile de colza, hydrogénocarbonate de potassium, sable quartzeux, huile de poisson, répulsifs olfactifs d'origine animale ou végétale/graisses de mouton, phéromones de lépidoptères à chaîne linéaire, tébuconazole et urée

Numéro officiel : UE/2020/1160
Date de signature : 05/08/2020

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

Accès au document

https://doi.org/10.15454/9HM9-3C17

Limites maximales applicables aux résidus de chlorpyriphos et de chlorpyriphos-méthyl présents dans ou sur certains produits

RÈGLEMENT (UE) 2020/1085 DE LA COMMISSION du 23 juillet 2020 modifiant les annexes II et V du règlement (CE) n° 396/2005 du Parlement européen et du Conseil en ce qui concerne les limites maximales applicables aux résidus de chlorpyriphos et de chlorpyriphos-méthyl présents dans ou sur certains produits

Numéro officiel : UE/2020/785
Date de signature : 23/07/2020

Liens juridiques : Modification le 06/08/2020 Règlement CE/396/2005 23/02/2005

Accès au document

Icaridine approuvée en tant que substance active existante destinée à être utilisée dans les produits biocides

RÈGLEMENT D'EXÉCUTION (UE) 2020/1086 DE LA COMMISSION du 23 juillet 2020 approuvant l'icaridine en tant que substance active existante destinée à être utilisée dans les produits biocides relevant du type de produits 19

Numéro officiel : UE/2020/1086

Date de signature : 23/07/2020

Accès au document

Non-approbation de certaines substances actives dans des produits biocides

DÉCISION D'EXÉCUTION (UE) 2020/1036 DE LA COMMISSION du 15 juillet 2020 concernant la non-approbation de certaines substances actives dans des produits biocides en vertu du règlement (UE) n° 528/2012 du Parlement européen et du Conseil

Numéro officiel : UE/2020/1036

Date de signature : 15/07/2020

Accès au document

Date d'expiration reportée de l'approbation de la créosote en vue de son utilisation dans les produits biocides

DÉCISION D'EXÉCUTION (UE) 2020/1038 DE LA COMMISSION du 15 juillet 2020 reportant la date d'expiration de l'approbation de la créosote en vue de son utilisation dans les produits biocides relevant du type de produits 8

Numéro officiel : UE/2020/1038

Date de signature : 15/07/2020

Accès au document

Mise sur le marché des produits phytopharmaceutiques : «pyrophosphate ferrique» approuvée en tant que substance active à faible risque

RÈGLEMENT D'EXÉCUTION (UE) 2020/1018 DE LA COMMISSION du 13 juillet 2020 relatif à l'approbation de la substance «pyrophosphate ferrique» en tant que substance active à faible risque, conformément au règlement (CE) n° 1107/2009 du Parlement européen et du Conseil concernant la mise sur le marché des produits phytopharmaceutiques, et modifiant le règlement d'exécution (UE) n° 540/2011 de la Commission

Numéro officiel : UE/2020/1018

Date de signature : 13/07/2020

https://doi.org/10.15454/9HM9-3C17

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

Accès au document

Approbation renouvelée de la substance active «pyriproxyfène»

RÈGLEMENT D'EXÉCUTION (UE) 2020/968 DE LA COMMISSION du 3 juillet 2020 renouvelant l'approbation de la substance active «pyriproxyfène» 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/2020/968
Date de signature : 03/07/2020

Liens juridiques : Modification le 01/08/2020 Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Acide perfluorooctanoïque (PFOA), ses sels et les composés apparentés au PFOA

Rectificatif au règlement délégué (UE) 2020/784 de la Commission du 8 avril 2020 modifiant l'annexe I du règlement (UE) 2019/1021 du Parlement européen et du Conseil aux fins d'y inscrire l'acide perfluorooctanoïque (PFOA), ses sels et les composés apparentés au PFOA

Numéro officiel : UE/2020/784
Date de signature : 09/07/2020

Liens juridiques : Rectification Règlement délégué UE/2020/784 08/04/2020

Accès au document

Approbation renouvelée des substances actives «*Phlebiopsis gigantea* - souches VRA 1835, VRA 1984 et FOC PG 410.3»

RÈGLEMENT D'EXÉCUTION (UE) 2020/1003 DE LA COMMISSION du 9 juillet 2020 renouvelant l'approbation des substances actives «*Phlebiopsis gigantea* - souches VRA 1835, VRA 1984 et FOC PG 410.3» en tant que substances à faible risque 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/2020/1003
Date de signature : 09/07/2020

Liens juridiques : Modification le 01/09/2020 Règlement d'exécution UE/540/2011 25/05/2011

Accès au document

Approbation de la substance de base «lait de vache»

RÈGLEMENT D'EXÉCUTION (UE) 2020/1004 DE LA COMMISSION du 9 juillet 2020 relatif à l'approbation de la substance de base «lait de vache» 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/2020/1004
Date de signature : 09/07/2020

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

Accès au document

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

RÈGLEMENT D'EXÉCUTION (UE) 2020/892 DE LA COMMISSION du 29 juin 2020 concernant le non-renouvellement de l'approbation de la substance active «béta-cyfluthrine», 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/2020/892
Date de signature : 29/06/2020

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

Accès au document

AVIS / EXPERTISES / NORMES

Review of the evidence on bee background mortality

In March 2019, the European Commission mandated EFSA to revise its guidance document on the risk assessment of plant protection products on bees (Apis mellifera, Bombus spp. and solitary bees). One of the aspects of this revision involves are view of the evidence on bee background mortality, which is addressed in this report. Eight different assessment questions were formulated in order to account for the various bee groups, the difference between active and inactive periods, and to specifically consider the influence of beekeeping practices on honey bees. [...]

Accès au document

Évaluation du troisième plan chlordécone et propositions

La chlordécone est un insecticide organochloré qui a été utilisé en Guadeloupe et en Martinique pour lutter contre le charançon du bananier de 1972 à 1993. Toujours présente dans les sols, la chlordécone pollue durablement les écosystèmes via un transfert par l'eau et les plantes. Cette molécule, classée cancérigène possible en 1979, est considérée comme un perturbateur endocrinien. Depuis le début des années 2000, et la publication du premier plan en 2008, l'Etat met en œuvre des actions contre la pollution durable de la terre et des eaux et contre les risques qui en découlent pour la santé humaine et l'environnement. Alors que le plan III (2014-2020) n'est pas achevé et qu'une récente feuille de route (2019-2020) l'a complété, la mission interinspections a mené, dans l'hexagone et aux Antilles, une évaluation administrative, centrée sur l'observation des modalités et de l'effectivité de la mise en œuvre des actions prévues, ainsi que les résultats obtenus au regard des moyens déployés. [...]

Accès au document

NF EN ISO 21479 - Qualité du sol - Détermination des effets des polluants sur la flore du sol - Composition en acides gras foliaires des plantes utilisées pour évaluer la qualité du sol

X31-328, mai 2020

Le présent document décrit une méthode visant à comparer la qualité des sols en déterminant la composition en acides gras des feuilles d'espèces végétales poussant sur ces sols. Cette méthode ne permet pas de déterminer une valeur optimale de l'indice Oméga-3 et ne peut donc pas être utilisée pour déterminer la qualité intrinsèque d'un sol d'une zone spécifique (considérée homogène). La méthode peut être utilisée uniquement pour comparer la qualité des sols entre plusieurs zones. Cette méthode est applicable à : - des sols provenant de sites contaminés; - des sols amendés; - des sols après remédiation; - des sols contenant des produits résiduaires (par exemple lisier, fumier, boues ou composts) . La qualité des sols peut aussi être évaluée en déterminant l'indice Oméga-3 de plantules de Lactuca sativa poussant dans ces sols dans des conditions contrôlées (c'est-à-dire, enceinte phytotronique) et en comparant ces valeurs avec celles obtenues à partir de sols témoins (voir l'Annexe B).

NF EN ISO 20130 - Qualité du sol - Mesure de l'activité enzymatique dans des échantillons de sol en utilisant des substrats colorimétriques

https://doi.org/10.15454/9HM9-3C17

X31-299, mai 2020

Le présent document spécifie une méthode de mesure simultanée (ou non) de plusieurs activités des hydrolases (arylamidase, arylsulfatase, ß-galactosidase, a-glucosidase, ß-glucosidase, N-acétylglucosaminidase, phosphatases acides, alcalines et globales, uréase) dans des échantillons de sol en utilisant des substrats colorimétriques. Les activités enzymatiques du sol varient en fonction des saisons et dépendent des caractéristiques chimiques, physiques et biologiques du sol. Cette méthode peut être appliquée soit pour la détection des effets nocifs de substances toxiques ou d'autres agents anthropiques dans un sol contaminé par comparaison avec un sol de référence, soit pour la réalisation d'essais sur des produits chimiques.

NF EN ISO 21286 - Qualité du sol - Identification des espèces par codes-barres ADN dans les essais d'écotoxicologie

X31-329, avril 2020

Le présent document spécifie un protocole d'identification de spécimens d'essais écotoxicologiques (principalement des invertébrés et des végétaux) au niveau de l'espèce, reposant sur la technique du code-barres ADN. Ce protocole peut être utilisé par les laboratoires effectuant le code-barres ADN afin de normaliser le plus possible les travaux de laboratoire et les flux d'analyse de données, et de les mettre en conformité avec les normes et les lignes directrices communautaires.

NF EN ISO 21285 - Qualité du sol - Inhibition de la reproduction de l'acarien prédateur (*Hypoaspis aculeifer*) par des contaminants du sol

X31-330, avril 2020

Le présent document décrit une méthode d'essai chronique pour évaluer la fonction d'habitat des sols et déterminer les effets des contaminants du sol et des substances sur la reproduction de l'espèce *Hypoaspis aculeifer* par - principalement - absorption par voie alimentaire. Cette méthode est applicable aux sols et matériaux du sol de qualité inconnue, par exemple, provenant de sites contaminés, de sols amendés, de sols ayant fait l'objet d'une remédiation, de sites industriels, agricoles et autres, et aux déchets (par exemple, matériau de dragage, boue résiduaire des stations d'épuration des eaux usées, engrais ou fumier, notamment ceux pour épandage éventuel).

NF EN ISO 15473 - Qualité du sol - Lignes directrices relatives aux essais en laboratoire pour la biodégradation de produits chimiques organiques dans le sol sous conditions anaérobies

X31-334, avril 2020

La présente Norme internationale fournit des lignes directrices pour le choix et la conduite d'essais appropriés en vue de déterminer la biodégradation de produits chimiques organiques dans le sol sous conditions anaérobies. NOTE Si la méthode est utilisée pour des essais dans le cadre de la notification des substances chimiques, une ligne directrice de l'OCDE sur la dégradation dans le sol [20] fournit des recommandations utiles relatives aux exigences d'essais supplémentaires.

An update of the Worldwide Integrated Assessment (WIA) on systemic pesticides. Part 4: Alternatives in major cropping systems

Veres A, Wyckhuys KAG, Kiss J…

Environ Sci Pollut Res 2020, DOI: 10.1007/s11356-020-09279-x

https://doi.org/10.15454/9HM9-3C17

We present a synthetic review and expert consultation that assesses the actual risks posed by arthropod pests in four major crops, identifies targets for integrated pest management (IPM) in terms of cultivated land needing pest control and gauges the implementation "readiness" of non-chemical alternatives. Our assessment focuses on the world's primary target pests for neonicotinoid-based management : (...) First, we queried scientific literature databases and consulted experts from different countries in Europe, North America, and Asia about available IPM tools for each crop-pest system. Next, using an online survey, we quantitatively assessed the economic relevance of target pests by compiling country-level records of crop damage, yield impacts, extent of insecticide usage, and "readiness" status of various pest management alternatives (i.e., research, plot-scale validation, grower-uptake). (...) Our study identifies opportunities to advance applied research, IPM technology validation, and grower education to halt or drastically reduce our over-reliance on systemic insecticides globally.

Accès au document

PUBLICATIONS DU RESEAU ECOTOX

Impact of peri-urban landscape on the organic and mineral contamination of pond waters and related risk assessment

Authors: Nelieu S, Lamy I, Karolak S, Delarue G, Crouzet O, Barraud C, Bimbot M, Allaoui F, Hanot C, Delorme A, Levi Y, Hulot FD, Baudry E

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, Early access August, 2020, DOI: 10.1007/s11356-020-10355-5

Abstract: Ponds are important for their ecological value and for the ecosystem services they provide to human societies, but they are strongly affected by human activities. Peri-urban development, currently one of the most pervasive processes of land use change in Europe, exposes ponds to both urban and agricultural contaminants, causing a potential combination of adverse effects. This study, focused on 12 ponds located in a peri-urban area, has two main objectives: (1) to link the physico-chemical characteristics of the waters and the nature of their contaminants, either organic or mineral, with the human activities around ponds, and (2) to estimate the environmental risk caused by these contaminants. The ponds were sampled during two consecutive years in both spring and in autumn. Although the ponds were distributed over a limited geographical area, their contamination profiles were different and more correlated with the agricultural than the urban land use. In terms of aptitude for biology, half of the ponds were classified in degraded states due to their physico-chemical parameters, but without correlation with the endocrine disrupting activities and the levels of organic pollutants as indicators. The main quantified organic pollutants, however, were pesticides with sufficiently high levels in certain cases to induce an environmental risk exceeding the classical thresholds of risk quotient.

Dietary bioaccumulation of persistent organic pollutants in the common sole *Solea solea* in the context of global change. Part 2: Sensitivity of juvenile growth and contamination to toxicokinetic parameters uncertainty and environmental conditions variability in estuaries

Authors: Mounier F, Loizeau V, Pecquerie L, Drouineau H, Labadie P, Budzinski H, Lobry J

Source: ECOLOGICAL MODELLING 431:109196, 2020, DOI: 10.1016/j.ecolmodel.2020.109196

Abstract: The amount of potentially toxic chemicals in a fish depends on various environmental factors, such as temperature and feeding ecology, which can be affected by Global Changes (GC). The main objective of the present work was to study the relative influence of temperature, food quality and food availability on the growth and contamination of juveniles of common sole (Solea solea), a marine flatfish species known to be a relevant indicator of the nursery quality. It focuses on two Persistent Organic Pollutants (CB153 and L-PFOS) of legacy

and emerging concern, respectively. To achieve this, we used a toxicokinetic (TK) model in which toxicant flows are mechanistically predicted using a bioenergetic model based on the Dynamic Energy Budget (DEB) theory. This modelling framework was applied to juvenile sole from the Gironde estuary (SW France) and allows accounting for the influence of environmental conditions on fish biological processes involved in toxicant fluxes. To compare their respective influence on model predictions of age, length, and contamination at puberty, we included in a global sensitivity analysis: (1) environmental variability gathered from literature for this particular estuary and (2) TK parameters (i.e. assimilation efficiency AE and elimination rate (k) over dot(e)) variability and uncertainty gathered from literature about each contaminant but for different fish species and experimental conditions. Then, model predictions were confronted to fish contamination measurements from the Gironde Estuary with different combinations of TK parameter values from literature. Results highlighted a key role of diet composition on fish contamination and growth while water temperature only affected growth. It stressed the need to focus on GC impact on benthic communities and their consequences on juvenile fish diet for future work on GC scenarios. Furthermore, for both chemical, the range of variability of TK parameters from experiments led to underestimated fish contaminations. The best model fits were obtained using TK parameter values from model applications: from Mounier et al. for CB153 (Solea solea, experiment, AE= 0.8 and =0 d(-1)) and from de Vos et al. (2008) for PFOS (food chain of the Western Scheldt estuary, The Netherlands, AE = 0.8 and (k) over dot(e)=0.8 10(-2) d(-1)).

QuEChERS applicability to measure land snail polycyclic aromatic hydrocarbons for risk assessment

Authors: Morin-Crini N, Louzon M, Amiot C, de Vaufleury A

Source: TOXICOLOGICAL AND ENVIRONMENTAL CHEMISTRY 102 (5-6):209-223, 2020, DOI: 10.1080/02772248.2020.1781855

Abstract: The methods conventionally used for the extraction of organic pollutants in different environmental matrices are not suitable for measuring low concentrations of polycyclic aromatic hydrocarbons bioaccumulated in terrestrial snails that are both indicator of soil quality and a food item of various consumers including human being. A protocol, adapted from the QuEChERS method, originally designed for the extraction of pesticides in fruits and vegetables, in combination with gas chromatography-triple quadrupole mass spectrometry was developed to assess the bioavailability of polycyclic aromatic hydrocarbon extraction at low levels in soils to the soil quality bioindicator Cantareus aspersus. Bioaccumulation was measured in snails exposed ex situ for 28 days under controlled conditions to soils lightly or highly contaminated (sum of 16 molecules in the range 3.32-140 mg kg(-1) dry weight). The method was validated (low limits of detection, linear calibration curves, good precision and trueness) and found to be efficient to show that strongly contaminated soils were not necessarily those that presented the highest bioavailable organics concentrations. This methodology offers a tool to assess the environmental risk of contaminated soils and to prioritize the management of polycyclic aromatic hydrocarbons-contaminated soils.

Challenges and ways forward in pesticide emission and toxicity characterization modeling for tropical conditions

Authors: Gentil C, Fantke P, Mottes C, Basset-Mens C

Source: INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT 25(7):1290-1306, 2020, DOI: 10.1007/s11367-019-01685-9

Abstract: In tropical cropping systems, pesticides are extensively used to fight pests and ensure high crop yields. However, pesticide use also leads to environmental and health impacts. While pesticide emissions and impacts are influenced by farm management practices and environmental conditions, available Life Cycle Inventory (LCI) emission models and Life Cycle Impact Assessment (LCIA) toxicity characterization models are generally designed based on temperate conditions. There is, hence, a need for adapting LCI and LCIA models for

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evaluating pesticides under tropical conditions. To address this need, we aim to identify the characteristics that determine pesticide emissions and related impacts under tropical conditions, and to assess to what extent LCI and LCIA models need to be adapted to better account for these conditions. We investigated the state-of-knowledge with respect to characteristics that drive pesticide emission patterns, environmental fate, human and ecological exposures, and toxicological effects under tropical conditions. We then discuss the applicability of existing LCI and LCIA models to tropical regions as input for deriving specific recommendations for future modeling refinements. Our results indicate that many pesticide-related environmental processes, such as degradation and volatilization, show higher kinetic rates under tropical conditions mainly due to higher temperatures, sunlight radiation, and microbial activity. Heavy and frequent rainfalls enhance leaching and runoff. Specific soil characteristics (e.g., low pH), crops, and cropping systems (e.g., mulching) are important drivers of distinct pesticide emission patterns under tropical conditions. Adapting LCI models to tropical conditions implies incorporating specific features of tropical cropping systems (e.g, intercropping, ground cover management), specific drift curves for tropical pesticide application techniques, and better addressing leaching processes. The validity domain of the discussed LCI and LCIA models could be systematically extended to tropical regions by considering tropical soil types, climate conditions, and crops, and adding active substances applied specifically under tropical conditions, including the consideration of late applications of pesticides before harvest and their effect on crop residues and subsequent human intake. Current LCI and LCIA models are not fully suitable for evaluating pesticide emissions and impacts for crops cultivated in tropical regions. Models should be adapted and parameterized to better account for various characteristics influencing emission and impact patterns under tropical conditions using best available data and knowledge. Further research is urgently required to improve our knowledge and data with respect to understanding and evaluating pesticide emission and impact processes under tropical conditions.

Soil dissipation and bioavailability to earthworms of two fungicides under laboratory and field conditions

Authors: Nelieu S, Delarue G, Amosse J, Bart S, Pery ARR, Pelosi C

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access July, 2020, DOI: 10.1007/s11356-020-10222-3

Abstract: The representativeness of laboratory studies of the fate of pesticides in soil in field conditions is questionable. This study aimed at comparing the dissipation and bioavailability to earthworms of two fungicides, dimoxystrobin (DMX) and epoxiconazole (EPX), over 12 months under laboratory and field conditions. In both approaches, the fungicides were applied to the same loamy soil as a formulated mixture at several concentrations. We determined total DMX and EPX concentrations in the soil using exhaustive extraction, their environmental availability using mild extraction and their bioavailability through internal concentrations in exposed earthworms. The initial fungicide application appeared as much better controlled in terms of dose and homogeneity in the laboratory than in the field. One year after application, a similar dissipation rate was observed between the laboratory and field experiments (ca 80% and 60% for DMX and EPX, respectively). Similarly, the ratio of available/total concentrations in soil displayed the same trend whatever the duration and the conditions (field or lab), EPX being more available than DMX. Finally, the environmental bioavailability of the two fungicides to earthworms was heterogeneous in the field, but, in the laboratory, the bioaccumulation was evidenced to be dose-dependent only for DMX. Our findings suggest that the actual fate of the two considered fungicides in the environment is consistent with the one determined in the laboratory, although the conditions differed (e.g, presence of vegetation, endogeic earthworm species). This study allowed better understanding of the fate of the two considered active substances in the soil and underlined the need for more research dedicated to the link

between environmental and toxicological bioavailability.

Ex situ environmental risk assessment of polluted soils using threshold guide values for the land snail *Cantareus aspersus* (vol 721, 137789, 2020)

Authors: Louzon M, Pauget B, Gimbert F, Morin-Crini N, de Vaufleury A

Source: SCIENCE OF THE TOTAL ENVIRONMENT 737:140740, 2020, DOI: 10.1016/j.scitotenv.2020.140740

Corrigendum: The authors regret that the printed version of the above article contained a number of errors. The correct and final version follows. The authors would like to correct the toxicity point of the polychlorobiphenyls (PCBs) in Table 1 with the value of 600 (ATSDR, 2015) instead of 10. Consecutively the risk coefficients (RC) of PCBs to the only soil for which PCB transfers were found, the soil N2 (Table 4), are: RC PCB 118 = 2376, RC PCB 153 = 2430, ERITPCB = 4806. This change does not alter the discussion and the conclusion of this study. The authors would like to apologize for any inconvenience caused.

Insights into the Function and Horizontal Transfer of Isoproturon Degradation Genes (pdmAB) in a Biobed System

Authors: Storck V, Gallego S, Vasileiadis S, Hussain S, Beguet J, Rouard N, Baguelin C, Perruchon C, Devers-Lamrani M, Karpouzas DG, Martin-Laurent F

Source: APPLIED AND ENVIRONMENTAL MICROBIOLOGY 86(14):e00474-20, 2020, DOI: 10.1128/AEM.00474-20

Abstract: Biobeds, designed to minimize pesticide point source contamination, rely mainly on biodegradation processes. We studied the interactions of a biobed microbial community with the herbicide isoproturon (IPU) to explore the role of the pdmA gene, encoding the large subunit of an N-demethylase responsible for the initial demethylation of IPU, via quantitative PCR (qPCR) and reverse transcription-PCR (RT-qPCR) and the effect of IPU on the diversity of the total bacterial community and its active fraction through amplicon sequencing of DNA and RNA, respectively. We further investigated the localization and dispersal mechanisms of pdmAB in the biobed packing material by measuring the abundance of the plasmid pSH (harboring pdmAB) of the IPU-degrading Sphingomonas sp. strain SH (previously isolated from the soil used in the biobed) compared with the abundance of the pdmA gene and metagenomic fosmid library screening. pdmA abundance and expression increased concomitantly with IPU mineralization, verifying its major role in IPU transformation in the biobed system. DNA- and RNA-based 16S rRNA gene sequencing analysis showed no effects on bacterial diversity. The pdmAB-harboring plasmid pSH showed a consistently lower abundance than pdmA, suggesting the localization of pdmAB in replicons other than pSH. Metagenomic analysis identified four pdmABcarrying fosmids. In three of these fosmids, the pdmAB genes were organized in a wellconserved operon carried by sphingomonad plasmids with low synteny with pSH, while the fourth fosmid contained an incomplete pdmAB cassette localized in a genomic fragment of a Rhodanobacter strain. Further analysis suggested a potentially crucial role of IS6 and IS256 in the transposition and activation of the pdmAB operon.

Behavioural and biochemical alterations in gammarids as induced by chronic metallic exposures (Cd, Cu and Pb): Implications for freshwater biomonitoring

Authors: Lebrun JD, Gismondi E

Source: CHEMOSPHERE 257:127253, 2020, DOI: 10.1016/j.chemosphere.2020.127253

Abstract: In freshwater species, metal toxicity is usually assessed through short-term exposures, hence limiting the practical usefulness of biomarkers for monitoring long-term impacts on wildlife populations. This study investigates the

biological alterations elicited by chronic metallic exposures in Gammarus fossarum using multi-level biomarkers. In aquaria, gammarids were exposed for 10 weeks to field-realistic concentrations of Cd, Cu or Pb (0.25, 1.5 or 5.0 mu g/L). At the individual level, behavioural traits (respiration, locomotion and feeding) were compared between naive and chronically-exposed gammarids. At the cellular level, enzymatic activities involved in digestion, moult and cell stress were monitored after 2, 6 and 10 weeks of exposure in males and females to consider the temporal feature of their responses. Results showed that the inhibitory effects of Cd and Pb on respiration and locomotion disappeared in chronically-exposed gammarids, reflecting acclimation to maintain these processes, unlike Cu. Chronic Cu- and Pb-elicited feeding inhibition was associated with the inhibitions of digestion enzymes. Chitobiase was inhibited by Cu in males and, by Cd and Pb in females, suggesting gender-dependent disturbances in moulting. In both genders, Cd generated cellular stress by stimulating acidic phosphatase and peroxidase activities. To conclude, such cellular impairments and alterations in individual performances are likely to disturb individual growth, population dynamics and litter decomposition in the long-term. Besides, obtaining biological responses, common to metals or specific to a metal or a gender, supports the development of biomarkers highlighting long-term impacts of metals on the health of organisms and their associated ecological functions in natural environments. (C) 2020 Elsevier Ltd. All rights reserved.

Editorial: Microbial Ecotoxicology

Authors: Pesce S, Ghiglione JF, Topp E, Martin-Laurent F

Source: FRONTIERS IN MICROBIOLOGY 11:1342, 2020, DOI: 10.3389/fmicb.2020.01342

Editorial: In the age of the Anthropocene, the world is facing unprecedented environmental challenges that have multifactorial and interlinked causes including population growth, pollution, and climate change. The “One Health” and “EcoHealth” paradigms emphasize the urgent need to protect ecosystem health in order to ensure human well-being and food security (Naeem et al., 2016 ; Destoumieux-Garzón et al., 2018). It is noteworthy that the majority of the 17 United Nations Sustainable Development Goals (UN-SDGs) fundamentally link environmental health to human health and well-being (Blicharska et al., 2019)…

A generic PBTK model implemented in the MCRA platform: Predictive performance and uses in risk assessment of chemicals

Authors: Tebby C, van der Voet H, de Sousa G, Rorije E, Kumar V, de Boer W, Kruisselbrink JW, Bois FY, Faniband M, Moretto A, Brochot C

Source: FOOD AND CHEMICAL TOXICOLOGY 142:111440, 2020, DOI:

Abstract: Physiologically-based toxicokinetic (PBTK) models are important tools for in vitro to in vivo or inter-species extrapolations in health risk assessment of foodborne and non-foodborne chemicals. Here we present a generic PBTK model implemented in the EuroMix toolbox, MCRA 9 and predict internal kinetics of nine chemicals (three endocrine disrupters, three liver steatosis inducers, and three developmental toxicants), in data-rich and data-poor conditions, when increasingly complex levels of parametrization are applied. At the first stage, only QSAR models were used to determine substance-specific parameters, then some parameter values were refined by estimates from substance-specific or high-throughput in vitro experiments. At the last stage, elimination or absorption parameters were calibrated based on available in vivo kinetic data. The results illustrate that parametrization plays a capital role in the output of the PBTK model, as it can change how chemicals are prioritized based on internal concentration factors. In data-poor situations, estimates can be far from observed values. In many cases of chronic exposure, the PBTK model can be summarized by an external to internal dose factor, and interspecies concentration factors can be used to perform interspecies extrapolation. We finally discuss the implementation and use of the model in the MCRA risk assessment platform.

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Effects of low concentrations of deltamethrin are dependent on developmental stages and sexes in the pest moth *Spodoptera littoralis*

Authors: Malbert-Colas A, Drozdz T, Massot M, Bagni T, Chertemps T, Maria A, Maibeche M, Siaussat D

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, Early Access July, 2020, DOI: 10.1007/s11356-020-10181-9

Abstract: Effects of low concentrations of pesticides, with no or moderate mortality of targeted species, are poorly studied even though these low concentrations are common under natural conditions. Studying their effects is critical because they can induce positive hormetic responses, possibly leading to greater pest multiplication and promoting the evolution of pest resistance. Here, we investigated the responses of the pest moth *Spodoptera littoralis* to low concentrations of deltamethrin, and tested for variation in effects of the pesticide between developmental stages and sexes. Indeed, we show that a given concentration of deltamethrin has different effects between stages, and even between sexes. Two experimental concentrations led to very high mortality early in *S. Littoralis* development (4th larval instar), but only to low mortality rates in adults. Moreover, our highest experimental concentration had only detrimental effects in adult females, but improved the reproductive success of adult males. Model projections showed that the lethality from treatments at the 4th larval instar was the predominant effect. Because of the high multiplication rate of *S. littoralis*, it was also found that treatments with very similar effects on larval mortality can lead to either population extinction or rapid pest resurgence.

Temperature effect on perfluorooctane sulfonate toxicokinetics in rainbow trout (*Oncorhynchus mykiss*): Exploration via a physiologically based toxicokinetic model

Authors: Vidal A, Babut M, Garric J, Beaudouin R

Source: AQUATIC TOXICOLOGY 225:105545, 2020, DOI: 10.1016/j.aquatox.2020.105545

Abstract: Salmonids are poikilotherms, which means that their internal temperature varies with that of water. Water temperature thus controls many of their lifecycle processes and physiological functions, which could influence the mechanisms of absorption, distribution, metabolism and excretion (ADME) of many substances, including perfluorinated alkyl acids (PFAAs). However, the processes governing the fate of PFAAs are still poorly understood in fish. Here we developed a physiologically-based toxicokinetic (PBTK) model for rainbow trout (Oncorhynchus mykiss) to study changes in physiological functions and PFAA ADME at different temperatures. The model was calibrated using experimental data from dietary exposure to perfluorooctane sulfonate at 7 degrees C and 19 degrees C. Predictions of PFOS concentrations were globally satisfactory at both temperatures, when accounting for the influence of temperature on growth, ventilation rate, cardiac output, clearances, and absorption rates. Accounting for the influence of temperature on tissue-plasma partition coefficients significantly improved predicted in-organ PFOS concentrations.

The Zebra Mussel (*Dreissena polymorpha*) as a Model Organism for Ecotoxicological Studies: A Prior H-1 NMR Spectrum Interpretation of a Whole Body Extract for Metabolism Monitoring

https://doi.org/10.15454/9HM9-3C17

Authors: Prud'homme SM, Hani YMI, Cox N, Lippens G, Nuzillard JM, Geffard A

Source: METABOLITES 10(6):256, 2020, DOI: 10.3390/metabo10060256

Abstract: The zebra mussel (Dreissena polymorpha) represents a useful reference organism for the ecotoxicological study of inland waters, especially for the characterization of the disturbances induced by human activities. A nuclear magnetic resonance (NMR)-based metabolomic approach was developed on this species. The investigation of its informative potential required the prior interpretation of a reference (1) H NMR spectrum of a lipid-free zebra mussel extract. After the extraction of polar metabolites from a pool of whole-body *D. polymorpha* powder, the resulting highly complex 1D(1)H NMR spectrum was interpreted and annotated through the analysis of the corresponding 2D homonuclear and heteronuclear NMR spectra. The spectrum interpretation was completed and validated by means of sample spiking with 24 commercial compounds. Among the 238 detected (1)H signals, 53% were assigned, resulting in the identification of 37 metabolites with certainty or high confidence, while 5 metabolites were only putatively identified. The description of such a reference spectrum and its annotation are expected to speed up future analyses and interpretations of NMR-based metabolomic studies on *D. Polymorpha* and to facilitate further explorations of the impact of environmental changes on its physiological state, more particularly in the context of large-scale ecological and ecotoxicological studies.

Agrochemicals disrupt multiple endocrine axes in amphibians

Authors: Trudeau VL, Thomson P, Zhang WS, Reynaud S, Navarro-Martin L, Langlois VS,

Source: MOLECULAR AND CELLULAR ENDOCRINOLOGY 513:110861, 2020, DOI: 10.1016/j.mce.2020.110861

Abstract: Concern over global amphibian declines and possible links to agrochemical use has led to research on the endocrine disrupting actions of agrochemicals, such as fertilizers, fungicides, insecticides, acaricides, herbicides, metals, and mixtures. Amphibians, like other species, have to partition resources for body maintenance, growth, and reproduction. Recent studies suggest that metabolic impairments induced by endocrine disrupting chemicals, and more particularly agrichemicals, may disrupt physiological constraints associated with these limited resources and could cause deleterious effects on growth and reproduction. Metabolic disruption has hardly been considered for amphibian species following agrichemical exposure. As for metamorphosis, the key thyroid hormone-dependent developmental phase for amphibians, it can either be advanced or delayed by agrichemicals with consequences for juvenile and adult health and survival. While numerous agrichemicals affect anuran sexual development, including sex reversal and intersex in several species, little is known about the mechanisms involved in dysregulation of the sex differentiation processes. Adult anurans display stereotypical male mating calls and female phonotaxis responses leading to successful amplexus and spawning. These are hormone-dependent behaviours at the foundation of reproductive success. Therefore, male vocalizations are highly ecologically-relevant and may be a non-invasive low-cost method for the assessment of endocrine disruption at the population level. While it is clear that agrochemicals disrupt multiple endocrine systems in frogs, very little has been uncovered regarding the molecular and cellular mechanisms at the basis of these actions. This is surprising, given the importance of the frog models to our deep understanding of developmental biology and thyroid hormone action to understand human health. Several agrochemicals were found to have multiple endocrine effects at once (e.g., targeting both the thyroid and gonadal axes); therefore, the assessment of agrochemicals that alter cross-talk between hormonal systems must be further addressed. Given the diversity of life-history traits in Anura, Caudata, and the Gymnophiona, it is essential that studies on endocrine disruption expand to include the lesser known taxa. Research under ecologically-relevant conditions will also be paramount. Closer collaboration between molecular and cellular endocrinologists and ecotoxicologists and ecologists is thus recommended.

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Trophic Transfer of Micropollutants and Their Metabolites in an Urban Riverine Food Web

Authors: Goutte A, Alliot F, Budzinski H, Simonnet-Laprade C, Santos R, Lachaux V, Maciejewski K, Le Menach K, Labadie P

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY 54(13):8043-8050, 2020, DOI: 10.1021/acs.est.0c01411

Abstract: Trophic magnification factors (TMFs, i.e., the average change in the log-concentration of a pollutant per trophic level) have been extensively assessed for the so-called persistent organic pollutants, especially organochlorine pesticides (OCPs) and poly-chlorinated biphenyls (PCBs), which are biomagnified along the food web. In contrast, trophic dilution was documented for pollutants with a high metabolic conversion rate, such as phthalate plasticizers and polycyclic aromatic hydrocarbons (PAHs). However, the fate of their metabolites across the food web has been rarely investigated. In this comparative study, the trophodynamics of 104 micropollutants and 25 of their metabolites were investigated in a freshwater food web from the urban Orge River, France. Trophic levels were determined using stable isotopes. Pyrethroid pesticides and their metabolites were not detected. As predicted, PCBs and OCPs biomagnified (TMF >1), while all chlorinated paraffins (CPs), PAHs, and phthalates underwent a trophic dilution (TMF <1). TMFs significantly decreased with a metabolic transformation rate and increased with hydrophobicity. The levels of PAH or phthalate metabolites were not significantly correlated with trophic levels or underwent a trophic dilution. This study highlighted that the relative contribution of metabolite levels in TMF values calculated for both parent compound and its metabolite(s) is weak compared to TMF values of the parent compound only in a riverine food web.

A "Population Dynamics" Perspective on the Delayed Life-History Effects of Environmental Contaminations: An Illustration with a Preliminary Study of Cadmium Transgenerational Effects over Three Generations in the *Crustacean Gammarus*

Authors: Cribiu P, Devaux A, Garnero L, Abbaci K, Bastide T, Delorme N, Queau H, Degli Esposti D, Ravanat JL, Geffard O, Bony S, Chaumot A

Source: INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES 21:13:4704, 2020, DOI: 10.3390/ijms21134704

Abstract: We explore the delayed consequences of parental exposure to environmentally relevant cadmium concentrations on the life-history traits throughout generations of the freshwater crustacean *Gammarus fossarum*. We report the preliminary results obtained during a challenging one-year laboratory experiment in this environmental species and propose the use of population modeling to interpret the changes in offspring life-history traits regarding their potential demographic impacts. The main outcome of this first long-term transgenerational assay is that the exposure of spawners during a single gametogenesis cycle (3 weeks) could result in severe cascading effects on the life-history traits along three unexposed offspring generations (one year). Indeed, we observed a decrease in F1 reproductive success, an early onset of F2 offspring puberty with reduced investment in egg yolk reserves, and finally a decrease in the growth rate of F3 juveniles. However, the analysis of these major transgenerational effects by means of a Lefkovitch matrix population model revealed only weak demographic impacts. Population compensatory processes mitigating the demographic consequences of parental exposure seem to drive the modification of life-history traits in offspring generations. This exploratory study sheds light on the role of population mechanisms involved in the demographic

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regulation of the delayed effects of environmental toxicity in wild populations.

Estrogenic activity of surface waters using zebrafish- and human-based in vitro assays: The Danube as a case-study

Authors: Serra H, Brion F, Chardon C, Budzinski H, Schulze T, Brack W, Ait-Aissa S

Source: ENVIRONMENTAL TOXICOLOGY AND PHARMACOLOGY 78:103401, 2020, DOI: 10.1016/j.etap.2020.103401

Abstract: Most in vitro reporter gene assays used to assess estrogenic contamination are based on human estrogen receptor alpha (hER alpha) activation. However, fish bioassays can have distinct response to estrogenic chemicals and mixtures, questioning the relevance of human-based bioassays for assessing risk to this species. In this study, zebrafish liver cells stably expressing zebrafish ER beta 2 (ZELH beta 2) and human breast cancer cells expressing hER alpha (MELN) were used to quantify the estrogenic activity of 25 surface water samples of the Danube River, for which chemicals have been previously quantified. Most samples had a low estrogenic activity below 0.1 ng/L 17 beta-estradiol-equivalents that was more often detected by MELN cells, while ZELH beta 2 response tend to be lower than predicted based on the chemicals identified. Nevertheless, both bioassays quantified well a higher estrogenic activity at two sites, which was confirmed in vivo using a transgenic zebrafish assay. The results are discussed considering the effect-based trigger values proposed for water quality monitoring.

Detrimental sublethal effects hamper the effective use of natural and chemical pesticides in combination with a key natural enemy of *Bemisia tabacion tomato*

Authors: Soares MA, Carvalho GA, Campos MR, Passos LC, Haro MM, Lavoir AV, Biondi A, Zappala L, Desneux N

Source: PEST MANAGEMENT SCIENCE, 2020, DOI: 10.1002/ps.5927

Abstract: Background *Bemisia tabaci* (Hemiptera: Aleyrodidae) represents one of the greatest threats to agricultural crops. Chemical control is the primary tool used in integrated pest management (IPM) programs. However, release of the predator *Nesidiocoris tenuis* (Hemiptera: Miridae) on tomato plants is a highly recommended control tactic. The objective of this study was to evaluate the efficacy of a commercial borax plus citrus oil (BCO) product against *B. tabaciin* the presence and absence of *N. tenuis*. The synthetic insecticide lambda-cyhalothrin was used as a positive control. We also evaluated the sublethal effects of BCO on the behavior and predation rate of *N. tenuis*. Results Our results demonstrated that BCO, alone and at its maximum recommended field rate for *B. tabaci*, was not effective in controlling the pest under laboratory conditions. Application of BCO simultaneous with *N. Tenuis* release did not reduce the increase in the *B. tabaci* population. Effective control of *B. Tabaci* was achieved using only N. tenuis. However, synthetic lambda-cyhalothrin pyrethroid, used here as a control, caused high pest mortality and led to on-site extinction ofN. tenuis, which did not occur for insects exposed to BCO. Lambda-cyhalothrin and BCO significantly affected the foraging behavior of *N. tenuis*, reducing the predation rate, especially following exposure to lambda-cyhalothrin. Conclusion The insecticide lambda-cyhalothrin achieved satisfactory results in suppressing *B. tabaci*, but was harmful to *N. tenuis*. Additionally, lambda-cyhalothrin and BCO affected predator behavior.

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Impact of ageing and soil contaminants on telomere length in the land snail

Authors: Louzon M, Zahn S, Capelli N, Massemin S, Coeurdassier M, Pauget B, Gimbert F, de Vaufleury

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 201:110766, 2020, DOI: 10.1016/j.ecoenv.2020.110766

Abstract: Telomeres (TLs) are non-coding DNA sequences that are usually shortened with ageing and/or chemical exposure. Bioindicators such as the land snail can be used to assess the environmental risk of contaminated soils. As for most invertebrates, the evolution of TLs with ageing or exposure to contaminants is unknown in this mollusc. The aims of this study were to explore the relationships between ageing, contaminant exposure, sublethal effects and TL length in the terrestrial gastropod *Cantareus aspersus*. TL length was investigated in haemocytes from five age classes of C. aspersus. The impact of contaminants on sub-adult snails exposed to Cd, Hg or a mixture of polycyclic aromatic hydrocarbons (PAHs) in soils for one or two months was studied. Bioaccumulation, growth, sexual maturity and TLs were measured. TL attrition was significant for the juvenile and sub-adult stages, but not later. Exposure to Cd increased the mortality (around 30%). Exposure to polluted soils inhibited growth (19-40%) and sexual maturity (6-100%). Although the health of the snails exposed to Cd, Hg and PAHs was altered, TL length in haemocytes was not disturbed, suggesting a high capacity of this snail species to maintain its TLs in haemocytes under chemical stress. These results first address TL length in snails and reveal that the relationship commonly proposed for vertebrates between TL shortening and ageing or exposure to contaminants cannot be generalized.

Feasibility of Metal(loid) Phytoextraction from Polluted Soils: The Need for Greater Scrutiny

Authors: Neaman A, Robinson B, Minkina TM, Vidal K, Mench M, Krutyakov YA, Shapoval OV

Source: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY Early access, 2020, DOI: 10.1002/etc.4787

Abstract: The goal of phytoextraction is to remove contaminants—for example, metal(loid)s—from polluted soils through root uptake and accumulation in the harvested plant parts. Many articles propound phytoextraction as a low-cost means of cleaning up such polluted soils. However, if legislation is based on total soil metal(loid) concentrations, phytoextraction is generally infeasible because of unrealistically long time frames required for success in this process (Robinson et al. 2015)…

Ionising Radiation Induces Promoter DNA Hypomethylation and Perturbs Transcriptional Activity of Genes Involved in Morphogenesis during Gastrulation in Zebrafish

Authors: El Houdigui SM, Adam-Guillermin C, Armant O

Source: INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES 21(11):4014, 2020, DOI: 10.3390/ijms21114014

Abstract: Embryonic development is particularly vulnerable to stress and DNA damage, as mutations can accumulate through cell proliferation in a wide number of cells and organs. However, the biological effects of chronic exposure to ionising radiation (IR) at low and moderate dose rates (< 6 mGy/h) remain largely controversial, raising concerns for environmental protection. The present study focuses on the molecular effects of IR (0.005 to 50 mGy/h) on zebrafish embryos at the gastrula stage (6 hpf), at both the transcriptomics and epigenetics levels. Our results show that

exposure to IR modifies the expression of genes involved in mitochondrial activity from 0.5 to 50 mGy/h. In addition, important developmental pathways, namely, the Notch, retinoic acid, BMP and Wnt signalling pathways, were altered at 5 and 50 mGy/h. Transcriptional changes of genes involved in the morphogenesis of the ectoderm and mesoderm were detected at all dose rates, but were prominent from 0.5 to 50 mGy/h. At the epigenetic level, exposure to IR induced a hypomethylation of DNA in the promoter of genes that colocalised with both H3K27me3 and H3Kme4 histone marks and correlated with changes in transcriptional activity. Finally, pathway enrichment analysis demonstrated that the DNA methylation changes occurred in the promoter of important developmental genes, including morphogenesis of the ectoderm and mesoderm. Together, these results show that the transcriptional program regulating morphogenesis in gastrulating embryos was modified at dose rates greater than or equal to 0.5 mGy/h, which might predict potential neurogenesis and somitogenesis defects observed at similar dose rates later in development.

Dolomite and Compost Amendments Enhance Cu Phytostabilization and Increase Microbiota of the Leachates from a Cu-Contaminated Soil

Authors: Giagnoni L, Borges LGD., Giongo A, Silveira AD, Ardissone AN, Triplett EW, Mench M, Renella G

Source: AGRONOMY-BASEL 10(5):719, 2020, DOI: 10.3390/agronomy10050719

Abstract: The chemical properties, ecotoxicity, and microbiome of leachates from phytomanaged Cu-contaminated soils were analyzed. The phytomanagement was carried out using Cu-tolerant poplar Populus trichocarpa x deltoides cv. Beaupre and black bent Agrostis gigantea L., aided by soil amendments, i.e., dolomitic limestone (DL) and compost (OM), alone and in combination (OMDL). Plants plus either DL or OMDL amendments reduced in leachates the electrical conductivity, the Cu concentration, and the concentration of total organic C except for the OMDL treatment, and decreased leachate toxicity towards bacteria. Total N concentration increased in the OM leachates. The aided phytostabilization increased the culturable bacteria numbers and the proportion of Cu-resistant bacteria in the leachates, as compared to the leachate from the untreated soil. Phytomanagement also enriched the microbial communities of the leachates with plant beneficial bacteria. Overall, the Cu stabilization and phytomanagement induced positive changes in the microbial communities of the soil leachates.

Modeling and optimizing the removal of cadmium by *Sinapis alba* L. from contaminated soil via Response Surface Methodology and Artificial Neural Networks during assisted phytoremediation with sewage sludge

Authors: Jaskulak M, Grobelak A, Vandenbulcke F

Source: INTERNATIONAL JOURNAL OF PHYTOREMEDIATION Early access, 2020, DOI: 10.1080/15226514.2020.1768513

Abstract: The study was aimed to model and optimize the removal of cadmium from contaminated post-industrial soil viaSinapis albaL. by comparing two modeling approaches: Response Surface Methodology (RSM) and Artificial Neural Networks (ANN). The experimental design was done using the Box-Behnken Design method. In the RSM model, the quadratic model was shown to predict the closest results in comparison to our experimental data. For ANN approach, a two-layer Feed-Forward Back-Propagation Neural Network model was designed. The results showed that sewage sludge supplementation increased the efficiency of theSinapis albaplant in removing Cd from the soil. After 28 days of exposure, the removal rate varied from 10.96% without any supplementation to 65.9% after supplementation with the highest possible (law allowed) dose of sewage sludge. The comparison proved that the prediction capability of the ANN model was much higher than that of the RSM model (adjustedR-square:

https://doi.org/10.15454/9HM9-3C17

0.98, standard error of the Cd prediction removal: 0.85 +/- 0.02). Thus, the ANN model could be used for the prediction of heavy metal removal during assisted phytoremediation with sewage sludge. Moreover, such approach could also be used to determinate the dose of sewage sludge that will ensure highest process efficiency.

Can contamination by major systemic insecticides affect the voracity of the harlequin ladybird?

Authors: Dai CC, Ricupero M, Puglisi R, Lu YH, Desneux N, Biondi A, Zappala L

Source: CHEMOSPHERE 256:126986, 2020, DOI: 10.1016/j.chemosphere.2020.126986

Abstract: Systemic neurotoxic insecticides are widely used to control aphid pests worldwide and their potential non-target effects on aphid predators are often unknown. Behavioral responses linked to biological control services are crucial when assessing the compatibility of chemicals with biocontrol organisms. This is particularly relevant for insecticides at low and sublethal concentrations. We studied the acute toxicity and the sublethal effect on the voracity of the generalist predator *Harmonia axyridis* (Coleoptera: Coccinellidae) caused by the exposure to three systemic insecticides routinely used against aphids. The tested insecticide concentrations were the Lethal Concentration 50% (LC50), 20% (LC20) and 1% (LC1) estimated for the target pest Aphis gossypii (Hemiptera: Aphididae) in a companion study. The survival and the voracity differed among the tested chemicals and concentrations, but only thiamethoxam at LC50 caused a significant predator mortality, and individuals that survived showed a reduced predation rate. The predators showed a density independent functional response after the exposure to most of the insecticide-concentration combinations, while an inverse density dependence of the prey consumption rate was observed for coccinellids exposed to sulfoxaflor and thiamethoxam at their lowest tested concentration. The estimated parameters, i.e., the attack rate and the prey handling time, were affected at higher concentrations by both imidacloprid and sulfoxaflor. These findings stress the importance of carefully evaluating side effects of insecticides at very low concentrations on beneficial arthropods in the risk assessment schemes for sustainable pest control programmes.

New protocols for the selection and rearing of *Metoncholaimus pristiurus* and the first evaluation of oxidative stress biomarkers in meiobenthic nematodes

Authors: Allouche M, Nasri A, Harrath AH, Mansour L, Alwasel S, Beyrem H, Bourioug M, Geret F, Boufahja F

Source: ENVIRONMENTAL POLLUTION 263, Part: B:114529, 2020, DOI: 10.1016/j.envpol.2020.114529

Abstract: Meiobenthic nematodes have been designated as sensitive global models in the development of biomonitoring and ecotoxicology monitoring programs howbeit the sensitivity of these organisms against oxidative stress biomarkers have never been addressed. The present study aimed to decipher this research axis after selecting and culturing a single nematode species from an entire community through original laboratory protocols. The purpose of this investigation was to change the grain size of the sediment into the immediate environment of nematodes by progressively adding a biosubstrate made from Sepia officinalis endoskeletton. At the end of the experiment, Metoncholaimus pristiurus became the unique component of the nematode species when the sediment was enriched with 80% of S. officinalis powder. After the mono-species level had been achieved, the selected species was fed on an another biosubstrate made from bodies of Porcellio scaber under the identical laboratory controlled conditions of light and temperature adopted during the selection process. Accordingly, the bioassay protocol this study layed new foundations for the study of meiobenthic nematodes in the biomarker field. Our results revealed that, in case of M. pritiurus, discernible oxidative stress responses are valid for catalase and gluthatione S-transferase. Indeed, for both enzymes, a clear increase in the activity was recorded, and the response was more reinforced when zinc and permethrin were

administrated in combination. The relevance of the protocols proposed in this work parallels their global applicability to reach and maintain the monospecific level in laboratory by using biosubstrates made from animals widely distributed. It is true also that our data provided the first results in terms of biochemical biomarkers for meiobenthic nematodes and showed that the selected taxa, M. pristiurus, could be one of the first marine taxa responding early to the tested stressors, zinc and permethrin, even at very low concentrations.

How to quantify the links between bioavailable contamination in watercourses and pressures of anthropogenic land cover, contamination sources and hydromorphology at multiple scales?

Authors: Sarkis N, Geffard O, Souchon Y, Chandesris A, Ferreol M, Valette L, Alric B, Francois A, Piffady J, Chaumot A, Villeneuve B

Source: SCIENCE OF THE TOTAL ENVIRONMENT 735:139492, 2020, DOI: 10.1016/j.scitotenv.2020.139492

Abstract: Active biomonitoring permits the quantification of biological exposure to chemicals through measurements of bioavailable concentrations in biota and biological markers of toxicity in organisms. It enables respective comparison of the levels of contamination between sites and sampling campaigns. Caged gammarids are recently proposed as relevant probes for measuring bioavailable contamination in freshwater systems. The purpose of the present study was to develop a multi-pressure and multiscale approach, considering metallic contamination levels (from data based on active biomonitoring) as a response to pressures (combination of individual stressors). These pressures were anthropogenic land cover, industry density, wastewater treatment plant density, pressures on stream hydromorphological functioning, riverside vegetation and bioavailability factors. A dataset combining active biomonitoring and potentially related pressures was established at the French national scale, with 196 samplings from 2009 to 2016. The links between pressures and metallic contamination were defined and modelled via structural equation modeling (more specifically partial least squares – path modeling). The model enabled the understanding of the respective influences of pressures on metallic bioconcentration in caged sentinel organisms. Beyond validating the local influence of industries and wastewater treatment plants on metallic contamination, this model showed a complementary effect of driving forces of anthropogenic land cover (leading to human activities). It also quantified a significant influence of pressures on stream hydromorphological functioning, presence of vegetation and physico-chemical parameters on metal bioconcentration. This hierarchical multi-pressure approach could serve as a concept on how pressures and contamination (assessed by active biomonitoring) can be connected. Its future application will enable better understanding of environmental pressures leading to contamination in freshwater ecosystems.

Free or Protein-Bound Microcystin Accumulation by Freshwater Bivalves as a Tool to Evaluate Water Contamination by Microcystin-Producing Cyanobacteria?

Authors: Lepoutre A, Grilot T, Jean S, Geffard A, Lance E

Source: APPLIED SCIENCES-BASEL 10(10), 2020, DOI: 10.3390/app10103426

Abstract: Cyanobacterial proliferations display rapid spatiotemporal variations that can interfere in the assessment of water contamination levels by microcystins (MC), and make necessary the use of integrative tools. This study evaluates the pertinence of bivalves Anodonta anatina and Dreissena polymorpha as bioindicators of the presence of MC-producing cyanobacteria in water. Ingested MC accumulates into two fractions in bivalve tissues-the cellular free and the protein-bound fractions-both forming the total MC fraction. Mussels were exposed to the cyanobacteria Planktothrix

agardhii at densities producing an equivalent of 1, 10 and 100 mu g/L of intracellular MC, with the evaluation of: (i) cyanobacterial cells and MC daily intake by mussels, (ii) free and total MC kinetics in whole individuals (using all the tissues) or only in the digestive gland, during and after the exposure, (iii) bioaccumulation factors. For each species, the kinetics of the two accumulation fractions were compared to evaluate which one best reflect levels and dynamics of MC-producing cyanobacteria in water. Results showed that the dynamic of free MC in bivalve tissues better highlight the dynamic of intracellular MC in water. Using whole D. polymorpha may be appropriate to reveal and discriminate the water contamination levels above densities of cyanobacteria producing 1 mu g MC/L. Digestive glands of A. anatina appeared more sensitive to reveal low environmental concentration, but without direct correlation with levels of water contamination. Further experimentations in situ are necessary to confirm those results in order to propose the use of freshwater bivalves for a biomonitoring of MC-producing cyanobacteria in fresh waters.

Imaging Differential Mercury Species Bioaccumulation in Glass Eels Using Isotopic Tracers and Laser Ablation Inductively Coupled Plasma Mass Spectrometry

Authors: Monperrus M, Pecheyran C., Bolliet V.

Source: APPLIED SCIENCES-BASEL 10(7):2463, 2020, DOI: 10.3390/app10072463

Abstract: Dramatic increases in global mercury pollution require a deeper understanding of specific toxicity mechanisms for mercury compounds in organisms. Despite numerous studies addressing mercury toxicity, the detailed mechanisms underlying its transport and accumulation in fish remain unclear. The aim of this study was to unravel differential uptake pathways for mercury compounds, metabolisation, and sequestration mechanisms in glass eels using techniques able to localize at the tissue and organ levels. A multi isotope image mapping procedure was developed to simultaneously study the uptake and distribution of both mercury compounds MeHg and Hg(II) within the organs of the whole organism. The use of isotopically labelled Hg species (methylmercury (MeHg)-Hg-201 and inorganic mercury Hg-199(II)) and image based on isotope ratio instead of elemental signals allowed to visualize spatially and with time the differential Hg species uptake, transport, and sequestration routes. The results showed a preferential uptake of the MeHg counterpart and a dynamic transport of MeHg within different organs. The gills were the main target organs for MeHg uptake, whereas the skeletal muscle was the final MeHg storage tissue. Hg(II) was found to mainly transit by the gills and the olfactory bulbs with a very low transfer and storage in the other organs and a rapid depuration. No significant internal demethylation and methylation was observed during this experimentation.

Ecosystems monitoring powered by environmental genomics: A review of current strategies with an implementation roadmap

Authors: Cordier T, Alonso-Saez L, Apotheloz-Perret-Gentil L, Aylagas E, Bohan DA, Bouchez A, Chariton A, Creer S, Fruhe L, Keck F, Keeley N, Laroche O, Leese F, Pochon X, Stoeck T, Pawlowski J, Lanzen A

Source: MOLECULAR ECOLOGY Early Access, 2020, DOI: 10.1111/mec.15472

Abstract: A decade after environmental scientists integrated high-throughput sequencing technologies in their toolbox, the genomics-based monitoring of anthropogenic impacts on the biodiversity and functioning of ecosystems is yet to be implemented by regulatory frameworks. Despite the broadly acknowledged potential of environmental genomics to this end, technical limitations and conceptual issues still stand in the way of its broad application by end-users. In addition, the multiplicity of potential implementation strategies may contribute to a perception that the routine application of this methodology is premature or "in development", hence restraining regulators from binding these tools into legal frameworks. Here, we review recent implementations of environmental genomics-based methods, applied to the biomonitoring of ecosystems. By taking a general overview, without narrowing our perspective to

https://doi.org/10.15454/9HM9-3C17

particular habitats or groups of organisms, this paper aims to compare, review and discuss the strengths and limitations of four general implementation strategies of environmental genomics for monitoring: (a) Taxonomy-based analyses focused on identification of known bioindicators or described taxa; (b) De novo bioindicator analyses; (c) Structural community metrics including inferred ecological networks; and (d) Functional community metrics (metagenomics or metatranscriptomics). We emphasise the utility of the three latter strategies to integrate meiofauna and microorganisms that are not traditionally utilised in biomonitoring because of difficult taxonomic identification. Finally, we propose a roadmap for the implementation of environmental genomics into routine monitoring programmes that leverage recent analytical advancements, while pointing out current limitations and future research needs.

Process type is the key driver of the fate of organic micropollutants during industrial scale treatment of organic wastes

Authors: Sertillanges N, Haudin CS, Bourdat-Deschamps M, Bernet N, Serre V, Danel A, Houot S, Patureau D

Source: SCIENCE OF THE TOTAL ENVIRONMENT 734:139108, 2020, DOI: 10.1016/j.scitotenv.2020.139108

Abstract: Organic micropollutants (OMPs) such as polycyclic aromatic hydrocarbons, nonylphenols and pharmaceutical products are ubiquitous in organic wastes generated by most human activities. Those wastes are mainly recycled by land spreading, most often after treatments, such as liming, dewatering, composting or anaerobic digestion. It has been shown essentially at lab scales that biological treatments have an effect on the removal of some OMPs. However, less is known on the role of each step of industrial treatment lines combining physico-chemical and biological treatments on the OMP fate and removal. The present study focuses on the impact of waste treatment on the fate of 53 OMPs along 10 industrial treatment lines treating urban, agricultural wastes or mixtures. The combination of studying a diversity of organic wastes and of OMPs with different characteristics (solubility, ionic charges, hydrophobicity etc.), sampling in situ industrial sites, quantifying native OMP concentrations and looking at each step of complete treatment lines allows for a global and representative view of the OMP fate in the French organic waste treatment sector. Less studied wastes, i.e. territorial mixtures, revealed intermediate OMP contents and compositions, between urban and agricultural wastes. Dewatering and liming, usually dismissed, had a noticeable effect on concentrations. Anaerobic digestion and composting had significant effects on the removal of all pollutant families. Combination of processes enhanced most OMP dissipation. Here we showed for the first time that the process type rather than the waste origin affects dissipation of organic micropollutants. Such data could be used to build and validate dynamic models for the fate of OMPs on solid waste treatment plants.

Benthic diatom growth kinetics under combined pressures of microalgal competition, predation and chemical stressors

Authors: Neury-Ormanni J, Vedrenne J, Morin S

Source: SCIENCE OF THE TOTAL ENVIRONMENT 734:139484, 2020, DOI: 10.1016/j.scitotenv.2020.139484

Abstract: Pesticides are increasingly used worldwide to protect crops. However, only a small fraction of pesticides really hit their target organisms, with the remaining fraction reaching the environment by several phenomena such as leaching, and ending up in aquatic ecosystems: the final receptor of micropollutants. Chemical stressors induce changes in taxonomic composition of fauna and flora which are now the focus of many biomonitoring studies. Interspecific competition and predation are structuring factors of community composition. But the combined effects of biotic relationships (competition, predation) and pesticides are rarely accounted for.

We tested four factors (Predation, Competition, Diuron (Herbicide) and Imidacloprid

https://doi.org/10.15454/9HM9-3C17

(insecticide)) separately on three distinct morphotypes of two diatoms species: Planothidium lanceolatum and Gomphonema gracile (normal and teratogen forms), to quantify the daily growth kinetics of each under varied pressures. The predator used was a nematode, cosmopolitan in soils and aquatic ecosystems (Aphelenchoides bicaudatus). We reproduced experiments combining the factors in binary and ternary combinations. Diuron had lower toxicity than expected, while imidacloprid affected the growth of non-target diatoms. Interalgal competition had marked negative effects on diatom growth kinetics, which increased as supplementary pressures (nematodes and/or pesticides) were added. These results demonstrate that ecological relationships in freshwater biofilms (competition, predation) have a non negligible effect on community composition, population behavior and impacts usually observed. Multistress conditions including the presence of pesticides in freshwaters are expected to affect biodiversity in ways that are hard to predict from simple toxicity assays.

Corbicula fluminea: A sentinel species for urban Rare Earth Element origin

Authors: Pereto C, Coynel A, Lerat-Hardy A, Gourves PY, Schafer J, Baudrimont M

Source: SCIENCE OF THE TOTAL ENVIRONMENT 732:138552, 2020, DOI: 10.1016/j.scitotenv.2020.138552

Abstract: The increase in the global population, coupled with growing consumption of Rare Earth Elements (REEs), has led to increasing transfer of these emerging contaminants into the environment, particularly through the effluents from wastewater treatment plants (WWTP). The objectives of this study were to determine the geochemical quality of a French river subject to strong urban pressure (the Jalle River in the Bordeaux area) and to examine the bioavailability of natural and anthropogenic REEs in a model species of freshwater bivalve, the Asian clam *Corbicula fluminea*. To this end, two fractions (dissolved and total) of the water from the Jalle River were sampled and the bivalves were exposed by in situ caging during a three-month monitoring period. The REE patterns obtained showed the presence of Gadolinium (Gd) anomalies in the dissolved and total fractions as well as in *Corbicula fluminea*. The apparent bioavailability of natural REEs was in the following order for the dissolved fraction: Medium REEs (MREEs) > Light REEs (LREEs) > Heavy REEs (HREEs) and for the particulate fraction: MREEs > LREEs = HREEs. These results highlight the importance of the particulate fraction in the study of the bioavailability of REEs in bivalves. An increase of anthropogenic Gd (Gdanth) was observed in the dissolved fraction between the upstream site (3.4 ng.L−1) and the WWTP Downstream site (48.4 ng.L−1). The Gd anomaly observed in the water was also observed in Corbicula fluminea with a significant increase in the bioaccumulation of Gdanth, from 1.5 ± 1 ng.gDW−1 upstream to 4.1 ± 0.7 ng.g DW−1 downstream of the WWTP effluents, thus confirming the enhanced bioavailability of medical-origin Gd to freshwater bivalves. This study strongly suggests that *Corbicula fluminea* can be used as a sentinel species in the monitoring of Gd contamination of medical origin. It would thus appear important to consider the potential entry of this contaminant into the human food chain via other, commercially exploited bivalve species.

Environmental and Human Health Issues Related to Long-Term Contamination by Chlordecone in the French Caribbean

Authors: Benoit P, Cravedi JP, Desenclos JC, Mouvet C, Rychen G, Samson M

Source: Environmental Science and Pollution Research, Early Access, 2020, DOI: 10.1007/s11356-020-09531-4

Abstract: Chlordecone is an organochlorine insecticide extensively used in the French Caribbean (FC), Guadeloupe and Martinique, from 1972 to 1993. This pesticide, which was applied on banana plantations to control banana weevil, undergoes an extremely slow degradation in the environment and is still present in soils where it was applied. It was only in 1999 that French health and environmental authorities became aware of the extent of the pollution due to chlordecone. In addition to soils, it was detected in rivers and groundwaters as well as in coastal ecosystems, and was found to contaminate the terrestrial and aquatic food

https://doi.org/10.15454/9HM9-3C17

chains. From that date, the consequences of long-term environmental contamination by chlordecone on human and ecosystem health were considered of major concern…

Effects of chronic exposure to a pharmaceutical mixture on the three-spined stickleback (gasterosteus aculeatus) population dynamics in lotic mesocosms

Authors: David V, Joachim S, Catteau A, Not K, Ronkart S, Robert C, Gillard N, Bado-Nilles A, Chadili E, Palluel O, Turies C, Julian N, Castiglione J, Dedourge-Geffard O, Hani Y, Geffard A, Porcher JM, Beaudouin R

Source: AQUATIC TOXICOLOGY 224:105499, 2020, DOI: 10.1016/j.aquatox.2020.105499

Abstract: Pharmaceutical substances are ubiquitous in the aquatic environment and their concentration levels typically range from ng/L up to several pg/L. Furthermore, as those compounds are designed to be highly biologically active, assessing their impacts on non-target organisms is important. Here, we conducted a mesocosm experiment testing a mixture of five pharmaceuticals (diclofenac, carbamazepine, irbesartan, acetaminophen and naproxen) on fish, three-spined stickleback (Gasterosteus aculeatus). The mixture concentration levels were chosen on the basis of the contamination of the Meuse river in Belgium which had been measured previously during a monitoring campaign undertaken in 2015 and 2016. Three nominal mixture concentration levels were tested: the lowest concentration level mixture was composed by environmentally-relevant concentrations that approximate average realistic values for each pharmaceuticals (Mxl); the two other levels were 10 and 100 times these concentrations. Although no impact on stickleback prey was observed, the mixture significantly impaired the survival of female fish introduced in the mesocosms at the highest treatment level without causing other major differences on fish population structure. Impacts on condition factors of adults and juveniles were also observed at both individual and population levels. Using a modelling approach with an individual-based model coupled to a bioenergetic model (DEB-IBM), we concluded that chronic exposure to environmentally-relevant concentrations of five pharmaceuticals often detected in the rivers did not appear to strongly affect the three-spined stickleback populations. Mechanisms of population regulation may have counteracted the mixture impacts in the mesocosms.

Trophic Conditions Influence Widespread Distribution of Aster-Like Nanoparticles Within Aquatic Environments

Authors: Fuster M, Billard H, Mandart M, Steiger J, Sime-Ngando T, Colombet J

Source: MICROBIAL ECOLOGY, Early Access, 2020, DOI: 10.1007/s00248-020-01541-6

Abstract: Aster-like nanoparticles (ALNs) are newly described femto-entities. Their ecology (e.g., geographic distribution, spatial dynamic, preferences, forcing factors) is still unknown. Here, we report that these entities, which have largely been ignored until now, can develop or maintain themselves in most aquatic environments in the Loire River catchment, France. We observed a significant influence of the trophic state on ALN ecological distributions. A positive relationship between prokaryotic abundance and ALN ($r2 = 0.72, p < 0.01$) has been identified, but its exact nature remains to be clarified. Combined with their ubiquitous distribution and high abundances (up to 7.9 x 10(6) ALNs mL (-1)) recorded in our samples, this probably makes ALNs an overlooked functional component in aquatic ecosystems.

OUVRAGES / RAPPORTS / ACTES DE CONGRES

Can the history of pollution shape a better future?

https://doi.org/10.15454/9HM9-3C17

The poisonous legacy of industry holds lessons, two books show.

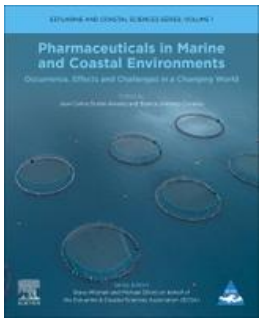
The Chemical Age: How Chemists Fought Famine and Disease, Killed Millions, and Changed Our Relationship with the EarthFrank A. von Hippel Univ. Chicago Press (2020)

The Contamination of the Earth: A History of Pollutions in the Industrial AgeFrançois Jarrige & Thomas Le Roux. Translated by Janice Egan & Michael Egan MIT Press (2020)

Nature 585:25-26, 2020, DOI: 10.1038/d41586-020-02498-9

Accès au document

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, 4th Jan. 2021, 800 p., **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

Heavy Metals in the Environment 1st Edition: Impact, Assessment, and Remediation

Editors: Vinod Kumar Anket Sharma; Elsevier, 1st January 2021, 248 p. ISBN: 9780128216569

Heavy Metals in the Environment: Impact, Assessment, and Remediation synthesizes both fundamental concepts of heavy metal pollutants and state-of-the-art techniques and technologies for assessment and remediation. The book discusses the sources, origin and health risk assessment of heavy metals as well as the application of GIS, remote sensing and multivariate techniques in the assessment of heavy metals. The various contamination indices like contamination factor, geoaccumulation index, enrichment factor, and pollution index ecological risk index are also included to provide further context on the state of heavy metals in the environment.

Covering a variety of approaches, techniques, and scenarios, this book is a key resource for environmental scientists and policymakers working to address environmental pollutants.

Accès au document

REVUE DE PRESSE / ALTERNATIVES / BIOPESTICIDES

Avec la plateforme Openfield, Bioline illustre la 3e voie de l'agriculture

https://doi.org/10.15454/9HM9-3C17

Terre-net 31/08/20

Pour illustrer sur le terrain sa notion de la 3e voie de l'agriculture, Bioline a mis en place la campagne passée la plateforme d'essais Openfield, basée sur l'innovation et la combinaison de solutions. Les visites réelles ayant été compromises par la situation sanitaire du pays, l'entité vous propose une visite digitale via le développement d'un site web dédié.

Face aux différents enjeux du monde agricole, Bioline France prône la mise en œuvre de la 3e voie de l'agriculture (#3VA), synonyme « d'une agriculture performante et durable au bénéfice des consommateurs (objectif 0 % de résidu de pesticides), des agriculteurs (un revenu juste et équitable) et de l'environnement (anticiper les changements climatiques et préserver la biodiversité) ». [...]

Accès au document

Gestion du risque : activer tous les leviers agronomiques

Arvalis 10/08/20

Pour lutter efficacement contre les maladies des céréales, la gestion des résistances et des intrants implique de construire sa protection bien en amont du semis. La prise en compte de certaines données parcellaires (gestion des résidus, rotation, variété) allège la facture de la lutte en végétation. Si la lutte chimique, bien positionnée, est une réponse efficace aux maladies en végétation, elle ne doit pas être le seul recours.

L'essentiel est de l'inscrire dans une approche agronomique globale pour répondre à l'enjeu de produire plus et mieux. L'utilité de ces « bonnes pratiques prophylactiques », qui visent à prévenir l'apparition ou la propagation d'une maladie, n'est pas toujours perçue par l'agriculteur et elles sont parfois oubliées, voire négligées, au profit d'une lutte chimique à laquelle une grande confiance est accordée.

Sommaire :

[...]

Accès au document

REVUE DE PRESSE / ASSOCIATIONS

Ré-autorisation de pesticides interdits : l'UFC-Que Choisir dénonce une grave atteinte démocratique, environnementale et sanitaire

UFC-Que choisir 01/09/20

En voulant ré-autoriser les néonicotinoïdes, dans un premier temps pour la betterave et potentiellement pour toutes les cultures, le Gouvernement met en péril la stratégie française d'éradication des pesticides les plus dangereux. Ce projet, déjà ficelé, ne fera l'objet d'aucun débat au CNTE réuni mardi 1er septembre, d'aucun avis, mais d'une simple présentation. Dans ces conditions, l'UFC-Que Choisir boycottera cette séance en signe de vive protestation quant aux conditions d'élaboration d'un projet aussi critiquable, tant dans ses conséquences sanitaires qu'environnementales. [...]

Accès au document

Alerte Sondage : Près de 7 français sur 10 opposés aux dérogations pour les insecticides néonicotinoïdes sur les cultures de betterave !

Générations futures 25/08/20

Générations Futures demande au gouvernement d'entendre ce rejet massif et de renoncer à réautoriser ces 'tueurs d'abeilles' pour la culture de la betterave !

https://doi.org/10.15454/9HM9-3C17

L'opposition massive des français aux dérogations pour les insecticides néonicotinoïdes 'tueurs d'abeilles' que le gouvernement envisage d'accorder aux betteraviers est confirmée par un sondage Opinion Way réalisé pour Générations Futures et publié ce mardi 25 aout. Ce sondage, réalisé du 19 au 20 aout sur un échantillon de 1028 personnes (constitué selon la méthode des quotas) est en effet sans appel : ce sont 69% des personnes interrogées qui se disent opposées à de telles dérogations. Seulement 29% des sondés se disent favorables à la mesure. [...]

Accès au document

EU microplastics ban set to make a growing problem worse

EEB 1/09/20

The world is being smothered by a growing cloud of toxic plastic particles, which the EU has pledged to ban. But the typical cast of powerful industrial polluters has secured a loophole that excludes nano, the most dangerous form of microplastic.

The EU has promised to tackle microplastic pollution. Its own scientists are warning that the situation is out of control and will be a "widespread risk within a century." [...]

Accès au document

Pesticides and Fertilizers Outrank Fossil Fuels as the Number One Contributor of Hazardous Sulfur Emissions

Beyond Pesticide, August 27, 2020

The latest research finds that pesticides and fertilizers supersede fossil fuels as the greatest contributor of sulfur emissions in the environment, according to U.S. National Science Foundation (NSF)-funded study, published in Nature Geoscience. Particularly, atmospheric sulfur dioxide and reactive sulfur emissions contribute to sulfur deposition via acidic rain and snow, causing a multitude of human and animal of health problems and environmental degradation. Although some U.S. policy regulations curb sulfur emissions from atmospheric sources, alternative sulfur inputs from agricultural sources can cause similar issues as atmospheric sulfur emissions, including acid rain. With peak sulfur concentrations from agricultural outputs up to ten-fold higher than previous 20th-century sulfur levels, studies like these are significant in understanding how underrepresented pollution sources may contribute to overall environmental pollution. Lead author of the study, Eve-Lyn Hinckley, Ph.D., states, "We have an imperative to understand the impact that we're having on the environment. And then we need to work together towards solutions to mitigate those effects." [...]

Accès au document

Neonicotinoids harm shrimp and oyster Health, decrease nutritional value

Beyond Pesticides, August 26, 2020

Neonicotinoid insecticides damage the health of shrimp and oysters, according to two new studies published by Australian researchers. Although this class of chemicals is best known for its hazardous impacts on pollinator populations, it is becoming increasingly clear that the entire food chain is at risk from continued neonicotinoid use. This study builds on an already established body of literature showing these systemic chemicals poison waterways. [...]

Accès au document

Insecticides tueurs d'abeilles : le gouvernement ne doit pas se laisser berner et doit accéder à la demande des 71 000 signataires de notre pétition !

Générations futures 11/08/20

https://doi.org/10.15454/9HM9-3C17

Pourquoi l'argument des betteraviers selon lequel la betterave sucrière ne fleurit pas au champ et ne peut donc pas être visitée par les abeilles (et donc ne pas les impacter) est bidon ! [...]

La question est : est-ce que cette mesure visant à interdire de planter des cultures à fleur après la culture de la betterave « aux néonicotinoïdes » sera suffisante pour protéger les abeilles ?

Notre réponse est clairement : non !

Pourquoi ? Pour 2 raisons :

1 : l'exposition des abeilles et autres pollinisateurs aux néonicotinoïdes se fait aussi, et peut être même surtout, par les fleurs sauvages. Une étude de 2015 montre ainsi clairement que les plantes se trouvant à proximité des cultures traitées aux néonicotinoïdes sont largement contaminées, conduisant ainsi à une contamination importante du pollen ramené dans les ruches.

2 : Les néonicotinoïdes étant persistants, on les retrouve longtemps après l'arrêt de leur utilisation dans les sols cultivés, dans les plantes y poussant LES années suivantes et dans l'environnement des champs traités, exposant ainsi les pollinisateurs à un risque important. [...]

Conclusion :

[...] Il ne faut donc pas que le gouvernement accorde la dérogation à l'utilisation des néonicotinoïdes et c'est la demande de plus de 70 000 citoyen.nes signataires de notre pétition à ce jour !

Accès au document

Une nouvelle étude américaine montre les effets dramatiques des néonicotinoïdes sur les populations d'oiseaux !

Générations futures 12/08/20

Les insecticides néonicotinoïdes sont largement utilisés et ont soulevé des inquiétudes quant aux effets négatifs sur les organismes non cibles.

Cependant, il n'y a pas eu d'étude à grande échelle et généralisable sur leur impact sur la biodiversité des espèces aviaires aux États-Unis. L'étude parue dans Nature sustainability le 10 août 2020 montre, à l'aide d'un riche ensemble de données sur les oiseaux nicheurs et l'utilisation de pesticides aux États-Unis, que l'augmentation de l'utilisation des néonicotinoïdes a conduit à des réductions statistiquement significatives de la biodiversité des oiseaux entre 2008 et 2014, en particulier pour les oiseaux des prairies et insectivores, avec des taux annuels moyens de réduction de 4% et 3% respectivement. [...]

Accès au document

Scientists link toxic Coronavirus disinfectant use to wild animal deaths

Beyond Pesticides, August 13, 2020

An alarming new scientific report finds that excessive, indiscriminate disinfectant use against COVID-19 puts wildlife health at risk, especially in urban settings. The analysis, published in the journal Environmental Research, finds many of the chemical ingredients in disinfectant products are "acutely toxic to both terrestrial and aquatic animals," causing death following exposure. Additionally, these chemicals have implications for human health as infectious disease specialists at the World Health Organization (WHO) warn excessive disinfectant use can cause respiratory problems, especially for those with underlying respiratory conditions. [...]

Accès au document

Néonicotinoïdes : Le ministre a ouvert la boîte de Pandore !

Générations futures 07/08/20

Après la dérogation promise par le Ministre de l'Agriculture pour l'utilisation de néonicotinoïdes sur la culture de la betterave les prochaines années, les producteurs de maïs demandent à leur tour des dérogations pour pouvoir utiliser ces insecticides tueurs d'abeilles ! Générations Futures demande au Ministre de l'Agriculture de revenir sur sa décision pour refermer la boîte de Pandore des dérogations, véritable système organisé pour contourner la Loi ! [...]

Accès au document

https://doi.org/10.15454/9HM9-3C17

Dérogations pour les insecticides tueurs d'abeilles : Générations Futures réagit et s'insurge !

Générations futures 06/08/20

Fin juillet notre association s'insurgeait contre l'attitude de quatre vice-présidents élus dans des régions betteravières (Hauts-de-France, Grand Est, Ile-de-France et Normandie) qui s'exprimaient aux côtés de plusieurs représentants de la CGB (planteurs de betteraves) lors d'une conférence de presse le 29 juillet 2020, demandant à retoucher à la loi pour permettre, par dérogation, l'usage des néonicotinoïdes en protection de semences (lire notre CP ici).

Force est de constater que notre colère face à la pression des betteraviers était légitime car nous venons d'apprendre que le ministère de l'Agriculture va accorder des dérogations permettant d'utiliser des néonicotinoïdes sur cette culture. Le Ministère annonce une modification législative cet automne pour permettre explicitement, pour la campagne 2021 et le cas échéant les deux campagnes suivantes tout au plus, le recours à l'article 53 du règlement européen n°1107/2009 pour pouvoir prendre au moment des semis une dérogation de 120 jours pour les semences enrobées. [...]
Accès au document

Intox sur les pesticides dans l'eau à Tautavel : l'eau du robinet est archi potable.

Alerte-environnement 31/07/20

La diffusion sur TF1 il y a quelques jours d'un reportage sur les habitants de Tautavel (Midi-Pyrénées) nous donne l'occasion de nous pencher sur la problématique des pollutions de l'eau aux pesticides et de tordre le coup à la propagande des marchands de peur.[…]

En l'occurrence, les habitants de Tautavel sont privés d'eau potable depuis un mois et demi et bien sûr, la colère monte. […]

La présence des résidus de pesticides dans l'eau potable est encadrée par la directive européenne 98/83/CE. Ce texte fixe des limites de qualité pour les pesticides : 0,1 µg/L par substance et 0,5 µg/L pour la somme de ces substances.

Selon les informations rapportées dans les média pour Tautavel, cette pollution de l'eau serait due à la présence de résidus de deux pesticides : le thiaméthoxame (famille des néonicotinoïdes, interdit en 2018) et le fluxapyroxade. Les taux de résidus de ces deux substances ont dépassé chacune le seuil réglementaire de 0,1 µg/L et cumulés, le taux de 0,5 µg/L, ce qui a déclenché une alerte de l'Agence régionale de Santé et une interdiction de boire l'eau du robinet.

Effectivement, […] sur le site dédié, on trouve ces données datant du 24 juin :

Le taux de résidus de thiaméthoxame est donc revenu en deçà du seuil de 0,1 µg/L et celui du Fluxapyroxade est au toujours au-dessus, ce qui justifierait l'interdiction toujours en vigueur de boire l'eau potable.

Sauf que […] le seuil de 0,1 µg/L est un seuil de qualité de l'eau potable et non pas un seuil sanitaire. Pour certaines substances, un seuil sanitaire a été défini (appelé Vmax). En l'occurrence, pour le fluxapyroxade, cette valeur est de 44 µg/L. Qu'en déduire ? C'est que l'eau de Tautavel est parfaitement potable depuis fin juin ! Qu'attend l'Agence régionale de santé pour l'annoncer et pour rassurer la population ? Quant aux ONG qui surfent sur ce sujet, elles confirment leur rôle de marchandes de peur.

Accès au document

28 Pesticides Linked to Mammary Gland Cancer, Inadequately Reviewed by EPA

Beyond Pesticides, August 7, 2020

Research out of the Silent Spring Institute identifies 28 registered pesticides linked with development of mammary gland tumors in animal studies. Study authors Bethsaida Cardona and Ruthann Rudel also report that many of the pesticides they investigated behave as endocrine disruptors; breast cancers in humans are significantly influenced by hormones generated by the endocrine system. The Environmental Protection Agency (EPA) acknowledges that nine of these 28 pesticide compounds cause mammary tumors, but dismisses the evidence of the other 19. The results of this research, published in the journal Molecular and Cellular Endocrinology,

https://doi.org/10.15454/9HM9-3C17

evince Beyond Pesticides' long-standing argument that the risk assessment process used by EPA for its pesticide registration process is substantially inadequate to protect human health. [...]

Accès au document

Tentatives d'affaiblissement de la future stratégie européenne sur les produits chimiques au sein de la Commission

Générations futures 28/7/20

Rappelons que dans le cadre du pacte vert pour l'Europe (European Green Deal), lancé en décembre 2019 afin de rendre l'économie de l'UE durable et notamment d'atteindre l'ambition « zéro pollution » pour un environnement exempt de substances toxiques, la stratégie européenne durable sur les produits chimiques (Chemical strategy for sustainability) est actuellement en cours d'élaboration. Cette stratégie visant à réduire les risques liés à la production et à l'utilisation de produits chimiques dangereux, et ainsi à mieux protéger les citoyens et l'environnement tout en encourageant l'innovation pour le développement de solutions de substitution sûres et durables, devrait être présentée par la Commission à l'automne.

Rappelons également que le Parlement européen adoptait vendredi 10 juillet une résolution à une large majorité (579 voix pour, 18 contre et 84 abstentions) sur la stratégie de l'UE sur les produits chimiques, établissant un programme détaillé pour la Commission européenne afin de placer la protection de notre santé et de l'environnement au premier plan. [...]

A présent, la direction générale chargée de l'environnement (DG Environnement) au sein de la Commission a pour mission d'élaborer cette stratégie. Or, nous avons appris que son contenu faisait l'objet de vifs débats. La bataille se joue notamment entre la DG Environnement et la direction générale chargée du marché unique, de l'industrie, de l'entrepreneuriat et des petites entreprises (DG Grow), présidée par le Français Thierry Breton.

Plusieurs médias, dont le quotidien Le Monde, ont eu accès au projet de texte amendé et commenté par la DG Growqui cherche explicitement à vider de sa substance la stratégie. Les commentaires visent principalement à sauvegarder les intérêts économiques des entreprises, à minimiser les preuves scientifiques existantes sur les effets sur la santé et l'environnement d'un nombre important de produits chimiques présentes sur le marché européen, et à freiner l'adoption de mesures en faveur de la santé publique. [...]

Accès au document

Générations Futures s'oppose fermement aux insecticides néonicotinoïdes dans les plantations de betteraves !

Générations futures 30/07/20

Non à la pression des betteraviers !

Alerte. Quatre vice-présidents élus dans des régions betteravières (Hauts-de-France, Grand Est, Ile-de-France et Normandie) se sont exprimés aux côtés de plusieurs représentants de la CGB (planteurs de betteraves) lors d'une conférence de presse le 29 juillet 2020, demandant à retoucher à la loi pour permettre, par dérogation, l'usage des néonicotinoïdes en protection de semences.

Rappel. Les néonicotinoïdes ont été interdits dans les champs français à partir du samedi 1er septembre 2018 en France, afin de protéger les colonies d'abeilles décimées par l'usage de ces produits chimiques très toxiques. […]

« Face à la pression des betteraviers, Générations Futures se positionne fermement contre d'éventuelles dérogations accordées à des néonicotinoïdes pour la culture de la betterave car ces substances sont trop dangereuses pour l'environnement et la santé pour être utilisées en agriculture. De telles dérogations constitueraient une régression inacceptable en matière de politique agricole et de santé environnementale, totalement incompatible avec les objectifs affichés par le gouvernement dans ces domaines. » déclare François Veillerette, Directeur de Générations Futures.

Accès au document

https://doi.org/10.15454/9HM9-3C17

Long-Term Pesticide Exposure Linked to Hearing Loss in Farmworkers

Beyond Pesticides, July 30, 2020

Simultaneous exposure to pesticides and noise from agricultural machinery increases farmworkers, risk of hearing loss, according to the study, "Hearing Loss in Agricultural Workers Exposed to Pesticides and Noise," published in the journal Annals of Work Exposures and Health. Hearing loss is the 3rd most common health issue in the U.S., affecting eight million Americans. Although specific conditions like age, illness, and genetics, can mediate hearing loss, research suggests other factors can induce auricle (ear) damage, including medications, exposure to toxic chemicals (including pesticides), and loud, ongoing noise. Past studies find an association between hearing loss and pesticide exposure or noise exposure, alone. However, this study is one of the first to associate hearing loss with the additive effect to concurrent, persistent pesticide exposure, and noise. [...]

Accès au document

Much Higher Rates of Covid-19 Infection and Death in Farmworkers and Landscapers, May Be Enhanced by Pesticide Exposure

Beyond Pesticides, July 29, 2020

Farmworkers and landscapers are deemed essential employees during the coronavirus outbreak, but without mandated safety protocols or government assistance, have experienced an explosion in Covid-19 cases. Workers in these industries are primarily Latinx people of color, many of whom are undocumented. According to a report published by the University of California Los Angeles, Latinx Californians aged 50 to 64 have died from the virus at rate five times higher than white people of the same age. The poor working conditions farmworkers and landscapers are subject to already put them at disproportionate risk of pesticide-induced diseases. Alongside other hardships such preexisting health problems, family obligations, cramped housing and transportation, threat of deportation, and communication difficulties, the risks of these essential workers contracting and dying from Covid-19 are compounded exponentially. [...]

Accès au document

Researchers Developing New Methods to Detect Pesticide Contamination in Bee Hives

Beyond Pesticides, July 28, 2020

With honey bees around the world under threat from toxic pesticide use, researchers are investigating a new way to track environmental contaminants in bee hives. This new product, APIStrip (Adsorb Pesticide In-hive Strip), can be placed into bee hives and act as a passive sampler for pesticide pollution. Honey bees are sentinel species for environmental pollutants, and this new technology could provide a helpful way not only for beekeepers to pinpoint problems with their colonies, but also track ambient levels of pesticide pollution in a community. [...]

Accès au document

Fiche info sur les PFAS dans l'environnement

Centre ecotox 9/7/20

Les substances perfluoroalkylées et polyfluoroalkylées (PFAS) forment un groupe de plus de 4700 composés utilisés dans de nombreux procédés et produits tels que les revêtements anti adhésifs et les mousses anit-incendie. Très stables dans l'environnement, les PFAS sont déjà détectables presque partout dans les êtres vivants et le milieu naturel, ce qui est très inquiétant car elles sont souvent toxiques et peuvent s'accumuler dans les animaux sauvages et les êtres humains. Une nouvelle fiche info fournit des informations sur leur présence, leur toxicité et leur régulation.

Accès au document

https://doi.org/10.15454/9HM9-3C17

Pesticide mixtures a bigger problem than previously thought

EurekAlert! 14/7/20

New research led by The University of Queensland has provided the first comprehensive analysis of pesticide mixtures in creeks and rivers discharging to the Great Barrier Reef.

UQ's School of Earth and Environmental Sciences researcher Associate Professor Michael Warne conducted the study with the Queensland Department of Environment and Science, and analysed 2600 water samples from 15 waterways that discharge into the Great Barrier Reef lagoon over a four-year period.

"While I knew many water samples would contain mixtures, I was shocked to find that essentially every sample contained mixtures of pesticides," Dr Warne said. [...]

Accès au document

76,3% des quantifications de pesticides dans l'air sont le fait de pesticides PE suspectés et/ou classés CMR 1ou 2 selon l'UE

Générations futures 16/7/20

Analyse des résultats de la Campagne Nationale Exploratoire des Pesticides dans l'air (CNEP) par Générations Futures

Générations Futures a décidé d'analyser les résultats de la Campagne Nationale Exploratoire de mesure des résidus de Pesticides dans l'air ambiant parus début juillet 2020 en appliquant la même méthodologie que dans son rapport de février 2020 analysant les données publiées par les AASQA de 2002 à 2017 regroupées sur la base PhytAtmo. Seules ont été retenues les substances actives quantifiées au moins une fois dans le cadre de la CNEP.

Les propriétés CMR (1 ou 2) et le statut d'autorisation des substances pesticides en Europe ont été définies en fonction de la base de données de l'Union européenne sur les pesticides : EU pesticides database en février 2020. [...]

Accès au document

Mancozèbe : Nous ne voulons plus de ce fongicide dangereux au sein de l'UE !

Générations futures 16/7/20

Générations Futures et 6 associations écrivent au nouveau Ministre français de l'Agriculture, Mr. Julien Denormandie, pour lui demander de soutenir le non-renouvellement du fongicide toxique Mancozèbe lors de la réunion des représentants des gouvernements européens le 16 juillet.

Objet : Vote des 16 et 17 juillet au sein du Comité permanent des végétaux, des animaux, des denrées alimentaires et de l'alimentation animale (ScoPAFF) sur le non-renouvellement de l'autorisation du fongicide Mancozèbe. Soutien de la France à la proposition de la Commission européenne.

Copie à Madame Pompili, Ministre de la Transition écologique

Monsieur le Ministre de l'Agriculture, nous vous écrivons au nom des associations suivantes : Justice Pesticides, Générations Futures, Réseau Environnement Santé, Wecf France, Phyto-Victimes, FNAB, France Nature Environnement, pour vous demander de soutenir la proposition de la Commission européenne (CE) de ne pas renouveler l'autorisation du fongicide Mancozèbe, compte tenu de son identification par l'EFSA comme substance présentant six domaines critiques d'inquiétude. [...]

Accès au document

Pesticides dans l'air : Générations Futures dénonce la communication mensongère de l'ANSES

Générations futures 15/7/20

Générations Futures livre son analyse du rapport de la Campagne Nationale Exploratoire de mesure des résidus de Pesticides dans l'air

https://doi.org/10.15454/9HM9-3C17

ambiant publié le 2 juillet et dénonce une communication mensongère de l'ANSES sur ces résultats.

DES PESTICIDES DANGEREUX QUANTIFIEES DANS DE NOMBREUSES ANALYSES

Les résultats de la Campagne Nationale Exploratoire de mesure des résidus de Pesticides dans l'air ambiant (CNEP 2018-2019) sont parus récemment. Générations Futures a […] décidé de passer les données de la CNEP au même filtre d'analyse que celui que nous avions utilisé en février 2020 pour les campagnes d'analyses régionales réalisées de 2002 à 2017 par les différents AASQA. Nous avons donc recherché les pesticides perturbateurs endocriniens, cancérogènes, mutagènes ou reprotoxiques parmi les molécules quantifiées dans la CNEP.

Le résultat est sans appel puisque plus de 76% des quantifications de pesticides dans l'air étaient le fait de pesticides PE suspectés et/ou classés CMR 1 ou 2 selon l'UE (concerne 74,55% des Substances Actives quantifiées soit 41/55).

Accès au document

Le Parlement européen adopte une résolution sur la future stratégie de l'UE en matière de produits chimiques

Générations futures 13/7/20

Vendredi dernier, le Parlement européen a adopté une résolution sur la stratégie de l'UE sur les produits chimiques, établissant un programme détaillé pour la Commission européenne. L'objectif visé est de placer la protection de notre santé et de l'environnement au premier plan de la future législation sur les produits chimiques [1]. [...]

En tant qu'élément clé de cette résolution, les eurodéputés demandent à la Commission de mettre enfin à jour et sans délai son cadre législatif sur les perturbateurs endocriniens (PE) et de renforcer la mise en œuvre de la législation existante. [...]

Accès au document

SDHI : alerte sanitaire non légitime

Alerte-environnement 10/7/20

Nos lecteurs ne l'ignorent pas, les fongicides inhibiteurs de la succinate déshydrogénase (SDHI) sont le nouveau chiffon rouge agité par des marchands professionnels de peur comme Générations Futures. Un rapport de l'Office parlementaire d'évaluation des choix scientifiques et technologiques (OPECST) publié le 25 juin 2020 juge que les craintes soulevées par un « collectif scientifique » au printemps 2018 (mais jamais démontrées) ne sont « pas (suffisantes) pour légitimer une alerte sanitaire à la hauteur des craintes exprimées par voie de presse ». Vous nous direz, les qualifications de certains soutiens de ces chercheurs laissaient songeurs.

Parmi les 450 signataires, il y a d'éminents scientifiques ! Le 1er, Henri-Pierre Arbenlenc, entomologiste, déclare sur son blog : « Trop hédoniste et n'ayant jamais été matheux, je n'ai pu faire d'études scientifiques […] https://t.co/RAtkePacJ0https://t.co/obcIpxsn1C

— GRW (@AEGRW) January 21, 2020

Continuons notre petite analyse des signataires de la tribune #SDHI : Angela Biancofiore, qui enseigne l'art et la littérature italienne à l'Université Paul-Valéry de Montpellier. Certainement une grande spécialiste des #SDHI ! https://t.co/xzcnsFXBHchttps://t.co/obcIpxsn1C

— GRW (@AEGRW) January 21, 2020

En page 56 du rapport, Jean-Luc Fugit, député et scientifique revient sur l'intervention du Pr Rustin, pourfendeur des SDHI, auditionné par l'OPECST :

Nous avons eu des démonstrations qui m'ont paru peu convaincantes, à l'image des feuilles des végétaux : elles ne sont pas imperméables comme l'a dit l'équipe de chercheurs, car les végétaux respirent par les stomates des feuilles, par lesquels l'eau est évacuée et qui permettent la fixation du CO2. J'ai eu le sentiment de ne pas me trouver en face de scientifiques, mais de militants – le ton m'a d'ailleurs autant gêné que le fond. En bref, cela manque de rigueur scientifique.

Bref, tout cela pour dire que le retrait des SDHI au nom du principe de précaution demandé par

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le « collectif scientifique » n'est pas justifié. En 2019, déjà, l'Anses avait conclu que « les travaux de ces chercheurs ne remettaient pas en cause l'évaluation du risque inhérent aux molécules SDHI ».

Accès au document

Study Shows Brain Effects during Fetal Development Linked to Common Pesticide Exposure, Supports Call for Organic Alternatives

Beyond pesticides 10/7/20

A study published in June 2020 in Environmental Health journal is especially concerning for people who become, or plan to become, pregnant. It concludes that personal, agricultural, and household exposures to pesticides may increase the risk of a relatively rare fetal disorder called "holoprosencephaly." The study finds that pre-conception and the first few weeks of pregnancy are the most vulnerable periods during which exposure can increase risk of this disorder, in which the embryo's forebrain fails to develop into two distinct hemispheres. The study's results reinforce Beyond Pesticide's long-standing warnings of the dangers of pesticides to children and the necessity of shifting to a precautionary approach to the introduction and use of synthetic pesticides (and other chemicals) across all sectors. The importance of this shift is perhaps no more poignantly illustrated than in the impacts that pesticide exposure can have on new life. [...]

Accès au document

Thailand's chemical pesticide ban troubles farmers, industries

BANGKOK Reuters 8/7/20

Thailand enforced a ban on Monday on two agricultural chemicals widely regarded as toxic to humans, prompting claims from farmers they will face losses, while environmental campaigners welcomed a step towards sustainability.

Many countries have already prohibited paraquat and chlorpyrifos, which are found in pesticides or insecticides.

Some 10 million farming households in Thailand, one of the biggest exporters of natural rubber and sugar, use paraquat to kill weed on palm, rubber, sugarcane, corn, and cassava plantations.

"Without paraquat, Thai farmers will face losses in key crops, because there are no alternatives," said Sukan Sungwanna, secretary-general of the Federation of Safe Agriculture. [...]

Accès au document

With 400,000 Malaria Deaths Worldwide, Insect Resistance to Mosquito Pesticides Calls for Urgent Need to Shift to Alternative Management Strategies

Beyond Pesticides, July 8, 2020

Efforts to control the transmission of malaria are encountering a big, though predictable, problem: the mosquitoes that transmit malaria are developing resistance to at least five of the insecticides that have been central to limiting transmission of the disease. A study released in late June reveals a dramatic increase in resistance to pyrethroid insecticides and DDT across sub-Saharan Africa. This signals the failure of a mainstay chemical approach to the spread of malarial mosquitoes; this same problem — resistance — is happening with chemical management of agricultural pests and weeds, and with antibiotics to treat human bacterial infections. This study underscores a point Beyond Pesticides has made repeatedly: resistance to pesticides (whether insecticides, herbicides, biocides, fungicides, or medical antibiotics) is nearly inevitable. The solution to containing the spread of malaria lies not in the use of more and different chemicals, but in nontoxic approaches that respects nature and ecological balance. [...]

Accès au document

https://doi.org/10.15454/9HM9-3C17

Cour des comptes européenne : les initiatives de l'UE n'ont pas enrayé le déclin des abeilles

Terre-Net 9/7/20

La Cour des comptes européenne estime dans un rapport publié jeudi que les initiatives de l'Union européenne pour la protection des abeilles n'ont pas permis d'enrayer leur déclin.

La Politique agricole commune (Pac) a même « contribué au problème et non à sa résolution », assurent les auditeurs dans un communiqué. « Jusqu'à présent, les initiatives lancées par l'UE pour protéger les pollinisateurs sauvages n'ont malheureusement pas été suffisamment ambitieuses pour porter leurs fruits », a déclaré Samo Jereb, responsable du rapport, cité dans un communiqué.

Après son « initiative » de juin 2018 sur la protection des pollinisateurs sauvages, la Commission a établi un cadre de mesures mais « les grandes politiques n'ont pas été substantiellement modifiées » pour en tenir compte, qu'il s'agisse de textes sur la biodiversité, sur la protection des habitats ou encore sur les pesticides, déplore la Cour des comptes européenne.

Sur les pesticides notamment, elle regrette que malgré la législation européenne, certains produits considérés comme responsables de la disparition d'abeilles continuent d'être utilisés. [...]

Accès au document

Baisse supposée des pesticides : le ministère de l'Agriculture fait ce jour un coup de com' sur des chiffres provisoires

Générations futures 30/06/20

Générations Futures note que le gouvernement a communiqué […] mardi 30 sur une supposée baisse des volumes de 44% des volumes de pesticides vendus en 2019 par rapport à 2018.

Cette communication appelle de la part de Générations Futures les remarques suivantes :

il est surprenant que ce type de données soit rendue publique sans que les parties prenantes du plan Ecophyto (sensé réduire les pesticides mis en œuvre en 2008) ne soient prévenues et destinataires des informations officielles ! C'est pour le moins une rupture avec l'esprit de gouvernance à 4 ou 5 qui avait présidé lors du Grenelle de l'environnement qui a conduit, entre autre, à la naissance de ce plan, au profit d'une approche purement Com' du gouvernement.

Générations futures […] rappelle que cette supposée baisse intervient après une forte hausse en 2018 (+ de 20 %), les chiffres sont donc à mettre en perspective.

De plus Générations Futures s'étonne de voir avancés des chiffres en volume …alors que l'indicateur de suivi du plan est le NODU, basé sur le nombre de doses, et pas le volume des pesticides. Pourquoi le gouvernement n'utilise t'il pas l'indicateur de référence du plan, qui pourrait donner des chiffres assez différents ?

Il faut toujours prendre des chiffres de vente de pesticides publiés en juillet avec un certain recul car l'expérience nous montre que les remontées d'information peuvent être incomplètes à cette période et les chiffres définitifs connus seulement à l'automne […].

« Le ministère de l'agriculture fait donc un coup de com' en informant sur des données non consolidées et le tout sans en informer les parties prenantes. Pour toutes ces raisons Générations Futures rappelle le gouvernement à revenir à un fonctionnement normal du suivi du plan Ecophyto ce qui sous-entend un respect des parties prenantes et une vraie transparence dans les données utilisées. » déclare F. Veillerette Directeur de Générations Futures

Accès au document

La commission de l'environnement du Parlement européen exige de la future stratégie européenne sur les produits chimiques une approche

https://doi.org/10.15454/9HM9-3C17

axée prioritairement sur la santé

Générations futures 30/06/20

Hier, la commission de l'environnement, de la santé et de la sécurité alimentaire du Parlement européen (ENVI) a adopté, […] une résolution définissant sa position sur la stratégie européenne durable sur les produits chimiques. La stratégie finale […] est attendue pour le second semestre 2020. [...]

Les points saillants de la résolution proposée sont les suivants :

La réaffirmation de l'ambition zéro pollution pour un environnement sans toxique et les liens avec d'autres initiatives liées à sa réalisation, telles que le plan de lutte contre le cancer de l'UE et la stratégie pour la biodiversité. […]

Une action accélérée sur les produits chimiques prioritaires, y compris : des dispositions pour une définition horizontale des **perturbateurs endocriniens** connus et suspectés et desactions pour minimiser l'exposition ; un plan d'action pour éliminer progressivement les utilisations non essentielles des **PFAS** ; l'accélération de l'élimination progressive des pesticides à haut risque d'ici 2030 ;

Une meilleure comptabilité des mélanges et l'utilisation d'approches de regroupement dans les évaluations ;

Une révision de la législation sur les matériaux en contact avec les aliments pour plus de protection et de cohérence de la santé.

Accès au document

Produits phytos - 44 % de pesticides vendus en 2019

Terre-Net 30/06/20

Les ventes de pesticides ont reculé en France de 44 % en volume en 2019, après l'envolée des ventes intervenue en 2018 (+ 18 %), a annoncé mardi le gouvernement.

Les quantités vendues de glyphosate, désherbant controversé, « diminuent de 35 % (- 3 358 tonnes) entre 2018 et 2019 après avoir augmenté de 11 % (+ 999 tonnes) entre 2017 et 2018 », ont précisé les ministères de la transition écologique et de l'agriculture dans un communiqué conjoint.

Le gouvernement français avait promis fin 2017 que cette molécule serait interdite « dans ses principaux usages » dans un délai de trois ans, sans attendre les cinq ans décidés au niveau européen. [...]

Accès au document

Pac et Green Deal L'eurodéputé B. Biteau veut aller plus loin dans la réduction des pesticides

Terre-Net 30/06/20

Dans le cadre du Green Deal, la Commission européenne a dévoilé mi-mai ses stratégies Biodiversité et de la Ferme à l'assiette, deux stratégies dont les ambitions respectives ne semblent pas compatibles, estime le député européen Benoît Biteau (EELV), qui défend une suppression totale des pesticides et des engrais de synthèse et milite pour une Pac qui accompagne davantage les transitions.

[…] « La réduction de 50 % des pesticides et des engrais de synthèse sont des objectifs parfaitement atteignables sans impacter la productivité agricole, mais qui ne suffisent pas à enrayer la disparition des oiseaux et insectes », estime l'élu, agriculteur en Charente-Maritime depuis 14 ans. Ils ne permettent pas non plus de réaliser les objectifs de la stratégie Biodiversité, pourtant proposée par la même Commission européenne.

Pour Benoît Biteau, réduire la dose ne résout pas les problèmes en matière de biodiversité. « C'est très réducteur de cantonner la problématique des pesticides à un problème de santé publique, il faut que l'on convoque une approche globale », incluant les effets sur le climat et sur l'environnement, ajoute-t-il. « On ne doit pas continuer sur des voies qui menacent les générations futures, et c'est d'autant plus vrai que l'on a des études qui montrent que c'est possible », insiste l'agriculteur. [...]

Accès au document

https://doi.org/10.15454/9HM9-3C17

REVUE DE PRESSE / RECHERCHE ET MEDIAS

Saving marine life: Novel method quantifies the effects of plastic on marine wildlife

EurekAlert! 31/08/20

Scientists at Tokyo Institute of Technology together with their international collaborators developed a novel quantitative method to quantify the effects of plastic on marine animals. This method successfully shows that plastic ingestion by sea turtles might be causing population declines, despite a lack of strong effects on individual turtles.

Plastic debris in marine ecosystems is a serious global issue and is the research focus of leading scientists across the globe. Annually, around 10 million tons of waste, mostly plastic, finds its way into the world's oceans. Plastic debris in the open and coastal seas can jeopardize the health of marine wildlife, affecting human health and economy both directly and indirectly. [...]

Accès au document

Investigation into ecological impact of Chernobyl wildfires

Nerc 25/08/2020

A new project led by the UK Centre for Ecology & Hydrology (UKCEH) will investigate the impact of this year's wildfires in the Chernobyl Exclusion Zone on wildlife.

The 2,600 km2 Ukrainian exclusion zone was created when people and farm animals were evacuated following the explosion at the Chernobyl nuclear plant in April 1986. The Chernobyl disaster remains the world's worst nuclear accident and the exclusion zone is the most radioactively contaminated ecosystem on earth. Yet it has become a haven for wildlife in the absence of humans.

An area of more than 500 km2 within the Ukrainian exclusion zone was affected by severe fires in April this year. The new study led by UKCEH will assess the effect the fires have had on the diversity and abundance of mammals and birds, as well as soil function. It will also assess the impact of the fires on the mobility of radionuclides (or radioactive elements) and the risk posed to firefighters and the general population by the inhalation of contaminated smoke. [...]

Accès au document

Treating COVID-19 could lead to increased antimicrobial resistance

EurekAlert! 25/08/20

The use of antibiotics in people with COVID-19 could result in increased resistance to the drugs' benefits among the wider population, a new study suggests.

Patients hospitalised as a result of the virus are being given a combination of medications to prevent possible secondary bacterial infections.

However, research by the University of Plymouth and Royal Cornwall Hospital Trust suggests their increased use during the pandemic could be placing an additional burden on waste water treatment works. [...]

Accès au document

Maternal insecticide use during pregnancy and neonatal jaundice

EurekAlert! 28/08/20

The data of 61,751 pregnant women, out of approximately 100,000 collected by the Japan Environment and Children's Study analyzed the association between the maternal usage of insecticides and insect repellents during pregnancy and neonatal hyperbilirubinemia. The Koshin Unit Center at Shinshu University played a central role in this analysis. Newborns appear jaundiced, or appear to have yellow skin and sclera of the eyes when bilirubin in the blood becomes too high. When bilirubin builds up in the brain and is left untreated, neurotoxic damage can occur in newborns. Phototherapy is

most often used to treat neonatal hyperbilirubinemia. [...]

Accès au document

Planetary ball-milling helps protect our planet from plastics pollution

EurekAlert! 27/08/20

Researchers from Osaka University have developed eco-friendly polymer materials with extended functional lifespans that are self-healing, tough and recyclable, by innovatively using a planetary ball mixing method

Plastics are ubiquitous in modern life; unfortunately, once they lose function, they pollute the environment. Now, researchers at Osaka University have developed polymer materials that combine self-healing with strength and recyclability that could extend the functional lifetimes of manufactured plastics, thus minimizing the surging problem of discarded remnants. [...]

Accès au document

Reduce insecticide spraying by using ant pheromones to catch crop pests

EurekAlert! 27/08/20

Scientists at the Universities of Bath and Sussex have developed a new system that slowly releases ant pheromones to attract pests to an insecticide bait. This means that instead of spraying the whole crop with pesticides, traps can be placed in specific areas for more targeted protection.

Leaf-cutting ants are major pest species of agriculture and forestry in many areas of the tropics causing an estimated $8 billion damage each year to eucalyptus forestry in Brazil alone.

[…]

The team of chemists and chemical engineers at Bath used molecular sponges called metal-organic frameworks (MOFs), to soak up the alarm pheromones of leaf cutter ants and then slowly release them to attract the insects to a trap. [...]

Accès au document

Pollution exposure at work may be associated with heart abnormalities among Latinx community

EurekAlert! 26/08/20

Hispanic/Latinx adults who are exposed to smoke from burning wood, vehicle exhaust, pesticides or metals at workplaces are more likely to have abnormalities of the heart structure and function that could lead to cardiovascular disease, according to new research published today in the Journal of the American Heart Association, an open access journal of the American Heart Association.

Environmental toxin exposure is a recognized cardiovascular disease risk factor. Researchers have found environmental pollutant exposure is associated with stroke, heart attack, heart failure, atrial fibrillation and sudden cardiac death. [...]

Accès au document

Biocontrôle : la liste des produits autorisés a été mise à jour

Terre-net 31/08/20

La liste des produits phytopharmaceutiques de biocontrôle a été mise à jour le 13 août par le ministère de l'agriculture.

Publiée le 13 août au bulletin officiel du ministère de l'agriculture et de l'alimentation, la liste des produits phytopharmaceutiques de biocontrôle est […] téléchargeable ici ou consultable sur le site info.agriculture.gouv.fr. [...]

Accès au document

Betteraves et néonicotinoïdes L'eurodéputé E. Andrieu

https://doi.org/10.15454/9HM9-3C17

demande à l'Europe d'annuler la dérogation française

Terre-net 27/08/20

Alors que le gouvernement a annoncé sa volonté de revenir sur l'interdiction des néonicotinoïdes suite aux difficultés rencontrées par les betteraviers, le député européen Eric Andrieu a déposé le 26 août une demande de procédure d'annulation auprès de Bruxelles pour suspendre la dérogation française.

« L'Europe pourrait faire annuler la décision française sur les néonicotinoïdes », affirme le député européen Eric Andrieu (Socialiste), qui a déposé auprès de la Commission européenne une demande de procédure d'annulation de la dérogation française. [...]

Accès au document

Pollution de l'eau dans le Finistère : interrogations sur la méthanisation industrielle

Actu-environnement 21/08/20

La restriction de l'usage de l'eau dans 50 communes bretonnes résulte d'une pollution occasionée par une installation de méthanisation. Un événement qui interroge sur le fort développement de la filière et les risques qu'il comporte. [...]

Accès au document

Perturbation endocrinienne chez le poisson : synergie entre le réchauffement climatique et les pesticides

Actu-environnement 26/08/20

Les « stress anthropiques », comme le réchauffement climatique ou la pollution des eaux par les pesticides, induisent une perturbation endocrinienne chez un poisson des récifs coralliens, selon une étude menée par des chercheurs du Centre national de la recherche scientifique (CNRS).

En juillet dernier, les scientifiques de l'Observatoire océanologique de Banyuls-sur-Mer (BIOM) et du Centre de recherches insulaires et observatoire de l'environnement de Moorea (CRIOBE) ont publié leurs travaux dans la revue Nature Communication. Leur étude montre comment une perturbation des hormones thyroïdiennes « est à l'origine de défauts sensoriels et de la vulnérabilité à la prédation observés chez le poisson chirurgien bagnard Acanthurus triostegus, exposé aux deux stress anthropiques, température et pesticide », expliquent les scientifiques. [...]

Accès au document

Néonicotinoïdes : un projet de loi confirme la volonté d'étendre les dérogations jusqu'en 2023

Actu-environnement 31/08/20

Un projet de loi prévoit de prolonger la possibilité d'accorder des dérogations d'utilisation de produits néonicotinoïdes jusqu'au 1er juillet 2023. Dans la réglementation actuelle, cette possibilité s'arrêtait le 1er juillet 2020. Mais alors que la filière betteravière-sucre est durement touchée par la jaunisse, le Gouvernement a affiché sa volonté d'autoriser l'utilisation de ces produits phytosanitaires en semences enrobées pour lutter contre le puceron, transmetteur de la jaunisse....

Accès au document

Néonicotinoïdes autorisés pour la filière betterave : les défenseurs des abeilles sont vent debout

Actu-environnement 17/08/20

Le Gouvernement veut accorder une dérogation de betteraves, infectées par la jaunisse, pour utiliser des pesticides néonicotinoïdes en enrobage de semence au moment des semis dès 2021. Une décision décriée par les défenseurs des abeilles. [...]

https://doi.org/10.15454/9HM9-3C17

Accès au document

Pollution linked to antibiotic resistance

EurekAlert! 13/08/20

Antibiotic resistance is an increasing health problem, but new research suggests it is not only caused by the overuse of antibiotics. It's also caused by pollution.

Using a process known as genomic analysis, University of Georgia scientists found a strong correlation between antibiotic resistance and heavy metal contamination in an environment.

Jesse C. Thomas IV, an alumnus of the College of Public Health and the Savannah River Ecology Laboratory, found commonalities in soils contaminated with heavy metals on the U.S. Department of Energy's Savannah River Site near Aiken, South Carolina.

According to the study, published in the July issue of the journal Microbial Biotechnology, soils with heavy metals had a higher level of specific bacterial hosts that were accompanied by antibiotic-resistant genes. [...]

Accès au document

RCSI research finds air pollution in Ireland associated with strokes

EurekAlert! 11/08/20

Scientists have found that air pollution in the winter is associated with more hospitalisations for all strokes in Dublin.

The study, led by researchers from RCSI University of Medicine and Health Sciences, is published in the current edition of Cerebrovascular Diseases.

During winter months in Ireland, particularly in Dublin, higher levels of fine particles, coarse particles, sulphur dioxide and nitrogen dioxide are found in the air. The sources of these are solid fuel burning, such as coal, peat, and wood, as well as road traffic - especially diesel engines.

After accounting for other variables, such as temperature, humidity, day of the week and time, the researchers found that there was a statistically significant rise in the number of hospitalisations for strokes in Dublin zero to two days after a rise in air pollution. [...]

Accès au document

Atrazine Found to Harm Marsupial Health

Beyond Pesticides, August 12, 2020

The herbicide atrazine can interfere with the health and reproduction of marsupials (including kangaroos and opossums) kangaroo, *Virginia opossum*, according to research published in the journal Reproduction, Fertility, and Development. Although the research focuses on the health of the Australian wallaby, the data is relevant for the only marsupial in the United States, the opossum. Unfortunately, the research is no surprise, as atrazine has a long history of displaying endocrine (hormone) disrupting properties, affecting sex and reproduction in a broad range of species. [...]

Accès au document

Agriculture replaces fossil fuels as largest human source of sulfur in the environment

Science daily 11/08/20

A new paper out today in Nature Geoscience identifies fertilizer and pesticide applications to croplands as the largest source of sulfur in the environment -- up to 10 times higher than the peak sulfur load seen in the second half of the 20th century, during the days of acid rain.

As a result, University of Colorado Boulder researchers recommend greatly expanded monitoring of sulfur and examining possible negative impacts of this increase, including increasing levels of mercury in wetlands, soil degradation and a higher risk for asthma for populations in agricultural areas. [...]

Accès au document

Depuis quand utilise-t-on des pesticides ?

https://doi.org/10.15454/9HM9-3C17

Agri-mutuel 13/08/20

Le besoin de préserver les réserves alimentaires plonge ses racines plus de 10 000 années avant le temps présent. Les substances naturelles toxiques font partie des premiers moyens utilisés par l'homme pour se prémunir plus particulièrement contre les dégâts causés par les rongeurs et les insectes. Au fil des siècles, ces moyens se sont perfectionnés avec une recherche menée en parallèle pour obtenir une meilleure efficacité pratique et davantage d'innocuité. [...]

Accès au document

Lutte contre les mouches, le taupin... Les producteurs de maïs veulent aussi déroger à l'interdiction des néonicotinoïdes

Terre-Net 08/08/20

Les producteurs de maïs veulent à leur tour bénéficier d'une dérogation pour utiliser des pesticides à base de néonicotinoïdes, disent-ils vendredi, au lendemain de l'engagement du gouvernement à ouvrir la voie à ces insecticides pour les planteurs de betteraves.

Le ministère de l'agriculture a annoncé jeudi vouloir autoriser les agriculteurs à utiliser dès 2021, « dans des conditions strictement encadrées » et jusqu'en 2023 maximum, des semences de betteraves enrobées de néonicotinoïdes. [...]

Accès au document

Alain Commissaire, de Cristal Union, demande « du temps » pour la filière

Agri-mutuel 07/98/20

Le directeur-général du groupe sucrier français Cristal Union, Alain Commissaire, justifie la réintroduction sous conditions des semences de betteraves enrobées d'un insecticide interdit depuis 2018 : « Il faut donner du temps à la filière. La recherche n'a pas suivi », avance-t-il. […]

Accès au document

Recours aux néonicotinoïdes, aides, prévention : les mesures gouvernementales

Agri-mutuel 06/08/20

Face aux multiples alertes de la filière et de nombreux élus, le gouvernement a présenté jeudi 6 août 2020 un plan de soutien à la filière betteravière, concédant que « les alternatives techniques aujourd'hui disponibles se sont révélées inefficaces pour la culture de la betterave ». Ce plan comprend notamment un recours dérogatoire aux néonicotinoïdes au moins pour 2021 et des indemnisations pour les pertes les plus importantes. Objectif : éviter un abandon massif de la betterave en 2021 par les agriculteurs. [...].

Accès au document

Lutte anti-limaces : le métaldéhyde dans le viseur

Terre-net 05/08/20

Les produits molluscicides dont la concentration en méthaldéhyde est supérieure ou égale à 3 % sont désormais classés cancérogènes, mutagènes et toxiques pour la reproduction. Le changement de considération de cette substance active par la puissance publique aura, pour les agriculteurs, un impact financier ainsi que des conséquences sur les pratiques de stockage et d'utilisation des anti-limaces.

Le métaldéhyde, matière active utilisée dans la composition de nombreux anti-limaces, va faire son entrée dans la liste des produits classés CMR 21. [...]

Accès au document

Phytosanitaires : pesticide dans l'eau d'un village catalan :

https://doi.org/10.15454/9HM9-3C17

plainte pour « empoisonnement »

Terre-Net 6/8/20

Deux plaintes ont été déposées mercredi à Perpignan, une pour « empoisonnement », l'autre pour « négligence », à la suite de la découverte de pesticides dans l'eau alimentant un village des Pyrénées-Orientales, a indiqué à l'AFP l'avocat des plaignants.

À la suite de la pollution d'une rivière, les quelque 900 habitants de Tautavel sont privés d'eau potable depuis deux mois. [...]

« Ensuite, ajoute-t-il, [l'avocat] on suspecte un ou des viticulteurs soit d'avoir utilisé ces produits chimiques interdits, soit d'avoir vidangé des cuves contenant ces produits dans des zones inadaptées », qui auraient terminé dans la rivière qui traverse le village, le Verdouble.

« Les analyses révèlent la présence de plusieurs molécules de pesticides, soit du fluxapyroxad, un fongicide, le thiamétoxame, un insecticide substance active de la famille néonicotinoides, de l'atrazine et therbuthylazine dont l'utilisation est interdite par décret N°2018-675 du 30 juillet 2018 », soulignent dans leur plainte les trois associations. [...]

Accès au document

Children's National Hospital case report sounds the alarm for antibiotic resistance

EurekAlert! 3/8/20

A recent meningitis case at Children's National Hospital raises serious concerns about antibiotic resistance in the common bacterium that caused it, researchers from the hospital write in a case report. Their findings, published online August 3 in the Journal of the Pediatric Infectious Disease Society, could change laboratory and clinical practice across the U.S. and potentially around the globe. [...]

Accès au document

Plastics, pathogens and baby formula: What's in your shellfish?

EurekAlert! 30/7/20

The first landmark study using next-generation technology to comprehensively examine contaminants in oysters in Myanmar reveals alarming findings: the widespread presence of human bacterial pathogens and human-derived microdebris materials, including plastics, kerosene, paint, talc and milk supplement powders.

[…] The study concludes that coastal urbanization and lack of sewage treatment increases contamination in seafood and can cause potential health risks to humans, even large distances from pollution sources. [...]

Accès au document

Lead released in Notre Dame Cathedral fire detected in Parisian honey

EurekAlert! 29/7/20

Elevated levels of lead have been found in samples of honey from hives downwind of the Notre Dame Cathedral fire, collected three months after the April 2019 blaze.

In research outlined in Environmental Science & Technology Letters, scientists from UBC's Pacific Centre for Isotopic and Geochemical Research (PCIGR) analyzed concentrations of metals, including lead, in 36 honey samples collected from Parisian hives in July 2019.

While all the honey fell within the EU's allowable limits for safe consumption, honey from hives downwind of the Notre Dame fire had average lead concentrations up to four times that of samples collected in the suburbs or countryside surrounding the city, and up to three and a half times the amount found in Parisian honey pre-dating the fire. [...]

Accès au document

https://doi.org/10.15454/9HM9-3C17

Newer PFAS compound detected for first time in Arctic seawater

EurekAlert! 29/7/20

Per- and polyfluoroalkyl substances (PFAS), found in many household products and food packages, have raised concerns because of their persistence and possible toxicity to people and wildlife. Because the compounds don't break down naturally, they have become environmental contaminants. Now, researchers reporting in ACS' Environmental Science & Technology have studied the transport of 29 PFAS into and out of the Arctic Ocean, detecting a newer compound for the first time in Arctic seawater. [...]

Accès au document

Exposure to environmental chemicals may disrupt sleep during menopause

EurekAlert! July 29, 2020

For menopausal women who have difficulty sleeping, it might be because of chemicals in the environment. A new study based on data from the Midlife Women's Health Study suggests that exposure to various chemicals, such as phthalates, found in hundreds of products used daily, is associated with sleep disruptions in midlife women. Study results are published online today in Menopause, the journal of The North American Menopause Society (NAMS). [...]

Accès au document

Dingoes have gotten bigger over the last 80 years - and pesticides might be to blame

EurekAlert! 03/8/20

Dingoes have gotten around 6-9 per cent bigger over the past 80 years, new research from UNSW and the University of Sydney shows - but the growth is only happening in areas where poison baiting is used. [...]

Accès au document

Coastal cities leave up to 75% of seafloor exposed to harmful light pollution

EurekAlert! 30/07/20

The global expansion of coastal cities could leave more than three quarters of their neighbouring seafloor exposed to potentially harmful levels of light pollution.

A study led by the University of Plymouth (UK) showed that under both cloudy and clear skies, quantities of light used in everyday street lighting permeated all areas of the water column.

This could pose a significant threat to coastal species, with recent research showing the presence of artificial skyglow can disrupt the lunar compass species use when covering long distances. [...]

Accès au document

Pesticides can protect crops from hydrophobic pollutants

EurekAlert! 28/7/20

Researchers have revealed that commercial pesticides can be applied to crops in the Cucurbitaceae family to decrease their accumulation of hydrophobic pollutants (*1), thereby improving crop safety. The research group consisted of FUJITA Kentaro (1st year Ph.D. student) of Kobe University's Graduate School of Agricultural Science, Academic Researcher YOSHIHARA Ryouhei (now an assistant professor at Saitama University) and Associate Professor INUI Hideyuki of Kobe University's Biosignal Research Center, Senior Research Scientist KONDOH Yasumitsu, Technical Staff HONDA Kaori and Group Director OSADA Hiroyuki of RIKEN, and Lead Researcher HAGA Yuki and Senior Scientist MATSUMURA Chisato of Hyogo Prefectural Institute of Environmental Sciences. [...]

Accès au document

https://doi.org/10.15454/9HM9-3C17

Iowa State University scientists examine reproductive effects of glyphosate in mice

EurekAlert! 28/7/20

Exposure to the chemical glyphosate changed the level of some ovarian proteins in mice but did not impact ovarian steroid production, an indication glyphosate may not adversely affect reproduction, according to a new study. [...]

Accès au document

Pesticides : la séparation de la vente et du conseil se précise

Actu-environnement 29/07/20

Le ministère de l'Agriculture a ouvert, le 27 juillet, une consultation publique sur plusieurs projets de textes réglementaires visant à organiser précisément la séparation du conseil et de la vente de produits phytosanitaires. Cette séparation est prévue au 1er janvier 2021 par la loi Egalim adoptée à l'automne 2018. Elle doit participer à la réduction de l'utilisation de pesticides. Après l'adoption d'une ordonnance, un décret et deux arrêtés viendront compléter ce dispositif. [...]

Accès au document

Métaux en contact avec l'eau potable : la liste des alliages autorisés est actualisée

Actu-environnement 1/07/20

L'arrêté qui actualise la liste des compositions autorisées pour les matériaux et objets métalliques en contact avec l'eau potable est désormais publié au Journal officiel. La Directive sur les eaux destinées la consommation humaine, en cours de révision, demande aux États membres que les substances et matériaux utilisés pour préparer et distribuer l'eau ne présentent pas de risque pour le consommateur. Le présent arrêté fixe les dispositions pour y répondre et actualise l'inventaire...

Accès au document

Règlement européen PIC : 22 substances ajoutées à la liste des produits chimiques dangereux exportés

Actu-environnement 23/07/20

Le 22 juillet, l'Agence européenne des produits chimiques (Echa) a annoncé l'ajout de vingt-deux substances à la liste des produits chimiques dangereux qui font désormais l'objet de notifications d'exportation au titre du règlement européen PIC. La majorité des 22 substances ont été ajoutées au règlement PIC parce qu'elles sont interdites en tant que substances actives dans les produits phytopharmaceutiques au sein de l'Union européenne. [...]

Accès au document

Sécurité des aliments : l'Anses propose un outil de hiérarchisation des dangers chimiques et biologiques

Actu-environnement 24/07/20

Hiérarchiser les dangers biologiques et chimiques transmis par voie alimentaire. Tel était l'objet de l'expertise confiée en... 2014 à l'Agence de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses) suite aux travaux du comité interministériel pour la modernisation de l'action publique (Cimap) en matière de sécurité sanitaires des aliments. L'Anses a dévoilé vendredi 24 juillet une méthodologie permettant d'établir cette hiérarchisation et de prioriser les situations...

Accès au document

Études sur le glyphosate : comment rétablir la confiance dans les données scientifiques ?

Actu-environnement 25/07/20

https://doi.org/10.15454/9HM9-3C17

Le retrait d'un groupe de scientifiques, sélectionné par l'Anses pour réaliser une étude sur la toxicité du glyphosate interroge sur la perte de confiance dans la production de données scientifiques et les moyens pour la rétablir. […] « *Le coordinateur du consortium a décidé de se retirer considérant que les conditions de sérénité n'étaient pas réunies pour avoir un débat scientifique (…), il y a déjà des suspicions sur les données qui pourraient être produites* », a indiqué Roger Genet, directeur général de l'Anses, lors de son audition devant l'Assemblée nationale jeudi 23 juillet. [...]

Accès au document

Honeybees reveal environmental pollution in their surroundings

EurekAlert! 17/7/20

Honeybee colonies are bioindicators of environmental contamination in the area, since they get coated in everything that there is in the environment, including pollutants, and they end up taking it all back to their bee hives. [...]

Accès au document

Study of natural gas flaring finds high risks to babies

EurekAlert! 15/7/20

Researchers from USC and UCLA have found that exposure to flaring - the burning off of excess natural gas - at oil and gas production sites is associated with 50% higher odds of preterm birth, compared with no exposure.

"Our study finds that living near flaring is harmful to pregnant women and babies," said Jill Johnston, an environmental health scientist at the Keck School of Medicine of USC. "We have seen a sharp increase in flaring in Texas' Eagle Ford Shale, and this is the first study to explore

Global methane emissions soar to record high

EurekAlert! 15/7/20

[…] But levels of the powerful heat-trapping gas methane continue to climb, dragging the world further away from a path that skirts the worst effects of global warming.

Global emissions of methane have reached the highest levels on record. Increases are being driven primarily by growth of emissions from coal mining, oil and natural gas production, cattle and sheep ranching, and landfills. [...]

Accès au document

Antibiotic allergy reporting may lead to resistance, higher costs, decreased safety

Eurekalert! 14/7/20

Antibiotics are among the most commonly prescribed medications, but in determining the most appropriate prescription for a patient, doctors and pharmacists often rely on inaccurate records of the patient's antibiotic allergies. Many records are incomplete, unclear or incorrect. They may have originated with a patient's previous physician, or incompatible electronic medical record systems may have introduced errors. In turn, this may contribute to the development of antibiotic resistance, higher health care costs and decreased patient safety. This qualitative study by researchers in the Netherlands identifies problems with the antibiotic allergy reporting process that may point toward interventions for improving registration accuracy. Based on focus group discussions, the researchers suggest that developing a training module and primary care guidelines regarding the registration process, cleaning up existing records, and fostering better communication, both human and electronic, as potential ways to improve antibiotic allergy registrations.

Accès au document

Antibiotic resistance and the need for personalized treatments

Eurekalert! 13/7/20

Antibiotic resistance is a growing challenge in the treatment of infectious diseases worldwide.

https://doi.org/10.15454/9HM9-3C17

Bacteria become resistant to antibiotics by acquiring or mutating genes that allow them to survive the administration of antibiotics, which otherwise would kill them. However, this advantage in the presence of antibiotics can imply costs to bacteria when the drugs stop being administered. This occurs because resistance generally affects genes that are essential for the cell and so, once back to the original context, without antibiotics, bacteria stop being fit to compete for its own survival.

Until now, our knowledge about this process comes from studies done in artificial systems that provide an incomplete perspective on the real complexity of this phenomenon. To bridge this gap, a team of researchers led by Isabel Gordo, principal investigator at IGC, used mice as a model organism and identified that in the gut, after the administration of antibiotics, competition for survival shows very different dynamics over time depending on the host where it occurs. The same resistance has different interactions that determine that in one individual a bacterium has low ability to survive in the absence of antibiotics, whereas in another individual that ability is high. [...]

Accès au document

Bird droppings carry risk of antibiotic resistance

EurekAlert! 13/7/20

Bird poop may pose more health risks than people realize, according to Rice University environmental engineers who study antibiotic resistance.

Their study found high levels of genes that encode antibiotic resistance harbored by opportunistic pathogens in the droppings of common urban ducks, crows and gulls.

The study led by postdoctoral research associate Pingfeng Yu of Rice's Brown School of Engineering appears in the Elsevier journal Environmental Pollution. Yu is a member of the lab of civil and environmental engineer and co-author Pedro Alvarez. [...]

Accès au document

Research: Crop plants are taking up microplastics

EurekAlert! 13/7/20

Microplastics (MPs), i.e., tiny plastic particles less than 5 millimeters in length, can now be found throughout the ocean and other aquatic ecosystems, and even in our seafood and salt. As MPs have become ubiquitous, scientists have become concerned about the transfer of MPs from the environment to the food chain and the potential impact of MPs on human health.

Scientists from the Chinese Academy of Sciences (CAS) recently found that microplastics are indeed contaminating edible plants, including vegetables we eat. The study was published in Nature Sustainability on July 13. [...]

Accès au document

105th Annual Meeting of the Ecological Society of America: Preview and highlights

EurekAlert! 11/7/20

The sessions and events on this curated list delve into 2020 meeting theme: Harnessing the Ecological Data Revolution. These presentations will be available for registered meeting attendees to view beginning on August 3, 2020. [...]

Better Living Through Pharma-Ecology: What It Takes to Tackle Emerging Contaminants

The term "emerging contaminants" is used to describe numerous chemicals associated with the modern human lifestyle that have inadvertently worked their way into terrestrial and aquatic ecosystems. As humans have developed new treatments for diseases, safer cosmetics, and more potent pesticides, we have also created new pollutants, which are having significant unintended consequences on organismal and ecosystem health. In this Inspire session, speakers will present novel research on the ecological effects of several key emerging contaminants, including opioids, veterinary antibiotics, human-use antibiotics and insecticides, from microbial to ecosystem scales. [...]

https://doi.org/10.15454/9HM9-3C17

Accès au document

Lead fallout from Notre Dame fire was likely overlooked

EurekAlert! 9/7/20

On April 15, 2019, the world watched helplessly as black and yellow smoke billowed from the Notre Dame cathedral in Paris. The fire started just below the cathedral's roof and spire, which were covered in 460 tons of lead -- a neurotoxic metal, dangerous especially to children, and the source of the yellow smoke that rose from the fire for hours. The cathedral is being restored, but questions have remained about how much lead the fire emitted into the surrounding neighborhoods, and how much of a threat it posed to the health of people living nearby.

[…] The study concludes that, for a brief time, people residing within a kilometer and downwind of the fire were probably more exposed to lead fallout than measurements by French authorities indicated. [...]

Accès au document

Unraveling the impact of environmental chemicals on the immune system of pregnant women and the health of their children

UFZ 9/7/20

Since July 1st, the UFZ Department of Environmental Immunology has a new Head: Prof. Ana Zenclussen. She was jointly appointed by the UFZ and the Medical Faculty of the University of Leipzig and holds the professorship "Pediatric Environmental Epidemiology/ Immunology". She previously held the Professorship for Experimental Gynaecology and Obstetrics at the Otto-von-Guericke University in Magdeburg. Ana Zenclussen's research focuses on reproductive immunology, hormonal modulation of immune cells as well as the effects of environmental chemicals on maternal and foetal health and the underlying mechanisms. [...]

Accès au document

Identifying sources of deadly air pollution in the United States

EurekAlert! 15/7/20

A new study from University of Minnesota researchers provides an unprecedented look at the causes of poor air quality in the United States and its effects on human health.

The research, to be published Wednesday in the journal Environmental Science and Technology Letters, finds that air pollution from sources in the United States leads to 100,000 deaths in the U.S. each year. About half of these deaths are from burning fossil fuels, but researchers also identified less obvious sources of lethal pollution. [...]

Accès au document

Health and Behavioral Development of Beneficial Black Garden Ants Stunted by Low Levels of Pesticide Exposure in Soils

Beyond Pesticides, July 16, 2020

Long-term exposure to sublethal (low-level) concentrations of the neonicotinoid in soil negatively affects the health and behavioral development of black garden ants (*Lasius niger*) colonies, according to a study published in Communications Biology by scientists at the University of Bern, Switzerland. Ants are one of the most biologically significant insects in the soil ecosystem, acting as ecosystem engineers. Their burrowing behavior aerates the soil, allowing oxygen and water to penetrate down to plant roots. Additionally, ants increase soil nutrient levels by importing and accumulating organic material like food and feces, thus enhancing nutrient cycling. [...]

Accès au document

From Udder to Table: Toxic Pesticides Found in

https://doi.org/10.15454/9HM9-3C17

Conventional Milk, Not Organic Milk

Beyond Pesticides, July 9, 2020

Conventional U.S. milk contains growth hormones, antibiotics, and low to elevated levels of pesticides not found in organic milk, according to a study published in the journal of Public Health Nutritionby Emory University researchers. Milk can bioconcentrate, or accumulate, certain organic pollutants, making it a valuab le medium to assess what chemical we might be ingesting daily. With milk being one of the most consumed beverages in the U.S., in addition to its use in other popular drinks (i.e., coffee and tea), this study discloses widespread contamination and highlights the need for improved regulation. [...]

Accès au document

Pacte vert : comment la Commission européenne veut protéger la biodiversité après la crise sanitaire

Touteleurope 9/7/20

La pandémie de Covid-19 n'a pas eu raison des ambitions écologiques de la Commission, ni de sa volonté d'agir vite, comme présenté dans le Pacte vert ou Green deal européen. Mieux, elle semble l'avoir renforcée dans cette conviction : "La crise provoquée par la pandémie de Covid-19 a mis en évidence notre vulnérabilité due à l'appauvrissement croissant de la biodiversité et démontré l'importance cruciale d'un système alimentaire efficace pour notre société", indique la Commission européenne. Alors que "plus de la moitié du PIB mondial dépend de la nature et des services qu'elle fournit" selon ses estimations, "la protection de la biodiversité se justifie clairement sur le plan économique".

Dans cet esprit la Commission européenne a présenté le 20 mai 2020 deux stratégies conjointes visant à "renforcer la résilience de l'Europe en enrayant l'appauvrissement de la biodiversité et en mettant en place un système alimentaire sain et durable". Avec la stratégie "de la ferme à la table", la Commission s'attaque à des sujets tels que le développement de l'agriculture biologique, la protection des consommateurs ou encore le gaspillage alimentaire et l'utilisation des pesticides. [...]

Accès au document

Baromètre IBMA France « Les solutions de biocontrôle confirment leur attractivité »

Terre-Net 8/7/20

Selon le baromètre d'IBMA France, le biocontrôle poursuit sa progression en France avec une hausse de 8,5 % du chiffre d'affaires 2019 en France. Ces ventes représentent près de 11 % du marché de la protection des plantes.

[…]« Cette nouvelle progression confirme l'installation durable du biocontrôle au cœur des itinéraires techniques pour la protection des végétaux », indique Céline Barthet, présidente d'IBMA France. Selon l'association IBMA France, « le biocontrôle se positionne véritablement comme une alternative d'avenir pour limiter l'utilisation des solutions conventionnelles. [...]

Accès au document

Produits phytos : consultation publique pour l'interdiction dans tous les lieux de vie d'ici 2022

Actu-environnement 03/07/20

La ministre de la Transition écologique et solidaire lance une consultation sur l'interdiction des produits phytopharmaceutiques dans les lieux de vie. L'arrêté est soumis à consultation du public jusqu'au 16 août.

Le 1er janvier 2017, la loi Labbé avait interdit aux personnes publiques d'utiliser des produits phytopharmaceutiques pour l'entretien des espaces verts, forêts, promenades et voiries. Une étape qui a permis de diminuer l'usage des produits phytopharmaceutiques par les collectivités et les particuliers de 70 %.

https://doi.org/10.15454/9HM9-3C17

L'arrêté mis en consultation vise à interdire l'utilisation des produits phytopharmaceutiques dès le 1er juillet 2022 dans tous les lieux de vie en dehors des terrains de sports de haut niveau. [...]

Accès au document

Présence de pesticides dans l'air : les connaissances progressent

Actu-environnement 02/07/20

Les résultats de la campagne de mesures des résidus de pesticides dans l'air menée entre juin 2018 et juin 2019 sont connus. L'exercice permet d'affiner la mise en place d'une surveillance pérenne et ouvre d'autres perspectives de recherche.

C'est un pas de plus vers la mise en place d'une stratégie nationale de surveillance des pesticides dans l'air qui s'opère. L'Anses et l'Ineris ont publié les résultats de leur campagne nationale de mesure menée entre juin 2018 et juin 2019 dans toutes les régions et dans différents profils d'habitation (urbain, péri-urbain et rural). Grâce à un protocole harmonisé, cette campagne a permis de mesurer 75 substances sur 50 sites, de produire 100 000 données et d'analyser 1 800 échantillons...

Accès au document

Ventes de pesticides : une baisse attendue pour 2019

Actu-environnement 1/07/20

Les premiers chiffres divulgués par le ministère de la Transition écologique font état d'une baisse des ventes de pesticides en 2019. Les ventes de substances actives ont baissé de 44 % entre 2018 et 2019 après une hausse de 18 % l'année précédente. [...]

Accès au document

Microplastic pollution accumulates heavily in coastal areas such as fjords and estuaries

EurekAlert! 30/06/20

Microplastic pollution in marine environments is concentrated most highly in coastal habitats, especially fjords and estuaries, according to a new review article published in the journal Marine Pollution Bulletin. Deep sea environments generally have much lower microplastic concentrations, although there are hotspots where elevated concentrations of microplastic occur.

Each year humans produce 360 million tonnes of plastic, and according to one study, around 8 million tonnes of it enters the ocean. Until recently the fate of microplastics (particles less than 5 mm in size) in the ocean has been unclear, but recent research has found that microscopic particles often settle in marine sediments, following the pattern of other pollutants. [...]

Accès au document

Convention citoyenne pour le climat : les mesures agricoles pourraient être adoptées par Emmanuel Macron

Terre-Net 30/06/20

Le président de la République, qui a reçu le 29 juin les citoyens de la Convention pour le climat, s'est dit prêt à reprendre 146 mesures sur les 149 proposées, incluant par conséquent les propositions relatives à l'agriculture.

Mise en place l'année dernière, la Convention citoyenne pour le climat a rendu sa copie le 21 juin, une feuille de route de 149 propositions devant permettre à la France d'atteindre ses objectifs en matière de réduction des gaz à effet de serre. [...]

Le président ouvre donc la possibilité de reprendre toutes les autres mesures, y compris celles qui concernent l'agriculture : 50 % des terres cultivées en agro-écologie, promotion des circuits courts, repas végétariens dans les cantines, interdiction des pesticides d'ici 2040...

Accès au document