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Bulletin de veille du réseau d'écotoxicologie terrestre et aquatique



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Edito

Voici notre 51^{ème} bulletin de veille, qui nous espérons toujours informatif !

Nous vous proposons dans ce bulletin une tribune concernant la publication du 1^{er} outil national de sélection des couples espèce/biomarqueur pour le suivi de la qualité des milieux aquatiques : enjeux & perspectives pour la communauté Ecotox. 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-33-juin-2021>

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Tribune libre

Publication du 1^{er} outil national de sélection des couples espèce/biomarqueur pour le suivi de la qualité des milieux aquatiques : enjeux & perspectives pour la communauté Ecotox



Le projet Biomarqueurs & Biodiversité : contexte et bilan

Réalisé entre 2017 et 2020 dans le cadre de l'appel à manifestations d'intérêt « Besoins de développements en appui à la surveillance et à l'évaluation de l'état des eaux et des milieux aquatiques » de l'OFB, le projet Biomarqueurs et Biodiversité (B&B) a eu pour objet :

- 1- De répertorier les couples espèce/biomarqueur disponibles sur le territoire national ;
- 2- D'évaluer la pertinence de l'utilisation des biomarqueurs pour la surveillance opérationnelle des masses d'eau continentales, côtières et de transition dans le contexte de la Directive Cadre sur l'Eau (DCE).

La Fondation ROVALTAIN a coordonné ce projet, en s'appuyant sur des partenaires et experts issus des organismes suivants : l'INRAE, l'UMR-I 2-SEBIO, le LIENS, l'EA MMS, l'UMR LEMAR, et le GIP Seine-Aval. Un travail d'enquête approfondi auprès de 15 laboratoires de recherche français a ainsi permis de référencer 331 couples espèce/biomarqueur, de les évaluer selon leur maturité opérationnelle et de caractériser leurs limites, leur spécificité et leur pertinence écologique dans un objectif de surveillance réglementaire des milieux aquatiques.

A émergé de ce travail une base de données (BMK) recensant les couples espèce/biomarqueur utilisables dans 4 contextes d'application différents : surveillance générale, qualité du rejet, impact du rejet sur le milieu, diagnostic control enquête ; et pour 3 types de masses d'eau : continentale, de transition, côtière. Un aperçu de l'utilisation de cette base de données est présenté en Annexe 1. Cet outil opérationnel est accompagné d'un guide pratique destiné aux utilisateurs.

Basée sur l'analyse de l'état chimique (45 molécules) et de l'état écologique des masses d'eau, la DCE prend peu en compte l'état biologique et physiologique des espèces animales et végétales présentes au sein de l'écosystème aquatique : des paramètres qui pourraient pourtant améliorer la description de l'état des milieux. Face à ce constat, de nombreux écotoxicologues œuvrent en faveur de l'intégration des

biomarqueurs et des bio-essais dans ce cadre réglementaire, à l'image de ce qui est déjà réalisé dans la Directive Cadre Stratégie pour le Milieu Marin (DCSMM). Afin d'évaluer les manques essentiels de la DCE, un consortium européen s'est également constitué et a mis en avant l'intérêt d'utiliser des méthodes innovantes de surveillance biologique, complémentaires à l'analyse chimique, appelées « Effect-based Methods » (EBMs), ou méthodes basées sur les effets (Wernersson *et al.*, 2015). Ces EBMs, qui regroupent les biomarqueurs et les bio-essais, sont proposées en complément des analyses chimiques et écologiques.

Dans ce contexte, les biomarqueurs sont donc de véritables outils de détermination de l'état de santé des organismes aquatiques, à la fois pour la surveillance générale, mais aussi lors d'un incident isolé de pollution. Une réflexion autour de l'utilisation de ces outils dans le cadre réglementaire de la DCE a ainsi fait l'objet d'un premier article (Milinkovitch *et al.*, 2019).

La pertinence et l'opérationnalité des couples espèce/biomarqueur au sein des quatre cadres d'études mentionnés précédemment ont fait l'objet d'un classement en fonction de 10 critères d'évaluation, comme l'existence d'une relation dose/réponse, l'existence de valeurs de base et de valeurs seuil ou encore des considérations technico-économiques.

Le projet B&B a permis de mettre en avant l'expertise française sur les biomarqueurs en écotoxicologie aquatique et de faire émerger la base de données BMK recensant les couples espèce/biomarqueur disponibles pour la biosurveillance aquatique. C'est le premier outil d'aide à la décision de cette envergure disponible en France.

Une base de données des couples espèce/biomarqueur disponibles en fonction du cadre d'étude : pour qui ? Pour quoi faire ?

La base de données BMK a permis dans un premier temps de faire un état des lieux des biomarqueurs actuellement disponibles en France, et de rassembler la communauté autour de ce sujet. Cette base de données est la plus exhaustive réalisée à ce jour en France et a pour fonction (i) d'éclairer les gestionnaires de l'environnement sur le potentiel de ces outils dans un contexte opérationnel et (ii) d'accompagner et nourrir les thématiques de recherche en cours. Ainsi, les étudiants, chercheurs ou gestionnaires de l'eau souhaitant en savoir plus sur la possible utilisation d'un couple espèce/biomarqueur et son degré de maturité opérationnelle peuvent trouver les informations nécessaires (contacts, chercheurs...) sur le Guide Pratique associé à la BMK. Ce guide accompagne les utilisateurs dans la prise en main de cet outil et apporte des précisions sur les critères de sélection des couples espèce/biomarqueur ainsi que sur leur pertinence en fonction du contexte de l'étude, e.g. méthode active ou passive.

Quelle stratégie pour l'intégration des couples espèce/biomarqueur dans un cadre réglementaire ? Au niveau national ? Au niveau européen ?

En juin 2020, après un examen approfondi, la commission européenne a finalement décidé de ne pas procéder à la révision de La DCE et de ne pas modifier les critères et méthodes d'évaluation en place. Le point positif de cette décision est que le texte ne sera pas affaibli. En revanche, l'intégration d'outils de biosurveillance aquatique tels que les biomarqueurs n'a pas été validée et la décision remise à la prochaine date de révision.

Ce délai pourra permettre d'affiner l'utilisation de ces biomarqueurs et de relever les défis qu'elle représente afin de s'insérer dans un cadre réglementaire, notamment :

- Définir de façon précise, une batterie de marqueurs capables de couvrir toutes les classes de produits chimiques qui peuvent affecter l'homéostasie des espèces aquatiques ;

- Mettre en place des indicateurs (de type Effect-Based Treshold « EBT ») permettant de définir des valeurs de base et des valeurs seuils, afin de différencier une qualité d'eau acceptable d'une qualité d'eau médiocre.

En termes de stratégies de déploiement, l'inventaire des couples espèce/biomarqueur réalisé grâce à ce projet pourrait ainsi être un premier pas vers la mise en place de protocoles de surveillance cadrés impliquant les différents acteurs de l'eau à un niveau national, au premier rang desquels les agences et gestionnaires de l'eau. Pour cela, il est nécessaire d'identifier des sites pilotes et travailler de concert avec les acteurs de l'eau, afin de lever les interrogations sur le mode d'application, la pertinence des biomarqueurs (valeurs de base, valeurs seuils ...) et leurs apports pour la définition d'actions. En France, on dénombre déjà plusieurs exemples de déploiement de ces couples espèce/biomarqueur pour la biosurveillance des masses d'eau. Parmi eux, le projet BIOSURVEILLANCE¹ (2019 - 2022), un projet pilote coordonné par le GIP Seine-Aval et basé sur l'utilisation de biomarqueurs pour un appui à la surveillance de la qualité de différents types de masses d'eau du district Seine-Normandie, en concertation avec l'agence de l'eau Seine-Normandie. Plus précisément, des biomarqueurs de génotoxicité et d'immunotoxicité sont mesurés sur organismes engagés, représentatifs de différents milieux (eaux douce, de transition, et marin côtier) et de différents groupes taxonomiques de sensibilités différentes aux contaminants chimiques (crustacés, bivalves et poissons).

Il apparaît donc à la fois nécessaire de présenter des exemples de suivi fonctionnels et de mettre en place des groupes de travail, pilotés par les gestionnaires et accompagnés par les chercheurs, afin de définir des « protocoles types » concrets, adaptés et transférables, à l'image du projet SASHIMI², en cours de réalisation dans le bassin Seine-Normandie.

Enfin, en parallèle du projet B&B, un autre groupe de travail a été réuni par l'OFB et l'INERIS dans le cadre du partenariat avec le consortium AQUAREF³ afin de lister les bio-essais disponibles sur le territoire national. Les résultats de ce groupe de travail, complémentaires à ceux du projet B&B, seront publiés courant 2021, et la mise en commun de ces deux études constituera une base de travail solide. Déjà amorcée, la réflexion autour du déploiement de méthodes intégratives permettant de combiner plusieurs bio-essais ou plusieurs biomarqueurs pour la biosurveillance des milieux aquatiques est plus que jamais d'actualité. Le concept des EBM (Wernersson *et al.*, 2015) a permis d'esquisser des réflexions et des recommandations par des groupes de travail au niveau européen sur leur intégration au niveau de la DCE ou dans des contextes d'études locales ou de monitoring spécifique. Parmi ces groupes de travail, le projet collaboratif SOLUTIONS⁴ recommande l'utilisation d'EBMs intégratives pour le diagnostic et la biosurveillance de la qualité du milieu aquatique, avec le déploiement d'une batterie minimum de bio-essais *in vitro* et *in vivo* (Brack *et al.*, 2019).

Concernant plus spécifiquement les biomarqueurs, une réflexion autour des nouvelles méthodes intégratives permettant d'avoir en sortie une réponse biologique lisible par les gestionnaires et les décisionnaires est

¹ <https://www.seine-aval.fr/projet/biosurveillance/>

² <https://www.seine-aval.fr/projet/sashimi/> Projet de Surveillance Active de l'impact de la pression chimique par des biomarqueurs (SASHIMI)

³ AQUAREF, laboratoire national de référence pour la surveillance des milieux aquatiques, est né de la nécessité de renforcer l'expertise française dans le domaine de la surveillance des milieux aquatiques à partir de la mise en réseau des compétences et des capacités de recherche des cinq établissements publics directement concernés: BRGM, IFREMER, INERIS, INRAE, LNE.

⁴ <https://www.solutions-project.eu/> SOLUTIONS recherche des outils, méthodes et modèles nouveaux et performants pour soutenir les décisions en matière de politiques environnementales et de l'eau

nécessaire. A ce sujet, un deuxième article ayant pour objet la comparaison et l'analyse critique de ces différentes méthodes est en cours de rédaction par les partenaires du projet B&B et la Fondation Rovaltain.

Quelle évolution pour la base de données des couples espèce/biomarqueur ? Faire vivre/évoluer la base de données ?

La base de données Biomarqueurs & Biodiversité recense les couples espèce/biomarqueur disponibles pour contribuer à évaluer la qualité des masses d'eau à un instant précis. Bien que cette base de données soit le 1^{er} outil de cette envergure créé pour la biosurveillance des écosystèmes aquatiques en France, il n'est pas exhaustif. En effet, de nouveaux couples espèce/biomarqueur ont pu être développés depuis la publication de cette base de données. Par ailleurs, parmi les couples espèce/biomarqueur sélectionnés, la maturité de certains a pu évoluer entre la publication de la base de données et la rédaction de cette tribune.

Il apparaît donc nécessaire de faire évoluer cet outil, dans le but d'intégrer de nouveaux couples espèce/biomarqueur, mais également afin de prendre en compte la modulation de certains paramètres, comme le degré de maturité opérationnelle, les valeurs de base/seuils ou encore un changement de protocole permettant de faciliter l'utilisation d'un biomarqueur.

Plusieurs solutions sont à l'étude :

- La mise à jour annuelle sur le site web du projet par la Fondation Rovaltain, avec l'appui des partenaires ayant contribué à la création de la base de données, après validation par un comité scientifique ;
- Une journée annuelle organisée à la Fondation Rovaltain dédiée aux biomarqueurs et permettant de faire remonter les informations principales sur les nouveaux biomarqueurs.

Comment fédérer la communauté Ecotox autour de l'outil de sélection des couples Espèce/Biomarqueur au niveau national ?

Le projet B&B et la création de la base de données BMK et du Guide Pratique associé constituent une opportunité de fédérer la communauté Ecotox autour du sujet transverse des biomarqueurs. Pour faire suite à ce projet, et en coordination avec les résultats du groupe de travail bio-essais, des formations sur l'utilisation des biomarqueurs et des bio-essais en fonction des différents cadre d'étude pourraient être mises en place/organisées par la Fondation Rovaltain. Il pourrait ainsi être envisagé une école d'été/d'hiver dédiée à l'apprentissage de l'utilisation des biomarqueurs et des bio-essais.

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Pour en savoir plus et obtenir la Base de Données BMK & le Guide Pratique

<https://sites.google.com/view/biomarqueur-et-biodiversite/accueil>

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Annexe 1. Exemple d'utilisation de la Base de données BMK : Rang de maturité opérationnelle des couple espèce/biomarqueur en fonction du Cadre d'étude (entouré en rouge, dans l'exemple, la surveillance générale) et du milieu (entouré en vert, dans l'exemple, tout milieu confondu)

1	Sélectionnez dans le menu déroulant ci contre votre cadre de questionnement >>>		Critère 1			Critère 2			Critère 3																		
			Rotation dose / réponse			Robustesse /Caractérisation des facteurs confondants (intrinsèque et environnemental)			Connaissance des conséquences sur les niveaux d'organisation supérieure																		
			relation dose/réponse connue, profil de réponse MONOTONE (inhibition ou induction)	relation dose/réponse connue, profil de réponse NON MONOTONE (induction/inhibition)	relation dose/réponse non connue	Effets des facteurs confondants connus et/ou est possible de les	Effets des facteurs confondants connus mais non pris en compte dans l'interprétation	pas de connaissance de l'effet des facteurs confondants	Ce biomarqueur a un lien connu avec un trait de vie? survie, repro, croissance,	N'a pas de lien établi avec trait de vie																	
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
Espece	Biomarqueur	MILIEU	Labo	Rang																							
Gammarus fossarum	mue	Continental	RIVERLY	1																							
Mytilus edulis	ACHE	Transition / Côtier	LEX	2	X				X																		
Mytilus edulis	ACHE	Transition	LEX	3	X				X																		
Gammarus fossarum	taux d'alimentation	Continental	RIVERLY	4		X																					
Gammarus fossarum	comet sur spermatozoide	Continental	RIVERLY	5	X					X																	
Crassostrea gigas	Laccase	Transition / Côtier	LIENS	6	X					X																	
Gammarus fossarum	Tyrosine	Continental	SEBO	7				X			X																
Gammarus fossarum	Amylase	Continental	SEBO	8				X			X																
Gammarus fossarum	ACHE	Continental	RIVERLY	9	X					X																	
Palaeomon longirostris	comet sur spermatozoide	Transition	SEBO	10	X					X																	
Oncorhynchus mykiss	test des micronoyaux	Continental	EPOC	11	X					X																	
Dreissena polymorpha	Amylase	Continental	SEBO	12		X				X																	
Gammarus pulex	pression osmotique sg	Continental	MARREC	13	X					X																	
Gammarus fossarum	pression osmotique sg	Continental	MARREC	14	X					X																	
Oncorhynchus mykiss	Tbars	Continental	EPOC	15	X					X																	
Oncorhynchus mykiss	protéines carbonyles	Continental	EPOC	16	X					X																	
Gasterosteus aculeatus	phagocytose	Continental	SEBO	17		X				X																	
Dreissena polymorpha	Phosphatase acide	Continental	SEBO	18			X			X																	
Dreissena polymorpha	LDH	Continental	SEBO	19				X		X																	
Dreissena polymorpha	Election transport system	Continental	SEBO	20				X		X																	
Dreissena polymorpha	LDH	Continental	LIEC	21				X		X																	
Gasterosteus aculeatus	ACHE	Continental	SEBO	22			X			X																	
Gasterosteus aculeatus	Flambée oxydative	Continental	SEBO	23		X				X																	
Gasterosteus aculeatus	Distribution leucocytaire	Continental	SEBO	24		X				X																	

ERA / PUBLICATIONS SCIENTIFIQUES / COMMUNAUTES MICROBIENNES AQUATIQUES

Study of the Tagus River and Entrepenas reservoir ecosystem around the Trillo nuclear power plant using chemometric analysis: Influence on water, sediments, algae and fish

Authors: Arguelles R, Toledo M, Martin MA
Source: CHEMOSPHERE 279:130532, 2021, DOI:
10.1016/j.chemosphere.2021.130532

Abstract: The fluvial and aquatic ecosystem of the Tagus River and Entrepenas reservoir located in the surrounding of the Trillo nuclear power plant (NPP) was evaluated from 1992 to 2008, considering the physicalchemical characteristics, metal content and radiological activity of the water, sediments, algae and fish...

The link between pharmaceuticals and cyanobacteria: a review regarding ecotoxicological, ecological, and sanitary aspects

Authors: Costa RD, Quadra GR, Souza HD et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: 10.1007/s11356-021-14698-5

Abstract: Cyanobacteria are important for ecosystem functioning, but eutrophication may affect the surrounding biome by losing ecosystem services and/or through affecting the cyanotoxins production that threatens ecological and human health. Pollution is an environmental issue that affects aquatic ecosystems worldwide, and the knowledge of the role of synthetic chemicals such as pharmaceuticals is still scarce. [...] An overview of ecotoxicological tests performed in the literature exposing cyanobacteria to pharmaceuticals and the possible consequences regarding ecological and sanitary aspects was conducted...

Insights into the microbial degradation and biochemical mechanisms of carbamates

Authors: Mishra S, Pang SM, Zhang WP et al.

Source: CHEMOSPHERE 279:130500, 2021, DOI:
10.1016/j.chemosphere.2021.130500

Abstract: [...] This review discusses the deep understanding of carbamate degradation mechanisms with microbial strains, metabolic pathways, molecular mechanisms, and their genetic basis in degradation.

A trophic transfer study: accumulation of multi-walled carbon nanotubes associated to green algae in water flea *Daphnia magna*

Authors: Politowski I, Wittmers F, Hennig MP et al.

Source: NANOIMPACT 22:100303, 2021 DOI: 10.1016/j.impact.2021.100303

Abstract: Carbon nanotubes (CNT) are promising nanomaterials in modern nanotechnology and their use in many different applications leads to an inevitable release into the aquatic environment. In this study, we quantified trophic transfer of weathered multi-walled carbon nanotubes (wMWCNT) from green algae to primary consumer *Daphnia magna* in a concentration of 100 µg L⁻¹ using radioactive labeling of the carbon backbone (C-14-wMWCNT). Trophic transfer of wMWCNT was compared to the uptake by daphnids exposed to nanomaterials in the water phase without algae...

Thorium Exposure Drives Fatty Acid and Metal Transfer from Biofilms to the Grazer *Lymnaea sp.*

Authors: Doose C, Fadhlaoui M, Morin S, Fortin C

Source: ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY Early Access, DOI:10.1002/etc.5067

Abstract: Aquatic ecotoxicological risks associated with tetravalent metallic elements such as thorium (Th) are still poorly understood. Periphytic biofilm represents an important food source in aquatic environments; thus, such risks could severely affect nutrient and energy cycling in these ecosystems. The present study investigated the potential for Th to change the fatty acid composition of biofilm communities. Bioaccumulation of Th and fatty acids were measured after 4 wk to 2 exposure conditions: a control (C0) and Th exposure (C10)...

Cytotoxicity and genotoxicity of coated-gold nanoparticles on freshwater algae *Pseudokirchneriella subcapitata*

Authors: Mahaye N, Leareng SK, Musee N

Source: AQUATIC TOXICOLOGY 236:105865, 2021, DOI: 10.1016/j.aquatox.2021.105865

Abstract: Gold engineered nanoparticles (nAu) are increasingly detected in ecosystems, and this raises the need to establish their potential effects on aquatic organisms. Herein, cytotoxic and genotoxic effects of branched polyethylenimine- and citrate-coated nAu (5, 20, and 40 nm) on algae *Pseudokirchneriella subcapitata* were evaluated. The apical biological endpoints: growth inhibition and chlorophyll a content were investigated at 62.5-1000 µg/L over 168 h. In addition, the apurinic/aprimidinic sites, randomly amplified polymorphic deoxyribonucleic acid profiles, and genomic template stability were assessed to determine the genotoxic effects of nAu...

Exploring the role of water chemistry on metal accumulation in biofilms from streams in mining areas

Authors: Laderriere V, Le Faucheur S, Fortin C

Source: SCIENCE OF THE TOTAL ENVIRONMENT 784:146986, 2021, DOI: 10.1016/j.scitotenv.2021.146986

Abstract: Biofilms play a key role in aquatic ecosystems. They are ubiquitous, even in the most contaminated ecosystems, and have great potential as biomonitors of exposure to contaminants such as metals. Freshwater biofilms and surface waters were sampled in two active mining areas of Canada: in the northern part of Nunavik (Quebec) and in the Greater Sudbury area (Ontario)...

Toxicity evaluation of nano-TiO₂ in the presence of

functionalized microplastics at two trophic levels: Algae and crustaceans

Authors: Thiagarajan V, Alex SA, Seenivasan R et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 784:147262, 2021, DOI: 10.1016/j.scitotenv.2021.147262

Abstract: The rising use of contaminants such as nanoparticles and microplastics has taken a heavy toll on the marine environment. However, their combined toxic effects on the species across various trophic levels remain quite unexplored. The aim of this study was to explore the effects of three surface-functionalized (carboxylated, plain, and aminated) polystyrene microplastics on nano-TiO₂ toxicity across two trophic levels containing *Chlorella* sp. as the prey and *Artemia salina* as the predator. The experiments carried out on *Chlorella* sp. include the toxicity assessment, oxidative stress determination, and uptake of nano-TiO₂ (both in the presence and absence of microplastics)...

Metagenomic analysis of a mega-city river network reveals microbial compositional heterogeneity among urban and peri-urban river stretch

Authors: Yadav R, Rajput V, Dharne M

Source: SCIENCE OF THE TOTAL ENVIRONMENT 783:146960, 2021, DOI:10.1016/j.scitotenv.2021.146960

Abstract: The rivers in the megacities face a constant inflow of extremely polluted wastewaters from various Source:s, and their influence on the connected peri-urban river is still poorly understood. The riverine system in Pune consists of Rivers Mula, Ramnadi, Pawana, Mutha,

and Mula-Mutha, traversing through the urban settlements of Pune before joining River Bhima in the peri-urban region. We used MinION-based metagenomic sequencing to generate a comprehensive understanding of the microbial diversity differences between the urban and peri-urban zones, which has not been explored at the meta scale until date...

Characterizations of heavy metal contamination, microbial community, and resistance genes in a tailing of the largest copper mine in China

Authors: Jiang XW, Liu WH, Xu H et al.

Source: ENVIRONMENTAL POLLUTION 280:116947, 2021, DOI: 10.1016/j.envpol.2021.116947

Abstract: Copper mine tailings are causing great environmental concern nowadays due to their high contents of heavy metals. These hazards may release to air, water, and soil, posing great threat to the living organisms in the surroundings. In the present work, we profiled the heavy metal contents, microbiome and resistome of a mine tailing in Dexing Copper Mine, which is the largest open-pit copper mine in China...

Effects of acid drainage from abandoned coal mines on the microbial community of Shandi River sediment, Shanxi Province

Authors: Chen D, Feng QY, Li WB and more...

Source: INTERNATIONAL JOURNAL OF COAL SCIENCE & TECHNOLOGY 2021, DOI: 10.1007/s40789-021-00433-5

Abstract: The discharge of acid mine drainage from abandoned high sulfur (S) coal mines has caused serious pollution in the Shandi River, Yangquan, Shanxi Province. To determine the impact of long-term acid mine drainage on the microorganisms in the river, we collected river sediments from a polluted tributary (Group P) and the mainstream of Shandi River (Group R) to study the bacterial diversity and community composition...

The impacts of metal-based engineered nanomaterial mixtures on microbial systems: A review

Authors: Wu SS, Gaillard JF, Gray KA

Source: SCIENCE OF THE TOTAL ENVIRONMENT 780:146496, 2021, DOI: 10.1016/j.scitotenv.2021.146496

Abstract: The last decade has witnessed tremendous growth in the commercial use of metal-based engineered nanomaterials (ENMs) for a wide range of products and processes. Consequently, direct and indirect release into environmental systems may no longer be considered negligible or insignificant. Previous research has focused primarily on the acute effects of individual ENMs using pure cultures under controlled laboratory environments, which may not accurately reveal the ecological impacts of ENMs under real environmental conditions. The goal of this review is to assess our current understanding of ENM effects as we move from exposure of single to multiple ENMs or microbial species. For instance, are ENMs' impacts on microbial communities predicted by their intrinsic physical or chemical characteristics or their effects on single microbial populations; how do chronic ENM interactions compare to acute toxicity; does behavior under simplified laboratory conditions reflect that in environmental media; finally, is biological stress modified by interactions in ENM mixtures relative to that of individual ENM? ...

Effect of pyrethroid on growth and protein content of two unicellular cyanobacteria (blue green algae)

Authors: Bano S, Shafique S, Burhan ZUN, Rasheed M

Source: PAKISTAN JOURNAL OF BOTANY 53(4): 1531-1535, 2021, DOI: 10.30848/PJB2021-4(24)

Abstract: Two unicellular strains of cyanobacteria *Chroococcidiopsis* sp. and *Microcystis* sp. isolated from marine environment were mass cultured and their interaction with pyrethroid pesticides was studied...

Dissolved organic matter modulates the impact of herbicides on a freshwater alga: A laboratory study of a three-way interaction

Authors: Morin S, Coquille N, Eon M et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 782:146881, 2021, DOI: 10.1016/j.scitotenv.2021.146881

Abstract: In freshwater environments, microorganisms such as microalgae are influenced by the concentrations of dissolved chemicals but can modify the fate of these substances by biosorption, accumulation and even metabolization. In this laboratory study, we assessed the growth and physiology of non-axenic cultures of the chlorophyte *Sphaerellopsis* sp. exposed to environmental concentrations of diuron, irgarol and S-metolachlor (0.5, 0.5 and 5 µg.L⁻¹, respectively) singly and in mixture, in the presence or absence of natural dissolved organic matter. The growth, photosynthetic efficiency and relative intracellular lipid content of *Sphaerellopsis* sp., as were measured after 14

days of exposure, as were the concentrations of bacteria in the cultures...

Environmental concentrations of sulfonamides can alter bacterial structure and induce diatom deformities in freshwater biofilm communities

Authors: Kergoat L, Besse-Hoggan P, Lereboure M et al.

Source: FRONTIERS IN MICROBIOLOGY 12:643719, 2021, DOI: 10.3389/fmicb.2021.643719

Abstract: The antibiotics commonly found in surface waters include sulfamethoxazole (SMX) and sulfamethazine (SMZ), which belong to the class of sulfonamides, the oldest antibiotic class still in use. [...] Sulfonamides are known to inhibit bacterial growth by altering microbial production of folic acid, but sub-lethal doses may trigger antimicrobial resistance, with unknown consequences for exposed microbial communities. We investigated the effects of two environmentally relevant concentrations (500 and 5,000 ng L⁻¹) of SMZ and SMX on microbial activity and structure of periphytic biofilms in stream mesocosms for 28 days...

The inhibitory effects of the antifouling compound Irgarol 1051 on the marine diatom *Skeletonema* sp. across a broad range of photosynthetically active radiation

Authors: Tang Y, Chen C, Sheng YJ et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: 10.1007/s11356-021-14135-7

Abstract: The release of anthropogenic organic pollutants has resulted in extensive environmental risks to coastal waters. Among pollutants released, the most common antifoulant, Irgarol 1051, is an effective inhibitor of photosystem II of photoautotrophs; thus, the continuous release of this compound into surrounding seawater would potentially threaten marine algae. To investigate this, we grew the model marine diatom *Skeletonema* sp. at different concentrations of Irgarol 1051 and levels of photosynthetically active radiation (PAR)...

The microbial community in a green turtle nesting beach in the Mediterranean: application of the Biolog EcoPlate approach for beach pollution

Authors: Candan ED, Idil N, Candan O

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: 10.1007/s11356-021-14196-8

Abstract: This study aims to characterize the microbial community and its relationship with heavy metal pollution in the beaches of Sugoçu, an important nesting site for the green turtle. Heavy metal concentrations of sand samples from subregions of Sugoçu were determined using ICP-MS. The microbial community was analyzed using the Biolog (R) EcoPlate. The relationship between microbial catalytic activity and heavy metal levels were analyzed using canonical correspondence analysis...

Combined effects of sulfamethoxazole and erythromycin on a freshwater

microalga, *Raphidocelis subcapitata*: toxicity and oxidative stress

Authors: Zhang YB, He D, Chang F et al.

Source: ANTIBIOTICS-BASEL 10:576, 2021, DOI: 10.3390/antibiotics10050576

Abstract: This study investigated the environmental effects of two familiar emerging contaminants, sulfamethoxazole and erythromycin, and their mixture (10:1 w/w) using a green microalga, *R. subcapitata*. The cell density, pigment content, and the activities of superoxide dismutase, catalase, glutathione, glutathione peroxidase, and glutathione S-transferase were analysed...

Ecological risk potentials of petroleum hydrocarbons and heavy metals shape the bacterial communities of marine hydrosphere at Atlantic Ocean, Atlas Cove, Nigeria

Authors: Oyetibo GO, Ige OO, Obinani PK, Amund OO

Source: JOURNAL OF ENVIRONMENTAL MANAGEMENT 289:112563, 2021, DOI: 10.1016/j.jenvman.2021.112563

Abstract: Trans-Atlantic voyage of petroleum often leads to marine pollution with petroleum hydrocarbons and heavy metals that defines structures of autochthonous bacteria in the hydrosphere. Bacterial taxa of marine sediments exposed to petroleum transport activities were profiled using 16S rDNA metagenomics and correlated with the geochemistry to establish their impact on the microbiome...

Biodiversity and functional trait effects on copper toxicity in a proof-of-concept multispecies microalgal assay

Authors: Joonas E, Olli K, Kahru A, Aruoja V

Source: ALGAL RESEARCH-BIOMASS BIOFUELS AND BIOPRODUCTS 55:102204, 2021, DOI: 10.1016/j.algal.2021.102204

Abstract: This study aimed to elucidate biodiversity effects on algal biomass production under toxicant stress and to increase environmental realism in ecotoxicological testing by exposing artificial algal communities to Cu²⁺. All 15 possible combinations of four functionally distinct microalgal species (green algae *Chlamydomonas reinhardtii* and *Raphidocelis subcapitata*, diatom *Fistulifera pelliculosa* and cyanobacterium *Synechocystis* sp.) were exposed to 0.01 and 0.02 mg Cu²⁺/L in a modified algal growth inhibition assay (OECD 201)...

Formation of silver nanoparticles in aquatic environments facilitated by algal extracellular polymeric substances: Importance of chloride ions and light

Authors: Xiong SC, Cao XS, Fang H et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 775:145867, 2021, DOI: 10.1016/j.scitotenv.2021.145867

Abstract: Natural conversion of metal species is an important Source: for nanoscale metal particles in the aquatic environment, and it could affect their fate and toxicity. Extracellular polymeric substances (EPSs) are ubiquitous and abundant in the aquatic environment, thus likely can reduce metal ions to nanoscale particles. However, the effect of natural inorganic ligand and light on this process has not been well

investigated. In this work, Ag⁺ was readily reduced to silver nanoparticles (AgNPs, around 15 nm in size) by the EPS collected from *Chlorella pyrenoidosa*...

Evaluation of Multivariate Biomarker Indexes Application in Ecotoxicity Tests with Marine Diatoms Exposed to Emerging Contaminants

Authors: Pires VL, Novais SC, Lemos MFL et al.

Source: APPLIED SCIENCES-BASEL 11:3878, 2021, DOI: 10.3390/app11093878

Abstract: Worldwide anthropogenic activities result in the production and release of potentially damaging toxic pollutants into ecosystems, thereby jeopardizing their health and continuity. Research studies and biomonitoring programs attend to this emerging problematic by applying and developing statistically relevant indexes that integrate complex biomarker response data to provide a holistic approach, reflecting toxically induced alterations at the organism or population level. Ultimately, indexes allow simple result communications, enhancing policy makers understanding, and contributing to better reSource: and environmental managing policies. In this study three indexes, the integrated biomarker response index (IBR), the bioeffects assessment index (BAI) and principal components analysis (PCA), were evaluated for their sensitivity in revealing toxically induced stress patterns in cells of the diatom *Phaeodactylum tricornutum* under contaminant exposure...

Response of Benthic Diatom Assemblages to

Contamination by Metals in a Marine Environment

Authors: Martinez YJ, Siqueiros-Beltrones DA, Marmolejo-Rodriguez AJ

Source: JOURNAL OF MARINE SCIENCE AND ENGINEERING 9:443, 2021, DOI: 10.3390/jmse9040443

Abstract: Studies on marine benthic diatoms in environments contaminated by metals are scarce. The typical structure of benthic diatom assemblages (species richness, diversity, dominance, dominant taxa) from undisturbed environments may be used as reference for contrasting with contaminated environments in order to observe how said assemblages respond to such disturbance. [...] To do this, concentrations of 24 metals were surveyed in a coastal zone impacted by mining residues, and the structure of benthic local diatom assemblages was described...

Glyphosate-based herbicide exposure affects diatom community development in natural biofilms

Authors: Corrales N, Meerhoff M, Antoniadis D

Source: ENVIRONMENTAL POLLUTION 284:117354, 2021, DOI: 10.1016/j.envpol.2021.117354

Abstract: Glyphosate herbicide is ubiquitously used in agriculture and weed control. It has now been identified in aquatic ecosystems worldwide, where numerous studies have suggested that it may have both suppressive and stimulatory effects on diverse non-target organisms. We cultured natural biofilms from a hypereutrophic environment to test the effects on periphytic diatoms of exposure to a glyphosate-based herbicide formulation at concentrations from 0 to 10 mg L⁻¹ of active ingredient...

Influence of silver nanoparticle-based coating

on calcareous rock surfaces on microbial biofilm colonization in intertidal environments in Campeche, Mexico

Authors: Camacho-Chab JC, Ortega-Morales BO, Gaylarde C et al.

Source: WATER AIR AND SOIL POLLUTION 232:172, 2021, DOI: 10.1007/s11270-021-05123-1

Abstract: The influence of silver nanoparticles (AgNPs) on microbial biofilm colonization on natural calcareous rocks was studied in the Campeche marine intertidal environment in southeast Mexico. The biofilm formation was assessed by color spectrophotometer measurements represented in the CIELAB color space, digital image analysis, confocal laser scanning microscopy, biochemical biomarkers, and enumeration of morphologically characterized cells by FlowCAM (R). Coupons were exposed with or without polydimethylsiloxane (PDMS) coatings and without or with various concentrations of AgNPs...

The effect of chromium on photosynthesis and lipid accumulation in two chlorophyte microalgae

Authors: Bashir KMI, Lee HJ, Mansoor S et al.

Source: ENERGIES 14:2260, 2021, DOI: 10.3390/en14082260

Abstract: Heavy metals have adverse effects on microalgae metabolism and growth. Photosynthesis and lipid profile are quite sensitive to heavy metal toxicity. The impact of hexavalent chromium-Cr(VI) on photosynthesis and lipid accumulation in *Mucidosphaerium pulchellum* and *Micractinium pusillum* exposed to different concentrations (0-500 µg L⁻¹) was investigated for 11 days...

Toxicity of copper on marine diatoms, *Chaetoceros calcitrans* and *Nitzschia closterium* from Cochin estuary, India

Authors: Neethu KV, Saranya KS, Krishna NGA et al.

Source: ECOTOXICOLOGY Early Access, 2021, DOI: 10.1007/s10646-021-02410-9

Abstract: The effects of copper (Cu) toxicity on the growth, pigments, protein, carbohydrate, lipid and antioxidant enzyme activities of two endemic microalgae, *Chaetoceros calcitrans* and *Nitzschia closterium* from Cochin estuary were studied and compared...

Bacteria compete with hematite nanoparticles during their uptake by the ciliate *Tetrahymena thermophila*

Authors: Guo WB, Yang LY, Miao AJ

Source: JOURNAL OF HAZARDOUS MATERIALS 411:125098, 2021, DOI: 10.1016/j.jhazmat.2021.125098

Abstract: Bacterial accumulation of engineered nanoparticles (NPs) result in their transfer along the food chain. However, there are a lot of NPs not associated with bacteria. Whether bacteria, as representative biotic particles, influence the biological uptake of these non-associated NPs in aquatic ecosystems is unclear. In the present study, we examined the effects of four bacterial species on the uptake kinetics of polyacrylate-coated hematite nano particles (HemNPs) by the ciliate *Tetrahymena thermophila*...

Pesticide mixture toxicity to algae in agricultural streams? Field observations and laboratory studies with in situ samples and reconstituted water

Authors: Stenstrom JR, Kreuger J, Goedkoop W
Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 215:112153, 2021, DOI: 10.1016/j.ecoenv.2021.112153

Abstract: Long-term pesticide water concentrations were investigated in four agricultural streams and their mixture toxicity on algae was assessed, based on realistic (i.e. observed) concentrations in laboratory tests using (i) natural weekly water samples and (ii) reconstituted pesticide-spiked water samples representing mixtures with predicted high mixture. This approach both covered the full complexity of natural water samples and the controlled approach of reconstituted water samples...

ERA / PUBLICATIONS SCIENTIFIQUES / ECOTOXICOLOGIE SPATIALE

Detecting landscape scale consequences of insecticide use on invertebrate communities

Authors: Mancini F, Woodcock BA, Redhead J, Spurgeon DJ et al.

Source: *The Future of Agricultural Landscapes, Part I*. Advances in Ecological Research 63:93-126, 2020, DOI: 10.1016/bs.aecr.2020.07.001

Abstract: Insecticides represent an important management tool in agriculture. They provide a low cost and efficacious approach to pest control, where they may be employed both reactively and pre-emptively. It is likely insecticides will continue to play a role in meeting the challenge of feeding a growing global population. The widespread use of insecticides creates potential for negative impacts on non-target invertebrate populations. Many countries have regulatory processes in place to manage these. However, there regulatory processes have potential limitations when it comes to detecting the long-term and large-scale consequences of insecticide use. For example, long-term sub-lethal effects resulting from low dose exposure durations are rarely considered in toxicity tests, while predictable additive effects of mixtures of active ingredient are often ignored. In order to address this data gap, there is substantial scope for using existing spatially and temporally explicit biological records of species occurrence. This could help in monitoring and assessment to support our responsibilities to maintain biodiversity while continuing to grow enough food to feed the human population. How this is achieved poses several problems, both practical and analytical. Here, we describe how national-scale data on the spatial and temporal distribution of native invertebrates can be combined with maps of large-scale insecticide application and exposure risk to explore the actual consequences for non-target native biodiversity. Understanding these impacts on native invertebrates will provide a vital evidence base to inform policy decisions that could complement existing regulatory processes.

Neonicotinoid residues in honey from urban and rural environments

Authors: Kavanagh S, Henry M, Stout JC, White B

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, Early Access, 2021, DOI: 10.1007/s11356-021-12564-y

Abstract: Pesticide residues in honey can negatively affect bee health. Although recent studies have detected neonicotinoid residues in honeys from around the world, little is known about how residues relate to land use and vegetation composition. To investigate potential relationships, we sampled multi-floral honey from 30 *Apis mellifera* hives from urban, agricultural and semi-natural habitats (SNH), identified and quantified three neonicotinoids present (clothianidin, imidacloprid and thiacloprid) using UHPLC-MS, and classified surrounding land use up to 5 km around hive sites.

Occurrence, spatial distribution, Source, and ecological risk assessment of organochlorine pesticides in Dongting Lake, China

Authors: Cao, F., Li, Z., He, Q. et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, Early Access, 2021, DOI: 10.1007/s11356-021-12743-x

Abstract: The occurrence, distribution, Source:s, and ecological risks of organochlorine pesticides in Dongting Lake of China were investigated.

Landscape Composition and Fungicide Exposure Influence Host-Pathogen Dynamics in a Solitary Bee

Authors: Krichilsky E, Centrella M, Eitzer B. et al.

Source: ENVIRONMENTAL ENTOMOLOGY 50(1):107-116, 2021, DOI: 10.1093/ee/nvaa138

Abstract: Both ecosystem function and agricultural productivity depend on services provided by bees ; these services are at risk from bee declines which have been linked to land use change, pesticide exposure, and pathogens. Although these stressors often co-occur in agroecosystems, a majority of pollinator health studies have focused on these factors in isolation, therefore limiting our ability to make informed policy and management decisions. Here, we investigate the combined impact of altered landscape composition and fungicide exposure on the prevalence of chalkbrood disease, caused by fungi in the genus *Ascosphaera* Olive and Spiltoir 1955 (*Ascosphaeraceae*: *Onygenales*), in the introduced solitary bee, *Osmia cornifrons* (Radoszkowski 1887) (*Megachilidae*: *Hymenoptera*). We used both field studies and laboratory assays to evaluate the potential for interactions between altered landscape composition, fungicide exposure, and *Ascosphaera* on *O. cornifrons* mortality.

Synergism between local- and landscape-level pesticides reduces wild bee floral visitation in pollinator-dependent crops

Authors: Bloom EH, Wood TJ, Hung KLJ, Ternest JJ et al.

Source: JOURNAL OF APPLIED ECOLOGY, Early Access, 2021, DOI: 10.1111/1365-2664.13871

Abstract: The hazard pesticides pose to pollinators are well-understood from laboratory studies. However, the field-level response of pollinators to pesticide use in agroecosystems is not well-established, nor is it clear if synergisms between pesticides affect pollinator visitation to crops...

Here, we evaluated if fungicide and insecticide use posed a hazard to wild and honeybees at 87 cucurbit-pumpkin, cucumber, watermelon-farms in the Midwestern United States. We also evaluated if synergisms between local- (i.e. focal cucurbit field) and landscape-level (i.e. surrounding crops) pesticide use influence wild and honeybee visitation to crop flowers.

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS

Metagenomic sequencing reveals detoxifying and tolerant functional genes in predominant bacteria assist *Metaphire guillelmi* adapt to soil vanadium exposure

Authors: Wang XW, Xia R, Sun MM, Hu F

Source: JOURNAL OF HAZARDOUS MATERIALS 415, 2021, DOI: 10.1016/j.jhazmat.2021.125666

Abstract: Due to extensive vanadium (V) mining and processing, an increasing amount of V has accumulated in soil, which poses a threat to public health. Consequently, we used earthworm (*Metaphire guillelmi*) incubation trials in Vcontaminated soil (0 & ndash;300 mg kg⁻¹) to explore the response of soil indigenous bacteria and earthworm intestinal bacteria to V stress ...

Effects of increasing concentrations of fungicide Quadris(R) on bacterial

functional profiling in loamy sand soil

Authors: Aleksova M, Kenarova A, Boteva S and more...

Source: ARCHIVES OF MICROBIOLOGY, 2021, DOI: 10.1007/s00203-021-02423-2

Abstract: A mesocosm experiment was conducted to assess the side effects of the fungicide Quadris(R) on soil bacterial functioning. Quadris(R) was applied to a loamy sand soil at increasing concentrations (0.0-35.0 mg kg⁻¹ dry soil) calculated according to its active ingredient azoxystrobin (Az)...

Determination of Bactericidal Effects of Some Pesticides on Useful and Pathogenic Bacteria

Authors: Kotan R, Tozlu E

Source: JOURNAL OF TEKIRDAG AGRICULTURE FACULTY-TEKIRDAG ZIRAAT FAKULTESI DERGISI 18(2): 197-212, 2021, DOI: 10.33462/jotaf.737039

Abstract: The damage of chemicals that are used for plant protection and plant nutrition products used in agriculture to human health and the environment is understood better day by day. However, a significant part of this damage occurs on the beneficial microbial fauna on the plant and in the soil described as a living system...

Field-scale studies on the change of soil microbial community structure and functions after stabilization at a chromium-contaminated site

Authors: Li DN, Li GH, Zhang DY

Source: JOURNAL OF HAZARDOUS MATERIALS 415, 2021, DOI: 10.1016/j.jhazmat.2021.125727

Abstract: Various remediation strategies have been developed to eliminate soil chromium (Cr) contamination which challenges the ecosystem and human health, and chemical stabilization is the most popular one. Limited work focuses on the change of soil microbial community and functions after chemical stabilization...

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

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

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 27, 33: 41265-41278, 2021, 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...

Responses of soil microbial community to combination pollution of galaxolide and cadmium

Authors: Lv Z, Li XG, Wang YJ and more...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-14520-2

Abstract: The goal of this work was to assess the effect of combined pollution of galaxolide (HHCB) and cadmium (Cd) on soil microbial community as measured by phospholipid fatty acid (PLFA)...

Measurement and modeling of hormesis in soil bacteria and fungi under single and combined treatments of Cd and Pb

Authors: Fan DW, Sun J, Liu C, and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 783, 2021, DOI: 10.1016/j.scitotenv.2021.147494

Abstract: Heavy metals are considered major environmental pollutants. Soil microorganisms represent a predominant component of soils ecosystems, yet there is little information regarding hormetic responses of soil microorganisms to single and combined exposures to heavy metals...

Characterizations of heavy metal contamination, microbial community, and resistance genes in a tailing of the largest copper mine in China

Authors: Jiang XW, Liu WH, Xu H and more...

Source: ENVIRONMENTAL POLLUTION 280, 2021, DOI: 10.1016/j.envpol.2021.116947

Abstract: Copper mine tailings are causing great environmental concern nowadays due to their high contents of heavy metals. These hazards may release to air, water, and soil, posing great threat to the living organisms in the surroundings. In the present work, we profiled the heavy metal contents, microbiome and resistome of a mine

tailing in Dexing Copper Mine, which is the largest open-pit copper mine in China...

Field study on the soil bacterial associations to combined contamination with heavy metals and organic contaminants

Authors: Wu YX, Son, QM, Wu JH and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778, 2021, DOI: 10.1016/j.scitotenv.2021.146282

Abstract: The understanding of soil microbial associations to combined contamination would substantially benefit the restoration of damaged ecosystems, which is currently limited at the field scale. In this study, we investigated the soil bacterial associations to combined contamination with metals (Cd, Cu, Hg, Pb, and Zn), polyaromatic hydrocarbons (PAHs), and polybrominated diphenyl ethers (PBDEs)...

Effects of long-term discharge of acid mine drainage from abandoned coal mines on soil microorganisms: microbial community structure, interaction patterns, and metabolic functions

Authors: Chen Di, Feng QY, Liang HQ

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-14566-2

Abstract: More than twenty abandoned coal mines in the Yudong River Basin of Guizhou Province have discharged acid mine drainage (AMD) for a long time. The revelation of microbial community composition, interaction patterns, and metabolic functions can contribute to a better

understanding of such ecosystems, which in its turn can be helpful in the development of strategies aiming at the ecological remediation of AMD pollution. In this study, reference and contaminated soil samples were collected along the AMD flow path for high-throughput sequencing...

Soil characteristics and microbial community response in rare earth mining areas in southern Jiangxi Province, China

Authors: Liang ZT, Zhang WJ, Yang YS and more...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-14337-z

Abstract: The microbial community and functional flora in rare earth mining areas are correlated, but the characteristics and metabolic pathways of pollutant in such mining areas are still poorly known. The heavy metals, rare earth elements, and microorganisms present after mining of rare earth mine sites were analyzed...

Enzyme activities and microbial functional diversity in metal(loid) contaminated soils near to a copper smelter

Authors: Aponte H, Mondaca P, Santander C and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 779, 2021, DOI: 10.1016/j.scitotenv.2021.146423

Abstract: The monitoring of soil metal(loid) contamination is of global significance due to deleterious effects that metal(loid)s have on living organisms. Soil biological properties such as enzyme activities (EAs) are good indicators of metal(loid) contamination due to their high sensitivity, fast response, and low-cost. Here, the

effect of metal(loid) contamination on physicochemical properties and microbial functionality in soils sampled from within 10 km of a Cu smelter is investigated...

Microbial Ecotoxicity of Biochars in Agricultural Soil and Interactions with Linear Alkylbenzene Sulfonates

Authors: Nissen R, Khanal G, Elsgaard L

Source: AGRONOMY-BASEL 11, 5, 2021, DOI: 10.3390/agronomy11050828

Abstract: Large-scale application of biochar on agricultural land offers the prospect of soil improvement and carbon sequestration for climate-change mitigation. However, negative side-effects on the soil microbial ecosystem are poorly understood, notably in relation to the functions of native microbiomes under realistic routes of biochar exposure. Due to divergent properties, different biochars might interact with soil in complex ways. This might result in decreased or increased ecotoxicity from biochar contaminants, such as heavy metals and polycyclic aromatic hydrocarbons (PAHs)...

Side effects of traditional pesticides on soil microbial respiration in orchards on the Russian Black Sea coast

Authors: Karpun NN, Yanushevskaya EB, Mikhailova YV and more...

Source: CHEMOSPHERE 275, 2021, DOI: 10.1016/j.chemosphere.2021.130040

Abstract: Agricultural use of pesticides has greatly increased worldwide over the last several decades, affecting soil microorganisms. Microbial basal respiration and substrate-induced respiration rates are commonly used to assess the detrimental effects of pesticides on soil quality.

The goal of the present study was (1) to compare the impact of different pesticides on soil microbial respiration under field conditions, and (2) to characterize the recovery time of soil microbial respiration after pesticide application. The following pesticides were used in the present study: chlorpyrifos, phosalone, dimethoate (organophosphorus insecticides), lambda-cyhalothrin (pyrethroid insecticide), and kresoxim-methyl (fungicide)...

Gut microbial community response to herbicide exposure in a ground beetle

Authors: Giglio A, Vommaro ML, Gionechetti F, Pallavicini A

Source: JOURNAL OF APPLIED ENTOMOLOGY 2021, DOI: 10.1111/jen.12919

Abstract: Gut microbiota plays a key role in physiological processes of insects, including nutritional metabolism, development, immunity and detoxification. Environmental stressors such as herbicides, used to optimize and improve crop yields, may interfere with the mutualistic relationships causing negative consequences for the host health. Dinitroaniline herbicides, for example pendimethalin, are used worldwide in pre-emergence application to control grass and some broadleaf weeds...

Field study on the soil bacterial associations to combined contamination with heavy metals and organic contaminants

Authors: Wu YX, Song QM, Wu JH and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778, 2021, DOI: 10.1016/j.scitotenv.2021.146282

Abstract: The understanding of soil microbial associations to combined contamination would

substantially benefit the restoration of damaged ecosystems, which is currently limited at the field scale. In this study, we investigated the soil bacterial associations to combined contamination with metals (Cd, Cu, Hg, Pb, and Zn), polyaromatic hydrocarbons (PAHs), and polybrominated diphenyl ethers (PBDEs)...

CuO, ZnO, and gamma-Fe₂O₃ nanoparticles modified the underground biomass and rhizosphere microbial community of *Salvia miltiorrhiza* (Bge.) after 165-day exposure

Authors: Wei XM, Cao P, Wang G, and more...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 217, 2021, DOI: 10.1016/j.ecoenv.2021.112232

Abstract: To investigate whether metal oxide nanoparticles exhibit toxicity or positive effects on medicinal plants, CuO, ZnO, and gamma-Fe₂O₃ nanoparticles (NPs), at concentrations of 100 and 700 mg kg⁻¹, were introduced into the cultivation of *Salvia miltiorrhiza* (Bge.). Metal elemental contents, chemical constituents, biomass and the structure of the rhizosphere microbial community was used to estimate this effect...

Microbial communities of the drinking water with gradient radon concentration are primarily contributed by radon and heavy metal content

Authors: Nayak T, De D, Karmakar P and more...

Source: FRONTIERS IN ENVIRONMENTAL SCIENCE 9, 2021, DOI: 10.3389/fenvs.2021.576400

Abstract: Radon and heavy metal (HM) contamination in drinking water and their impact on health have been reported earlier. However, relatively little is known about the microbial community in drinking water with gradients of radon and the drivers of microbial community patterns in such water...

Salt stress-induced changes in microbial community structures and metabolic processes result in increased soil cadmium availability

Authors: Wang, M, Zhao, SW, Wang, LF, and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 782, 2021, DOI: 10.1016/j.scitotenv.2021.147125

Abstract: Salt stress can cause significant changes to soil microbial community structure, metabolic processes, and the surrounding micro-environments. However, how these processes affect the availability of cadmium (Cd) remains poorly understood...

Soil characteristics and microbial community response in rare earth mining areas in southern Jiangxi Province, China

Authors: Liang ZT, Zhang WJ, Yang YS and more...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-14337-z

Abstract: The microbial community and functional flora in rare earth mining areas are correlated, but the characteristics and metabolic pathways of pollutant in such mining areas are still poorly known. The heavy metals, rare earth

elements, and microorganisms present after mining of rare earth mine sites were analyzed...

Microbial ecotoxicity of biochars in agricultural soil and interactions with linear alkylbenzene sulfonates

Authors: Nissen R, Khanal G, Elsgaard L

Source: AGRONOMY-BASEL 11, 5, 2021, DOI: 10.3390/agronomy11050828

Abstract: Large-scale application of biochar on agricultural land offers the prospect of soil improvement and carbon sequestration for climate-change mitigation. However, negative side-effects on the soil microbial ecosystem are poorly understood, notably in relation to the functions of native microbiomes under realistic routes of biochar exposure...

Effects of heavy metals on bacterial community structure in the rhizosphere of *Salsola collina* and bulk soil in the Jinchuan mining area

Authors: Gao TP, Wan ZD, Liu XX and more...

Source: GEOMICROBIOLOGY JOURNAL, 2021, DOI: 10.1080/01490451.2021.1914784

Abstract: It is important to understand the changes in microbial properties of plant rhizospheres to elucidate the interaction between heavy metals and plant communities. In this study, high throughput sequencing method was used to analyze the effects of heavy metals on rhizosphere microbial community structure of the autochthonous plant *Salsola collina* in the Jinchuan mining area...

Study on the regulatory mechanism of the earthworm microbial community in vitro and in vivo under cadmium stress

Authors: Zhou DX, Liang XY, Wang JH and more...

Source: ENVIRONMENTAL POLLUTION 279, 2021, DOI: 10.1016/j.envpol.2021.116891

Abstract: In this paper, cadmium (Cd) stress tests were performed on *Eisenia fetida* in sterile artificial soil, and its regulatory mechanism between microbial communities in vivo and in vitro after Cd stress was explored...

Bacterial response to soil property changes caused by wood ash from wildfire in forest soils around mining areas: Relevance of bacterial community composition, carbon and nitrogen cycling

Authors: Zhang YY, Yan CC, Liu HJ and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 412, 2021, DOI: 10.1016/j.jhazmat.2021.125264

Abstract: The different physical-chemical properties of the black ash (200?500 ?C) and white ash (>510 ?C) generated by wildfire may result in varied impacts on soil biological and abiotic indicators. Many studies have highlighted the environmental impacts of wood ash application due to its complex mixture of beneficial and detrimental compounds. However, few studies have compared the effect of black ash and white ash on soil, especially for the heavy metal polluted soil...

Soil bacterial community functions and distribution after mining disturbance

Authors: Xiao EZ, Ning ZP, Xiao TF and more...

Source: SOIL BIOLOGY & BIOCHEMISTRY 157, 2021, DOI: 10.1016/j.soilbio.2021.108232

Abstract: Mining disturbances alter soil edaphic factors, modifying soil biogeochemical processes and thus impacting the soil microbiome. The objectives of this study were (1) to identify the dominant edaphic factor influencing the soil bacterial functions after mining disturbance and (2) to investigate how the soil microbiome was distributed, relative to the dominant edaphic factor...

Compositional and functional responses of bacterial community to titanium dioxide nanoparticles varied with soil heterogeneity and exposure duration

Authors: Zhai YJ, Chen LH, Liu G and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 773, 2021, DOI: 10.1016/j.scitotenv.2020.144895

Abstract: Titanium dioxide nanoparticles (TiO₂ NPs) are widely used as nano-agrochemicals. In this study we investigated the influence of soil heterogeneity on bacterial communities exposed to TiO₂ NPs over time...

Spatial variation in microbial community in response to As and Pb contamination in paddy soils near a Pb-Zn mining site

Authors: Zou LN, Lu YH, Dai YX and more...

Source: FRONTIERS IN ENVIRONMENTAL SCIENCE 9, 2021, DOI: 10.3389/fenvs.2021.630668

Abstract: Mining activity is a growing environmental concern as it contributes to heavy metals (HMs) pollution in agricultural soils. Microbial communities play an important role in the biogeochemical cycling of HMs and have the potential to be used as bioindicators. Arsenic (As) and lead (Pb) are the most hazardous HMs and are mainly originated from mining activities. However, spatial variation in microbial community in response to As and Pb contamination in paddy soils remains overlooked...

Diversity patterns and drivers of soil microbial communities in urban and suburban park soils of Shanghai, China

Authors: Zhang WW, Han JG, Wu HB and more...

Source: PEERJ 9, 2021, DOI: 10.7717/peerj.11231

Abstract: Background: The rapid expansion of urbanization leads to significant losses of soil ecological functions. Microbes directly participate in key soil processes and play crucial roles in maintaining soil functions. However, we still have a limited understanding of underlying mechanisms shaping microbial communities and the interactions among microbial taxa in park soils...

High-throughput sequencing clarifies the spatial structures of microbial communities in cadmium-polluted rice soils

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

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-13993-5

Abstract: Soil microbial communities are affected by environmental factors. Contamination with heavy metals such as cadmium (Cd) can decrease soil microbial species richness and substantially alter soil microbial species composition. Investigations of the microbial communities in Cd-contaminated soils are necessary to obtain data for soil bioremediation efforts. However, depth-associated variations in microbial community composition and structure in Cd-contaminated paddy soils are not well understood...

Study of pollutant accumulation characteristics and microbial community impact at three bioretention facilities

Authors: Li YJ, Fu H, Zhang JY and more...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-13801-0

Abstract: In this paper, three bioretention facilities (BT, RG1-A, and RG1-B) were selected for on-site testing and experimental analysis. Of which, BT is a roadside bioretention tank with layered filler, while RG1-A and RG1-B are rain gardens with conventional filler (Bioretention soil media, BSM) and modified filler (BSM+10% Water treatment residuals, WTR), respectively. The effect of pollutant accumulation on the soil microbial community structure in the facilities, and the risk of heavy metal contamination over several years of bioretention facility operation were studied...

Microbiological indicators of heavy metals and carbon-containing preparations applied to agrosoddy-podzolic

soils differing in humus content

Authors: Terekhova VA, Prudnikova EV, Kulachkova SA and more...

Source: EURASIAN SOIL SCIENCE 54, 3: 448-458, 2021, DOI: 10.1134/S1064229321030157

Abstract: The response of the microbial community (microbial biomass carbon (C-mic), basal respiration (BR), and functional diversity (FD)) of agrosoddy-podzolic soil (Albic Glossic Retisols (Loamic, Aric Cutanic, Ochric)) to pollution by heavy metals (HMs: Cu 660, Zn 1100, Pb 650 mg/kg) and carbon-containing preparations (5% of biochar and 0.25% of lignohumate) was studied in model experiment (30 days)...

Land use in urban areas impacts the composition of soil bacterial communities involved in nitrogen cycling. A case study from Lefkosia (Nicosia) Cyprus

Authors: Stephanou C, Omirou M, Philippot L and more...

Source: SCIENTIFIC REPORTS 11 1, 2021, DOI: 10.1038/s41598-021-87623-y

Abstract: The different types of land-use and soil lithology in urban and peri-urban areas of modern cities compose a complex mosaic of soil ecosystems. It is largely unknown how these differences result in changes in bacterial community composition and structure as well as in functional guilds involved in N cycling. To investigate the bacterial composition and the proportion of denitrifiers in agricultural, forested, schoolyard and industrial areas...

Spatial distribution characteristics of the microbial community and multi-phase distribution of toxic metals in the geochemical gradients caused by acid mine drainage, South China

Authors: Pan Y, Ye H, Li XF and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 774, 2021, DOI: 10.1016/j.scitotenv.2021.145660

Abstract: Acid mine drainage (AMD) poses a potential environmental risk due to the low pH combined with high concentrations of toxic metals and sulfate. The Hengshi River in China is continually contaminated by the AMD from upstream mining areas and this river was selected as a study site to investigate the spatial distribution of Cu, Cd, Pb, Zn and the microbial communities in the paddy soil in vicinity of the river...

Insights on the effects of ZnO nanoparticle exposure on soil heterotrophic respiration as revealed by soil microbial communities and activities

Authors: Jiang H, Yang BS, Wang H and more

Source: JOURNAL OF SOILS AND SEDIMENTS 2021, DOI: 10.1007/s11368-021-02947-6

Abstract: Purpose The information on the effects of ZnONPs on soil biological processes and the resulting changes of ecosystem function is limited in wheat straw return agricultural soil. This study investigated the effects of ZnONPs on soil heterotrophic respiration and biochemical properties in wheat straw return farmland soil...

The effects of vehicular emissions on the activity and diversity of the roadside soil microbial community

Authors: De Silva S, Ball AS, Shahsavari E and more...

Source: ENVIRONMENTAL POLLUTION 277, 2021, DOI: 10.1016/j.envpol.2021.116744

Abstract: Motor vehicles emit a variety of pollutants including metals, petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs). The relationships between metals, petroleum hydrocarbons and PAHs, soil respiration and microbial diversity (fungi and bacteria) were studied using control (n = 3) and roadside soils (n = 27) with different exposure periods to vehicle emissions (2e-63 years)...

Synergistic effects of antimony and arsenic contaminations on bacterial, archaeal and fungal communities in the rhizosphere of *Miscanthus sinensis*: Insights for nitrification and carbon mineralization

Authors: Yu H, Zheng XF, Weng WL and more

Source: JOURNAL OF HAZARDOUS MATERIALS 411, 202, DOI: 10.1016/j.jhazmat.2021.125094

Abstract: The impacts of metal(loids) on soil microbial communities are research focuses to understand nutrient cycling in heavy metal-contaminated environments. However, how antimony (Sb) and arsenic (As) contaminations synergistically affect microbially-driven ecological processes in the rhizosphere of plants is poorly understood. Here we examined the

synergistic effects of Sb and As contaminations on bacterial, archaeal and fungal communities in the rhizosphere...

Impact of pesticide/fertilizer mixtures on the rhizosphere microbial community of field-grown sugarcane

Authors: Huang WJ, Lu YL, Chen LJ and more...

Source: 3 BIOTECH 11, 5, 2021, DOI: 10.1007/s13205-021-02770-3

Abstract: The rhizosphere microbial community is important for plant health and is shaped by numerous environmental factors. This study aimed to unravel the effects of a pesticide/fertilizer mixture on the soil rhizosphere microbiome of field-grown sugarcane. A field trial on sugarcane was conducted...

Uranium(VI) bioassociation by different fungi - a comparative study into molecular processes

Authors: Wollenberg A, Kretzschmar J, Drobot B and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 411, 2021, DOI: 10.1016/j.jhazmat.2021.125068

Abstract: After the Chernobyl and Fukushima incidents it has become clear that fungi can take up and accumulate large quantities of radionuclides and heavy metals, but the underlying processes are not well understood yet. For this study, the molecular interactions of uranium(VI) with the white-rot fungi, *Schizophyllum commune* and *Pleurotus ostreatus*, and the soil-living fungus, *Leucoagaricus naucinus*, were investigated ...

Ecotoxicity of as-synthesised copper nanoparticles on soil bacteria

Authors: Sharma P, Goyal D, Chudasama B

Source: IET NANOBIO TECHNOLOGY 15, 2: 236-245, 2021, DOI: 10.1049/nbt2.12039

Abstract: Release of metallic nanoparticles in soil poses a serious threat to the ecosystem as they can affect the soil properties and impose toxicity on soil microbes that are involved in the biogeochemical cycling. In this work, in vitro ecotoxicity of as-synthesised copper nanoparticles (CuNPs) on *Bacillus subtilis* (MTCC No. 441) and *Pseudomonas fluorescens* (MTCC No. 1749)...

Metagenomic insights into taxonomic diversity and metabolic potential of bacterial communities associated with tannery waste-contaminated soils

Authors: Lukhele T, Ogola HJO, Selvarajan R and more...

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY; 2021, DOI: 10.1007/s13762-021-03298-y

Abstract: Long-term exposure to anthropogenic stressors can lead to perturbations in microbiomes, either selecting for novel and biotechnologically important biotypes, or reductions in the microbial diversity and disequilibrium of ecosystem services. Consequently, analysis of variations in microbial structure and function in stressful environments remains a critical issue in microbial ecology ...

Impacts of Redox Conditions on Arsenic and Antimony Transformation in Paddy Soil: Kinetics and Functional Bacteria

Authors: Xia BQ, Yang Y, Wu YD and more...

Source: BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, 2021, DOI: 10.1007/s00128-021-03242-3

Abstract: Arsenic (As) and antimony (Sb) are known carcinogens and are present as contaminants in paddy soils. However, the complicated dynamics of the mobility of these metalloids have not been well understood due to changing redox conditions in paddy soils...

Changes in soil and rat gut microbial diversity after long-term exposure to the chiral fungicide epoxiconazole

Authors: Kaziem AE, He ZZ, Li LS and more...

Source: CHEMOSPHERE 272, 2021, DOI: 10.1016/j.chemosphere.2021.129618

Abstract: In previous articles, it was found that epoxiconazole enantiomers can persist for a long time in the environment, causing severe environmental damage. Herein, we investigated alterations in the soil microbial community and rat gut microbiota after six weeks of treatment with rac-epoxiconazole or one of its enantiomers...

Microbial Features Indicating the Recovery of Soil Ecosystem Strongly Affected by Mining and Ore Processing

Authors: Feketeova Z, Hrabovsky A, Simkovic I

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 18, 6, 2021, DOI: 10.3390/ijerph18063240

Abstract: Tailings-derived soils formed from waste materials produced during mineral processing often exhibit extremes of pH, low content of organic matter and limited nutrient availability. The success of site revitalization depends mostly on the ability to maintain natural soil functions. We analyzed technogenic sediments from four selected localities in Slovakia defined as environmental burdens...

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS / Antibiotiques et antibiorésistances

Distribution of the microbial community and antibiotic resistance genes in farmland surrounding gold tailings: A metagenomics approach

Authors: Qiao LK, Liu XX, Zhang S and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 779, 2021, DOI: 10.1016/j.scitotenv.2021.146502

Abstract: Metal mining has caused the accumulation of waste mine tailing dumps from abandoned mines. The pollution of farmlands surrounding metal tailings by heavy metals has been a long-recognized problem. However, the distribution of antibiotic resistance genes (ARGs) in tailings and the main factors influencing this distribution have rarely been reported. In this study, a metagenomics approach was used to

investigate the microbial community and ARGs present in farmland surrounding gold tailings in northern China...

Chicken Manure and Mushroom Residues Affect Soil Bacterial Community Structure but Not the Bacterial Resistome When Applied at the Same Rate of Nitrogen for 3 Years

Authors: Peng S, Wang YM, Chen RR, Lin XG

Source: FRONTIERS IN MICROBIOLOGY 12, 2021, DOI: 10.3389/fmicb.2021.618693

Abstract: Animal manure is a reservoir of antibiotic resistance genes (ARGs), and direct application of the manure will lead to spread of ARGs in farmland. Here, we explored the impacts of chicken manure and heat-treated chicken manure on the patterns of soil resistome after 3 years' application, with mushroom residues set as the plant-derived organic manure treatment...

Habitat determines the relationships among bacteria, resistance genes and mobile genetic elements in the soil-plant system

Authors: Huang RL, Ding JX, Guo YW and more...

Source: EUROPEAN JOURNAL OF SOIL SCIENCE 2021, DOI: 10.1111/ejss.13132

Abstract: The soil antibiotic resistome is considered to be primarily determined by bacterial community composition. However, the antibiotic resistance of plant microbiota and its association with the soil microbiome in soil-plant systems remain largely unknown. Here, we studied the connections between bacteria and

resistance genes (RGs) (mainly antibiotic resistance genes, ARGs) and mobile genetic elements (MGEs) in different cropping systems...

Bacterial community assembly and antibiotic resistance genes in the lettuce-soil system upon antibiotic exposure

Authors: Shen YK, Ryser ELT, Li H, Zhang W

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778, 2021, DOI: 10.1016/j.scitotenv.2021.146255

Abstract: Bacteria and antibiotic resistance genes (ARGs) in vegetables may influence human gut microbiome and ultimately human health. However, little is known about how vegetable microbiomes and ARGs respond to exposure of anthropogenic antibiotics from crop irrigation water. This study investigated bacterial community assembly and ARG profiles in lettuce (*Lactuca sativa*) shoots and roots, rhizosphere soil, and bulk soil irrigated with antibiotics-containing water, using 16S rRNA amplicon sequencing and high throughput real-time qPCR, respectively...

Distinct resistomes and microbial communities of soils, wastewater treatment plants and households suggest development of antibiotic resistances due to distinct environmental conditions in each environment

Authors: Schages L, Wichern F, Geisen S and more...

Source: ANTIBIOTICS-BASEL 10, 5, 2021, DOI: 10.3390/antibiotics10050514

Abstract: The use of antibiotics in humans and animals results in a release of excess antibiotic residues into the environment through wastewaters and insufficient removal in wastewater treatment plants (WWTP), leading to increasing numbers of bacteria enriched in antibiotic resistance genes (ARG). However, the potential transfer of ARG and their host bacteria between different environments remains largely unexplored...

Polystyrene microplastics alleviate the effects of sulfamethazine on soil microbial communities at different CO₂ concentrations

Authors: Xu ML, Du WC, Ai FX and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 413, 2021, DOI: 10.1016/j.jhazmat.2021.125286

Abstract: Microplastics were reported to adsorb antibiotics and may modify their effects on soil systems. But there has been little research investigating how microplastics may affect the toxicities of antibiotics to microbes under future climate conditions. Here, we used a free-air CO₂ enrichment system to investigate the responses of soil microbes to sulfamethazine (SMZ, 1 mg kg⁻¹) in the presence of polystyrene microplastics (PS, 5 mg kg⁻¹) at different CO₂ concentrations...

Soil Enzymatic Activities and Microbial Community Structure in Soils Polluted with Tetracycline Antibiotics

Authors: Santas-Miguel V, Diaz-Ravina M, Martin A and more...

Source: AGRONOMY-BASEL 11, 5, 2021, DOI: 10.3390/agronomy11050906

Abstract: A laboratory experiment was performed to examine the medium-term influence of three tetracycline antibiotics (chlortetracycline, CTC; tetracycline, TC and oxytetracycline, OTC) at different concentrations in four agricultural soils with similar pH and different soil organic content. After a 42-days incubation period, three different soil enzymes (beta-glucosidase, urease, and phosphomonoesterase) were estimated, as well as the phospholipid fatty acids (PLFAs)...

Effects of Sulfamethoxazole on Growth and Antibiotic Resistance of A Natural Microbial Community

Authors: Rauseo J, Caracciolo AB, Spataro F and more...

Source: WATER 13, 9, 2021, DOI: 10.3390/w13091262

Abstract: Diffuse environmental antibiotic and antibiotic resistance gene contamination is increasing human and animal exposure to these emerging compounds with a consequent risk of reduction in antibiotic effectiveness. The present work investigated the effect of the antibiotic sulfamethoxazole (SMX) on growth and antibiotic resistance genes of a microbial community collected from an anaerobic digestion plant fed with cattle manure...

Tetracycline-resistant bacteria and ribosomal protection protein genes in soils from selected agricultural fields and livestock farms

Authors: Nogrado K, Unno T, Hur HG, Lee JH

Source: APPLIED BIOLOGICAL CHEMISTRY 64, 1, 2021, DOI: 10.1186/s13765-021-00613-6

Abstract: Antibiotic resistance in soil environment has eminently been compared and studied between agricultural and pristine soils, and the role of concentrated animal feeding operations has markedly been recognized as one of the major Source:s of antibiotic resistance. This study described the tetracycline resistance in small-scale farms in pursuit of presenting its possible role and contribution to the persistence of antibiotic resistance in the environment...

Manure-Based Amendments Influence Surface-Associated Bacteria and Markers of Antibiotic Resistance on Radishes Grown in Soils with Different Textures

Authors: Guron GKP, Chen CQ, Du P and more...

Source: APPLIED AND ENVIRONMENTAL MICROBIOLOGY 87, 10, 2021, DOI: 10.1128/AEM.02753-20

Abstract: A controlled greenhouse study was performed to determine the effect of manure or compost amendments, derived during or in the absence of antibiotic treatment of beef and dairy cattle, on radish taproot-associated microbiota and indicators of antibiotic resistance when grown in different soil textures...

Effects of sulfamethoxazole on growth and antibiotic resistance of a natural microbial community

Authors: Rauseo J, Barra Caracciolo A, Spataro F and more...

Source: WATER 13, 9, 2021, DOI: 10.3390/w13091262

Abstract: Diffuse environmental antibiotic and antibiotic resistance gene contamination is

increasing human and animal exposure to these emerging compounds with a consequent risk of reduction in antibiotic effectiveness. The present work investigated the effect of the antibiotic sulfamethoxazole (SMX) on growth and antibiotic resistance genes of a microbial community collected from an anaerobic digestion plant fed with cattle manure...

Application of manure from cattle administered antibiotics has sustained multi-year impacts on soil resistome and microbial community structure

Authors: Shawver S, Wepking C, Ishii S and more...

Source: SOIL BIOLOGY & BIOCHEMISTRY 157, 2021, DOI: 10.1016/j.soilbio.2021.108252

Abstract: In agroecosystems, application of manure from livestock treated with antibiotics has the potential to spread antibiotic compounds, resistant bacteria, and antibiotic resistance genes (ARGs) to soil. Although environmental transmission of antibiotic resistance is a major human health concern, few studies have looked at long-term effects on soil microbial communities from applying manure from livestock administered antibiotics...

Gain and loss of antibiotic resistant genes in multidrug resistant bacteria: One Health perspective

Authors: Kim M, Park J, Kang M, Yang J, Park W

Source: JOURNAL OF MICROBIOLOGY, 2021, DOI: 10.1007/s12275-021-1085-9

Abstract: The emergence of multidrug resistance (MDR) has become a global health threat due to

the increasing unnecessary use of antibiotics. Multidrug resistant bacteria occur mainly by accumulating resistance genes on mobile genetic elements (MGEs), made possible by horizontal gene transfer (HGT). Humans and animal guts along with natural and engineered environments such as wastewater treatment plants and manured soils have proven to be the major reservoirs and hot-spots of spreading antibiotic resistance genes (ARGs)...

Antibiotrophy: key function for antibiotic-resistant bacteria to colonize soils-case of sulfamethazine-degrading microbacterium sp. C448

Authors: Billet L, Pesce S, Rouard N and more...

Source: FRONTIERS IN MICROBIOLOGY 12, 2021, DOI: 10.3389/fmicb.2021.643087

Abstract: Chronic and repeated exposure of environmental bacterial communities to anthropogenic antibiotics have recently driven some antibiotic-resistant bacteria to acquire catabolic functions, enabling them to use antibiotics as nutritive Source:s (antibiotrophy). Antibiotrophy might confer a selective advantage facilitating the implantation and dispersion of antibiotrophs in contaminated environments. A microcosm experiment was conducted to test this hypothesis in an agroecosystem context...

Can heavy metal pollution induce bacterial resistance to heavy metals and antibiotics in soils from an ancient land-mine?

Authors: Zhong QM, Cruz-Paredes C, Zhang SR Rousk J

Source: JOURNAL OF HAZARDOUS MATERIALS 411, 2021, DOI: 10.1016/j.jhazmat.2020.124962

Abstract: Microbial resistance to antibiotics is a growing challenge to human health. Recent evidence has indicated that antibiotic resistance can be co-selected for by exposure to heavy metals in agricultural soils. It remains unknown if this is a concern in other environments contaminated by metals...

Potential environmental and human health risks caused by antibiotic-resistant bacteria (arb), antibiotic resistance genes (args) and emerging contaminants (ecs) from municipal solid waste (msw) landfill

Authors: Anand U, Reddy B, Singh VK and more...

Source: ANTIBIOTICS-BASEL 10, 4, 2021, DOI: 10.3390/antibiotics10040374

Abstract: The disposal of municipal solid waste (MSW) directly at landfills or open dump areas, without segregation and treatment, is a significant concern due to its hazardous contents of antibiotic-resistant bacteria (ARB), antibiotic resistance genes (ARGs), and metal resistance genes (MGEs). The released leachate from landfills greatly effects the soil physicochemical, biological, and groundwater properties associated with agricultural activity and human health ...

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS / Biocontrôle

Role of two plant growth-promoting bacteria in remediating cadmium-contaminated soil combined with *miscanthus floridulus* (lab.)

Authors: Liu SM, Liu HM, Chen R and more...

Source: PLANTS-BASEL 10, 5, 2021, DOI: 10.3390/plants10050912

Abstract: *Miscanthus* spp. are energy plants and excellent candidates for phytoremediation approaches of metal(loid)s-contaminated soils, especially when combined with plant growth-promoting bacteria ...

Physiological and metagenomic strategies uncover the rhizosphere bacterial microbiome succession underlying three common environmental stresses in cassava

Authors: Zeng HQ, Xu HR, Liu GY and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 411, 2021, DOI: 10.1016/j.jhazmat.2021.125143

Abstract: The most common environmental pollutants such as cadmium (Cd), glyphosate and

tetracycline have led to profoundly adverse impacts on plant productivity. However, how tropical crops such as cassava sense these pollutants via roots and how rhizosphere microbiome interacts with the host and pollutants remain largely unknown...

Plant growth-promoting rhizobacteria effect on maize growth and microbial biomass in a chromium-contaminated soil

Authors: Silva RS, Antunes JEL, de Aquino JPA and more...

Source: BRAGANTIA 80, 2021, DOI: 10.1590/1678-4499.20200492

Abstract: Chromium contamination in soils affects plant growth and this metal can accumulate in plants tissues. In addition, Cr can affect soil microbial biomass and activity. On the other hand, plant growth-promoting rhizobacteria (PGPR) can protect plants against metals and, at the same time, promote plant growth and could alleviate adverse effects on microbial biomass. This study evaluated five PGPR on maize growth, Cr accumulation and soil microbial biomass in a Cr-contaminated soil...

A pesticide biopurification system: a source of biosurfactant-producing bacteria with environmental biotechnology applications

Authors: Lamilla C, Schalchli H, Briceno G and more...

Source: AGRONOMY-BASEL 11, 4, 2021, DOI: 10.3390/agronomy11040624

Abstract: Biosurfactants, a wide group of compounds produced by different

microorganisms, generally have less toxicity and are more biodegradable than synthetic surfactants. Biosurfactant-producing bacteria can be found in contaminated environments, such as soils receiving pesticide applications constantly, or in pesticides treatment systems where microorganisms are adapted to biodegrading pesticides. Five pesticide-tolerant bacteria previously isolated from a pesticide biopurification system were evaluated as biosurfactant-producers...

ERA / PUBLICATIONS SCIENTIFIQUES / MICROBIOLOGIE ET CONTAMINANTS / Bioremédiation

Recruiting endophytic bacteria of wetland plants to phytoremediate organic pollutants

Authors: Singh T, Awasthi G, Tiwari Y

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY 2021, DOI: 10.1007/s13762-021-03476-y

Abstract: The release of organic compounds in the aquatic environment, resulting from different human activities, is a serious hazard due to the toxic, hydrophobic and persistent nature of these compounds. Removing organic contaminants from aquatic systems is vital and is one of the major topics of research in the arena of environmental science. Pesticides, plasticizers, pharmaceuticals, petroleum hydrocarbons are the organic pollutants which are considered to be the emerging contaminants of concern. Phytoremediation is a process of contaminant removal using plants, to clean up surface waters,

groundwaters, sediments and soils. Phytoremediation of organic contaminants can occur through plant uptake, plant enzymes or exudates, or by the contribution of rhizosphere and endophytic organisms...

Degradation of chlorpyrifos and polyethylene by endosymbiotic bacteria from citrus mealybug

Authors: Ibrahim SS, Gupta RK, War AR and more...

Source: SAUDI JOURNAL OF BIOLOGICAL SCIENCES 28, 6: 3214-3224, 2021, DOI: 10.1016/j.sjbs.2021.03.058

Abstract: Chlorpyrifos is one of the major organophosphorus pesticides used widely to control a range of insect pests across several crops. This insecticide is hazardous to the environment and toxic to mammals, thus, it is essential to remove the same from the environment. Similarly, use of polythene is also increasing day by day. Therefore, it is highly important to identify ways to degrade chlorpyrifos and other pesticides from the environment...

The microbial community from the early-plant colonizer (*Baccharis linearis*) is required for plant establishment on copper mine tailings

Authors: Gazitua MC, Morgante V, Poupin MJ and more...

Source: SCIENTIFIC REPORTS 11, 1, 2021, DOI: 10.1038/s41598-021-89769-1

Abstract: Plants must deal with harsh environmental conditions when colonizing

abandoned copper mine tailings. We hypothesized that the presence of a native microbial community can improve the colonization of the pioneer plant, *Baccharis linearis*, in soils from copper mining tailings. Plant growth and microbial community compositions and dynamics were determined in cultivation pots containing material from two abandoned copper mining tailings (Huana and Tambillos) and compared with pots containing fresh tailings or surrounding agricultural soil...

Effects of arbuscular mycorrhizal fungi on maize (*zea mays* l.) Under zinc deficient and toxic field conditions

Authors: Saboor A., Ali MA

Source: APPLIED ECOLOGY AND ENVIRONMENTAL RESEARCH 19, 3: 2151-2169, 2021, DOI: 10.15666/aeer/1903_21512169

Abstract: Arbuscular mycorrhizal fungi (AMF) have potential to cope with nutrient stress environment when the soil is zinc (Zn) deficient or toxic...

Fungal biosorption of cadmium(II) onto *Fennelia nivea* from aqueous solution: equilibrium, thermodynamics, and kinetics

Authors: Aracagok YD, Ogun E, Torun M and more...

Source: DESALINATION AND WATER TREATMENT 222: 386-393, 2021, DOI: 10.5004/dwt.2021.27091

Abstract: Cadmium(II) is an important ecotoxic pollutant and may cause health problems if accumulated in the human body. This study focused on the removal of cadmium(II) from

aqueous solutions using newly isolated fungus dry mass as the adsorber...

Strategies in microbial degradation enhancement of chlorpyrifos - a review based on the primary approaches in soil bioremediation

Authors: Varghese EM, Aswani P, Jisha MS

Source: BIOCATALYSIS AND BIOTRANSFORMATION 2021, DOI: 10.1080/10242422.2021.1939693

Abstract: The worldwide demand for potential agrochemicals is escalating day-by-day. Unsystematic and widespread pesticide use has resulted in constant expansion of pesticide industry making them the leaders of the agrochemical industry. The consumption of organophosphate pesticides is rapidly rising leading to its persistence in the environment thereby resulting in environmental contamination. Chlorpyrifos (O,O-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate) is the most broadly used wide-spectrum chlorinated organophosphate pesticide...

Motor oil wastewater treatment in a packed bed bioreactor using immobilized native microbial consortium

Authors: Houbroun E, Cruz-Carmona E, Ponciano-Rosas A and more...

Source: REVISTA MEXICANA DE INGENIERIA QUIMICA 20(2): 761-773, 2021, DOI: 10.24275/rmiq/IA2271

Abstract: The global increase in population has led to a higher demand for motor oil from a raising number of automobiles. The inappropriate disposal of waste motor oil generates water contamination, therefore, removing motor oil from contaminated water can prevent damage to

the environment and human health. In this study, a new native microbial consortium from contaminated soil was tested and exposed to different concentrations of motor oil...

Insight into Cr(VI) biosorption onto algal-bacterial granular sludge: Cr(VI) bioreduction and its intracellular accumulation in addition to the effects of environmental factors

Authors: Yang XJ, Zhao ZW, Zhang GH and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 414, 2021, DOI: 10.1016/j.jhazmat.2021.125479

Abstract: Hexavalent chromium (Cr(VI)) is one of the typical heavy metals that pose a great threat to the environment. As a novel biotechnology, algal-bacterial aerobic granular sludge (AGS) possesses the merits of both bacterial AGS and algae. This study firstly evaluated Cr(VI) removal via biosorption by algal-bacterial AGS under different operation conditions and then some environmental factors...

Improved immobilization of soil cadmium by regulating soil characteristics and microbial community through reductive soil disinfestation

Authors: Li X, Li XF, Li YY and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778, 2021, DOI: 10.1016/j.scitotenv.2021.146222

Abstract: Cadmium (Cd) contamination arising from industrialization has attracted increasing attention in recent years. Reductive soil disinfestation (RSD) as an effective agricultural practice has been widely applied for soil

sterilization. However, there is little research regarding RSD affecting Cd immobilization...

Effects of magnetic biochar-microbe composite on Cd remediation and microbial responses in paddy soil

Authors: Wang L, Chen HR, Wu JZ and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 414, 2021, DOI: 10.1016/j.jhazmat.2021.125494

Abstract: There is growing global interest in the bioremediation of cadmium (Cd) using combinations of biochar and microorganisms. However, the interactions among biochar, introduced and indigenous microorganisms remain unclear. Accordingly, a 90 day microcosm experiment was conducted to investigate this by adding *Bacillus* sp. K1 strain inoculated rice straw biochar (SBB) and magnetic straw biochar (MBB) into a Cd contaminated paddy soil from Hunan, China...

Biodegradation pathway of polycyclic aromatic hydrocarbons by ligninolytic fungus *podoscypha elegans* strain ftg4 and phytotoxicity evaluation of their metabolites

Authors: Agrawal N, Barapatre A, Shahi MP, Shahi SK

Source: ENVIRONMENTAL PROCESSES-AN INTERNATIONAL JOURNAL 2021, DOI: 10.1007/s40710-021-00525-z

Abstract: Polycyclic aromatic hydrocarbons (PAHs) are a type of persistent toxic organic pollutants with potential carcinogenicity and mutagenicity, therefore, dangerous for the safety

of human and animal health. The present study investigated the biodegradation of phenanthrene (PHE) and pyrene (PYR) in in-vitro and in-vivo conditions, by the white rot fungus *Podoscypha elegans* strain FTG4, isolated from an old rotten wood log through the lignin enrichment method...

Microbial and abiotic factors of flooded soil that affect redox biodegradation of lindane

Authors: Yuan J, Jue ST, Ma B and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 780, 2021, DOI: 10.1016/j.scitotenv.2021.146606

Abstract: Pollution induces pressure to soil microorganism; and conversely, the degradation of pollutants is reported largely regulated by the soil microbiome assembly in situ. However, the specific-dependent core taxa of degraders were barely confirmed, which is not conducive to improving the soil remediation strategy. Taking pollution of a typical organochlorine pesticide (OCP), lindane, as an example, we explored the microbial community assembly in flooded soils and simultaneously quantified the corresponding dynamics of typical soil redox processes...

Phytostabilization of acidic mine tailings with biochar, biosolids, lime, and locally-Sourced microbial inoculum: Do amendment mixtures influence plant growth, tailing chemistry, and microbial composition?

Authors: Trippe KM, Manning VA, Reardon C and more...

Source: APPLIED SOIL ECOLOGY 165, 2021, DOI: 10.1016/j.apsoil.2021.103962

Abstract: Abandoned mine lands present persistent environmental challenges to ecosystems and economies; reclamation is an important step for overcoming these challenges. Phytostabilization is an elegant and cost-effective reclamation strategy, however, establishing plants on severely degraded soils is problematic, often requiring soil amendments. We evaluated whether amendment mixtures composed of lime, biochar, biosolids, and locally-sourced microbial inoculum (LSM) could alleviate the constraints that hinder phytostabilization success...

Current insights into the microbial degradation for butachlor: strains, metabolic pathways, and molecular mechanisms

Authors: Lin ZQ, Pang SM, Zhou Z and more...

Source: APPLIED MICROBIOLOGY AND BIOTECHNOLOGY 2021, DOI: 10.1007/s00253-021-11346-3

Abstract: The herbicide butachlor has been used in huge quantities worldwide, affecting various environmental systems. Butachlor residues have been detected in soil, water, and organisms, and have been shown to be toxic to these non-target organisms...

The multi metal-resistant bacterium *Cupriavidus*

metallidurans CH34 affects growth and metal mobilization in *Arabidopsis thaliana* plants exposed to copper

Authors: Clavero-Leon C, Ruiz D, Cillero J and more...

Source: PEERJ 9, 2021, DOI: 10.7717/peerj.11373

Abstract: Copper (Cu) is important for plant growth, but high concentrations can lead to detrimental effects such as primary root length inhibition, vegetative tissue chlorosis, and even plant death. The interaction between plant-soil microbiota and roots can potentially affect metal mobility and availability, and, therefore, overall plant metal concentration...

Role of plant growth promoting bacteria in driving speciation gradients across soil-rhizosphere-plant interfaces in zinc-contaminated soils

Authors: Adele NC, Ngwenya BT, Heal KV, Mosselmans JFW

Source: ENVIRONMENTAL POLLUTION 279, 2021, DOI: 10.1016/j.envpol.2021.116909

Abstract: Inoculation of soil or seeds with plant growth promoting bacteria ameliorates metal toxicity to plants by changing metal speciation in plant tissues but the exact location of these changes remains unknown. Knowing where the changes occur is a critical first step to establish whether metal speciation changes are driven by microbial metabolism or by plant responses...

Bacterial isolates from Argentine Pampas and their ability to degrade glyphosate

Authors: Masotti F, Garavaglia BS, Piazza A and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 774, 2021, DOI: 10.1016/j.scitotenv.2021.145761

Abstract: Glyphosate is a synthetic phosphonate compound characterized by a carbon-phosphorus bond. Glyphosate based herbicides (GBH) are widely distributed in most of the economically productive lands in which crop production is mainly based on glyphosate-resistant genetically modified plants. Naturally, glyphosate is remediated by soil microorganisms, which accelerate its degradation...

Carboxylic acid reduction and sulfate-reducing bacteria stabilization combined remediation of Cr (VI)-contaminated soil

Authors: Gu WZ, Cui MY, Tian C and more...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 218, 2021, DOI: 10.1016/j.ecoenv.2021.112263

Abstract: For controlling heavy metal pollution, the utilization of carboxylic acids (CAs) combined with sulfate-reducing bacteria (SRB) for continuous and stable remediation of Cr (VI)-contaminated soil was comprehensively investigated...

Biodegradation Pathway of Polycyclic Aromatic Hydrocarbons by Ligninolytic Fungus *Podoscypha elegans* Strain FTG4 and Phytotoxicity Evaluation of their Metabolites

Authors: Agrawal, N, Barapatre, A, Shahi, MP, Shahi, SK

Source: ENVIRONMENTAL PROCESSES-AN INTERNATIONAL JOURNAL 2021, DOI: 10.1007/s40710-021-00525-z

Abstract: Polycyclic aromatic hydrocarbons (PAHs) are a type of persistent toxic organic pollutants with potential carcinogenicity and mutagenicity, therefore, dangerous for the safety of human and animal health. The present study investigated the biodegradation of phenanthrene (PHE) and pyrene (PYR) in in-vitro and in-vivo conditions, by the white rot fungus *Podoscypha elegans* strain FTG4, isolated from an old rotten wood log through the lignin enrichment method...

Contribution of Nano-Zero-Valent Iron and Arbuscular Mycorrhizal Fungi to Phytoremediation of Heavy Metal-Contaminated Soil

Authors: Cheng P, Zhang SQ, Wang QL and more...

Source: NANOMATERIALS 11, 5, 2021, DOI: 10.3390/nano11051264

Abstract: Soil pollution with heavy metals has attracted increasing concern, which calls for the development of new remediation strategies. The combination of physical, chemical, and biological techniques can achieve more efficient remediation. However, few studies have focused on whether nanomaterials and beneficial microbes can be jointly used to facilitate

phytoremediation. Therefore, we studied the role of nano-zero-valent iron (nZVI) and arbuscular mycorrhizal (AM) fungi in the phytoremediation of an acidic soil polluted with Cd, Pb and Zn, using sweet sorghum. X-ray diffraction (XRD), energy dispersive X-ray spectroscopy (EDS), and mapping analyses were conducted to explore the mechanisms of metal immobilization by nZVI...

Microbial and abiotic factors of flooded soil that affect redox biodegradation of lindane

Authors: YuanJ, Jue ST, Ma B, Lu ZJ and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 780, 2021, DOI: 10.1016/j.scitotenv.2021.146606

Abstract: Pollution induces pressure to soil microorganism; and conversely, the degradation of pollutants is reported largely regulated by the soil microbiome assembly in situ. However, the specific-dependent core taxa of degraders were barely confirmed, which is not conducive to improving the soil remediation strategy. Taking pollution of a typical organochlorine pesticide (OCP), lindane, as an example, we explored the microbial community assembly in flooded soils and simultaneously quantified the corresponding dynamics of typical soil redox processes...

Fungal biostimulant-driven phytoextraction of heavy metals from tannery solid waste contaminated soils

Authors: Nazir A, Shafiq M, Bareen FE

Source: INTERNATIONAL JOURNAL OF PHYTOREMEDIATION 2021, DOI: 10.1080/15226514.2021.1924115

Abstract: Two of the multiple limitations of phytoextraction efficiency (PE %) of TSW polluted soils are: (i) low growth of plant performance, (ii)

poor bioavailability of excessive essential and heavy metals (ascribed as Category-I and II metals respectively) The current study reports biostimulant role of allochthonous *Trichoderma harzianum* (F1) and autochthonous *Trichoderma pseudokoningii* (F2) in growth of *Tagetes patula* L. and uptake of Category-I & II metals from TSW-soil (0, 5 et 10%)...

An overview of neonicotinoids: biotransformation and biodegradation by microbiological processes

Authors: Anjos CS, Lima RN, Porto ALM

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-13531-3

Abstract: ...This review discusses the most recent microbial biodegradation and bioremediation processes for neonicotinoids, which employ isolated microorganisms (bacteria and fungi), consortiums of microorganisms, and different types of soils, biobeds, and biomixtures.

Synergistic Effects of Zinc Oxide Nanoparticles and Bacteria Reduce Heavy Metals Toxicity in Rice (*Oryza sativa* L.) Plant

Authors: Akhtar N, Khan S, Rehman SU and more...

Source: TOXICS 9, 5, 2021, DOI: 10.3390/toxics9050113

Abstract: Heavy metals (HMs) are toxic elements which contaminate the water bodies in developing countries because of their excessive discharge from industrial zones. Rice (*Oryza sativa* L) crops are submerged for a longer period of time in

water, so irrigation with HMs polluted water possesses toxic effects on plant growth. This study was initiated to observe the synergistic effect of bacteria (*Bacillus cereus* and *Lysinibacillus macroides*) and zinc oxide nanoparticles (ZnO NPs) (5, 10, 15, 20 and 25 mg/L) on the rice that were grown in HMs contaminated water...

Effects of Soil Properties on Phytoextraction of Cd and the Associated Soil Bacterial Communities across Four Soil Types

Authors: Hou F, Du JJ

Source: SOIL & SEDIMENT CONTAMINATION, 2021, DOI: 10.1080/15320383.2021.1926420

Abstract: Soils are one of the repositories for heavy metal. Phytoextraction with hyperaccumulator *Tagetes patula* (*T.patula*) has great promise for the cadmium (Cd) removal from contaminated soils. However, there is lack of information about the effects of soil types with different properties on the phytoextraction efficiency and the associated bacterial communities. A pot experiment...

Ureolytic bacteria from electronic waste area, their biological robustness against potentially toxic elements and underlying mechanisms

Authors: Li WL, Fishman A, Achal V

Source: JOURNAL OF ENVIRONMENTAL MANAGEMENT 289, 2021, DOI: 10.1016/j.jenvman.2021.112517

Abstract: Ureolytic bacteria can be a promising mediator used for the immobilization of potentially toxic elements via microbially-induced carbonate precipitation (MICP) process from

biodegradable ions to carbonate form. Electronic waste (E-waste) environment is very complex compared to general metal contaminated soil, however, MICP has not been studied under such an environment. In this study, three bacterial strains were successfully isolated from an E-waste area...

Metagenomics reveals functional profiling of microbial communities in OCP contaminated sites with rapeseed oil and tartaric acid biostimulation

Authors: Zhang ZY, Wan JZ, Liu L and more...

Source: JOURNAL OF ENVIRONMENTAL MANAGEMENT 289, 2021, DOI: 10.1016/j.jenvman.2021.112515

Abstract: Organochlorine pesticides (OCPs) contaminated sites pose great threats to both human health and environmental safety. Targeted bioremediation in these regions largely depends on microbial diversity and activity. This study applied metagenomics to characterize the microbial communities and functional groups composition features during independent or simultaneous rapeseed oil and tartaric acid applications, as well as the degradation kinetics of OCPs...

Metagenomic analysis of microbial community and its role in bioelectrokinetic remediation of tannery contaminated soil

Authors: Prakash AA, Rajasekar A, Sarankumar RK and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 412, 2021, DOI: 10.1016/j.jhazmat.2021.125133

Abstract: Tanneries create a serious threat to the environment by generating a significant amount of toxic metal-containing solid waste. This study deals with the application of bio-electrokinetic remediation (Bio-EK) of tannery effluent contaminated soil (TECS). Metagenomes representing the TECS sample were sequenced using the Illumina HiSeq platform...

Effects of different dissolved organic matter on microbial communities and arsenic mobilization in aquifers

Authors: Wang YH, Zhang GL, Wang HL and more...

Source: JOURNAL OF HAZARDOUS MATERIALS 411, 2021, DOI: 10.1016/j.jhazmat.2021.125146

Abstract: Dissolved organic matter (DOM) play key roles in the biotransformation of arsenic in groundwater systems. However, the effects of different types of DOM on arsenic biogeochemistry remain poorly understood. In this study, four typical DOM compounds (acetate, lactate, AQS and humic acid) were amended to high As aquifer sediments to investigate their effects on arsenic/iron biotransformation and microbial community response...

Heavy Metal-Resistant Filamentous Fungi as Potential Mercury Bioremediators

Authors: Vacar CL, Covaci E, Chakraborty S and more...

Source: JOURNAL OF FUNGI 7, 5, 2021, DOI: 10.3390/jof7050386

Abstract: Filamentous fungi native to heavy metals (HMs) contaminated sites have great potential for bioremediation, yet are still often underexploited. This research aimed to assess the HMs resistance and Hg remediation capacity of

fungi isolated from the rhizosphere of plants resident on highly Hg-contaminated substrate...

Microbial bioremediation of heavy metals

Authors: Volaric A, Svircev Z, Tamindzija D, Radnovic D

Source: HEMIJSKA INDUSTRIJA 75, 2: 103-115, 2021, DOI: 10.2298/HEMIND200915010V

Abstract: Heavy metal pollution is one of the most serious environmental problems, due to metal ions persistence, bioavailability, and toxicity. There are many conventional physical and chemical techniques traditionally used for environmental clean-up. Due to several drawbacks regarding these methods, the use of living organisms, or bioremediation, is becoming more prevalent...

The participation of cyanobacteria in reducing the concentration of fusariotoxins and heavy metal ions in aqueous solutions (model experiments)

Authors: Domracheva LI, Skugoreva SG, Fokina AJ and more...

Source: SOUTH OF RUSSIA-ECOLOGY DEVELOPMENT 16, 1: 53-60, 2021, DOI: 10.18470/1992-1098-2021-1-53-60

Abstract: Aim. The goal was to establish the effect of soil cyanobacteria (CB) *Fischerella muscicola*, *Nostoc paludosum* and *Nostoc linckia* on change in the concentration of heavy metal ions (HM) and fusariotoxins in aqueous media...

Heavy metals in soils and the remediation potential of bacteria associated with the plant microbiome

Authors: Henaó SG, Ghneim-Herrera T

Source: FRONTIERS IN ENVIRONMENTAL SCIENCE 9, 2021, DOI: 10.3389/fenvs.2021.604216

Abstract: High concentrations of non-essential heavy metals/metalloids (arsenic, cadmium, and lead) in soils and irrigation water represent a threat to the environment, food safety, and human and animal health. Microbial bioremediation has emerged as a promising strategy to reduce the concentration of heavy metals in the environment due to the demonstrated ability of microorganisms, especially bacteria, to sequester and transform these compounds...

Plant growth-promoting rhizobacteria effect on maize growth and microbial biomass in a chromium-contaminated soil

Authors: Silva RS, Antunes JEL, de Aquino JPA and more...

Source: BRAGANTIA 80, 2021, DOI: 10.1590/1678-4499.20200492

Abstract: Chromium contamination in soils affects plant growth and this metal can accumulate in plants tissues. In addition, Cr can affect soil microbial biomass and activity. On the other hand, plant growth-promoting rhizobacteria (PGPR) can protect plants against metals and, at the same time, promote plant growth and could alleviate adverse effects on microbial biomass...

A review on mechanism of biomineralization using microbial-induced precipitation for immobilizing lead ions

Authors: Shan B, Hao RX, Xu H and more...

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 2021, DOI: 10.1007/s11356-021-14045-8

Abstract: Lead (Pb) is a toxic metal originating from natural processes and anthropogenic activities such as coal power plants, mining, waste gas fuel, leather whipping, paint, and battery factories, which has adverse effects on the ecosystem and the health of human beings. Hence, the studies about investigating the remediation of Pb pollution have aroused extensive attention. Microbial remediation has the advantages of lower cost, higher efficiency, and less impact on the environment...

Microbial community responses to land-use types and its ecological roles in mining area

Authors: Xiao EZ, Wang YQ, Xiao TF and more...

Source: SCIENCE OF THE TOTAL ENVIRONMENT 775, 2021, DOI: 10.1016/j.scitotenv.2021.145753

Abstract: Mining activities result in adverse impacts on soil ecosystems, leading to environmental damage and ecological degradation. Soil microorganisms are considered critical for soil ecosystem restoration. However, questions about how soil microbiomes respond to land-use types and their beneficial roles in soil restoration have received little attention ...

The physiological response of Ectomycorrhizal fungus *Lepista sordida* to Cd and Cu stress

Authors: Yin DC, Qi JY

Source: PEERJ 9, 2021, DOI: 10.7717/peerj.11115

Abstract: Ectomycorrhizal fungi (ECMF) can develop the resistance of host plants to heavy metal stress. However, little is known about the response of ECMF to heavy metal exposure. In this study, the growth and physiological indices of *Lepista sordida* under Cd and Cu stress were studied...

Microbial degradation of recalcitrant pesticides: a review

Authors: Bose S, Kumar PS, Vo DVN and more...

Source: ENVIRONMENTAL CHEMISTRY LETTERS 2021, DOI: 10.1007/s10311-021-01236-5

Abstract: Some pesticides such as organochlorines are of critical environmental concern because they are highly persistent due to their stable chemical nature. As a consequence, even after banning, dichlorodiphenyltrichloroethane and endosulfan can be detected at concentrations above permissible limits. Moreover, classical pesticide degradation of these compounds using physiochemical processes is limited. Alternatively, biodegradation using microorganisms isolated in contaminated sites appears promising...

Effect of poultry manure compost and arbuscular mycorrhizal fungi on Cu immobilization and soil microbial communities in a Cu-contaminated soil using the metallophyte *Oenothera picensis*

Authors: Meier S, Moore F, Khan N and more...

Source: JOURNAL OF SOIL SCIENCE AND PLANT NUTRITION 2021, DOI: 10.1007/s42729-021-00493-1

Abstract: Soil metal contamination has emerged as a global environmental issue due to toxicity to living organisms. Traditional remediation techniques applied to metal-contaminated soils are intrusive and expensive, by which more environmental-friendly methods, such as phytoremediation, are necessary to remediate metal-contaminated soils. This study aimed to evaluate the combined effect of poultry manure compost (PMC) and indigenous arbuscular mycorrhizal (IM) fungi inoculation over copper (Cu) immobilization and the effectiveness of these elements promoting the plant growth and the soil microbial communities in a Cu-contaminated soil...

Multiple heavy metals immobilization based on microbially induced carbonate precipitation by ureolytic bacteria and the precipitation patterns exploration

Authors: Qiao SY, Zeng GQ, Wang XT and more...

Source: CHEMOSPHERE 274, 2021, DOI: 10.1016/j.chemosphere.2021.129661

Abstract: Biomineralization to immobilize the toxic metal has great potential for the bioremediation of multiple heavy metal contamination. In this study, the efficiency of Microbially Carbonate Induced Precipitation (MICP) for several common heavy metals (Cu, Zn, Ni, Cd) in mining areas as well as their precipitation patterns were researched...

Removal of Iron from Aqueous Solution by Novel Bacteria Isolated from Marine Macro Alga

Authors: Mishra A, Christian V, Kouame LM, Saraf M

Source: BIOSCIENCE BIOTECHNOLOGY RESEARCH COMMUNICATIONS 13, 1: 194-198, 2021, DOI: 10.21786/bbrc/13.1specialissue/31

Abstract: Iron is the most abundant metal element on earth, and iron-bearing minerals are everywhere and that are reactive element of water, soils, and sediments. Iron is a beneficial when it is in permissible limit when excess amount of iron is present it becomes toxic. Current technologies for removal and recovery of toxic elements are the industrial interest and metals usually produce wastes with high concentrations...

Bio-mercury remediation suitability index: a novel proposal that compiles the pgpr features of bacterial strains and its potential use in phytoremediation

Authors: Robas M, Jimenez PA, Gonzalez D, Probanza A

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 18, 8, 2021, DOI: 10.3390/ijerph18084213

Abstract: Soil pollution from heavy metals, especially mercury, is an environmental problem for human health. Biological approaches offer interesting tools, which necessarily involve the selection of organisms capable of transforming the environment via bioremediation. To evaluate the potential use of microorganisms in phytoremediation, bacterial strains were isolated from rhizospheric and bulk soil...

Effects of microbial spatial distribution on organic biodegradation and immobilization of trace metals in co-contaminated soils

Authors: Masum SA, Thomas HR

Source: COMPUTERS AND GEOTECHNICS 133, 2021, DOI: 10.1016/j.compgeo.2021.104063

Abstract: Predicting the transport and fate of organic and inorganic contaminants in co-contaminated soils is challenging, since various complex, inter-related processes are involved. In the presence of soil microbes that metabolise organic compounds (e.g., phenol), the chemical and the physical properties of the soil may alter and consequently affect the transport of inorganic trace metals e.g., Cu, Cd, Ni, Pb...

Characterization of soil bacteria with potential to degrade benzoate and antagonistic to fungal and bacterial phytopathogens

Authors: Esikov, TZ, Anokhina TO, Abashina TN and more...

Source: MICROORGANISMS 9, 4, 2021, DOI: 10.3390/microorganisms9040755

Abstract: The intensive development of agriculture leads to the depletion of land and a decrease in crop yields and in plant resistances to diseases. A large number of fertilizers and pesticides are currently used to solve these problems. Chemicals can enter the soil and penetrate into the groundwater and agricultural plants. Therefore, the primary task is to intensify agricultural production without causing additional damage to the environment. This problem can be partially solved using microorganisms with target properties...

Review on Pesticides Application in Agriculture and its Effect on Environment with Brief on their Microbial Degradation

Authors: Chouhan S, Mulani R, Goswami D

Source: BIOSCIENCE BIOTECHNOLOGY RESEARCH COMMUNICATIONS 13, 1: 239-250, 2020, DOI: 10.21786/bbrc/13.1specialissue/38

Abstract: Pesticides utilization for preventing insect pests, weeds in crops and improving production has led to application of pesticides...

Frenemies: interactions between rhizospheric bacteria and fungi from metalliferous soils

Authors: Rosatto S, Cecchi G, Roccotiello E and more...

Source: LIFE-BASEL 11, 4, 273, 2021, DOI: 10.3390/life11040273

Abstract: Is it possible to improve the efficiency of bioremediation technologies? The use of mixed cultures of bacteria and fungi inoculated at the

rhizosphere level could promote the growth of the associated hyperaccumulating plant species and increase the absorption of metals in polluted soils, broadening new horizons on bioremediation purposes...

Green remediation of toxic metals contaminated mining soil using bacterial consortium and *Brassica juncea*

Authors: Jayasundar PGSA, Ali A, Azeem M and more...

Source: ENVIRONMENTAL POLLUTION 277, 20121, DOI: 10.1016/j.envpol.2021.116789

Abstract: Microorganism-assisted phytoremediation is being developed as an efficient green approach for management of toxic metals contaminated soils and mitigating the potential human health risk. The capability of plant growth promoting Actinobacteria (*Streptomyces pactum* Act12 - ACT) and Firmicutes (*Bacillus subtilis* and *Bacillus licheniformis* - BC) in mono-and co-applications (consortium) to improve soil properties and enhance phytoextraction of Cd, Cu, Pb, and Zn by *Brassica juncea* (L.) Czern. was studied...

The effects of vermicompost and shell powder addition on Cd bioavailability, enzyme activity and bacterial community in Cd-contaminated soil: A field study

Authors: Wang F, Zhang WW, Miao LJ and more...

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 215, 2021, DOI: 10.1016/j.ecoenv.2021.112163

Abstract: Cadmium (Cd) contamination has become serious in soil and in situ stabilization technology has been widely used for heavy metal remediation. A field study was conducted to determine the effect of amendments with the doses of 3 kg/m², including single vermicompost (A1), a 95% vermicompost mixed with 5% shell powder composite (A2) and a 95% vermicompost mixed with 5% modified shell powder composite (A3), on the Cd bioavailability, enzyme activity and bacterial community in soil...

Improvement of alfalfa resistance against Cd stress through rhizobia and arbuscular mycorrhiza fungi co-inoculation in Cd-contaminated soil

Authors: Wang X, Fang LC, Beiyuan JZ and more...

Source: ENVIRONMENTAL POLLUTION 277, 2021, DOI: 10.1016/j.envpol.2021.116758

Abstract: Rhizobia and arbuscular mycorrhiza fungi (AMF) are important symbiotic microbes that are advantageous to plants growing in metal-contaminated soil. However, it remains unclear how inoculated microbes affect rhizosphere microbial communities or whether subsequent changes in rhizosphere microbiomes contribute to improving plant resistance under metal stress...

Biodegradation of 4-chloro-2-methylphenoxyacetic acid by endophytic fungus *Phomopsis* sp. In liquid medium and soil

Authors: Wang Y, Feng G, Li H., Du L, Zeng D

Source: APPLIED ECOLOGY AND ENVIRONMENTAL RESEARCH 19, 2: 1295-1307, 2021, DOI: 10.15666/aeer/1902_12951307

Abstract: An endophytic fungus strain, newly isolated from *Psidium guajava* (common guava), could effectively degrade 4-chloro-2-methylphenoxyacetic acid (MCPA). According to the analysis of its phenotypic feature and ITS rDNA gene sequence, the isolated strain was identified as *Phomopsis* sp. and named E41. The influencing factors including medium pH, temperature, and initial concentration of MCPA affecting the degradation of MCPA by this strain were optimized in this study...

Insight into metal immobilization and microbial community structure in soil from a steel disposal dump phytostabilized with composted, pyrolyzed or gasified wastes

Authors: Radziemska M, Gusiatin ZM, Cydzik-Kwiatkowska A and more...

Source: CHEMOSPHERE 272, 2021, DOI: 10.1016/j.chemosphere.2021.129576

Abstract: The soil system is a key component of the environment that can serve as a sink of pollutants. Using processed waste for aided phytostabilization of metals (HMs) in contaminated soils is an attractive phytoremediation technique that integrates waste utilization and recycling. In this study, we evaluated the effect of biologically and thermally processed wastes...

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

Measurement of multixenobiotic resistance activity in enchytraeids as a tool in soil ecotoxicology

Authors: Kovacevic M, Hackenberger DK, Loncaric Z, Hackenberger BK

Source: CHEMOSPHERE 279: 130549, 2021, DOI: 10.1016/j.chemosphere.2021.130549

Abstract: The multixenobiotic resistance (MXR) mechanism is the first defense line against xenobiotics. Enchytraeids, a model organism in soil ecotoxicology, are often exposed to various xenobiotics, some of which may influence MXR activity. Since MXR activity has not been studied in these organisms, the aim of this paper was to establish a methodology for the implementation of the dye assay in enchytraeids...

Ecotoxicological effects of the pyrethroid insecticide tefluthrin to the earthworm *Eisenia fetida*: a chiral view

Authors: Wen Y, Zhou LL, Li D, La Q, Shi HY, Wang MH

Source: ENVIRONMENTAL RESEARCH 190: 109991, 2021, DOI: 10.1016/j.envres.2020.109991

Abstract: Tefluthrin was the first pyrethroid developed for soil treatment. There was no report about the toxicity to terrestrial invertebrates at the enantiomer level. The main objective of the present study was to investigate the enantiomer-

specific acute toxicity to the earthworm *Eisenia fetida* and potential mechanism via multilevel response. (...)

Biomarker responses and metabolism in *Lumbricus terrestris* exposed to drugs of environmental concern, an in vivo and in vitro approach

Authors: Sole M, Montemurro N, Perez S

Source: CHEMOSPHERE 277: 130283, 2021, DOI: 10.1016/j.chemosphere.2021.130283

Abstract: The earthworm *Lumbricus terrestris* is an anecic species living in natural soils but it is also a sentinel in pollution monitoring. Specimens of *L. terrestris* were exposed for 48 h through the filter paper contact test at 1 mg/mL of the chemicals: Lamotrigine (LMG), Cocaine (COC), Fipronil (FIP) and the pesticide bis-4-nitrophenyl phosphate (BNPP). (...)

Pesticides and soil invertebrates: a hazard assessment

Authors: Gunstone T, Cornelisse T, Klein K, Dubey A, Donley N

Source: FRONTIERS IN ENVIRONMENTAL SCIENCE 9: 643847, 2021, DOI: 10.3389/fenvs.2021.643847

Abstract: (...) Many terrestrial invertebrates have declined in recent decades. Habitat loss and agricultural pollution due to agricultural intensification have been identified as major driving factors. Here, we review nearly 400 studies on the effects of pesticides on non-target invertebrates that have egg, larval, or immature development in the soil. (...)

Soil biodiversity: state-of-the-art and possible implementation in chemical risk assessment

Authors: van Gestel CAM, Mommer L, Montanarella L, Pieper S et al...

Source: INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT 17: 541-551, 2021, DOI: 10.1002/ieam.4371

Abstract: (...) The central aim of the SESSS14 was to provide information on how to include soil biodiversity and soil functions as protection goal options in the risk assessment and quantification of the effects of chemicals and other stressors (including their respective regulations). (...)

Effects of glyphosate-based herbicides and their active ingredients on earthworms, water infiltration and glyphosate leaching are influenced by soil properties

Authors: Zaller JG, Weber M, Maderthaner M, Gruber E, Takacs E, Mortl M, Klatyik S et al.

Source: ENVIRONMENTAL SCIENCES EUROPE 33: 51, 2021, DOI: 10.1186/s12302-021-00492-0

Abstract: (...) In a greenhouse experiment, we established a weed population with common amaranth (*Amaranthus retroflexus*) to examine the effects of three GBHs (Roundup LB Plus, Roundup PowerFlex, Touchdown Quattro) and their corresponding AIs (salts of glyphosate isopropylammonium, potassium, diammonium) on the activity and physiological biomarkers (glutathione S-transferase, GST; acetylcholine esterase, AChE) of an ecologically relevant earthworm species (*Lumbricus terrestris*). (...)

The pursuit of Alachlor herbicide toxicity on *Eisenia fetida* and its biochemical responses

Authors: Gangadhar D, Babu PV, Pamanji R, Srikanth K

Source: WATER AIR AND SOIL POLLUTION 232: 149, 2021, DOI: 10.1007/s11270-021-05109-z

Abstract: Alachlor is a chloroacetanilide herbicide, which is extensively used in agriculture globally. (...) Earthworms are largely involved in increasing the soil fertility, and excess use of this herbicide may result in toxicity to burrowing organisms like earthworms. In this context, the current intent of the proposed work is to assess the toxicity of alachlor on *Eisenia fetida*. (...)

ERA / PUBLICATIONS SCIENTIFIQUES / PLASTIQUES

Attached and planktonic bacterial communities on bio-based plastic granules and micro-debris in seawater and freshwater

Authors: Nguyen NHA, EL-Temsah YS, Cambier S et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 785:147413, 2021, DOI: 10.1016/j.scitotenv.2021.147413

Abstract: Bio-based plastics, produced from renewable biomass Sources, may contribute to lowering greenhouse gases and the demand for fossil reSource:s. However, their environmental fate is not well understood. Here, we compared the impacts of industrially produced granules (G)

and micro-debris (MD) from three pristine bio-based plastics: high-density polyethylene (HDPE), polylactic acid (PLA) and poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) on natural bacterial communities in seawater and freshwater using metagenomics...

Comparison of the effects of continuous and accumulative exposure to nanoplastics on microalga *Chlorella pyrenoidosa* during chronic toxicity

Authors: Yang WF, Gao P, Nie Y et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 788:147934, 2021, DOI: 10.1016/j.scitotenv.2021.147934

Abstract: Most previous studies have focused on the continuous exposure of aquatic organisms to nanoplastics. However, persistent pollutants in natural aquatic surroundings are a threat, and their concentrations are continuously creasing. The discussion and research into the effects of accumulative exposure to these materials are limited. Therefore, this study aimed to compare the effects of continuous and accumulative exposure to polystyrene (PS) nanoplastics (80 nm) on *Chlorella pyrenoidosa* during chronic toxicity...

Effect of microplastics on growth and biochemical composition of microalga *Acutodesmus obliquus*

Authors: Ansari FA, Ratha SK, Renuka N et al.

Source: ALGAL RESEARCH-BIOMASS BIOFUELS AND BIOPRODUCTS 56:102296, 2021, DOI: 10.1016/j.algal.2021.102296

Abstract: Microplastics have been widely detected in different aquatic ecosystems. The

toxicity of microplastics has been extensively evaluated on aquatic animals; however, there is limited information on their influence on microalgal growth and metabolism. This study investigates the effect of different concentrations (0, 5, 10, 15, 25, 100, 125, 200, and 250 mg L⁻¹), of microplastics namely high-density polyethylene, polypropylene, and polyvinyl chloride exposure on growth, photosynthesis, and biochemical composition of *Acutodesmus obliquus*...

Plastic degradation by extremophilic bacteria

Authors: Atanasova N, Stoitsova S, Paunova-Krasteva T, Kambourova M

Source: INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES 22:5610, 2021, DOI: 10.3390/ijms22115610

Abstract: [...] This review represents a first attempt to summarize the extraordinarily limited information on biodegradation of conventional synthetic plastics by thermophilic, alkaliphilic, halophilic, and psychrophilic bacteria in natural environments and laboratory conditions...

Effects of Plastic Debris on the Biofilm Bacterial Communities in Lake Water

Authors: Shen C, Huang LY, Xie, GW et al.

Source: WATER 13:1465, 2021, DOI:10.3390/w13111465

Abstract: Increasing discharge of plastic debris into aquatic ecosystems and the worsening ecological risks have received growing attention. Once released, plastic debris could serve as a new substrate for microbes in waters. The complex relationship between plastics and biofilms has aroused great interest. To confirm the hypothesis that the presence of plastic in water affects the composition of biofilm in natural state, in situ biofilm culture experiments were conducted in a

lake for 40 days. The diversity of biofilm attached on natural (cobble stones and wood) and plastic substrates (Polyethylene terephthalate and Polymethyl methacrylate) were compared, and the community structure and composition were also analyzed...

Mechanism of the inhibition and detoxification effects of the interaction between nanoplastics and microalgae *Chlorella pyrenoidosa*

Authors: Yang WF, Gao P, Li HX et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 783:146919, 2021, DOI: 10.1016/j.scitotenv.2021.146919

Abstract: Most previous studies have focused on the toxicity of microplastics on aquatic organisms. However, research on nanoplastics is still limited and poses significant threat to aquatic organisms than microplastics. Therefore, this study investigated the effects of nanoplastics (80 nm) on the microalgae *Chlorella pyrenoidosa*. One unanticipated finding was that inhibition and detoxification effects existed in the interaction between nanoplastics and *C. pyrenoidosa*...

Microplastics contamination in the protected agricultural soils and its effects on bacterial community diversity

Authors: Fei YF, Huang SY, Wang JQ and more...

Source: CHINESE SCIENCE BULLETIN-CHINESE 66(13): 1592-1601, 2021, DOI: 10.1360/TB-2020-0685

Abstract: Microplastics (MPs) are defined as plastic particles or fibers of size $\leq 5\text{ mm}$ and have been of concern in terrestrial ecosystems for several years. Protected agricultural soils have been assumed to be potentially contaminated

with MPs because of the use of large amounts of plastic films and annual compost inputs. However, there is little published information on MP contamination of protected agricultural soils and its ecological effects on soil biota remain unknown...

Soil type driven change in microbial community affects poly(butylene adipate-co-terephthalate) degradation potential

Authors: Han YJ, Teng Y, Wang X and more...

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY 55(8): 4648-4657, 2021, DOI: 10.1021/acs.est.0c04850

Abstract: Biodegradable mulch films have been developed as a suitable alternative to conventional nondegradable polyethylene films. However, the key factors controlling the degradation speed of biodegradable mulch films in soils remain unclear. Here, we linked changes in the soil microbiome with the degradation rate of a promising biodegradable material poly(butylene adipate-co-terephthalate) (PBAT) in four soil types...

Aged microplastics decrease the bioavailability of coexisting heavy metals to microalga *Chlorella vulgaris*

Authors: Wang ZZ, Fu DD, Gao L et al.

Source: ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY 217:112199, 2021, DOI: 10.1016/j.ecoenv.2021.112199

Abstract: Environmental aging of ubiquitous microplastics (MP) occurs through the action of biotic and abiotic factors, and aged MP exhibit different physicochemical properties and environmental behavior from virgin MP. This study

aimed to investigate the aged micro-sized polystyrene (mPS) and polyvinyl chloride (mPVC), and the heavy metals copper (Cu) and cadmium (Cd), and examine the effects of their combined toxicities on microalga *Chlorella vulgaris*...

Effect thresholds for the earthworm *Eisenia fetida*: Toxicity comparison between conventional and biodegradable microplastics

Authors: Ding WL, Li Z, Qi RM, Jones DL, Liu QY et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 781: 146884, 2021, DOI: [10.1016/j.scitotenv.2021.146884](https://doi.org/10.1016/j.scitotenv.2021.146884)

Abstract: Biodegradable plastics have been developed to eliminate the progressive accumulation and ever-growing threat posed by conventional fossil fuel-derived plastics. The impact of these bioplastics, particularly in an agricultural context (e.g. biopolymer mulch films), however, remains poorly understood. In this study, we compared the biotoxicity of biodegradable (polylactic acid, PLA; polypropylene carbonate, PPC) and non-degradable (polyethylene, PE) microplastics using a series of standardized bioassays using the earthworm *Eisenia fetida*. The responses studied included: avoidance behavior, mortality, biomass, and reproduction responses. We incubated earthworms in artificial soils amended with different concentrations of microplastic (0, 0.125, 1.25, 12.5, 125, 250, and 500 g kg⁻¹) under laboratory conditions...

The rise of artificial soil carbon inputs: Reviewing

microplastic pollution effects in the soil environment

Authors: Mbachu O, Jenkins G, Kaparaju P, Pratt C

Source: CIENCE OF THE TOTAL ENVIRONMENT 780: 146569, 2021, DOI: [10.1016/j.scitotenv.2021.146569](https://doi.org/10.1016/j.scitotenv.2021.146569)

Abstract: The surge in the use of plastic materials, its poor handling and disposal have led to an increase in microplastic pollution in terrestrial environments. Microplastic pollution in soils is of concern due to potential influences on soil properties which play a critical role in plant growth and soil fertility. Moreover, the soil environment is a key nexus linking the atmosphere, hydrosphere, biosphere and lithosphere, and thus represents a crucial conduit for pollutant migration from the anthroposphere. In this review we evaluate the effects of microplastics in the soil environment with a specific focus on physical properties and biological function in the rhizosphere...

Microplastics contamination in the protected agricultural soils and its effects on bacterial community diversity

Authors: Fei YF, Huang SY, Wang JQ, Luo YM, Zhang HB

Source: CHINESE SCIENCE BULLETIN-CHINESE 66(13): 1592-1601, 2021, DOI: [10.1360/TB-2020-0685](https://doi.org/10.1360/TB-2020-0685)

Abstract: Microplastics (MPs) are defined as plastic particles or fibers of size < 5 mm and have been of concern in terrestrial ecosystems for several years. Protected agricultural soils have been assumed to be potentially contaminated with MPs because of the use of large amounts of plastic films and annual compost inputs. However, there is little published information on MP contamination of protected agricultural soils and its ecological effects on soil biota remain

unknown. Here, a total of 54 surface (0-10 cm depth) soils were sampled from intensively managed protected agricultural soils around Hangzhou Bay, east China. MPs were extracted from the soil samples using continuous air flotation followed by density separation. Stereomicroscopy and micro-Fourier transform infrared spectroscopy (μ-FTIR) were used for identification after the extracted MPs were pre-sorted based on their shapes. In addition, a 29-d soil incubation experiment was conducted to observe the changes in microbial community diversity

Soil microbial community and network changes after long-term use of plastic mulch and nitrogen fertilization on semiarid farmland

Authors: Liu JL, Li SQ, Yue SC, Tian JQ, Chen H et al.

Source: GEODERMA 396: 115086, 2021, DOI: [10.1016/j.geoderma.2021.115086](https://doi.org/10.1016/j.geoderma.2021.115086)

Abstract: Soil microbes are crucial for improving soil quality and productivity. Plastic film mulch (FM), in conjunction with fertilization, has significantly improved crop yields over vast areas of dryland production. However, how these practices affect soil microbial communities, especially as regards co-occurrence patterns within microbial taxa, is unclear. The objective of this study was to determine the effects of 10 years of FM and four nitrogen (N) fertilization rates [0 (N0), 100 (N100), 250 (N250), and 400 (N400) kg N ha⁻¹] on soil bacterial and fungal diversity, community structure, composition, and the co-occurrence network in a rainfed maize (*Zea mays* L.) field on the Loess Plateau of China....

Effects of biofilm colonization on the sinking of

microplastics in three freshwater environments

Authors: Miao LZ, Gao YX, Adyel TM et al.

Source: JOURNAL OF HAZARDOUS MATERIALS 413:125370, 2021, DOI:10.1016/j.jhazmat.2021.125370

Abstract: Microplastics (MPs) have frequently been detected in freshwater environments, and there is growing concern about their ecological effects, especially the influence of the "plastisphere" on the freshwater ecosystems. The colonization of microbes on MPs would significantly alter their transport behavior, i.e., buoyancy, in fresh water. In this research, we studied the effects of biofilm colonization on the sinking and floating of three MPs, i.e., polyethylene terephthalate, polypropylene, and polyvinyl chloride, after 44 days of incubation in three freshwater systems (the Niushoushan River, the Qinhuai River, and East Lake) in China...

Bacterial and fungal assemblages and functions associated with biofilms differ between diverse types of plastic debris in a freshwater system

Authors: Wang LF, Tong JX, Li Y et al.

Source: ENVIRONMENTAL RESEARCH 196:110371, 2021, DOI: 10.1016/j.envres.2020.110371

Abstract: Once in aquatic ecosystems, plastics can be easily colonized by diverse microbes, and these microbial communities on plastics -the 'plastisphere'- often differ from the communities in the surrounding water and other substrates. However, our knowledge of plastic-associated bacterial and fungal communities on diverse plastics in freshwater is poor, especially for fungal communities. Furthermore, intraspecies interactions among bacterial and fungal communities colonized on diverse plastics are

poorly known. Here, we characterized the taxonomic composition and diversity of bacteria and fungi on three types of plastics in a lab-scale incubator with freshwater from an urban river...

Genomic and proteomic profiles of biofilms on microplastics are decoupled from artificial surface properties

Authors: Oberbeckmann S, Bartosik D, Huang SX et al.

Source: ENVIRONMENTAL MICROBIOLOGY Early Access, 2021, DOI: 10.1111/1462-2920.15531

Abstract: Microplastics in marine ecosystems are colonized by diverse prokaryotic and eukaryotic communities. How these communities and their functional profiles are shaped by the artificial surfaces remains broadly unknown. In order to close this knowledge gap, we set up an in situ experiment with pellets of the polyolefin polymer polyethylene, the aromatic hydrocarbon polymer polystyrene, and wooden beads along a coastal to estuarine gradient in the Baltic Sea, Germany. We used an integrated metagenomics/metaproteomics approach to evaluate the genomic potential as well as protein expression levels of aquatic plastic biofilms...

Combined effects of microplastics and biochar on

the removal of polycyclic aromatic hydrocarbons and phthalate esters and its potential microbial ecological mechanism

Authors: Ren XW, Tang JC, Wang L, Sun HW

Source: FRONTIERS IN MICROBIOLOGY 12, 2021, DOI: 10.3389/fmicb.2021.647766

Abstract: Microplastics (MPs) have been attracting wide attention. Biochar (BC) application could improve the soil quality in the contaminated soil. Currently, most studies focused on the effect of MPs or BC on the soil properties and microbial community, while they neglected the combined effects...

Effect of plastic film mulching on the distribution of plastic residues in agricultural fields

Authors: Kumar MV, Sheela AM

Source: CHEMOSPHERE 273:28590, 2021, DOI: [10.1016/j.chemosphere.2020.128590](https://doi.org/10.1016/j.chemosphere.2020.128590)

Abstract: In the present study, plastic residues were identified in the following four regions of Tamil Nadu, India: Sulur, Nagondapalli, Royakottah, and Krishnagiri. Among these regions, the percent distribution of plastic residues was found to be higher in Sulur of Coimbatore District where plastic film mulching has been practiced for 10 years for cultivating tomato (*Lycopersicon esculentus* L.) crop. At different depths, namely 0-10, 11-20, and 21-30 cm, the distribution of plastic residues at Sulur was 37.97%, 35.07%, and 36.99%, respectively, compared with other regions. The distribution of plastic residues was found to decrease with increasing depth...

The microplastisphere: Biodegradable microplastics addition alters soil microbial

community structure and function

Authors: Zhou J, Gui H, Banfield CC and more...

Source: SOIL BIOLOGY & BIOCHEMISTRY 156, 2021, DOI: 10.1016/j.soilbio.2021.108211

Abstract: Plastics accumulating in the environment, especially microplastics (defined as particles $\leq 5\text{ mm}$), can lead to a range of problems and potential loss of ecosystem services. Polyhydroxyalkanoates (PHAs) are biodegradable plastics used in mulch films, and in packaging material to minimize plastic waste and to reduce soil pollution. Little is known, however, about the effect of microbioplastics on soil-plant interactions, especially soil microbial community structure and functioning in agroecosystems. For the first time, we combined zymography (to localize enzyme activity hotspots) with substrate-induced growth respiration to investigate the effect of PHAs addition on soil microbial community structure, growth, and exoenzyme kinetics in the microplastisphere (i.e. interface between soil and microplastic particles) compared to the rhizosphere and bulk soil...

Trading tree growth for soil degradation: Effects at 10 years of black plastic mulch on fine roots, earthworms, organic matter and nitrate in a multi-species riparian buffer

Authors: Jones A, Fortier J, Gagnon D, Truax B

Source: TREES FORESTS AND PEOPLE 2: 100032, 2020, DOI: [10.1016/j.tfp.2020.100032](https://doi.org/10.1016/j.tfp.2020.100032)

Abstract: This study assessed the effects of two vegetation management treatments (black polyethylene mulch and a control treatment) on tree growth, fine root biomass of trees and of competing vegetation, earthworms, and

physiochemical soil properties in a 10 year-old agricultural riparian buffer planted in southern Québec (Canada) with five trees species: *Populus canadensis* Moench (hybrid poplar), *Fraxinus pennsylvanica* Marsh. (red or green ash), *Quercus macrocarpa* Michx. (bur oak), *Quercus rubra* L. (red oak), and *Pinus strobus* L. (eastern white pine). Vegetation management treatments had a significant effect on tree growth, fine root biomass, earthworms and on many soil properties. Overall, the use of plastic mulch increased tree growth in all species (not to the same extent), but locally decreased soil organic matter, total soil carbon, total soil nitrogen, earthworm biomass and abundance, competing vegetation fine root biomass and the biomass of the total pool of fine roots...

Diversity and structure of microbial biofilms on microplastics in riverine waters of the Pearl River Delta, China

Authors: Yang GQ, Gong MT, Mai L et al.

Source: CHEMOSPHERE 272:129870, 2021, DOI: 10.1016/j.chemosphere.2021.129870

Abstract: Riverine runoff is a significant transport pathway for microplastics (MPs) discharged from land-based sources to marine environments where MPs accumulate. Knowledge of riverine MP-associated biofilms will improve the understanding of the fate and potential effects of MPs in marine environments. This study aimed to characterize the microbial biofilms colonizing MPs in the riverine water of the Pearl River Delta, China, and identify the seasonal, geographical and environmental influences on MP-associated communities...

DROIT ET POLITIQUE DE L'ENVIRONNEMENT

Protection des abeilles et autres insectes pollinisateurs et préservation des services de pollinisation lors de l'utilisation des produits phytopharmaceutiques - Consultations publiques

Ministère de la Transition Ecologique

Ce projet d'arrêté interministériel vise à renforcer les dispositions réglementaires de protection des pollinisateurs vis-à-vis de l'exposition aux produits phytopharmaceutiques. Il constitue une action du projet de plan national en faveur des insectes pollinisateurs et de la pollinisation 2021-2026.

La consultation, effectuée en application de l'article L. 123-19-1 du code de l'environnement, aura lieu jusqu'au 20 juillet 2021. [...]

[Accès au document](#)

Identification des alternatives au glyphosate pour les usages non agricoles

Ministère Agriculture 28/05/21

Une mission interministérielle, composée du CGAAER et du CGEDD, a été chargée d'identifier les alternatives non chimiques au glyphosate pour les usages non agricoles et non forestiers (zones non agricoles), en particulier pour la SNCF et les sites industriels, dans le cadre du plan de sortie de cette substance active.

[Accès au document](#)

EPA releases updated occupational pesticide handler and post-application exposure calculators

EPA May 26, 2021

EPA has updated the [Occupational Pesticide Handler Exposure Calculator](#) and [Occupational Pesticide Post-application Exposure Calculator](#) with the latest available data and Source:s to provide the agency with more efficiency in completing risk assessments and ensuring transparency to the public and affected stakeholders.

EPA uses these tools to carry out risk assessments to make informed decisions when approving new pesticides, new uses of registered pesticides, and during regular reviews of existing pesticides. The updated exposure values are more reflective of actual exposures to occupational pesticide handlers and post-application scenarios, which reduces uncertainty in decisions and serves as the basis for labeling decisions. [...]

[Accès au document](#)

Substance active terbuthylazine : conditions d'approbation

RÈGLEMENT D'EXÉCUTION (UE) 2021/824 DE LA COMMISSION du 21 mai 2021 modifiant les règlements d'exécution (UE) n° 540/2011 et (UE) n° 820/2011 en ce qui concerne les conditions d'approbation de la substance active terbuthylazine

Numéro officiel : UE/2021/824
Date de signature : 21/05/2021
Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

Modification Règlement d'exécution UE/820/2011 16/08/2011

[Accès au document](#)

Approbation renouvelée de la substance active cyazofamid

RÈGLEMENT D'EXÉCUTION (UE) 2021/843 DE LA COMMISSION du 26 mai 2021 renouvelant l'approbation de la substance active cyazofamid conformément au règlement (CE) no 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) no 540/2011 de la Commission

Numéro officiel : UE/2021/843
Date de signature : 26/05/2021
Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

[Accès au document](#)

Approbation renouvelée de la substance active Streptomyces souche K61

RÈGLEMENT D'EXÉCUTION (UE) 2021/853 DE LA COMMISSION du 27 mai 2021 renouvelant l'approbation de la substance active Streptomyces souche K61, conformément au règlement (CE) no 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) no 540/2011 de la Commission

Numéro officiel : UE/2021/853
Date de signature : 27/05/2021
Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

[Accès au document](#)

La commission européenne présente son plan d'actions "Zero pollution" à l'horizon 2050

Dans une communication finale, la Commission présente au Parlement européen, au conseil, au comité économique et social européen, et au Comité des régions un Plan d'action de l'UE : "Vers une pollution zéro pour l'air, l'eau et le sol" : Voie vers une planète saine pour tous.

[Accès au document](#)

REGLEMENTATION / DROIT

Produits phytopharmaceutiques : AMM d'une durée maximale de 120 jours délivrées par le ministère dans des situations d'urgence phytosanitaire

Dans le cadre de la loi d'avenir pour l'agriculture, l'alimentation et la forêt (LAAAF) du 13 octobre 2014, le ministère chargé de l'Agriculture reste compétent pour délivrer, dans des situations d'urgence phytosanitaire, des autorisations de mise sur le marché d'une durée maximale de 120 jours. Ces décisions sont rendues publiques sur le site du ministère durant leur période de validité. [...]

Liste des cultures concernées : cf l'article

[Accès au document](#)

Alternatives aux phytosanitaires : un arrêté facilite le recours aux substances naturelles

Décoctions, extraits de plantes obtenus par pression ou macération, purins... Les techniques utilisées à partir de plantes pour stimuler les processus naturels des plantes ou du sol sont nombreuses. [...]. Elles peuvent constituer un appoint ou une alternative aux traitements phytosanitaires destinés à soigner les maladies des plantes.

L'arrêté signé par le ministre de l'Agriculture et de l'Alimentation et publié le 17 juin au Journal Officiel constitue une avancée importante pour faciliter l'utilisation de ces recettes traditionnelles ou innovantes à base de plantes. Le texte réglementaire définit le cahier des charges à respecter pour la fabrication, la commercialisation et l'utilisation des préparations naturelles à usage biostimulant produites à partir de parties consommables de plantes. [...]

[Accès au document](#)

Périodes d'approbation des substances actives «Adoxophyes orana granulovirus» et «flutriafol»

RÈGLEMENT D'EXÉCUTION (UE) 2021/726 DE LA COMMISSION du 4 mai 2021 modifiant le règlement d'exécution (UE) no 540/2011 en ce qui concerne les périodes d'approbation des substances actives «Adoxophyes orana granulovirus» et «flutriafol»

Numéro officiel : UE/2021/726
Date de signature : 04/05/2021
Liens juridiques : Modification Règlement d'exécution UE/540/2011 25/05/2011

[Accès au document](#)

AVIS / EXPERTISES / NORMES

Peer review of the pesticide risk assessment of the active substance carbon dioxide

Commission Implementing Regulation (EU)

No 844/2012, as amended by Commission Implementing Regulation (EU) No 2018/1659, lays down the procedure for the renewal of the approval of active substances submitted under Article 14 of Regulation (EC) No 1107/2009. The list of those substances is established in Commission Implementing Regulation (EU) No 686/2012 as amended by Commission Implementing Regulation (EU) No 2016/183. Carbon dioxide is one of the active substances listed in that Regulation. [...]

DOI: <https://doi.org/10.2903/j.efsa.2021.6605>

Des solutions alternatives aux néonicotinoïdes pour lutter contre la jaunisse dans les cultures de betteraves

ANSES 02/06/21

Dans une mise à jour de son avis de 2018 sur les alternatives aux néonicotinoïdes, l'Anses a identifié vingt-deux solutions pour lutter contre les pucerons et la maladie de la jaunisse dans les cultures de betteraves sucrières. Ces moyens de lutte pourraient prendre le relais des produits à base de néonicotinoïdes, interdits depuis 2018, mais dont l'utilisation a été réintroduite par dérogation en 2020 pour les traitements des semences de betteraves. Ces solutions alternatives qui présentent des efficacités correctes mais insuffisantes en utilisation seule, nécessiteront une approche de lutte intégrée pour atteindre une efficacité suffisante, voire une évolution des pratiques culturales. [...]

[Accès au document](#)

A systems-based approach to the environmental risk assessment of multiple stressors in honey bees

EFSA 20/05/21

The European Parliament requested EFSA to develop a holistic risk assessment of multiple stressors in honey bees. To this end, a systems-based approach that is composed of two core components: a monitoring system and a modelling system are put forward with honey bees taken as a showcase. [...]

DOI: <https://doi.org/10.2903/j.efsa.2021.6607>

Pesticide risk assessment of the active substance *Bacillus amyloliquefaciens* strain IT-45 : peer review

The conclusions of the European Food Safety Authority (EFSA) following the peer review of the initial risk assessments carried out by the competent authority of the rapporteur Member State, France, for the pesticide active substance *Bacillus amyloliquefaciens* strain IT-45 and the considerations as regards the inclusion of the substance in Annex IV of Regulation (EC) No 396/2005 are reported. The context of the peer review was that required by Regulation (EC) No 1107/2009 of the European Parliament and of the Council. The conclusions were reached on the basis of the evaluation of the representative use of *Bacillus amyloliquefaciens* strain IT-45 as a fungicide on citrus (field use, application to soil via drip irrigation systems).

DOI: <https://doi.org/10.2903/j.efsa.2021.6594>

Incendie Lubrizol et NL Logistique : bilan des mesures de polluants et d'odeurs dans l'air ambiant et retombées atmosphériques

ATMO Normandie, 07/05/2021

Atmo Normandie publie aujourd'hui, vendredi 7 mai 2021, son rapport final concernant l'incendie de Lubrizol/Normandie Logistique du 26 septembre 2019. [...]

Ce rapport revient sur la chronologie de l'intervention d'Atmo Normandie, détaille les résultats des mesures effectuées entre le 26 septembre 2019 et le 1er octobre 2020 et dresse les perspectives.

[Accès au document](#)

Review of the existing MRL for valifenalate according to Article 12 of Regulation (EC) No 396/2005

According to Article 12 of Regulation (EC) No 396/2005, EFSA has reviewed the maximum residue levels (MRLs) currently established at European level for the pesticide valifenalate. To assess the occurrence of valifenalate residues in plants, processed commodities, rotational crops and livestock, EFSA considered the conclusions derived in the framework of Commission Regulation (EU) No 188/2011, as well as European authorisations reported by Member States and the UK (including the supporting residues data). [...] Although no apparent risk to consumers was identified, some information required by the regulatory framework was missing. Hence, the consumer risk assessment is considered indicative only and one MRL proposal derived by EFSA still requires further consideration by risk managers.

[Accès au document](#)

PUBLICATIONS DU RESEAU ECOTOX

Impact of repeated irrigation of lettuce cultures with municipal wastewater on soil bacterial community diversity and composition

Authors: Gallego S, Brienza M, Beguet J, Chiron S, Martin-Laurent F

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: [10.1007/s11356-021-14734-4](https://doi.org/10.1007/s11356-021-14734-4)

Abstract: The effect of wastewater irrigation on the diversity and composition of bacterial communities of soil mesocosms planted with lettuces was studied over an experiment made of five cultivation campaigns. A limited effect of irrigation with either raw or treated wastewater was observed in both alpha-diversity and beta-diversity of soil bacterial communities. However, the irrigation with wastewater fortified with a complex mixture of fourteen relevant chemicals at 10 µg/L each, including pharmaceutical, biocide, and pesticide active substances, led to a drift in the composition of soil bacterial community. One hundred operational taxonomic units (OTUs) were identified as responsible for changes between treated and fortified wastewater irrigation treatments...

Assessment of pesticides volatilization potential based on their molecular properties using the TyPol tool

Authors: Mamy L, Bonnot K, Benoit P, Bockstaller C et al.

Source: JOURNAL OF HAZARDOUS MATERIALS 415: 125613, 2021, DOI: [10.1016/j.jhazmat.2021.125613](https://doi.org/10.1016/j.jhazmat.2021.125613)

Abstract: Following treatment, amounts of pesticides can reach the atmosphere because of spray drift, volatilization from soil or plants, and/or wind erosion. Monitoring and risk assessment of air contamination by pesticides is a recent issue and more insights on pesticide transfer to atmosphere are needed. Thus, the objective of this work was to better understand and assess pesticides emission potential to air through volatilization. The TyPol tool was used to explore the relationships between the global, soil and plant volatilization potentials of 178 pesticides, and their molecular properties. The outputs of TyPol were then compared to atmospheric pesticide concentrations monitored in various French regions. TyPol was able to discriminate pesticides that were observed in air from those that were not. Clustering considering parameters driving the emission potential from soil (sorption characteristics) or plant (lipophilic properties), in addition to vapor pressure, allowed better discrimination of the pesticides than clustering considering all parameters for the global emission potential...

Evaluation of trace metal accumulation in six vegetable crops intercropped with phytostabilizing plant species, in a French urban wasteland

Authors: Laffray X, Toulaib K, Balland-Bolou-Bi C, Bagard et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: [10.1007/s11356-021-14512-2](https://doi.org/10.1007/s11356-021-14512-2)

Abstract: The extensive development of agriculture in urban and peri-urban wastelands polluted with several trace elements (TE) poses risks to human health through contaminated food

products. The objective was to explore the accumulation of TE in the various parts of vegetable crop plants (tomato, French bean, radish, potato, spinach, and leek) intercropped with phytostabilizing plant species (ryegrass and white clover, respectively). Field studies were conducted in a multicontaminated French urban wasteland with Cd, Cu, Pb and Zn, and an alkaline soil pH. Analyses of the respective non-edible parts of monocultured vegetable crops showed accumulation of all TE, mostly Zn, then Pb and Cu, and finally Cd...

Molecular bases of P450-mediated resistance to the neonicotinoid insecticide imidacloprid in the mosquito *Ae. Aegypti*

Authors: Zoh MG, Gaude T, Prud'homme SM, Riaz MA, David JP, Reynaud S

Source: AQUATIC TOXICOLOGY 236: 105860, 2021, DOI: [10.1016/j.aquatox.2021.105860](https://doi.org/10.1016/j.aquatox.2021.105860)

Abstract: Resistance to chemical insecticides including pyrethroids, the main insecticide class used against mosquitoes, has re-kindled interest in the use of neonicotinoids. In this context, the present study aimed to characterize the molecular basis of neonicotinoid resistance in the mosquito *Aedes aegypti*. Resistance mechanisms were studied by combining transcriptomic and genomic data obtained from a laboratory strain selected at the larval stage after 30 generations of exposure to imidacloprid (Imida-R line). After thirty generations of selection, larvae of the Imida-R line showed an 8-fold increased resistance to imidacloprid and a significant cross-tolerance to the pyrethroids permethrin and deltamethrin...

Global data on earthworm abundance, biomass, diversity and corresponding environmental properties

Authors: Phillips HRP, Bach EM, Bartz MLC, Bennett JM et al.

Source: SCIENTIFIC DATA 8(1): 136, 2021, DOI: [10.1038/s41597-021-00912-z](https://doi.org/10.1038/s41597-021-00912-z)

Abstract: Earthworms are an important soil taxon as ecosystem engineers, providing a variety of crucial ecosystem functions and services. Little is known about their diversity and distribution at large spatial scales, despite the availability of considerable amounts of local-scale data. Earthworm diversity data, obtained from the primary literature or provided directly by Authors, were collated with information on site locations, including coordinates, habitat cover, and soil properties. Datasets were required, at a minimum, to include abundance or biomass of earthworms at a site...

Quantifying pesticide emission fractions for tropical conditions

Authors: Gentil-Sergent C, Basset-Mens C, Gaab J, Mottes C et al.

Source: CHEMOSPHERE 275: 130014, 2021, DOI: [10.1016/j.chemosphere.2021.130014](https://doi.org/10.1016/j.chemosphere.2021.130014)

Abstract: The inventory model 'PestLCI Consensus', originally developed for temperate conditions, estimates initial pesticide emission fractions to air, to off-field surfaces by drift deposition, and to field crop and field soil surfaces according to crop foliar interception characteristics. Since crop characteristics and application techniques differ in tropical conditions, these aspects need to be included in the model in support of evaluating pesticide emissions under tropical conditions. Based on published literature, a consistent set of crop foliar

interception fractions was developed as function of crop characteristics and spraying techniques for tropical crops...

The Isotopic Signature of Lead Emanations during the Fire at Notre Dame Cathedral in Paris, France

Authors: Glorennec P, Azema A, Durand S, Ayrault S et al.

Source: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 18(10): 5420, 2021, DOI: [10.3390/ijerph18105420](https://doi.org/10.3390/ijerph18105420)

Abstract: When Notre Dame de Paris cathedral caught fire on 15 April 2019, lead particles were deposited in its surroundings. Our objective was to determine whether the lead plume had a homogeneous isotopic signature (i.e., a set of homogenous isotopic ratios), and whether, if so, this was different from common Sources. In January 2020, dust samples were collected from six areas inside the cathedral, downwind of the fire, as well as from eight roof debris fragments. These samples were mineralized and analyzed using ICP-MS. Their isotopic ratios ($^{207}\text{Pb}/^{206}\text{Pb}$ and $^{206}\text{Pb}/^{204}\text{Pb}$) were determined and then compared both to each other and to previous published ratios measured in home dusts and blood samples collected in France...

New perspectives on the calculation of bioaccumulation metrics for active substances in living organisms

Authors: Ratier A, Lopes C, Multari G, Mazerolles V et al.

Source: INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT Early access, 2021, DOI: [10.1002/ieam.4439](https://doi.org/10.1002/ieam.4439)

Abstract: Today, only few ready-to-use and convenient decision-making tools are available in ecotoxicology concerning accumulation and effects of chemical substances on organisms, accounting for exposure situations that are known to be complex (routes of exposure, metabolism, mixtures, etc.). This paper presents new perspectives on the generic calculation of bioaccumulation metrics via the innovative web tool MOSAIC(bioacc) (<http://mosaic.univ-lyon1.fr/bioacc>). MOSAIC(bioacc) provides all kinds of bioaccumulation metrics associated with their uncertainty whatever the species-compound combination...

Impact of cadmium on forage kale (*Brassica oleracea* var. *viridis* cv "Prover") after 3-, 10- and 56-day exposure to a Cd-spiked field soil

Authors: Bernard F, Dumez S, Lemiere S, Platel A et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 28(20): 25060-25068, 2021, DOI: [10.1007/s11356-018-1636-8](https://doi.org/10.1007/s11356-018-1636-8)

Abstract: Cadmium (Cd) is a highly toxic element for living organisms and is widespread in metal-contaminated soils. As organisms which can grow up on these polluted areas, plants have some protection mechanisms against Cd issues. Among the plant kingdom, the Brassicaceae family includes species which are known to be able to tolerate and accumulate Cd in their tissues. In this study, *Brassica oleracea* var. *viridis* cv "Prover" was exposed to a range of artificially Cd-contaminated soils (from 2.5 up to 20 mg kg⁻¹) during 3, 10, and 56 days and the effects on life traits, photosynthesis activity, antioxidant enzymatic activities were studied. Metal accumulation was quantified, as well as DNA damage, by means of the comet assay and immunodetection of 8-OHdG levels...

Origin, fate and ecotoxicity of manganese from legacy metallurgical wastes

Authors: Petitjean Q, Choulet F, Walter-Simonnet AV, Mariet AL, Laurent H et al.

Source: CHEMOSPHERE 277: 130337, 2021, DOI: [10.1016/j.chemosphere.2021.130337](https://doi.org/10.1016/j.chemosphere.2021.130337)

Abstract: Over the course of history, mining and metallurgical activities have influenced the socioeconomic development of human populations. However, these past and current activities can also lead to substantial environmental contamination by various metals. Here, we used an interdisciplinary approach (incorporating archaeology, mineralogy, environmental chemistry and ecotoxicology) to investigate the origin, fate and potential ecotoxicity of anomalous manganese (Mn) concentrations detected in the ancient mining district of Berthelange (medieval period, eastern France). Mineralogical investigations of slag samples showed that smelting temperature conditions in medieval bloomeries led to the production of slags mainly composed of Fe- and Mn-rich olivine, i.e., fayalites. Further mineralogical analyses of bulk soil and clay fractions allowed us to identify the presence of serpentine...

Phase Transfer and Biodegradation of Pesticides in Water-Sediment Systems Explored by Compound-Specific Isotope Analysis and Conceptual Modeling

Authors: Droz B, Drouin G, Maurer L, Villette C, Payraudeau S, Imfeld G

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY 55(8): 4720-4728, 2021, DOI: [10.1021/acs.est.0c06283](https://doi.org/10.1021/acs.est.0c06283)

Abstract: Current approaches are often limited to evaluating the contribution of pesticide dissipation processes in water-sediment systems as both degradation and phase transfer, that is, sorption-desorption, contribute to the apparent decrease of pesticide concentration. Here, the dissipation of widely used herbicides acetochlor and S-metolachlor was examined in laboratory by water-sediment microcosm experiments under oxic and anoxic conditions. Compound-specific isotope analysis (CSIA) emphasized insignificant carbon isotope fractionation in the sediment, indicating prevailing pesticide degradation in the water phase. Conceptual modeling accounting for phase transfer and biodegradation indicated that biodegradation may be underestimated when phase transfer is not included. Phase transfer does not affect carbon isotope fractionation for a wide spectrum of molecules and environmental conditions, underscoring the potential of pesticide CSIA as a robust approach to evaluate degradation in water-sediment systems...

Simple models efficiently predict free cadmium Cd²⁺ in the solutions of low-contaminated agricultural soils

Authors: Viala Y, Sappin-Didier V, Bussiere S, Coriou C, Nguyen C

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778: 146428, 2021, DOI: [10.1016/j.scitotenv.2021.146428](https://doi.org/10.1016/j.scitotenv.2021.146428)

Abstract: Speciation of Cd in soil solutions strongly determines the fate of this toxic metal in the environment. Generally, in soil solutions, Cd predominantly binds to the dissolved organic matter (DOM). The determination of the quantity and reactivity of DOM that actually complexes Cd in soil solutions is challenging for operational purposes. Therefore, this study tested whether Cd²⁺ concentration in soil solutions could effectively be predicted by considering complexation with a single mean organic ligand

assumed to be a fraction of DOM of unspecified nature or assumed to be purely fulvic acids (FA) with reactivity as described in WHAM VII. The reactivity of the unspecified ligand and the concentration of FA were modelled and fitted to experimental data from 76 agricultural soils with low Cd contents...

New challenges of marine ecotoxicology in a global change context

Authors: Tlili S, Mouneyrac C

Source: MARINE POLLUTION BULLETIN 166: 112242, 2021, DOI: [10.1016/j.marpolbul.2021.112242](https://doi.org/10.1016/j.marpolbul.2021.112242)

Abstract: Currently, research agenda in marine ecotoxicology is facing new challenges with the emergence of newly and complex synthesized chemicals. The study of the fate and adverse effects of toxicants remains increasingly complicated with global change events. Ecotoxicology had provided for a decades, precious scientific data and knowledge but also technical and management tools for the environmental community. Regarding those, it is necessary to update methodologies dealing with these issues such as combined effect of conventional and emergent stressors and global changes. In this point of view article, we discuss one hand the new challenges of ecotoxicology in this context, and in the other hand, the need of updating agenda and methodologies currently used in monitoring programs and finally recommendations and future research needs. Among recommendations, it could be cited the necessity to perform long-term experiments, the standardization of sentinel species and taking benefit from baseline studies and omics technologies.

Individual quality and phenology mediate the effect of radioactive contamination on body temperature in Chernobyl barn swallows

Authors: Boratynski Z, Mousseau TA, Moller AP

Source: ECOLOGY AND EVOLUTION Early Access, 2021, DOI: [10.1002/ece3.7742](https://doi.org/10.1002/ece3.7742)

Abstract: Anthropogenic stressors, such as radioactive contaminants released from the Chernobyl and Fukushima Daiichi accidents, deteriorate ecological and evolutionary processes, as evidence for damaging effects of radioactive contamination on wildlife is accumulating. Yet little is known about physiological traits of animals inhabiting contaminated areas, and how those are affected by individual quality and phenology. We investigated variation in body temperature of wild barn swallows, *Hirundo rustica*, exposed to radioactive contamination from the Chernobyl accident in Ukraine and Belarus. We tested whether exposure to variable levels of radioactive contamination modified core body temperature of birds, and whether individual and phenological characteristics modulated radiosensitivity of body temperature...

Individual performances and biochemical pathways as altered by field-realistic exposures of current-use fungicides and their mixtures in a non-target species, *Gammarus fossarum*

Authors: Lebrun JD, De Jesus K, Tournebize J

Source: CHEMOSPHERE 277: 130277, 2021, DOI: [10.1016/j.chemosphere.2021.130277](https://doi.org/10.1016/j.chemosphere.2021.130277)

Abstract: Persistent fungicides, which are widely applied to agricultural soils to protect crops, are frequently detected in freshwaters because of hydraulic transfer, possibly resulting in unintentional adverse effects on wildlife. However, the ecotoxicity of fungicides in aquatic species remains scarcely assessed at environmentally relevant concentrations, and there is scant information available on their combined effects. This study aims at investigating multi-level changes elicited by two currently used fungicides, boscalid and tebuconazole, in the amphipod *Gammarus fossarum*. In microcosms, gammarids were exposed for 72 h to fungicides tested individually or in binary mixture at 0.01, 0.1 and 1.0 $\mu\text{g/L}$ to monitor individual performances (locomotion, respiration and amplexus formation) and biochemical parameters (involved in energy metabolism, growth, moulting and cell stress). This range of exposure concentrations was field-realistic and largely lower than local environmental quality standards for the protection of aquatic wildlife...

Pesticide risk assessment in honeybees: Toward the use of behavioral and reproductive performances as assessment endpoints

Authors: Barascou L, Brunet JL, Belzunces L, Decourtye A, Henry M, Fourrier J, Le Conte Y, Alaux C

Source: CHEMOSPHERE 276: 130134, 2021, DOI: [10.1016/j.chemosphere.2021.130134](https://doi.org/10.1016/j.chemosphere.2021.130134)

Abstract: The growing gap between new evidence of pesticide toxicity in honeybees and conventional toxicological assays recommended by regulatory test guidelines emphasizes the need to complement current lethal endpoints with sublethal endpoints. In this context, behavioral and reproductive performances have received growing interest since the 2000s, likely due to their ecological relevance and/or the emergence of new technologies. We review the biological

interests and methodological measurements of these predominantly studied endpoints and discuss their possible use in the pesticide risk assessment procedure based on their standardization level, simplicity and ecological relevance. It appears that homing flights and reproduction have great potential for pesticide risk assessment, mainly due to their ecological relevance...

Molecular impacts of dietary exposure to nanoplastics combined with arsenic in Canadian oysters (*Crassostrea virginica*) and bioaccumulation comparison with Caribbean oysters (*Isognomon alatus*)

Authors: Lebordais M, Gutierrez-Villagomez JM, Gigault J, Baudrimont M, Langlois VS

Source: CHEMOSPHERE 277: 130331, 2021, DOI: [10.1016/j.chemosphere.2021.130331](https://doi.org/10.1016/j.chemosphere.2021.130331)

Abstract: Despite the urge need to address the possible impact of plastic debris, up to now, little is known about the translocation of nanoplastics through the trophic web. Plus, due to their surface reactivity, nanoplastics could sorb and thus increase metals bioavailability to aquatic filter-feeding organisms (e.g., bivalves). In this study, we investigated the dietary exposure route on the oyster *Crassostrea virginica* through microalgae themselves exposed to three nanoplastic dispersions (PSL, PSC and NPG) at reportedly environmental concentrations combined or not with arsenic. Interactive effects of nanoplastics on arsenic bioaccumulation were studied, along with the expression of key genes in gills and visceral mass. The investigated gene functions were endocytosis (cltc), oxidative stress (gapdh, sod3, cat), mitochondrial metabolism (12S), cell cycle regulation (gadd45, p53),

apoptosis (bax, bcl-2), detoxification (cyp1a, mdr, mt), and energy storage (vit)...

Molecular Impacts of Dietary Exposure to Nanoplastics Combined or Not with Arsenic in the Caribbean Mangrove Oysters (*Isognomon alatus*)

Authors: Lebordais M, Venel Z, Gigault J, Langlois VS, Baudrimont M

Source: NANOMATERIALS 11(5): 1151, 2021, DOI: [10.3390/nano11051151](https://doi.org/10.3390/nano11051151)

Abstract: Nanoplastics (NPs) are anthropogenic contaminants that raise concern, as they cross biological barriers. Metals' adsorption on NPs' surface also carries ecotoxicological risks to aquatic organisms. This study focuses on the impacts of three distinct NPs on the Caribbean oyster *Isognomon alatus* through dietary exposure. As such, marine microalgae *Tisochrysis lutea* were exposed to environmentally weathered mixed NPs from Guadeloupe (NPG), crushed pristine polystyrene nanoparticles (PSC), and carboxylated polystyrene nanoparticles of latex (PSL). Oysters were fed with NP-*T. lutea* at 10 and 100 $\mu\text{g L}^{-1}$, concentrations considered environmentally relevant, combined or not with 1 mg L⁻¹ pentoxide arsenic (As) in water. We investigated key gene expression in *I. alatus*' gills and visceral mass...

Characterization of chlordecone distribution and elimination in ewes during daily exposure and depuration

Authors: Fourcot A, Feidt C, Le Roux Y, Thome JP, Rychen G, Fournier A

Source: CHEMOSPHERE 277: 130340, 2021, DOI: [10.1016/j.chemosphere.2021.130340](https://doi.org/10.1016/j.chemosphere.2021.130340)

Abstract: To reduce the exposure of the French West Indies population to the pollutant chlordecone (CLD), the contamination of consumed products must be reduced. One of the strategies to secure safe animal products is related to the depuration of contaminated animals. In order to set up this strategy in situ, characterizing CLD distribution and elimination appears to be essential. The aim of this study is to characterize CLD distribution and elimination in ewes, and establish correlations between CLD concentrations in tissues following a continuous oral contamination period and a depuration period. The experiment consisted in a 90-d period of CLD exposure via daily feeding at 0.01 mg kg⁻¹ body weight, followed by a 127-d period of depuration. A total of 24 ewes were sequentially slaughtered and serum, liver, perirenal fat, subcutaneous fat, shaft muscle, longissimus dorsi muscle and heart samples were collected...

Response from the Authors of the article "Critical review of the role of personal protective Equipment (PPE) in the prevention of risks related to agricultural pesticide use" to the letter to the editor from the European crop protection association (ECPA) Occupational and bystander exposure expert group (OBEEG)

Authors: Garrigou A, Laurent C, Baldi I, Berthet A et al.

Source: SAFETY SCIENCE 138: 105191, 2021, DOI: [10.1016/j.ssci.2021.105191](https://doi.org/10.1016/j.ssci.2021.105191)

Abstract: In March 2020, Safety Science published the article "Critical review of the role of PPE in the prevention of risks related to agricultural pesticide use" by an international group of researchers working for public research organisations. An expert group from an association representing the interests of the agricultural pesticide industry at European level (the European Crop Protection Association -ECPA-) then published a letter challenging the relevance of the discussion and the conclusions of this article. The Authors of the review have decided to use their right to reply.

Ecotoxicological risk assessment of contaminants of emerging concern identified by "suspect screening" from urban wastewater treatment plant effluents at a territorial scale

Authors: Gosset A, Wiest L, Fildier A, Libert C, Giroud B et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 778: 146275, 2021, DOI: [10.1016/j.scitotenv.2021.146275](https://doi.org/10.1016/j.scitotenv.2021.146275)

Abstract: Urban wastewater treatment plants (WWTP) are a major vector of highly ecotoxic contaminants of emerging concern (CECs) for urban and sub-urban streams. Ecotoxicological risk assessments (ERAs) provide essential information to public environmental authorities. Nevertheless, ERAs are mainly performed at very local scale (one or few WWTPs) and on pre-selected list of CECs. To cope with these limits, the present study aims to develop a territorial-scale ERA on CECs previously identified by a « suspect screening » analytical approach (LC-QToF-MS) and quantified in the effluents of 10 WWTPs of a highly urbanized territory during three periods of the year. Among CECs, this work focused on pharmaceutical residue and pesticides. ERA was conducted following two

complementary methods: (1) a single substance approach, based on the calculation for each CEC of risk quotients (RQs) by the ratio of Predicted Environmental Concentration (PEC) and Predicted No Effect Concentration (PNEC), and (2) mixture risk assessment (« cocktail effect ») based on a concentration addition model (CA), summing individual RQs...

Evaluation of the OECD QSAR toolbox automatic workflow for the prediction of the acute toxicity of organic chemicals to fathead minnow

Authors: Mombelli E, Pandard P

Source: REGULATORY TOXICOLOGY AND PHARMACOLOGY 122: 104893, 2021, DOI: [10.1016/j.yrtph.2021.104893](https://doi.org/10.1016/j.yrtph.2021.104893)

Abstract: Regulatory frameworks require information on acute fish toxicity to ensure environmental protection. The experimental assessment of this property relies on a substantial number of fish to be tested and it is in conflict with the current drive to replace in vivo testing. For this reason, alternatives to in vivo testing have been proposed during the past years. Among these alternatives, there are Quantitative Structure-Activity Relationships (QSAR) that require the sole knowledge of chemical structure to yield predictions of toxicities. In this context, the OECD QSAR Toolbox is one of the leading QSAR tools for regulatory purposes that enables the prediction of fish toxicities. The aim of this work is to provide evidence about the predictive reliability of the automated workflow for predicting acute toxicity in fish which is embedded within this toolbox...

Dissolved organic matter modulates the impact of herbicides on a freshwater

alga: A laboratory study of a three-way interaction

Authors: Morin S, Coquille N, Eon M, Budzinski H, Parlanti E et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 782: 146881, 2021, DOI: [10.1016/j.scitotenv.2021.146881](https://doi.org/10.1016/j.scitotenv.2021.146881)

Abstract: In freshwater environments, microorganisms such as microalgae are influenced by the concentrations of dissolved chemicals but can modify the fate of these substances by biosorption, accumulation and even metabolization. In this laboratory study, we assessed the growth and physiology of non-axenic cultures of the chlorophyte *Sphaerellopsis* sp. exposed to environmental concentrations of diuron, irgarol and S-metolachlor (0.5, 0.5 and 5 μ g.L⁻¹, respectively) singly and in mixture, in the presence or absence of natural dissolved organic matter (DOM). The growth, photosynthetic efficiency and relative intracellular lipid content of *Sphaerellopsis* sp., as were measured after 14 days of exposure, as were the concentrations of bacteria in the cultures. DOM absorbance and fluorescence, and concentrations of the herbicides and their metabolites in the culture medium were also recorded...

Adsorption of a triazole antifungal agent, difenoconazole, on soils from a cereal farm: Protective effect of hemp felt

Authors: Godeau C, Morin-Crini N, Staelens JN, Martel B et al.

Source: ENVIRONMENTAL TECHNOLOGY & INNOVATION 22: 101394, 2021, DOI: [10.1016/j.eti.2021.101394](https://doi.org/10.1016/j.eti.2021.101394)

Abstract: Difenoconazole is a triazole fungicide widely used in agriculture for the protection of

various crops. The present study evaluated by batch technique, the high capacity of two soils to adsorb difenoconazole. The Freundlich and Henry models fitted the adsorption data well, suggesting a multi-layer adsorption of difenoconazole. Groundwater ubiquity score (GUS) were between 1.8 and 2.8, indicating that difenoconazole had a moderate risk of contaminating groundwater resources. Adsorption in percolation and leaching experiments were also tested in the laboratory with a soil column. We performed tests on soils alone, on soils covered by hemp felt (raw or chemically modified by the grafting of cyclodextrin molecules) as an adsorbent material for limiting the dissipation of this molecule in the soil, and at the same time on felts alone...

Using textile industrial sludge, sewage wastewater, and sewage sludge as inoculum to degrade recalcitrant textile dyes in a co-composting process an assessment of biodegradation efficiency and compost phytotoxicity

Authors: Testolin RC, Feuzer-Matos AJ, Cotelle S, Adani F et al.

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Early Access, 2021, DOI: 10.1007/s11356-021-14211-y

Abstract: Recalcitrant dyes found in textile wastewater represent a threat for sustainable textile production due to their resistance to conventional treatments. This study assessed an alternative co-composting system for the treatment of recalcitrant textile dyes where textile industrial sludge, sewage wastewater, or sewage sludge were used as microbial compost inocula. The biodegradation efficiency of bioreactor trials and compost quality of the co-composting system were assessed by visible

spectrophotometry and by a phytotoxicity test. The co-composting system (dry weight (dw) basis) consisted of 200 g of restaurant organic residues + 200 g sewage sludge (or 100 mL sewage wastewater, or 200 g textile sludge) + 100 mL of a 10% dye solution (Reactive Red 195, or Synolon Brown, or Orange Remazol, or Yellow Synozol, or Reactive Orange 122, or Reactive Black 5) ...

From environmental bioavailability of metal(loid)s to their ecogenotoxicological effects in land snails

Authors: Louzon M, Gimbert F, Belly T, Amiot C et al

Source: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH Earlu Access, 2021, DOI: 10.1007/s11356-021-13618-x

Abstract: To date, no study has linked the environmental and the ecogenotoxicological bioavailability of contaminants to land snails. Yet, understanding the specific ecotoxicological mechanisms from bioaccumulation to genotoxicity is necessary e.g., to build an adverse outcome pathway relevant to risk assessment. Consequently, the aim of our study is to look for relationships between accumulated concentrations of As, Cd and Hg in sub-adult snails and ecotoxicological effects at the individual (survival and growth) and molecular (genomic stability) levels. This study combines random amplified polymorphic DNA (RAPD) coupled with high-resolution capillary electrophoresis system (HRS) and micronucleus (MN) assay on haemocytes to consider various types of cytogenomic damage, such as chromosomal aberrations, breakages, adducts and mutations...

Biodiversity monitoring using environmental DNA

Authors: Rodriguez-Ezpeleta N, Zinger L, Kinzinger A, Bik HM et al.

Source: MOLECULAR ECOLOGY RESOURCE:S Early Access, 2021, DOI: [10.1111/1755-0998.13399](https://doi.org/10.1111/1755-0998.13399)

Edito: Monitoring biodiversity is essential to protect, preserve and restore ecosystems, particularly in the context of current challenges such as climate change, habitat destruction and globalization (Baird & Hajibabaei, 2012). Biomonitoring is needed for developing biotic indices for assessing ecological status, measuring impacts of an-thropogenic activities in natural ecosystems, evaluating biodiversity loss, surveying nonindigenous species, conservation, and identifying cryptic species (Balvanera et al., 2006 ; Fišer et al., 2018)...

Greening effect of slag cement-based concrete: Environmental and ecotoxicological impact

Authors: Couvidat J, Diliberto C, Meux E, Cotelle S, Bojic C et al.

Source: ENVIRONMENTAL TECHNOLOGY & INNOVATION 22: 101467, 2021, DOI: [10.1016/j.eti.2021.101467](https://doi.org/10.1016/j.eti.2021.101467)

Abstract: Materials containing ground granulated blast furnace slag (GGBFS) display a transient green & ndash;blue color after demolding. This greening effect has been investigated for leaching behavior and ecotoxicological impact. Color of concretes and pure pastes containing GGBFS was assessed with a portable spectrophotometer, and samples were then submitted to a tank monolith leaching test. Ecotoxicological tests were conducted on reference sample and a green concrete sample at both natural and adjusted pH of 8.1. Main results support that the temporary greening effect of GGBFS-containing materials has no particular impact neither on the chemistry of leachates, nor ecotoxicity...

Impact of ancient iron smelting wastes on current

soils: Legacy contamination, environmental availability and fractionation of metals

Authors: Amnai A, Radola D, Choulet F, Buatier M, Gimbert F

Source: SCIENCE OF THE TOTAL ENVIRONMENT 776:145929, 2021, DOI: [10.1016/j.scitotenv.2021.145929](https://doi.org/10.1016/j.scitotenv.2021.145929)

Abstract: Past and present metallurgical activity is the origin of the metallic contamination of some current soils. The purpose of this research is to assess the environmental risk of ancient Fe smelting wastes to the terrestrial compartment. For this purpose, two study sites were investigated in Bourgogne-Franche Comt & eacute; (France). For each site, the soil contamination (Co, Cu, Fe, Mn, Ni and Zn) and the mobility of each metal from the slag to the topsoils were assessed. The principal results show that the topsoils are particularly enriched in Fe and Mn compared to the reference soils. The bulk chemistry of the slag showed high Fe and Mn content related to the mineralogy of slags, in which the minerals include fayalite, spinel, wustite and glass...

Uptake and effects of graphene oxide nanomaterials alone and in combination with polycyclic aromatic hydrocarbons in zebrafish

Authors: Martinez-Alvarez I, Le Menach K, Devier MH, Barbarin I, Tomovska R et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 775:145669, 2021, DOI: [10.1016/j.scitotenv.2021.145669](https://doi.org/10.1016/j.scitotenv.2021.145669)

Abstract: Because of its surface characteristics, once in the aquatic environment, graphene could act as a carrier of pollutants, such as polycyclic

aromatic hydrocarbons (PAHs), to aquatic organisms. In this study we aimed to (1) assess the capacity of graphene oxide (GO) to sorb PAHs and (2) to evaluate the toxicity of GO alone and in combination with PAHs on zebrafish embryos and adults. GO showed a high sorption capacity for benzo(a)pyrene (B(a)P) (98% of B(a)P sorbed from a nominal concentration of 100 $\mu\text{g/L}$) and for other PAHs of the water accommodated fraction (WAF) of a naphthenic North Sea crude oil, depending on their log K_{ow} (95.7% of phenanthrene, 84.4% of fluorene and 51.5% of acenaphthene) ...

Phytoavailability of cd, cr, cu, hg, mn, mo, ni, pb, tl and zn in arable crop systems amended for 13 to 15 years with organic waste products

Authors: Michaud AM, Sappin-Didier V, Cambier P, Nguyen C, Janot N et al.

Source: AGRONOMY-BASEL 11(4):664, 2021, DOI: [10.3390/agronomy11040664](https://doi.org/10.3390/agronomy11040664)

Abstract: Repeated applications of organic waste products (OWP) are a Source: of trace elements (TE) inputs to agricultural topsoils. The present study aimed at (i) assessing the effects of repeated OWP inputs on the chemical properties of topsoils in two long-term field experiments (13 and 15 years ; calcareous and non-calcareous soils), (ii) evaluating TE phytoavailability and their transfer to grain (winter wheat and maize) and (iii) identifying the underlying factors causing alterations of TE phytoavailability. In both field experiments, receiving compliant or slightly high doses of OWP in compliance with regulations, OWP and soil physicochemical properties and TE concentrations in soils and grains were determined. In situ phytoavailability of TE was assessed at two juvenile crop growth stages by analyzing TE concentrations in shoot plantlets...

The role of ponds in pesticide dissipation at the agricultural catchment scale: a critical review

Authors: Imfeld G, Payraudeau S, Tournebize J, Sauvage S, Macary F et al.

Source: WATER 13(9):1202, 2021, DOI: [10.3390/w13091202](https://doi.org/10.3390/w13091202)

Abstract: Ponds in agricultural areas are ubiquitous water retention systems acting as reactive biogeochemical hotspots controlling pesticide dissipation and transfer at the catchment scale. Several issues need to be addressed in order to understand, follow-up and predict the role of ponds in limiting pesticide transfer at the catchment scale. In this review, we present a critical overview of functional processes underpinning pesticide dissipation in ponds. We highlight the need to distinguish degradative and non-degradative processes and to understand the role of the sediment-water interface in pesticide dissipation. Yet it is not well-established how pesticide dissipation in ponds governs the pesticide transfer at the catchment scale under varying hydro-climatic conditions and agricultural operation practices. To illustrate the multi-scale and dynamic aspects of this issue, we sketch a modelling framework integrating the role of ponds at the catchment scale...

Record of trace organic contaminants in a river sediment core: From historical wastewater management to historical use

Authors: Thiebault T, Alliot F, Berthe T, Blanchoud H et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 773:145694, 2021, DOI: [10.1016/j.scitotenv.2021.145694](https://doi.org/10.1016/j.scitotenv.2021.145694)

Abstract: Some trace organic contaminants (TrOCs) can be considered as ubiquitous contaminants since the 1950s, and the study of their historical distribution within river sediments allows us to better understand the temporal variation of the chemical quality of sediments, and make assumptions about the most insightful forcings impacting these distributions. In this study, the occurrence of 41 TrOCs of various classes (i.e. pharmaceutical products and pesticides) was studied in a sedimentary core sampled in a disused dock along the Seine River, France. This core covers a 60 year-long period between 1944 and 2003, and 23 TrOCs were detected at least once. Their concentrations mainly ranged between 1 and 10 ng g⁻¹ within the core, except for tetracycline that exhibited higher concentrations (similar to hundreds of ng.g⁻¹)...

Modeling acetylcholine esterase inhibition resulting from exposure to a mixture of atrazine and chlorpyrifos using a physiologically-based kinetic model in fish

Authors: Mit C, Tebby C, Gueanno T, Bado-Nilles A, Beaudouin R

Source: SCIENCE OF THE TOTAL ENVIRONMENT 773:144734, 2021, DOI: [10.1016/j.scitotenv.2020.144734](https://doi.org/10.1016/j.scitotenv.2020.144734)

Abstract: Aquatic organisms are exposed to mixtures of chemicals that may interact. Mixtures of atrazine (ATR) and chlorpyrifos (CPF) may elicit synergic effects on the permanent inhibition of acetylcholinesterase (AChE) in certain aquatic organisms, causing severe damage. Mechanistic mathematical models of toxicokinetics and toxicodynamics (TD) may be used to better characterize and understand the interactions of these two chemicals. In this study, a previously published generic physiologically-based toxicokinetic (PBTK) model for fish was adapted

to ATR and CPF. A sub-model of the kinetics of one of the main metabolites of CPF, chlorpyrifos-oxon (CPF-oxon), was included, as well as a TD model...

Thermal plasticity and sensitivity to insecticides in populations of an invasive beetle: Cyfluthrin increases vulnerability to extreme temperature

Authors: Dahl JE, Marti SL, Colinet H, Wiegand C et al.

Source: CHEMOSPHERE 274:129905, 2021, DOI: [10.1016/j.chemosphere.2021.129905](https://doi.org/10.1016/j.chemosphere.2021.129905)

Abstract: Climate change increases average temperatures and the occurrence of extreme weather events, in turn accentuating the risk of organism exposure to temperature stress. When thermal conditions become stressful, the sensitivity of insects toward insecticides can be exacerbated. Likewise, exposure of insects to insecticides can subsequently influence their ability to handle stressful temperatures. Here, we investigated the effects of constant temperature and daily heat spikes, in presence/absence of insecticide treatment (cyfluthrin), on the condition (impairment of mobility) and thermal tolerance to cold (-6 degrees C) and heat (42.5 degrees C) of the terrestrial beetle *Alphitobius diaperinus*. The responses of insects from four populations (three farm-collected populations, one laboratory population) to different durations of extreme temperature exposure were compared...

The added value of Bayesian inference for estimating biotransformation rates of organic contaminants in aquatic invertebrates

Authors: Ratier A, Lopes C, Geffard O, Babut M

Source: AQUATIC TOXICOLOGY 234:105811, 2021, DOI: [10.1016/j.aquatox.2021.105811](https://doi.org/10.1016/j.aquatox.2021.105811)

Abstract: Toxicokinetic (TK) models refer to the process of contaminant bioaccumulation as a balance between rate of uptake from different Sources (e.g., water or food), and rate of elimination via different processes such as excretion, growth and/or biotransformation. Biotransformation can considerably modify the fate of chemicals in an organism, especially their bioavailability, residence time, and toxicity. Invertebrate models generally neglect this process as they assume a low metabolic activity. However, some species such as *Gammarus* sp. amphipods are able to metabolize a vast range of organic compounds. Some recent TK models include biotransformation, but they prove limited for estimating related parameters by giving negative values and/or large uncertainties for biotransformation rate(s). Here we propose a generic TK model accounting for biotransformation using a Bayesian framework for simultaneously estimating the parameters. We illustrated the added value of our method by fitting this generic TK model to 22 published datasets of several benthic invertebrate species exposed to different chemicals...

Occurrence and removal of emerging pollutants in urban sewage treatment plants using LC-QToF-MS suspect screening and quantification

Authors: Wiest L, Gosset A, Fildier A., Libert C., Hervé M. et al.

Source: SCIENCE OF THE TOTAL ENVIRONMENT 774: 145779, 2021, DOI: [10.1016/j.scitotenv.2021.145779](https://doi.org/10.1016/j.scitotenv.2021.145779)

Abstract: Urban wastewaters (WW) are a major vector of many emerging pollutants (EPs) to aquatic ecosystems, as urban wastewater treatment plants (WWTPs) are not designed to

abate them. New methods are now critically necessary for a more comprehensive analysis of WW samples and for the assessment of the WWTP efficiency in EP removal. To this end, the present study aims to develop a methodology to identify and quantify EPs, especially pharmaceutical residues and pesticides, in the raw and treated wastewater of 10 heterogeneous WWTPs in a highly urbanized territory in France over three sampling campaigns, through the following steps: (1) development and implementation of a suspect screening of EPs in WW samples, based on a solid phase extraction followed by an LC-QToF-MS analysis; (2) confirmation of their identification by reinjection of WW samples spiked with authentic analytical standards; (3) quantification of previously identified compounds by targeted LC-QToF-MS analysis in raw and treated effluents and assessment of their removal efficiency by WWTPs. Forty-one EPs, including 37 pharmaceutical residues (such as anti-depressive, anti-hypertensive, or antipsychotic drugs) and 4 pesticides, were identified by suspect screening ...

Pollutant Dissipation at the Sediment-Water Interface: A Robust Discrete Continuum Numerical Model and Recirculating Laboratory Experiments

Authors: Drouin G, Fahs M, Droz B, Younes A, Imfeld G, Payraudeau S

Source: WATER RESOURCE: S RESEARCH 57(3):e2020WR028932, 2021, DOI: [10.1029/2020WR028932](https://doi.org/10.1029/2020WR028932)

Abstract: Pollutant exchange in the hyporheic zone is a major process controlling its degradation in river systems. Knowledge of mass transfer processes at the sediment-water interface (SWI) remains scarce. Accurate predictive modeling of flow driving pollutant fluxes at the SWI is currently limited. We examined mass exchange at the SWI by combining laboratory tracer

experiments and the development of a flow reactive transport (FRT) model. NaCl and Foron Blue 291 tracers were used as surrogates of conservative and moderately sorptive organic pollutants, respectively. Tracer experiments in the bench-scale river channel reproduced the influence of overlying water velocities, the Source of the pollutant, and its sorption capacity on pollutant exchange. A methodological framework to calibrate the FRT model against experiments was developed...

A pilot experiment to assess the efficiency of pharmaceutical plant wastewater treatment and the decreasing effluent toxicity to periphytic biofilms

Authors: Tardy V, Bonnineau C, Bouchez A, Miegé C, Masson M, Jeannin P, Pesce S

Source: JOURNAL OF HAZARDOUS MATERIALS 411:125121, 2021, DOI: [10.1016/j.jhazmat.2021.125121](https://doi.org/10.1016/j.jhazmat.2021.125121)

Abstract: Pharmaceutical industry effluents are complex and highly variable in time. Assessing the efficiency of a pharmaceutical industry wastewater treatment plant (WWTP) and the resulting decrease in effluent toxicity and ecological risk is thus not straightforward. We set up an original in situ pilot directly connected to a pharmaceutical WWTP to monitor the chronic toxicity of successive effluents using natural periphytic biofilms. Their structural and functional responses to effluent exposure were assessed by combining (i) a molecular approach to characterize the bacterial and diatom diversity and (ii) functional measurements of photosynthetic and enzyme activities. Effluent contamination by pharmaceuticals strongly decreased after the quaternary treatment (activated carbon). Most of the structural biological characteristics improved with cumulative WWTP treatment (bacterial diversity,

microbial genetic structure, and biological diatom index), showing community recovery along the treatment process...

Antibiotrophy: Key Function for Antibiotic-Resistant Bacteria to Colonize Soils- Case of Sulfamethazine-Degrading Microbacterium sp. C448

Authors: Billet L, Pesce S, Rouard N, Spor A, Paris L, Leremboure M, Mounier A, Besse-Hoggan P, Martin-Laurent F, Devers-Lamrani M

Source: FRONTIERS IN MICROBIOLOGY 12:643087, 2021, DOI: [10.3389/fmicb.2021.643087](https://doi.org/10.3389/fmicb.2021.643087)

Abstract: Chronic and repeated exposure of environmental bacterial communities to anthropogenic antibiotics have recently driven some antibiotic-resistant bacteria to acquire catabolic functions, enabling them to use antibiotics as nutritive Sources (antibiotrophy). Antibiotrophy might confer a selective advantage facilitating the implantation and dispersion of antibiotrophs in contaminated environments. A microcosm experiment was conducted to test this hypothesis in an agroecosystem context. The sulfonamide-degrading and resistant bacterium *Microbacterium* sp. C448 was inoculated in four different soil types with and without added sulfamethazine and/or swine manure. After 1 month of incubation, *Microbacterium* sp. (and its antibiotrophic gene *sadA*) was detected only in the sulfamethazine-treated soils, suggesting a low competitiveness of the strain without antibiotic selection pressure...

The utility of *Dreissena polymorpha* for assessing the viral contamination of rivers

by measuring the accumulation of f-specific rna bacteriophages

Authors: Capizzi-Banas S, Ladeiro MP, Bastien F, Bonnard I, Boudaud N, Gantzer C, Geffard A

Source: WATER 13(7):904, 2021, DOI: [10.3390/w13070904](https://doi.org/10.3390/w13070904)

Abstract: River water that receives treated wastewater can be contaminated by pathogens including enteric viruses due to fecal pollution, which may represent an important public health hazard. There is a great diversity of enteric viruses and fecal bacteriophages, especially F-specific RNA bacteriophages (FRNAPHs), are commonly proposed as indicators of viral pollution due to a variety of characteristics such as their structural similarities to the main enteric viruses, their high concentrations in raw wastewater and their environmental survival rate, which is better than other cultivable enteric viruses. However, evaluating the viral contamination of water on the basis of FRNAPH concentration levels continues to present a challenge. This is because the quality of detection is strongly dependent on the quantity of viral particles, high spatio-temporal variabilities and the physico-chemical conditions of the water during sampling. To overcome these limitations, the present study aims to evaluate whether the bivalve mollusk *Dreissena polymorpha* (zebra mussel) could be considered a suitable experimental model for assessing the viral contamination of rivers...

Fluorescence excitation/emission matrices as a tool to monitor the removal of organic micropollutants from wastewater effluents by adsorption onto activated carbon

Authors: Guillosoy R, Le Roux J, Goffin A, Mailler R, Varrault G, Vulliet E, Morlay C, Nauleau F, Guerin S, Rocher V, Gasperi J

Source: WATER RESEARCH 190:116749, 2021, DOI: [10.1016/j.watres.2020.116749](https://doi.org/10.1016/j.watres.2020.116749)

Abstract: Monitoring the removal of organic micropollutants (OMPs) in advanced wastewater treatment facilities requires expensive and time-consuming analytical methods that cannot be installed online. Spectroscopic techniques such as fluorescence excitation/emission spectroscopy were demonstrated to offer the potential for monitoring OMPs removal in conventional wastewater treatment plants or ozonation pilots but their application to activated carbon (AC) adsorption processes was only investigated at lab scale and not in real treatment facilities. In this study, indexes from fluorescence emission/excitation matrices (EEMs) were used to find correlations with the removal of 28 OMPs from a large-scale AC pilot in fluidized bed employed for wastewater advanced treatment, as well as from batch experiments. Differences in OMPs removal could be observed depending on the operational conditions (i.e. pilot or batch experiments, contact time, type of AC) and the physico-chemical properties of the molecules...

Does copper contamination affect soil CO2 emissions ? A literature review

Authors: Sereni L, Guenet B, Lamy I

Source: FRONTIERS IN ENVIRONMENTAL SCIENCE 9:585677, 2021, DOI: [10.3389/fenvs.2021.585677](https://doi.org/10.3389/fenvs.2021.585677)

Abstract: Contaminated soils are widespread and contamination is known to impact several biotic soil processes. But it is still not clear to what extent soil contamination affects soil carbon efflux (CO₂) occurring through soil microfauna respiration. Regarding the large stocks of organic carbon (C_{org}) stored in soils, even limited changes in the outputs fluxes may modify atmospheric CO₂ concentration with important feedbacks on climate. In this study, we aimed at

assessing and quantifying how soil respiration is affected by contamination. For that, we performed a quantitative review of literature focusing on 1) soil heterotrophic respiration measurements thus excluding autotrophic respiration from plants, 2) soil copper contamination, and 3) the influence of pedo-climatic parameters such as pH, clay content or the type of climate. Using a dataset of 389 data analyzed with RandomForest and linear mixed statistical models, we showed a decrease in soil CO₂ emission with an increase in soil copper contamination...

Graphene-based nanomaterials modulate internal biofilm interactions and microbial diversity

Authors: Evariste L, Brayle P, Mouchet F, Silvestre JM and more...

Source: FRONTIERS IN MICROBIOLOGY 12:623853, 2021, DOI: [10.3389/fmicb.2021.623853](https://doi.org/10.3389/fmicb.2021.623853)

Abstract: Graphene-based nanomaterials (GBMs), such as graphene oxide (GO) and reduced graphene oxide (rGO), possess unique properties triggering high expectations for the development of new technological applications and are forecasted to be produced at industrial-scale. This raises the question of potential adverse outcomes on living organisms and especially toward microorganisms constituting the basis of the trophic chain in ecosystems. However, investigations on GBMs toxicity were performed on various microorganisms using single species that are helpful to determine toxicity mechanisms but fail to predict the consequences of the observed effects at a larger organization scale. Thus, this study focuses on the ecotoxicological assessment of GO and rGO toward a biofilm composed of the diatom *Nitzschia palea* associated to a bacterial consortium. After 48 and 144 h of exposure to these GBMs at 0, 0.1, 1, and 10 mg. L⁻¹, their effects on the diatom physiology, the structure, and the metabolism of bacterial communities were measured through

the use of flow cytometry, 16S amplicon sequencing, and Biolog ecoplates, respectively...

Effects of silver nanoparticles on performance of anaerobic digestion of sewage sludge and associated microbial communities

Authors: Grosser A, Grobelak A, Rorat A, Courtois P, Vandenbulcke F and more...

Source: RENEWABLE ENERGY 171:1014-1025, 2021, DOI: [10.1016/j.renene.2021.02.127](https://doi.org/10.1016/j.renene.2021.02.127)

Abstract: The effects of nanoparticles on performance and stability of anaerobic digestion of sewage sludge were investigated in four reactors. One reactor was fed with only sewage sludge (control reactor) while the remaining ones were fed with sewage sludge with the addition of the following additives: 1) silver nanoparticles (NPs reactor); 2) ionic silver (AgNO₃ reactor); 3) diluent used for nanoparticles (DIS reactor). The results indicated that: 1) the form of silver had significantly affected the methane yield as well as the share of hydrogen sulphide in the biogas, however this was not the case for VS removal; 2) the tested additives did not significantly affect methane content; 3) the addition of nanoparticles had a positive effect on the kinetic parameters of anaerobic digestion; for the aforementioned sample, the maximum rate of methane production was significantly higher in comparison to other trials executed in this experiment...

OUVRAGES /
RAPPORTS / ACTES
DE CONGRES

Pesticides in the Natural Environment

Elsevier 06/21

Editors: Pardeep Singh Suruchi Singh ; Elsevier ; 31st January 2022 ; 320 p.

ISBN: 9780323904896

Pesticides in the Natural Environment: Sources, Health Risks, and Remediation presents direct and indirect impacts of the use of pesticides on the environment, human health, and agriculture. It then goes on to explore sustainable alternatives to pesticide use, policies for regulating use, and remediation techniques. Bridging the gap between regulations and the tangible environmental threat, the book proposes practical solutions while also providing important context on the hazards of pesticides. It highlights as well the influence on climate change, offering a holistic perspective for researchers in environmental science, policymakers, and land managers.

[Accès au document](#)

Reproductive and Developmental Toxicology

Elsevier 06/21

Editor: Ramesh Gupta/Academic Press, 1st January 2022, p. 1200, ISBN: 9780323897730

Reproductive and Developmental Toxicology, Third Edition is a comprehensive and authoritative reSource: providing the latest literature on this complex subject, focusing on the core three components - parent, placenta, and fetus - and the continuous changes that occur in each. Enriched with relevant references describing every aspect of reproductive toxicology, this revised and updated reSource: addresses the totality of the subject, discussing a broad range of topics including nanoparticles and radiation, gases and solvents, smoking, alcohol and drugs of abuse, and metals, among others. With a special focus on placental toxicity, this book is the only

available reference to connect the three key risk stages and is the only reSource: to include reproductive and developmental toxicity in domestic animals, fish, and wildlife. Completely revised and updated to include the most recent developments in the field, Reproductive and Developmental Toxicology, Third Edition is an essential resource for advanced students and researchers in toxicology, as well as biologists, pharmacologists, and teratologists from academia, industry, and regulatory agencies.

[Accès au document](#)

Exploring the benefits of biocontrol for sustainable agriculture

IEEP 24/06/21

Exploring the benefits of biocontrol for sustainable agriculture in creating a sustainable and healthy food system, reducing the pressure on the environment is key. As a non-chemical and targeted input, biocontrol can offer a systemic and balanced solution for sustainable agriculture. This new report explores the benefits of biocontrol and the role it could play in the implementation of the European Green Deal.

[Accès au document](#)

Biopesticides in Organic Farming: Recent Advances



Ed: L.P. Awasthi /CRC Press ; 2021 April 30 ; 404 p. ; ISBN 9780367460174



CRC Press 30/04/21

The book entitled "Biopesticides in Organic Farming : Recent Advances", describes critically reviewed, key aspects of organic farming and provides a unique and timely science-based reSource: for researchers, teachers, extension

workers, students, primary producers and others around the world. This book is intended to be a unique and indispensable resource: that offers a diverse range of valuable information and perspectives on biopesticides in organic agriculture.

[Accès au document](#)

REVUE DE PRESSE / ALTERNATIVES / BIOPESTICIDES

Nicotinamide can 'immunize' plants to protect from fungal disease

EurekAlert! 10/06/21

Fungal diseases in cereal crops cause major economic losses and also threaten human and livestock health, because some fungi produce powerful toxins that might enter the food chain. Farmers use fungicides to control crop diseases, such as wheat head blight. Although agrochemicals are rigorously tested for safety, there can be concerns over chemical residues in food.

Now, researchers at Kanazawa University, in collaboration with colleagues at Ehime University and Nagoya University, have shown that the natural substance nicotinamide (NIM - a vitamin found in food and used as a dietary supplement) can help stimulate plant immune systems. Pre-treatment with NIM can prevent or reduce development of fungal disease in wheat plants. This knowledge could lead to new approaches to tackle crop diseases. The team recently published their work in the International Journal of Molecular Sciences. [...]

[Accès au document](#)

Pollen-sized technology protects bees from deadly insecticides

EurekAlert! 28/05/21

A Cornell University-developed technology provides beekeepers, consumers and farmers with an antidote for deadly pesticides, which kill wild bees and cause beekeepers to lose around a third of their hives every year on average.

An early version of the technology - which detoxified a widely-used group of insecticides called organophosphates - is described in a new study, "Pollen-Inspired Enzymatic Microparticles to Reduce Organophosphate Toxicity in Managed Pollinators," published in Nature Food. The antidote delivery method has now been adapted to effectively protect bees from all insecticides, and has inspired a new company, Beemunity, based in New York state. [...]

[Accès au document](#)

Study points to potential treatment for citrus disease

Phys.org 19/05/21

Brazil is the world leader in sweet orange production, but citrus cultivation in the region faces constant threats concerning the availability of water and the outbreak of diseases. New research published in the Journal of Applied Microbiology indicates that a fatty acid called hexanoic acid may help protect against one such problem: citrus canker, a bacterial infection that causes brownish eruptive lesions on the leaves, stems, and fruit of citrus trees. [...]

[Accès au document](#)

REVUE DE PRESSE / ASSOCIATIONS

Victoire du CRIIGEN : Interdiction du Roundup Pro 360 !

CRIIGEN, le 30/06/2021

[...] la Cour administrative d'appel de Lyon confirme l'annulation de l'autorisation de mise sur le marché du Roundup Pro 360 [...] considérant que le principe de précaution (A. cinq de la Charte de l'environnement) a été doublement méconnu par l'Agence Nationale de Sécurité Sanitaire (ANSES) chargée de délivrer les autorisations de mise sur le marché après avoir évalué la toxicité des produits.

[Communiqué de Presse en version PDF](#)

[Accès au document](#)

Vineyard Pesticides Linked to Parkinson's

Beyond Pesticides, June 30, 2021

Vineyard farmers who spend more money on pesticide use are more likely to develop Parkinson's disease, according to research published by French scientists in the journal [Environmental Research](#). With Parkinson's disease on the rise around the world, and emerging evidence growing for a [Parkinson's pandemic](#), it is critically important to suss out the factors at play. And as [pesticides continue to appear as a driving force](#) for this deadly chronic disease, it is increasingly necessary to pressure regulators to restrict use of these hazardous substances in chemical farming operations. [...]

[Accès au document](#)

Pesticide contamination in waterways raises new alarm

for aquatic life, citing poor regulation

Beyond Pesticides, June 23, 2021

Small streams are prone to excessively high levels of pesticide contamination that even more hazardous than one thought, according to a [pilot study](#) generated by a team of German researchers. The results indicate significant risks for the health of aquatic ecosystems and should be used as evidence for establishing greater protections from toxic pesticide use, researchers say. With many aquatic benchmarks set by the U.S. Environmental Protection Agency lower than those established in Germany and the European Union, and [evidence of widespread pesticide contamination in America's waterways](#), the study could have even greater weight for U.S. regulatory agencies' deficiencies. [...]

[Accès au document](#)

Produits phytos et santé : le lien se précise pour six maladies graves

Terre-Net 30/06/21

Les produits phytosanitaires à nouveau pointés du doigt : il existe une « présomption forte » de lien entre l'exposition professionnelle à ces produits et six maladies graves, dont certains cancers et des troubles du cerveau, selon une vaste expertise française publiée mercredi.

Les six pathologies sont trois types de cancer (prostate, lymphomes non hodgkiniens, myélomes multiples), la maladie de Parkinson, les troubles cognitifs et une maladie respiratoire évolutive, la BPCO, selon l'expertise réalisée par l'Inserm (Institut national de la santé et de la recherche médicale). Pour les quatre premières, la « présomption forte » de lien avec l'exposition professionnelle à certains pesticides avait déjà été mise en évidence lors de la précédente expertise de l'Inserm, en 2013. [...]

[Accès au document](#)

Prosulfocarbe : l'herbicide volatil qui contamine les productions bios

Généralités futures 15/06/21

Plusieurs lots biologiques contaminés par une molécule très volatile, 100 000 euros de perte et aucune indemnisation prévue !

En mai dernier, des producteurs et productrices bio sont victimes d'une contamination de leurs cultures de Sarrasin et de Chia par un pesticide très utilisé en agriculture conventionnelle et dénoncé pour sa volatilité : le prosulfocarbe. 14 agriculteurs bio sont concernés, répartis sur le quart nord-ouest de la France. C'est la coopérative agricole biologique Biocer qui a fait les analyses et a détruit l'ensemble des lots pour protéger le consommateur. Résultat : 100 000 € de pertes pour les agriculteur-rice-s. Aucun système d'indemnisation n'est prévu par l'Etat, aucun recours n'est possible. [...]

[Accès au document](#)

Past use of lead arsenate pesticides continue to contaminate residential areas 70 years later

Beyond Pesticides, June 17, 2021

Lead arsenate pesticides continue to contaminate Central Washington residential areas that were once tree fruit orchards. Although these toxic legacy pesticides have not been in use for almost 70 years, the Washington State Department of Ecology report finds lead and arsenic soil concentrations above the Washington State cleanup levels. It is well-known that traces of legacy (past-use) pesticides, like organochlorines, remain in the environment for decades—possibly centuries, post-final

application. However, these chemicals have profound adverse impacts on human health, with links to cancer, reproductive and endocrine (hormone) disruption, and birth/developmental abnormalities. Current-use pesticides also contaminate the ecosystem via drift, runoff, and leaching. Therefore the impact of both current and past use of pesticides on human, animal, and environmental health, especially in combination, is critical to any safety analysis. [...]

[Accès au document](#)

Ominous first step in EU renewal process of glyphosate: 4 member states suggest no risk for human health

HEAL 15/06/21

Exposure to PFAS (per- and polyfluoroalkyl substances), a class of more than 4,700 widely-used synthetic chemicals, constitutes a global threat to public and environmental health. The International Federation of Gynecology and Obstetrics (FIGO), the Health and Environment Alliance (HEAL) and the University of California in San Francisco (UCSF) have joined forces to call for immediate action against these “forever chemicals”, to protect reproductive health, fertility and human development. [...]

[Accès au document](#)

Propazine Cancelled by EPA - Advocates Urge Agency to Finish the Job by Banning Atrazine and Simazine

Beyond Pesticides, June 15, 2021

The endocrine disrupting herbicide propazine (in the triazine family of frog-deforming endocrine disruptors) is set for cancelation by the U.S.

Environmental Protection Agency (EPA), according to a [Federal Register notice published last week](#). The move would eliminate use of the hazardous herbicide by the end of 2022. While health and environmental advocates are pleased with the agency's move, they say it is critical that all pesticides in the triazine class, including atrazine and simazine, also be eliminated from use. [...]

[Accès au document](#)

Gil Rivière-Wekstein : le débat sur le glyphosate a été détourné

Enviscope 16/06/21

Gil Rivière Wekstein, journaliste, créateur et animateur de la revue et du site *Agriculture et Environnement*, vient de publier la seconde édition de son livre *Glyphosate, l'impossible débat*. Pour lui, le débat scientifique sur ce désherbant a été détourné, notamment par des associations et des cabinets d'avocats aux États-Unis, afin de déclencher des procès en série, débouchant sur d'importantes indemnités et d'importants honoraires. [...]

[Accès au document](#)

Les Suisses disent non à une agriculture sans pesticides à court terme

Campagnes et Environnement 16/06/21

[...] « Pour une Suisse libre de pesticides de synthèse » n'a pas convaincu les Suisses. Un peu plus de 60 % de la population helvétique a rejeté cette initiative populaire, issue de la société civile, le 13 juin 2021. Le texte suggérait une interdiction pure et simple des produits phytosanitaires sur le territoire national sous dix ans, que ce soit pour un usage privé ou commercial, et d'en bannir les importations. [...]

[Accès au document](#)

[Lire aussi Propagande anti-phytos : la tromperie échoue en Suisse](#) (Alerte-environnement)

A study analyzes the risk of karst groundwater contamination to human consumption

EurekAlert! 09/06/21

Led by Professor Andreas Hartmann, from the University of Freiburg (Germany), the researchers analyzed the presence of several pollutants in water from many karst aquifers of Europe, North Africa, and the Middle East, relating fast infiltration processes to an increased concentration of these substances. The findings of this research are published in the scientific journal *Proceedings of the National Academy of Sciences (PNAS)*. [...] The researchers considered the degradable pesticide named glyphosate, a widely used agricultural herbicide, as an example to demonstrate their findings. [...]

[Accès au document](#)

Plan pollinisateur : encore un raté du gouvernement sur le sujet des pesticides et des abeilles

Génération futures 09/06/21

[...] les parties prenantes, dont Génération Futures, ont reçu un message ce 7 juin de la part des ministères de l'Agriculture et de l'Alimentation et de la Transition Ecologique, nous invitant à participer à une réunion de présentation du projet de plan pollinisateur et du projet d'arrêté « abeille » vendredi 11 juin. [...]

Premier constat amer, ce projet de plan est loin d'être ambitieux. En effet ce dernier s'appuie essentiellement sur le recueil de données, sans

chiffage des moyens, recueils certes nécessaires mais loin d'être suffisants. Ce manque d'ambition est d'autant plus dramatique que l'urgence est immense sur ce sujet. De plus, le gros point noir se trouve pour notre association dans la « révision de l'arrêté abeilles de 2003 », censé mieux protéger les pollinisateurs de l'impact des pesticides. [...]

[Accès au document](#)

Scandale : des pesticides autorisés par l'UE en dépit de leur dangerosité et d'évaluations sujettes à caution !

Génération futures 07/06/21

[...] Selon un [nouveau rapport](#), du réseau européen PAN Europe, dont Génération Futures est membre et intitulé « EFSA, science ou idéologie ? », l'Autorité européenne de sécurité des aliments (EFSA) a évalué certains pesticides d'une manière peu rigoureuse, ignorant les obligations réglementaires et les risques de cancer que ces substances et leurs produits de dégradation (métabolites) peuvent causer, le tout en laissant bien trop de place aux industriels. [...]

[Accès au document](#)

Court Blocks Trump-era, Toxic Citrus Pesticide, Defended by Biden EPA

Beyond Pesticides, June 9, 2021

Earlier this week the U.S. Court of Appeals for the District of Columbia blocked the U.S. Environmental Protection Agency (EPA) from approving use of the hazardous insecticide aldicarb on citrus crops in Florida. The decision comes shortly after Nikki Fried, Florida's Agriculture Commissioner, denied a state-level registration for aldicarb, which was cancelled in

the United States over a decade ago due to risks to children and water contamination. Health, conservation, and farmworker advocates that brought the suit are praising the court's decision. [...]

[Accès au document](#)

Biodiversité Le Parlement européen demande des objectifs contraignants pour 2030

Terre-net 09/06/2

Les députés européens ont approuvé [...] une résolution réclamant à l'UE des objectifs contraignants à l'horizon 2030 pour préserver la biodiversité du continent, notamment en protégeant 30 % des zones terrestre et maritimes. [...]

Les eurodéputés exigent une interdiction stricte de l'utilisation des herbicides à base de glyphosate (soupçonnés d'être cancérigènes et nuisibles pour la biodiversité) après décembre 2022. La résolution réclame aussi une révision « rapide » de l'initiative européenne visant à protéger les abeilles et des « objectifs clairs pour arrêter le déclin de la population de pollinisateurs », qui pâtissent notamment des néonicotinoïdes, de puissants insecticides. [...]

[Accès au document](#)

Un mouvement visionnaire pour une alimentation durable : comment transformer nos systèmes alimentaires d'ici 2045

CRIIGEN 27/05/21

Ce rapport dessine deux futurs très différents pour les systèmes alimentaires, les populations et la planète. Sur fond de dépassement des limites

planétaires et des crises emmêlées du climat et de la biodiversité, nous explorons ce que les 25 prochaines années pourraient nous réserver. [...]

[Dossier de présentation \(FR\) Rapport complet \(EN\)](#)

[Accès au document](#)

Exposure to certain pesticides increase the risk of thyroid cancer

Beyond Pesticides, May 27, 2021

Research by the U.S. National Institutes of Health (NIH) finds exposure to lindane and metalaxyl pesticides heightens thyroid cancer risk. Both incidents of non-aggressive thyroid tumors and advanced-stage thyroid cancer are on the rise. However, researchers speculate that environmental pollutants, such as pesticides, may contribute to this increase, especially considering the pervasiveness of pesticide exposure among the general population. [...]

[Accès au document](#)

Coffee Leaf Rust Hits Hawaii - EPA Approves Emergency Fungicide While Hyperparasite Biocontrol Shows Promise

Beyond Pesticides, May 26, 2021

Coffee leaf rust, caused by a fungus that can devastate fields of coffee plants, and the coffee industry of entire countries, was recently detected on the Hawaiian Islands for the first time. The U.S. Environmental Protection Agency (EPA) acted quickly to approve the emergency use of a synthetic fungicide, but new research conducted in the fungus' home range shows the promise of a hyperparasite biocontrol. [...]

[Accès au document](#)

More evidence documents glyphosate's link to adverse birth outcomes

Beyond Pesticides, May 25, 2021

High levels of glyphosate in urine later in a pregnancy is significantly associated with preterm birth, according to [recent research conducted by scientists at the University of Michigan](#). While awareness of the strong connection between glyphosate and certain cancers is growing among the public, the chemical's link to adverse pregnancy outcomes is beginning to receive more attention. "Since most people are exposed to some level of glyphosate and may not even know it, if our results reflect true associations, then the public health implications could be enormous," said senior author John Meeker, ScD, professor at the University of Michigan School of Public Health. [...]

[Accès au document](#)

New commercial pesticide toxicity analysis highlights need to shift to organic products

Beyond Pesticides, May 20, 2021

Beyond Pesticides and Friends of the Earth (FOE) collaborated to analyze herbicide products at two of the most popular home and garden retailers, Home Depot and Lowe's. This new Commercial Herbicide Analysis highlights the adverse health and environmental effects of widely available toxic pesticides while encouraging retailers to expand on—and consumers to use—safer, least/non-toxic pesticide products. [...]

[Accès au document](#)

Manche : jusqu'à 100 000 euros requis contre l'usage de produits phytos interdits

Terre-Net 25/05/21

Jusqu'à 100 000 euros d'amende a été requis vendredi en correctionnelle à Coutances (Manche) contre des producteurs de carottes qui ont utilisé 100 tonnes de pesticides interdits importés d'Espagne.

[...]. Le magistrat [le procureur de la République de Coutances] a demandé des peines allant de 8 000 à 100 000 euros contre 10 maraîchers accusés de détention et/ou utilisation de dichloropropène, un produit classé cancérigène probable utilisé pendant des décennies par les producteurs de carottes de Créances (Manche) et des environs, avant qu'il ne soit interdit en France en 2018. [...]

[Accès au document](#)

Le crédit d'impôt glyphosate de 2 500 € est opérationnel

La Commission européenne vient d'accepter le crédit d'impôt glyphosate de 2 500 euros, inscrit dans la loi de finances pour 2021 pour les agriculteurs français. [...]

[Accès au document](#)

Conventional Meats Contaminated with Multi-Drug Resistant Bacteria, at Significantly Higher Rates than Organic Meats

Beyond Pesticides, May 18, 2021

Organic meat is far less likely to be adulterated with multi-drug resistant bacteria (MDRB) than conventional meat, according a study published earlier this month in [Environmental Health Perspectives](#). The research by experts at John

Hopkins Bloomberg School of Public Health is the latest news on the health and safety benefits of choosing organic, which prohibits the regular use of risky antibiotics, for one's food purchases. Scientists indicate that contaminated foods pose serious dangers for consumers, public health, and the economy writ large. "The presence of pathogenic bacteria is worrisome in and of itself, considering the possible increased risk of contracting foodborne illness," senior author Meghan Davis, PhD, associate professor at the Bloomberg School said. "If infections turn out to be multidrug resistant, they can be more deadly and more costly to treat." [...]

[Accès au document](#)

Ecological mystery unravels, with toxic pesticide use at the center

Beyond Pesticides, May 12, 2021

[...] Throughout the southeastern United States, bald eagles and other top-level avian predators were experiencing mass deaths from a disease known as vacuolar myelinopathy (VM), a neurological ailment that causes lesions in affected animal's brains. Scientists identified the Source of the exposure as a cyanobacteria growing on an invasive weed, but up until now, did not know how the bacterium caused disease. Now, scientists have determined that the chemical bromine, likely introduced by brominated herbicides in attempts to manage the invasive species, is the trigger for the production of the cyanobacteria's neurotoxin. [...]

[Accès au document](#)

Hormone disrupting chemicals may also harm

children's brains - scientists call for action

ChemTrust 12/05/21

[...] Some phthalates were banned years ago in certain uses because prenatal exposure to them has long been known to harm reproductive development of male offspring, due to their endocrine disrupting properties. Other harmful effects have also been reported, e.g. [a new scientific paper](#) reports a link between some ubiquitous chemicals, including phthalates, and risk of breast cancer.

US scientists have also recently raised the alarm that phthalates can impair children's brain development, and immediate action on this group of chemicals is needed. [...]

[Accès au document](#)

EU zero pollution action plan lacks action, NGOs say

EEB 12/05/21

[...] Today, the European Commission published its much-awaited [Zero Pollution Action Plan](#) - one of the last missing pieces of the European Green Deal.

The aim of the plan is to prevent, minimise and remediate the pollution of air, water and soil across Europe, strengthening the EU's commitment to protect people's health and the environment.

However, the proposal falls short on ramping up action to prevent pollution at Source and instead mainly lists existing legal obligations and ongoing reviews of EU laws. [...]

[Accès au document](#)

EPA to review Roundup weedkiller to assess potential 'ecological risks'

SFchronicle 20/05/21

Biden administration environmental officials say they will consider restrictions on the world's most widely used herbicide because of concerns about potential harm to monarch butterflies and other species.

But the Environmental Protection Agency told a federal appeals court Tuesday it has not identified any risks to humans from the main ingredient in the weedkiller Roundup, whose manufacturer, Monsanto, has been hit with multimillion-dollar jury verdicts in suits by cancer victims. The EPA is not proposing to limit the use of Roundup or add label warnings, at least until after it reviews the chemical's environmental effects. [...]

[Accès au document](#)

Pourquoi les scientifiques cherchent-ils à s'affranchir du terme « métaux lourds » ?

The Conversation 19/05/21

[...] Le plomb fait partie des métaux dits « lourds » et l'empoisonnement au plomb existe bel et bien. Également connu sous le nom de saturnisme, il se produit le plus souvent par ingestion du métal, plus particulièrement par ingestion orale de poussière et d'éclats de peinture contenant du plomb. Ce type d'empoisonnement est bien connu et particulièrement dramatique pour les petits enfants, mais au-delà de l'ingestion par voie orale, les mesures de contamination au plomb sont encore difficiles à interpréter. [...]

[Accès au document](#)

Pesticides are becoming increasingly toxic for the world's most important insects

EHN 18/05/21

Over the last 25 years, the toxicity of 381 pesticides in the U.S. more than doubled for pollinators and aquatic invertebrates such as crustaceans, mayflies, and dragonflies, according to a new study.

For vertebrate groups like birds, fish, and mammals, toxicity dropped. But as pesticides harmful to vertebrates were phased out, this made way for greater use of the insecticide classes, neonicotinoids and pyrethroids.

"Both of these are less toxic to vertebrates, but more toxic for invertebrates," Ralf Schulz, a professor of ecosystem resilience at University of Koblenz and Landau in Germany, and lead author of the study, told EHN. [...]

[Accès au document](#)

Glyphosate doesn't just kill plants. It harms beetles, too

Popular science 13/05/21

Across the world, insects are in decline. Ubiquitous species, like the rust-patched bumblebee and monarch butterfly, are now rarities, and studies in Europe have found catastrophic crashes in the total number of flying bugs.

There are overlapping causes of the decline, from habitat loss to electric light. Agricultural chemicals are almost certainly key, like the neonicotinoid pesticides involved in the catastrophic collapse of monarch populations. But it's not just pesticides: [new research](#) implicates glyphosate, one of the world's most common herbicides, as part of the problem, though in an unexpected way. [...]

[Accès au document](#)

Néonicotinoïdes : le Conseil d'Etat confirme leur utilisation temporaire pour les betteraves sucrières

HSE 12/05/21

Le Conseil d'Etat a confirmé (décision du 15 mars 2021) la régularité de l'[arrêté ministériel du 5 février 2021](#), pris en application de la [loi du 14 décembre 2020](#) qui autorise l'utilisation de [néonicotinoïdes](#) pour les betteraves sucrières. Malgré des demandes de suspension d'associations environnementales et de représentants des agriculteurs, le juge des référés du Conseil d'Etat a déclaré que l'utilisation de ces substances en principe interdite, a été prévue et autorisée temporairement - loi du 14 décembre 2020 validée par le Conseil constitutionnel. Plus précisément, il s'agit d'une disposition temporaire puisqu'elle ne sera applicable que jusqu'en 2023 au plus tard, le temps de trouver des alternatives plus satisfaisantes. [...]

[Accès au document](#)

29 ONG interpellent l'Anses sur des pesticides en vente libre

Environnement-magazine 12/05/21

Une coalition de 29 associations (Secrets toxiques) demande le retrait de produits en vente libre. [...] Arsenic, plomb, hydrocarbures cancérigènes... Des produits toxiques non indiqués sur les étiquettes seraient présents dans 14 pesticides, parmi lesquels 10 sont commercialisés en France, indique l'étude [Toxic compounds in herbicides without glyphosate](#), réalisée par les chercheurs Gilles-Eric Séralini et Gerald Jungers. [...]

[Accès au document](#)

Générations Futures réagit à la publication ce jour du PNSE 4

Générations futures 07/05/21

[...] L'essentiel de ce PNSE [4 ° plan National Santé Environnement] repose donc sur l'information du public - [...]. Le [...] projet d'application mobile Scan4Chem [...] application [...] permet de scanner le code barre des articles de consommation [...] pour savoir s'ils contiennent des substances extrêmement préoccupantes, appelées SVHC (Substances of Very High Concern) [1]. Ce projet s'inscrit dans le cadre de la mise en application de l'article 33 du règlement européen sur les produits chimiques Reach, qui impose une obligation de communication sur les SVHC. [...]

Un point positif cependant dans ce PNSE 4 : une base de données « Green Data for Health » censée faciliter l'accès aux données environnementales afin de mieux caractériser l'exposition des populations aux facteurs de risques environnementaux (exposome). [...]

[Accès au document](#)

Victoire juridique dans le dossier des néonicotinoïdes

Générations futures, 6 mai 2021

La Cour de justice de l'UE soutient la décision de l'UE de restreindre les néonicotinoïdes [sur les cultures attractives pour les abeilles] en 2013 [2023], sur la base du principe de précaution[...]

[Accès au document](#)

L'UFC-Que Choisir opte pour la schizophrénie

Agriculture et environnement 03/05/21

Le 21 juin 2020, l'association UFC-Que Choisir mettait [...] en garde ses lecteurs contre les

« fausses alertes » [alarmistes]. [...] « Régulièrement, l'association Générations Futures sort un dossier sur la pollution par les pesticides (...) À chaque fois, le propos est très alarmiste, [...] notait alors la journaliste Élisabeth Chesnais, qui s'étonnait « de voir la plupart des médias reprendre quasiment mot pour mot le communiqué de presse de Générations Futures, sans aucun recul et sans trop de vérification ». [...] Moins d'un an après, l'UFC-Que Choisir réalise une étude sur la présence de pesticides dans l'eau en collaboration avec Générations Futures ! L'occasion de dénoncer « une eau polluée » et de demander, « au nom du principe de précaution », l'interdiction de certains produits « soupçonnés d'être des perturbateurs endocriniens ». Mais aussi l'occasion de lancer une pétition « pour une eau du robinet garantie sans pesticides ». Bref, l'association tient exactement aujourd'hui le type de discours anxiogène qu'elle fustigeait l'an dernier. [...]

[Accès au document](#)

Breakdown products (metabolites) from pesticides may be more toxic than parent compound, study finds

Beyond Pesticides, May 6, 2021

Nearly half of all breakdown products (transformation products) from four common-use environmental pesticides produce stronger endocrine (hormone) disrupting (ED) effects than the parent compound, according to new research published in [Environment International](#). Over [300 environmental contaminants](#) and their byproducts—from chemicals in plastics to cosmetic/personal care products—are commonly present in water bodies, food commodities, and human blood/urine samples. These toxicants can alter hormone metabolism, producing endocrine-disrupting effects that put the health of animals, humans, and the environment at risk. [...]

[Accès au document](#)

Federal Court Gives EPA 60-Day Deadline to Decide the Fate of Chlorpyrifos

Beyond Pesticides, May 4, 2021

The U.S. Environmental Protection Agency (EPA) has less than two months to determine whether cancel or modify its registration of the brain-damaging, organophosphate insecticide chlorpyrifos, following a decision from a federal appeals court last week. The ruling comes after more than a decade of delay from the federal agency tasked with protecting public health and the environment from the hazards of chemicals like chlorpyrifos. The decision now falls to the Biden Administration's EPA Administrator Michael Regan, after the previous administration reversed a proposal to ban agricultural uses of chlorpyrifos in 2017. Most residential uses of the chemical were banned in 2000. [...]

[Accès au document](#)

Research shows adverse impacts of glyphosate on the human gut microbiome

Beyond Pesticides, April 30, 2021

[A bioinformatics tool developed by researchers from the University of Turku in Finland](#) indicates that "54% of species in the core human gut microbiome are sensitive to glyphosate." This tool may help predict which microbes in the human gut could be negatively affected by exposure to the ubiquitous herbicide. Because damage to the gut biome is linked to a variety of diseases, this information could prove critical in recognition of the role(s) glyphosate may play in the development of human diseases. [...]

[Accès au document](#)

Plastics and toxic chemicals are killing fish – and poisoning us

National Observer 29/04/21

The [study](#), which was not peer-reviewed, was published by the International Pollutants Elimination Network (IPEN), a global coalition of environmental organizations. It reviewed academic research conducted worldwide on the impacts of plastic and toxic chemicals, and is the first systematic review of these dispersed studies designed to paint a global picture of the problem.

The findings were dire: Pollution is compromising the world's oceans, fisheries and coastal communities while exacerbating the impacts of climate change and overfishing. [...]

[Accès au document](#)

REVUE DE PRESSE / RECHERCHE ET MEDIAS

Deuxième stratégie nationale sur les perturbateurs endocriniens : quel bilan à mi-parcours ?

Ministère Ecologie 30/06/21

Adoptée en 2019, la deuxième stratégie nationale sur les perturbateurs endocriniens (SNPE 2) est une composante du quatrième plan national santé environnement (PNSE 4), copilotée par le ministère de la Transition écologique et le ministère des Solidarités et de la Santé. Elle a un objectif principal : réduire l'exposition des populations et de l'environnement aux perturbateurs endocriniens, en renforçant la réglementation, la formation et l'information et

en améliorant la connaissance sur ces substances. [...]

[Accès au document](#)

Antibiotic-resistant bacteria found in cattle

EurekaAlert! 30/06/21

Growing resistance to our go-to antibiotics is one of the biggest threats the world faces. As common bacteria like strep and salmonella become resistant to medications, what used to be easily treatable infections can now pose difficult medical challenges.

New research from the University of Georgia shows that there may be more antimicrobial-resistant salmonella in our food animals than scientists previously thought. [...]

[Accès au document](#)

Arrêté abeilles : le texte « préservant les pollinisateurs et les conditions de travail » des agriculteurs soumis à consultation publique

Réussir 28/06/21

Le projet d'arrêté abeilles entre en phase de consultation publique. Il élargit à l'ensemble des produits phytosanitaires les restrictions d'usage pendant la floraison jusqu'ici réservées aux insecticides, avec toutefois des dérogations.

La nouvelle version de l'arrêté abeilles, fixant les conditions d'application de produits phytosanitaires sur une culture attractive pour les pollinisateurs pendant la période de floraison, vient enfin d'être soumise à consultation publique. Chacun pourra envoyer ses commentaires sur le site du ministère de la

Transition écologique pendant trois semaines, jusqu'au 20 juillet. [...]

[Accès au document](#)

Publication de l'expertise collective Inserm - « Pesticides et effets sur la santé : nouvelles données »

INSERM 30/06/21

En 2013, à la demande de la DGS, l'Inserm [avait publié une expertise collective](#) « Pesticides : effets sur la santé ». En 2018, cinq directions générales ministérielles ont saisi l'Institut afin qu'il réactualise cette expertise et y inclue de nouvelles thématiques.

Le groupe d'experts réuni par l'Inserm a analysé la littérature scientifique récente afin d'examiner le lien entre une vingtaine de pathologies et les pesticides. Il analyse aussi les effets sanitaires de deux substances actives et d'une famille de pesticides : le chlordécone, le glyphosate et les fongicides inhibiteurs de la succinate déshydrogénase (SDHi).

L'[expertise collective de 2021](#) dresse un bilan des connaissances sur les liens entre exposition aux pesticides et santé humaine au travers d'une analyse critique de la littérature scientifique internationale. [...]

[Accès au document](#)

Les 27 ouvrent la voie à de nouveaux efforts de protection

Agri-mutuel 29/06/21

Les ministres européens de l'agriculture se sont accordés lundi sur la manière de prendre en compte, dans l'évaluation des produits phytosanitaires, leurs effets sur les colonies d'abeilles, ouvrant la voie à de nouvelles mesures

contre le déclin de ces insectes cruciaux pour la pollinisation.

[...] les critères pour évaluer l'impact [des produits phytosanitaires] sur les abeilles n'avaient pas évolué depuis 2002, [...]. Saisie en mars 2019 par l'exécutif européen, l'Autorité européenne de sécurité des aliments (Efsa) a élaboré plusieurs scénarios permettant de fixer des « objectifs spécifiques » de protection des abeilles mellifères dans l'évaluation des produits phytosanitaires. [...]

[Accès au document](#)

Étude : L'agroécologie pas incompatible avec la souveraineté alimentaire

Terre-Net 21/06/21

La généralisation en Europe des pratiques agroécologiques, permettant de réduire voire de supprimer l'usage de produits phytosanitaires et d'engrais de synthèse permettrait de préserver la biodiversité, tout en améliorant la souveraineté alimentaire du continent, selon une étude du CNRS publiée vendredi.

Afin d'améliorer la cohabitation entre agriculture et environnement, le scénario envisagé repose sur trois leviers : un changement de régime alimentaire, avec une consommation moindre de produits animaux, l'application des principes de l'agroécologie, avec la généralisation de rotations de cultures longues et diversifiées et enfin, le rapprochement entre culture et élevage. [...]

[Accès au document](#)

Seabird eggs contaminated with cocktail of plastic additives

PHYS 17/06/21

Chemical additives used in plastic production have been found in herring gull eggs, new research shows.

Phthalates are a group of chemicals added to plastics to keep them flexible.

The study, by the universities of Exeter and Queensland, looked for evidence of phthalates in newly laid herringgull eggs—and found up to six types of phthalate per egg.

Phthalates function as pro-oxidants—potentially causing "oxidative stress" that can damage cells.[...]

[Accès au document](#)

Public concern on human health impact of plastic pollution

PHYS 17/06/21

The impact of marine plastic pollution on human health tops a list of health-related concerns over marine threats in a large scale survey which could help shape policy over how best to protect our oceans.

Researchers at the University of Exeter led a survey of more than 15,000 people across 14 European countries, plus Australia, as part of the interdisciplinary European collaboration called the Seas, Oceans and Public Health in Europe (SOPHIE) Project, funded by Horizons 2020. [...]

[Accès au document](#)

Several persistent chemicals were found in fetal organs

EurekAlert! 16/06/21

Researchers at Karolinska Institutet in Sweden found industrial chemicals in the organs of fetuses conceived decades after many countries had banned the substances. In a study published in the journal Chemosphere, the researchers urge decision makers to consider the combined impact

of the mix of chemicals that accumulate in people and nature.

"These are important findings that call for regulators to consider the collective impact of exposure to multiple chemicals rather than evaluating just one chemical at a time," says first author Richelle Duque Björvang, PhD student at the Department of Clinical Science, Intervention and Technology at Karolinska Institutet. [...]

[Accès au document](#)

Pollinisateurs : l'arrêté abeilles nouvelle version inquiète les apiculteurs

Réussir 18/06/21

La version de l'arrêté abeilles envoyée début juin aux professionnels agricoles et apicoles est jugée insuffisamment protectrice par certaines organisations d'apiculteurs et d'environnementalistes.

Le projet de révision de l'arrêté abeilles de décembre 2003 a été soumis aux professionnels participant à la concertation sur ce texte. « *L'application sur une culture attractive en floraison ou sur une zone de butinage d'un produit autorisé est réalisée entre les deux heures qui précèdent le coucher du soleil et les trois heures qui le suivent* », précise le texte. Les produits concernés sont les fongicides, herbicides et certains insecticides et acaricides comportant une mention autorisant ce type d'usage. [...]

[Accès au document](#)

Le glyphosate n'est pas jugé cancérigène par les régulateurs

Cultivar 16/06/21

Suite à la restitution des travaux préliminaires d'évaluation réalisés par les régulateurs de quatre États membres (France, Hongrie, Pays-Bas

et Suède), l'Autorité européenne de la sécurité des aliments (Efsa) et l'Agence européenne des produits chimiques (ECHA) ont indiqué qu'ils allaient lancer les consultations dans le cadre de **l'évaluation pour le renouvellement de l'utilisation du glyphosate en Europe**. D'après les régulateurs, **"le glyphosate répond aux critères d'approbation"** pour le renouvellement de l'autorisation ; il n'y a **aucune justification à la classification du glyphosate comme cancérigène**, toxique pour la reproduction, toxique pour des organes spécifiques, mutagène ou perturbant la fonctionnalité endocrinienne. [...]

[Accès au document](#)

L'État lance une consultation publique sur la réglementation relative aux pulvérisateurs de pesticides

Actu-environnement 03/06/21

Le ministère de l'Agriculture et de l'Alimentation soumet à consultation publique un nouveau décret qui devrait durcir la réglementation sur les pulvérisateurs de produits phytopharmaceutiques. Le débat, lancé ce 2 juin, se terminera le 23 juin prochain. L'objectif est de coller à la directive cadre européenne 2009/128/CE qui se traduit en France par le plan Écophyto II+, notamment en matière de pesticides. [...]

Source sur abonnement

[Accès au document](#)

Les apiculteurs et les arboriculteurs dénoncent la révision de l'arrêté « abeilles »

Actu-environnement 14/06/21

L'État a présenté son projet de plan en faveur des pollinisateurs. Il prévoit un nouvel arrêté devant encadrer l'utilisation des pesticides en période de floraison. Un texte décrié par les apiculteurs et les arboriculteurs. Le 11 juin, les ministères de l'Agriculture et de la Transition écologique ont dévoilé aux parties prenantes (apiculteurs, syndicats agricoles, associations, etc.) le projet de plan national en faveur des insectes pollinisateurs, couvrant la période 2021-2026. [...]

Accès au texte intégral sur demande (Abonnement)

[Accès au document](#)

Research establishes safe water thresholds for antimicrobials, to help mitigate resistance

EurekAlert! 10/06/21

Researchers have made progress towards a G7 commitment to establish safe standards for the release of antimicrobials into the environment, by developing a new framework that establishes safe thresholds. [...]

A major issue is the spread of antimicrobials and resistant bacteria through water systems. When we take antibiotics, 70 per cent passes through our bodies into wastewater. Farm animals are treated with antibiotics which can also end up in aquatic systems through run-off and flooding. University of Exeter research has previously shown that even when antimicrobials are present in these waters [at low levels, they can contribute to the evolution of resistant bacteria](#). These bacteria can make their way into our guts, [potentially causing health problems](#). [...]

Now, in a paper published in *Water Research*, the Exeter team worked with global pharmaceutical company AstraZeneca to make a significant step towards meeting this need. After reviewing the available evidence in the field, they have developed a framework which effectively

provides guidance on how to perform a risk assessment to ensure the levels of antimicrobials released into the environment are safe. Currently there are no thresholds for safe levels of antimicrobials in wastewater and aquatic systems, although the EU and UK government are monitoring the emerging evidence. [...]

[Accès au document](#)

MISP : un outil de calcul d'impact sur les eaux souterraines

BRGM 04/06/21

MISP a été développé pour traiter le cas où une Source de pollution est située au-dessus de la nappe phréatique. Ce cas est pertinent pour un certain nombre de situations, par exemple pour le cas de l'enfouissement des déchets en surface, ou celui de sols superficiels pollués. [...] La principale caractéristique de MISP par rapport à des outils existants analogues, réside dans le fait que ce modèle ne fait pas appel à l'hypothèse d'une "couche de mélange" pour calculer la concentration en polluant dans l'eau souterraine à l'aplomb de la Source de pollution. [...]

[Accès au document](#)

Research: Journey of PFAS in wastewater facilities highlights regulation challenges

Phys.org 26/05/21

Researchers at the University of New Hampshire have conducted two of the first studies in New England to collectively show that toxic man-made chemicals called PFAS (per- and polyfluoroalkyl substances), found in everything from rugs to product packaging, end up in the environment differently after being processed through wastewater treatment facilities—making it more

challenging to set acceptable screening levels.
[...]

[Accès au document](#)

Effects of nanoplastics on Canadian and Guadeloupean oysters

Phys/org 27/05/21

Oysters' exposure to plastics is concerning, particularly because these materials can accumulate and release metals which are then absorbed by the mollusks. According to a recent study published in the journal *Chemosphere*, the combined presence of nanoplastics and arsenic affects the biological functions of oysters. This study was conducted by the Institut national de la recherche scientifique (INRS) in Québec City and the French National Centre for Scientific Research (CNRS) at the University of Bordeaux in France.
[...]

[Accès au document](#)

Produits phytosanitaires Projet de stockage près de Rouen : l'interdiction confirmée en appel

Terre-Net 28/05/21

La cour administrative d'appel de Douai (Nord) a confirmé l'annulation d'un arrêté préfectoral autorisant une plateforme de stockage de 4 150 tonnes de produits phytopharmaceutiques classée Seveso seuil haut à 26 km de Rouen [...].

« Un incendie déclenché sur le site de l'installation en cause », à Vieux Manoir, à 26 km au nord-est de Rouen, « est susceptible de causer des dommages graves ou irréparables aux personnes et aux biens », écrivent les juges de Douai. [...]

[Accès au document](#)

Honeybees are accumulating airborne microplastics on their bodies

National Geographic 25/05/21

[...] Bees are covered with hairs that have evolved to hold tiny particles that the bee collects intentionally or simply encounters in its daily travels. These hairs become electrostatically charged in flight, which helps attract the particles. Pollen is the most obvious substance that gets caught up in these hairs, but so do plant debris, wax, and even bits of other bees.

Now, another material has been added to that list: plastics. Specifically, 13 different synthetic polymers, according to a study of honeybees and microplastics in Denmark. The study was published earlier this year in [Science of the Total Environment](#). [...]

Certain pesticides can be absorbed by plastic debris, Negri said, and could have “devastating effects” on the health of bees and other wildlife and insects if ingested.

[Accès au document](#)

Breast cancer risk in association with atmospheric pollution exposure: a meta-analysis of effect estimates followed by a health impact assessment

EHP 26/05/21

Background: The epidemiological literature of associations between atmospheric pollutant exposure and breast cancer incidence has recently strongly evolved. Objectives: We aimed to perform *a*) a meta-analysis of studies considering this relationship, correcting for publication bias and taking menopausal status and cancer hormone responsiveness into account; and *b*) for the pollutants most likely to affect breast cancer, an

assessment of the corresponding number of attributable cases in France and of the related economic costs.

Conclusion: These findings suggest that decreasing long-term NO₂ exposure or correlated air pollutant exposures could lower breast cancer risk.

<https://doi.org/10.1289/EHP8419>

[Accès au document](#)

Pollution aux pesticides dans le port de Rouen : la caractérisation des impacts environnementaux à affiner

Actu-Environnement 26/05/21

Le port de plaisance de Rouen (bassin Saint Gervais) a été exposé à une pollution aux pesticides samedi 22 mai : un récipient percé d'une entreprise de transport situé à Canteleu, à proximité du port, est à l'origine de cette fuite, selon la préfecture de Rouen. « *Les fortes précipitations de l'après-midi ont emporté une partie du liquide échappé jusqu'à la Seine* », précise-t-elle. [...]

Source sur abonnement, n'hésitez pas à nous demander sa consultation.

[Accès au document](#)

Les arbitrages de la France pour la future PAC suscitent de vives crispations

Le Monde 21/05/21

Le ministre de l'agriculture, [...] a présenté, [...] les grandes orientations françaises de la future politique agricole commune. Les « écorégimes » cristallisent notamment tous les mécontentements. [...]

Principale nouveauté introduite dans cette nouvelle version de la PAC, qui entrera en vigueur

à partir de 2023 : la plus grande latitude donnée à chaque Etat membre dans la manière de redistribuer les aides européennes, à travers l'élaboration de « plans stratégiques nationaux », véritables déclinaisons locales de la PAC. Mais après plusieurs mois de négociations sur ces arbitrages nationaux, la Confédération paysanne, la Fédération nationale de l'agriculture biologique (FNAB), la plate-forme Pour une autre PAC, ainsi que les organisations WWF, Greenpeace et France Nature Environnement (FNE) ont quitté avec fracas le CSO, dénonçant un « *simulacre de négociation* » et « *un statu quo* » qui renforce un modèle agricole « *à bout de souffle* ». [...]

[Accès au document](#)

Study reveals high levels of contaminants in killer whales

EurekAlert! 19/05/21

Little is known concerning environmental contaminants in predators at the top of a food chain. A study published in [Environmental Toxicology and Chemistry](#) has demonstrated that new types of brominated flame retardants accumulate in the tissues of killer whales near Norway and are also passed on to nursing offspring.

Investigators also detected man-made chemicals called perfluoroalkyl substances (PFAS) in the tissues of adult killer whales. Thresholds for health effects of PFAS in marine mammals are not established, but the chemical has been linked to reproductive and endocrine effects in wildlife. [...]

[Accès au document](#)

In California's farm country, climate change is likely to

trigger more pesticide use, fouling waterways

Inside Climate News 11/05/21

[...] Many insect species survive the winter as eggs or larvae and then emerge in early spring as the first generation to feed and breed on millions of acres of California vineyards, orchards and row crops. Climate change will complicate farmers' efforts to control these pests in complex and unpredictable ways.

The most alarming consequence is apt to be ramping up pesticide applications, with broad implications for the safety of California's waterways—just as the state gears up for a future filled with drought. [...]

[Accès au document](#)

Vital soil organisms being harmed by pesticides, study shows

The Guardian 06/05/21

Info également diffusée par PANNA et Beyondpesticides.

Pesticides are causing widespread damage to the tiny creatures that keep soils healthy and underpin all life on land, according to the first comprehensive review of the issue.

The researchers found the measured impacts of farm chemicals on earthworms, beetles, springtails and other organisms were overwhelmingly negative. Other scientists said the findings were alarming, given the importance of these “unsung heroes”. [...]

Nathan Donley, at the Center for Biological Diversity in the US and an author of the new review, said: “The level of harm we’re seeing is much greater than I thought it would be. Soils are incredibly important. But how pesticides can harm soil invertebrates gets a lot less coverage than pollinators, mammals and birds - it’s incredibly important that changes.” [...]

[Accès au document](#)

Interdiction des néonicotinoïdes : la justice de l'UE rejette un pourvoi de Bayer

Terre-net 07/05/21

La Cour de justice de l'UE a rejeté un pourvoi du géant de la chimie Bayer, qui réclamait l'annulation d'un arrêt de 2018 confirmant la quasi-interdiction de trois néonicotinoïdes, insecticides jugés très nocifs pour les abeilles, une décision saluée vendredi par ONG et apiculteurs.

L'UE avait imposé dès 2013 des restrictions drastiques sur l'usage de ces trois néonicotinoïdes, le bannissant des cultures qui attirent les abeilles (maïs, colza oléagineux, tournesol) avec quelques rares exceptions. Une mesure vivement contestée par deux géants des pesticides, le suisse Syngenta et l'allemand Bayer, mais le tribunal de l'Union européenne avait confirmé en mai 2018 les restrictions imposées. [...]

[Accès au document](#)