Rapport de veille n°111

Risques biologiques
Novembre-Décembre 2020

Objectifs : veilles spécifiques sur la thématique du risque biologique : biotechnologies (nouveaux procédés), équipements de protection individuelle (fièvre hémorragique, Ebola), protection respiratoire (ajustement), zoonoses (pathologies émergentes), légionellose (cas professionnels), endotoxines (effets toxiques/multi-expositions).

+ suivi d'organismes français et internationaux (sélection d'actualités classées par thème).

Note : la pandémie de Covid-19 est traitée séparément (voir Bulletins de veille/Veille risque biologique/Veille Covid-19).

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.

Sommaire :

- **Protection respiratoire : ajustement**

Forouzandeh P, O'Dowd K, Pillai SC.

Face masks and respirators in the fight against the COVID-19 pandemic: An overview of the standards and testing methods.

Safety Science. 2021;133:11.

https://doi.org/10.1016/j.ssci.2020.104995

The COVID-19 outbreak has resulted in a shortage of personal protective equipment (PPE) throughout the world. This shortage has resulted in an increase in production of PPE to meet the demand, and as a result, several substandard equipment has entered the market. With face masks and respirators now beginning to see widespread use throughout the world, the standards and test with which they are required to undertake have become points of interest. The filtration efficiency of the masks is a key testing element that examines its ability to filter particles, bacteria and viruses; this examines the penetration efficiency percentage of each with lower results being preferable. Masks are also subjected to NaCl testing method, which allows a range of particle sizes to be examined and their penetration to be observed. The masks must also show considerable resistance to fluids and flames, to prevent the penetration of liquids and to be non-flammable. Various PPE testing protocols such as biological, chemical, fluid and flame resistances, protective ensemble, facepiece fit testing, NIOSH NaCl method and impact protection have been discussed. In addition, various tests involving bacterial and viral filtration efficiencies are also discussed. Differential pressure is examined to ascertain the comfort, airflow and breathability of the masks, whilst fit testing is examined to ensure a correct fit of the mask.

Sheets D, Shaw J, Baldwin M, Daggett D, Elali I, Curry EB, et al.

An apparatus for rapid and nondestructive comparison of masks and respirators.

Rev Sci Instrum. 2020;91(11):11.

https://aip.scitation.org/doi/10.1063/5.0015983

The SARS-CoV-2 global pandemic has produced widespread shortages of certified air-filtering personal protection equipment and an acute need for rapid evaluation of breathability and filtration efficiency of proposed alternative solutions. Here, we describe experimental efforts to nondestructively quantify three vital characteristics of mask approaches: breathability, material filtration effectiveness, and sensitivity to fit. We focus on protection against aqueous aerosols >0.3 mu m using off-the-shelf particle, flow, and pressure sensors, permitting rapid comparative evaluation of these three properties. We present and discuss both the pressure drop and the particle penetration as a function of flow to permit comparison of relative protection for a set of proposed filter and mask designs. The design considerations of the testing apparatus can be reproduced by university laboratories and medical facilities and used for rapid local quality control of respirator masks that are of uncertified origin, monitoring the long-term effects of various disinfection schemes and evaluating improvised products not designed or marketed for filtration.

Lieu A, Mah J, Zanichelli V, Exantus RC, Longtin Y.

Impact of extended use and decontamination with vaporized hydrogen peroxide on N95 respirator fit.

American Journal of Infection Control. 2020;48(12):1457-61.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7428459/pdf/main.pdf

Background: To address the shortage of N95 respirators in the wake of the COVID-19 pandemic, some organizations have recommended the decontamination of respirators using vaporized hydrogen peroxide (VHP) sterilizer for up to 10 times. However, these recommendations are based on studies that did not take into account the extended use of respirators, which can degrade respirator fit. Methods: We investigated the impact of extended use and decontamination with VHP on N95 Respirator Fit. We performed a prospective cohort study to determine the number of times respirators can be decontaminated before respirator fit test failure. The primary outcome was the overall number of cycles required for half of the respirators to fail (either mechanical failure or fit test failure). Results: Thirty-six participants completed 360 hours of respirator usage across 90 cycles. The median number of cycles completed by participants before respirator failure was 2. The overall number of cycles required for half of respirators to fail was 1, 3, 5, and 4 for the 3M 1860(S), 3M 1870+, Moldex 151X and ProGear 88020 respirators, respectively. Conclusions: The combination of prolonged usage and VHP decontamination was associated with early failure. Decontamination and prolonged usage of respirators must be done cautiously. (C) 2020 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

Kumar A, Kasloff SB, Leung A, Cutts T, Strong JE, Hills K, et al.

Decontamination of N95 masks for re-use employing 7 widely available sterilization methods.

PloS one. 2020;15(12):16.

https://doi.org/10.1371/journal.pone.0243965

The response to the COVID-19 epidemic is generating severe shortages of personal protective equipment around the world. In particular, the supply of N95 respirator masks has become severely depleted, with supplies having to be rationed and health care workers having to use masks for prolonged periods in many countries. We sought to test the ability of 7 different decontamination methods: autoclave treatment, ethylene oxide gassing (ETO), low temperature hydrogen peroxide gas plasma (LT-HPGP) treatment, vaporous hydrogen peroxide (VHP) exposure, peracetic acid dry fogging (PAF), ultraviolet C irradiation (UVCI) and moist heat (MH) treatment to decontaminate a variety of different N95 masks following experimental contamination with SARS-CoV-2 or vesicular stomatitis virus as a surrogate. In addition, we sought to determine whether masks would tolerate repeated cycles of decontamination while maintaining structural and functional integrity. All methods except for UVCI were effective in total elimination of viable virus from treated masks. We found that all respirator masks tolerated at least one cycle of all treatment modalities without structural or functional deterioration as assessed by fit testing; filtration efficiency testing results were mostly similar except that a single cycle of LT-HPGP was associated with failures in 3 of 6 masks assessed. VHP, PAF, UVCI, and MH were associated with preserved mask integrity to a minimum of 10 cycles by both fit and filtration testing. A similar result was shown with ethylene oxide gassing to the maximum 3 cycles tested. Pleated, layered non-woven fabric N95 masks retained integrity in fit testing for at least 10 cycles of autoclaving but the molded N95 masks failed after 1 cycle; filtration testing however was

intact to 5 cycles for all masks. The successful application of autoclaving for layered, pleated masks may be of particular use to institutions globally due to the virtually universal accessibility of autoclaves in health care settings. Given the ability to modify widely available heating cabinets on hospital wards in well-resourced settings, the application of moist heat may allow local processing of N95 masks.

Haji JY, Subramaniam A, Kumar P, Ramanathan K, Rajamani A.

State of Personal Protective Equipment Practice in Indian Intensive Care Units amidst COVID-19 Pandemic: A Nationwide Survey.

Indian J Crit Care Med. 2020;24(9):809-16.

https://dx.doi.org/10.5005%2Fjp-journals-10071-23550

Background: Optimal personal protective equipment (PPE) preparedness is key to minimize healthcare workers (HCW) infection with COVID-19. This two-phase survey evaluated PPE preparedness (adherence to Ministry of Health India (MoH) PPE-recommendations; HCW-training; PPE-inventory; PPE-breach management) in Indian intensive care units (ICU). Materials and methods: The phase 1 survey was distributed electronically to intensivists from 481 Indian hospitals between March 25, 2020, and April 06, 2020, as part of a multinational survey. Phase 2 was repeated in 320 Indian hospitals between April 20, 2020, and April 30, 2020. Results: Response rate was 25% from 22 states. PPE practice varied between states and between private, government, and medical colleges. Between phase 1 and phase 2, all aspects of PPE training improved: donning/doffing 43% vs 66%, respectively; p value <0.01); safe waste disposal practices (38% vs 52%; p value = 0.09); intubation training (18% vs 31%; p value = 0.05); and transport (18% vs 31%; p value = 0.05). Perception of confidence for adequate PPE-training improved from 39 to 53% (p value = 0.26). In all, 47 to 60% ICUs adhered to MoH recommendations. Wearing N95-masks at all times increased from 47 to 60% (p value = 0.89). Very few ICUs provided quantitative/qualitative N95 masks fit testing (12% vs 29%; p value <0.01). Low-cost practices like "buddy-system" for donning-doffing (27% vs 44%; p value = 0.02) and showering after PPE breach (10% vs 8%; p value = 0.63) were underutilized. There was reluctance to PPE reuse. In all, 71% were unaware/diffident about PPE inventory. Conclusion: Despite interstate variability, most ICUs conformed to MoH recommendations. This survey conducted during initial pandemic phase demonstrated improved PPE preparedness uniformly across India with scope for further improvement. We suggest implementation of quality improvement measures to improve pandemic preparedness and minimize HCW infection rates, focused on regular PPE training, buddy system, and PPE-breach management.

Czubryt MP, Stecy T, Popke E, Aitken R, Jabusch K, Pound R, et al.

N95 mask reuse in a major urban hospital: COVID-19 response process and procedure.

Journal of Hospital Infection. 2020;106(2):277-82.

https://www.journalofhospitalinfection.com/article/S0195-6701(20)30366-2/pdf

Background: The shortage of single-use N95 respirator masks (NRMs) during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has prompted consideration of NRM recycling to extend limited stocks by healthcare providers and facilities. Aim: To assess potential reuse via autoclaving of NRMs worn daily in a major urban Canadian hospital. Methods: NRM reusability was assessed following collection from volunteer staff after 2-8 h use, sterilization by autoclaving and PortaCount fit testing. A workflow was developed for reprocessing hundreds of NRMs daily. Findings: Used NRMs passed fit testing after autoclaving once, with 86% passing a second reuse/autoclave cycle. A separate cohort of used masks pre-warmed before autoclaving passed fit testing. To recycle 200-1000 NRMs daily, procedures for collection, sterilization and re-distribution were developed to

minimize particle aerosolization risk during NRM handling, to reject NRM showing obvious wear, and to promote adoption by staff. NRM recovery ranged from 49% to 80% across 12 collection cycles. Conclusion: Reuse of NRMs is feasible in major hospitals and other healthcare facilities. In sharp contrast to studies of unused NRMs passing fit testing after 10 autoclave cycles, we show that daily wear substantially reduces NRM fit, limiting reuse to a single cycle, but still increasing NRM stocks by similar to 66%. Such reuse requires development of a comprehensive plan that includes communication across staffing levels, from front-line workers to hospital administration, to increase the collection, acceptance of and adherence to sterilization processes for NRM recovery. (C) 2020 The Healthcare Infection Society. Published by Elsevier Ltd. All rights reserved.

Brun D, Curti C, Mekideche T, Benech A, Hounliasso I, Lamy E, et al.

Stockpiled N95 respirator/surgical mask release beyond manufacturer-designated shelf-life: a French experience.

Journal of Hospital Infection. 2020;106(2):258-63.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7395218/pdf/main.pdf

Background: To reduce the shortage of N95 respirators and surgical masks during the COVID-19 pandemic, stockpiled equipment beyond its expiry date could be released. Aim: Centralized testing of batches of expired surgical masks and N95 for safe distribution to hospital departments saving users time. Methods: Tests of compliance with health authority directives were developed and carried out on 175 batches of N95 masks and 31 batches of surgical masks from 12th March 2020 to 16 April 2020. Five quality-control tests were performed on batch samples to check: packaging integrity, mask appearance, breaking strength of elastic ties and strength of nose clip test, and face-fit. Findings: Forty-nine per cent of FFP2 mask batches were compliant with directives, 32% of batches were compliant but with some concerns and 19% of batches were non-compliant. For surgical masks, 58% of batches were compliant, 39% of batches compliant but with concerns and 3% of batches were non-compliant. Conclusion: The main areas of non-compliance were the breaking strength of the elastic ties and the nose clip but these alone were not considered to make the masks unacceptable. Only mask appearance and face-fit results were decisive non-compliance criteria. (C) 2020 The Healthcare Infection Society. Published by Elsevier Ltd. All rights reserved.

• Zoonoses : pathologies émergentes

Sahu R, Rawool DB, Dhaka P, Yadav JP, Mishra SP, Kumar M, et al.

Current perspectives on the occurrence of Q fever: highlighting the need for systematic surveillance for a neglected zoonotic disease in Indian subcontinent.

Environ Microbiol Rep.21.

https://sfamjournals.onlinelibrary.wiley.com/doi/10.1111/1758-2229.12918

Coxiellosis or Q fever is an important global occupational zoonotic disease caused by one of the most contagious bacterial pathogens - Coxiella burnetii, which ranks one among the 13 global priority zoonoses. The detection of C. burnetii infection is exhibiting an increasing trend in high-risk personnel around the globe. It has increasingly been detected from foods of animal origin (including bulk milk, eggs, and meat) as well as tick vectors in many parts of the world. Coxiellosis is reported to be an important public health threat causing spontaneous abortions in humans and potential reproductive

failure, which would result in production losses among livestock. Further, comprehensive coverage of the reports and trends of Q fever in developing countries, where this infection is supposed to be widely prevalent appears scarce. Also, the pathogen remains grossly neglected and underreported. Moreover, policymakers and funding agencies do not view it as a priority problem, especially in the Indian subcontinent, including Sri Lanka, Bhutan, Pakistan, Nepal, Bangladesh and Maldives. Here, we review the occurrence and epidemiology of the disease in a global context with special emphasis on its status in the Indian subcontinent.

Chiuya T, Masiga DK, Falzon LC, Bastos ADS, Fevre EM, Villinger J.

Tick-borne pathogens, including Crimean-Congo haemorrhagic fever virus, at livestock markets and slaughterhouses in western Kenya.

Transboundary and emerging diseases.17.

https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/tbed.13911?download=true

Vectors of emerging infectious diseases have expanded their distributional ranges in recent decades due to increased global travel, trade connectivity and climate change. Transboundary range shifts, arising from the continuous movement of humans and livestock across borders, are of particular disease control concern. Several tick-borne diseases are known to circulate between eastern Uganda and the western counties of Kenya, with one fatal case of Crimean-Congo haemorrhagic fever (CCHF) reported in 2000 in western Kenya. Recent reports of CCHF in Uganda have highlighted the risk of cross-border disease translocation and the importance of establishing inter-epidemic, early warning systems to detect possible outbreaks. We therefore carried out surveillance of tick-borne zoonotic pathogens at livestock markets and slaughterhouses in three counties of western Kenya that neighbour Uganda. Ticks and other ectoparasites were collected from livestock and identified using morphological keys. The two most frequently sampled tick species were Rhipicephalus decoloratus (35%) and Amblyomma variegatum (30%); Ctenocephalides felis fleas and Haematopinus suis lice were also present. In total, 486 ticks, lice and fleas were screened for pathogen presence using established molecular workflows incorporating high-resolution melting analysis and identified through sequencing of PCR products. We detected CCHF virus in Rh. decoloratus and Rhipicephalus sp. cattle ticks, and 82 of 96 pools of Am. variegatum were positive for Rickettsia africae. Apicomplexan protozoa and bacteria of veterinary importance, such as Theileria parva, Babesia bigemina and Anaplasma marginale, were primarily detected in rhipicephaline ticks. Our findings show the presence of several pathogens of public health and veterinary importance in ticks from livestock at livestock markets and slaughterhouses in western Kenya. Confirmation of CCHF virus, a Nairovirus that causes haemorrhagic fever with a high case fatality rate in humans, highlights the risk of under-diagnosed zoonotic diseases and calls for continuous surveillance and the development of preventative measures.

Biotechnologies

- ## Nouveaux procédés

Yaashikaa PR, Kumar PS, Saravanan A, Varjani S, Ramamurthy R.

Bioconversion of municipal solid waste into bio-based products: A review on valorisation and sustainable approach for circular bioeconomy.

Science of the Total Environment. 2020;748:12.

https://www.sciencedirect.com/science/article/abs/pii/S0048969720348415?via%3Dihub

Municipal solid waste management is one of the major issues throughout the world. Inappropriate management of municipal solid waste (MSW) can pose a major hazard. Anaerobic processing of MSW followed by methane and biogas generation is one of the numerous sustainable energy source options. Compared with other technologies applicable for the treatment of MSW, factors like economic aspects, energy savings, and ecological advantages make anaerobic processing an attractive choice. This review discusses the framework for evaluating conversion of municipal solid waste to energy and waste derived bioeconomy in order to address the sustainable development goals. Further, this review will provide an innovative work foundation to improve the accuracy of structuring, quality control, and pre-treatment for the ideal treatment of different segments of MSW to achieve a sustainable circular bioeconomy. The increasing advancements in three essential conversion pathways, in particular the thermochemical, biochemical, and physiochemical conversion methods, are assessed. Generation of wastes should be limited and resource utilization must be minimised to make total progress in a circular bioeconomy. (C) 2020 Elsevier B.V. All rights reserved.

Tetteh EK, Amankwa MO, Armah EK, Rathilal S.

Fate of COVID-19 Occurrences in Wastewater Systems: Emerging Detection and Treatment Technologies-A Review.

Water. 2020;12(10):20.

https://res.mdpi.com/d_attachment/water/water-12-02680/article_deploy/water-12-02680.pdf

The coronavirus (COVID-19) pandemic is currently posing a significant threat to the world's public health and social-economic growth. Despite the rigorous international lockdown and quarantine efforts, the rate of COVID-19 infectious cases remains exceptionally high. Notwithstanding, the end route of COVID-19, together with emerging contaminants' (antibiotics, pharmaceuticals, nanoplastics, pesticide, etc.) occurrence in wastewater treatment plants (WWTPs), poses a great challenge in wastewater settings. Therefore, this paper seeks to review an inter-disciplinary and technological approach as a roadmap for the water and wastewater settings to help fight COVID-19 and future waves of pandemics. This study explored wastewater-based epidemiology (WBE) potential for detecting SARS-CoV-2 and its metabolites in wastewater settings. Furthermore, the prospects of integrating innovative and robust technologies such as magnetic nanotechnology, advanced oxidation process, biosensors, and membrane bioreactors into the WWTPs to augment the risk of COVID-19's environmental impacts and improve water quality are discussed. In terms of the diagnostics of COVID-19, potential biosensors such as sample-answer chip-, paper- and nanomaterials-based biosensors are highlighted. In conclusion, sewage treatment systems, together with magnetic biosensor diagnostics and WBE, could be a possible way to keep a surveillance on the outbreak of COVID-19 in communities around the globe,

thereby identifying hotspots and curbing the diagnostic costs of testing. Photocatalysis prospects are high to inactivate coronavirus, and therefore a focus on safe nanotechnology and bioengineering should be encouraged.

Rugbjerg P, Olsson L.

The future of self-selecting and stable fermentations.

J Ind Microbiol Biotechnol. 2020;47(11):993-1004.

https://doi.org/10.1007/s10295-020-02325-0

Unfavorable cell heterogeneity is a frequent risk during bioprocess scale-up and characterized by rising frequencies of low-producing cells. Low-producing cells emerge by both non-genetic and genetic variation and will enrich due to their higher specific growth rate during the extended number of cell divisions of large-scale bioproduction. Here, we discuss recent strategies for synthetic stabilization of fermentation populations and argue for their application to make cell factory designs that better suit industrial needs. Genotype-directed strategies leverage DNA-sequencing data to inform strain design. Self-selecting phenotype-directed strategies couple high production with cell proliferation, either by redirected metabolic pathways or synthetic product biosensing to enrich for high-performing cell variants. Evaluating production stability early in new cell factory projects will guide heterogeneity-reducing design choices. As good initial metrics, we propose production half-life from standardized serial-passage stability screens and production load, quantified as production-associated percent-wise growth rate reduction. Incorporating more stable genetic designs will greatly increase scalability of future cell factories through sustaining a high-production phenotype and enabling stable long-term production.

Mandeep, Shukla P.

Microbial Nanotechnology for Bioremediation of Industrial Wastewater.

Frontiers in Microbiology. 2020;11:8.

https://doi.org/10.3389/fmicb.2020.590631

Pollutant removal from industrial effluents is a big challenge for industries. These pollutants pose a great risk to the environment. Nanotechnology can reduce the expenditure made by industries to mitigate these pollutants through the production of eco-friendly nanomaterials. Nanomaterials are gaining attention due to their enhanced physical, chemical, and mechanical properties. Using microorganisms in the production of nanoparticles provides an even greater boost to green biotechnology as an emerging field of nanotechnology for sustainable production and cost reduction. In this mini review, efforts are made to discuss the various aspects of industrial effluent bioremediation through microbial nanotechnology integration. The use of enzymes with nanotechnology has produced higher activity and reusability of enzymes. This mini review also provides an insight into the advantages of the use of nanotechnology as compared to conventional practices in these areas.

Capeness MJ, Horsfall LE.

Synthetic biology approaches towards the recycling of metals from the environment.

Biochem Soc Trans. 2020;48(4):1367-78.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7458392/pdf/BST-48-1367.pdf

Metals are a finite resource and their demand for use within existing and new technologies means metal scarcity is increasingly a global challenge. Conversely, there are areas containing such high levels of metal pollution that they are hazardous to life, and there is loss of material at every stage of the lifecycle of metals and their products. While traditional resource extraction methods are becoming less cost effective, due to a lowering quality of ore, industrial practices have begun turning to newer technologies to tap into metal resources currently locked up in contaminated land or lost in the extraction and manufacturing processes. One such technology uses biology for the remediation of metals, simultaneously extracting resources, decontaminating land, and reducing waste. Using biology for the identification and recovery of metals is considered a much 'greener' alternative to that of chemical methods, and this approach is about to undergo a renaissance thanks to synthetic biology. Synthetic biology couples molecular genetics with traditional engineering principles, incorporating a modular and standardised practice into the assembly of genetic parts. This has allowed the use of non-model organisms in place of the normal laboratory strains, as well as the adaption of environmentally sourced genetic material to standardised parts and practices. While synthetic biology is revolutionising the genetic capability of standard model organisms, there has been limited incursion into current practices for the biological recovery of metals from environmental sources. This mini-review will focus on some of the areas that have potential roles to play in these processes.

Asante-Badu B, Kgorutla LE, Li SS, Danso PO, Xue Z, Qiang G.

PHYTOREMEDIATION OF ORGANIC AND INORGANIC COMPOUNDS IN A NATURAL AND AN AGRICULTURAL ENVIRONMENT: A REVIEW.

Appl Ecol Environ Res. 2020;18(5):6875-904.

Phytoremediation is currently an area of trending research due to its huge potential as a sustainable substitute for traditional methods of restoring contaminated sites. It is a profitable and ecological alternative to mechanical and chemical remediation techniques used worldwide. An increase in soil, water, and air pollution has severely disturbed an ecosystem functions and poses a huge threat to the natural and agricultural environment as well as public health Remediation of the contaminated environment is one of the paramount concerns of the world. Hence this article deliberates on the general problems of pollutants linked to phytoremediation techniques of organic and inorganic contaminants, especially agrochemicals, petroleum, and explosive compounds The paper also reviews a systematic assessment of the recent progress in the phytoremediation of contaminants in a natural and agricultural environment. Additionally, we highlight the benefits and limitations of phytoremediation along with a brief clarification of the resilient mechanistic removal of contaminants by a three-phase method. Finally, the perspective of biotechnological approaches in remediation is also suggested; taking into consideration the future of synergistic remediation approaches and genetically improved plants to enhance phytoremediation.

Andler R.

Bacterial and enzymatic degradation of poly(cis-1,4-isoprene) rubber: Novel biotechnological applications.

Biotechnology advances. 2020;44:14.

https://www.sciencedirect.com/science/article/abs/pii/S0734975020301087?via%3Dihub

Poly(cis-1,4-isoprene) rubber is a highly demanded elastomeric material mainly used for the manufacturing of tires. The end-cycle of rubber-made products is creating serious environmental concern and, therefore, different recycling processes have been proposed. However, the current physical-chemical processes include the use of hazardous chemical solvents, large amounts of energy,

and possibly generations of unhealthy micro-plastics. Under this scenario, eco-friendly alternatives are needed and biotechnological rubber treatments are demon-strating huge potential. The cleavage mechanisms and the biochemical pathways for the uptake of poly(cis-1,4-isoprene) rubber have been extensively reported. Likewise, novel bacterial strains able to degrade the polymer have been studied and the involved structural and functional enzymes have been analyzed. Considering the fundamentals, biotechnological approaches have been proposed considering process optimization, cost-effective methods and larger-scale experiments in the search for practical and realistic applications. In this work, the latest research in the rubber biodegradation field is shown and discussed, aiming to analyze the combination of detoxification, devulcanization and polymer-cleavage mechanisms to achieve better degradation yields. The modified superficial structure of rubber materials after biological treatments might be an interesting way to reuse old rubber for re-vulcanization or to find new materials.

Lopez-Fernandez M, Jroundi F, Ruiz-Fresneda MA, Merroun ML.

Microbial interaction with and tolerance of radionuclides: underlying mechanisms and biotechnological applications.

Microbial biotechnology.19.

https://sfamjournals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/1751-7915.13718?download=true

Radionuclides (RNs) generated by nuclear and civil industries are released in natural ecosystems and may have a hazardous impact on human health and the environment. RN-polluted environments harbour different microbial species that become highly tolerant of these elements through mechanisms including biosorption, biotransformation, biomineralization and intracellular accumulation. Such microbial-RN interaction processes hold biotechnological potential for the design of bioremediation strategies to deal with several contamination problems. This paper, with its multidisciplinary approach, provides a state-of-the-art review of most research endeavours aimed to elucidate how microbes deal with radionuclides and how they tolerate ionizing radiations. In addition, the most recent findings related to new biotechnological applications of microbes in the bioremediation of radionuclides and in the long-term disposal of nuclear wastes are described and discussed.

Organismes français et internationaux - Actualités

Suivi d'organismes français et internationaux. Sélection d'actualités classées par thème.

- **Allergies**

ANSES, L'ambroisie en France : coûts des impacts sanitaires et pistes d'actions, 04/12/2020.

- **Bactéries**

ANSES, La FAO désigne l'Anses comme centre de référence pour la résistance antimicrobienne, 27/11/2020.

ANSES, Un premier état des connaissances sur l'antibiorésistance et les antibiotiques dans l'environnement, 18/11/2020.

INSERM, Antibiorésistance : face à un fléau mondial, une toute première interface nationale, 15/12/2020.

Santé Publique France, Bilan BHRe 2019, 17/12/2020.

Santé Publique France, Surveillance de l'antibiorésistance en établissement de santé. Données 2018. Partie 2 : résistance bactérienne aux antibiotiques, 11/12/2020. 54 p.

Santé Publique France, Surveillance de la consommation des antibiotiques et des résistances bactériennes en établissement de santé. Mission Spares. Résultats préliminaires 2019, 17/11/2020. 7 p.

- **Hygiène des mains**

Santé Publique France, Surveillance des consommations de produits hydro-alcooliques en établissement d'hébergement pour personnes âgées dépendantes. Résultats de la phase pilote inter-régionale, 29/12/2020. 51 p.

- **Maladies infectieuses**

Ministère des Solidarités et de la Santé, Création d'une nouvelle agence de recherche sur les maladies infectieuses et émergentes (communiqué de presse), 16/12/2020.

Santé Publique France, Bulletin épidémiologique grippe, semaine 52. Saison 2020-2021, 30/12/2020.

Santé Publique France, Bilan de la surveillance des infections à Campylobacter en France en 2015, 17/12/2020.

Santé Publique France, Dépistage du VIH : nouvelles expérimentations, données de surveillance et impact de la Covid, BEH n°33-34, 01/12/2020.

Santé Publique France, Dépistage et prise en charge des hépatites B et C et de leurs complications, BEH n°31-32, 24/11/2020.

Santé Publique France, Clinical and epidemiological performance of WHO Ebola case definitions: a systematic review and meta-analysis, 01/11/2020.

Santé Publique France, Influence of information sources on vaccine hesitancy and practices, 01/11/2020.

INSERM, Conférence : Changement climatique, quel impact sur la diffusion des maladies infectieuses, 03/12/2020.

CDC, Ebola Outbreak in the Democratic Republic of the Congo Ends, 18/11/2020.

Eurosurveillance, Where has all the influenza gone? The impact of COVID-19 on the circulation of influenza and other respiratory viruses, Australia, March to September 2020, 26/11/2020.

Eurosurveillance, West Nile virus keeps on moving up in Europe, 19/11/2020.