Rapport de veille n°115

Risques biologiques
Janvier – Février 202

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), à l'exception des références évoquant un sujet traité dans le cadre de cette veille.

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 :

Veille risque biologique

- ## **Protection respiratoire : Ebola, fièvres hémorragiques**

Schwerin MR, Lucas AD, Woods TO.

Development of a Standard Test Method for Assessing Mechanical Penetration of Personal Protective Equipment Material to Test Soils by Simulating Actual Use.

J Test Eval. 2022;50(1):275-83.

Preventing healthcare worker exposure to dangerous pathogens is a crucial factor in sustaining the fight against Ebola, Coronaviruses, and other microorganisms that may cause infectious diseases. It is critical that personal protective equipment (PPE) used to protect healthcare workers be safe and effective in meeting labeled performance claims for barrier resistance to deadly viruses such as Ebola (Zaire ebolavirus) and severe acute respiratory syndrome coronavirus 2. The aim of this study is to develop a readily reproducible and standardized simulated use test for gown and drape materials using a blood test soil to evaluate the ability of the materials to prevent penetration of clinically relevant test soils at clinically relevant pres-sures. We designed and constructed a simulated use "elbow lean" apparatus based on the apparatus in ASTM F1819, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Synthetic Blood Using a Mechanical Pressure Technique, that applies a physiologically relevant load to PPE material. We developed a test protocol for our proposed method and used the apparatus on a variety of PPE materials to assess penetration of a blood test soil. The testing demonstrated that the new apparatus can be used to assess penetration of a blood test soil through PPE materials under conditions that are more clinically relevant than those in ASTM F1670, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Synthetic Blood, and ASTM F1671, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System. The apparatus and procedure detailed in this study will be proposed for use in the development of a new standard test method for assessing mechanical penetration of PPE to test soils that better simulate clinical use conditions.

- ## **Protection respiratoire : ajustement**

Derrick D, Kabaliuk N, Longworth L, Pishyar-Dehkordi P, Jermy M.

Speech air flow with and without face masks.

Scientific reports. 2022;12(1):10.

Face masks slow exhaled air flow and sequester exhaled particles. There are many types of face masks on the market today, each having widely varying fits, filtering, and air redirection characteristics. While particle filtration and flow resistance from masks has been well studied, their effects on speech air flow has not. We built a schlieren system and recorded speech air flow with 14 different face masks, comparing it to mask-less speech. All of the face masks reduced air flow from speech, but some allowed air flow features to reach further than 40 cm from a speaker's lips and nose within a few seconds, and all the face masks allowed some air to escape above the nose. Evidence from available literature shows

that distancing and ventilation in higher-risk indoor environment provide more benefit than wearing a face mask. Our own research shows all the masks we tested provide some additional benefit of restricting air flow from a speaker. However, well-fitted mask specifically designed for the purpose of preventing the spread of disease reduce air flow the most. Future research will study the effects of face masks on speech communication in order to facilitate cost/benefit analysis of mask usage in various environments.

Janson DJ, Clift BC, Dhokia V.

PPE fit of healthcare workers during the COVID-19 pandemic.

Appl Ergon. 2022;99:8.

https://www.sciencedirect.com/science/article/pii/S000368702100257X?via%3Dihub

Historically, PPE (Personal Protective Equipment) has generally been designed around the size and shape of an average European or US white man's face and body. There is little academic evidence to support anecdotal reports that women are at a greater disadvantage than men from ill-fitting PPE. This is especially relevant in healthcare settings where women make up at least 75% of frontline workers. The COVID-19 pandemic has exacerbated problems associated with the fit of PPE that until now have been mainly anecdotal. This research presents results and analysis of a quantitative and qualitative survey concerning the fit of PPE worn by 248 healthcare workers, in a variety of healthcare roles and settings, during the COVID-19 pandemic. The analysis of the survey results showed that women were less likely than men to feel safe carrying out their roles, with only 30.5% of women and 53.3% of men stating that they felt safe all of the time. A statistically significant link is made between women suffering more with poor fit than men with certain categories of PPE (gowns, masks, visors, goggles). Over four times as many women (54.8%) as men (13.3%) reported their surgical gowns being large to some degree and women were nearly twice as likely (53.5%) to experience oversized surgical masks than men (28.6%). However, it was recognized that PPE fit problems are not exclusive to women as many men also do not conform to the underlying shape and size of PPE designs. Survey results indicated that both sexes felt equally hampered due to the fit of their PPE and around a third of both women and men had modified their PPE to address fit issues. Oversized and modified PPE presents its own set of unintended consequences. Following strict processes for doffing and removing PPE is key to virus control but doffing modified PPE can fall outside of these processes, risking cross infection. In addition, wearers of critical items of PPE (such as respirators) currently undergo a "fit test"; however, fit does not reconcile with comfort and over-tightened PPE can cause headaches, discomfort and distraction when worn for long periods. Requirements and fit tests are also not setting-specific; qualitative responses from the survey give an indication that this must be a future consideration.

Yen CF, Seeley R, Gordon P, Parameswaran L, Wright SB, Pepe DE, et al.

Assessing changes to N95 respirator filtration efficiency, qualitative and quantitative fit, and seal check with repeated vaporized hydrogen peroxide (VHP) decontamination.

American Journal of Infection Control. 2022;50(2):217-9.

https://www.ajicjournal.org/article/S0196-6553(21)00741-0/fulltext

N95 respirators were reprocessed using vaporized hydrogen peroxide to supplement limited supplies during the COVID-19 pandemic. In this study, we found no statistically significant differences in qualitative and quantitative fit or filtration efficiency with reprocessing. Filtration efficiency remained above 95% even at 25 cycles of reprocessing without statistically significant change from cycle 20-25 compared to cycle 0 (P = .10, P = .05, respectively). Vaporous hydrogen peroxide is an effective option

- ## Zoonoses : pathologies émergentes

Acharya D, Park JH, Chun JH, Kim MY, Yoo SJ, Lewin A, et al.

Seroepidemiologic evidence of Q fever and associated factors among workers in veterinary service laboratory in South Korea.

PLoS neglected tropical diseases. 2022;16(2):19.

https://journals.plos.org/plosntds/article/file?id=10.1371/journal.pntd.0010054&type=printable

Author summaryThis study investigated the seroprevalence and seroreactivity of Q fever and determined the risk factors associated with seroprevalence of Q fever among the nationally representative sample of workers in the veterinary service laboratory (VSL) in South Korea. We found the seroprevalence and seroreactivity of C. burnetii infection among VSL staff were 7.9% and 16.0%, respectively. In addition, the work-specific tasks such as antemortem inspection of cattle, goats, or sheep, contact with animals having Q fever, and having animal blood splashed into or around eyes were found to be significantly associated with the seroprevalence of Q fever. Our findings suggest precautions be taken when contacting cattle, goats, or sheep, especially during the antemortem inspection, and dealing with C. burnetii infected animals, and when there is a risk of ocular contact with animal derivatives, such as the use of appropriate personal protective equipment, and compliance with other measures that prevent C. burnetii infections among VSL staff in South Korea. The incidence of Q fever has rapidly increased in South Korea since 2015. This study was undertaken to investigate the seroprevalence and seroreactivity of Q fever and the risk factors associated with its seroprevalence among workers in the veterinary service laboratory (VSL) in South Korea. This seroepidemiologic study was conducted in a total of 661 human subjects out of 1,328 subjects working in 50 VSL existing in South Korea between July 15 and July 29, 2019. Data were collected by administering survey questionnaires and by analyzing collected blood samples to determine the presence of antibodies against Coxiella burnetii. The seroprevalence and seroreactivity of C. burnetii infection were determined based on serum titers as (phase II IgG >= 1:256 and/or IgM >= 1:16) and (phase II IgG >= 1:16 and/or IgM >= 1:16) as determined by indirect immunofluorescent assay. Work, work environment, behavioral risk and protective factors associated with seroprevalence of Q fever were assessed by employing multivariable logistic regression analysis. Among the 661, the seroprevalence and seroreactivity of C. burnetii infection were 7.9% and 16.0%, respectively. Multivariate logistic regression analysis showed the risk factors significantly associated with seroprevalence were the antemortem inspection of cattle, goats, or sheep (APR (adjusted prevalence ratio), 2.52; 95% CI, 1.23-4.70)), animal blood splashed into or around eyes (APR, 2.24; 95% CI, 1.04-4.41), and contact with animals having Q fever (APR, 6.58; 95% CI, 3.39-10.85) during the previous year. This study suggests the need for precautions when contact with cattle, goats, or sheep is expected, especially during the antemortem inspection, when dealing with C. burnetii infected animals, or when there is a risk of ocular contact with animal derivatives. Therefore, we recommend the consistent use of appropriate personal protective equipment and other protective measures including PPE treatment and washing of body surfaces after work to prevent C. burnetii infections among VSL staff in South Korea.

Marrero LM, Nunez GB, Frabasile S, Delfraro A.

Alphavirus Identification in Neotropical Bats.

Viruses-Basel. 2022;14(2):11.

Alphaviruses (Togaviridae) are arthropod-borne viruses responsible for several emerging diseases, maintained in nature through transmission between hematophagous arthropod vectors and susceptible vertebrate hosts. Although bats harbor many species of viruses, their role as reservoir hosts in emergent zoonoses has been verified only in a few cases. With bats being the second most diverse order of mammals, their implication in arbovirus infections needs to be elucidated. Reports on arbovirus infections in bats are scarce, especially in South American indigenous species. In this work, we report the genomic detection and identification of two different alphaviruses in oral swabs from bats captured in Northern Uruguay. Phylogenetic analysis identified Rio Negro virus (RNV) in two different species: Tadarida brasiliensis (n = 6) and Myotis spp. (n = 1) and eastern equine encephalitis virus (EEEV) in Myotis spp. (n = 2). Previous studies of our group identified RNV and EEEV in mosquitoes and horse serology, suggesting that they may be circulating in enzootic cycles in our country. Our findings reveal that bats can be infected by these arboviruses and that chiropterans could participate in the viral natural cycle as virus amplifiers or dead-end hosts. Further studies are warranted to elucidate the role of these mammals in the biological cycle of these alphaviruses in Uruguay.

Slunge D, Boman A, Studahl M.

Burden of Tick-Borne Encephalitis, Sweden.

Emerging Infectious Disease journal. 2022;28(2):314.

https://wwwnc.cdc.gov/eid/article/28/2/20-4324_article

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8798699/pdf/20-4324.pdf

In recent decades, the incidence of tick-borne encephalitis (TBE) in Sweden has increased. To calculate the burden of disease over a 17-year period, we analyzed data from the Swedish National Health Data Register for TBE cases diagnosed during 1998–2014. We compared healthcare use and sick leave associated with 2,429 persons with TBE with a referent cohort of 7,287 persons without TBE. Patients with TBE were hospitalized for significantly more days during the first year after disease onset (11.5 vs. 1.1 days), logged more specialist outpatient visits (3.6 vs. 1.2 visits), and logged more sick leave days (66 vs. 10.7 days). These differences generally increased over time. The case-fatality rate for TBE was 1.1%. Our calculated cost of TBE to society provides a baseline for decisions on immunization programs. Analyzing register data, our study adds to clinical studies of smaller cohorts and model-based studies that calculate disease burden.

Tran NTB, Shimoda H, Ishijima K, Yonemitsu K, Minami S, Kuroda Y, et al.

Zoonotic Infection with Oz Virus, a Novel Thogotovirus.

Emerging Infectious Disease journal. 2022;28(2):436.

https://wwwnc.cdc.gov/eid/article/28/2/21-1270_article

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8798690/pdf/21-1270.pdf

Oz virus is a novel thogotovirus isolated from ticks that causes lethal infection in mice. We conducted serosurveillance of Oz virus infection among humans and wild mammals in Japan using virus-neutralization tests and ELISAs. Results showed that Oz virus may be naturally infecting humans and other mammalian hosts.

- ## Légionellose

Rousseau C, Ginevra C, Simac L, Fiard N, Vilhes K, Ranc AG, et al.

A Community Outbreak of Legionnaires' Disease with Two Strains of L. pneumophila Serogroup 1 Linked to an Aquatic Therapy Centre.

https://mdpi-res.com/d_attachment/ijerph/ijerph-19-01119/article_deploy/ijerph-19-01119.pdf

An outbreak of Legionnaires' disease affected 18 people in Montpellier, a town of the south of France, between December 2016 and July 2017. All cases were diagnosed by a positive urinary antigen test. No deaths were reported. Epidemiological, environmental and genomic investigations (nested Sequence-Based Typing (nSBT) and whole genome sequencing) were undertaken. For the cases for which we had information, four had a new isolate (ST2471), one had a different new isolate (ST2470), one had a genomic pattern compatible with the ST2471 identified by nSBT (flaA = 3), and one had a genomic pattern not compatible with two previous identified STs (pilE = 6). The analysis conducted on the pool of an aquatic therapy center revealed seven isolates of Legionella pneumophila. Whole genome analysis confirmed the link between the environmental and clinical isolates for both ST2470 and ST2471. As the outbreak occurred slowly, with several weeks between new cases, it was not possible to immediately identify a common source. The sixth case was the first to report having aquatic therapy care. Of the 18 cases, eight had attended the aquatic therapy center and the other 10 were inhabitants who lived, worked or walked close to the center. The main cause for this outbreak was the lack of facility maintenance. This investigation highlights the risk to public health of aquatic therapy centers for users and nearby populations, and emphasizes the need for risk reduction measures with specific guidelines to improve health and safety in aquatic facilities.

- ## Endotoxines : effets toxiques, multi-expositions

Wojcik-Fatla A, Mackiewicz B, Sawczyn-Domanska A, Sroka J, Siwiec J, Pasciak M, et al.

Timber-colonizing gram-negative bacteria as potential causative agents of respiratory diseases in woodworkers.

https://link.springer.com/content/pdf/10.1007/s00420-021-01829-1.pdf

Occurrence Gram-negative bacteria occur commonly in the inner tissues of stored coniferous and deciduous timber, showing a marked variation in numbers. The greatest maximal numbers are found in the sapwood of coniferous timber. The common constituents of the Gram-negative biota are potentially pathogenic species of Enterobacteriaceae family of the genera Rahnella, Pantoea, Enterobacter, and Klebsiella. The air of wood-processing facilities is polluted with the wood-borne Gram-negative bacteria and produced by them endotoxin, as demonstrated worldwide by numerous studies. Effects There are three potential pathways of the pathogenic impact of wood-borne Gram-negative bacteria on exposed woodworkers: allergic, immunotoxic, and infectious. Allergic impact has been underestimated for a long time with relation to Gram-negative bacteria. Hopefully, the recent demonstration of the first documented case of hypersensitivity pneumonitis (HP) in woodworkers caused by Pantoea agglomerans which developed in extremely large quantities in birch sapwood, would speed up finding of new wood-related cases of HP caused by Gram-negative bacteria. The second pathway is associated with endotoxin, exerting strong immunotoxic (excessively immunostimulative)

action. It has been demonstrated that endotoxin is released into wood dust in the form of nano-sized microvesicles, by peeling off the outer membrane of bacteria. Endotoxin microvesicles are easily inhaled by humans together with dust because of small dimensions and aerodynamic shape. Afterwards, they cause a nonspecific activation of lung macrophages, which release numerous inflammatory mediators causing an inflammatory lung reaction, chest tightness, fever, gas exchange disorders, and bronchospasm, without radiographic changes. The resulting disease is known as "Organic Dust Toxic Syndrome" or "toxic pneumonitis." The potential third pathway of pathogenic impact is infection. The suspected species is Klebsiella pneumoniae that may occur commonly in wood dust; however, until now this pathway has not been confirmed. Conclusion Summarizing, Gram-negative bacteria-inhabiting timber should be considered, besides filamentous fungi and actinobacteria, as important risk factors of occupational disease in woodworkers that could be either HP with allergenic background or toxic pneumonitis elicited by endotoxin.

Biotechnologies

- **Nouveaux procédés**

Ahmad A, Banat F, Alsafar H, Hasan SW.

Algae biotechnology for industrial wastewater treatment, bioenergy production, and high-value bioproducts.

Science of the Total Environment. 2022;806:21.

https://www.sciencedirect.com/science/article/abs/pii/S0048969721056631?via%3Dihub

A growing world population is causing hazardous compounds to form at an increasingly rapid rate, calling for ecological action. Wastewater management and treatment is an expensive process that requires appropriate integration technology to make it more feasible and cost-effective. Algae are of great interest as potential feedstocks for various applications, including environmental sustainability, biofuel production, and the manufacture of high value bioproducts. Bioremediation with microalgae is a potential approach to reduce wastewater pollution. The need for effective nutrient recovery, greenhouse gas reduction, wastewater treatment, and biomass reuse has led to a wide interest in the use of microalgae for wastewater treatment. Furthermore, algae biomass can be used to produce bioenergy and high-value bioproducts. The use of microalgae as medicine (production of bioactive and medicinal compounds), biofuels, biofertilizers, and food additives has been explored by researchers around the world. Technological and economic barriers currently prevent the commercial use of algae, and optimal downstream processes are needed to reduce production costs. Therefore, the simultaneous use of microalgae for wastewater treatment and biofuel production could be an economical approach to address these issues. This article provides an overview of algae and their application in bioremediation, bioenergy production, and bioactive compound production. It also highlights the current problems and opportunities in the algae-based sector, which has recently become quite promising. (c) 2021 Elsevier B.V. All rights reserved.

Chauhan G, Gonzalez-Gonzalez RB, Iqbal HMN.

Bioremediation and decontamination potentials of metallic nanoparticles loaded nanohybrid matrices-A review.

Environmental Research. 2022;204:14.

The current nanotechnological advancements provide an astonishing insight to fabricate nanomaterials for nanobioremediation purposes. Exciting characteristics possessed by hybrid matrices at the nanoscale knock endless opportunities to nano-remediate environmentally-related pollunanomaterials tants of emerging concern. Nanometals are considered among the oldest generation of the world has ever noticed. These tiny nanometals and nanometal oxides showed enormous potential in almost every extent of industrial and biotechnological domains, including their potential multipurpose approach to deal with water impurities. In this manuscript, we discussed their role in the diversity of water treatment technologies used to remove bacteria, viruses, heavy metals, pesticides, and organic impurities, providing an ample perspective on their recent advances in terms of their characteristics, attachment strategies, performance, and their scale-up challenges. Finally, we tried to explore their futuristic contribution to nano-remediate environmentally-related pollutants of emerging concern aiming to collect treated yet safe water that can be reused for multipurpose.

Gondi R, Kavitha S, Kannah RY, Karthikeyan OP, Kumar G, Tyagi VK, et al.

Algal-based system for removal of emerging pollutants from wastewater: A review.

Bioresource Technology. 2022;344:13.

The bioremediation of emerging pollutants in wastewater via algal biotechnology has been emerging as a costeffective and low-energy input technological solution. However, the algal bioremediation technology is still not fully developed at a commercial level. The development of different technologies and new strategies to cater specific needs have been studied. The existence of multiple emerging pollutants and the selection of microalgal species is a major concern. The rate of algal bioremediation is influenced by various factors, including accidental contaminations and operational conditions in the pilot-scale studies. Algal-bioremediation can be combined with existing treatment technologies for efficient removal of emerging pollutants from wastewater. This review mainly focuses on algal-bioremediation systems for wastewater treatment and pollutant removal, the impact of emerging pollutants in the environment, selection of potential microalgal species, mechanisms involved, and challenges in removing emerging pollutants using algal-bioremediation systems.

Johnson SA, Chen S, Bolton G, Chen Q, Lute S, Fisher J, et al.

Virus filtration: A review of current and future practices in bioprocessing.

Biotechnology and bioengineering. 2022;119(3):743-61.

For drug products manufactured in mammalian cells, safety assurance practices are needed during production to assure that the final medicinal product is safe from the potential risk of viral contamination. Virus filters provide viral retention for a range of viruses through robust, largely size-based retention mechanism. Therefore, a virus filtration step is commonly utilized in a well-designed recombinant therapeutic protein purification process and is a key component in an overall strategy to minimize the risks of adventitious and endogenous viral particles during the manufacturing of biotechnology products. This study summarizes the history of virus filtration, currently available virus filters and prefilters, and virus filtration integrity test methods and study models. There is also discussion of current understanding and gaps with an eye toward future trends and emerging filtration technologies.

Liu SX, Laaksonen O, Li P, Gu Q, Yang BR.

p Use of Non-Saccharomyces Yeasts in Berry Wine Production: Inspiration from Their Applications in Winemaking.

Journal of Agricultural and Food Chemistry.15.

Although berries (nongrape) are rich in health-promoting bioactive compounds, and their consumption is associated with a lower risk of diverse chronic diseases, only a fraction of the annual yield of berries is exploited and consumed. Development of berry wines presents an approach to increase the utilization of berries. Alcoholic fermentation is a complex process driven by yeasts, which influence key properties of wine diversification and quality. In winemaking, non-Saccharomyces yeasts were traditionally considered as undesired microorganisms because of their high production of metabolites with negative connotations. However, there has been a recent and growing interest in the application of non-Saccharomyces yeast in many innovative wineries. Numerous studies have demonstrated the potential of these yeasts to improve properties of wine as an alternative or complement to Saccharomyces cerevisiae. The broad use of non-Saccharomyces yeasts in winemaking provides a promising picture of these unconventional yeasts in berry wine production, which can be considered as a novel biotechnological approach for creating value-added berry products for the global market. This review provides an overview of the current use of non-Saccharomyces yeasts in winemaking and their applicative perspective in berry wine production.

Rahman SU, McCoy E, Raza G, Ali Z, Mansoor S, Amin I.

Improvement of Soybean; A Way Forward Transition from Genetic Engineering to New Plant Breeding Technologies.

Mol Biotechnol.19.

Soybean is considered one of the important crops among legumes. Due to high nutritional contents in seed (proteins, sugars, oil, fatty acids, and amino acids), soybean is used globally for food, feed, and fuel. The primary consumption of soybean is vegetable oil and feed for chickens and livestock. Apart from this, soybean benefits soil fertility by fixing atmospheric nitrogen through root nodular bacteria. While conventional breeding is practiced for soybean improvement, with the advent of new biotechnological methods scientists have also engineered soybean to improve different traits (herbicide, insect, and disease resistance) to fulfill consumer requirements and to meet the global food deficiency. Genetic engineering (GE) techniques such as transgenesis and gene silencing help to minimize the risks and increase the adaptability of soybean. Recently, new plant breeding technologies (NPBTs) emerged such as zinc-finger nucleases, transcription activator-like effector nucleases, and Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR/Cas9), which paved the way for enhanced genetic modification of soybean. These NPBTs have the potential to improve soybean via gene functional characterization precision genome engineering for trait improvement. Importantly, these NPBTs address the ethical and public acceptance issues related to genetic modifications and transgenesis in soybean. In the present review, we summarized the improvement of soybean through GE and NPBTs. The valuable traits that have been improved through GE for different constraints have been discussed. Moreover, the traits that have been improved through NPBTs and potential targets for soybean improvements via NPBTs and solutions for ethical and public acceptance are also presented.

Sellami K, Couvert A, Nasrallah N, Maachi R, Abouseoud M, Amrane A.

Peroxidase enzymes as green catalysts for bioremediation and biotechnological applications: A review.

Science of the Total Environment. 2022;806:18.

https://www.sciencedirect.com/science/article/abs/pii/S0048969721055777?via%3Dihub

The fast-growing consumer demand drives industrial process intensification, which subsequently creates a significant amount of waste. These products are discharged into the environment and can affect the quality of air, degrade water streams, and alter soil characteristics. Waste materials may contain polluting agents that are especially harmful to human health and the ecosystem, such as the synthetic dyes, phenolic agents, polycyclic aromatic hydrocarbons, volatile organic compounds, polychlorinated biphenyls, pesticides and drug substances. Peroxidases are a class oxidoreductases capable of performing a wide variety of oxidation reactions, ranging from reactions driven by radical mechanisms, to oxygen insertion into C-H bonds, and two-electron substrate oxidation. This versatility in the mode of action presents peroxidases as an interesting alternative in cleaning the environment. Herein, an effort has been made to describe mechanisms governing biochemical process of peroxidase enzymes while referring to H2O2/substrate stoichiometry and metabolite products. Plant peroxidases including horseradish peroxidase (HRP), soybean peroxidase (SBP), turnip and bitter gourd peroxidases have revealed notable biocatalytic potentialities in the degradation of toxic products. On the other hand, an introduction on the role played by ligninolytic enzymes such as manganese peroxidase (MnP) and lignin peroxidase (LiP) in the valorization of lignocellulosic materials is addressed. Moreover, sensitivity and selectivity of peroxidase-based biosensors found use in the quantitation of constituents and the development of diagnostic kits. The general merits of peroxidases and some key prospective applications have been outlined as concluding remarks. (C) 2021 Elsevier B.V. All rights reserved.

Sharma P, Gujjala LKS, Varjani S, Kumar S.

Emerging microalgae-based technologies in biorefinery and risk assessment issues: Bioeconomy for sustainable development.

Science of the Total Environment. 2022;813:14.

https://www.sciencedirect.com/science/article/abs/pii/S0048969721074957?via%3Dihub

Industrial wastewater treatment is of paramount importance considering the safety of the aquatic ecosystem and its associated health risk to humankind inhabiting near the water bodies. Microalgae-based technologies for remediation of environmental pollutants present avenues for bioenergy applications and production of value-added biochemicals having pharmaceutical, nutraceutical, antioxidants, carbohydrate, phenolics, long-chain multi-faceted fatty acids, enzymes, and proteins which are considered healthy supplements for human health. Such a wide range of products put up a good case for the biorefinery concept. Microalgae play a pivotal role in degrading complex pollutants, such as organic and inorganic contaminants thereby efficiently removing them from the environment. In addition, microalgal species, such as Botryococcus braunii, Tetraselmis suecica, Phaeodactylum tricornutum, Neochloris oleoabundans, Chlorella vulgaris, Arthrospira, Chlorella, and Tetraselmis sp., etc., are also reported for generation of value-added products. This review presents a holistic view of microalgae based biorefinery starting from cultivation and harvesting of microalgae, the potential for remediation of environmental pollutants, bioenergy application, and production of value-added biomolecules. Further, it summarizes the current understanding of microalgae-based technologies and discusses the risks involved, potential for bioeconomy, and outlines future research directions.

Speight RE, Navone L, Gebbie LK, Blinco JAL, Bryden WL.

Platforms to accelerate biomanufacturing of enzyme and probiotic animal feed supplements: discovery considerations and manufacturing implications.

Anim Prod Sci.16.

https://www.publish.csiro.au/an/pdf/AN21342

Probiotics and enzymes are important components of the global livestock feed supplement market, which is expected to be approximately US$56 billion by 2027. They make essential contributions to animal health and productivity and are very important for on-farm economics, as well as feed supplement and bulk feed businesses. Despite the variety of on-market products, there remains a strong drive to develop new function or more effective enzymes (e.g. more active or stable) and probiotics (e.g. for specific health or nutrition requirements) that can be produced economically and commercialised to gain market share. Various large and established supplement development, manufacture and supply companies with highly refined, efficient and vertically integrated processes dominate the market. In contrast, many challenges exist for less established players, such as feed companies, large farming corporations, start-up companies and the research community, to develop and commercialise improved feed supplements. These less established players may have niche markets or needs or may have identified highly novel candidate products through basic or collaborative academia-industry applied research. In these situations, the path from discovery and development to a commercial product is unclear and likely to be very challenging. However, the risk of not progressing is that the value of research investments is not realised, or the needs of specific niche markets are not met. For these situations, new pathways to market based on rapid discovery, production (at various scales), and testing feedback loops, along with appropriate intellectual property management and clear regulatory strategies need to be established. To deliver these new pathways, it is essential to define key performance, production and economic criteria, have a rapid route from laboratory to pilot-scale manufacture and livestock feeding trials, and include all the necessary participants in the value chain from research development, manufacturing, distribution, and regulatory management to the end user. These issues are discussed with reference to the current state-of-the-art and our development of new pathways for a specific enzyme and probiotic based on efficient laboratory-to-market platforms. Although new supplements have been brought closer to market, challenges remain regarding scaling to commercial manufacture for new products without an established market.

Westphal SG, Mannon RB.

Emerging biomarkers in kidney transplantation and challenge of clinical implementation.

Curr Opin Organ Transpl. 2022;27(1):15-21.

https://www.ingentaconnect.com/content/wk/mot/2022/00000027/00000001/art00004;jsessionid=4qbuoje6tsrwh.x-ic-live-02

Purpose of review Despite improvement in short-term outcomes after kidney transplantation, long-term outcomes remain suboptimal. Conventional biomarkers are limited in their ability to reliably identify early immunologic and nonimmunologic injury. Novel biomarkers are needed for noninvasive diagnosis of subclinical injury, prediction of response to treatment, and personalization of the care of kidney transplant recipients. Recent findings Recent biotechnological advances have led to the discovery of promising molecular biomarker candidates. However, translating potential biomarkers from bench to clinic is challenging, and many potential biomarkers are abandoned prior to clinical implementation. Despite these challenges, several promising urine, blood, and tissue novel molecular biomarkers have emerged and are approaching incorporation into clinical practice. This article

highlights the challenges in adopting biomarker-driven posttransplant management and reviews several promising emerging novel biomarkers that are approaching clinical implementation.

Organismes français et internationaux - Actualités

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

- **Bactéries**

ANSES, Un partenariat pour mieux lutter contre les bactéries dans les ateliers de transformation des aliments, 14/01/2022.

- **Brévétoxines**

ANSES, Brévétoxines : l'inhalation d'embruns peut être responsable d'intoxications, 01/02/2022.

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