

Bulletin de veille risques biologiques

N°127 – Avril-juin 2024

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).

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 éléments issus de cette veille sont fournis sans garantie d'exhaustivité.

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

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Veille risque biologique

- **Protection individuelle : fièvre hémorragique, Ebola**

King WB, Goulart MA, Luciani DL, Brown DS, El Itani R, Hays AK, et al.

Revisiting Ebola Virus Disease infection control protocols at an academic level I trauma center: Successes, challenges, and ways ahead.

Am J Infect Control. 2024;52(2):243-5.

<https://doi.org/10.1016/j.ajic.2023.08.015>

In the decade since the largest Ebola Virus Disease (EVD) outbreak in history, hospitals within the United States have discovered deficiencies in EVD infection control protocols. A large academic level I trauma medical center and frontline EVD receiving hospital in northeast Florida conducted a large-scale review and revision of the facility's EVD infection control protocols to increase preparedness. The revision process revealed opportunities for improvement and highlighted the need for excellent resource management and interdepartmental communication.

- **Protection respiratoire : ajustement**

Chu CK, Wu HC, Kuo MC, Chan SY.

Study on the fit of nonwoven face masks on different face shapes.

J Text Inst. 2024:13.

<https://doi.org/10.1080/00405000.2024.2324506>

In the midst of the global COVID-19 pandemic, airborne infectious diseases, including contagious tuberculosis and illnesses transmitted through airborne droplets, such as influenza, SARS, and avian influenza, have emerged as some of the most severe pandemics in human history. Face masks have become an essential everyday item, despite their previous use primarily for the sick. Current mask designs come in various sizes; however, they may not be suitable for all face shapes, particularly for individuals with smaller or frequently moving facial features. Therefore, there is a need for research, especially focusing on women and individuals with smaller faces, to enhance the effectiveness of face masks in providing adequate protection. Accordingly, this study examined the current typical mask design 'normal mask' and four proposed mask designs for five face shapes (round, diamond, oval, square, or oblong) by using a quantitative fit test, as suggested in ISO 16975-3 and OSHA 29 CFR1910.134, to determine the masks' fit factor (FF). The FF of the normal mask was 80% on round faces, 66% on diamond faces, but only 41% on square and oblong faces. The FaceMe artificial intelligence program was used to modify the face mask design in accordance with each face shape, and the level of air leakage was evaluated. The results showed that modifying the mask edges could reduce air leakage, especially during movements. For square faces, the leakage level was reduced from 63% (normal mask) to 38% (line mask). For oblong faces, the normal mask had a leakage level of 63%, whereas wave masks reduced leaking to 34%, resulting in a reduction of almost 30%. Mask fit could also be improved by adjusting earloop tightness.

Collis B, Tacey M, McGrath C, Madigan V, Kainer M, Tramontana A, Aboltins C.

P2/N95 fit testing and the risk of COVID-19 in Healthcare Workers.

Infect Dis Health. 2024;29(1):8-14.

<https://doi.org/10.1016/j.idh.2023.07.005>

Background: Guidelines recommend healthcare workers (HCWs) undertake fit testing of P2/N95 respirators to mitigate the risk of infectious aerosols, however few studies have assessed whether fit testing reduces COVID-19 infection. Methods: A retrospective cohort study was conducted amongst HCWs across two tertiary health services in Melbourne, Australia during a period of low community transmission. Institution-wide quantitative fit testing and detailed questionnaires assessing COVID-19 acquisition risk factors were undertaken from September 2020. HCWs diagnosed with COVID-19 in the period prior to the fit testing program (February 1st - August 31st 2020) were matched on a 1:3 ratio to HCWs who had not been diagnosed with COVID-19. Risk factors for COVID-19 acquisition, including fit testing outcome, were compared between groups. Results: A total of 1571 HCWs took part in fit testing programs. Seventy-two (4.6%) were diagnosed with COVID-19 within the study period. Younger age, nursing staff, close contact with a COVID-19 case, and working longer periods in wards with COVID-19 patients, were associated with COVID-19 infection. After matching for intensity of occupational exposure to infectious aerosols, close contact was the only independent variable associated with COVID-19 infection (OR 3.50, 95% CI:1.65-7.44, $p = 0.001$). Adequate fit test for the respirator predominately worn before the fit testing period was not associated with COVID-19 (OR 1.08, 95% CI:0.59 -1.98, $p = 0.815$). Conclusion: After controlling for intensity of occupational exposure to infectious aerosols, P2/ N95 respirator fit testing was not associated with reduced risk of COVID-19 infection. The utility of widespread fit testing to reduce HCW COVID-19 infections should be reconsidered. (c) 2023 Australasian College for Infection Prevention and Control. Published by Elsevier B.V. All rights reserved.

Jain S, Dempsey K, Clezy K, Bradd P.

Evaluation of health worker acceptance and tolerance of respirators in clinical practice-An Australian perspective.

American Journal of Infection Control. 2024;52(1):46-53.

<https://doi.org/10.1016/j.ajic.2023.07.003>

Background: One of the main infection prevention and control measures introduced during the COVID-19 pandemic was the focused application of respiratory protection to ensure health worker safety and the effective use of personal protective equipment. However, user acceptance of these strategies is paramount in sustainable compliance. This study explores various aspects of respirator use and provides recommendations to improve and maximize health worker safety. The aim of this study was to understand the relationship between respirator (P2/N95) comfort and user experience toward respiratory protection. The aim of this study was to understand the relationship between respirator (P2/N95) comfort and user experience toward respiratory protection. Methods: The nonexperimental cross-sectional design study was conducted in New South Wales, Australia between November and December 2022 using an anonymous self-administered online questionnaire in Microsoft Forms. Results: Of 2,514 respondents, 65% reported to have used a respirator every working day with only a few using a respirator once weekly or less (9%). Almost all respondents had completed at least one quantitative fit test (96%) prior to the survey. Fifty-nine percent reported to have experienced discomfort from wearing a respirator and the most reported adverse effect was difficulty communicating (64%), followed by skin irritation or acne (62%) and headache (56%). Conclusions:

Rapport de veille Risques biologiques n°127 – 04-06/2024

Despite somewhat less favorable ratings on comfort and communication, health workers are in favor of respiratory protection. However, a focus on tolerance of respirators and strategies to address adverse effects from prolonged respirator use must be considered when implementing policies and procedures. Moreover, resources must be allocated to improve the design, breathability, and sustainability of a respirator along with education and training on how to use respiratory protection safely and effectively. Crown Copyright (c) 2023 Published by Elsevier Inc. on behalf of Association for Professionals in Infection Control and Epidemiology, Inc. All rights reserved.

Nicas M.

A critique of Occupational Safety and Health Administration's halfmask respirator assigned protection factor.

Ann NY Acad Sci. 2024;8.

<https://doi.org/10.1111/nyas.15136>

Halfmask air-purifying respirators are used by millions of workers to reduce inhaling air contaminants, both chemical (e.g., asbestos, styrene) and biological (e.g., SARS-CoV-2, Mycobacterium tuberculosis). In 2006, the federal Occupational Safety and Health Administration (OSHA) promulgated a standard that gave halfmask respirators an assigned protection factor (APF) of 10. This signified that OSHA assumes a fit-tested and trained wearer will experience a 10% maximum total inward leakage of contaminated air into the facepiece. To derive APF = 10, OSHA analyzed data from 16 workplace studies of the efficacy of halfmask respirators worn against particulate contaminants. In this commentary, I contend that, in considering the data, OSHA made several errors that overstated halfmask respirator efficacy. The errors were (i) failing to properly account for within-wearer and between-wearer variability in respirator efficacy; (ii) ignoring the effect of particle deposition in the respiratory tract; (iii) aggregating unbalanced data within and between studies, and effectively double-counting the data in some studies; and (iv) ignoring the effect that particle size exerts in penetrating respirator facepiece leak paths. The net result is that OSHA's APF = 10 can lead to excessive toxicant exposure for many workers.

Onishi K, Nojima M.

Comparison of the inward leakage rate between N95 filtering facepiece respirators and modified surgical masks during the COVID-19 pandemic.

Environmental health and preventive medicine. 2024;29:11.

https://www.jstage.jst.go.jp/article/ehpm/29/0/29_23-00303/pdf

Background: Owing to shortage of surgical and N95 filtering facepiece respirators (FFRs) during the COVID-2019 pandemic, various masks were developed to prevent infection. This study aimed to examine the inward leakage rate (ILR) of sealed face masks and modified surgical masks using a quantitative fit test and compared it with the ILR of unmodified N95 FFRs. Methods: We conducted paired comparisons of ILRs of bent nose-fit wire masks, double masks, and N95 FFRs from October to December 2021. To measure the protective effectiveness of masks, participants wore masks, and the number of particles outside and inside the mask were measured. The ILR was based on the percentage of particles entering the mask using a fit tester. Results: We enrolled 54 participants (20 men and 34 women) in this study. The median ILR for surgical masks without and with a W-shaped bend in the nose-fit wire were 96.44% and 50.82%, respectively. The nose-fit wire adjustment reduced the ILR of surgical masks by a mean of 28.57%, which was significantly lower than the ILR without adjustment ($P < 0.001$). For double masks, with surgical or polyurethane masks on top of the W-shaped mask, the ILR did not

differ significantly from that of N95. Although the filtration performance of double surgical masks matched that of N95 masks, their ILR was notably higher, indicating that double masks do not provide equivalent protection. Conclusions: Wearing N95 masks alone is effective in many cases. However, surgical mask modifications do not guarantee consistent effectiveness. Properly selected, sealed masks with a good fit overcome leakage, emphasizing their crucial role. Without evidence, mask-wearing may lead to unexpected infections. Education based on quantitative data is crucial for preventing adverse outcomes.

Trotta F, Petrosino F, Pucciarelli G, Alvaro R, Vellone E, Bartoli D.

Reliability and validity of the training satisfaction questionnaire for family members (TSQ-FM) entering the ICU during an isolation disease outbreak.

Heart Lung. 2024;66:37-45.

<https://doi.org/10.1016/j.hrtlng.2024.03.004>

Background: The presence of family members in an isolated ICU during an isolation disease outbreak is restricted by hospital policies because of the infectious risk. This can be overcome by conferring to family members the skill and the ability to safely don and doff the personal protective equipment (PPE) through a nurse-led training intervention and assess their satisfaction, to respond to the need to define a safe, effective and quality care pathway focused on Family-Centered Care (FCC) principles. Objective: the study aimed to build a valid and reliable instrument for clinical practice to assess family members' satisfaction to allow ICU nurses to restore family integrity in any case of infectious disease outbreak that requires isolation. Methods: A cross-sectional study was conducted to test the psychometric properties. The questionnaire was constructed based on a literature review on the needs of family members in the ICU. 76 family members were admitted to a COVID-ICU. Cronbach's coefficient, Geomin rotated loading, and EFA were applied to assess the reliability and validity of the instrument. Results: The Kaiser-Meyer-Olkin (KMO) measure was 0.662, the Bartlett sphericity test showed a significant pvalue ($\chi^2=448.33$; $df=45$; $p < 0.01$), Cronbach's alpha coefficient was .896. A further CFA analysis confirmed that all fit indices were acceptable. The results showed satisfactory validity and reliability, which could be generalized and extended to any outbreak of isolation disease. Conclusions: This study provides a valid and reliable instrument for clinical practice to maintain family integrity in the dyadic relationship between the patient and the family member, even during an emergency infectious disease outbreak that requires isolation.

Wang GF, Luo CW, Cui C, Huang J.

Study on the relationship between the fitness of three types of N95 respirators and facial dimensions.

Journal of occupational and environmental hygiene. 2024;21(5):319-25.

<https://doi.org/10.1080/15459624.2024.2311295>

N95 respirators are the core equipment used by healthcare workers to prevent the spread of respiratory diseases. The protective effect of N95 against infection spread depends on the fit of the N95 to the wearer, which is related to the wearer's facial dimensions. The purpose of this cross-sectional study was to assess the relationship between the fit of three types of N95 and facial dimensions. A total of 305 healthcare workers from ten hospitals in Beijing were recruited for this study. Facial dimensions of workers were measured using Intel RealSense Depth Camera D435. Fit testing was conducted on three types of N95 using the TSI-8038 Porta Count Pro + Respirator Fit Tester. Possible associations between the fit test results and facial dimension data were examined. A Porta Count reading of 100 was used as

the criterion for an acceptable fit. The fit of the folding respirators was positively correlated with nose length ($r = 0.13$, $p = 0.02$), nose height ($r = 0.14$, $p = 0.02$), and face width ($r = 0.12$, $p = 0.03$), whereas that of flat respirators was correlated with nose width ($r = 0.16$, $p < 0.01$), chin length ($r = 0.18$, $p < 0.01$), and pro-face width ($r = 0.13$, $p = 0.02$), and that of arched respirators was correlated with the nose length ($r = 0.13$, $p = 0.03$). The fit of N95 for wearers depends on their facial features. The results of this study can provide advice for medical workers to choose the appropriate N95. Medical staff should fully consider their facial dimensions when choosing an appropriate N95 to improve the protective efficacy of respirators and to reduce the risk of infection by respiratory diseases.

- **Zoonoses : pathologies émergentes**

Baz-Flores S, Jiménez-Martín D, Peralbo-Moreno A, Herraiz C, Cano-Terriza D, Cuadrado-Matías R, et al.

Animal Exposure Model for Mapping Crimean-Congo Hemorrhagic Fever Virus Emergence Risk.

Emerging Infectious Disease journal. 2024;30(4):672.

https://wwwnc.cdc.gov/eid/article/30/4/22-1604_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977842/pdf/22-1604.pdf>

To estimate the determinants of spatial variation in Crimean-Congo hemorrhagic fever virus (CCHFV) transmission and to create a risk map as a preventive public health tool, we designed a survey of small domestic ruminants in Andalusia, Spain. To assess CCHFV exposure spatial distribution, we analyzed serum from 2,440 sheep and goats by using a double-antigen ELISA and modeled exposure probability with environmental predictors by using generalized linear mixed models. CCHFV antibodies detected in 84 samples confirmed low CCHFV prevalence in small domestic ruminants in the region. The best-fitted statistical model indicated that the most significant predictors of virus exposure risk were cattle/horse density and the normalized difference vegetation index. Model validation showed 99.7% specificity and 10.2% sensitivity for identifying CCHFV circulation areas. To map CCHFV exposure risk, we projected the model at a 1 × 1-km spatial resolution. Our study provides insight into CCHFV ecology that is useful for preventing virus transmission.

Besombes C, Mbrennga F, Gonofio E, Malaka C, Bationo C-S, Gaudart J, et al.

Seasonal Patterns of Mpox Index Cases, Africa, 1970–2021.

Emerging Infectious Disease journal. 2024;30(5):1017.

https://wwwnc.cdc.gov/eid/article/30/5/23-0293_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11060470/pdf/23-0293.pdf>

Across 133 confirmed mpox zoonotic index cases reported during 1970–2021 in Africa, cases occurred year-round near the equator, where climate is consistent. However, in tropical regions of the northern hemisphere under a dry/wet season cycle, cases occurred seasonally. Our findings further support the seasonality of mpox zoonotic transmission risk.

Cuadrado-Matías R, Moraga-Fernández A, Peralbo-Moreno A, Negrodo AI, Sánchez-Seco MP, Ruiz-Fons F.

Crimean-Congo haemorrhagic fever virus in questing non-Hyalomma spp. ticks in Northwest Spain, 2021.

Zoonoses and public health. 2024.

<https://doi.org/10.1111/zph.13130>

Crimean-Congo haemorrhagic fever (CCHF) unexpectedly emerged in humans in Northwest Spain in 2021, and two additional cases were reported in the region in 2022. The 2021 case was associated with a tick bite on the outskirts of the city where the patient lived. PCR analysis of 95 questing ticks collected in the outskirts of that city in 2021, none of the genus Hyalomma, revealed a prevalence of confirmed CCHF virus (CCHFV) infection of 10.5%. Our results in this emerging scenario suggest the need to consider that CCHFV may be effectively spreading to Northwest Spain and to urgently understand any possible role of non-Hyalomma spp. ticks in the eco-epidemiological dynamics of CCHFV.

de Franca DA, da Silva JS, Rodrigues NJL, Dure AID, Farinhas JH, Kmetiuk LB, et al.

Serosurvey of *Coxiella burnetii* in Police Officers and Working Dogs in Brazil: Case Report and One Health Implications.

Tropical Medicine and Infectious Disease. 2024;9(4):8.

https://mdpi-res.com/d_attachment/tropicalmed/tropicalmed-09-00078/article_deploy/tropicalmed-09-00078.pdf?version=1712389274

*Background: Although the *Coxiella burnetii* infection has been investigated in dogs, its role in human transmission remains to be fully established, particularly in close and daily human-dog contact settings, such as in Police K-9 Units. Methods: Accordingly, this study aimed to assess anti-*C. burnetii* antibodies in clinically healthy police officers by an in-house indirect immunofluorescence assay (IFA), and working dogs by a commercial IFA Kit, from the State Special Operations Battalion, Paran & acute;, Southern Brazil. Results: Overall, 1/18 (5.5%) police officers and 9/30 (30.0%; CI 95% 16.66-47.88) dogs tested seropositive to anti-*C. burnetii* IgG antibodies. Conclusions: To date, this is the highest prevalence of Q fever seropositivity among military dogs worldwide. Despite the low sampling rate, a statistically significant association was found between seropositivity and female dogs ($p = 0.0492$). Further studies with larger sample sizes should be conducted to establish the prevalence of Q Fever in other Brazilian K-9 Units. In summary, this study is the first to conduct a concomitant serosurvey of police officers and working dogs, and its findings should be considered a warning for cross-exposure and transmission of *Coxiella burnetii* among Police K-9 Units in Brazil and worldwide.*

Dieng I, Diarra M, Sadio BD, Sow B, Gaye A, Diallo A, et al.

Reemergence of Sylvatic Dengue Virus Serotype 2 in Kedougou, Senegal, 2020.

Emerging Infectious Disease journal. 2024;30(4):770.

https://wwwnc.cdc.gov/eid/article/30/4/23-1301_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977847/pdf/23-1301.pdf>

In 2020, a sylvatic dengue virus serotype 2 infection outbreak resulted in 59 confirmed dengue cases in Kedougou, Senegal, suggesting those strains might not require adaptation to reemerge into urban

transmission cycles. Large-scale genomic surveillance and updated molecular diagnostic tools are needed to effectively prevent dengue virus infections in Senegal.

Frank M, Weaver G, Raabe V.

Crimean-Congo Hemorrhagic Fever Virus for Clinicians—Epidemiology, Clinical Manifestations, and Prevention.

Emerging Infectious Disease journal. 2024;30(5):854.

https://wwwnc.cdc.gov/eid/article/30/5/23-1647_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11060446/pdf/23-1647.pdf>

Crimean-Congo hemorrhagic fever (CCHF) is a tickborne infection that can range from asymptomatic to fatal and has been described in >30 countries. Early identification and isolation of patients with suspected or confirmed CCHF and the use of appropriate prevention and control measures are essential for preventing human-to-human transmission. Here, we provide an overview of the epidemiology, clinical features, and prevention and control of CCHF. CCHF poses a continued public health threat given its wide geographic distribution, potential to spread to new regions, propensity for genetic variability, and potential for severe and fatal illness, in addition to the limited medical countermeasures for prophylaxis and treatment. A high index of suspicion, comprehensive travel and epidemiologic history, and clinical evaluation are essential for prompt diagnosis. Infection control measures can be effective in reducing the risk for transmission but require correct and consistent application.

Hennessee I, Barber E, Petro E, Lindemann S, Buss B, Santos A, et al.

Sporotrichosis Cluster in Domestic Cats and Veterinary Technician, Kansas, USA, 2022.

Emerging Infectious Disease journal. 2024;30(5):1053.

https://wwwnc.cdc.gov/eid/article/30/5/23-1563_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11060436/pdf/23-1563.pdf>

We describe a feline sporotrichosis cluster and zoonotic transmission between one of the affected cats and a technician at a veterinary clinic in Kansas, USA. Increased awareness of sporotrichosis and the potential for zoonotic transmission could help veterinary professionals manage feline cases and take precautions to prevent human acquisition.

Kalonji T, Malembi E, Matela JP, Likafi T, Kinganda-Lusamaki E, Vakaniaki EH, et al.

Co-Circulating Monkeypox and Swinepox Viruses, Democratic Republic of the Congo, 2022.

Emerging Infectious Disease journal. 2024;30(4):761.

https://wwwnc.cdc.gov/eid/article/30/4/23-1413_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977837/pdf/23-1413.pdf>

In September 2022, deaths of pigs manifesting pox-like lesions caused by swinepox virus were reported in Tshuapa Province, Democratic Republic of the Congo. Two human mpox cases were found concurrently in the surrounding community. Specific diagnostics and robust sequencing are needed to characterize multiple poxviruses and prevent potential poxvirus transmission.

Lelli D, Moreno A, Canziani S, Soliani L, Carrera M, Castelli A, et al.

Isolation of Batborne Neglected Zoonotic Agent Issyk-Kul Virus, Italy.

Emerging Infectious Disease journal. 2024;30(4):786.

https://wwwnc.cdc.gov/eid/article/30/4/23-1186_article

<https://wwwnc.cdc.gov/eid/article/30/4/pdfs/23-1186.pdf>

*We isolated Issyk-Kul virus (ISKV) from a bat sampled from Italy in 2021 and conducted ISKV-specific surveillance in bats collected in Italy during 2017–2023. ISKV circulation among synanthropic and sedentary species of bat, such as Savi's pipistrelle bat (*Hypsugo savii*) in northern Italy, may have public health implications in this region.*

Ling J, Lundeberg EE, Wasberg A, Faria I, Vucicevic S, Settergren B, Lundkvist Å.

Nephropathia Epidemica Caused by Puumala Virus in Bank Voles, Scania, Southern Sweden.

Emerging Infectious Disease journal. 2024;30(4):732.

https://wwwnc.cdc.gov/eid/article/30/4/23-1414_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977816/pdf/23-1414.pdf>

*In 2018, a local case of nephropathia epidemica was reported in Scania, southern Sweden, more than 500 km south of the previously known presence of human hantavirus infections in Sweden. Another case emerged in the same area in 2020. To investigate the zoonotic origin of those cases, we trapped rodents in Ballingslöv, Norra Sandby, and Sörby in southern Sweden during 2020–2021. We found Puumala virus (PUUV) in lung tissues from 9 of 74 *Myodes glareolus* bank voles by screening tissues using a hantavirus pan-large segment reverse transcription PCR. Genetic analysis revealed that the PUUV strains were distinct from those found in northern Sweden and Denmark and belonged to the Finnish PUUV lineage. Our findings suggest an introduction of PUUV from Finland or Karelia, causing the human PUUV infections in Scania. This discovery emphasizes the need to understand the evolution, cross-species transmission, and disease outcomes of this newly found PUUV variant.*

Liu TT, Liu HF, Jia YJ.

***Streptococcus suis* meningitis in China: a case report.**

Frontiers in public health. 2024;12:5.

<https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1369703/pdf>

Introduction: Streptococcus suis is one of the porcine pathogens that have recently emerged as a pathogen capable of causing zoonoses in some humans. Patients infected with S. suis can present with sepsis, meningitis, or arthritis. Compared to common pathogens, such as Meningococcus, Streptococcus pneumoniae, and Haemophilus influenzae, S. suis infections in humans have been reported only rarely. Methods: This case report described a 57-year-old man who presented with impaired consciousness and fever following several days of backache. He was a butcher who worked in an abattoir and had wounded his hands 2 weeks prior. The patient was dependent on alcohol for almost 40 years. S. suis was detected in the cerebrospinal fluid by metagenomic next-generation sequencing. Although he received adequate meropenem and low-dose steroid therapy, the patient suffered from bilateral sudden deafness after 5 days of the infection. The final diagnosis was S. suis meningitis and

sepsis. Results: The patient survived with hearing loss in both ears and dizziness at the 60-day follow-up. Discussion: We reported a case of S. suis infection manifested as purulent meningitis and sepsis. Based on literature published worldwide, human S. suis meningitis shows an acute onset and rapid progression in the nervous system. Similar to bacterial meningitis, effective antibiotics, and low-dose steroids play important roles in the treatment of human S. suis meningitis.

Meier-Stephenson V, Drebot M, Dimitrova K, DiQuinzio M, Fonseca K, Forrest D, et al.

Case Series of Jamestown Canyon Virus Infections with Neurologic Outcomes, Canada, 2011–2016.

Emerging Infectious Disease journal. 2024;30(5):874.

https://wwwnc.cdc.gov/eid/article/30/5/22-1258_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11060468/pdf/22-1258.pdf>

Jamestown Canyon virus (JCV) is a mosquito-borne orthobunyavirus in the California serogroup that circulates throughout Canada and the United States. Most JCV exposures result in asymptomatic infection or a mild febrile illness, but JCV can also cause neurologic diseases, such as meningitis and encephalitis. We describe a case series of confirmed JCV-mediated neuroinvasive disease among persons from the provinces of British Columbia, Alberta, Quebec, and Nova Scotia, Canada, during 2011–2016. We highlight the case definitions, epidemiology, unique features and clinical manifestations, disease seasonality, and outcomes for those cases. Two of the patients (from Quebec and Nova Scotia) might have acquired JCV infections during travel to the northeastern region of the United States. This case series collectively demonstrates JCV's wide distribution and indicates the need for increased awareness of JCV as the underlying cause of meningitis/meningoencephalitis during mosquito season.

Ramos GSS, Rego RFD, de Oliveira MFF, Rocha VDD, de Oliveira EP, Reis JN.

Streptococcus suis meningitis: An emerging zoonotic disease in Brazil.

Rev Soc Bras Med Trop. 2024;57:4.

<https://www.scielo.br/j/rsbmt/a/JypGvWxsMnYRXM55gthtj8n/?lang=en&format=pdf>

Streptococcus suis has been widely reported as a pathogen in animals, especially pigs. In terms of human health implications, it has been characterized as a zoonosis associated with the consumption of pork products and occupational exposure, particularly in Southeast Asian countries. Here, we present a rare case of human S. suis infection in Brazil, diagnosed in an older adult swine farmer, a small rural producer residing in the semi-arid region of Bahia, Brazil.

Rimondi A, Vanstreels RET, Olivera V, Donini A, Lauriente MM, Uhart M.

Highly Pathogenic Avian Influenza A(H5N1) Viruses from Multispecies Outbreak, Argentina, August 2023.

Emerging Infectious Disease journal. 2024;30(4):812.

https://wwwnc.cdc.gov/eid/article/30/4/23-1725_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977829/pdf/23-1725.pdf>

We report full-genome characterization of highly pathogenic avian influenza A(H5N1) clade 2.3.4.4b virus from an outbreak among sea lions (August 2023) in Argentina and possible spillover to fur seals

and terns. *Mammalian adaptation mutations in virus isolated from marine mammals and a human in Chile were detected in mammalian and avian hosts.*

Stammler R, Chevalier K, Benhamida S, Le Goff E, Lebut J, Lau N, et al.

The other great imitator among infectious diseases: Leptospirosis.

Rev Med Interne. 2024;45(3):132-7.

<https://doi.org/10.1016/j.revmed.2023.12.001>

Introduction. - Leptospirosis is a worldwide zoonosis responsible for highly diverse clinical presentations with a wide range of severity. Variable environment exposures to infected urines of rodents have been described. Observation. - We report five cases of serologically confirmed leptospirosis leading to hospitalization in an intensive care unit (ICU) of a French center. These patients displayed neurological, respiratory, and abdominal presentation of leptospirosis with variable level of severity. Either professional, leisure related, or daily living exposures have been retrieved. Conclusion. - These cases underline the diversity of clinical presentation and environmental exposure of this infectious disease. They highlight the interest of an exhaustive anamnesis with collection of professional activity, environmental exposures, and leisure activities. (c) 2023 Societe Nationale Française de Medecine Interne (SNFMI). Published by Elsevier Masson SAS. All rights reserved.

Wang Y, Yang C, Liu Y, Zhang J, Qu W, Liang J, et al.

Seroprevalence of Avian Influenza A(H5N6) Virus Infection, Guangdong Province, China, 2022.

Emerging Infectious Disease journal. 2024;30(4):826.

https://wwwnc.cdc.gov/eid/article/30/4/23-1226_article

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10977835/pdf/23-1226.pdf>

In 2022, we assessed avian influenza A virus subtype H5N6 seroprevalence among the general population in Guangdong Province, China, amid rising numbers of human infections. Among the tested samples, we found 1 to be seropositive, suggesting that the virus poses a low but present risk to the general population.

- **Légionellose**

Pijnacker R, Brandsema P, Euser S, Vahidnia A, Kuitert A, Limaheluw J, et al.

An outbreak of Legionnaires' disease linked to a municipal and industrial wastewater treatment plant, The Netherlands, September–October 2022.

Eurosurveillance. 2024;29(20):2300506.

<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2024.29.20.2300506>

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11100293/pdf/eurosurv-29-20_3.pdf

- **Endotoxines**

Iversen IB, Vestergaard JM, Basinas I, Ohlander J, Peters S, Bendstrup E, et al.

Risk of hypersensitivity pneumonitis and other interstitial lung diseases following organic dust exposure.

Thorax. 2024.

<https://thorax.bmj.com/content/thoraxjnl/early/2024/05/21/thorax-2023-221275.full.pdf>

BACKGROUND: Organic dust is associated with hypersensitivity pneumonitis, and associations with other types of interstitial lung disease (ILD) have been suggested. We examined the association between occupational organic dust exposure and hypersensitivity pneumonitis and other ILDs in a cohort study. METHODS: The study population included all residents of Denmark born in 1956 or later with at least 1 year of gainful employment since 1976. Incident cases of hypersensitivity pneumonitis and other ILDs were identified in the Danish National Patient Register 1994-2015. Job exposure matrices were used to assign individual annual levels of exposure to organic dust, endotoxin and wood dust from 1976 to 2015. We analysed exposure-response relations by different exposure metrics using a discrete-time hazard model. RESULTS: For organic dust, we observed increasing risk with increasing cumulative exposure with incidence rate ratios (IRR) per 10 unit-years of 1.19 (95% CI 1.12 to 1.27) for hypersensitivity pneumonitis and 1.04 (95% CI 1.02 to 1.06) for other ILDs. We found increasing risk with increasing cumulative endotoxin exposure for hypersensitivity pneumonitis and other ILDs with IRRs per 5000 endotoxin units/m(3)-years of 1.55 (95% CI 1.38 to 1.73) and 1.09 (95% CI 1.00 to 1.19), respectively. For both exposures, risk also increased with increasing duration of exposure and recent exposure. No increased risks were observed for wood dust exposure. CONCLUSION: Exposure-response relations were observed between organic dust and endotoxin exposure and hypersensitivity pneumonitis and other ILDs, with lower risk estimates for the latter. The findings indicate that organic dust should be considered a possible cause of any ILD. TRIAL REGISTRATION NUMBER: j.no.: 1-16-02-196-17.

Radbel J, Meshanni JA, Vayas KN, Le-Hoang O, Abramova E, Zhou P, et al.

Effects of ozone exposure on lung injury, inflammation, and oxidative stress in a murine model of non-pneumonic endotoxemia.

Toxicol Sci. 2024.

<https://academic.oup.com/toxsci/advance-article-abstract/doi/10.1093/toxsci/kfae062/7674866?redirectedFrom=fulltext>

Recent studies have identified exposure to environmental levels of ozone as a risk factor for the development of acute respiratory distress syndrome (ARDS), a severe form of acute lung injury (ALI) that can develop in humans with sepsis. The aim of this study was to develop a murine model of ALI to mechanistically explore the impact of ozone exposure on ARDS development. Mice were exposed to ozone (0.8 ppm, 3 hr) or air control followed 24 hr later by intravenous administration of 3 mg/kg lipopolysaccharide (LPS) or PBS. Exposure of mice to ozone + LPS caused alveolar hyperplasia; increased BAL levels of albumin, IgM, phospholipids, and proinflammatory mediators including surfactant protein D and soluble receptor for advanced glycation end products were also detected in BAL, along with markers of oxidative and nitrosative stress. Administration of ozone + LPS resulted in an increase in neutrophils and anti-inflammatory macrophages in the lung, with no effects on proinflammatory macrophages. Conversely, numbers of resident alveolar macrophages decreased after ozone + LPS;

however, expression of *Nos2*, *Arg1*, *Cxcl1*, *Cxcl2*, *Ccl2* by these cells increased, indicating that they are activated. These findings demonstrate that ozone sensitizes the lung to respond to endotoxin, resulting in ALI, oxidative stress and exacerbated pulmonary inflammation, and provide support for the epidemiologic association between ozone exposure and ARDS incidence.

Schwab AD, Wyatt TA, Moravec G, Thiele GM, Nelson AJ, Gleason A, et al.

Targeting transitioning lung monocytes/macrophages as treatment strategies in lung disease related to environmental exposures.

Respir Res. 2024;25(1):157.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11003126/pdf/12931_2024_Article_2804.pdf

BACKGROUND: Environmental/occupational exposures cause significant lung diseases. Agricultural organic dust extracts (ODE) and bacterial component lipopolysaccharide (LPS) induce recruited, transitioning murine lung monocytes/macrophages, yet their cellular role remains unclear. **METHODS:** CCR2 RFP(+) mice were intratracheally instilled with high concentration ODE (25%), LPS (10 µg), or gram-positive peptidoglycan (PGN, 100 µg) for monocyte/macrophage cell-trafficking studies. CCR2 knockout (KO) mice and administration of intravenous clodronate liposomes strategies were employed to reduce circulating monocytes available for lung recruitment following LPS exposure. Lung tissues and bronchoalveolar lavage fluid (BALF) were collected. Pro-inflammatory and/or pro-fibrotic cytokines, chemokines, and lung extracellular matrix mediators were quantitated by ELISA. Infiltrating lung cells including monocyte/macrophage subpopulations, neutrophils, and lymphocytes were characterized by flow cytometry. Lung histopathology, collagen content, vimentin, and post-translational protein citrullination and malondialdehyde acetaldehyde (MAA) modification were quantitated. Parametric statistical tests (one-way ANOVA, Tukey's multiple comparison) and nonparametric statistical (Kruskal-Wallis, Dunn's multiple comparison) tests were used following Shapiro-Wilk testing for normality. **RESULTS:** Intratracheal instillation of ODE, LPS, or PGN robustly induced the recruitment of inflammatory CCR2(+) CD11c(int)CD11b(hi) monocytes/macrophages and both CCR2(+) and CCR2(-) CD11c(-)CD11b(hi) monocytes at 48 h. There were also increases in CCR2(+) CD4(+) and CD8(+) T cells and NK cells. Despite reductions in LPS-induced lung infiltrating CD11c(int)CD11b(hi) cells (54% reduction), CCR2 knockout (KO) mice were not protected against LPS-induced inflammatory and pro-fibrotic consequences. Instead, compensatory increases in lung neutrophils and CCL2 and CCL7 release occurred. In contrast, the depletion of circulating monocytes through the administration of intravenous clodronate (vs. vehicle) liposomes 24 h prior to LPS exposure reduced LPS-induced infiltrating CD11c(int)CD11b(hi) monocyte-macrophage subpopulation by 59% without compensatory changes in other cell populations. Clodronate liposome pre-treatment significantly reduced LPS-induced IL-6 (66% reduction), matrix metalloproteinases (MMP)-3 (36%), MMP-8 (57%), tissue inhibitor of metalloproteinases (61%), fibronectin (38%), collagen content (22%), and vimentin (40%). LPS-induced lung protein citrullination and MAA modification, post-translational modifications implicated in lung disease, were reduced (39% and 48%) with clodronate vs. vehicle liposome. **CONCLUSION:** Highly concentrated environmental/occupational exposures induced the recruitment of CCR2(+) and CCR2(-) transitioning monocyte-macrophage and monocyte subpopulations and targeting peripheral monocytes may reduce the adverse lung consequences resulting from exposures to LPS-enriched inhalants.

Biotechnologies

- Nouveaux procédés

Abdelgalil SA, Kaddah MMY, Abo-Zaid GA.

Eggshell waste bioprocessing for sustainable acid phosphatase production and minimizing environmental hazards.

J Biol Eng. 2024;18(1):33.

<https://jbioleng.biomedcentral.com/counter/pdf/10.1186/s13036-024-00421-8.pdf>

Background The Environmental Protection Agency has listed eggshell waste as the 15th most significant food industry pollution hazard. Using eggshell waste as a renewable energy source has been a hot topic recently. Therefore, finding a sustainable solution for the recycling and valorization of eggshell waste by investigating its potential to produce acid phosphatase (ACP) and organic acids by the newly-discovered *B. sonorensis* was the target of the current investigation. *Results* Drawing on both molecular and morphological characterizations, the most potent ACP-producing *B. sonorensis* strain ACP2, was identified as a local bacterial strain obtained from the effluent of the paper and pulp industries. The use of consecutive statistical experimental approaches of Plackett-Burman Design (PBD) and Orthogonal Central Composite Design (OCCD), followed by pH-uncontrolled cultivation conditions in a 7 L bench-top bioreactor, revealed an innovative medium formulation that substantially improved ACP production, reaching 216 U L⁻¹ with an ACP yield coefficient $Y_{p/x}$ of 18.2 and a specific growth rate (μ) of 0.1 h⁻¹. The metals Ag⁺, Sn⁺, and Cr⁺ were the most efficiently released from eggshells during the solubilization process by *B. sonorensis*. The uncontrolled pH culture condition is the most suitable and favoured setting for improving ACP and organic acids production. Quantitative and qualitative analyses of the produced organic acids were carried out using liquid chromatography-tandem mass spectrometry (LC-MS/MS). Lactic acid, citric acid, and hydroxybenzoic acid isomer were the most common organic acids produced throughout the cultivation process. The findings of TGA, DSC, SEM, EDS, FTIR, and XRD analysis emphasize the significant influence of organic acids and ACP activity on the solubilization of eggshell particles. *Conclusions* This study emphasized robust microbial engineering approaches for the large-scale production of a newly discovered acid phosphatase, accompanied by organic acids production from *B. sonorensis*. The biovalorization of the eggshell waste and the production of cost-effective ACP and organic acids were integrated into the current study, and this was done through the implementation of a unique and innovative medium formulation design for eggshell waste management, as well as scaling up ACP production on a bench-top scale.

Bello MN, Sabri S, Mohd Yahaya N, Mohd Shariff F, Mohamad Ali MS.

Catalytically active inclusion bodies as a potential tool for biotechnology.

Biotechnol Appl Biochem. 2024.

The initial assumption that viewed inclusion bodies as a hindrance to the efficient production of protein is no longer held due to the emergence of catalytically active inclusion bodies (CatIBs). Recent studies revealed their potential to be used in free form or immobilized as biocatalysts. The curiosity to acquire suitable catalysts has remained the measure of concern for researchers and industrialists. Numerous processes and production in various sectors of food industries, petroleum, pharmaceutical, cosmetics, and many others are still searching for a robust catalyst with outstanding features such as recyclability, resistance to pH, as well as temperature. CatIBs are forms of inclusion bodies that

possess catalytic activity, which can improve catalysis efficiency, stability, and recyclability. One of the advantages of CatIBs is their potential to be used as catalysts for numerous bioprocesses when generated by an enzyme. These aggregates can efficiently be used as a replacement for traditional enzyme immobilization. This review tends to focus on the possibility of its application in various processes. The novelty of this review is that it considered the production of CatIBs both from artificial and natural perspectives, as well as how to improve it. Inclusion bodies' immobilization may provide an efficient alternative in the area of biocatalysis, and hence it will improve industrial sectors and substantially provide a means of achieving excellent performance in the near future.

Chattaraj S, Mitra D, Ganguly A, Thatoi H, Das Mohapatra PK.

A critical review on the biotechnological potential of Brewers' waste: Challenges and future alternatives.

Curr Res Microb Sci. 2024;6:18.

<https://www.sciencedirect.com/science/article/pii/S2666517424000105?via%3Dihub>

In order to comply with the stringent discharge guidelines issued by governmental organizations to protect the ecosystem, the substantial amounts of effluent and sturdy wastes produced by the beer brewing process need to be discarded or handled in the most affordable and secure manner. Huge quantities of waste material released with each brew bestow a significant opportunity for the brewing sector to move towards sustainability. The concept of circular economy and the development of technological advancements in brewery waste processing have spurred interest to valorize brewery waste for implementation in various sectors of medical and food science, industrial science, and many more intriguing fields. Biotechnological methods for valorizing brewery wastes are showing a path towards green chemistry and are feasible and advantageous to environment. The study unfolds most recent prospectus for brewery waste usage and discusses major challenges with brewery waste treatment and valorization and offers suggestions for further work.

Chaudhary V, Kumar M, Chauhan C, Sirohi U, Srivastav AL, Rani L.

Strategies for mitigation of pesticides from the environment through alternative approaches: A review of recent developments and future prospects.

Journal of environmental management. 2024;354:36.

Chemical-based pesticides are having negative impacts on both the healths of human beings and plants as well. The World Health Organisation (WHO), reported that each year, >25 million individuals in poor nations are having acute pesticide poisoning cases along with 20,000 fatal injuries at global level. Normally, only similar to 0.1% of the pesticide reaches to the intended targets, and rest amount is expected to come into the food chain/environment for a longer period of time. Therefore, it is crucial to reduce the amounts of pesticides present in the soil. Physical or chemical treatments are either expensive or incapable to do so. Hence, pesticide detoxification can be achieved through bioremediation/biotechnologies, including nano-based methodologies, integrated approaches etc. These are relatively affordable, efficient and environmentally sound methods. Therefore, alternate strategies like as advanced biotechnological tools like as CRISPR Cas system, RNAi and genetic engineering for development of insects and pest resistant plants which are directly involved in the development of disease- and pestresistant plants and indirectly reduce the use of pesticides. Omics tools and multi omics approaches like metagenomics, genomics, transcriptomics, proteomics, and metabolomics for the efficient functional gene mining and their validation for bioremediation of pesticides also discussed from the literatures. Overall, the review focuses on the most recent advancements in bioremediation methods to lessen the effects of pesticides along with the role of

microorganisms in pesticides elimination. Further, pesticide detection is also a big challenge which can be done by using HPLC, GC, SERS, and LSPR ELISA etc. which have also been described in this review.

da Silva AS, Adriani PP, de Oliveira GS, Rocha ARL, Perpétuo EA, Dias MVB, Chambergo FS.

Biochemical characterization of an esterase from *Thermobifida fusca* YX with acetyl xylan esterase activity.

Mol Biol Rep. 2024;51(1):767.

<https://link.springer.com/article/10.1007/s11033-024-09601-7>

*BACKGROUND: Esterases (EC 3.1.1.X) are enzymes that catalyze the hydrolysis ester bonds. These enzymes have large potential for diverse applications in fine industries, particularly in pharmaceuticals, cosmetics, and bioethanol production. METHODS AND RESULTS: In this study, a gene encoding an esterase from *Thermobifida fusca* YX (TfEst) was successfully cloned, and its product was overexpressed in *Escherichia coli* and purified using affinity chromatography. The TfEst kinetic assay revealed catalytic efficiencies of $0.58 \text{ s}^{-1} \text{ mM}^{-1}$, $1.09 \text{ s}^{-1} \text{ mM}^{-1}$, and $0.062 \text{ s}^{-1} \text{ mM}^{-1}$ against *p*-Nitrophenyl acetate, *p*-Nitrophenyl butyrate, and 1-naphthyl acetate substrates, respectively. Furthermore, TfEst also exhibited activity in a pH range from 6.0 to 10.0, with maximum activity at pH 8.0. The enzyme demonstrated a half-life of 20 min at 70 °C. Notably, TfEst displayed acetyl xylan esterase activity as evidenced by the acetylated xylan assay. The structural prediction of TfEst using AlphaFold indicated that has an α/β -hydrolase fold, which is consistent with other esterases. CONCLUSIONS: The enzyme stability over a broad pH range and its activity at elevated temperatures make it an appealing candidate for industrial processes. Overall, TfEst emerges as a promising enzymatic tool with significant implications for the advancement of biotechnology and biofuels industries.*

Gholap AD, Uddin MJ, Faiyazuddin M, Omri A, Gowri S, Khalid M.

Advances in artificial intelligence for drug delivery and development: A comprehensive review.

Comput Biol Med. 2024;178:108702.

<https://doi.org/10.1016/j.compbio.2024.108702>

Artificial intelligence (AI) has emerged as a powerful tool to revolutionize the healthcare sector, including drug delivery and development. This review explores the current and future applications of AI in the pharmaceutical industry, focusing on drug delivery and development. It covers various aspects such as smart drug delivery networks, sensors, drug repurposing, statistical modeling, and simulation of biotechnological and biological systems. The integration of AI with nanotechnologies and nanomedicines is also examined. AI offers significant advancements in drug discovery by efficiently identifying compounds, validating drug targets, streamlining drug structures, and prioritizing response templates. Techniques like data mining, multitask learning, and high-throughput screening contribute to better drug discovery and development innovations. The review discusses AI applications in drug formulation and delivery, clinical trials, drug safety, and pharmacovigilance. It addresses regulatory considerations and challenges associated with AI in pharmaceuticals, including privacy, data security, and interpretability of AI models. The review concludes with future perspectives, highlighting emerging trends, addressing limitations and biases in AI models, and emphasizing the importance of collaboration and knowledge sharing. It provides a comprehensive overview of AI's potential to transform the pharmaceutical industry and improve patient care while identifying further research and development areas.

Kalgeri SH, Doddawad VG, Shivakumar AT, Shankar PM, Kumar BBS, Bharadwaj RS.

Xerostomia: Current advancements and insights in biomedical and biotechnology research.

Biomed Biotech Res J. 2024;8(1):1-12.

https://doi.org/10.4103/bbrj.bbrj_240_23

Xerostomia, commonly referred to as dry mouth, is a medical condition where the flow of saliva in the mouth is reduced or completely absent. Xerostomia is not categorized as a particular disease entity but is a symptom associated with decreased or lack of salivary secretion. Its effects on oral health and overall well-being can be significant and it can be caused by various factors such as medication use, radiation therapy, surgery, salivary gland problems, and other underlying medical conditions. A health-care professional typically diagnoses xerostomia by evaluating a patient's symptoms and conducting a physical clinical exam. The patient's medical and medication history may also be reviewed to identify any potential underlying causes. Decreased salivary secretion can make chewing, breaking up the food and the formation of a food bolus difficult, which increases the risk of incorrect swallowing as well as altered taste and can contribute to the experience of dysphagia. It is crucial for individuals experiencing xerostomia to seek medical attention from a health-care professional to determine the underlying cause and develop a suitable management plan. Xerostomia represents a serious problem with medical and dental implications. The search for related articles was conducted through databases including PubMed, Science Direct, and Google Scholar. This comprehensive review article offers the latest insights into the origins, diagnosis, and treatment of xerostomia, with a particular focus on prevention. In addition, it recognizes the significant impact of innovative approaches in addressing xerostomia and highlights their valuable contribution to its management.

Liao L, Shen X, Shen Z, Du G, Li J, Zhang G.

CRISPR/Cas9-Based Genome Editing for Protein Expression and Secretion in *Kluyveromyces lactis*.

ACS synthetic biology. 2024.

<https://doi.org/10.1021/acssynbio.4c00157>

*The budding yeast *Kluyveromyces lactis* has emerged as a promising microbial chassis in industrial biotechnology. However, a lack of efficient molecular genetic manipulation tools and strategies has hindered the development of *K. lactis* as a biomanufacturing platform. In this study, we developed and applied a CRISPR/Cas9-based genome editing method to *K. lactis*. Single-gene editing efficiency was increased to 80% by disrupting the nonhomologous end-joining-related gene *KU80* and performing a series of process optimizations. Subsequently, the CRISPR/Cas9 system was explored based on different sgRNA delivery modes for simultaneous multigene editing. With the aid of the color indicator, the editing efficiencies of two and three genes reached 73.3 and 36%, respectively, in the *K Δ KU80* strain. Furthermore, the CRISPR/Cas9 system was used for multisite integration to enhance lactase production and combinatorial knockout of *TMED10* and *HSP90* to characterize the extracellular secretion of lactase in *K. lactis*. Generally, genome editing is a powerful tool for constructing *K. lactis* cell factories for protein and chemical production.*

Liu S, Chen Q, Ding H, Song Y, Pan Q, Deng H, Zeng EY.

Differences of microplastics and nanoplastics in urban waters: Environmental behaviors, hazards, and removal.

Water research. 2024;260:121895.

<https://doi.org/10.1016/j.watres.2024.121895>

Microplastics (MPs) and nanoplastics (NPs) are ubiquitous in the aquatic environment and have caused widespread concerns globally due to their potential hazards to humans. Especially, NPs have smaller sizes and higher penetrability, and therefore can penetrate the human barrier more easily and may pose potentially higher risks than MPs. Currently, most reviews have overlooked the differences between MPs and NPs and conflated them in the discussions. This review compared the differences in physicochemical properties and environmental behaviors of MPs and NPs. Commonly used techniques for removing MPs and NPs currently employed by wastewater treatment plants and drinking water treatment plants were summarized, and their weaknesses were analyzed. We further comprehensively reviewed the latest technological advances (e.g., emerging coagulants, new filters, novel membrane materials, photocatalysis, Fenton, ozone, and persulfate oxidation) for the separation and degradation of MPs and NPs. Microplastics are more easily removed than NPs through separation processes, while NPs are more easily degraded than MPs through advanced oxidation processes. The operational parameters, efficiency, and potential governing mechanisms of various technologies as well as their advantages and disadvantages were also analyzed in detail. Appropriate technology should be selected based on environmental conditions and plastic size and type. Finally, current challenges and prospects in the detection, toxicity assessment, and removal of MPs and NPs were proposed. This review intends to clarify the differences between MPs and NPs and provide guidance for removing MPs and NPs from urban water systems.

Naveira-Pazos C, Veiga MC, Mussagy CU, Farias FO, Kennes C, Pereira JFB.

Carotenoids production and extraction from *Yarrowia lipolytica* cells: A biocompatible approach using biosolvents.

Sep Purif Technol. 2024;343:11.

<https://www.sciencedirect.com/science/article/pii/S138358662400875X?via%3Dihub>

*The use of carotenoids, pigments with significant importance in the food and pharmaceutical industries, has been widely recognized because of their functions as colorants and antioxidants. The production of carotenoids from oleaginous yeasts is an efficient and eco-friendly alternative to that of synthetic carotenoids. *Yarrowia lipolytica*, due to its ability to synthesize high-value-added compounds, including carotenoids and lipids, has emerged as a promising biotechnological platform for this purpose. This study aimed to evaluate the efficiency of biosolvents for carotenoid extraction with the goal of replacing toxic organic solvents that pose risks to both human health and the environment. The Solid-Liquid Extraction (SLE) technique was employed to disrupt the rigid cell wall and extract intracellular pigments. Subsequent extractions were conducted using a 2:3:1 (w/w/w) ratio of ethanol:ethyl acetate:water, resulting in a total beta-carotene concentration of approximately 5 mg beta-carotene equivalent/g dry biomass. The COSMO-SAC model was utilized to elucidate the solute-solvent affinity, and the results obtained were consistent with the experimental findings. To improve the process, various ratios of biosolvents were investigated, and a subsequent Solid-Liquid-Liquid Extraction (SLLE) was introduced. Process integration and adjustments to the mixed biosolvent composition achieved yields ranging from 50 to 100 % in just four consecutive extractions. The proposed integrative platform not only enhances the efficiency of the extraction process but also enables the fractionation and purification of bioproducts from *Y. lipolytica* cells, thereby maximizing their biotechnological potential.*

Zorrón M, Cabrera AL, Sharma R, Radhakrishnan J, Abbaszadeh S, Shahbazi MA, et al.

Emerging 2D Nanomaterials-Integrated Hydrogels: Advancements in Designing Theragenerative Materials for Bone Regeneration and Disease Therapy.

Advanced science (Weinheim, Baden-Wurttemberg, Germany). 2024:e2403204.

<https://doi.org/10.1002/adv.202403204>

This review highlights recent advancements in the synthesis, processing, properties, and applications of 2D-material integrated hydrogels, with a focus on their performance in bone-related applications. Various synthesis methods and types of 2D nanomaterials, including graphene, graphene oxide, transition metal dichalcogenides, black phosphorus, and MXene are discussed, along with strategies for their incorporation into hydrogel matrices. These composite hydrogels exhibit tunable mechanical properties, high surface area, strong near-infrared (NIR) photon absorption and controlled release capabilities, making them suitable for a range of regeneration and therapeutic applications. In cancer therapy, 2D-material-based hydrogels show promise for photothermal and photodynamic therapies, and drug delivery (chemotherapy). The photothermal properties of these materials enable selective tumor ablation upon NIR irradiation, while their high drug-loading capacity facilitates targeted and controlled release of chemotherapeutic agents. Additionally, 2D-materials -infused hydrogels exhibit potent antibacterial activity, making them effective against multidrug-resistant infections and disruption of biofilm generated on implant surface. Moreover, their synergistic therapy approach combines multiple treatment modalities such as photothermal, chemo, and immunotherapy to enhance therapeutic outcomes. In bio-imaging, these materials serve as versatile contrast agents and imaging probes, enabling their real-time monitoring during tumor imaging. Furthermore, in bone regeneration, most 2D-materials incorporated hydrogels promote osteogenesis and tissue regeneration, offering potential solutions for bone defects repair. Overall, the integration of 2D materials into hydrogels presents a promising platform for developing multifunctional theragenerative biomaterials.

Organismes français et internationaux - Actualités

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

- **Antibiorésistance**

ANSES, [Vers une surveillance décloisonnée de l'antibiorésistance](#), 22/05/2024.

- **Bactéries**

OMS,

[L'OMS publie un rapport sur les avancées dans la mise au point de médicaments antibactériens](#), 14/06/2024.

[L'OMS met à jour la liste des bactéries résistantes aux médicaments qui représentent la plus grande menace pour la santé humaine](#), 17/05/2024.

INSERM, [Pneumonie : De bonnes bactéries pour guérir des mauvaises ?](#), 17/06/2024.

Santé Publique France, [Description et mesures de gestion des cas d'infections invasives à streptocoque A depuis 2015 et pendant l'alerte nationale 2022-2023, Auvergne-Rhône-Alpes](#), 07/05/2024.

- **Biomatériaux**

INSERM, [C'est mécanique ! La chromatine régule la force d'adhésion des cellules](#), 10/06/2024.

- **Crises sanitaires**

COVARS,

[Avis sur le développement, la gouvernance et l'accès aux bases de données de santé humaine en anticipation des crises sanitaires](#), 26/06/2024.

[Evaluation des Risques de Situations Sanitaires Exceptionnelles majeures pour la santé humaine en France au cours des années 2025-2030](#), 18/04/2024.

- **Choléra**

COVARS, [Auto-Saisine sur le Renforcement de la Prévention de la propagation de l'épidémie de Choléra à Mayotte](#), 07/05/2024.

HCSP, [Vaccination et gestion des corps dans un contexte de choléra à Mayotte](#), 06/05/2024.

Santé Publique France,

[Choléra à Mayotte. Point au 26 juin 2024](#), 28/06/2024.

[Épidémie de choléra à Mayotte : Santé publique France est mobilisée et appelle au renfort de professionnels de santé volontaires](#), 17/05/2024.

- **Coqueluche**

DGS-Urgent, [Intensification de la circulation de la coqueluche en France et en Europe](#), 07/06/2024.

Santé Publique France, [Résurgence de la coqueluche en France : les mesures de prévention sont essentielles pour éviter des cas graves et des décès chez les nourrissons](#), 07/06/2024.

- **COVID-19**

HAS, [Covid-19 : structurer le parcours de soins de l'adulte présentant des symptômes prolongés \(« Covid long »\)](#), 02/05/2024.

Santé Publique France,

[Prévalence du COVID long dans la population adulte générale selon différentes définitions et selon les caractéristiques de l'infection et sociodémographique. Une enquête nationale par sondage aléatoire à l'automne 2022](#), 07/05/2024.

[Activités et profils des patients affectés par l'épidémie de Covid-19 au centre hospitalier universitaire de Bordeaux](#), 07/05/2024.

- **Diphtérie**

Ministère de la Santé, [La vaccination, le meilleur moyen pour se prémunir contre la diphtérie](#), 28/06/2024.

- **Jeux olympiques et paralympiques – organisation des soins**

Ministère de la Santé, [Foire aux questions organisation des soins Jeux olympiques et paralympiques](#), 20/06/2024.

- **Maladies à prions**

Santé Publique France, [Épidémiologie des encéphalopathies subaiguës spongiformes transmissibles \(ESST\) en France, 2011-2019](#), 09/04/2024.

- **Pandémies**

OMS, [Les États Membres de l'OMS conviennent de la voie à suivre pour conclure l'accord sur les pandémies](#), 28/05/2024.

- **Parvovirus**

Santé Publique France, [Épidémie d'infections à Parvovirus B19 en France, point](#) au 28/06/2024.

- **Vaccination**

CDC (US),

[CDC Recommends Updated 2024-2025 COVID-19 and Flu Vaccines for Fall/Winter Virus Season](#), 27/06/2024.

[CDC Updates RSV Vaccination Recommendation for Adults](#), 26/06/2024.

HAS, [Simplifions les vaccinations](#), 25/04/2024.

- **Voyageurs – Recommandations sanitaires**

HCSP, [Recommandations sanitaires 2024 aux voyageurs](#), 20/06/2024.

- **Zoonoses**

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