Bulletin de veille risques biologiques N°128 – Août-octobre 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.

Les bulletins de veille sont disponibles sur le portail documentaire de l'INRS. L'abonnement permet de recevoir une alerte mail lors de la publication d'un nouveau bulletin (bouton « M'abonner » disponible après connexion à son compte).

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

Uyanga KA, Li WX, Daoud WA.

Exploiting cellulose-based hydrogels for sustainable, intelligent wearables in pandemic preparedness and control.

Eur Polym J. 2024;212:25.

https://www.sciencedirect.com/science/article/pii/S0014305724003021?via%3Dihub

Following the rise of emerging infectious diseases (EIDs), hydrogel biomaterials are being explored for drugs and vaccines. Progress in designs, controlled-release mechanisms and well-defined microstructure highlight their untapped potential, exploitable as intelligent wearables host matrix, sensor or barrier coatings for pandemics. In particular, cellulose-based hydrogels can enhance the much-desired mechanical strength, flexibility, biocompatibility, affordability, smart-response, and durability of wearables. Besides, cellulose-based hydrogels provide an environmentally friendly solution for limiting pathogen transmission when used in personal protective equipment (PPE), alleviating substantial pressure on the environment associated with PPE disposal. Anticipating a continuous battle against EIDs, herein, we propose a sustainable preparedness and control approach based on hydrogel-wearable technology. First, we overview basic information on Coronaviruses, Human monkeypox, Ebola, Marburg virus, Lassa fever, Nipah, Rift valley fever, Zika and Crimean-Congo haemorrhagic fever to draw inferences, analyze the role of cellulose-based hydrogel in infectious disease control, and discuss recent advances in fundamental hydrogel and wearable technologies. Based on the successes and challenges, we advocate synergizing these technologies. Second, to illustrate the environmental benefits of cellulose-based hydrogel wearables, using the method CML-IA baseline V3.06/EU25, we assess the environmental impacts of a single-use surgical mask versus cellulose-based hydrogel, showing the energy and environmental footprint that could be saved. This study offers insights into the potential applications of hydrogel-based wearables to ameliorate pandemic preparedness and control in the post-COVID-19 era.

Wyer M, Hor SY, Ferguson PE, Morath A, Barratt R, Priestley CM, et al.

Using Video-Reflexive Methods to Develop a Provider Down Protocol for the New South Wales Biocontainment Center.

Health security. 2024:11.

https://doi.org/10.1089/hs.2023.0165

The New South Wales Biocontainment Centre is a statewide referral facility for patients with high-consequence infectious disease (HCID). The facility collaborates with researchers to adapt existing HCID procedures such as donning and doffing of personal protective equipment (PPE). However, information on how to respond safely to collapse of a healthcare provider in full PPE within a contaminated zone is scarce. To address this gap, we adapted Nebraska Medicine's "provider down" protocol on paper and then simulated and video recorded the process, iteratively, in the facility. Clinicians analyzed the recordings collaboratively in researcher-facilitated reflexive discussions. Our primary aim was to ascertain how to maintain optimal infection prevention and control while providing urgent care for the healthcare provider. We tested participants' suggested modifications, in repeated video recorded simulations, until consensus on optimal practice was achieved. Our

secondary aim was to assess the utility of video-reflexive methods to enhance clinicians' awareness and understanding of infection prevention and control in a rare and complex scenario. Six adaptations and simulations were discussed in video-reflexive sessions before consensus was reached; the final version of the protocol differed considerably from the first. Viewing footage of simulations in situ enabled participants to (1) identify infection and occupational risks not identified on paper or during verbal postsimulation debriefs and (2) test alternative perspectives on safe procedure. Video-reflexivity enables context-sensitive and consensus-building codesign of policies and procedures, critical to protocol development in a new unit. It contributes to a culture of teamwork, preparedness, and confidence before, rather than in the heat of, a crisis.

Zweers LN, Tingen-Wieland M, Bowles E, van Tricht J, Velers J, Tostmann A, Rovers CP.

Improving Safety and Comfort of Healthcare Workers Caring for Patients With High-Consequence Infectious Diseases in a High-Level Isolation Unit Using Innovative Approaches.

Health security. 2024:13.

https://www.liebertpub.com/doi/abs/10.1089/hs.2023.0147

Patients with high-consequence infectious diseases (HCIDs) require high-quality care by specially trained staff in a high-level isolation unit (HLIU) that follows strict infection prevention and control (IPC) measures. Caring for patients with (suspected) HCID is challenging, mainly because of the strict personal protective equipment (PPE) and IPC protocols healthcare workers (HCW) must adhere to for protection. The Radboud University Medical Center, located in Nijmegen, the Netherlands, has been a dedicated HLIU facility since 2008. A newly built HLIU opened in May 2022, and encouraged us to review the existing PPE selection, IPC protocols, and HCID training program to improve safety and comfort for HCWs working in the HLIU. Based on a systematic search through (inter)national HCID PPE guidelines and semistructured interviews with end users, we selected an improved, more comfortable set of PPE. Additionally, we developed a more concise and easier-to-use patient care process flow and implemented a new teaching strategy. The new way of working was tested in October 2022 when the first 2 patients with suspected HCID were admitted to our unit. We used surveys to evaluate the experiences of HCWs involved in this care to further improve the workflow of the unit. When optimizing safety and comfort for HCWs, it is important to consider (inter)national guidelines as well as user preferences. By systematically evaluating recent experiences of patient admission to the HLIU and then adjusting protocols and training, we can ensure that the quality of provided healthcare and the safety of HCWs working in the HLIU remains high.

- ## Protection respiratoire : ajustement

Fu LZ, Guo JZ, Zhang Y, Jing XH, Lu LH, Wang Y, et al.

Quantification and influence factor analysis on total inward leakage of N95 respirators by simulating healthcare professional's procedures.

Building Simulation. 2024:18.

https://link.springer.com/article/10.1007/s12273-024-1144-3

Respiratory protection is critical to minimize airborne infection risk for healthcare workers. The main factor affecting infection risk in the medical scenario is leakage between the respirator and the healthcare workers' face. However, it is difficult to quantify the effectiveness of respirators due to the numerous influencing factors. The medical activities were simulated by the fitting test, and the

inverse of the results were used to get the total inward leakage of respirators. 114 subjects were divided according to gender, profession, age, risk area, and BMIs, participated in fitting test of four N95 respirators. The result showed that the value range of total inward leakage for tested N95 respirators was between 0.50% and 2.39%. Flat-folded respirators were more prone to leakage than cup-shaped ones, so it was essential to account for the impact of respirator shape. Similarly, this study found that gender and profession had no significant correlation with total inward leakage. Some medical procedures include bending, and turning head from side to side, or up and down, which had a significant influence on the protective efficacy of the N95 respirator. Facial dimensions and BMI exerted a more pronounced influence on the protective efficacy of the N95 respirator, and they were in the correlations. Healthcare personnels wore a well-fitting N95 respirator properly for excellent protection, reducing occurrence of nosocomial infections and occupational exposures, and optimizing respiratory protection strategies.

Hackett L, Zhang M, Casey M, Miller J, Smith J, Low C, et al.

N-95/P2 respirator compliance with fit testing recommendations and respirator satisfaction amongst hospital staff.

Infect Dis Health. 2024;29(3):144-51.

https://www.sciencedirect.com/science/article/pii/S2468045124000233?via%3Dihub

Background: Filtering Facepiece Respirators (FFRs) are an important and readily scalable infection control measure; however their effectiveness is ultimately determined by compliance. We aimed to examine staff compliance and satisfaction with wearing the N95/ P2 FFRs assigned to them via the standardised fit testing protocol implemented in a single large healthcare network in Victoria, Australia. Methods: In this cross-sectional survey, employees from five hospital campuses who participated in the health networks N95/P2 FFR fit testing process were invited in person to participate in the study. Data were analysed descriptively, after which chi-squared analysis was performed to determine differences between respirator types, gender, and age groups. Results: Amongst the 258 staff members surveyed, 28% had either never or only sometimes worn an FFR to which they had been successfully fit tested, and 11% had experienced facial changes that potentially rendered their most recent fit test invalid. More than half (53%) of those surveyed had experienced side effects, the most common being skin irritation and pressure sores. A majority (87%) of staff felt that wearing an FFR had some impact on their ability to perform their duties. Pooled mean self-reported satisfaction ratings were highest for threepanel flat-fold and duckbill models. Conclusion: 28% of HCWs surveyed described not wearing N-95/P2 FFRs for which they had successfully been fit tested. Reasons for non-compliance remain unclear, but rates of side effects and interference with duties were high. Further research is required to determine and address potential causative factors and ascertain ongoing optimal organisation-level fit test strategies. <feminine ordinal indicator> 2024 The Authors. Published by Elsevier B.V. on behalf of Australasian College for Infection Prevention and Control. This is an open access article under the CC BY license (http:// creativecommons.org/licenses/by/4.0/).

Ng I, Bodas C, Roberts M, Coe A, Smith M, McCann H, Williams DL.

Development of a rapid, multi-organisational, multi-modal assessment of a newly available disposable respirator.

Infect Dis Health. 2024;29(3):124-9.

https://www.sciencedirect.com/science/article/pii/S2468045124000208?via%3Dihub

*Background: A rapid large-scale evaluation of a newly available duckbill style P2/ N95 respirator, the Care Essentials (CE) MSK-003, was required to determine its suitability for deployment into the Victorian healthcare service. The aims of this study were to assess the feasibility of establishing a rapid, multi-organisational and multi-modal evaluation of the respirator, and to investigate whether this respirator would meet the needs of healthcare workers. Methods: The evaluation was a collaboration among three healthcare organisations - two tertiary hospitals in metropolitan Melbourne and a rural-based hospital. Participants were healthcare workers undertaking their routine fit tests. They were required to complete quantitative fit testing and a usability assessment survey on the CE MSK-003 respirator. The a priori performance criteria were set as fit test pass rate of >70%, plus satisfactory subjective overall comfort and performance assessments, defined as a rating of adequate, good, or very good in >90% of the cohort. Results: A total of 1070 participants completed the multi-modal assessment within a month. Seventy-eight percent of participants passed their quantitative fit test. Over 90% of survey respondents reported that the CE MSK-003 was adequate, good or very good in terms of its overall comfort and performance assessments.
 Conclusion: We demonstrated that a multi-modal evaluation of a new respirator can be rapidly conducted with a high level of participation in a controlled, consistent manner across multiple organisations. The evaluation results of the CE MSK-003 respirator exceeded our predetermined (a priori) minimal criteria, making it suitable for broad distribution to health-care organisations.
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Pennington ER, Griffin JS, McInroe EM, Steinhardt W, Chen H, Samet JM, Prince SE.

Variation in the fitted filtration efficiency of disposable face masks by sex.

Journal of Exposure Science and Environmental Epidemiology. 2024:8.

https://www.nature.com/articles/s41370-024-00697-4.pdf

Background & objectiveDisposable face masks are a primary protective measure against the adverse health effects of exposure to infectious and toxic aerosols such as airborne viruses and particulate air pollutants. While the fit of high efficiency respirators is regulated in occupational settings, relatively little is known about the fitted filtration efficiencies of ear loop style face masks worn by the public.MethodsWe measured the variation in fitted filtration efficiency (FFE) of four commonly worn disposable face masks, in a cohort of healthy adult participants (N = 100, 50% female, 50% male, average age = 32.3 +/- 9.2 years, average BMI = 25.5 +/- 3.4) using the U.S. Occupational Safety and Health Administration Quantitative Fit Test, for an N95 (respirator), KN95, surgical, and KF94 masks. The latter three ear loop style masks were additionally tested in a clip-modified condition, tightened using a plastic clip to centrally fasten loops in the back of the head.ResultsThe findings show that sex is a major determinant of the FFE of KN95, surgical, and KF94 masks. On average, males had an 11% higher FFE relative to females, at baseline testing. We show that a simple modification using an ear loop clip, results in improvements in the average FFE for females but provides comparatively minor changes for males. On average, females had a 20% increased FFE when a clip was worn behind the head, relative to a 6% increase for males.ImpactThe efficacy of a disposable face mask as protection against air contaminants depends on the efficiency of the mask materials and how well it fits the wearer. We report that the sex of the wearer is a major determinant of the baseline fitted filtration efficiency (FFE) of commonly available ear loop style face masks. In addition, we show that a simple fit modifier, an ear loop clip fastened behind the head, substantially improves baseline FFE for females but produces only minor changes for males. These findings have significant public health implications for the use of face masks as a protective intervention against inhalational exposure to airborne contaminants.

- **Zoonoses : pathologies émergentes**

Addo SO, Amoah S, Unicorn NM, Kyeremateng ET, Desewu G, Obuam PK, et al.

Molecular Detection of Tick-Borne Pathogens in Kumasi: With a First Report of Zoonotic Pathogens in Abattoir Workers.

Biomed Research International. 2024;2024:10.

https://doi.org/10.1155/2024/4848451

Tick-borne pathogens continue to infect humans and animals worldwide. By adapting to the movement of livestock, ticks facilitate the spread of these infectious pathogens. Humans in close contact with animals that could be amplifying hosts are especially at risk of being infected with tick-borne pathogens. This study involved the collection of dry blood spots (DBSs) to determine tick-borne pathogens occurring in slaughtered livestock and abattoir workers in Kumasi. This study employed the use of conventional PCR, RT-PCR, and Sanger sequencing to detect and identify the tick-borne pathogens. The resulting data was analysed using Stata version 13. A total of 175 DBSs were collected from goats (76), cattle (54), and sheep (45) in the Kumasi abattoir (130, 74.29%) and Akwatia Line slaughter slab (45, 25.71%). The pathogens identified were mostly bacterial including Anaplasma capra (9.71%), Anaplasma phagocytophilum (1.14%), and Rickettsia aeschlimannii (0.57.%). The only parasite identified was Theileria ovis (9.14%). A significant association was seen between A. capra ($p<0.001$) infection and female sheep sampled from the Akwatia Line slaughter slab. Again, there was a significant association between T. ovis ($p<0.001$) infections and female sheep from the Kumasi abattoir. From the human DBS (63) screened, the pathogens identified were all bacterial including Coxiella burnetii (1.89%), Rickettsia africae (1.89%), and R. aeschlimannii (1.89%). This study reports the first detection of R. aeschlimannii in livestock as well as the occurrence of the above-mentioned pathogens in humans in Ghana. Animals can serve as amplifying hosts for infectious pathogens; hence, there is an increased risk of infections among the abattoir workers. Continuous surveillance effort is essential, and abattoir workers need to protect themselves from tick bites and infectious tick-borne pathogens.

Amadou HI, Moussa S, Arzika II, Ousmane H, Amadou S, Aoula B, et al.

Emergence of Indigenous Dengue Fever, Niger, October 2023.

Emerging Infectious Disease journal. 2024;30(7):1479.

https://wwwnc.cdc.gov/eid/article/30/7/24-0301_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210656/pdf/24-0301.pdf

Dengue fever is a growing worldwide public health concern. In mid-October 2023, multiple cases of uncommon febrile illness were reported among patients in Niamey, Niger. Fifteen samples were tested by using molecular methods, from which 7 (46.66%) were confirmed positive for mosquitoborne dengue virus belonging to serotypes 1 and 3.

Blair P, Kobba K, Okello S, Alharthi S, Naluyima P, Clemens E, et al.

Evidence of Orientia spp. Endemicity among Severe Infectious Disease Cohorts, Uganda.

Emerging Infectious Disease journal. 2024;30(7):1442.

https://wwwnc.cdc.gov/eid/article/30/7/23-1040_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210639/pdf/23-1040.pdf

At 3 severe infection cohort sites in Uganda, Orientia seropositivity was common. We identified 4 seroconversion cases and 1 PCR-positive case. These results provide serologic and molecular support for Orientia spp. circulating in sub-Saharan Africa, possibly expanding its endemic range. Orientia infections could cause severe illness and hospitalizations in this region.

Campos AS, Franco AC, Godinho F, Huff R, Candido D, da Cruz Cardoso J, et al.

Molecular Epidemiology of Western Equine Encephalitis Virus, South America, 2023–2024.

Emerging Infectious Disease journal. 2024;30(9):1834.

https://wwwnc.cdc.gov/eid/article/30/9/24-0530_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11346983/pdf/24-0530.pdf

Western equine encephalitis virus (WEEV) is a mosquitoborne virus that reemerged in December 2023 in Argentina and Uruguay, causing a major outbreak. We investigated the outbreak using epidemiologic, entomological, and genomic analyses, focusing on WEEV circulation near the Argentina–Uruguay border in Rio Grande do Sul state, Brazil. During November 2023–April 2024, the outbreak in Argentina and Uruguay resulted in 217 human cases, 12 of which were fatal, and 2,548 equine cases. We determined cases on the basis of laboratory and clinical epidemiologic criteria. We characterized 3 fatal equine cases caused by a novel WEEV lineage identified through a nearly complete coding sequence analysis, which we propose as lineage C. Our findings highlight the importance of continued surveillance and equine vaccination to control future WEEV outbreaks in South America.

Caraballo L, Rangel Y, Reyna-Bello A, Muñoz M, Figueroa-Espinosa R, Sanz-Rodriguez C, et al.

Outbreak of Intermediate Species Leptospira venezuelensis Spread by Rodents to Cows and Humans in L. interrogans–Endemic Region, Venezuela.

Emerging Infectious Disease journal. 2024;30(8):1514.

https://wwwnc.cdc.gov/eid/article/30/8/23-1562_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11286060/pdf/23-1562.pdf

Leptospirosis is a common but underdiagnosed zoonosis. We conducted a 1-year prospective study in La Guaira State, Venezuela, analyzing 71 hospitalized patients who had possible leptospirosis and sampling local rodents and dairy cows. Leptospira rrs gene PCR test results were positive in blood or urine samples from 37/71 patients. Leptospira spp. were isolated from cultured blood or urine samples of 36/71 patients; 29 had L. interrogans, 3 L. noguchii, and 4 L. venezuelensis. Conjunctival suffusion was the most distinguishing clinical sign, many patients had liver involvement, and 8/30 patients with L. interrogans infections died. The Leptospira spp. found in humans were also isolated from local rodents; L. interrogans and L. venezuelensis were isolated from cows on a nearby, rodent-infested farm. Phylogenetic clustering of L. venezuelensis isolates suggested a recently expanded outbreak strain spread by rodents. Increased awareness of leptospirosis prevalence and rapid diagnostic tests are needed to improve patient outcomes.

Edouard S, Boughammoura H, Colson P, La Scola B, Fournier P-E, Fenollar F.

Large-Scale Outbreak of Mycoplasma pneumoniae Infection, Marseille, France, 2023–2024.

Emerging Infectious Disease journal. 2024;30(7):1481.

https://wwwnc.cdc.gov/eid/article/30/7/24-0315_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210650/pdf/24-0315.pdf

We report a large-scale outbreak of Mycoplasma pneumoniae respiratory infections encompassing 218 cases (0.8% of 26,449 patients tested) during 2023–2024 in Marseille, France. The bacterium is currently circulating and primarily affects children <15 years of age. High prevalence of co-infections warrants the use of a syndromic diagnostic strategy.

Frías M, Caballero-Gómez J, Vázquez A, Madrigal E, Ruiz-Fons F, Gallo M, et al.

Serosurvey of Blood Donors to Assess West Nile Virus Exposure, South-Central Spain.

Emerging Infectious Disease journal. 2024;30(7):1496.

https://wwwnc.cdc.gov/eid/article/30/7/24-0450_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210648/pdf/24-0450.pdf

We analyzed West Nile Virus (WNV) exposure from 1,222 blood donors during 2017–2018 from an area of south-central Spain. Results revealed WNV seroprevalence of 0.08% (95% CI 0.004%–0.4%) in this population. Our findings underscore the need for continued surveillance and research to manage WNV infection in this region.

Khamly P, Kapadia N, Umali-Wilcox M, Butler-Wu S, Davar K.

Plasmodium vivax Infections among Immigrants from China Traveling to the United States.

Emerging Infectious Disease journal. 2024;30(7):1477.

https://wwwnc.cdc.gov/eid/article/30/7/24-0177_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210671/pdf/24-0177.pdf

Beginning in 2023, we observed increased Plasmodium vivax malaria cases at an institution in Los Angeles, California, USA. Most cases were among migrants from China who traveled to the United States through South and Central America. US clinicians should be aware of possible P. vivax malaria among immigrants from China.

Kubiak J, Klevay M, Hilt E, Ferrieri P.

Acute Meningoencephalitis Associated with Borrelia miyamotoi, Minnesota, USA.

Emerging Infectious Disease journal. 2024;30(7):1472.

https://wwwnc.cdc.gov/eid/article/30/7/23-1611_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210636/pdf/23-1611.pdf

Borrelia miyamotoi is an emerging tickborne pathogen that has been associated with central nervous system infections in immunocompromised patients, albeit infrequently. We describe a case-patient in

Minnesota, USA, who had meningeal symptoms of 1 month duration. B. miyamotoi infection was diagnosed by Gram staining on cerebrospinal fluid and confirmed by sequencing.

Mendoza W, Isaza JP, López L, López-Herrera A, Gutiérrez LA.

Bovine Leukemia Virus molecular detection and associated factors among dairy herd workers in Antioquia, Colombia.

Acta Trop. 2024;256:13.

https://www.sciencedirect.com/science/article/pii/S0001706X24001359?via%3Dihub

The Bovine Leukemia Virus (BLV) affects mainly cattle, is transmitted by exposure to contaminated biological fluids, and generates lymphomas in 5 % of infected animals. The zoonotic potential of BLV has been studied, and it is currently unknown if it circulates in human workers on dairy herds in Antioquia. Objective: To determine the frequency of BLV detection, the genotypes of the virus, and the factors associated with its detection in workers for dairy herds in Antioquia, Colombia. Through a cross-sectional study in 51 dairy herds, 164 adults were recruited. A peripheral blood sample was collected from each participant for molecular detection of the BLV env and tax genes, and associated factors were explored through bivariate and multivariate mixed Poisson model analyses. The analysis showed that 82 % (134/164) of the participants were men, with an average age of 40. Using qPCR, the constitutive gene GAPDH was amplified to evaluate the presence of amplification inhibitors in the DNA samples. Using nested PCR, the amplification of the env viral gene was obtained in 13 % (22/164) of the total samples analyzed, while all the samples tested negative for tax . The amplicons of the env gene were sequenced, and the identity compatible with BLV was verified by BLAST analysis (NCBI). Using molecular phylogeny analysis, based on maximum likelihood and haplotype network analysis, it was identified that BLV genotype 1 is present in the evaluated population. 16 % (26/164) of the participants reported having ever had an accident with surgical material during work with cattle; this variable was associated with BLV positivity even after adjusting for other variables (PRa =2.70, 95 % CI = 1.01- 7.21). Considering that other studies have reported the circulation of BLV genotype 1 in cattle from this same region and the present report in humans from dairy herds, the results suggest a possible zoonotic transmission of BLV genotype 1 in Antioquia, reinforcing the need to continue investigating to determine the potential role of this virus as an etiological agent of disease in livestock farmers in the department.

Obermeier P, Plinke C, Brinkmann A, Lachmann R, Melchert J, Corman V, et al.

Reemergence of Clade IIb–Associated Mpox, Germany, July–December 2023.

Emerging Infectious Disease journal. 2024;30(7):1416.

https://wwwnc.cdc.gov/eid/article/30/7/24-0092_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210634/pdf/24-0092.pdf

In July 2023, clade IIb–associated mpox reemerged in Germany at low levels, mainly affecting men who have sex with men. We report a representative case and phylogeny of available genome sequences. Our findings underscore the need for standardized surveillance and indication-based vaccination to limit transmission and help prevent endemicity.

Ogoina D, Dalhat MM, Denue BA, Okowa M, Chika-Igwenyi NM, Oiwoh SO, et al.

Mpox Epidemiology and Risk Factors, Nigeria, 2022.

Emerging Infectious Disease journal. 2024;30(9):1799.

https://wwwnc.cdc.gov/eid/article/30/9/24-0135_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11346979/pdf/24-0135.pdf

To investigate epidemiology of and risk factors for laboratory-confirmed mpox during the 2022 outbreak in Nigeria, we enrolled 265 persons with suspected mpox. A total of 163 (61.5%) were confirmed to have mpox; 137 (84.0%) were adults, 112 (68.7%) male, 143 (87.7%) urban/semi-urban dwellers, 12 (7.4%) self-reported gay men, and 3 (1.8%) female sex workers. Significant risk factors for adults were sexual and nonsexual contact with persons who had mpox, as well as risky sexual behavior. For children, risk factors were close contact with an mpox-positive person and prior animal exposure. Odds of being mpox positive were higher for adults with HIV and lower for those co-infected with varicella zoster virus (VZV). No children were HIV-seropositive; odds of being mpox positive were higher for children with VZV infection. Our findings indicate mpox affects primarily adults in Nigeria, partially driven by sexual activity; childhood cases were driven by close contact, animal exposure, and VZV co-infection.

Probert W, Haw M, Nichol A, Glaser C, Park S, Campbell L, et al.

Newly Recognized Spotted Fever Group Rickettsia as Cause of Severe Rocky Mountain Spotted Fever–Like Illness, Northern California, USA.

Emerging Infectious Disease journal. 2024;30(7):1344.

https://wwwnc.cdc.gov/eid/article/30/7/23-1771_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11210658/pdf/23-1771.pdf

The incidence of spotted fever group (SFG) rickettsioses in the United States has tripled since 2010. Rocky Mountain spotted fever, the most severe SFG rickettsiosis, is caused by Rickettsia rickettsii. The lack of species-specific confirmatory testing obfuscates the relative contribution of R. rickettsii and other SFG Rickettsia to this increase. We report a newly recognized rickettsial pathogen, Rickettsia sp. CA6269, as the cause of severe Rocky Mountain spotted fever–like illness in 2 case-patients residing in northern California. Multilocus sequence typing supported the recognition of this pathogen as a novel Rickettsia genotype most closely related to R. rickettsii. Cross-reactivity observed for an established molecular diagnostic test indicated that Rickettsia sp. CA6269 might be misidentified as R. rickettsii. We developed a Rickettsia sp. CA6269–specific real-time PCR to help resolve this diagnostic challenge and better characterize the spectrum of clinical disease and ecologic epidemiology of this pathogen.

Sipos D, Kappéter Á, Réger B, Kiss G, Takács N, Farkas R, et al.

Confirmed Case of Autochthonous Human Babesiosis, Hungary.

Emerging Infectious Disease journal. 2024;30(9):1972.

https://wwwnc.cdc.gov/eid/article/30/9/24-0525_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11346977/pdf/24-0525.pdf

We report a case of autochthonous human babesiosis in Hungary, confirmed by PCR and partial sequencing of the Babesia spp. 18S rRNA gene. Babesiosis should be considered during the differential

diagnosis of febrile illnesses, and peripheral blood smears to detect Babesia spp. should be part of the routine clinical workup.

Smith N, Keynan Y, Wuerz T, Sharma A.

Powassan Virus Encephalitis after Tick Bite, Manitoba, Canada.

Emerging Infectious Disease journal. 2024;30(9):1959.

https://wwwnc.cdc.gov/eid/article/30/9/23-1344_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11346980/pdf/23-1344.pdf

A case of Powassan encephalitis occurred in Manitoba, Canada, after the bite of a black-legged tick. Awareness of this emerging tickborne illness is needed because the number of vector tick species is growing. No specific treatment options exist, and cases with illness and death are high. Prevention is crucial.

Wang K-C, Chang C-K, Chang S-F, Shu P-Y, Wang H-C, Su S-W, et al.

Recurrent Occupational Hantavirus Infections Linked to Feeder Rodent Breeding Farm, Taiwan, 2022.

Emerging Infectious Disease journal. 2024;30(8):1702.

https://wwwnc.cdc.gov/eid/article/30/8/23-0875_article

https://pmc.ncbi.nlm.nih.gov/articles/PMC11286064/pdf/23-0875.pdf

We investigated 2 acute cases and 1 previous case of Seoul hantavirus infection in workers in a feeder rodent breeding farm in Taiwan. Prevalence of hantavirus IgG among the tested feeder rats was 37.5%. Appropriate prevention measures, including using disinfection protocols and personal protective equipment, are crucial to lowering risk.

- ## Légionellose

Harduar Morano L, Morawski BM, Herzig CTA, Edens C, Barskey AE, Luckhaupt SE.

Legionnaires' disease in transportation, construction and other occupations in 39 US jurisdictions, 2014-2016.

Occup Environ Med. 2024;81(3):163-6.

https://doi.org/10.1136/oemed-2023-109108

BACKGROUND: Certain workers are at increased risk for acquiring Legionnaires' disease compared with other workers. This study aims to identify occupations at increased risk for acquiring Legionnaires' disease. METHODS: Using data from the US Centers for Disease Control and Prevention's Supplemental Legionnaires' Disease Surveillance System, this study identified Legionnaires' disease confirmed patients ≥16 years of age in 39 states with reported symptom onset during 2014-2016. Age-adjusted and sex-adjusted incidence rate ratios (IRR) stratified by occupation group were calculated by comparing Legionnaires' disease patients in an occupation group (eg, transportation) to those in all other occupation groups (eg, non-transportation). RESULTS: A total of 2553 patients had a known occupation group. The two occupations with the highest burden were transportation (N=287; IRR=2.11) and construction (N=269; IRR=1.82). Truck drivers comprised the

majority (69.7%) of the transportation occupation group and construction labourers comprised almost half (49%) of the construction occupation group. The healthcare support occupation had the highest IRR (N=75; IRR=2.16). CONCLUSION: Transportation and construction workers, who are generally not covered by guidance related to building water systems, have increased risk of Legionnaires' disease compared with other workers. One hypothesised risk factor for truck drivers is the use of non-genuine windshield cleaner in their vehicles. A simple intervention is to use genuine windshield cleaner with bactericidal properties (ie, includes isopropanol/methanol) which can reduce the risk of Legionella growth and transmission. To improve surveillance of Legionnaires' disease and identification of similar exposures, the authors encourage the collection of occupation and industry information for all patients with Legionnaires' disease.

- ## Endotoxines

Poole JA, Zamora-Sifuentes JL, de las Vecillas L, Quirce S.

Respiratory Diseases Associated With Organic Dust Exposure.

J Allergy Clin Immunol-Pract. 2024;12(8):1960-71.

https://www.sciencedirect.com/science/article/pii/S221321982400196X?via%3Dihub

Organic dusts are complex bioaerosol mixtures comprised of dust and par ticulate matter of organic origin. These include components from bacteria, fungi, pollen, and viruses to fragments of animals and plants commonplace to several environmental/occupational settings encompassing agriculture/ farming, grain processing, waste/recycling, textile, cotton, woodworking, bird breeding, and more. Organic dust exposures are linked to development of chronic bronchitis, chronic obstructive pulmonary disease, asthma, asthma-like syndrome, byssinosis, hypersensitivity pneumonitis, and idiopathic pulmonary fi brosis. Risk factors of disease development include cumulative dust exposure, smoking, atopy, timing/duration, and nutritional factors. The immunopathogenesis predominantly involves Toll-like receptor signaling cascade, T-helper 1/T- helper 17 lymphocyte responses, neutrophil influx, fl ux, and potentiation of manifestations associated with allergy. The true prevalence of airway disease directly attributed to organic dust, especially in a workplace setting, remains challenging. Diagnostic confirmation can be difficult and complicated by hesitancy from workers to seek medical care, driven by fears of potential labor-related consequence. Clinical respiratory and systemic presentations coupled with allergy testing, lung function patterns of obstructive versus restrictive disease, and radiological characteristics are typically utilized to delineate these various organic dust-associated respiratory diseases. Prevention, risk reduction, and management primarily focus on reducing exposure to the offending dust, managing symptoms, and preventing disease progression. (c) 2024 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2024;12:1960-71)

Biotechnologies

- ## Nouveaux procédés

Adetunji AI, Erasmus M.

Green Synthesis of Bioplastics from Microalgae: A State-of-the-Art Review.

Polymers. 2024;16(10):25.

https://mdpi-res.com/d_attachment/polymers/polymers-16-01322/article_deploy/polymers-16-01322-v2.pdf?version=1715408673

The synthesis of conventional plastics has increased tremendously in the last decades due to rapid industrialization, population growth, and advancement in the use of modern technologies. However, overuse of these fossil fuel-based plastics has resulted in serious environmental and health hazards by causing pollution, global warming, etc. Therefore, the use of microalgae as a feedstock is a promising, green, and sustainable approach for the production of biobased plastics. Various biopolymers, such as polyhydroxybutyrate, polyurethane, polylactic acid, cellulose-based polymers, starch-based polymers, and protein-based polymers, can be produced from different strains of microalgae under varying culture conditions. Different techniques, including genetic engineering, metabolic engineering, the use of photobioreactors, response surface methodology, and artificial intelligence, are used to alter and improve microalgae stocks for the commercial synthesis of bioplastics at lower costs. In comparison to conventional plastics, these biobased plastics are biodegradable, biocompatible, recyclable, non-toxic, eco-friendly, and sustainable, with robust mechanical and thermoplastic properties. In addition, the bioplastics are suitable for a plethora of applications in the agriculture, construction, healthcare, electrical and electronics, and packaging industries. Thus, this review focuses on techniques for the production of biopolymers and bioplastics from microalgae. In addition, it discusses innovative and efficient strategies for large-scale bioplastic production while also providing insights into the life cycle assessment, end-of-life, and applications of bioplastics. Furthermore, some challenges affecting industrial scale bioplastics production and recommendations for future research are provided.

Baker D, Church G.

Protein design meets biosecurity.

Science. 2024;383(6681):349-.

https://www.science.org/doi/full/10.1126/science.ado1671

The power and accuracy of computational protein design have been increasing rapidly with the incorporation of artificial intelligence (AI) approaches. This promises to transform biotechnology, enabling advances across sustainability and medicine. DNA synthesis plays a critical role in materializing designed proteins. However, as with all major revolutionary changes, this technology is vulnerable to misuse and the production of dangerous biological agents. To enable the full benefits of this revolution while mitigating risks that may emerge, all synthetic gene sequence and synthesis data should be collected and stored in repositories that are only queried in emergencies to ensure that protein design proceeds in a safe, secure, and trustworthy manner.

Benech N, Barbut F, Fitzpatrick F, Krutova M, Davies K, Druart C, et al.

Update on microbiota-derived therapies for recurrent *Clostridioides difficile* infections.

Clin Microbiol Infect. 2024;30(4):462-8.

https://doi.org/10.1016/j.cmi.2023.12.007

Background: Faecal microbiota transplantation (FMT) is the standard treatment for patients with multiple recurrent Clostridioides difficile infection (rCDI). Recently, new commercially developed human microbiota-derived medicinal products have been evaluated and Food and Drug Administrationapproved with considerable differences in terms of composition, administration, and targeted populations. Objectives: To review available data on the different microbiota-derived treatments at the stage of advanced clinical evaluation and research in rCDI in comparison with FMT. Sources: Phase II or III trials evaluating a microbiota-derived medicinal product to prevent rCDI. Content: Two commercial microbiota-derived medicinal products are approved by the Food and Drug Administration: Rebyota (RBX2660 Ferring Pharmaceuticals, marketed in the United States) and VOWST (SER-109 -Seres Therapeutics, marketed in the United States), whereas VE303 (Vedanta Biosciences Inc) will be studied in phase III trial. RBX2660 and SER-109 are based on the processing of stools from healthy donors, whereas VE303 consists of a de fined bacterial consortium originating from human stools and produced from clonal cell banks. All have proven ef ficacy to prevent rCDI compared with placebo in patients considered at high risk of recurrence. However, the heterogeneity of the inclusion criteria, and the time between each episode and CDI diagnostics makes direct comparison between trials dif ficult. The differences regarding the risk of recurrence between the treatment and placebo arms were lower than previously described for FMT (FMT: A = 50.5%; RBX2660-phase III: A = 13.1%; SER-109-phase III: A = 28%; high -dose VE303-phase-II: A = 31.7%). All treatments presented a good overall safety pro file with mainly mild gastrointestinal symptoms. Implications: Stool-derived products and bacterial consortia need to be clearly distinguished in terms of product characterization and their associated risks with specific long-term post -marketing evaluation similar to registries used for FMT. Their place in the therapeutic strategy for patients with rCDI requires further studies to determine the most appropriate patient population and administration route to prevent rCDI. Nicolas Benech, Clin Microbiol Infect 2024;30:462 (c) 2023 European Society of Clinical Microbiology and Infectious Diseases. Published by Elsevier Ltd. All rights reserved.

Cao X, Yu T, Sun Z, Chen M, Xie W, Pang Q, Deng H.

Engineered phages in anti-infection and anti-tumor field: A review.

Microb Pathog. 2024:107052.

https://www.sciencedirect.com/science/article/pii/S0882401024005199?via%3Dihub

The abuse of antibiotics has led to the widespread emergence of multi-drug resistant bacteria. Phage therapy holds promise for enhancing antibacterial and anti-infection strategies. Traditional bacteriophage therapy employs phage preparations as an alternative to antibiotics for the eradication of bacteria, aiming to achieve the desired clinical outcomes. Modification of phage by transgene or chemical modification overcomes the limitations of traditional bacteriophage therapy, including host spectrum modification, bacterial resistance reversal, antigen presentation, and drug targeted delivery, and thus broadens the application field of phage. This article summarizes the progress of engineered phages in the fields of antibacterial, anti-infective, and anti-tumor therapy. It emphasizes the advantages of engineered phages in antibacterial and anti-tumor treatment, and discusses the widespread potential of phage-based modular design as multifunctional biopharmaceuticals, drug carriers, and other applications.

Carolin CF, Kamalesh T.

Advances in stabilization of metallic nanoparticle with biosurfactants- a review on current trends.

Heliyon. 2024;10(9):17.

https://www.sciencedirect.com/science/article/pii/S2405844024058043?via%3Dihub

Recently, research based on new biomaterials for stabilizing metallic nanoparticles has increased due to their greater environmental friendliness and lower health risk. Their stability is often a critical factor influencing their performance and shelf life. Nowadays, the use of biosurfactants is gaining interest due to their sustainable advantages. Biosurfactants are used for various commercial and industrial applications such as food processing, therapeutic applications, agriculture, etc. Biosurfactants create stable coatings surrounding nanoparticles to stop agglomeration and provide long-term stability. The present review study describes a collection of important scientific works on stabilization and capping of metallic nanoparticles as biosurfactants. This review also provides a comprehensive overview of the intrinsic properties and environmental aspects of metal nanoparticles coated with biosurfactants. In addition, future methods and potential solutions for biosurfactant-mediated stabilization in nanoparticle synthesis are also highlighted. The objective of this study is to ensure that the stabilized nanoparticles exhibit biocompatible properties, making them suitable for applications in medicine and biotechnology.

Cong ZQ, Li YY, Xie LM, Chen QW, Tang MH, Thongpon P, et al.

Engineered Microrobots for Targeted Delivery of Bacterial Outer Membrane Vesicles (OMV) in Thrombus Therapy.

Small. 2024:13.

https://doi.org/10.1002/smll.202400847

In the realm of thrombosis treatment, bioengineered outer membrane vesicles (OMVs) offer a novel and promising approach, as they have rich content of bacterial-derived components. This study centers on OMVs derived from Escherichia coli BL21 cells, innovatively engineered to encapsulate the staphylokinase-hirudin fusion protein (SFH). SFH synergizes the properties of staphylokinase (SAK) and hirudin (HV) to enhance thrombolytic efficiency while reducing the risks associated with re-embolization and bleeding. Building on this foundation, this study introduces two cutting-edge microrobotic platforms: SFH-OMV@H for venous thromboembolism (VTE) treatment, and SFH-OMV@M Phi, designed specifically for cerebral venous sinus thrombosis (CVST) therapy. These platforms have demonstrated significant efficacy in dissolving thrombi, with SFH-OMV@H showcasing precise vascular navigation and SFH-OMV@M Phi effectively targeting cerebral thrombi. The study shows that the integration of these bioengineered OMVs and microrobotic systems marks a significant advancement in thrombosis treatment, underlining their potential to revolutionize personalized medical approaches to complex health conditions. Two distinct microrobot platforms are developed, both integrating a bioengineered staphylokinase-hirudin fusion protein encapsulated within outer membrane vesicles (SHF-OMV). The first, a hydrogel-based microrobot, is particularly effective for treating venous thromboembolism (VTE). The second, a macrophage-based microrobot, is specifically designed for cerebral venous sinus thrombosis (CVST) therapy. image

Ghosh S, Chowdhury SR, Rahaman M, Basu B, Prajapati B.

Revolutionizing Influenza Treatment: A Deep Dive into Targeted Drug Delivery Systems.

Curr Pharm Biotechnol. 2024.

https://www.eurekaselect.com/article/144036

Influenza, a highly transmissible respiratory infection caused by influenza viruses A and B, poses a persistent threat to global public health due to its high mutation rate, ability to develop resistance to existing antiviral drugs, and capacity for rapid spread. Current treatment options, including four main classes of antiviral agents-adamantanes, neuraminidase inhibitors, RNA-dependent RNA polymerase inhibitors, and polymerase acidic endonuclease inhibitors- are limited by the emergence of drug-resistant viral strains, non-specific drug distribution, and adverse side effects. Moreover, the effectiveness of traditional vaccines is often compromised by antigenic drift and shift, necessitating the development of alternative therapeutic strategies. This review comprehensively explores the potential of novel targeted drug delivery systems to address these limitations and improve influenza management. Nanotechnology-based platforms, including lipid-based, polymer-based, inorganic, and hybrid nanoparticles, offer enhanced drug delivery through improved bioavailability, targeted action, and controlled release, thus minimizing systemic toxicity and optimizing therapeutic outcomes. Inhalation delivery systems such as dry powder inhalers (DPIs), nebulizers, and nanotechnology-based inhalation formulations provide direct delivery of antiviral agents to the respiratory tract, ensuring rapid onset of action with reduced systemic side effects. Transdermal delivery methods, including microneedle patches and hydrogel-based systems, offer non-invasive alternatives that enhance patient compliance and allow for sustained drug release. Furthermore, this review discusses recent innovations, such as responsive drug delivery systems and multifunctional nanoparticles capable of simultaneous delivery of multiple therapeutic agents, representing a significant advancement in the fight against influenza. These novel approaches promise improved targeting and efficacy and enable personalized treatment strategies, enhancing patient outcomes in both seasonal flu and pandemic scenarios. Integrating these advanced drug delivery systems into clinical practice could revolutionize the management of influenza, offering a promising pathway toward more effective and safer therapies.

Gordon R, Peters M, Ying C.

Optical scattering methods for the label-free analysis of single biomolecules.

Q Rev Biophys. 2024;57:e12.

https://www.cambridge.org/core/services/aop-cambridge-core/content/view/77B308A1D684282D6BD61F32869778CD/S0033583524000088a.pdf/div-class-title-optical-scattering-methods-for-the-label-free-analysis-of-single-biomolecules-div.pdf

Single-molecule techniques to analyze proteins and other biomolecules involving labels and tethers have allowed for new understanding of the underlying biophysics; however, the impact of perturbation from the labels and tethers has recently been shown to be significant in several cases. New approaches are emerging to measure single proteins through light scattering without the need for labels and ideally without tethers. Here, the approaches of interference scattering, plasmonic scattering, microcavity sensing, nanoaperture optical tweezing, and variants are described and compared. The application of these approaches to sizing, oligomerization, interactions, conformational dynamics, diffusion, and vibrational mode analysis is described. With early commercial successes, these approaches are poised to have an impact in the field of single-molecule biophysics.

Issac PK, Ravindiran G, Velumani K, Jayaseelan A, Greff B, Mani R, et al.

Futuristic advancements in phytoremediation of endocrine disruptor Bisphenol A: A step towards sustainable pollutant degradation for rehabilitated environment.

Waste Management. 2024;179:216-33.

https://www.sciencedirect.com/science/article/pii/S0956053X2400151X?via%3Dihub

Bisphenol A (BPA) accumulates in the environment at lethal concentrations because of its high production rate and utilization. BPA, originating from industrial effluent, plastic production, and consumer products, poses serious risks to both the environment and human health. The widespread aggregation of BPA leads to endocrine disruption, reactive oxygen species -mediated DNA damage, epigenetic modifications and carcinogenicity, which can disturb the normal homeostasis of the body. The living being in a population is subjected to BPA exposure via air, water and food. Globally, urinary analysis reports have shown higher BPA concentrations in all age groups, with children being particularly susceptible due to its occurrence in items such as milk bottles. The conventional methods are costly with a low removal rate. Since there is no proper eco-friendly and cost-effective degradation of BPA reported so far. The phytoremediation, green -biotechnology based method which is a cost-effective and renewable resource can be used to sequestrate BPA. Phytoremediation is observed in numerous plant species with different mechanisms to remove harmful contaminants. Plants normally undergo several improvements in genetic and molecular levels to withstand stress and lower levels of toxicants. But such natural adaptation requires more time and also higher concentration of contaminants may disrupt the normal growth, survival and yield of the plants. Therefore, natural or synthetic amendments and genetic modifications can improve the xenobiotics removal rate by the plants. Also, constructed wetlands technique utilizes the plant's phytoremediation mechanisms to remove industrial effluents and medical residues. In this review, we have discussed the limitations and futuristic advancement strategies for degrading BPA using phytoremediation-associated mechanisms.

Kovacs CJ, Antonacci A, Graham A, Jessup F, Rankin W, Brasko B, et al.

Comparing Methods to Genetically Engineer Bacteriophage and Increase Host Range.

Milit Med. 2024;189(7-8):e1488-e96.

https://doi.org/10.1093/milmed/usae226

Introduction Antibacterial resistance is an emerging problem in military medicine. Disruptions to the health care systems in war-torn countries that result from ongoing conflict can potentially exacerbate this problem and increase the risk to U.S. forces in the deployed environment. Therefore, novel therapies are needed to mitigate the impact of these potentially devastating infections on military operations. Bacteriophages are viruses that infect and kill bacteria. They can be delivered as therapeutic agents and offer a promising alternative to traditional antibiotic chemotherapy. There are several potential benefits to their use, including high specificity and comparative ease of use in the field setting. However, the process of engineering phages for military medical applications can be a laborious and time-consuming endeavor. This review examines available techniques and compares their efficacy.Materials and Methods This review evaluates the scientific literature on the development and application of four methods of bacteriophage genome engineering and their consideration in the context of military applications. Preffered Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed for a systematic review of available literature that met criteria for analysis and inclusion. The research completed for this review article originated from the United States Military Academy's library "Scout" search engine, which compiles results from 254 available databases (including PubMed, Google Scholar, and SciFinder). Particular attention was focused on identifying useful mechanistic insight into the nature of the engineering technique, the ease of use, and the applicability of the technique to countering the problem of antimicrobial resistance in the military setting.Results A total of 52 studies were identified that met inclusion criteria following PRISMA guidelines. The bioengineering techniques analyzed included homologous recombination (12 articles), in vivo recombineering (9 articles), bacteriophage recombineering of electroporated DNA (7 articles), and the CRISPR-Cas system (10 articles). Rates of success and fidelity

varied across each platform, and comparative benefits and drawbacks are considered.Conclusions Each of the phage engineering techniques addressed herein varies in amount of effort and overall success rate. CRISPR-Cas-facilitated modification of phage genomes presents a highly efficient method that does not require a lengthy purification and screening process. It therefore appears to be the method best suited for military medical applications.

Laezza C, Francesca S, Barone A, Rigano MM.

Genetic and biotechnological approaches to preserve food quality against climate change.

Food Agric Immunol. 2024;35(1):20.

https://doi.org/10.1080/09540105.2024.2358795

In this past decade, the bond between agriculture, food security, and climate change has become increasingly strong. Agriculture is recognized as one of the most endangered systems adversely affected by human activities and environmental issues. In particular, abiotic stress limits the quantity and quality of plant-based food. Heat stress, drought, and salinity impact plants at all different life stages, inducing morphological and physiological changes and provoking a reduction in their nutritional value. Accordingly, low-quality food results in a serious risk for the health of people worldwide. In this scenario, different genetic and biotechnological strategies have been investigated, including the use of New Plant Breeding Techniques (NBTs) and plant cell cultures. In this review, we describe how abiotic stresses alter the property and availability of nutritious food. In addition, we illustrate the advanced techniques that could be employed to address these issues and ameliorate the agricultural practices [GRAPHICS] .

Lee ALC, Lan JCW, Jambrak AR, Chang JS, Lim JW, Khoo KS.

Upcycling fruit waste into microalgae biotechnology: Perspective views and way forward.

Food Chem-Mol Sci. 2024;8:18.

https://doi.org/10.1016/j.fochms.2024.100203

Fruit and vegetable wastes are linked to the depletion of natural resources and can pose serious health and environmental risks (e.g. eutrophication, water and soil pollution, and GHG emissions) if improperly managed. Current waste management practices often fail to recover high-value compounds from fruit wastes. Among emerging valorization methods, the utilization of fruit wastes as a feedstock for microalgal biorefineries is a promising approach for achieving net zero waste and sustainable development goals. This is due to the ability of microalgae to efficiently sequester carbon dioxide through photosynthesis, utilize nutrients in wastewater, grow in facilities located on non-arable land, and produce several commercially valuable compounds with applications in food, biofuels, bioplastics, cosmetics, nutraceuticals, pharmaceutics, and various other industries. However, the application of microalgal biotechnology towards upcycling fruit wastes has yet to be implemented on the industrial scale due to several economic, technical, operational, and regulatory challenges. Here, we identify sources of fruit waste along the food supply chain, evaluate current and emerging fruit waste management practices, describe value-added compounds in fruit wastes, and review current methods of microalgal cultivation using fruit wastes as a fermentation medium. We also propose some novel strategies for the practical implementation of industrial microalgal biorefineries for upcycling fruit waste in the future.

Mian AH, Qayyum S, Zeb S, Fatima T, Jameel K, Rehman B.

Exploring indigenous fungal isolates for efficient dye degradation: A comprehensive study on sustainable bioremediation in the total environment.

Environ Technol Innov. 2024;34:13.

https://www.sciencedirect.com/science/article/pii/S2352186424000919?via%3Dihub

Synthetic dyes used in textile industries are hazardous and toxic to the environment, as some of the dyes used in these industries are non-biodegradable. Sustainable technologies using microbes are an eco-friendly and economical approach. Fungal decolorization processes are gaining much importance as biomass absorbs enzymes used in biodegradation. In the current study, six samples of dye wastewater were collected from different industries in the Faisalabad industrial area in Pakistan. The physiological characteristics of these samples were analyzed, and various parameters, including pH, temperature, BOD, COD, and electric conductivity, were investigated. Among six different (sample A-F) wastewater samples, the maximum reduction in BOD was observed in sample E, i.e.,1.3.In contrast, the maximum reduction in COD of sample C, i.e., 30, was observed. These samples' hydrogen ion concentration (pH) was mainly in an alkaline ratio, and a maximum electric conductivity of 8810 mu S/cm of sample A was observed. In contrast, a minimum sample E (540 mg/L) was observed. Three indigenous fungal strains were screened and purified from dye wastewater for detoxification of dyes and were identified morphologically and on a molecular basis as Aspergillus iranicus, Penicillium crustosum, and Aspergillus terreus. A comparative analysis of two methods, the tube overlay method and the liquid medium method, were conducted to biodetoxification synthetic dyes, including malachite green, methylene blue, and nigrosine. Spectrophotometric analysis showed that indigenous fungal strains, i.e., Penicillium crustosum decolorizing methylene blue at about 93%, followed by Aspergillus iranicus decolorizing malachite green at about 80% and Aspergillus terreus decolorizing about 90% of malachite green have good potential for degradation of dyes. These strains can be a potential source for treating textile dye effluent.

Mishra A, Kushare A, Gupta MN, Ambre P.

Advanced Dressings for Chronic Wound Management.

ACS Appl Bio Mater. 2024;7(5):2660-76.

https://doi.org/10.1021/acsabm.4c00138

Wound healing, particularly for chronic wounds, presents a considerable difficulty due to differences in biochemical and cellular processes that occur in different types of wounds. Recent technological breakthroughs have notably advanced the understanding of diagnostic and therapeutic approaches to wound healing. The evolution in wound care has seen a transition from traditional textile dressings to a variety of advanced alternatives, including self-healing hydrogels, hydrofibers, foams, hydrocolloids, environment responsive dressings, growth factor-based therapy, bioengineered skin substitutes, and stem cell and gene therapy. Technological advancements, such as 3D printing and electronic skin (e-skin) therapy, contribute to the customization of wound healing. Despite these advancements, effectively managing chronic wounds remains challenging. This necessitates the development of treatments that consider performance, risk-benefit balance, and cost-effectiveness. This review discusses innovative strategies for the healing of chronic wounds. Incorporating biomarkers into advanced dressings, coupled with corresponding biosensors and drug delivery formulations, enables the theranostic approach to the treatment of chronic wounds. Furthermore, integrating advanced dressings with power sources and user interfaces like near-field communication, radio frequency identification, and Bluetooth enhances real-time monitoring and on-demand drug

delivery. It also provides a thorough evaluation of the advantages, patient compliance, costs, and durability of advanced dressings, emphasizing smart formulations and their preparation methods.

Mittal RK, Krishna G, Sharma V.

Biotechnological Advances in Enzymatic Hydrolysis and Fermentation for Edible Insects: Functionality, Acceptability, and Safety.

Curr Pharm Biotechnol. 2024:16.

https://www.eurekaselect.com/article/140812

Objective This review paper examines biotechnological methods for enhancing edible insects using enzymatic hydrolysis and fermentation. Evaluations involve improving functionality, analyzing consumer acceptability elements, guaranteeing safety and quality, negotiating regulatory frameworks, and suggesting field breakthroughs and applications.Methods Our method comprises a thorough literature analysis and academic database searches for edible insect enzymatic hydrolysis and fermentation investigations. Based on gaps in the literature, we investigate edible insect safety, consumer acceptability, and legal and regulatory issues.Results The results show biotechnological advances in enzymatic hydrolysis and fermentation for edible insect functioning. Sensory and cultural aspects affect consumer acceptability. To ensure edible insect product safety, hazards and pollutants are addressed. The legal analysis highlights compliance issues and possibilities.Conclusion This review shows how enzymatic hydrolysis and fermentation improve edible insect functioning, safety, and nutrition. The review includes consumer acceptability dynamics, legal issues, and safety analysis.

Mittal RK, Krishna G, Sharma V, Purohit P, Mishra R.

Spirulina Unveiled: A Comprehensive Review on Biotechnological Innovations, Nutritional Proficiency, and Clinical Implications.

Curr Pharm Biotechnol. 2024:18.

https://www.eurekaselect.com/article/140633

This comprehensive review of Spirulina encompasses biotechnology, phycocyanin production, and purification. Bioactive compounds and vital nutrients are investigated during the study. The literature examines the potential therapeutic advantages and clinical applications of Spirulina. This analysis assesses Spirulina consumption and its associated health risks.The current review offers a comprehensive synthesis of the therapeutic applications as well as technologies utilized for the extraction and purification of phycocyanin. Moreover, this discourse delves into the examination of various advantageous techniques for extracting and purifying phycocyanin, encompassing physical, chemical, and enzymatic methods. The data derived from a multitude of studies strongly indicate the potential therapeutic applications of phycocyanin, encompassing its notable attributes as an antioxidant, anti-inflammatory agent, anticancer agent, antiviral agent, antimicrobial agent, antiallergic agent, anti-obesity agent, antihypertensive agent, and an immunological agent.

Pennone V, Rosini E, Mascheroni E, Gianola S, Castellini G, Bargeri S, Lovati AB.

Revolutionizing orthopedic healthcare: a systematic review unveiling recombinant antimicrobial peptides.

Frontiers in Microbiology. 2024;15:17.

https://www.frontiersin.org/journals/microbiology/articles/10.3389/fmicb.2024.1370826/pdf

The increasing demand for orthopedic surgeries, including joint replacements, is driven by an aging population and improved diagnosis of joint conditions. Orthopedic surgeries carry a risk of infection, especially in patients with comorbidities. The rise of antibiotic resistance exacerbates this issue, necessitating alternatives like in vitro bioengineered antimicrobial peptides (AMPs), offering broad-spectrum activity and multiple action mechanisms. This review aimed to assess the prevalence of antimicrobial potential and the yield after purification among recombinant AMP families. The antimicrobial potential was evaluated using the Minimum Inhibitory Concentration (MIC) values against the most common bacteria involved in clinical infections. This systematic review adhered to PRISMA guidelines, focusing on in vitro studies of recombinant AMPs. The search strategy was run on PubMed, Scopus and Embase up to 30(th) March 2023. The Population, Exposure and Outcome model was used to extract the data from studies and ToxRTool for the risk of bias analysis. This review included studies providing peptide production yield data and MIC values against pathogenic bacteria. Non-English texts, reviews, conference abstracts, books, studies focusing solely on chemical synthesis, those reporting incomplete data sets, using non-standard MIC assessment methods, or presenting MIC values as ranges rather than precise concentrations, were excluded. From 370 publications, 34 studies on AMPs were analyzed. These covered 46 AMPs across 18 families, with Defensins and Hepcidins being most common. Yields varied from 0.5 to 2,700 mg/L. AMPs were tested against 23 bacterial genera, with MIC values ranging from 0.125 to >1,152 mu g/mL. Arenicins showed the highest antimicrobial activity, particularly against common orthopedic infection pathogens. However, AMP production yields varied and some AMPs demonstrated limited effectiveness against certain bacterial strains. This systematic review emphasizes the critical role of bioengineered AMPs to cope infections and antibiotic resistance. It meticulously evaluates recombinant AMPs, focusing on their antimicrobial efficacy and production yields. The review highlights that, despite the variability in AMP yields and effectiveness, Arenicins and Defensins are promising candidates for future research and clinical applications in treating antibiotic-resistant orthopedic infections. This study contributes significantly to the understanding of AMPs in healthcare, underscoring their potential in addressing the growing challenge of antibiotic resistance.

Rodríguez-Eguren A, Bueno-Fernandez C, Gómez-Alvarez M, Francés-Herrero E, Pellicer A, Bellver J, et al.

Evolution of biotechnological advances and regenerative therapies for endometrial disorders: a systematic review.

Hum Reprod Update. 2024:30.

https://doi.org/10.1093/humupd/dmae013

BACKGROUND The establishment and maintenance of pregnancy depend on endometrial competence. Asherman syndrome (AS) and intrauterine adhesions (IUA), or endometrial atrophy (EA) and thin endometrium (TE), can either originate autonomously or arise as a result from conditions (i.e. endometritis or congenital hypoplasia), or medical interventions (e.g. surgeries, hormonal therapies, uterine curettage or radiotherapy). Affected patients may present an altered or inadequate endometrial lining that hinders embryo implantation and increases the risk of poor pregnancy outcomes and miscarriage. In humans, AS/IUA and EA/TE are mainly treated with surgeries or pharmacotherapy, however the reported efficacy of these therapeutic approaches remains unclear. Thus, novel regenerative techniques utilizing stem cells, growth factors, or tissue engineering have emerged to improve reproductive outcomes.OBJECTIVE AND RATIONALE This review comprehensively summarizes the methodologies and outcomes of emerging biotechnologies (cellular, acellular, and bioengineering approaches) to treat human endometrial pathologies. Regenerative therapies derived from human tissues or blood which were studied in preclinical models (in vitro and in vivo) and clinical trials are discussed.SEARCH METHODS A systematic search of full-text articles available in PubMed and Embase was conducted to identify original peer-reviewed studies published in English between

January 2000 and September 2023. The search terms included: human, uterus, endometrium, Asherman syndrome, intrauterine adhesions, endometrial atrophy, thin endometrium, endometritis, congenital hypoplasia, curettage, radiotherapy, regenerative therapy, bioengineering, stem cells, vesicles, platelet-rich plasma, biomaterials, microfluidic, bioprinting, organoids, hydrogel, scaffold, sheet, miRNA, sildenafil, nitroglycerine, aspirin, growth hormone, progesterone, and estrogen. Preclinical and clinical studies on cellular, acellular, and bioengineering strategies to repair or regenerate the human endometrium were included. Additional studies were identified through manual searches.OUTCOMES From a total of 4366 records identified, 164 studies (3.8%) were included for systematic review. Due to heterogeneity in the study design and measured outcome parameters in both preclinical and clinical studies, the findings were evaluated qualitatively and quantitatively without meta-analysis. Groups using stem cell-based treatments for endometrial pathologies commonly employed mesenchymal stem cells (MSCs) derived from the human bone marrow or umbilical cord. Alternatively, acellular therapies based on platelet-rich plasma (PRP) or extracellular vesicles are gaining popularity. These are accompanied by the emergence of bioengineering strategies based on extracellular matrix (ECM)-derived hydrogels or synthetic biosimilars that sustain local delivery of cells and growth factors, reporting promising results. Combined therapies that target multiple aspects of tissue repair and regeneration remain in preclinical testing but have shown translational value. This review highlights the myriad of therapeutic material sources, administration methods, and carriers that have been tested.WIDER IMPLICATIONS Therapies that promote endometrial proliferation, vascular development, and tissue repair may help restore endometrial function and, ultimately, fertility. Based on the existing evidence, cost, accessibility, and availability of the therapies, we propose the development of triple-hit regenerative strategies, potentially combining high-yield MSCs (e.g. from bone marrow or umbilical cord) with acellular treatments (PRP), possibly integrated in ECM hydrogels. Advances in biotechnologies together with insights from preclinical models will pave the way for developing personalized treatment regimens for patients with infertility-causing endometrial disorders such as AS/IUA, EA/TE, and endometritis.REGISTRATION NUMBER https://osf.io/th8yf/ The emergence of new therapeutics and biotechnological advances for the treatment of endometrial pathologies. AS, Asherman syndrome; IUA, intrauterine adhesions; EA, endometrial atrophy; TE, thin endometrium. Created with BioRender.com

Satta A, Zampieri G, Loprete G, Campanaro S, Treu L, Bergantino E.

Metabolic and enzymatic engineering strategies for polyethylene terephthalate degradation and valorization.

Reviews in Environmental Science and Bio-Technology. 2024;23(2):351-83.

https://link.springer.com/content/pdf/10.1007/s11157-024-09688-1.pdf

Polyethylene terephthalate (PET) is one of the most marketed aromatic polyesters in the world with an annual demand in 2022 of approximately 29 million metric tons, expected to increase by 40% by 2030. The escalating volume of PET waste and the current inadequacy of recycling methods have led to an accumulation of PET in the terrestrial ecosystem, thereby posing significant global health risks. The pressing global energy and environmental issues associated with PET underscore the urgent need for "upcycling" technologies. These technologies aim to transform reclaimed PET into higher-value products, addressing both energy concerns and environmental sustainability. Enzyme-mediated biocatalytic depolymerization has emerged as a potentially bio-sustainable method for treating and recycling plastics. Numerous plastic-degrading enzymes have been identified from microbial origins, and advancements in protein engineering have been employed to modify and enhance these enzymes. Microbial metabolic engineering allows for the development of modified microbial chassis capable of degrading PET substrates and converting their derived monomers into industrial relevant products. In this review, we describe several engineering approaches aiming at enhancing the

performances of PET-degrading enzymes and we present the current metabolic engineering strategies adopted to bio-upcycle PET into high-value molecules.

Schiltz L, Grivetti E, Tanner GI, Qazi TH.

Recent Advances in Implantable Biomaterials for the Treatment of Volumetric Muscle Loss.

Cells Tissues Organs. 2024:17.

https://karger.com/cto/article-abstract/doi/10.1159/000536262/895389/Recent-Advances-in-Implantable-Biomaterials-for?redirectedFrom=fulltext

Background: Volumetric muscle loss (VML) causes pain and disability in patients who sustain traumatic injury from invasive surgical procedures, vehicle accidents, and battlefield wounds. Clinical treatment of VML injuries is challenging, and although options such as free-flap autologous grafting exist, patients inevitably develop excessive scarring and fatty infiltration, leading to muscle weakness and reduced quality of life. Summary: New bioengineering approaches, including cell therapy, drug delivery, and biomaterial implantation, have emerged as therapies to restore muscle function and structure to pre-injury levels. Of these, acellular biomaterial implants have attracted wide interest owing to their broad potential design space and high translational potential as medical devices. Implantable biomaterials fill the VML defect and create a conduit that permits the migration of regenerative cells from the intact muscle tissue to the injury site. Invading cells and regenerating myofibers are sensitive to the biomaterial's structural and biochemical properties, which can play instructive roles in guiding cell fate and organization into functional tissue. Key Messages: Many diverse biomaterials have been developed for skeletal muscle regeneration with variations in biophysical and biochemical properties, and while many have been tested in vitro, few have proven their regenerative potential in clinically relevant in vivo models. Here, we provide an overview of recent advances in the design, fabrication, and application of acellular biomaterials made from synthetic or natural materials for the repair of VML defects. We specifically focus on biomaterials with rationally designed structural (i.e., porosity, topography, alignment) and biochemical (i.e., proteins, peptides, growth factors) components, highlighting their regenerative effects in clinically relevant VML models.

Sengupta PP, Kluin J, Lee SP, Oh JK, Smits A.

The future of valvular heart disease assessment and therapy.

Lancet. 2024;403(10436):1590-602.

https://doi.org/10.1016/S0140-6736(23)02754-X

Valvular heart disease (VHD) is becoming more prevalent in an ageing population, leading to challenges in diagnosis and management. This two-part Series offers a comprehensive review of changing concepts in VHD, covering diagnosis, intervention timing, novel management strategies, and the current state of research. The first paper highlights the remarkable progress made in imaging and transcatheter techniques, effectively addressing the treatment paradox wherein populations at the highest risk of VHD often receive the least treatment. These advances have attracted the attention of clinicians, researchers, engineers, device manufacturers, and investors, leading to the exploration and proposal of treatment approaches grounded in pathophysiology and multidisciplinary strategies for VHD management. This Series paper focuses on innovations involving computational, pharmacological, and bioengineering approaches that are transforming the diagnosis and management of patients with VHD. Artificial intelligence and digital methods are enhancing screening, diagnosis, and planning procedures, and the integration of imaging and clinical data is improving the classification of VHD severity. The emergence of artificial intelligence techniques,

including so-called digital twins-eg, computer-generated replicas of the heart-is aiding the development of new strategies for enhanced risk stratification, prognostication, and individualised therapeutic targeting. Various new molecular targets and novel pharmacological strategies are being developed, including multiomics-ie, analytical methods used to integrate complex biological big data to find novel pathways to halt the progression of VHD. In addition, efforts have been undertaken to engineer heart valve tissue and provide a living valve conduit capable of growth and biological integration. Overall, these advances emphasise the importance of early detection, personalised management, and cutting-edge interventions to optimise outcomes amid the evolving landscape of VHD. Although several challenges must be overcome, these breakthroughs represent opportunities to advance patient-centred investigations.

Silva J, Arias-Torres L, Carlesi C, Aroca G.

Use of Nanobubbles to Improve Mass Transfer in Bioprocesses.

Processes. 2024;12(6):20.

https://mdpi-res.com/d_attachment/processes/processes-12-01227/article_deploy/processes-12-01227-v2.pdf?version=1719305074

Nanobubble technology has emerged as a transformative approach in bioprocessing, significantly enhancing mass-transfer efficiency for effective microbial activity. Characterized by their nanometric size and high internal pressure, nanobubbles possess distinct properties such as prolonged stability and minimal rise velocities, allowing them to remain suspended in liquid media for extended periods. These features are particularly beneficial in bioprocesses involving aerobic strains, where they help overcome common obstacles, such as increased culture viscosity and diffusion limitations, that traditionally impede efficient mass transfer. For instance, in an experimental setup, nanobubble aeration achieved 10% higher soluble chemical oxygen demand (sCOD) removal compared to traditional aeration methods. Additionally, nanobubble-aerated systems demonstrated a 55.03% increase in caproic acid concentration when supplemented with air nanobubble water, reaching up to 15.10 g/L. These results underscore the potential of nanobubble technology for optimizing bioprocess efficiency and sustainability. This review delineates the important role of the mass-transfer coefficient (kL) in evaluating these interactions and underscores the significance of nanobubbles in improving bioprocess efficiency. The integration of nanobubble technology in bioprocessing not only improves gas exchange and substrate utilization but also bolsters microbial growth and metabolic performance. The potential of nanobubble technology to improve the mass-transfer efficiency in biotechnological applications is supported by emerging research. However, to fully leverage these benefits, it is essential to conduct further empirical studies to specifically assess their impacts on bioprocess efficacy and scalability. Such research will provide the necessary data to validate the practical applications of nanobubbles and identify any limitations that need to be addressed in industrial settings.

Yildiz H, Dolas H, Baytar O, Sahin O.

Bioeconomic transformation of bio-oil production wastes: a novel adsorbent material for toxic dye adsorption and optimization of process parameters.

J Text Inst. 2024:12.

https://doi.org/10.1080/00405000.2024.2352677

In this study, for the first time, an adsorbent material was produced from the waste left behind after the bio-oil production process from Terebinth (Pistacia Terebinthus L.) seeds as part of bioconversion, and the adsorption of the hazardous dyestuff methylene blue from aquatic media was investigated.

The characterization of the adsorbent was performed using FT-IR, SEM, and BET analysis. The characterization of methylene blue adsorption was conducted to fully understand its nature, including its kinetics, equilibrium, and thermodynamic works. The maximum adsorption capacity (qmax) of the monolayer, as determined from the equilibrium data, was calculated to be 166.07 mg g-1. Additionally, the experimental design method was utilized to determine the optimum conditions of the methylene blue adsorption process under various conditions. This study revealed that activated carbons from Terebinth seeds can be used as an economical and environmentally friendly adsorbent, which is very suitable for the removal of highly toxic dyes.

Zaytsev PA, Rodin VA, Zaytseva AA, Zvereva MI, Solovchenko AE.

Advances of high-throughput sequencing for unraveling biotechnological potential of microalgal-bacterial communities.

J Appl Phycol. 2024;36(4):1901-19.

https://link.springer.com/article/10.1007/s10811-024-03267-1

Although established biotechnological applications of microalgae e.g., the production of high-value metabolites is based on axenic cultures, exploitation of the mutualistic consortia of microalgae and bacteria quickly comes to foreground, especially in bioremediation and wastewater treatment. This trend shifts the focus from genomic research of certain microalgal species to metagenomic studies of interactions between microalgae and bacteria in natural communities and in artificial consortia. Dissection of the genetic determinants of the robustness and productivity of the consortia become a hot research direction, too. Admirable contribution to this topic had been made by high-throughput sequencing (HTS), while recent breakthrough in this field was entailed by the advent and rapid development of the 3rd generation nanopore sequencing which becomes increasingly accurate while providing unprecedented sequencing performance. Recent progress of the Oxford Nanopore Technologies (ONT) enabled both classical metagenomic analysis of microalgal-bacterial communities based on whole metagenome sequencing as well as taxonomic and genetic profiling based on the amplicon sequencing. The parallel emergence of novel bioinformatic algorithms for processing the metagenomic datasets opened new opportunities for the analysis of structure and physiology of microalgal-bacterial communities. From the practical perspective, the new HTS techniques became a time- and labor-savers in discovery of new microalgae with a high potential for the accumulation of valuable metabolites, biodegradation of hazardous micropollutants, and biosequestration of nutrients from waste streams. Search for prokaryotic species boosting the biotechnological potential of eukaryotic microalgae via mutualistic interactions with them is another important goal. The insights from the both short-read and long-read metagenomics will form a solid foundation for the rational design of microalgal-bacterial consortia for biotechnology. In this review, we briefly outline the benefits of the long-read sequencing for structural and functional investigation of algal-bacterial consortia and summarize recent reports on using this approach for achieving the biotechnology-related goals.

Muzammil K, Rayyani S, Sahib AA, Gholizadeh O, Sameer HN, Kazem TJ, et al.

Recent Advances in Crimean-Congo Hemorrhagic Fever Virus Detection, Treatment, and Vaccination: Overview of Current Status and Challenges.

Biol Proced Online. 2024;26(1):42.

https://biologicalproceduresonline.biomedcentral.com/counter/pdf/10.1186/s12575-024-00244-3.pdf

Crimean-Congo hemorrhagic fever virus (CCHFV) is a tick-borne virus, and zoonosis, and affects large regions of Asia, Southwestern and Southeastern Europe, and Africa. CCHFV can produce symptoms, including no specific clinical symptoms, mild to severe clinical symptoms, or deadly infections. Virus isolation attempts, antigen-capture enzyme-linked immunosorbent assay (ELISA), and reverse transcription polymerase chain reaction (RT-PCR) are all possible diagnostic tests for CCHFV. Furthermore, an efficient, quick, and cheap technology, including biosensors, must be designed and developed to detect CCHFV. The goal of this article is to offer an overview of modern laboratory tests available as well as other innovative detection methods such as biosensors for CCHFV, as well as the benefits and limits of the assays. Furthermore, confirmed cases of CCHF are managed with symptomatic assistance and general supportive care. This study examined the various treatment modalities, as well as their respective limitations and developments, including immunotherapy and antivirals. Recent biotechnology advancements and the availability of suitable animal models have accelerated the development of CCHF vaccines by a substantial margin. We examined a range of potential vaccines for CCHF in this research, comprising nucleic acid, viral particles, inactivated, and multi-epitope vaccines, as well as the present obstacles and developments in this field. Thus, the purpose of this review is to present a comprehensive summary of the endeavors dedicated to advancing various diagnostic, therapeutic, and preventive strategies for CCHF infection in anticipation of forthcoming hazards.Graphical AbstractFor the protection of medical personnel and effective case management, an early diagnosis of Crimean-Congo hemorrhagic fever (CCHF) is critical. CCHF is diagnosed through laboratory procedures such as RT-PCR, ELISA, virus isolation attempts, and ELISA detection of IgG and IgM antibodies. This review examines several biomarkers researched for their potential use in the diagnosis and prognosis of critical viral infections. It also explores the utility of more traditional diagnostic markers in predicting secondary complications, distinguishing Crimean-Congo hemorrhagic fever virus (CCHFV) infection, and serving as severity indicators. CCHFV vaccine development is advancing at an accelerated rate, facilitated by the availability of a lethal animal infection model. Hence, this review aims to furnish a comprehensive synopsis of the endeavors devoted to various vaccine candidates utilizing distinct approaches against CCHFV. These candidates comprise inactivated, virus-like particles, recombinant proteins, and nucleic acid vaccines. Furthermore, supportive therapy serves as the principal modality of treatment. Human cases of CCHF have been treated with ribavirin, a broad-spectrum antiviral medication; nevertheless, the therapeutic advantages of this intervention remain elusive. This article analyzes the present advancements and prospective trajectories in the realm of antiviral approaches targeting CCHFV.

Organismes français et internationaux - Actualités

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

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INSERM, Infections sévères : Un rempart contre le cancer ?, 21/10/2024.

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ANRS Maladies infectieuses émergentes, Lancement du réseau thématique Virus & Cerveau, 15/10/2024.