

### Bulletin de veille risques biologiques N°122 – Août 2023

**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.

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# Veille risque biologique

### • Protection respiratoire : ajustement

Bodas CR, Ng I, Kave B, Begg F, Williams DL.

# A randomised crossover trial of two flat-fold cup respirators: BYD DE2322 N95 versus Care Essentials MSK-002 P2.

Infect Dis Health. 2023;28(1):64-70.

#### https://www.sciencedirect.com/science/article/pii/S2468045122000505?via%3Dihub

Background: The use of respiratory protection remains important in protecting health care workers from airborne pathogens such as viruses. Respirator supply is constantly changing with new models regularly becoming available. Health services should consider a broad range of factors when procuring respirators, including the results of quantitative fit testing in a representative sample of the workforce. Subjective comfort factors and compatibility with a variety of workplace tasks, such as suitability for staff use near magnetic resonance imaging (MRI) environments where relevant, should also be considered. This article compares the quantitative fit factors and user assessments for two styles of flat-fold cup respirators, Care Essentials (CE) MSK-002 P2 and BYD DE2322 N95. Methods: Quantitative fit tests (QNFT) were performed on 300 participants on each model of respirator in this randomised crossover trial. Participants then completed a questionnaire on their assessments of each respirator. Results: The Care Essentials MSK-002 had a significantly higher quantitative fit test pass rate than the BYD DE2322 (57% vs 18%, p < 0.001). There was no concordance between fit test pass rates for each model. Additionally, the Care Essentials MSK-002 achieved significantly higher scores on each of the responses in the subjective usability survey. Conclusion: It is recommended that the Care Essentials MSK-002 be made available for health care use due to higher QNFT pass rates, higher subjective usability assessment scores, plus its potential for use in MRI environments when compared to the BYD DE2322. 2022 The Author(s). 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-NC-ND license (http:// creativecommons.org/licenses/by-nc-nd/4.0/).

Chen JM, Zhang ZH, Zhao SQ, Fang S, Peters TM, Floyd EL, et al., editors.

#### Poster: Noninvasive Respirator Fit Factor Inference by Semi-Supervised Learning.

8th IEEE/ACM International Conference on Connected Health - Applications, Systems and Engineering Technologies (CHASE); 2023 Jun 21-23; Orlando, FL: Assoc Computing Machinery.

#### https://doi.ieeecomputersociety.org/10.1145/3580252.3589420

The need for personal protective equipment, such as respirators, has been emphasized by pandemics as they provide protection against infectious diseases. Adequate protection is only possible when respirators fit properly and are worn correctly. Therefore, it is especially critical to closely monitor and ensure respirator fit, particularly during a pandemic. To ensure proper fit and continuous monitoring, we propose a newnoninvasive method that uses speech signals to measure the attenuation of sound caused by the respirator. This method provides a quantitative measure of respirator Fit Factor (FF, the



ratio of the concentration of a substance in ambient air to its concentration inside the respirator). This method is also cost-effective and easy to implement. By collecting limited labeled and unlabeled speech data, augmenting labeled data, extracting time and frequency domain features, we achieved up to 86.24% accuracy in respirator fit detection using semi-supervised learning model.

Toigo S, Jacques M, Razek T, Rajda E, Omelon S, Dankoff F, et al.

# Fit Testing Retrofitted Full-Face Snorkel Masks as a Form of Novel Personal Protective Equipment During the COVID-19 Pandemic.

Disaster medicine and public health preparedness. 2023;16(6):2343-7.

### https://doi.org/10.1017/dmp.2021.133

Objective: Bottlenecks in the personal protective equipment (PPE) supply chain have contributed to shortages of PPE during the coronavirus disease 2019 (COVID-19) pandemic, resulting in fractures in the functionality of health-care systems. This study was conducted with the aim of determining the effectiveness of retrofitted commercial snorkel masks as an alternative respirator for health-care workers during infectious disease outbreaks. Methods: A retrospective analysis was performed, analyzing qualitative and quantitative fit test results of the retrofitted Aria Ocean Reef (R) full-face snorkeling mask on health-care workers at the McGill University Health Centre between April and June 2020. Historical fit test results, using medical-grade respirators, for health-care workers, were also analyzed. Results: During the study period, 71 participants volunteered for fit testing, 60.6% of which were nurses. The overall fit test passing rate using the snorkel mask was 83.1%. Of the participants who did not previously pass fit testing with medical-grade respirators, 80% achieved a passing fit test with the snorkel respirator. Conclusions: The results suggest that this novel respirator may be an effective and feasible alternative solution to address PPE shortages, while still providing health-care workers with ample protection. Additional robust testing will be required to ensure that respirator fit is maintained, after numerous rounds of disinfection.

Xu XD, Zhao LL, Zhu Y, Du B, Zhu BL, Zhang HD, et al.

#### Conducting quantitative mask fit tests: application details and affecting factors.

Frontiers in public health. 2023;11:10.

#### https://doi.org/10.3389/fpubh.2023.1218191

IntroductionRespirators chosen based on their assigned protection factor (APF) enable wearers to effectively reduce particulate matter concentrations to safe levels when used correctly. As a crucial factor in achieving the intended APF, the fit test has become a necessary procedure in respiratory disease protection. MethodsThis study involved 225 participants who underwent a fit test using two reusable types of half masks and two types of full masks. Condensation nuclei counting (CNC) and controlled negative pressure (CNP) were performed. ResultsThe results revealed that the passing rate of full masks was higher compared to half masks. Specifically, the passing rate for the half masks and the full masks were 84.7 and 91.6%, respectively. Gender exerted a statistically significant effect on the passing rate. Nevertheless, age, educational background, and training exhibited relatively negligible effects. Certain movements, such as facing forward, were identified as key actions with strong correlation. Additionally, talking was considered a key action with a high failure rate due to instantaneous leakages. Most participants failed at the initial step of CNP, but nearly all of them passed the fit test using CNC. DiscussionTherefore, putting on full masks, especially for women, provides



optimal protection during work. Furthermore, attention should be given to the displacement and deformation of the respirator during the key actions. When it comes to fit test methods, CNC was found to be more practical and comprehensive compared to CNP. Moreover, additional physiological characteristics, such as double chins, could be explored as potential influential factors.

### • Zoonoses : pathologies émergentes

Ariyama N, Pardo-Roa C, Muñoz G, Aguayo C, Ávila C, Mathieu C, et al.

#### Highly Pathogenic Avian Influenza A(H5N1) Clade 2.3.4.4b Virus in Wild Birds, Chile.

Emerging Infectious Disease journal. 2023;29(9):1842.

https://wwwnc.cdc.gov/eid/article/29/9/23-0067\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0067.pdf

In December 2022, highly pathogenic avian influenza A(H5N1) clade 2.3.4.4b virus emerged in Chile. We detected H5N1 virus in 93 samples and obtained 9 whole-genome sequences of strains from wild birds. Phylogenetic analysis suggests multiple viral introductions into South America. Continued surveillance is needed to assess risks to humans and domestic poultry.

Bonney JHK, Sanders T, Pratt D, Agbodzi B, Laryea D, Agyeman NKF, et al.

#### Molecular Characterization of Circulating Yellow Fever Viruses from Outbreak in Ghana, 2021–2022.

Emerging Infectious Disease journal. 2023;29(9):1818.

https://wwwnc.cdc.gov/eid/article/29/9/22-1671\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/22-1671.pdf

Yellow fever virus, transmitted by infected Aedes spp. mosquitoes, causes an acute viral hemorrhagic disease. During October 2021–February 2022, a yellow fever outbreak in some communities in Ghana resulted in 70 confirmed cases with 35 deaths (case-fatality rate 50%). The outbreak started in a predominantly unvaccinated nomadic community in the Savannah region, from which 65% of the cases came. The molecular amplification methods we used for diagnosis produced full-length DNA sequences from 3 confirmed cases. Phylogenetic analysis characterized the 3 sequences within West Africa genotype II; strains shared a close homology with sequences from Cote d'Ivoire and Senegal. We deployed more sensitive advanced molecular diagnostic techniques, which enabled earlier detection, helped control spread, and improved case management. We urge increased efforts from health authorities to vaccinate vulnerable groups in difficult-to-access areas and to educate the population about potential risks for yellow fever infections.

Briand F-X, Souchaud F, Pierre I, Beven V, Hirchaud E, Hérault F, et al.

#### Highly Pathogenic Avian Influenza A(H5N1) Clade 2.3.4.4b Virus in Domestic Cat, France, 2022.

Emerging Infectious Disease journal. 2023;29(8):1696.

https://wwwnc.cdc.gov/eid/article/29/8/23-0188 article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/23-0188.pdf



We detected highly pathogenic avian influenza A(H5N1) clade 2.3.4.4b virus in a domestic cat that lived near a duck farm infected by a closely related virus in France during December 2022. Enhanced surveillance of symptomatic domestic carnivores in contact with infected birds is recommended to prevent further spread to mammals and humans.

Chen K, Travanty N, Garshong R, Crossley D, Wasserberg G, Apperson C, et al.

# Detection of Orientia spp. Bacteria in Field-Collected Free-Living Eutrombicula Chigger Mites, United States.

Emerging Infectious Disease journal. 2023;29(8):1676.

https://wwwnc.cdc.gov/eid/article/29/8/23-0528\_article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/23-0528.pdf

Scrub typhus, a rickettsial disease caused by Orientia spp., is transmitted by infected larval trombiculid mites (chiggers). We report the molecular detection of Orientia species in free-living Eutrombicula chiggers collected in an area in North Carolina, USA, to which spotted fever group rickettsiae infections are endemic.

de Franca DA, Mioni MDR, Fernandes J, de Lemos ERS, Dure AID, Silva MVF, et al.

#### Overview of Q fever in Brazil: an underestimated zoonosis.

Rev Inst Med Trop Sao Paulo. 2023;65:11.

#### https://www.scielo.br/j/rimtsp/a/TLHJX3cK9dKqwyQyNFRYRcR/?lang=en&format=pdf

This review aims to provide current information about Q fever, elucidating the etiological, epidemiological, pathogenic, clinical, diagnostic, therapeutic, and prophylactic aspects of the disease for the medical community. We discuss the main forms of presentation of the agent, its ability to persist in the body, the infinite possibilities of susceptible hosts, the main known forms of transmission, its importance in populations at occupational risk, and the role of arthropods in the natural history of the disease. Focusing on Brazil, we present the cases already described and studies developed since its first report, and how there is still much to unravel. We are aware of the possibilities of the persistence of the agent and the development of severe clinical pictures and the specific treatments currently instituted. We also wish to raise awareness about the future, the new genotypes that are emerging, the need to study the effects of vaccines, and the impact of Q fever on the population. Q fever is a poorly understood disease in Latin America, and recent studies, especially in Brazil, have revealed the importance of developing new studies.

Enborn T, Suominen K, Laitinen S, Ollgren J, Autio T, Rimhanen-Finne R.

#### Cryptosporidium parvum: an emerging occupational zoonosis in Finland.

https://actavetscand.biomedcentral.com/counter/pdf/10.1186/s13028-023-00684-z.pdf

BackgroundCryptosporidiosis has increased in recent years in Finland. We aimed to identify risk factors for human cryptosporidiosis and to determine the significance of Cryptosporidium parvum as a causative agent. Based on notifications to the Finnish Infectious Disease Register (FIDR), we conducted a case-control study and genotyped Cryptosporidium species from patient samples from July to December 2019. We also retrieved the occupational cryptosporidiosis cases from 2011 to 2019 from the Finnish Register of Occupational Diseases (FROD).ResultsOf 272 patient samples analyzed, 76%



were C. parvum and 3% C. hominis. In the multivariable logistic regression analysis of 82 C. parvum cases and 218 controls, cryptosporidiosis was associated with cattle contact (OR 81, 95% confidence interval (CI) 26-251), having a family member with gastroenteritis (OR 34, 95% CI 6.2-186), and spending time at one's own vacation home (OR 15, 95% CI 4.2-54). Of the cases, 65% had regular cattle contact. The most common gp60 subtypes identified were IIaA15G2R1 and IIaA13G2R1. In FROD, 68 recognized occupational cryptosporidiosis cases were registered in 2011-2019.ConclusionsC. parvum is the most common Cryptosporidium species found in humans in Finland and poses a moderate to high risk of occupational infection for people working with cattle. The number of occupational notifications of cryptosporidiosis increased between 2011 and 2019. Cryptosporidiosis should be recognized as an important occupational disease among persons working with livestock in Finland, criteria to identify occupational cryptosporidiosis need to be created, and occupational safety in cattle-related work should be improved.

Garba-Ouangole S, Bourner J, Mbrenga F, Gonofio E, Selekon B, Manirakiza A, et al.

#### Laboratory Diagnosis of Mpox, Central African Republic, 2016–2022.

Emerging Infectious Disease journal. 2023;29(9):1846.

https://wwwnc.cdc.gov/eid/article/29/9/23-0514\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0514.pdf

During 2016–2022, PCR testing confirmed 100 mpox cases among 302 suspected cases in the Central African Republic. The highest detection rates were from active lesions (40%) and scabs (36%); cycle thresholds were lower ( $\approx$ 18) than those for blood samples ( $\approx$ 33). Results were consistent for generic primer– and clade I primer–specific PCR tests.

Garrigos T, Grimal A, Badell E, Traversier N, Picot S, Lignereux A, et al.

# Emerging Corynebacterium diphtheriae Species Complex Infections, Réunion Island, France, 2015–2020.

Emerging Infectious Disease journal. 2023;29(8):1630.

https://wwwnc.cdc.gov/eid/article/29/8/23-0106\_article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/23-0106.pdf

Clinical, epidemiologic, and microbiologic analyses revealed emergence of 26 cases of Corynebacterium diphtheriae species complex infections on Réunion Island, France, during 2015–2020. Isolates were genetically diverse, indicating circulation and local transmission of several diphtheria sublineages. Clinicians should remain aware of the risk for diphtheria and improve diagnostic methods and patient management.

Giovanetti M, Vazquez C, Lima M, Castro E, Rojas A, Gomez de la Fuente A, et al.

### Rapid Epidemic Expansion of Chikungunya Virus East/Central/South African Lineage, Paraguay.

Emerging Infectious Disease journal. 2023;29(9):1859.

https://wwwnc.cdc.gov/eid/article/29/9/23-0523\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0523.pdf



The spread of Chikungunya virus is a major public health concern in the Americas. There were >120,000 cases and 51 deaths in 2023, of which 46 occurred in Paraguay. Using a suite of genomic, phylodynamic, and epidemiologic techniques, we characterized the ongoing large chikungunya epidemic in Paraguay.

Hecht G, Dale A, Ruberto I, Adame G, Close R, Snyder S-J, et al.

#### Detection of Hantavirus during the COVID-19 Pandemic, Arizona, USA, 2020.

Emerging Infectious Disease journal. 2023;29(8):1663.

https://wwwnc.cdc.gov/eid/article/29/8/22-1808\_article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/22-1808.pdf

We identified 2 fatal cases of persons infected with hantavirus in Arizona, USA, 2020; 1 person was coinfected with SARS-CoV-2. Delayed identification of the cause of death led to a public health investigation that lasted  $\approx$ 9 months after their deaths, which complicated the identification of a vector or exposure.

Islam MM, Farag E, Hassan MM, Jaffrey SS, Atta M, Al-Marri AM, et al.

# Rodent-borne zoonoses in Qatar: A possible One-Health framework for the intervention of future epidemic.

#### https://www.sciencedirect.com/science/article/pii/S235277142300037X?via%3Dihub

The increasing frequency of spillover of zoonotic pathogens from animals to humans in recent years highlights a need to develop a more comprehensive framework to investigate and prevent pathogens of animal origin, including rodents. Despite the presence of several species of rodents, there is a certain knowledge gap regarding rodent-borne zoonoses in Qatar. The current review provides an update on rodent-borne zoonoses in Qatar, its possible drivers and transmission dynamics, and proposed a One Health framework for intervention. Following an extensive literature review, we conducted a field investigation. Then the qualitative information and knowledge gaps were addressed with a virtual discussion with national, regional, and international experts in the relevant field. Overall, Rattus norvegicus population was found to be more prevalent, followed by Rattus rattus, and M. musculus, which are mainly found in animal farms, followed by agricultural farms, residential areas, and other facilities. Over 50% of rodents carry at least one pathogen of public health importance. Several pathogens were identified at the human, animal, and ecosystem interface, which can be mediated in transmission by rodents. E. coli, Salmonella spp., and Campylobacter spp. are the frequently reported bacteria. Hymenolepis spp., Cryptosporidium spp., Giardia spp., Entamoeba spp., and Toxoplasma spp. are the major parasites. In addition, many vectors, including Ornithonyssus bacoti and Xenopsylla astia were reported in this country. Based on the changes over the past 70 years in Qatar, seven drivers have been identified, which could be important in rodentborne disease emergences, such as the Oil and gas revolution, fast population growth, rapid urbanization, importation of food and agricultural products, agricultural and livestock development, farm biosecurity, and stray animals. The experts emphasized that mixed-species animal farming with poor biosecurity and management can be associated to increase the risk of zoonoses. Moreover, rapid urbanization and global climate change together can alter the ecosystem of the country and impact on vectors and vector-borne diseases. Finally, the One Health framework has been proposed for the surveillance, and mitigation of any future spillover or epidemic of rodent-borne zoonoses.



Laine C, Johnson V, Scott HM, Arenas-Gamboa A.

#### **Global Estimate of Human Brucellosis Incidence.**

Emerging Infectious Disease journal. 2023;29(9):1789.

https://wwwnc.cdc.gov/eid/article/29/9/23-0052\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0052.pdf

Brucellosis is a major public health concern worldwide, especially for persons living in resource-limited settings. Historically, an evidence-based estimate of the global annual incidence of human cases has been elusive. We used international public health data to fill this information gap through application of risk metrics to worldwide and regional at-risk populations. We performed estimations using 3 statistical models (weighted average interpolation, bootstrap resampling, and Bayesian inference) and considered missing information. An evidence-based conservative estimate of the annual global incidence is 2.1 million, significantly higher than was previously assumed. Our models indicate Africa and Asia sustain most of the global risk and cases, although areas within the Americas and Europe remain of concern. This study reveals that disease risk and incidence are higher than previously suggested and lie mainly within resource-limited settings. Clarification of both misdiagnosis and underdiagnosis is required because those factors will amplify case estimates.

Lin Z-T, Du L-F, Zhang M-Z, Han X-Y, Wang B-H, Meng J, et al.

Genomic Characteristics of Emerging Intraerythrocytic Anaplasma capra and High Prevalence in Goats, China.

Emerging Infectious Disease journal. 2023;29(9):1780.

https://wwwnc.cdc.gov/eid/article/29/9/23-0131\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0131.pdf

Anaplasma capra is an emerging tickborne human pathogen initially recognized in China in 2015; it has been reported in ticks and in a wide range of domestic and wild animals worldwide. We describe wholegenome sequences of 2 A. capra strains from metagenomic sequencing of purified erythrocytes from infected goats in China. The genome of A. capra was the smallest among members of the genus Anaplasma. The genomes of the 2 A. capra strains contained comparable G+C content and numbers of pseudogenes with intraerythrocytic Anaplasma species. The 2 A. capra strains had 54 unique genes. The prevalence of A. capra was high among goats in the 2 endemic areas. Phylogenetic analyses revealed that the A. capra strains detected in this study were basically classified into 2 subclusters with those previously detected in Asia. Our findings clarify details of the genomic characteristics of A. capra and shed light on its genetic diversity.

Loayza Mafayle R, Morales-Betoulle M, Whitmer S, Cossaboom C, Revollo J, Loayza NM, et al.

#### Rio Negro Virus Infection, Bolivia, 2021.

Emerging Infectious Disease journal. 2023;29(8):1705.

https://wwwnc.cdc.gov/eid/article/29/8/22-1885\_article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/22-1885.pdf



In May 2021, an agricultural worker originally from Trementinal, Argentina, sought treatment for febrile illness in Tarija, Bolivia, where he resided at the time of illness onset. The patient tested negative for hantavirus RNA, but next-generation sequencing of a serum sample yielded a complete genome for Rio Negro virus.

McCormick D, Brown C, Bjork J, Cervantes K, Esponda-Morrison B, Garrett J, et al.

# Characteristics of Hard Tick Relapsing Fever Caused by Borrelia miyamotoi, United States, 2013–2019.

Emerging Infectious Disease journal. 2023;29(9):1719.

https://wwwnc.cdc.gov/eid/article/29/9/22-1912\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/22-1912.pdf

Borrelia miyamotoi, transmitted by Ixodes spp. ticks, was recognized as an agent of hard tick relapsing fever in the United States in 2013. Nine state health departments in the Northeast and Midwest have conducted public health surveillance for this emerging condition by using a shared, working surveillance case definition. During 2013–2019, a total of 300 cases were identified through surveillance; 166 (55%) were classified as confirmed and 134 (45%) as possible. Median age of case-patients was 52 years (range 1–86 years); 52% were male. Most cases (70%) occurred during June–September, with a peak in August. Fever and headache were common symptoms; 28% of case-patients reported recurring fevers, 55% had arthralgia, and 16% had a rash. Thirteen percent of patients were hospitalized, and no deaths were reported. Ongoing surveillance will improve understanding of the incidence and clinical severity of this emerging disease.

Rowe D, McDermott C, Veliz Y, Kerr A, Whiteside M, Coss M, et al.

#### Dengue Outbreak Response during COVID-19 Pandemic, Key Largo, Florida, USA, 2020.

Emerging Infectious Disease journal. 2023;29(8):1643.

https://wwwnc.cdc.gov/eid/article/29/8/22-1856 article

https://wwwnc.cdc.gov/eid/article/29/8/pdfs/22-1856.pdf

We report a dengue outbreak in Key Largo, Florida, USA, from February through August 2020, during the COVID-19 pandemic. Successful community engagement resulted in 61% of case-patients self-reporting. We also describe COVID-19 pandemic effects on the dengue outbreak investigation and the need to increase clinician awareness of dengue testing recommendations.

van der Westhuizen CG, Burt FJ, van Heerden N, van Zyl W, Anthonissen T, Musoke J.

# Prevalence and occupational exposure to zoonotic diseases in high-risk populations in the Free State Province, South Africa.

Frontiers in Microbiology. 2023;14:11.

https://doi.org/10.3389/fmicb.2023.1196044

IntroductionZoonotic diseases are responsible for 2.5 billion human cases globally and approximately 2.7 million deaths annually. Surveillance of animal handlers and livestock for zoonotic pathogens contributes to understanding the true disease burden and risk factors within a community. This study investigated the prevalence of selected zoonoses in cattle, farm workers and occupational exposure to



endemic zoonotic diseases and their associated risk factors. MethodsSputum samples from farmworkers were screened for Mycobacterium bovis. Blood specimens from farmworkers and archived sera were tested for serological evidence of Brucella sp., hantaviruses, and Leptospira sp. Communal and commercial cattle herds were tested for bovine tuberculosis and brucellosis. ResultsMycobacterium bovis was not isolated from human samples. A total of 327 human sera were screened, and 35/327 (10.7%) were Brucella sp. IgG positive, 17/327 (5.2%) Leptospira sp. IgM positive, and 38/327 (11.6%) hantavirus IgG positive (95% CI). A higher proportion of Brucella sp. IgG-positive samples were detected among veterinarians (value of p = 0.0006). Additionally, two cattle from a commercial dairy farm were bovine tuberculosis (bTB) positive using the bTB skin test and confirmatory interferon-gamma assay. A higher percentage of confirmed brucellosis-positive animals were from communal herds (8.7%) compared to commercial herds (1.1%). DiscussionThese findings highlight the brucellosis and M. bovis prevalence in commercial and communal herds, the zoonotic disease risk in commercial and subsistence farming in developing countries, and the occupational and rural exposure risk to zoonotic pathogens.

van Diemen P, Byrne AMP, Ramsay A, Watson S, Nunez A, v Moreno A, et al.

# Interspecies Transmission of Swine Influenza A Viruses and Human Seasonal Vaccine-Mediated Protection Investigated in Ferret Model.

Emerging Infectious Disease journal. 2023;29(9):1798.

https://wwwnc.cdc.gov/eid/article/29/9/23-0066\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0066.pdf

We investigated the infection dynamics of 2 influenza A(H1N1) virus isolates from the swine 1A.3.3.2 (pandemic 2009) and 1C (Eurasian, avian-like) lineages. The 1C-lineage virus, A/Pavia/65/2016, although phylogenetically related to swine-origin viruses, was isolated from a human clinical case. This strain infected ferrets, a human influenza model species, and could be transmitted by direct contact and, less efficiently, by airborne exposure. Infecting ferrets and pigs (the natural host) resulted in mild or inapparent clinical signs comparable to those observed with 1A.3.3.2-lineage swine-origin viruses. Both H1N1 viruses could infect pigs and were transmitted to cohoused ferrets. Ferrets vaccinated with a human 2016–17 seasonal influenza vaccine were protected against infection with the antigenically matched 1A pandemic 2009 virus but not against the swine-lineage 1C virus. Our results reaffirm the need for continuous influenza A virus surveillance in pigs and identification of candidate human vaccine viruses.

Vergara HD, Gómez C, Faccini-Martínez Á, Herrera AC, López MJ, Camacho C, et al.

### Acute Chagas Disease Outbreak among Military Personnel, Colombia, 2021.

Emerging Infectious Disease journal. 2023;29(9):1882.

https://wwwnc.cdc.gov/eid/article/29/9/23-0886\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0886.pdf

We report an acute Chagas disease outbreak among soldiers in Colombia. Trypanosoma cruzi infection was confirmed through parasitology, serology, and molecular methods. Among 9 affected soldiers, 2 died; 7 were hospitalized and received benznidazole treatment, which produced favorable outcomes. Personnel patrolling rural areas in Colombia could be at increased risk for Chagas disease.

Virtanen J, Hautaniemi M, Dutra L, Plyusnin I, Hautala K, Smura T, et al.



#### Partial Genome Characterization of Novel Parapoxvirus in Horse, Finland.

Emerging Infectious Disease journal. 2023;29(9):1941.

https://wwwnc.cdc.gov/eid/article/29/9/23-0049\_article

https://wwwnc.cdc.gov/eid/article/29/9/pdfs/23-0049.pdf

We report a sequencing protocol and 121-kb poxvirus sequence from a clinical sample from a horse in Finland with dermatitis. Based on phylogenetic analyses, the virus is a novel parapoxvirus associated with a recent epidemic; previous data suggest zoonotic potential. Increased awareness of this virus and specific diagnostic protocols are needed.

• Légionellose

Ricco M, Ferraro P, Ranzieri S, Boldini G, Zanella I, Marchesi F.

# Legionnaires' Disease in Occupational Settings: A Cross-Sectional Study from Northeastern Italy (2019).

Tropical Medicine and Infectious Disease. 2023;8(7):27.

#### https://doi.org/10.3390/tropicalmed8070364

In Italy, Legionnaires' Disease (LD) causes >1000 hospital admissions per year, with a lethality rate of 5 to 10%. Occupational exposures could reasonably explain a substantial share of total cases, but the role of Occupational Physicians (OPs) in management and prevention of LD has been scarcely investigated. The present survey therefore evaluates the knowledge, attitudes and practices (KAP) regarding LD from a convenience sample of Italian OPs, focusing on their participation in preventive interventions. A total of 165 OPs were recruited through a training event (Parma, Northeastern Italy, 2019), and completed a specifically designed structured questionnaire. The association between reported participation in preventive interventions and individual factors was analyzed using a binary logistic regression model, calculating corresponding multivariable Odds Ratio (aOR). Overall, participants exhibited satisfactory knowledge of the clinical and diagnostic aspects of LD, while substantial uncertainties were associated epidemiological factors (i.e., notification rate and lethality). Although the majority of participating OPs reportedly assisted at least one hospital (26.7%) and/or a nursing home (42.4%) and/or a wastewater treatment plant, only 41.8% reportedly contributed to the risk assessment for LD and 18.8% promoted specifically designed preventive measures. Working as OPs in nursing homes (aOR 8.732; 95% Confidence Intervals [95%CI] 2.991 to 25.487) and wastewater treatment plants (aOR 8.710; 95%CI 2.844 to 26.668) was associated with participation in the risk assessment for LD, while the promotion of preventive practice was associated with working as an OP in hospitals (aOR 6.792; 95%CI 2.026 to 22.764) and wastewater treatment plants (aOR 4.464, 95%Cl 1.363 to 14.619). In other words, the effective participation of the OP in the implementation of preventive measures appears uncommon and is limited to certain occupational settings. Collectively, these results highlight the importance of tailoring specifically designed information campaigns aimed to raise the involvement of OPs in the prevention of LD in occupational settings other than healthcare.



### **Biotechnologies**

• Nouveaux procédés

Al-Sakkaf MK, Basfer I, Iddrisu M, Bahadi SA, Nasser MS, Abussaud B, et al.

An Up-to-Date Review on the Remediation of Dyes and Phenolic Compounds from Wastewaters Using Enzymes Immobilized on Emerging and Nanostructured Materials: Promises and Challenges.

Nanomaterials. 2023;13(15):38.

#### https://doi.org/10.3390/nano13152152

Addressing the critical issue of water pollution, this review article emphasizes the need to remove hazardous dyes and phenolic compounds from wastewater. These pollutants pose severe risks due to their toxic, mutagenic, and carcinogenic properties. The study explores various techniques for the remediation of organic contaminants from wastewater, including an enzymatic approach. A significant challenge in enzymatic wastewater treatment is the loss of enzyme activity and difficulty in recovery post-treatment. To mitigate these issues, this review examines the strategy of immobilizing enzymes on newly developed nanostructured materials like graphene, carbon nanotubes (CNTs), and metalorganic frameworks (MOFs). These materials offer high surface areas, excellent porosity, and ample anchoring sites for effective enzyme immobilization. The review evaluates recent research on enzyme immobilization on these supports and their applications in biocatalytic nanoparticles. It also analyzes the impact of operational factors (e.g., time, pH, and temperature) on dye and phenolic compound removal from wastewater using these enzymes. Despite promising outcomes, this review acknowledges the challenges for large-scale implementation and offers recommendations for future research to tackle these obstacles. This review concludes by suggesting that enzyme immobilization on these emerging materials could present a sustainable, environmentally friendly solution to the escalating water pollution crisis.

Dhar K, Venkateswarlu K, Megharaj M.

# Anoxygenic phototrophic purple non-sulfur bacteria: tool for bioremediation of hazardous environmental pollutants.

World Journal of Microbiology & Biotechnology. 2023;39(10):18.

### https://link.springer.com/content/pdf/10.1007/s11274-023-03729-7.pdf

The extraordinary metabolic flexibility of anoxygenic phototrophic purple non-sulfur bacteria (PNSB) has been exploited in the development of various biotechnological applications, such as wastewater treatment, biohydrogen production, improvement of soil fertility and plant growth, and recovery of high-value compounds. These versatile microorganisms can also be employed for the efficient bioremediation of hazardous inorganic and organic pollutants from contaminated environments. Certain members of PNSB, especially strains of Rhodobacter sphaeroides and Rhodopseudomonas palustris, exhibit efficient remediation of several toxic and carcinogenic heavy metals and metalloids, such as arsenic, cadmium, chromium, and lead. PNSB are also known to utilize diverse biomass-derived lignocellulosic organic compounds and xenobiotics. Although biodegradation of some substituted aromatic compounds by PNSB has been established, available information on the involvement of PNSB in the biodegradation of toxic organic pollutants is limited. In this review, we present advancements in the field of PNSB-based bioremediation of heavy metals and organic pollutants. Furthermore, we



highlight that the potential role of PNSB as a promising bioremediation tool remains largely unexplored. Thus, this review emphasizes the necessity of investing extensive research efforts in the development of PNSB-based bioremediation technology.

Khan S, Zahoor M, Khan RS, Ikram M, Ul Islam N.

#### The impact of silver nanoparticles on the growth of plants: The agriculture applications.

Heliyon. 2023;9(6):16.

#### https://doi.org/10.1016/j.heliyon.2023.e16928

Nanotechnology is the most advanced and rapidly progressing field of science and technology. It primarily deals with developing novelty in nanomaterials by understanding and controlling matter at the nanoscale level. Silver nanoparticles (AgNPs) are the most prominent nanoparticles incorporated with wide-ranging applications, owing to their distinct characteristics. Different methods have been employed for nanoparticles synthesis like chemical method, physical method, photochemical method, top-down/bottom-up approach and biological methods. The positive impacts of silver nanoparticles have been observed in various economy-based sectors, including agriculture. The scientific curiosity about AgNPs in agriculture and plant biotechnology has shown optimum efficacy over the last few years. It not only enhances seed germination and plant growth, but also improves the quantum efficiency of the photosynthetic process. AgNPs play a vital role in agriculture by having several applications that are crucial for ensuring food security and improving crop production. Moreover, they also act as nano-pesticides, providing sufficient dose to the target plants without releasing unnecessary pesticides into the environment. Nanofertilizers slowly release nutrients to the plants, thereby preventing excessive nutrient loss. AgNPs are utilized for effective and non-toxic pest management, making them an excellent tool for combating pests safely. They combine either edible or nonbiodegradable polymers for active food packaging. In addition, AgNPs also possess diverse biological properties such as antiviral, antibacterial and antifungal activities, which protect plants from hazardous microbes. The aim of this review is to comprehensively survey and summarize recent literature regarding the positive and negative impacts of AgNPs on plant growth, as well as their agricultural applications.

Michaeli DT, Michaeli JC, Albers S, Boch T, Michaeli T.

Established and Emerging Lipid-Lowering Drugs for Primary and Secondary Cardiovascular Prevention.

Am J Cardiovasc Drugs. 2023:19.

### https://link.springer.com/content/pdf/10.1007/s40256-023-00594-5.pdf

Despite treatment with statins, patients with elevated low-density lipoprotein cholesterol (LDL-C) and triglycerides remain at increased risk for adverse cardiovascular events. Consequently, novel pharmaceutical drugs have been developed to control and modify the composition of blood lipids to ultimately prevent fatal cardiovascular events in patients with dyslipidaemia. This article reviews established and emerging lipid-lowering drugs regarding their mechanism of action, development stage, ongoing clinical trials, side effects, effect on blood lipids and reduction in cardiovascular morbidity and mortality. We conducted a keyword search to identify studies on established and emerging lipid modifying drugs. Results were summarized in a narrative overview. Established pharmaceutical treatment options include the Niemann-Pick-C1 like-1 protein (NPC1L1) inhibitor ezetimibe, the protein convertase subtilisin-kexin type 9 (PCSK9) inhibitors alirocumab and evolocumab, fibrates as peroxisome proliferator receptor alpha (PPAR-& alpha;) activators, and the omega-3 fatty



acid icosapent ethyl. Statins are recommended as the first-line therapy for primary and secondary cardiovascular prevention in patients with hypercholesterinaemia and hypertriglyceridemia. For secondary prevention in hypercholesterinaemia, second-line options such as statin add-on or statinintolerant treatments are ezetimibe, alirocumab and evolocumab. For secondary prevention in hypertriglyceridemia, second-line options such as statin add-on or statin-intolerant treatments are icosapent ethyl and fenofibrate. Robust data for these add-on therapeutics in primary cardiovascular prevention remains scarce. Recent biotechnological advances have led to the development of innovative small molecules (bempedoic acid, lomitapide, pemafibrate, docosapentaenoic and eicosapentaenoic acid), antibodies (evinacumab), antisense oligonucleotides (mipomersen, volanesorsen, pelcarsen, olezarsen), small interfering RNA (inclisiran, olpasiran), and gene therapies for patients with dyslipidemia. These molecules specifically target new cellular pathways, such as the adenosine triphosphate-citrate lyase (bempedoic acid), PCSK9 (inclisiran), angiopoietin-like 3 (ANGPTL3: evinacumab), microsomal triglyceride transfer protein (MTP: lomitapide), apolipoprotein B-100 (ApoB-100: mipomersen), apolipoprotein C-III (ApoC-III: volanesorsen, olezarsen), and lipoprotein (a) (Lp(a): pelcarsen, olpasiran). The authors are hopeful that the development of new treatment modalities alongside new therapeutic targets will further reduce patients' risk of adverse cardiovascular events. Apart from statins, data on new drugs' use in primary cardiovascular prevention remain scarce. For their swift adoption into clinical routine, these treatments must demonstrate safety and efficacy as well as cost-effectiveness in randomized cardiovascular outcome trials.

Mulholland N, Chandra J, Sanderson R, Kuhnl A.

#### Chimeric Antigen Receptor T-Cell Therapy and Imaging Applications for Large B-Cell Lymphoma.

Radiology. 2023;307(5):16.

#### https://doi.org/10.1148/radiol.221362

Chimeric antigen receptor (CAR) T-cell therapy has revolutionized the treatment of large B-cell lymphoma (LBCL) and other-hematologic malignancies. Its mechanism of action relies on recent biotechnological advances that allow clinicians to harness and enhance a patient's immune system to fight cancerous cells. The indications for CAR T-cell therapy continue to expand, with ongoing trialsevaluating their use in other hematologic and solid organ malignancies. This review explores the vital role of diagnostic imaging in patient selection and treatment response in CAR T-cell therapy for LBCL and the management of specific therapy-related adverse events. For a patient-centered and costeffective use of CAR T-cell therapy, it is crucial to select patients who are likely to derive long-term benefit and optimize their care during a lengthy treatment pathway. Metabolic tumor volume and kinetics assessed at PET/CT have emerged as powerful tools to predict outcome after CAR T-cell therapy in LBCL, allowing for the early identification of lesions refractory to treatment and identification of the severity of CAR T-cell therapy toxicity. Radiologists should be aware that the success of CAR T-cell therapy is mitigated by adverse events, most importantly neurotoxicity, which remains poorlyunderstood and challenging to treat. Neuroimaging, with experienced clinical evaluation, is critical in the diagnosis and management of neurotoxicity and the exclusion of other central nervous system complications that can occur in this clinically vulnerable patient group. This review discusses current applications of imaging in the standard CAR T-cell therapy pathway for the treatment of LBCL, which serves as a model disease in the integration of diagnostic imaging and radiomic risk markers. (c) RSNA, 2023



Nageshwari K, Pathy A, Pugazhendhi A, Balasubramanian P.

#### Bioprocess strategies to augment biohydrogen production from algae.

Fuel. 2023;351:18.

#### https://doi.org/10.1016/j.fuel.2023.128922

Drastic climatic changes and health hazards, in the recent years, due to combustion of fossil fuels has elicited the need to find sustainable and economical fuel alternatives. Hydrogen gas is a versatile energy carrier that can be used for transportation, electricity generation, and industrial processes. It does not produce greenhouse gases or other pollutants when used, making it a promising alternative to fossil fuels. Among the feedstocks used for hydrogen production, algae are found to be a potential source due to their high growth rate, ability to grow in diverse environments, and ability to produce hydrogen via the process of photosynthesis. However, current hydrogen production rates using algae are low, and strategies to improve these rates are needed. This review is aimed to investigate and evaluate different strategies to enhance biohydrogen production using algae. In addition, the prospects of using macro and microalgae as feedstocks have been elucidated. This review also provides brief insights on the current technologies available for algal biohydrogen production and their bottlenecks. The recent advancements, research gaps and future scopes of this research have been highlighted. Overall, the discussion of the various strategies can provide valuable information for the development of cost-effective and sustainable hydrogen production methods.

Oszust K, Szpilska K, Gryta A, Panek J, Pylak ML, Lipa T, et al.

New biotechnological solutions in biocontrol and molecular diagnostics of Neofabraea spp. in apples-A review.

Postharvest Biol Technol. 2023;204:11.

https://www.sciencedirect.com/science/article/pii/S092552142300203X?via%3Dihub

The most important requirement for apple producers is to ensure the best possible apple quality after storage. Growers must comply with several regulations in the field of food and environmental safety. In the production of apples, it has been observed that financial losses are related to the occurrence of latent storage diseases caused by phytopathogenic fungi of the genus Neofabraea (bull's eye rot). Therefore, investors in this sector require new solutions supporting rational apple management, with a particular focus on pro-ecological methods of controlling Neofabraea sp. pathogenic representatives and methods for the early detection of these pathogens, especially when there are no symptoms of disease in the apple. This review summarizes the activities being undertaken to increase sustainable production in horticulture. What is more, the up-to-date significance of apple production and the various ways of counteracting bull's eye rot were also described. Next, biopreparations based on microorganisms in horticulture applications are characterized, with special attention being paid to the preparations preventing the development of Neofabraea spp. The various methods used to detect fungal phytopathogens are explored towards Neofabraea spp. detection using genetic markers. Finally, expectations and future directions in the quest for new biotechnological solutions in the area of the biocontrol and molecular diagnostics of Neofabraea spp. in apples were presented. In particular, the need for targeted biocontrol biopreparations and an early detection method of Neofabraea spp. in apples to evaluate the risk of the occurrence of apple bull's eye rot was highlighted.



Patel A, Miles A, Strackhouse T, Cook L, Leng SN, Patel S, et al.

#### Methods of crop improvement and applications towards fortifying food security.

Front Genome Edit. 2023;5:22.

https://doi.org/10.3389%2Ffgeed.2023.1171969

Agriculture has supported human life from the beginning of civilization, despite a plethora of biotic (pests, pathogens) and abiotic (drought, cold) stressors being exerted on the global food demand. In the past 50 years, the enhanced understanding of cellular and molecular mechanisms in plants has led to novel innovations in biotechnology, resulting in the introduction of desired genes/traits through plant genetic engineering. Targeted genome editing technologies such as Zinc-Finger Nucleases (ZFNs), Transcription Activator-Like Effector Nucleases (TALENs), and Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) have emerged as powerful tools for crop improvement. This new CRISPR technology is proving to be an efficient and straightforward process with low cost. It possesses applicability across most plant species, targets multiple genes, and is being used to engineer plant metabolic pathways to create resistance to pathogens and abiotic stressors. These novel genome editing (GE) technologies are poised to meet the UN's sustainable development goals of "zero hunger" and "good human health and wellbeing." These technologies could be more efficient in developing transgenic crops and aid in speeding up the regulatory approvals and risk assessments conducted by the US Departments of Agriculture (USDA), Food and Drug Administration (FDA), and Environmental Protection Agency (EPA).

Tuemerkan ETA, Kozaci LD, Miri AK, Maharjan S, Cecen B.

Sustainable aquatic waste and by-products processing: biomaterials in tissue engineering facts and gaps.

Mater Today Sustain. 2023;23:16.

https://doi.org/10.1016/j.mtsust.2023.100445

The need to modify aquatic waste using sterile, non-hazardous, and ecological procedures has become one of the significant challenges in its disposal. Biomaterials from aquatic species and their waste or by-products are considered renewable biosources because they are highly volatile substances or high energy inputs. The biological wastes can be recovered for biomedicine, pharmacology, and other applications. This study summarizes the current groups of aquatic biomaterials, made of plants, fish species living in freshwater or marine environments, waste biomass, biopolymers, and stabilization agents. Aquatic biomaterials from several sources are discussed in some clinical and in vitro experiments for tissue engineering purposes. The near-future demands are also demonstrated, depending on biomaterial-specific problem-solving. This review may help bioengineers discover more economical and eco-compatible biomaterial options.& COPY; 2023 Elsevier Ltd. All rights reserved.

Wang J, Huang ZY, Jiang QJ, Roubik H, Xu QH, Gharsallaoui A, et al.

# Fungal solid-state fermentation of crops and their by-products to obtain protein resources: The next frontier of food industry.

Trends in Food Science & Technology. 2023;138:628-44.

https://doi.org/10.1016/j.tifs.2023.06.020



Background: Over the past three decades, solid-state fermentation (SSF) has gained much attention in biotech-nology, allowing efficient production of feed, fuels, industrial enzymes, etc., accompanied by less wastewater and less risk of contamination than submerged fermentation (SmF). Meanwhile, mycoproteins obtained using plant biomass to culture fungi have good nutritional values and interesting functional properties. As the environmental burden of producing high-quality protein grows, there is an ongoing discussion about alternatives to conven-tional animal proteins; mycoprotein production via SSF may offer a potential solution. Scope and approach: This review conducted a visualization analysis on related studies, demonstrating research hotspots and trends in the development of fungal SSF, and compared fermentation conditions under different circumstances. We further discussed the protein profile of crops and their by-products, and the effects of fungal SSF on protein content, amino acid composition, bioaccessibility, etc. Lately, the technical feasibility and extant limitations of this design are summarized. Key findings and conclusions: SSF promotes the conversion of residual biomass into edible ingredients or enzymes, alleviating the environmental impact of the food industry with the development of this technology. The fermentation substrate is diversifying from mainly agro-industrial waste. Most crops and their by-products contain significant amounts of plant proteins, existing studies confirm that fungal SSF can further improve the nutritional profile and bioaccessibility. Such solutions accelerate the decoupling of the food industry from arable land and enable the production of high value-added crops. The protein content and amino acid composition of edible fungi are more desirable than those of general fungi and are expected to contribute to the exploration of meat analogs.



# Organismes français et internationaux - Actualités

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

### • Hépatites

Santé Publique France, <u>Hépatites B, C et Delta : une activité de dépistage élevée et en augmentation</u>, 07/09/2023.

### • Maladies infectieuses émergentes

INSERM, Maladies infectieuses émergentes : la recherche ne faiblit pas, 07/09/2023.

• SARS-CoV-2

ANSES,

SARS-CoV-2 : une piste de vaccin efficace contre tous les variants, 08/09/2023.

Santé Publique France,

COVID-19 : un premier cas de variant BA.2.86 détecté en France, 01/09/2023.

<u>COVID-19 – Point de situation au 23 août 2023 : le virus SARS-CoV-2 continue de circuler, la vigilance</u> <u>se poursuit</u>, 24/08/2023.

### • Vaccination

ANSES, <u>Obligations vaccinales des professionnels : la HAS publie le 2nd volet de ses travaux</u>, 31/07/2023.

Santé Publique France, <u>Infections invasives à pneumocoques et impact de la vaccination par le vaccin pneumococcique conjugué 13-valent (VPC13)</u>. Bilan 2021, 07/09/2023.

• Zoonoses

ARS IDF, <u>Lutte anti-vectorielle : l'ARS Île-de-France engage deux actions de démoustication à Paris et</u> à Colombes après deux cas importés de dengue, 30/08/2023.

### Santé Publique France,

La leptospirose devient une maladie à déclaration obligatoire, 28/08/2023.

Chikungunya, dengue et zika - Données de la surveillance renforcée en France métropolitaine en 2023, 28/08/2023.

L'épidémie de dengue déclarée en Martinique et en Guadeloupe : protégez-vous !, 23/08/2023.

CDC (US), Emerging Tick Bite-Associated Meat Allergy Potentially Affects Thousands, 27/07/2023.