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Antimicrobials and Antimicrobial Resistance in the Environment

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Antimicrobial Resistance In The Environment

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Antimicrobial Resistance In The Environment:

Antimicrobial Resistance in the Environment Patricia L. Keen, Mark H. M. M. Montforts, 2012-01-24 Examines effects of the environmental distribution of antimicrobial resistance genes on human health and the ecosystem Resistance genes are everywhere in nature in pathogens commensals and environmental microorganisms This contributed work shows how the environment plays a pivotal role in the development of antimicrobial resistance traits in bacteria and the distribution of resistant microbial species resistant genetic material and antibiotic compounds Readers will discover the impact of the distribution in the environment of antimicrobial resistance genes and antibiotics on both the ecosystem and human and animal health Antimicrobial Resistance in the Environment is divided into four parts Part I Sources including ecological and clinical consequences of antibiotic resistance by environmental microbes Part II Fate including strategies to assess and minimize the biological risk of antibiotic resistance in the environment Part III Antimicrobial Substances and Resistance including antibiotics in the aquatic environment Part IV Effects and Risks including the effect of antimicrobials used for non human purposes on human health Recognizing the intricate links among overlapping complex systems this book examines antimicrobial resistance using a comprehensive ecosystem approach Moreover the book's multidisciplinary framework applies principles of microbiology environmental toxicology and chemistry to assess the human and ecological risks associated with exposure to antibiotics or antibiotic resistance genes that are environmental contaminants Each chapter has been written by one or more leading researchers in such fields as microbiology environmental science ecology and toxicology Comprehensive reference lists at the end of all chapters serve as a gateway to the primary research in the field Presenting and analyzing the latest findings in a field of growing importance to human and environmental health this text offers readers new insights into the role of the environment in antimicrobial resistance development the dissemination of antimicrobial resistant genetic elements and the transport of antibiotic resistance genes and antibiotics [Antibiotic Resistance in the Environment](#) Célia M. Manaia, Erica Donner, Ivone Vaz-Moreira, Peiying Hong, 2020-08-21 This book provides a multidisciplinary review of antibiotic resistance and unravels the complex and interrelated roles of environmental sources including pharmaceutical industry effluents hospital and domestic effluents wildlife and drinking water Antibiotic resistance is a global public health issue in which the interface between humans animals and the environment is particularly relevant The contrasts seen across different environmental compartments and world regions which are due to climate social and policy differences mean that this problem needs to be analyzed from a multi geographic and multi cultural angle Bringing together contributions from researchers on different continents with expertise in antibiotic resistance in a range of different environmental compartments the book offers a detailed reflection on the paths that make antibiotic resistance a global threat and the state of the art in antibiotic resistance surveillance and risk assessment in complex environmental matrices

Antibiotics and Antibiotic Resistance in the Environment Carlos F. Amabile-Cuevas, 2015-12-30 The presence of

antibiotics antibiotic resistance genes and antibiotic resistant bacteria in the environment is a cause of growing worldwide concern as it reveals the extensive impact of antibiotic abuse and other human related pressures upon microbes The field of detecting and measuring resistance in the environment has rapidly evolved to a systematic search of organisms and genes This book will review the available evidence and hypotheses on where antibiotic resistance is coming from and for how long it has been there Further it will discuss involved maintenance pressures resistance spread traits and laboratory and in silico strategies to further investigate antibiotic resistance *Antimicrobials and Antimicrobial Resistance in the Environment* Cecilia Lundborg,Ashok J. Tamhankar,2020 Today the food and water that we encounter in any part of the world could contain antibiotic residues and or antibiotic resistant bacteria This book presents research evidence for this and also a potential way to mitigate the problem Although not presented in this book it is likely that this situation exists for all other types of antimicrobial agents as well including antivirals antifungals and antiprotozoal agents The presence of antibiotic residues and or antibiotic resistant bacteria contributes to the generation and propagation of resistance in disease causing pathogens in humans and animals Therefore the medicines that we use to treat and or prevent infections will not work as expected in many cases It is estimated that if we do not contain antimicrobial resistance urgently by 2050 up to 10 million people will die due to bacterial infectious diseases such as pneumonia skin infections urinary tract infections etc which were once easily treatable However this book presents a system that can eliminate resistant bacteria and antibiotics from the environment with the potential to work on other environmental microbes and antimicrobials This book opens pathways for academics and scientists to do further research on antimicrobials and antimicrobial resistant bacteria in various environmental areas and also presents evidence for policymakers to take further action and make the general public aware of the current situation in this context **Antibiotics and Antimicrobial Resistance Genes in the Environment**

Muhammad Zaffar Hashmi,2019-11-22 Antibiotics and Antimicrobial Resistance Genes AMR in the Environment summarizes and updates information on antibiotic producing organisms and their resistance and entry routes in soil air water and sediment As antibiotic use continues to rise in healthcare their fate bioavailability and biomonitoring and impacts on environment and public health are becoming increasingly important The book addresses the impact of antibiotics and AMR to environment and public health and risk assessment Moreover it focused on the metagenomics and molecular techniques for the detection of antibiotics and antimicrobial genes Lastly it introduces management strategies such as treatment technologies for managing antibiotics and AMR ARGs impacted environment and bioremediation approaches Summarizes and updates information on antibiotics and AMR ARGs production and its fate and transport in the environment Includes phytoremediation and bioremediation technologies for environmental management Provides analysis of risk assessment of antibiotic resistance genes to help understand the environmental and socioeconomic impacts of antibiotics and AMR ARGs

Antimicrobial Resistance in Humans, Animals, and the Environment Kunal Ranjan,Marcio José Poças-Fonseca,Rajani

Sharma,Kunal Kumar,2025-11-30 Antimicrobial Resistance in Humans Animals and the Environment One Health Approach examines the global impact of antimicrobial resistance AMR with a specific focus on the interconnectedness between animal human and environmental health The book details the origin evolution and ecology of AMR and its updated epidemiology It discusses the transmission of antimicrobial resistance between humans animals and the environment It delves into the molecular mechanisms of drug resistance development and epidemiology in human and animal health the different challenges in treating antimicrobial resistant infections including rapid diagnosis and the development of new antimicrobial agents and alternative strategies treating drug resistant infections Antimicrobial Resistance in Humans Animals and the Environment One Health Approach is a useful comprehensive resource for researchers academics postgraduate students PhD students early career researchers and medical scientists in microbiology infectious diseases and biotechnology public health professionals clinical personnel treating AMR or policymakers interested in implementing antimicrobial stewardship program in hospitals Discusses antimicrobial resistance across the microbial kingdoms of bacteria fungi viruses and protozoa and details the molecular mechanisms of resistance development in microbes Examines the link Between the environment such as climate change industrialization and heavy metal pollution and the rise of resistant microbes Offers alternative strategies to tackling AMR and the treatment of drug resistant infections

Antimicrobial Resistance in Wastewater Treatment

Processes Patricia L. Keen,Raphaël Fugère,2017-12-18 Antimicrobial resistance is arguably the greatest threat to worldwide human health This book evaluates the roles of human water use treatment and conservation in the development and spread of antimicrobial resistance Designed as a companion volume to Antimicrobial Resistance in the Environment Wiley Blackwell 2012 this book is a multi disciplinary synthesis of topics related to antimicrobial resistance and wastewater treatment processes Antimicrobial Resistance in Wastewater Treatment Processes assembles detailed discussions written by many of the world s best known experts in microbiology civil engineering chemistry environmental science public health and related fields The book presents a collection of subjects that includes Current knowledge of the role of the environment in development and spread of antimicrobial resistance Chemical analysis of antibiotics in environmental samples Molecular methods for analysis of antimicrobial resistance genes Advanced wastewater treatment processes and antimicrobial resistance effects Public perception of risk related to health consequences of antimicrobial resistance Public health implications of antimicrobial resistance with focus on wastewater treatment processes Antimicrobial resistance has gained a foothold in the global consciousness as a serious public health threat There is a much greater appreciation for the role of the environment in the dissemination of antimicrobial resistance and the effects of pollutants that can potentially promote development of resistance in bacteria Contaminants released from wastewater treatment plants are a concern In Antimicrobial Resistance in Wastewater Treatment Processes readers will be guided through examinations of the current science related to this important health issue

Antimicrobials in Environment Arti Gupta,Ram Prasad,2024-11-29 This

book provides a multidisciplinary coverage of all manifestations of antimicrobials and antimicrobial resistance technology to promote eco friendly processes and techniques for environmental sustainability It covers various aspects of the multidisciplinary framework applying principles of microbiology environmental toxicology and chemistry to assess the human and ecological risks associated with exposure to antibiotics or antibiotic resistance genes that are environmental contaminants In addition it also provides a variety of photographs diagrams and tables to help illustrate the material Bringing together contributions from researchers on different continents with expertise in antibiotic resistance in a range of diverse environmental sections the book offers a detailed reflection on the paths that make antibiotic resistance a global threat and the state of the art in antibiotic resistance surveillance and risk assessment in complex environmental conditions Students researchers scientists environmentalists academics computational biologists stakeholders and policymakers can benefit from using Antimicrobials in Environment as a resource that addresses microbial biotechnology microbiology toxicology and all disciplines related to antimicrobial research Features of the book Covers antimicrobial resistance in the environment with up to date research Includes recent references on each plausible antimicrobial resistance in the environment Details the possible spread of antibiotic resistant bacteria from an ecosystem Describes the public health impact of the use of antibiotics in the environment Presents cutting edge research on nanotechnology especially in food packaging and emergent antimicrobial technologies Highlights the antibiotic resistance in the environment challenges and outlook

Antimicrobial Resistance in Environmental Waters Karina Yew-Hoong Gin, Charmaine Ng, 2019-04-30 This Special Issue on Antimicrobial Resistance in Environmental Waters features 11 articles on the monitoring and surveillance of antimicrobial resistance AMR in natural aquatic systems i e reservoirs rivers and effluent discharge from water treatment plants to assess the effectiveness of AMR removal and resulting loads in treated waters Some of the key elements of AMR studies presented in this Special Issue highlight the underlying drivers of AMR contamination in the environment and the evaluation of the hazard imposed on aquatic organisms in receiving environments through ecological risk assessments As described in this Issue screening antimicrobial peptide AMP libraries for biofilm disruption and antimicrobial candidates are promising avenues for the development of new treatment options to eradicate resistance

Antimicrobial Movement from Agricultural Areas to the Environment Food & Agriculture Organization, 2020-02-10 The rise of antimicrobial resistance AMR has been approached mainly from a human or animal health lens until now This publication looks into the occurrence of antibiotic resistant genes in the environment especially as caused by movement from agricultural areas It argues that global efforts to manage AMR must also consider how antibiotics and resistant bacteria spread through manufacturing run off and human and animal waste The presence of antimicrobials in the environment can affect both biodiversity since resistant organisms may have evolutionary advantages and the food chain e g through the presence of resistant genes in microorganisms used for food production or cross contamination during processing Based on case studies this paper

proposes alternative screening methods useful for environmental samples and surveillance approaches for planning such screening efforts

Antibiotics and Antimicrobial Resistance Genes Muhammad Zaffar Hashmi, 2020-04-07 This volume summarizes and updates information about antibiotics and antimicrobial resistance AMR antibiotic resistant genes ARG production including their entry routes in soil air water and sediment their use in hospital and associated waste global and temporal trends in use and spread of antibiotics AMR and ARG Antimicrobial antibiotic resistance genes due to manure and agricultural waste applications bioavailability biomonitoring and their Epidemiological ecological and public health effects The book addresses the antibiotic and AMR ARG risk assessment and treatment technologies for managing antibiotics and AMR ARG impacted environments The book s expert contributions span 20 chapters and offer a comprehensive framework for better understanding and analyzing the environmental and social impacts of antibiotics and AMR ARGs Readers will have access to recent and updated models regarding the interpretation of antibiotics and AMR ARGs in environment and biomonitoring studies and will learn about the management options require to appropriately mitigate environmental contaminants and pollution The book will be of interest to students teachers researchers policy makers and environmental organizations

Degradation of Antibiotics and Antibiotic-Resistant Bacteria From Various Sources Pardeep Singh, Mika Sillanpää, 2022-09-30 The excessive use of antibiotics has given rise to an increase in microbial resistance threatening our ability to treat infectious diseases The growth in resistance to antimicrobials and antibiotics threatens to reverse almost a century of medical progress urgent action plans to tackle the crisis of Antimicrobial Resistance AMR and multi resistant bacteria are needed It is a major research task to find effective ways to reduce the release and degradation of antibiotics and ARBs to the environment Degradations of Antibiotics and Antibiotic Resistance Bacteria from various sources addresses various issues related the generations and degradations eliminations of antibiotics and antibiotics resistance bacteria Degradations of Antibiotics and Antibiotic Resistance Bacteria from various sources contains both practical and theoretical latest and broad aspects of antibiotics and antibiotics resistance bacteria management through the various recent methods Various factors which are responsible for the efficient degradations are highlighted in the Degradations of Antibiotics and Antibiotic Resistance Bacteria from various sources as separate chapters Socioeconomic and policies on the ARBs are also discussed Contains both practical and theoretical latest and broad aspects of antibiotics resistant bacteria Emphasizes the health impact of antibiotic resistance and genes Gives insight in the applications of anaerobic digestions for eliminations of ARBs antibiotic resistance blockers and ARGs Antibiotic Resistance Genes Shows how ARB s influences the degradation processes and management

Antimicrobial Resistance in Agriculture Indranil Samanta, Samiran Bandyopadhyay, 2019-09-25 Antimicrobial Resistance in Agriculture Perspective Policy and Mitigation is a valuable industrial resource that addresses complex multi factorial topics regarding farm wild companion animals fish and how the environment plays an important role in amplification and transmission of resistant bugs into the human food chain Information of

phenotypical and genotypical properties of each bacterial genus associated with antimicrobial resistance transmission dynamics from different reservoirs food animals poultry fishes and control measures with alternative therapy such as phytobiotics and nanomaterials are provided Researchers scientists and practitioners will find this an essential resource on the judicious use of antibiotics in animals and humans Explores all the genera of livestock and fish originated pathogenic bacteria associated with antimicrobial resistance Presents cutting edge research on epigenetics nanotechnology and intervention technologies Discusses transmission dynamics of resistance gene pools from different reservoirs including food animals poultry fishes and the environment

Surveying Antimicrobial Resistance: The New Complexity of the Problem
Gilberto Igrejas, José Luis Capelo, Carlos Lodiero, Patrícia Poeta, 2020-07-10 In January of 2015 under the 1st International Caparica Conference in Antibiotic Resistance a Research Topic entitled Surveying Antimicrobial Resistance Approaches Issues and Challenges to overcome was published <http://journal.frontiersin.org/researchtopic/3763/surveying-antimicrobial-resistance-approaches-issues-and-challenges-to-overcome> The problem of antimicrobial resistance AMR caused by excessive and inappropriate use of antibiotics is a public health issue that concerns us all The introduction of penicillin in the 1940s the start of the antibiotics era has been recognized as one of the greatest advances in therapeutic medicine However according to the World Health Organization WHO AMR infections are now an increasing worldwide public health threat and a post antibiotic era is imminent where common infections and minor injuries could be fatal AMR is a typical One Health problem in which livestock animals and the environment constitute AMR reservoirs and transmission routes to and from the human population Without effective antimicrobials to counter and prevent infections other major achievements in modern medicine such as organ transplantation cancer chemotherapy and major surgery risk being compromised AMR infections in animals have negative outcomes on animal health welfare biosecurity and production In 2006 the ban of growth promoting antibiotics highlighted antibiotic use in animal production as a risk factor in the development of antibiotic resistant bacteria Bacteria can be transferred to humans via several routes consumption of animal products exposure through contact with animals and the contamination of ground and surface waters by animal waste products Therefore it is of utmost importance that antimicrobial use in animals is reduced to a minimum without compromising animal health and welfare Mechanisms of bacterial antibiotic resistance are classified according to the types of antibiotic molecules or their targets in the cell Environmental antibiotic resistance genes are spread then acquired by clinically relevant microorganisms Many resistance genes are conveyed into pathogen genomes via mobile genetic elements such as plasmids transposons or integrons increasing the propagation of potential resistant pathogens Substantial progress has already been made in elucidating the basic regulatory networks that endow bacteria with their extraordinary capacity to adapt to a diversity of lifestyles and external stress factors So how will we face bacteria in the future

Antimicrobial Resistance Yashwant Kumar, 2019-05-02 The discovery of antibiotics was considered a milestone in health sciences and became the mainstay of

antimicrobial therapy to treat and control bacterial infections. However, its utility has subsequently become limited due to the emergence and spread of antimicrobial resistance among different bacterial species, which has emerged as a global threat. The development and spread of antimicrobial resistance have been attributed to many factors, including indiscriminate use of antibiotics in the healthcare and livestock industries. The present scenario of antibiotic resistance urgently requires interventions in terms of development of newer antimicrobials, evaluation of alternative therapies, and formulation of stringent policies to curb indiscriminate use of antimicrobials. This book highlights the importance and development of antimicrobial resistance in zoonotic, environmental, and food bacteria, including the significance of candidate alternative therapies.

Antimicrobial Resistance in Wastewater Arti Gupta, Ram Prasad, 2025-12-23 Antimicrobial resistance is considered one of the most pressing threats to human health worldwide and has firmly established itself as a major public health challenge. In urban environments, wastewater serves as a key reservoir of antibiotic resistance, hosting bacteria from environmental, human, and animal sources, many of which carry antibiotic resistance genes. The role of the environment in spreading antimicrobial resistance is now better recognized, along with the impact of pollutants that may foster resistance in bacteria. Contaminants released by wastewater treatment plants have become a growing concern. This book provides a comprehensive evaluation of antimicrobial resistance in wastewater treatment, compiling insights from global experts in fields such as microbiology, environmental biotechnology, civil engineering, biochemistry, environmental science, and public health. It delves into topics including the role of the environment in the development and spread of antimicrobial resistance, chemical analysis of antibiotics in environmental samples, molecular methods to study antimicrobial resistance, bacteria, and genes, advanced wastewater treatment technologies, the effects of antimicrobial resistance, and the public health implications related to wastewater treatment. Key features of this book are as follows: Explores the public health impacts of antimicrobial resistance with a focus on wastewater treatment; Provides detailed biochemical analyses of antibiotics in environmental samples; Discusses advanced wastewater treatment processes and their role in mitigating antimicrobial resistance; Highlights recent findings on the role of the environment in the emergence and spread of antimicrobial resistance; Examines molecular approaches for studying antimicrobial resistance genes.

Navigating Challenges and Innovations in Antimicrobial Resistance, Environmental Microbiology, and Industrial Solutions Arpit Shukla, Chaitanya Kumar Jha, Dweipayan Goswami, 2025-09-29 The national conference on Antimicrobial Resistance, Environmental Microbiology, and Industrial Solutions, ARTEMIS 2024, hosted by the Institute of Advanced Research, has been held on the 21st and 22nd of March 2024. This interdisciplinary forum aims to improve the comprehension and management of microbial interactions across various environments, addressing challenges such as antimicrobial resistance to promote a healthy and sustainable future. Understanding the dynamic roles of microorganisms in our world is vital, making microbial research spanning Antimicrobial Resistance (AMR), Environmental Microbiology, and Industrial Solutions crucial. The escalating threat of AMR poses a global

health crisis necessitating innovative strategies to combat resistant strains Environmental Microbiology challenges us to understand the intricate relationships between microorganisms and their environments fostering sustainable solutions to global issues such as climate change and pollution Industrial solutions include harnessing microorganisms for sustainable applications from enzyme production to waste treatment This Research Topic aims to connect these realms fostering interdisciplinary collaboration to address challenges and drive innovation By delving into the microbial frontiers we seek to unravel complexities and inspire novel approaches for a healthier more sustainable future

Fate and Transport of Determinants of Antimicrobial Resistance in Variably Saturated Terrestrial Environments Jennifer Hayward, 2020

Antimicrobial resistance AMR is a major global public health threat which contributes to reduced effectiveness of antibiotics for treatment of bacterial infections in humans Residuals of antimicrobial products from anthropogenic uses creates a selective environment and shifts the microbial populations in our municipal wastewater to become resistant This leads to high concentrations of bacterial resistance or hot spots The link between clinical incidence of AMR infections and the environmental dimension impacted by anthropogenic activities has been demonstrated to be important Surveillance of AMR hot spots in the environment is conducted by monitoring environmental compartments for determinants of AMR including antibiotic resistance genes ARGs mobile genetic elements and antibiotic resistant bacteria ARB This thesis explores the fate of AMR determinants in variably saturated terrestrial environments that are used for municipal wastewater treatment and disposal Specific focus was on rural developing and remote regions due to the challenges in the provision of adequate wastewater treatment in jurisdictions which are reliant on decentralized wastewater treatment Often residents in these communities are particularly vulnerable to AMR infections AMR contamination from municipal wastewater was studied in communities in the Canadian Arctic Hydrology of wetland receiving environments played an important role in the dissemination of AMR contaminants in the environment Reference wetlands representative of background conditions with limited anthropogenic impacts had relatively low levels of determinants of AMR indicative of the environmental resistome Technologies for mitigation of the spread of AMR from sources in rural regions were studied Removal of contaminants of AMR via physical filtration in lateral flow sand filters used as a type of domestic on site wastewater treatment system was studied This type of filtration technology was effective in attenuation of AMR contaminants with 2.9 to 5.4 log reductions for ARGs observed A commercially available computer model HYDRUS 2D/3D was used to simulate the attenuation processes within the sand filters Prediction of ARB was well represented in the modeling but prediction of ARGs and other genetic elements could be improved This thesis represents one of the first studies to observe and model the fate and transport of determinants of AMR in subsurface environments

Antimicrobial Resistance in food-producing environment: a One Health approach Kebede Amenu, Getahun E. Agga, 2024-08-06 One Health is an integrated unifying approach that aims to sustainably balance and optimize the health of people animals and ecosystems It recognizes the health of humans domestic

and wild animals plants and the wider environment including ecosystems are closely linked and inter dependent The approach mobilizes multiple sectors disciplines and communities at varying levels of society to work together to foster well being and tackle threats to health and ecosystems while addressing the collective need for clean water energy and air safe and nutritious food taking action on climate changes and contributing to sustainable development FAO OIE WHO UNEP

Combating Antimicrobial Resistance National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Global Health, Forum on Microbial Threats, 2017-12-08 As of 2017 the emergence and spread of antimicrobial resistance continues unabated around the world leaving devastating health and economic outcomes in its wake Those consequences will multiply if collaborative global action is not taken to address the spread of resistance Major drivers of antimicrobial resistance in humans have been accelerated by inappropriate antimicrobial prescribing in health care practices the inappropriate use of antimicrobials in livestock and the promulgation of antibiotic resistance genes in the environment To explore the issue of antimicrobial resistance the Forum of Microbial Threats planned a public workshop Participants explored issues of antimicrobial resistance through the lens of One Health which is a collaborative approach of multiple disciplines working locally nationally and globally for strengthening systems to counter infectious diseases and related issues that threaten human animal and environmental health with an end point of improving global health and achieving gains in development They also discussed immediate and short term actions and research needs that will have the greatest effect on reducing antimicrobial resistance while taking into account the complexities of bridging different sectors and disciplines to address this global threat This publication summarizes the presentations and discussions from the workshop

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Antimicrobial Resistance In The Environment Introduction

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