



Neurobehavioural effects of developmental toxicity

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Neurodevelopmental disabilities, including autism, attention-deficit hyperactivity disorder, dyslexia, and other cognitive impairments, affect millions of children worldwide, and some diagnoses seem to be increasing in frequency. Industrial chemicals that injure the developing brain are among the known causes for this rise in prevalence. In 2006, we did a systematic review and identified five industrial chemicals as developmental neurotoxicants: lead, methylmercury, polychlorinated biphenyls, arsenic, and toluene. Since 2006, epidemiological studies have documented six additional developmental neurotoxicants—manganese, fluoride, chlorpyrifos, dichlorodiphenyltrichloroethane, tetrachloroethylene, and the polybrominated diphenyl ethers. We postulate that even more neurotoxicants remain undiscovered. To control the pandemic of developmental neurotoxicity, we propose a global prevention strategy. Untested chemicals should not be presumed to be safe to brain development, and chemicals in existing use and all new chemicals must therefore be tested for developmental neurotoxicity. To coordinate these efforts and to accelerate translation of science into prevention, we propose the urgent formation of a new international clearinghouse.

Introduction

Disorders of neurobehavioural development affect 10–15% of all births,¹ and prevalence rates of autism spectrum disorder and attention-deficit hyperactivity disorder seem to be increasing worldwide.² Subclinical decrements in brain function are even more common than these neurobehavioural developmental disorders. All these disabilities can have severe consequences³—they diminish quality of life, reduce academic achievement, and disturb behaviour, with profound consequences for the welfare and productivity of entire societies.⁴

The root causes of the present global pandemic of neurodevelopmental disorders are only partly understood. Although genetic factors have a role,⁵ they cannot explain recent increases in reported prevalence, and none of the genes discovered so far seem to be responsible for more than a small proportion of cases.⁶ Overall, genetic factors seem to account for no more than perhaps 30–40% of all cases of neurodevelopmental disorders. Thus, non-genetic, environmental exposures are involved in causation, in some cases probably by interacting with genetically inherited predispositions.

Strong evidence exists that industrial chemicals widely disseminated in the environment are important contributors to what we have called the global, silent pandemic of neurodevelopmental toxicity.^{7,8} The developing human brain is uniquely vulnerable to toxic chemical exposures, and major windows of developmental vulnerability occur in utero and during infancy and early childhood.⁹ During these sensitive life stages, chemicals can cause permanent brain injury at low levels of exposure that would have little or no adverse effect in an adult.

In 2006, we did a systematic review of the published clinical and epidemiological studies into the neurotoxicity of industrial chemicals, with a focus on developmental neurotoxicity.⁷ We identified five industrial chemicals that could be reliably classified as developmental neurotoxicants: lead, methylmercury, arsenic, polychlorinated biphenyls, and toluene. We also noted 201 chemicals that had been reported to cause injury

to the nervous system in adults, mostly in connection with occupational exposures, poisoning incidents, or suicide attempts. Additionally, more than 1000 chemicals have been reported to be neurotoxic in animals in laboratory studies.

We noted that recognition of the risks of industrial chemicals to brain development has historically needed decades of research and scrutiny, as shown in the cases of lead and methylmercury.^{10–12} In most cases, discovery began with clinical diagnosis of poisoning in workers and episodes of high-dose exposure. More sophisticated epidemiological studies typically began only much later. Results from such studies documented developmental neurotoxicity at much lower exposure levels than had previously been thought to be safe. Thus, recognition of widespread subclinical toxicity often did not occur until decades after the initial evidence of neurotoxicity. A recurring theme was that early warnings of subclinical neurotoxicity were often ignored or even dismissed.¹³ David P Rall, former Director of the US National Institute of Environmental Health Sciences, once noted that “if thalidomide had caused a ten-point loss of intelligence quotient (IQ) instead of obvious birth defects of the limbs, it would probably still be on the market”.¹⁴ Many industrial chemicals marketed at present probably cause IQ deficits of far fewer than ten points and have therefore eluded detection so far, but their combined effects could have enormous consequences.

In our 2006 review,⁷ we expressed concern that additional developmental neurotoxicants might lurk undiscovered among the 201 chemicals then known to be neurotoxic to adult human beings and among the many thousands of pesticides, solvents, and other industrial chemicals in widespread use that had never been tested for neurodevelopmental toxicity. Since our previous review, new data have emerged about the vulnerability of the developing brain and the neurotoxicity of industrial chemicals. Particularly important new evidence derives from prospective epidemiological birth cohort studies.

In this Review, we consider recent information about the developmental neurotoxicity of industrial chemicals

Neurobehavioural Effects Of Developmental Toxicity

Anthony S. Fauci



Neurobehavioural Effects Of Developmental Toxicity:

Disability Studies and the Environmental Humanities Sarah Jaquette Ray, Jay Sibara, 2017-06 Although scholars in the environmental humanities have been exploring the dichotomy between wild and built environments for several years few have focused on the field of disability studies a discipline that enlists the contingency between environments and bodies as a foundation of its scholarship On the other hand scholars in disability studies have demonstrated the ways in which the built environment privileges some bodies and minds over others yet they have rarely examined the ways in which toxic environments engender chronic illness and disability or how environmental illnesses disrupt dominant paradigms for scrutinizing disability Designed as a reader for undergraduate and graduate courses Disability Studies and the Environmental Humanities employs interdisciplinary perspectives to examine such issues as slow violence imperialism race toxicity eco sickness the body in environmental justice ableism and other topics With a historical scope spanning the seventeenth century to the present this collection not only presents the foundational documents informing this intersection of fields but also showcases the most current work making it an indispensable reference

Toxic Timescapes Simone M. Müller, May-Brith Ohman Nielsen, 2023-01-17 An interdisciplinary environmental humanities volume that explores human environment relationships on our permanently polluted planet While toxicity and pollution are ever present in modern daily life politicians juridical systems media outlets scholars and the public alike show great difficulty in detecting defining monitoring or generally coming to terms with them This volume's contributors argue that the source of this difficulty lies in the struggle to make sense of the intersecting temporal and spatial scales working on the human and more than human body while continuing to acknowledge race class and gender in terms of global environmental justice and social inequality The term toxic timescapes refers to this intricate intersectionality of time space and bodies in relation to toxic exposure As a tool of analysis it unpacks linear understandings of time and explores how harmful substances permeate temporal and physical space as both event and process It equips scholars with new ways of creating data and conceptualizing the past present and future presence and possible effects of harmful substances and provides a theoretical framework for new environmental narratives To think in terms of toxic timescapes is to radically shift our understanding of toxicants in the complex web of life Toxicity pollution and modes of exposure are never static therefore dose timing velocity mixture frequency and chronology matter as much as the geographic location and societal position of those exposed Together these factors create a specific toxic timescape that lies at the heart of each contributor's narrative Contributors from the disciplines of history human geography science and technology studies philosophy and political ecology come together to demonstrate the complex reality of a toxic existence Their case studies span the globe as they observe the intersection of multiple times and spaces at such diverse locations as former battlefields in Vietnam aging nuclear weapon storage facilities in Greenland waste deposits in southern Italy chemical facilities along the Gulf of Mexico and coral breeding laboratories across the world

Health

Impacts of Developmental Exposure to Environmental Chemicals Reiko Kishi,Philippe Grandjean,2019-12-13 This book provides concise and cutting edge studies on threats resulting from exposure to environmental chemicals that can affect human health and development with a particular emphasis on the DOHaD concept The book is divided into five main parts the first of which includes an introduction to the impacts of developmental exposure to environmental chemicals and historical perspectives while the second focuses on how environmental chemicals can affect human organs including neurodevelopment immune functions etc In turn the third part addresses the characteristics of specific chemicals and their effects on human health and development while the fourth part provides a basis for future studies by highlighting the latest innovations in toxicology remaining challenges and promising strategies in children s environmental health research as well as ideas on how to bridge the gap between research evidence and practical policymaking The fifth and last part outlines further research directions and related policymaking aspects Health Impacts of Developmental Exposure to Environmental Chemicals will appeal to young and veteran researchers students and physicians especially gynecologists and pediatricians who are seeking comprehensive information on how children s health can be affected by harmful chemicals and other environmental toxicants

Herausforderung Schule Daniela Arnold,2017-08-30 Fehlender Schulerfolg ist selten ein Indikator f r mangelnde Intelligenz Clevere und wissbegierige Kinder zeigen im Alltag ein intelligentes Verhalten manche erleben trotzdem in der Schule Misserfolge Dieses Buch ist aus dem Wunsch entstanden Eltern und Fachkr fte auf der Suche nach Erkl rungen f r Schulerfolg bzw Schulschwierigkeiten zu begleiten Kinder machen heute im Allgemeinen zu wenig Bewegung Wahrnehmung und Bewegung bilden wesentliche Grundlagen f r die Gehirnentwicklung Legasthenie Dyskalkulie Leseschw che oder ADHS sind h ufig mit Verarbeitungsproblemen in den sensomotorischen Basiskompetenzen verbunden ber Bewegung k nnen funktionale Defizite in der Hirnverarbeitung ausgeglichen werden Warum ist Bewegung f r erfolgreiches Lernen so wichtig Der interessant dargestellte Theorieteil liefert fundiertes Hintergrundwissen das auch eine Basis f r Elternabende darstellen kann Viele praktische Beispiele lassen die Probleme von Kindern verst ndlich werden Ausgehend von den in der Schule wichtigen Leistungen des Rechnens Schreibens und Lesens sowie der Aufmerksamkeit und des sozialen Verhaltens werden die notwendigen Basiskompetenzen anhand von vielen praktischen Beispielen erkl rt Zudem enth lt es Anregungen wie Kinder zu Hause im Kindergarten und in der Schule ber Bewegung und Musik gef rdert werden k nnen Mit dem Bewegungsprogramm SIMMO Sinne Musik Motorik das in 13 sterreichischen Klassen ber zwei Jahre durchgef hrt wurde konnte Frau Arnold zeigen dass sich auch in sterreich ein F rderprogramm f r motorische und sensorische Basiskompetenzen in den Schulalltag integrieren l sst Eine begleitende wissenschaftliche Evaluierung zeigte die statistisch signifikanten Verbesserungen in der Motorik im Lesen und bei Verhaltensparametern Sich erfolgreich den Herausforderungen der Schule aber auch dem Leben stellen k nnen das ist das Ziel Ein informatives Buch f r alle die heute Kinder erziehen betreuen oder lehren

Handbuch ADHS Hans-Christoph Steinhausen,Manfred Döpfner,Martin

Holtmann,Alexandra Philipsen,Aribert Rothenberger,2024-09-04 Dieses Handbuch bietet einen perspektivenreichen Überblick über das umfangreiche Wissen zur ADHS Dabei werden die Grundlagen der Klassifikation und Epidemiologie aktuelle Forschungsbefunde zu den Ursachen sowie den vielfältigen Aspekten von Klinik Untersuchung Therapie und Verlauf der ADHS vermittelt Die verschiedenen Beiträge basieren auf den Kenntnissen und Erfahrungen führender Expertinnen und Experten in Forschung klinischer Praxis und evidenzbasierter Medizin Die 3. Auflage wurde umfassend aktualisiert

Neurotoxicology of Fish: Navigating Toxicological and Environmental Impacts on Aquatic Ecosystems Mr. Darshan Kumar T,Ms. Spoorthi K R,2025-05-05 **Neurodevelopmental Processes in Health and Disease: Bridging Basic and Clinical Research** Edna Grünblatt,Susanne Walitza,Tanja Maria Michel,Tracey Petryshen,2021-12-03 Challenges in Endocrine Disruptor Toxicology and Risk Assessment Alberto Mantovani,Alexandra Fucic,2020-12-08 Insight into the role of hormones particularly estrogen and testosterone in health and disease etiology including interactions with other hormone pathways has dramatically changed Estrogen and androgen receptors with their polymorphisms are key molecules in all tissues and are involved in a number of homeostatic mechanisms but also pathological processes including carcinogenesis and the development of metabolic and neurological disorders such as diabetes and Alzheimer's disease Endocrine disrupting chemicals EDCs can interfere with the endocrine hormone systems at certain dosages and play a key role in the pathology of disease Most known EDCs are manmade and are therefore an increasing concern given the number commonly found in household products and the environment This book will cover the mechanisms of EDC pathology across the spectrum of disease as well as risk assessment and government and legal regulation to provide a holistic view of the current issues and cutting edge research in the topic With contributions from global leaders in the field this book will be an ideal reference for toxicologists endocrinologists and researchers interested in developmental biology regulatory toxicology and the interface between environment and human health **Pediatric Neurotoxicology** Cynthia A. Riccio,Jeremy R. Sullivan,2016-08-10 This book focuses on children and the impact of neurotoxins on the developing brain to guide the practice of psychologists working with children in clinical and school settings Each chapter covers a distinct neurotoxin or group of neurotoxins with particular emphasis on the impact of the neurotoxin exposure on the developing brain and long term cognitive and psychosocial outcomes This is more complex than studying neurotoxins with adults because of the rapid development occurring in the child's brain Further children are more susceptible than adults to the effects of neurotoxins due to their developmental status Many of the effects discussed in this volume occur in utero thus setting the stage for an altered developmental trajectory *Gene-Environment Interactions in Birth Defects and Developmental Disorders* ,2023-01-25 *Gene-Environment Interactions in Birth Defects and Developmental Disorders* Volume 152 covers the multifactorial etiology of a variety of developmental disorders including orofacial clefts fetal alcohol spectrum disorders autism and others The causes of individual cases of most common birth defects are unknown but likely involve a combination of genetic predisposition and

environmental exposures How these risk factors interact in the genesis of these conditions is still largely unknown and readers will find the latest information and ideas on these disorders along with discussion of the challenges and opportunities for furthering knowledge in this area Presents latest information on gene environment interactions in birth defects and developmental disorders Covers multiple animal model systems and human conditions Includes discussion of the opportunities for discovery in a challenging area of biomedical research

Handbook of Arsenic Toxicology Swaran Jeet Singh Flora, 2014-12-26 Throughout history arsenic has been used as an effective and lethal poison Today arsenic continues to present a real threat to human health all over the world as it contaminates groundwater and food supplies Handbook of Arsenic Toxicology presents the latest findings on arsenic its chemistry its sources and its acute and chronic effects on the environment and human health The book takes readings systematically through the target organs before detailing current preventative and counter measures This reference enables readers to effectively assess the risks related to arsenic and provide a comprehensive look at arsenic exposure toxicity and toxicity prevention Brings together current findings on the effects of arsenic on the environment and human health Includes state of the art techniques in arsenic toxicokinetics speciation and molecular mechanisms Provides all the information needed for effective risk assessment prevention and countermeasure

Food Toxicology Debasis Bagchi, Anand Swaroop, 2016-11-25 Food toxicology studies how natural or synthetic poisons and toxicants in diverse food products cause harmful detrimental or adverse side effects in living organisms Food toxicology is an important consideration as food supply chain is becoming more multinational in origin and any contamination or toxic manifestation may cause serious wide spread adverse health effects Food Toxicology covers various aspects of food safety and toxicology including the study of the nature properties effects and detection of toxic substances in food and their disease manifestations in humans It will also include other aspects of consumer product safety The first two chapters discuss the measurement of toxicants and toxicity and the importance of dose response in food toxicology Additional chapters discuss the aspects of food associated carcinogenesis and food derived chemical carcinogenesis food allergy pathogens associated with fruits and vegetables and the detrimental effects of radionuclides exposure The chapters also cover the most important heavy metal contaminants namely mercury lead and vanadium and Fluoride toxicity which is extensively discussed in its own chapter Toxicologists scientists researchers in food toxicology nutritionists and public health care professionals will find valuable information in this book on all possible intricate areas of food toxicology

Essentials of Pharmatotoxicology in Drug Research, Volume 1 Rakesh Kumar Tekade, 2023-03-23 Toxicity and Toxicodynamics Volume One in the Essentials of Pharmatotoxicology in Drug Research series provides an overview on the essentials of toxicology risk assessment and the mechanisms Topics discussed include the types of cellular responses to chemical toxicants mechanisms of drug toxicity and their relevance to pharmaceutical product development The book examines omics and computer aided technologies for mechanistic and predictive toxicology and covers state of art testing in the evaluation of

detrimental pathways dose selection in toxicity studies as well as the role of regulatory agencies in toxicity studies In addition there is also discussion on clinical interventions such as pharmacotherapy and managed care strategies for acute poisoning This volume is a valuable resource to those learning more about the drug development process related to toxicology and those who want to get an update on newer concepts on the toxicology aspect of drug research Examines toxicological risk assessment in drug research Discusses toxicity mechanisms Covers risk assessment and the use of omics and computational technologies in mechanistic and predictive toxicology Offers clinical interventions and managed care as a result of toxic injury and acute poisoning

Early-life Environmental Exposure and Disease Yankai Xia,2020-07-09 This book offers valuable insights into the latest concepts and findings from epidemiologic clinical and basic studies in the burgeoning area of early life environmental exposure and diseases The book is divided into five parts starting with an overview of environmental exposure measurement and evaluation followed by a review of the effects of exposure to various substances like tobacco smoke pesticides and metals as well as stress on offspring s health It then discusses the developmental origins of a range of childhood diseases that affect growth neural development and the immune system and highlights the importance of longitudinal studies that measure exposure at potentially sensitive time points during childhood It also provides up to date evidence of the intergenerational transgenerational effects of early life environmental exposure especially via genetic and epigenetic pathways Allowing readers to gain a thorough understanding of the predominating aspects of early life environmental exposure and diseases the book also provides a basis for developing environmental and health policies that could have wide and long term impacts on human health

Food Toxicology Ashish Sachan,Suzanne Hendrich,2017-12-01 This volume covers a selection of important research in the multifaceted field of food toxicology With more than seven billion people in the world today and counting advances in food toxicology have a direct bearing on food safety issues that are of concern to all humanity for the foreseeable future Massive globalization industrialization and commercialization have affected every aspect of food production the food supply chain and food consumption This informative volume offers the global perspectives of scientists in important areas related to biomarkers and nanosensors in food toxicology toxicology of nanomaterials chemicals in sanitation and packaging additives mycotoxins endocrine disruptors radionuclides toxic metals and waste burning residues in food The book also emphasizes regulatory toxicology and includes an interesting example case study The challenge of sustainable and safe food for everyone needs a multidisciplinary and multi sectorial approach from related industries and governments alike Food chemical safety is an underappreciated aspect of consumer safety and this volume seeks to help fill that gap by providing informative research for food scientists and researchers and many others

Debunking the Bump Daphne Adler,2018-04-01 Stay away from sushi Cut out caffeine Get rid of your cat Step away from the microwave Pregnant women are bombarded with risk factors they must avoid from the moment the stick turns pink Heroic mothers to be sacrifice their favorite foods and activities for the sake of their baby but with such long lists of don ts

and conflicting information it is easy to feel overwhelmed Daphne Adler a mathematician management consultant and self proclaimed numbers junkie turns her expertise to pregnancy and the real research behind the risks With thousands of cited sources Adler wades through the research to reveal which factors are truly threats to a healthy pregnancy and which are simply red herrings or old wives tales From cheese to sex to saunas Debunking the Bump sheds light on everything expectant mothers need to know to avoid the real risks without skipping the sushi **Arctic One Health** Morten Tryland,2022-04-23

This multidisciplinary book discusses the manifold challenges arctic marine and terrestrial wildlife ecosystems and people face these times Major health threats caused by the consequences of climate change environmental pollution and increasing tourism in northern regions around the globe are explored The most common infectious diseases in wild and domesticated arctic animals are reviewed and the impact they could have on circumpolar ecosystems as well as on the lives of arctic people are profoundly discussed Moreover the book reviews arctic hunting herding and food conservation strategies and introduces veterinary medicine in remote indigenous communities Arctic One Health is authored by experts based in arctic regions spanning from North America over Europe to Asia to cover a broad range of topics and perspectives The book addresses researchers in Veterinary Medicine Ecology Microbiology and Anthropology The book contributes towards achieving the UN Sustainable Developmental Goals in particular SDG 15 Life on Land *Linking Environmental Exposure to*

Neurodevelopmental Disorders ,2018-05-24 Advances in Neurotoxicology Volume Two addresses contemporary advances in neurotoxicology with thematic volumes providing authoritative review articles on key issues in the field Updates in this new volume include chapters on Air pollution and neurodegenerative diseases Mercury and Parkinson s disease Pesticides and PD current evidence Aluminum and neurodegeneration Microglia and neurodegeneration Dietary factors Mitochondria in neurodegeneration and Manganese and neurodegeneration Edited by leading experts volumes are designed as in depth overviews of the latest topic developments that analyze the effect of varied chemical agents on the nervous system It is an essential resource for researchers and graduate students alike Includes in one single publication a selection of comprehensive reviews devoted to neurotoxicology Edited by high profile leading academics in the field ensuring a quality publication for subscribers Aims to widen the scope for participation by international contributors researchers and editorial board members outside North America Serves a broad audience of university faculty researchers and students as well as the industry drug development companies and the government Toxicological Assessment of Combined Chemicals in the Environment

De-Sheng Pei,Yiyun Liu,2025-01-28 Comprehensive resource covering toxicology fundamentals distribution of pollutants in the environment and research methodologies for toxicological assessment of chemical mixtures Toxicological Assessment of Combined Chemicals in the Environment offers an in depth exploration of various approaches and molecular mechanisms regarding how minor alterations in chemical mixtures can influence an organism s toxicity along with discussion of the challenges associated with assessing mixtures The first section of the book provides a concise introduction to the

background and significance of combined toxicity Section two delves into the primary sources and enrichment mechanisms of different chemical mixtures elucidating the biological exposure pathways of these compounds Section three introduces both classical and emerging toxicological research models in detail Building on the descriptions of compound emission migration accumulation and transformation processes and the analysis of combined molecular toxicity in the preceding sections section four introduces computer mathematical modeling methods for hazard assessment of compound mixtures The final section details the challenges and future trends in this field Written by a highly qualified author and seasoned research contributor in the field Toxicological Assessment of Combined Chemicals in the Environment covers sample topics including The degradation oxidation absorption distribution biotransformation and excretion of various compounds in both the environment and in organisms A variety of cell models and in vivo research models of model organisms supplemented with case studies Combined molecular toxicity mechanisms of heavy metals pesticides persistent organic pollutants POPs and pharmaceutical and personal care products PPCPs Principal sources fate and mechanism of chemical mixtures in the environment as well as experimental designs and sampling strategies for combined toxicity studies based on concentrations Toxicological Assessment of Combined Chemicals in the Environment serves as a valuable reference for researchers students and policymakers involved in environmental management and protection It is particularly relevant for toxicologists risk assessors and those engaged in the molecular modeling of toxic mixtures

Chemical agriculture and pollinators: signs of a Planet in danger Giuseppe Zicari, 2023-02-24 Bees that have inhabited the Planet for over 100 million years are the common thread that tells the story of various ecological challenges such as the reduction of biodiversity climate change soil degradation and energy transition Paradoxically agriculture is one of the major causes of irreversible and therefore unsustainable changes such as global warming and the extinction of pollinators from which it derives its benefits and wealth The massive use of fossil fuels the distribution of poisons such as pesticides persistent toxic and bioaccumulative the loss of fertility in monocultures of plants selected to satisfy economic needs are some of the main causes of an ecologically unsustainable food production system The book tries to show a different vision of the World we are building a story of backstories and underestimated dangers This book received two prizes Steli di Pace Stems of Peace by the Union of European Journalists and Communicators in 2023 and it was the winner of the Concorso Nazionale per la divulgazione scientifica Kerit LC Edizioni National Competition for science dissemination in 2024

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