

POLYCHLORINATED BIPHENYLS AND TERPHENYLS (ENVIRONMENTAL HEALTH CRITERIA SERIES; NO 140) pdf

1: WHO | Alphabetical list of EHCs

In , the World Health Organization published Environmental Health Criteria 2: Polychlorinated biphenyls (PCBs) and terphenyls (PCTs) (WHO,), discussing and evaluating the data then available on exposure levels and the effects of PCBs and PCTs on human beings, and, to a lesser extent, on the environment.

First draft prepared by Dr S. The main objective of the IPCS is to carry out and disseminate evaluations of the effects of chemicals on human health and the quality of the environment. Supporting activities include the development of epidemiological, experimental laboratory, and risk-assessment methods that could produce internationally comparable results, and the development of manpower in the field of toxicology. Other activities carried out by the IPCS include the development of know-how for coping with chemical accidents, coordination of laboratory testing and epidemiological studies, and promotion of research on the mechanisms of the biological action of chemicals. Environmental health criteria; 1. Polychlorinated biphenyls -- adverse effects 4. Polychlorinated biphenyls -- toxicity 5. Polychloroterphenyl compounds -- adverse effects 6. Polychloroterphenyl compounds -- toxicity I. Applications and enquiries should be addressed to the Office of Publications, World Health Organization, Geneva, Switzerland, which will be glad to provide the latest information on any changes made to the text, plans for new editions, and reprints and translations already available. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters. In the interest of all users of the environmental health criteria monographs, readers are kindly requested to communicate any errors that may have occurred to the Director of the International Programme on Chemical Safety, World Health Organization, Geneva, Switzerland, in order that they may be included in corrigenda, which will appear in subsequent volumes. Dobson environmental aspects and Dr G. The second draft was prepared by Dr G. Head, Oxford, for the editing. The efforts of all who helped in the preparation and finalization of the documents are gratefully acknowledged. The nature of this occupational disease was characterized by a skin affection with acneiform eruptions; occasionally the liver was involved, in some cases with fatal consequences. Subsequent safety precautions appear largely to have prevented further outbreaks of this disease in connection with the manufacture of PCBs, but, since , cases have been reported in Japanese factories manufacturing condensers. The distribution of PCBs in the environment was not recognized until Jensen started an investigation in to ascertain the origins of unknown peaks, observed during the gas-liquid chromatographic separation of organochlorine pesticides from wildlife samples. In , he and his colleagues succeeded in attributing these to the presence of PCBs. Since then, investigations in many parts of the world have revealed the widespread distribution of PCBs in environmental samples. The serious outbreaks of poisoning in humans and in domestic animals from the ingestion of food, accidentally contaminated with PCBs, have stimulated investigations into the toxic effects of PCBs on animals and on nutritional food chains. This has resulted in the limitation of the commercial exploitation of PCBs and polychlorinated terphenyls PCTs , and in regulations to limit the residues in human and animal food. In recent years, many industrial nations have taken steps to control the flow of PCBs into the environment. Now they are almost entirely restricted to use in closed systems, such as isolating oils in transformers, capacitors, and other electrical systems, and as a heat transfer medium and hydraulic liquid. The most influential forces leading to these restrictions have probably been the and decision-recommendations from the Organisation for Economic Co-operation and Development OECD. The environmental impact of the PCBs and PCTs has been discussed at a number of regional and international meetings and has been the subject of several reviews, including: Since then, a wealth of new information has become available. This publication includes a set of guidelines to assist Member States in the development of strategies to reduce the probability of accidents

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involving the environmental release of PCBs, PCDDs, and PCDFs and also the severity of their hazardous effects, should such accidents occur. Polychlorinated dibenzo- para-dioxins and dibenzofurans WHO, The PCBs have been used commercially, since , as dielectric and heat-exchange fluids and in a variety of other applications. They have become widely distributed in the environment throughout the world, and are persistent and accumulate in food webs. Human exposure to PCBs has resulted largely from the consumption of contaminated food, but also from inhalation and skin absorption in work environments. PCBs accumulate in the fatty tissues of humans and other animals and have caused toxic effects in both, particularly if repeated exposure occurs. The skin and liver are the major sites of pathology, but the gastrointestinal tract, the immune system, and the nervous system are also targets. The results of studies on rodents suggest that some PCB congeners may be carcinogenic and that they can promote the carcinogenicity of other chemicals. It is clear from available data on polychlorinated biphenyls PCBs and polychlorinated terphenyls PCTs that, in an ideal situation, it would be preferable not to have these compounds in food at any level. However, it is equally clear that the reduction of PCBs or PCTs exposure from food sources to "zero" or to a level approaching zero, would mean the elimination prohibition of the consumption of large amounts of important food items, such as fish, but more importantly breast milk. National and international scientific committees have to decide where the proper balance lies between providing an adequate degree of public health protection and avoiding excessive losses of food. No levels of PCBs or PCTs exposure that can provide an absolute assurance of safety can be identified on the basis of the available data. The chemical formula of PCBs can be presented as $C_{12}H_nCl_n$, where n is a number of chlorine atoms within the range of Theoretically, congeners are possible, but only about congeners are likely to occur in commercial products. These impurities are relatively stable and resistant to chemical reactions, under normal conditions. All congeners of PCBs are lipophilic and have a very low water solubility. As a result, they easily enter the food chain and accumulate in fatty tissues. However, when PCBs are mixed with other chlorinated compounds, such as the chloro-benzenes used in transformers, PCDDs can be found in the case of accidental fires and during incineration. Commercial PCB mixtures are light yellow or dark yellow in colour. They do not crystallize, even at low temperatures, but turn into solid resins. PCBs are, in practice, fire resistant, with rather high flash points. They form vapours heavier than air, but they do not form any explosive mixtures with air. They have very low electrical conductivity, rather high thermal conductivity, and extremely high resistance to thermal break-down. PCBs are chemically very stable under normal conditions; however, when heated, other toxic compounds, such as PCDFs, can be produced. Because of differences in the analytical methodology used, existing data are not directly comparable; nevertheless, they can be used for the establishment of control and preventive measures and for the preliminary assessment of health and environmental risks associated with these chemicals. PCBs have been determined using gas chromatography GC techniques with electron capture detection, often using packed columns, though more sophisticated methods, such as capillary column and GC coupled with mass-spectrometry GC-MS , have been used in recent studies to identify the individual congeners, to improve the comparability of the analytical data from different sources, and to establish a basis for toxicity assessment. An extensive quality assurance programme is required for these analyses and intercalibration studies have been implemented and recommended. The quality and utility of the analytical data depend critically on the validity of the sample and the adequacy of the sampling. They have been widely used in electrical equipment, and smaller volumes of PCBs are used as fire-resistant liquid in nominally closed systems. By the end of , the total world production of PCBs was in excess of 1 million tonnes and, since then, production has continued in some countries. Despite increasing withdrawal of the use, and restrictions on the production, of PCBs, very large amounts of these compounds continue to be present in the environment, either in use or as waste. In recent years, many industrialized countries have taken steps to control and restrict the flow of PCBs into the environment. Since then, the 24 OECD member countries have restricted the manufacture, sales, importation, exportation, and use of PCBs, as well as establishing a labelling system for these compounds. Current sources of PCB release include volatilization from landfills containing transformer, capacitor, and other PCB-wastes,

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sewage sludge, spills, and dredge spoils, and improper or illegal disposal to open areas. Pollution may occur during the incineration of industrial and municipal waste. Most municipal incinerators are not effective in destroying PCBs. Explosions or overheating of transformers and capacitors may release significant amounts of PCBs into the local environment. The virtually universal distribution of PCBs suggests transport in air. At present, the major source of PCB exposure in the general environment appears to be the redistribution of PCBs, previously introduced into the environment. Concentrations of PCBs in precipitation range from 0. Since the volatilization and degradation rates of PCBs vary between congeners, this redistribution leads to an alteration in the composition of PCB mixtures in the environment. In water, PCBs are adsorbed on sediments and other organic matter; experimental and monitoring data have shown that PCB concentrations in sediment and suspended matter are higher than those in associated water columns. Strong adsorption on sediment, especially in the case of the higher chlorinated PCBs, decreases the rate of volatilization. On the basis of their water solubilities and n-octanol-water partition coefficients, the lower chlorinated PCB congeners will sorb less strongly than the higher chlorinated isomers. Although adsorption can immobilize PCBs for relatively long periods in the aquatic environment, desorption into the water column has been shown to occur by both abiotic and biotic routes. The substantial quantities of PCBs in aquatic sediments can therefore act as both an environmental sink and a reservoir of PCBs for organisms. Most of the environmental load of PCBs has been estimated to be in aquatic sediment. The low solubility and the strong adsorption of PCBs on soil particles limits leaching in soil; lower chlorinated PCBs will tend to leach more than the highly chlorinated PCBs. Degradation of PCBs in the environment is dependent on the degree of chlorination of the biphenyl. In general, persistence of PCB congeners increases as the degree of chlorination increases. In the atmosphere, the vapour phase reaction of PCBs with hydroxyl radicals which are photochemically formed by sunlight may be the dominant transformation process. Estimated half-lives for this reaction in the atmosphere range from about 10 days for a monochlorobiphenyl to 1. In the aquatic environment, hydrolysis and oxidation do not significantly degrade PCBs. Photolysis appears to be the only viable abiotic degradation process in water; however, available experimental data are not sufficient to determine its rate or importance in the environment. Microorganisms degrade mono-, di-, and trichlorinated biphenyls relatively rapidly and tetrachlorobiphenyls slowly, whilst higher chlorinated biphenyls are resistant to biodegradation. Chlorine substitution positions on the biphenyl ring appear to be important in determining the biodegradation rate. PCBs containing chlorine atoms in the para positions are preferentially biodegraded. Higher chlorinated congeners are biotransformed anaerobically, by a reductive dechlorination, to lower chlorinated PCBs, which may then be biodegradable by aerobic processes. Several factors determine the degree of bioaccumulation in adipose tissues: In general, the higher chlorinated congeners are accumulated more readily. Experimentally determined bioconcentration factors of various PCBs in aquatic species fish, shrimp, oyster range from up to 70 or more. In the open ocean, there is bioaccumulation of PCBs in higher trophic levels with an increased proportion of higher chlorinated biphenyls in higher ranking predators. Transfer of PCBs from soil to vegetation takes place mainly by adsorption on the external surfaces of terrestrial plants; little translocation takes place. Globally, PCBs are found in air concentrations of 0. Under occupational conditions, the levels in the air may be much higher. In the latter situation, PCDFs will also be present. In these emergency situations, ingestion, skin contamination, or inhalation of soot particles may occur and result in serious exposure of personnel. However, the exposure of the general population via air will be very low. Surface water may be contaminated by PCBs from atmospheric fallout, from direct emissions from point sources, or from waste disposal. In the oceans, levels of 0.

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2: Polychlorinated biphenyls and terphenyls

IPCS INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY Health and Safety Guide No. 68 POLYCHLORINATED BIPHENYLS (PCBs) AND POLYCHLORINATED TERPHENYLS (PCTs) HEALTH AND SAFETY GUIDE UNITED NATIONS ENVIRONMENT PROGRAMME INTERNATIONAL LABOUR ORGANISATION WORLD HEALTH ORGANIZATION WORLD HEALTH ORGANIZATION, GENEVA This is a companion volume to Environmental Health Criteria Polychlorinated.

Environmental Health Criteria EHC monographs Comprehensive data from scientific sources for the establishment of safety standards and regulations. EHC publications are monographs designed for scientists and administrators responsible for the establishment of safety standards and regulations. This series issued by the International Programme on Chemical Safety IPCS , provides basic scientific risk evaluation of a wide range of chemicals and groups of chemicals. EHC monographs are based on a comprehensive search of available original publications, scientific literature and reviews and examine: How do series work? To create a series or add a work to it, go to a "work" page. The "Common Knowledge" section now includes a "Series" field. Enter the name of the series to add the book to it. Works can belong to more than one series. In some cases, as with Chronicles of Narnia , disagreements about order necessitate the creation of more than one series. If the series has an order, add a number or other descriptor in parenthesis after the series title eg. By default, it sorts by the number, or alphabetically if there is no number. If you want to force a particular order, use the character to divide the number and the descriptor. So, " 0 prequel " sorts by 0 under the label "prequel. Series was designed to cover groups of books generally understood as such see Wikipedia: Like many concepts in the book world, "series" is a somewhat fluid and contested notion. A good rule of thumb is that series have a conventional name and are intentional creations, on the part of the author or publisher. For now, avoid forcing the issue with mere "lists" of works possessing an arbitrary shared characteristic, such as relating to a particular place. Avoid series that cross authors, unless the authors were or became aware of the series identification eg. Also avoid publisher series, unless the publisher has a true monopoly over the "works" in question. So, the Dummies guides are a series of works. But the Loeb Classical Library is a series of editions, not of works.

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3: Environmental Health Criteria Poly chlorinated biphenyls and terphenyls.

Environmental Health Criteria Polychlorinated Biphenyls and Terphenyls (Second Edition) Published by the World Health Organization for the International.

Child Health and Development Study, " Estimates adjusted for specimen characteristics and an indicator of a prescription for sex steroids, oral contraceptives or corticosteroids. Discussion We observed a reduction in the ratio of male: Inverse associations between all nine PCB congeners and secondary sex ratio were also observed, though not all of these were statistically significant at the 0. As PCB blood concentrations have been shown to remain very stable during pregnancy [37], these findings suggest that high maternal PCB concentrations, at least for some congeners, may either favor the fertilization by female sperm, or result in greater male embryonic or fetal losses. Sex ratio alterations or decreased survival of wildlife in association with organochlorine exposures have been well documented [38 - 41], although not all studies have confirmed such findings [42]. Only a handful of human studies of PCBs with sufficient sample sizes have reported data on sex ratio. At environmental exposures, several provide some suggestion of a reduced proportion of males [43 - 46]. Weisskopf and colleagues [46] examined consumers of sport-fish caught in the Great Lakes and observed a reduction in male births in association with maternal but not paternal serum PCB concentration. In contrast, another investigation found increased male offspring in relation to paternal PCB exposures, though this analysis may have over-adjusted for multiple exposures correlated with paternal PCBs [47]. Reports from the Yucheng [48] and Yusho [16] accidents showed no alteration in sex ratio, however, serious shortcomings in these studies should be noted. The Yucheng group consisted of a select set of mothers who had registered with the health department as having been affected, and who had at least one live child in Not all affected subjects were registered, and some of the most severely affected children may not have survived: Moreover, both the Yucheng and the Yusho studies were small: These sample sizes would not be adequate to detect small variations in sex ratio. Analysis of a more complete cohort from Yucheng, numbering births with paternal data and with maternal data revealed reduced male: Analyses for maternal exposures also showed a lower than expected proportion of males, but the findings were not statistically significant. The difference in findings using maternal vs. Since every child has both a mother and a father, but fewer fathers were tested, this raises the question of selection bias for children whose fathers participated in the study. In addition to studies of secondary sex ratio, research on the proportion of Y-bearing spermatozoa in relation to paternal PCBs have produced mixed results, i. This would suggest that increased paternal PCB concentrations may also alter secondary sex ratio, but other factors may modify this effect. It is not clear from these studies " due to inadequate sample size " whether changes in Y-bearing spermatozoa resulted in more or fewer male births. The possibility of bias deserves consideration. Selection factors would have to be associated with sex ratio and PCBs, jointly to have produced artifacts for the relationship of these variables of primary interest. Since demographic variables are not generally associated with sex ratio, they would not bias the results. The slight preponderance of girls followed up at age 5 years It is possible that because a small number of deaths occurred between birth and five years of age, part of the shift in sex ratio might be due to far higher deaths among boys with higher PCBs, or among girls with lower PCBs. At these exposure levels, however, which were far lower than occurred in the Yusho or Yucheng incidents, it seems unlikely that PCBs would have had a sufficiently strong association with child mortality to produce the results observed and yet not be related to fetal mortality. If PCBs were strongly associated with unknown or gestational age below 35 weeks, some selection bias could have occurred by our exclusion of these births. However, the literature does not support an association of preterm delivery with PCBs, nor did we find any trend of higher PCBs with earlier gestational age among births at weeks 35"45 [23]. In regard to other variables, the sample was representative of the original cohort. Thus, selection bias seems unlikely to be of sufficient magnitude to explain the findings. Validity of our data is supported by the confirmation of known risk factors for other outcomes, such as

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maternal smoking, short stature, and low body mass index in relation to intrauterine growth restriction [23]. High quality PCB determinations were ensured by use of within-batch replicates, standards across batches, and surrogate standards. Conclusion In this study, we observed a lower secondary male: If not due to an unidentified bias, these results may indicate that with higher exposures to PCBs comes either greater susceptibility of male embryos or a more favorable environment for X-chromatin-bearing sperm. Secondly, these investigations are useful for assessing reproductive perturbations in populations currently exposed to higher levels, e. Thirdly, if the findings are actually due to contaminants associated with PCB mixtures rather than PCBs themselves, then attention should be paid to trends in the contaminants, regardless of their source. Finally, other chemical classes with similar structure, such as PBDEs polybrominated diphenyl ethers , are widely used in plastic casings and foam products and share many of the biochemical and toxicologic properties of PCBs [51 , 52]. As PBDE body burdens are rapidly increasing in wildlife and human populations [53 , 54], studies like this one provide an indication of potential effects from these newer compounds. Competing interests The authors declare that they have no competing interests. TJ conducted log-binomial and logistic analyses, with adjustment for sampling and robust variance estimators and helped edit the manuscript. MJC ran the laboratory which conducted the PCB analyses, participated in designing the study, in preparing manuscripts, and in study meetings until her death in September RJB was a graduate student who assisted in writing the grant proposal, cleaning and managing the data, and preliminary statistical analysis. She also participated actively in discussions of early results, prior to her death. JK provided key programming support for development and management of all the databases and quality control, and participated in study meetings and development of the analysis plans during the first three years of the study. ST provided expertise on early childhood development, assisted with study design and exclusion criteria, and gave guidance on medical conditions and medications used as covariates for study sample restriction and for adjustment in the analyses. Acknowledgements The authors wish to thank Drs. We also wish to thank Dr. This work was supported by grants from the U. This work is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. Annu Rev Pharmacol Toxicol. Toxicological Profile for polychlorinated biphenyls update Atlanta, GA: Polychlorinated biphenyls and terphenyls second edition. Environmental Health Criteria Vulnerability of the developing brain to thyroid abnormalities: Polychlorinated biphenyls and thyroid status in humans: Developmental exposure of rats to a reconstituted PCB mixture or aroclor In vitro antiestrogenic effects of aryl methyl sulfone metabolites of polychlorinated biphenyls and 2,2-bis 4-chlorophenyl -1,1-dichloroethene on 17beta-estradiol-induced gene expression in several bioassay systems. Workshop on perinatal exposure to dioxin-like compounds. Semen quality after prenatal exposure to polychlorinated biphenyls and dibenzofurans. Change in sex ratio with exposure to dioxin. Paternal concentrations of dioxin and sex ratio of offspring. Number of boys born to men exposed to polychlorinated biphenyls. Sex ratio in offspring of those affected by dioxin and dioxin-like compounds: Determinants of serum polychlorinated biphenyls and organochlorine pesticides measured in women from the child health and development study cohort, " Comparison of polychlorinated biphenyl levels across studies of human neurodevelopment. Inuit exposure to organochlorines through the aquatic food chain in arctic quebec. The California child health and development studies of the school of public health, university of california at Berkeley. In utero polychlorinated biphenyl exposures in relation to fetal and early childhood growth. Maternal DDT exposures in relation to fetal and 5-Year growth. Drugs and thyroid function. N Engl J Med. Re-using data from case-control studies. Logistic regression in case-control studies: A reproducible approach to the reporting of organochlorine compounds in epidemiologic studies.

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4: Environmental Health Criteria | Awards | LibraryThing

Evaluates the vast body of evidence demonstrating the serious threat to human and environmental health posed by polychlorinated biphenyls (PCBs). These chemicals, which are now ubiquitous in the environment, have been used commercially since as dielectric and heat-exchange fluids and in a variety of other applications.

In , PCBs congeners: Data from the present survey showing that serum levels of PCBs 28, 52, , , are below 2. Data from a large number of countries in the s and s summarized by World Health Organization WHO, suggested that PCBs in human milk from industrialized countries ranged between 0. The general population is primarily exposed to PCBs by consuming contaminated fish and, to a lesser extent, via other food products from animal origin such as meat, milk, cheese, poultry and eggs WHO, Contamination of fish muscle tissue by total-PCBs was rather low from "not detected" up to Except for Good Friday meals, however, fish and sea food are items that are only occasionally included in the diet in Rio de Janeiro. Besides this fact, according to data provided by Ferreira-da-Silva , levels of PCBs were rather low in sardines, the cheapest and most consumed fish species. No other volunteer who took part in the present study informed us of being occupationally exposed to DDT or any other pesticide. This trend was noted both in men youngest group: In a previous survey of the serum concentrations of OCPs in agricultural workers from Paty-do-Alferes, Rio de Janeiro, the only residues found were b-HCH in 6 out of 26 samples ranging from 1. At any rate, concentrations found in the present study as well as those determined in agricultural workers from Rio de Janeiro state Paumgartten et al. A similar conclusion can also be drawn from data on the levels of DDT-related material in the breast milk from 40 mothers who had been living in the urban area of Rio de Janeiro for at least 5 years in Paumgartten et al. Differences in the diet e. Nevertheless, as far as the authors are aware, DDT and other OCPs have not been used for insect-borne diseases control in Rio de Janeiro state during the last two decades. In conclusion, data from this study suggest that inhabitants of the urban area of greater Rio de Janeiro city have a relatively low body burden of persistent OCPs and PCBs. Ministry of Agriculture Directive from September 2, Ministry of Health Directive 11 from January 8, Journal of the Association of Official Analytical Chemists, Toxic effects of pesticides. The Basic Science of Poisons C. Veterinary and Human Toxicology, Environmental endocrine modulators and human health: An assessment of the biological evidence. Critical Reviews in Toxicology, Organochlorine exposure and risk of breast cancer. Plasma organochlorine levels and the risk of breast cancer: International Journal of Cancer, Revista do Instituto Adolfo Lutz, Bulletin of Environmental Contamination and Toxicology, General overview on vector control in relation to the organic insecticides pollution in Brazil. Levels of organochlorine pesticides in the blood serum of agricultural workers from Rio de Janeiro state, Brazil. Breast cancer, lactation history, and serum organochlorines. American Journal of Epidemiology, DDT and its Derivatives. Environmental Health Criteria Series 9. Polychlorinated Biphenyls and Terphenyls. Environmental Health Criteria Series

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5: Polychlorinated biphenyls and polychlorinated terphenyls (PCBs and PCTs) (HSG 68,)

Polychlorinated Biphenyls and Terphenyls. Environmental Health Criteria , 2. Auflage, bearbeitet von S. Dobson und G. J. van Esch. Seiten, 5 Abb. und 54 Tabellen.

J Public Health Res. Published online Jul 1. BK, data processing and compilation, statistical analysis and manuscript preparation; VKK and SKS, sample collection, processing and analysis; SK, technical correction in manuscript preparation; CSS, planning; ABA, guidance and permission to conduct study, and for publication. Abstract Background Polychlorinated biphenyls PCBs have never been produced in India, but were used in industrial applications. PCBs have been detected in environmental samples since , and their sources in soils come from depositions of industrial applications, incinerators and biomass combustions. PCBs adsorb to soil particles and persist for long time due to their properties. Their close proximity may also lead to human exposure through ingestion, inhalation, dermal contact, and may exert neurotoxic, mutagenic and carcinogenic health effects. Background Residential soil from Korba, India, was extracted using pressurized liquid extraction procedure, cleaned on modified silica and quantified for PCBs. Soil ingestion was considered as the main exposure pathways of life-long intake of PCBs. Human health risk in terms of life time average daily dose, incremental lifetime cancer risk ILCR and non-cancer hazard quotient HQ were estimated using established guidelines. HQ was lower than safe limit of 1. Background Study concluded that human population residing in Korba had low health risk due to PCBs in residential soils. Significance for public health The concentrations of polychlorinated biphenyls PCBs in soils from an industrial city in India were measured for the assessment of human health risk. PCBs composition profiles were dominated with tri-chlorinated and tetra-chlorinated biphenyls. The possible sources of PCBs contamination can be attributed to local industrial emissions and long range transport depositions. The daily intakes of PCBs, and corresponding incremental lifetime cancer risk and hazard quotient for humans were estimated and found to be lower than acceptable levels. This baseline study may provide database on persistent organic pollutants in tropical countries and may also be useful in risks assessment of the industrial pollutants on human population. Residential soil, polychlorinated biphenyls, dioxin like toxicity equivalency, risk assessment, hazardous quotient Introduction During the past decades, toxic persistent organic compounds have been synthesized and released into the environment for direct or indirect application. These are highly stable compounds and were primarily used in electrical and industrial applications such as in transformers and capacitors, lubricants, flame retardants, plasticizers, paint additives, etc. Building materials, such as caulking may also constitute a source of PCB contamination in the buildings and in surrounding soil. PCBs, especially DL-PCBs exposure through ingestion, inhalation and skin contact have long been recognized for their potential to cause health effects in wide variety of plants and animal species including humans. Human exposure to these compounds has been associated with their adverse affect on endocrine system, in addition to being neurotoxic, mutagenic, and carcinogenic in the liver, biliary tract and skin. PCBs adsorb strongly to soil, where they tend to persist due to their characteristic properties and, 7 soil acts as a good indicator of pollution and environmental risks. Accumulation of PCBs in soil may lead to contamination of vegetables and food chains. High content of these pollutants in soils may cause health risks to the living beings exposed to it. Therefore, several studies have been conducted around the world for assessing the status of human and environmental health risk due to PCBs in soils. Studies have been carried out in India, on the evaluation of PCBs in environmental matrices. This baseline data was compared with other studies, which may be useful in risks assessment of the industrial pollutants on human population. Korba is enriched with coal and water resources Hasdeo and Ahran rivers essential for power generation. Therefore, Korba is also known as Power City with several thermal and one hydro electric power plants generating more than MW of electricity. Besides these, one major aluminum plant is also operational in this area. Region experiences a typical climate, where April to June is summer, from June to October it is raining season with an average rainfall of mm, and winter season falls in November to

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February.

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6: Polychlorinated biphenyls and terphenyls (EHC , , 2nd edition)

Polychlorinated Biphenyls and Terphenyls (Environmental Health Criteria Series; No) Paperback - April 1, Be the first to review this item See all formats and editions Hide other formats and editions.

Health and safety guide ; no. Polychlorobiphenyl compounds - poisoning 2. Polychlorobiphenyl compounds - standards 3. Polychloroterphenyl compounds - poisoning 4. Polychloroterphenyl compounds - standards 5. Applications and enquiries should be addressed to the Office of Publications, World Health Organization, Geneva, Switzerland, which will be glad to provide the latest information on any changes made to the text, plans for new editions, and reprints and translations already available. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

Polychlorinated biphenyls - PCBs 1. Polychlorinated terphenyls - PCTs 1. Physical and chemical properties 1. Environmental transport, distribution, and transformation 2. Environmental levels and human exposure 2. Kinetics and metabolism 2. Effects on organisms in the environment 2. Effects on experimental animals and in vitro systems 2. Reproduction, embryotoxicity, and teratogenicity 2. Factors modifying toxicity; mode of action 2. Effects in humans 3. Effects on experimental animals 3. Effects on humans 3. Effects on the environment 3. Main human health hazards, prevention and protection, first aid 4. Advice to physicians 4. Health surveillance advice 4. Explosion and fire hazards 4. Leaking containers in store 4. Spillage and disposal 4. Previous evaluations by international bodies 7. Exposure limit values 7. Labelling, packaging, and transport 7. They also provide guidelines for setting exposure limits. The purpose of a Health and Safety Guide is to facilitate the application of these guidelines in national chemical safety programmes. The first three sections of a Health and Safety Guide highlight the relevant technical information in the corresponding EHC. Section 4 includes advice on preventive and protective measures and emergency action; health workers should be thoroughly familiar with the medical information to ensure that they can act efficiently in an emergency. Within the Guide is a Summary of Chemical Safety Information which should be readily available, and should be clearly explained, to all who could come into contact with the chemical. The target readership includes occupational health services, those in ministries, governmental agencies, industry, and trade unions who are involved in the safe use of chemicals and the avoidance of environmental health hazards, and those wanting more information on this topic. An attempt has been made to use only terms that will be familiar to the intended user. However, sections 1 and 2 inevitably contain some technical terms. A bibliography has been included for readers who require further background information. Revision of the information in this Guide will take place in due course, and the eventual aim is to use standardized terminology. Comments on any difficulties encountered in using the Guide would be very helpful and should be addressed to:

The chemical formula can be presented as $C_{12}H_nCl_n$, where n is the number of chlorine atoms in the molecule. Chemical composition The PCBs are chlorinated hydrocarbons that are manufactured commercially by the progressive chlorination of biphenyl in the presence of a suitable catalyst e . The yield is always a mixture of different compounds and congeners. Thus, a total of different chemical components may exist, but only about of these are likely to occur in commercial products or mixtures of these compounds. Individual PCBs have been synthesized for use as reference samples in the identification of gas-liquid chromatographic peaks, for toxicological investigations, and in order to study their metabolic fate in living organisms. Purity and impurities Commercial PCBs are sold on the basis of their physical properties, not their chemical composition. Different batches may vary somewhat in their composition. The impurities known to be present in commercial PCBs include chlorinated naphthalenes and small quantities of the highly toxic polychlorinated dibenzofurans PCDFs. Polychlorinated biphenyls - PCBs. TQ Relative molecular mass: Depends on degree of chlorination

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and composition of the mixture. Chemical composition The theoretically possible number of different PCTs is several orders of magnitude greater than the number of PCBs, but in practice, as with PCBs, PCTs are sold on the basis of their physical properties, which depend on the degree of chlorination, and not their chemical composition. Polychlorinated terphenyls - PCTs. WZ Relative molecular mass: In the Aroclor series, terphenyls are indicated by 54 in the first two places of the four digit code. They do not crystallize at low temperatures, but turn into solid resins. Because of the chlorine atoms in the molecule, the compounds have a fairly high density. They form vapours that are heavier than air, but they do not form an explosive mixture with air. The electrical conductivity of PCBs and PCTs is very low, and their resistance to thermal breakdown is extremely high. It is on the basis of these properties that they are used as cooling liquids in electrical equipment. The physical properties of some Aroclors are shown in Table 1. PCBs are chemically stable under normal conditions. PCBs are practically insoluble in water; however, they dissolve easily in hydrocarbons, fats, and other organic compounds, and they are readily adsorbed by fatty tissues. The partition coefficient $\log K_{ow}$ values for all PCB congeners range from 4. One probable source of error is incomplete extraction and clean-up of the PCBs. The method used to quantify the gas-liquid chromatographic peaks also gives rise to variation between laboratories. Data on concentrations of PCBs must be interpreted with the greatest care. Comparisons can only be made between data from the same laboratory, obtained using the same validated technique over a long period. Comparisons between data from different laboratories are possible in only the very few cases, in which very strict interlaboratory checks have been made on the basis of the same sampling and analytical techniques. Indications about trends can only be obtained when these basic considerations are taken into account. Gas-liquid chromatography GLC with packed or capillary columns, is generally used for the analysis, and comparison of peak patterns, and various PCB standard formulations are used for quantification. Different approaches are used for the summing-up of individual peaks. The main uses are or were: Both c and d are open-ended applications. The virtually universal distribution of PCBs suggests that they are transported in air. At present, the major source of PCB exposure for the general population appears to be as a consequence of the redistribution of PCBs previously introduced into the environment. This redistribution involves volatilization from soil and water into the atmosphere, with subsequent transport in air and removal from the atmosphere through wet or dry deposition of PCBs bound to particulates, and then re-volatilization. The concentrations of PCBs in precipitation range from 0. Since the volatilization and degradation rates of PCBs vary among the different congeners, this redistribution leads to an alteration in the composition of PCB mixtures in the environment. In water, PCBs are adsorbed to sediments and other organic matter; experimental and monitoring data have shown that PCB concentrations are higher in sediment and suspended matter than in the associated water columns. Strong adsorption to sediment, especially in the case of the higher chlorinated PCBs, decreases the rate of volatilization. On the basis of their water solubilities and n-octanol-water partition coefficients, the lower chlorinated PCB congeners will sorb less strongly than the higher chlorinated isomers. Although adsorption can immobilize PCBs for relatively long periods in the aquatic environment, desorption into the water column has been shown to occur by both the abiotic and biotic routes. The substantial quantities of PCBs in aquatic sediments therefore act as both an environmental sink and a reservoir of PCBs for subsequent recycling in the environment. Most of the PCBs in the environment are in the aquatic sediment. The low solubility of PCBs, and their strong adsorption to soil particles, limits leaching in soil; the lower chlorinated PCBs will tend to leach more than the highly chlorinated PCBs. Degradation of PCBs in the environment depends on the degree of chlorination of the biphenyl. In general, the persistence of PCB congeners increases as the degree of chlorination increases. In the atmosphere, the reaction of PCBs in the vapour phase with hydroxyl radicals which are photochemically formed by sunlight may be the most important transformation process. The estimated half-life of this reaction in the atmosphere ranges from about 10 days to 1. In the aquatic environment, PCBs are not significantly degraded by hydrolysis and oxidation. Photolysis appears to be the only abiotic degradation process in water; however, insufficient experimental data are available to determine its rate or its importance in the environment. Microorganisms

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degrade mono-, di-, and trichlorinated biphenyls relatively rapidly, and tetrachlorobiphenyls slowly, while higher chlorinated biphenyls are resistant to biodegradation. The chlorine substitution position on the biphenyl ring appears to be important in determining the biodegradation rate. PCBs containing chlorine atoms in the para position are preferentially biodegraded. Higher chlorinated congeners are biotransformed anaerobically, by reductive dechlorination, to lower chlorinated PCBs, which may then be biodegradable by aerobic processes. Several factors determine the degree of bioaccumulation in adipose tissues:

7: WHO | Numerical list of EHCs

Polychlorinated Biphenyls and Terphenyls. Environmental Health Criteria Series, No. , World Health Organization, Geneva, pp. (). 4) Masuda Y. Toxic effects of PCB/PCDF to human observed in Yusho and other poisonings.

8: World Health Organization - books from this publisher (ISBNs begin with) (11 of 15)

Background. Polychlorinated biphenyls (PCBs) have never been produced in India, but were used in industrial applications. PCBs have been detected in environmental samples since , and their sources in soils come from depositions of industrial applications, incinerators and biomass combustions.

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