Changing Status of Women in the Indian Society

भारतीय समाज में महिलाओं का बदलता हुआ परिदृश्य

Dr. Ashish Gupta
Dr. Sadhna Dehariya

महिला सशक्तिकरण के विविध आयाम

अखिलेश शुक्ल

महिला सशक्तिकरण के विविध आयाम

डॉ. अखिलेश शुक्ल

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अनुक्रमणिका

महिला सशक्तिकरण एवं ग्रामीण महिलाएँ

• डॉ. (श्रीमती) पूजा तिवारी

किसी भी समाज की सम्पन्नता का अनुमान इस बात से बेहतर तरीके से लगाया जा सकता है कि उस समाज में नारी की स्थिति कैसी है ,अर्थात जिस समाज में नारी की स्थिति जितनी सुदृढ़ होगी ,वह समाज उतना ही उन्नत होगा।

विश्व की कुल जनसंख्या में आधी जनसंख्या महिलाओं की है वे कार्यकारी घंटों में दो तिहाई का योगदान करती है किन्तु विश्व आय का केवल दसवाँ हिस्सा वे प्राप्त कर पाती है और उन्हें विश्व संपत्ति में सौवें से भी कम हिस्सा प्राप्त होता है। एक अरब से ज्यादा आबादी वाले इस देश में महज 4.7 करोड़ महिलाएं ही कामकाजी हैं। अगर हम इस संख्या को बढ़ा सके और वर्क फोर्स में स्त्री पुरूष के बीच एक संतुलन ला सकें तो देश की अर्थव्यवस्था में 27 प्रतिशत की वृद्धि हो सकती है। इस समय देश में लगभग 23.5 करोड़ महिलाएं ऐसी है जो बेहतर शिक्षा और प्रोफेशनल ट्रेनिंग के बावजूद वर्क फोर्स से बाहर है। डेलॉयट की 2018 ग्लोबल इंपैक्ट रिपोर्ट के अनुसार सन् 2005 में भारत के वर्क फोर्स में महिलाओं की भागीदारी 35 प्रतिशत थी जो सन् 2018 में घट कर महज 26 प्रतिशत रह गई है। राष्ट्र के आर्थिक विकास हेतु महिलाओं को वर्क फोर्स का हिस्सा बनाना जरूरी है। यद्यपि रोजगार में महिलाओं की संख्या में वृद्धि हो रही है लेकिन उन्हें कम वेतन मिल रहा है तथा उनके कार्य की परिस्थितियाँ असंतोषजनक है।

ग्रामीण क्षेत्रों में महिला सशक्तिकरण के प्रमुख चार आयाम हो सकते है।

1. महिलाएं एवं उनकी कार्य सहभागिता
2. महिलाएं एवं शिक्षा
3. महिलाएं एवं उनका स्वास्थ्य
4. महिलाएं एवं उनकी राजनैतिक सहभागिता

उद्देश्य–

1. ग्रामीण महिलाओं के सशक्तिकरण की स्थिति की जानकारी।
2. ग्रामीण महिलाओं की सामाजिक, राजनैतिक, आर्थिक स्थिति की जानकारीं।

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• सह-प्राध्यापक एवं विभागाध्यक्ष, समाजशास्त्र विभाग, शासकीय महाविद्यालय बिछुआ, जिला छिन्दवाड़ा

सशक्तिकरण का अर्थ पुरूषों की बराबरी करना नहीं है वरन् ग्रामीण महिलाओं को भी जीवन की मुख्य धारा से जोड़ना है।

ग्रामीण महिला सशक्तिकरण मुख्यत: शिक्षा के प्रति जागरूकता, कार्यकुशलता एवं अधिकारों की जानकारी तथा सामाजिक क्षेत्र में सबलता के आधार पर आंका जा सकता है।

हमारे देश में लगभग 70 प्रतिशत महिलाएं गाँवों में निवास करती है ,उनके कंधों पर गृह कार्य ,कृषि कार्य तथा अन्य सामाजिक कार्यो का सारा भार होता है।

ग्रामीण स्त्रियों की भूमिका बहुआयामी होती है। वे घरेलू कार्य जैसे बर्तन, झाड़ू, पौंछा, साफ-सफाई, खाना बनाना, बच्चों की देख रेख, पशुओं की साफ सफाई आदि निपटा कर खेतों में काम करने जाती है एवं जरूरत पड़ने पर लघु उद्योग करके भी परिवार के लिए अर्थोपार्जन करती है। ग्रामीण महिलाएं लगभग सोलह से अठारह घंटे कार्य करती है।

इस तारतम्य में बिछुआ के ग्राम गोनी एवं ग्राम जाखावाड़ी की ग्रामीण महिलाओं से उनकी दिनचर्या की जानकारी लेने पर ज्ञात हुआ कि वे प्रात: 5 बजे से उठकर घरेलू कार्य, पशुओं की देखरेख, खेती के कार्य पानी भरना, चारा काटना आदि जैसे कार्यो को करते हुए लगभग रात्रि के 11 बजे सोती है।

ग्रामीण महिलाओं के अथक परिश्रम के पश्चात् भी उनका स्थान एवं सम्मान समाज में नगण्य है। इसका प्रमुख कारण शिक्षा का अभाव है एवं शिक्षा के प्रति जागरूकता की कमी के कारणों में मुख्य रूप से अभिभावकों की समझ में कमी, बेटी की शादी की चिंता जल्दी विवाह, घर के काम, तथा स्त्रियों द्वारा स्वयं की शिक्षा के प्रति अरूचि ही उन्हें शिक्षा से वंचित कर देती है।

हमारा देश गांवों में बसता है और ग्रामीण विकास से ही देश का विकास होगा। सरकार की योजनाओं का परिणाम ग्रामीण महिलाओं के आर्थिक विकास में दिखाई पड़ने लगा है। ग्रामीण महिलाऐं कृषि के अलावा टोकरी बनाना, दोना पत्तल बनाना, कपड़ों की रंगाई करना, शहद बेचना आदि जैसे लघु कार्य कर रही है। ग्रामीण महिलाएं सब्जी बेचने से लेकर गृह निर्माण, पुल निर्माण में मजदूरी जैसे कार्यो में भी शामिल होती है।

भारत में नारी उत्थान हेतु विविध योजना एवं कानून बने है, परंतु व्यावहारिक रूप में इन कानूनों का पूर्णत: पालन नहीं हो पा रहा है। ग्रामीण महिला सशक्तिकरण हेतु आज आवश्यकता है महिला के परिश्रम के सही मूल्यांकन की।

वर्तमान में ग्रामीण महिलाओं के रहन-सहन विचारों में भी परिवर्तन परिलक्षित हो रहे हैं। अब ग्रामीण महिलाएं स्वयं के लघु उद्योग प्रारंभ करने में सक्षम हो रही है। ग्रामीण महिलाओं की भागीदारी बड़ी, पापड़, अचार तथा मसाले बनाने वाले लद्यु उद्योगों में निरंतर बढ़ रही हैं। ग्रामीण महिलाएं राजनैतिक क्षेत्र में भी सशक्त हो रही है, अनेक स्थानों पर महिलाएं सरपंच,जनपद सदस्य, ग्राम पंचायतों में सक्रिय भूमिका का निर्वहन कर रही है किंतु शिक्षा के अभाव में वह

अपने पद का समुचित प्रयोग नहीं कर पा रही है।

इस प्रकार से कहा जा सकता है कि स्वतंत्रता के पश्चात् महिलाओं के विकास ने गति पकड़ी है परन्तु ग्रामीण क्षेत्र में अभी बहुत कुछ करना शेष है। ग्रामीण क्षेत्रों में चल रही अनेक योजनाओं के बाद भी ग्रामीण विकास में महिलाओं की संख्या काफी न्यून है। अत: ग्रामीण महिला सशक्तिकरण की सफलता हेतू आवश्यक है कि सशक्त कहीं जाने वाली महिलाएं अपने ज्ञान एवं शिक्षा का दीप प्रज्जवलित करें एवं उसके प्रकाश में समस्त ग्रामीण महिलाओं को समाहित कर ले। राष्ट्र के विकास तथा एक सशक्त महिला समाज की स्थापना हेतू आवश्यक है कि ग्रामीण महिलाओं के सशक्तिकरण हेतू मुख्य रूप से शासकीय योजनाओं का लाभ दिलवाना ,समान वेतन देना,शिक्षा देना तथा स्वयं निर्णय लेने की क्षमता का विकास करना होगा तथा ग्रामीण महिलाओं द्वारा किए गए कार्यो एवं परिश्रम का बेहतर मूल्यांकन करके उन्हें प्रोत्साहित करना ही ग्रामीण महिला सशक्तिकरण की दिशा में सार्थक प्रयास सिद्ध होगा।

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संदर्भ ग्रंथ सूची-

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Ethnic Fermented Foods and Beverages of India: Science History and Culture

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Contents

Ethnic Fermented Beverages and Foods of Chhattisgarh

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Shubhra Tiwari, S. K. Jadhav, Esmil Beliya, Jai Shankar Paul, and G. D. Sharma

Abstract

Chhattisgarh is known as "rice bowl of India" due to enormous production of rice. Rice is the major ingredient of the ethnic fermented food and beverages of Chhattisgarh. Apart from rice, traditional dishes are also made from wheat, barley, and different lentils. Fermentation process has an impact on food's aroma, flavor, texture, and nutritional content besides preservation. The ethnic food of Chhattisgarh serves a wide range of mouthwatering dishes that are enriched with flavor and exceptional taste. With nutritional values, different fermented foods are lays an important ethic place in tribal people's life. Beverages play an important role in the life of tribal people of Chhattisgarh state. Fermented beverages are consumed in festivals, marriages, funeral feast, and other ceremonies cerebrated by tribal peoples. Fermented beverages and foods have several health benefits. Main ethnic beverage of Chhattisgarh is *handia*, *salfi*, and *mahua*. *Handia* is made up of cooked rice, *mahua* is made up of mahua flowers, and *salfi* is obtained from trunk sap of *salfi*. Some important fermented foods of Chhattisgarh are *boree basi*, *bara*, *dehori*, *aeersa*, *pidiya*, *bafaur*, *bijori*, *rakhiya bari*, etc. Most of the dishes are made up mainly from rice or rice flour and consumed during the festivals, marriage ceremony, and special occasions. Fermented food and their recipes give a real treat to the taste buds of people. These ethnic fermented Chhattisgarh beverages and dishes are healthy, cheap, and easy to digest.

Keywords

Chhattisgarh · Ethnic food · Fermented beverages · Tribes

S. Tiwari · S. K. Jadhav · E. Beliya · J. S. Paul
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with different recipes in local diets. However, no studies on microbiology, nutrition, and health benefits of these unique ethnic fermented foods and beverages of Chhattisgarh have been conducted yet.

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Dr Payal Mahobiya is an Assistant Professor of Zoology at School of Biological Sciences, Dr. Hari Singh Gour University, Sagar. She has 15 years experience of teaching and conducting research in the field of Endocrinology, Toxicology and Limnology. She has supervised one Ph.D thesis, published several book chapters and more than 15 research articles in reputable journals of national and international standard. She had joined the university in 2007. During teaching she also did her Doctorate of Philosophy and awarded in 2012.

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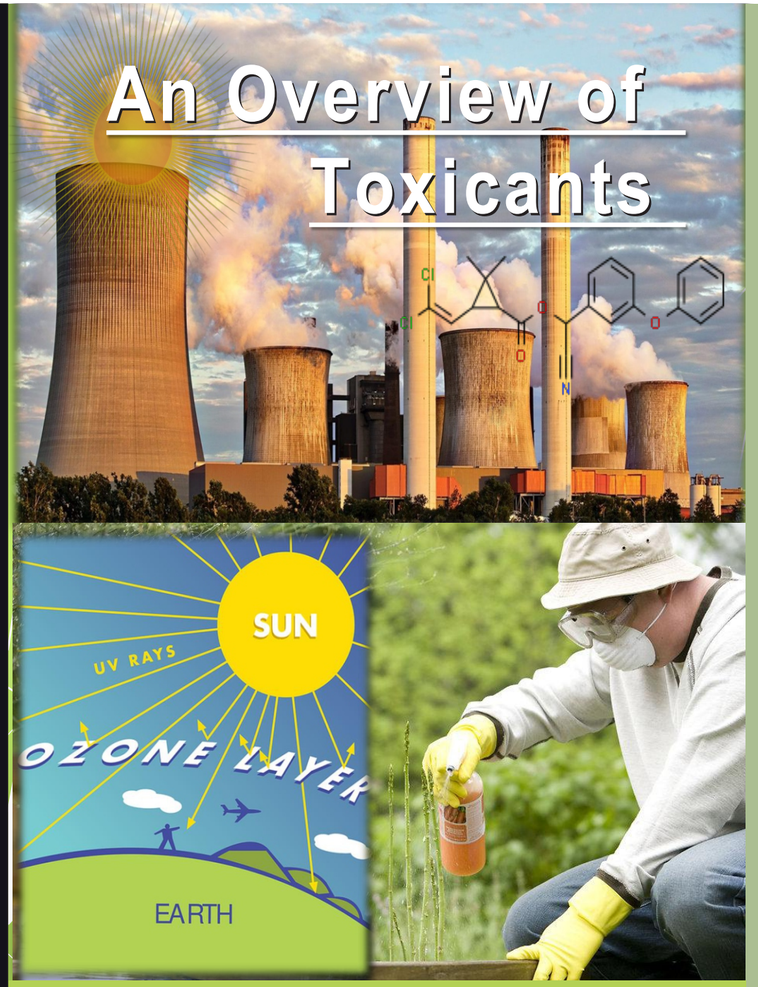
AN OVERVIEW OF TOXICANTS

Dr Payal Mahobiya

An Overview of Toxicants



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Dioxins

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Introduction

Toxins are the substances which cause malfunctioning and even death of any organisms. They can be classified in a number of ways. Based on the sources or origin, toxins can be classified as -plant toxins, animal toxins, mineral toxins, synthetic toxins. They can be produced by microorganisms, plants and animals. Toxins can also be synthetic or unwanted by-products of any process e.g. combustion of substances, making of products etc. Now days there are several kinds of toxins which are being produced by pollution, whether it is water, land or air pollution. Pollution can be defined as the production or mixing of unwanted substances in the environment. These unwanted substances act as toxins when they affect and cause diseases and even death in animals, plants and humans which ultimately leavesan impact on environment.

There are several kinds of toxinsand pollutants which are very harmful for environmental health, dioxin is one of them. Dioxins are a group of chemicals that form as unwanted byproducts from incomplete burning of household and industrial waste. They also can be produced during bleaching of paper pulp and the manufacturing of certain chlorinated chemicals like polychlorinated biphenyls (PCBs), chlorinated phenols, chlorinated benzene and certain herbicides/pesticides. Exhaust from vehicles, forest fires, and burning wood also releases dioxins into the air. Very small amounts of dioxins, that are not considered harmful, are present in bleached paper products including facial or toilet tissue, paper towels, and disposable diapers. In the environment, dioxins tend to accumulate in the food chain. The higher an animal is in the food chain, the higher the concentration of dioxins. Dioxins are present in all the compartments of the ecosystem (air, soil, animals, fresh and salt water sediments). Because of their solubility in lipids and chemical stability, they are concentrated all along the food chain, and food has become the major exposure pathway for humans (Figure 1). Dioxins are of concern because of their highly toxic potential. They belong to the group of dangerous chemicals known as persistent organic pollutants (POPs). They are almost exclusively produced by industrial processes, including incineration, chlorine bleaching of paper and pulp, and the manufacture of some pesticides, herbicides, and fungicides. Small amounts are synthesized for scientific research. They severely cause air pollution and several diseases in human beings and animals thus having a great impact on environment.

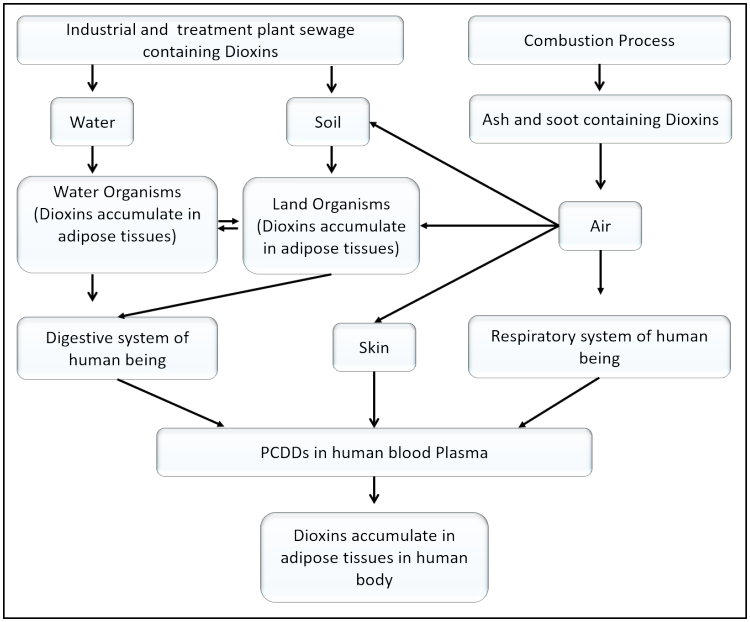


Figure 1: Circulation of dioxins in environment

Dioxins and dioxin-like chemicals form a large group of compounds which are structurally related, are environmentally and biologically persistent, induce a common spectrum of responses, and have a common mechanism of action. This group includes polychlorinated dibenzodioxins (PCDDs), dibenzofurans (PCDFs), biphenyls (PCBs), and related compounds. Dioxins did not exist prior to industrialization except in very small amounts due to natural combustion and geological processes. Dioxins have been featured in the news, following a poisoning incident in Europe. Today they are found in all humans, with higher levels commonly found in persons living in more industrialized countries. These compounds are of concern to both public health workers and clinicians because of the many types of illnesses, both overt and subclinical, they may cause.

Structure

Dioxins are a family of compounds that share distinct chemical structures and characteristics. The family of dioxins is characterized chemically by the presence of two benzene rings connected by a pair of oxygen atoms. Each of the eight carbon atoms on the rings that are not bonded to oxygen can bind with hydrogen atoms or atoms of other elements. By convention these positions are assigned the numbers 1 through 4 and 6 through 9. The more toxic dioxins carry chlorine atoms at these positions, and the best-known one has chlorine atoms at the 2, 3, 7, and 8 positions. This isomer—2, 3, 7, 8-TCDD—is extremely stable chemically. The chemical name for dioxin is: ***2, 3, 7, 8- tetrachlorodibenzo para dioxin*** *(TCDD)* (Figure 2). The cumulative and toxic properties of dioxins also depend closely on their chemical structure, i.e. on the number and position of the chlorine atoms in the two benzene rings.

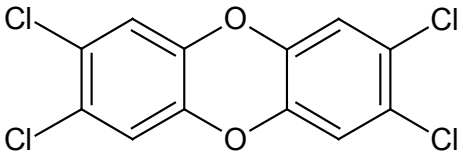
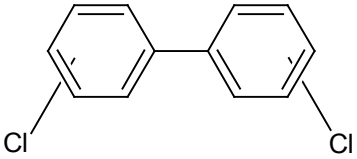


Figure 2: Structure of 2, 3, 7, 8- tetrachlorodibenzo para dioxin (TCDD)

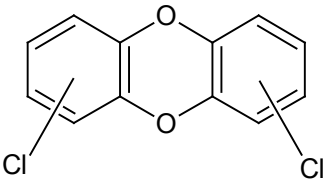
It is virtually insoluble in water and in most organic compounds but is soluble in fat. It is this combination of properties that allows this dioxin in soil to resist dilution with rainwater and causes it to seek and enter fatty tissue in the body if it is absorbed.

The name "dioxins" is often used for the family of structurally and chemically related *polychlorinated dibenzo para dioxins (PCDDs)* and *polychlorinated dibenzofurans*

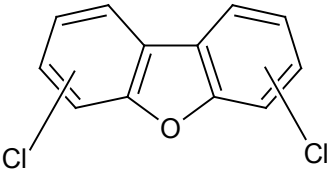
(PCDFs). Certain dioxin-like polychlorinated biphenyls (PCBs) with similar toxic properties are also included under the term "dioxins". Some 419 types of dioxin-related compounds have been identified but only about 30 of these are considered to have significant toxicity, with TCDD being the most toxic. There are several hundred dioxins, and they belong to three closely related families. These are listed below with their structure given in Figure 3:



Polychlorinated biphenyls (PCBs)



Polychlorinated dibenzo-p-dioxins (PCDDs)



Polychlorinated dibenzofurans (PCDFs)

Figure 3: Structure of PCBs, PCDDs and PCDFs

PCDDs and PCDFs are not created intentionally. They are produced inadvertently through human activities and because of natural processes. PCBs are manufactured

products, but they are no longer made. So basically PCDDs and PCDFs are two families of distinct compounds, albeit very similar with respects to their molecular structure and their physico-chemical properties. They are oxygenated polycyclic aromatic compounds; the structure of PCDD has two oxygen atoms, whereas PCDF has only one. The numbered positions in aromatic rings can be substituted by hydrogen or chlorine atoms (no more than eight of the latter). When two oxygens combine two benzenes (or chlorinated benzene), it becomes para-dibenzodioxins, and when one oxygen combines two benzenes, it is called dibenzofuran. Both chemicals could have up to 8 chlorines, so the number of isomers and congeners are many. Congeners are the molecules with the same basic structure but with a different number of substituted atoms. There are 75 congeners of PCDD and 135 of PCDF; they differ by the position and number of chlorine atoms in the basic structure.

Out of these 210 congeners of PCDD and PCDF, 17 compounds substituted in positions 2,3,7,8. Presence of four chlorine atoms at positions 2, 3, 7, and 8 on the dioxin molecules seems to cause toxicity. Out of these 17 congeners 7 are PCDD congeners and 10 are PCDF congeners. They possess a steric conformation that promotes their binding to the intracellular Ah receptor, but their affinity for it does vary. It is highest for 2, 3, 7, 8-TCDD and 10 to 10,000 times lower for the more chlorinated congeners (such as OCDD), which have a steric hindrance that limits binding to the receptor. Among these 17 congeners, those that are likely to bind to the Ah receptor and which include at least 4 chlorine atoms in positions 2, 3, 7, and 8 are considered to be the most toxic. Toxicity diminishes as the number of chlorine atoms increases: the most toxic PCDD is 2, 3, 7, 8-TCDD.

At more than 5 chlorine atoms, toxicity falls sharply. The toxic potential of the 17 congeners can be expressed relative to the most toxic compound by the concept of toxic equivalence (TEF, toxic equivalent factor). Toxicity of these congeners is evaluated based on the 2, 3, 7, 8-TCDD, and expressed as toxic equivalency factor (TEF).

Accordingly, the TEF is defined as follows:

Similarly, total toxic equivalent (TEQ) tells about the concentration of the toxic substances in an environment mixture. It can be calculated as the sum of the products of the concentration of each compound in an environment mixture and its TEF value. The TEQ value of dioxins from different sources can be expressed as given in Table 1.

Table 1: Expression of concentration of the toxic substances in different sources

Type of Samples/ Sources	Expression of results
Biological samples	ng TEQ/kg fresh weight or pg TEQ/g fat
Soil or sediment samples	ng TEQ or pg TEQ/g dry weight
Atmospheric emissions	ng TEQ/m^3

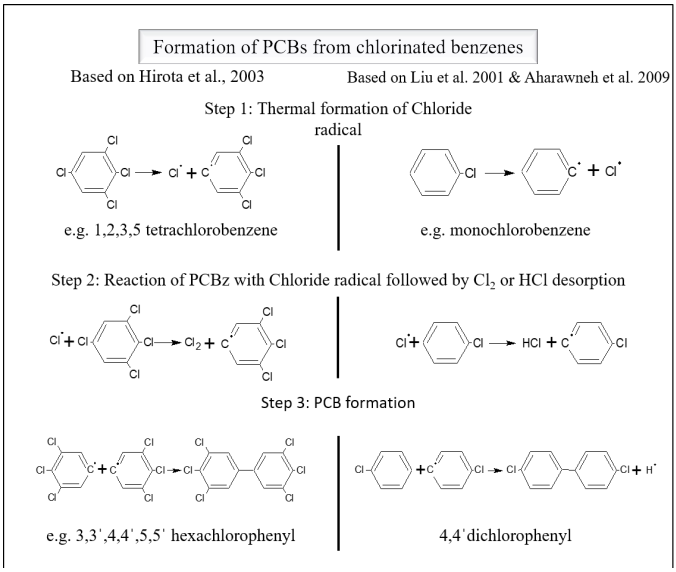
The physico-chemical characteristics of PCDD and PCDF are closely linked to the degree of chlorination of their aromatic structures. They are only slightly volatile, only slightly soluble in water, but soluble in lipids. This lipophilic character enables them to cross cell membranes and accumulate in the fatty tissue of the organism.

Synthesis and Sources of Dioxins

Dioxins and dibenzofurans are highly toxic compounds often produced by burning chlorine-containing organic

material. The greatest release of these chemicals is today the heat treatment of household waste, refuse, medical waste, fire in landfills, and agricultural and forest fires. Incinerators of chlorinated wastes are the most common environmental sources of dioxins, accounting for about 95% of the volume. Dioxins are also produced as contamination in making of herbicides like 2, 4, 5-T and 2, 4-D. The emission of dioxins and furans from combustion processes may follow three general physicochemical pathways (Figure 4 and 5).

The first pathway occurs when the feed material going to the incinerator contains dioxins and/or furans and a fraction of these compounds survives thermal breakdown mechanisms, and pass through to be emitted from vents or stacks. This is not considered to account for a large volume of dioxin released to the environment, but it may account for the production of dioxin-like, coplanar polychlorinated biphenyls (PCBs).



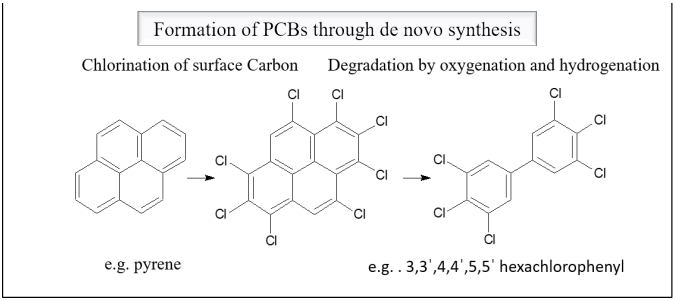


Figure 4: Occurrence and Formation PCBs

The second process is the formation of dioxins and furans from the thermal breakdown and molecular rearrangement of precursor compounds, such as the chlorinated benzenes, chlorinated phenols (such as pentachlorophenol), and PCBs, which are chlorinated aromatic compounds with structural resemblances to the chlorinated dioxin and furan molecules. Dioxins appear to form after the precursor has condensed and adsorbed onto the surface of particles, such as fly ash. This is a heterogeneous process, where the active sorption sites on the particles allow for the chemical reactions, which are catalyzed by the presence of inorganic chloride compounds and ions sorbed to the particle surface. The process occurs within the temperature range, 250–450 °C, so most of the dioxin formation under the precursor mechanism occurs away from the high-temperature zone in the incinerator, where the gases and smoke derived from combustion of the organic materials have cooled during conduction through flue ducts, heat exchanger and boiler tubes, air pollution control equipment or the vents and the stack.

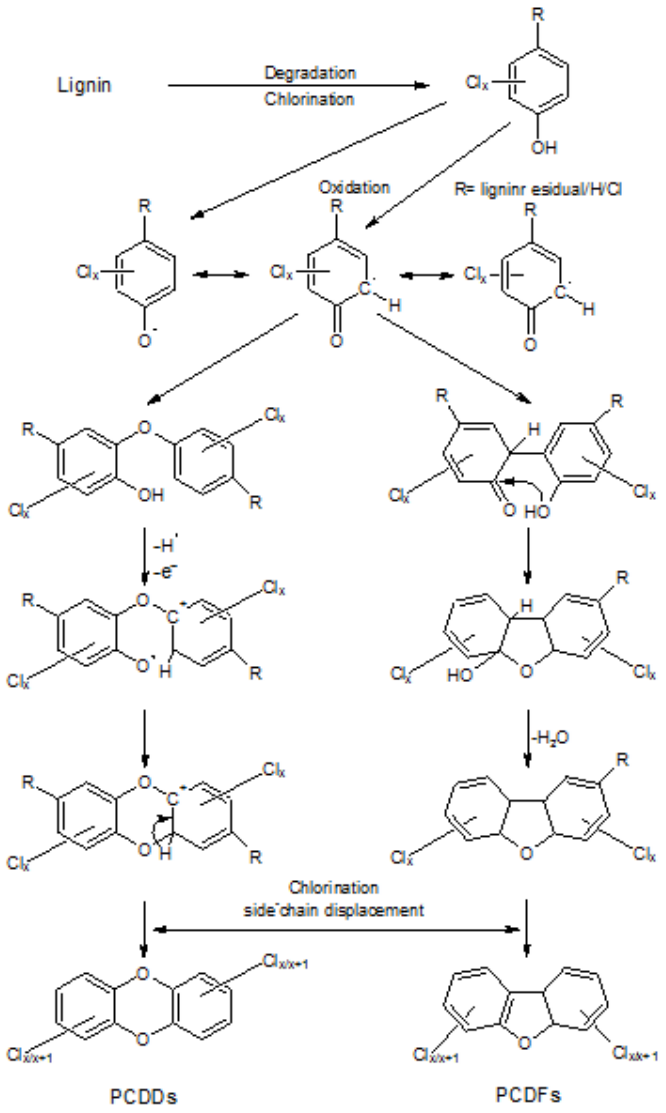


Figure 5: Formation of PCDDs and PCDFs

The third means of synthesizing dioxins is *de novo* within the so-called "cool zone" of the incinerator, wherein dioxins are formed from moieties different from those of the molecular structure of dioxins, furans, or precursor compounds. Generally, these can include a wide range of both halogenated compounds like polyvinyl chloride (PVC), and non-halogenated organic compounds like petroleum products, non-chlorinated plastics (polystyrene), cellulose, lignin, coke, coal, and inorganic compounds like particulate carbon, and hydrogen chloride gas. No matter which *de novo* compounds are involved the process needs a chlorine donor (a molecule that "donates" a chlorine atom to the precursor molecule). This leads to the formation and chlorination of a chemical intermediate that is a precursor. The reaction steps after this precursor is formed can be identical to the precursor mechanism discussed in the previous paragraph. Other processes generate dioxin pollution. A source that has been greatly reduced in the last decade is the paper production process, which formerly used chlorine bleaching. This process has been dramatically changed, so that most paper mills no longer use the chlorine bleaching process. Dioxin is also produced in the making of PVC plastics, which may follow chemical and physical mechanisms similar to the second and third processes discussed above.

Dioxins are mainly by-products of industrial processes but can also result from natural processes, such as volcanic eruptions and forest fires. Dioxins are unwanted by-products of a wide range of manufacturing processes including smelting, chlorine bleaching of paper pulp and the manufacturing of some herbicides and pesticides

(Figure 6).

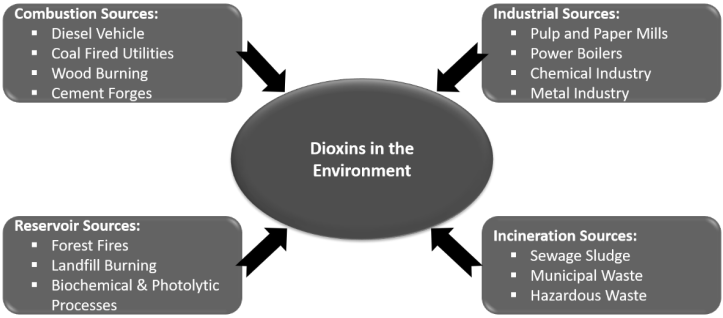


Figure 6: Different sources of Dioxin in the Environment

In terms of dioxin release into the environment, uncontrolled waste incinerators i.e. solid waste and hospital wasteare often the worst sources, due to incomplete burning. Although formation of dioxins is local, environmental distribution is global. Dioxins are found throughout the world in the environment. The highest levels of these compounds are found in some soils, sediments and food, especially dairy products, meat, fish and shellfish. Very low levels are found in plants, water and air (Figure 7).

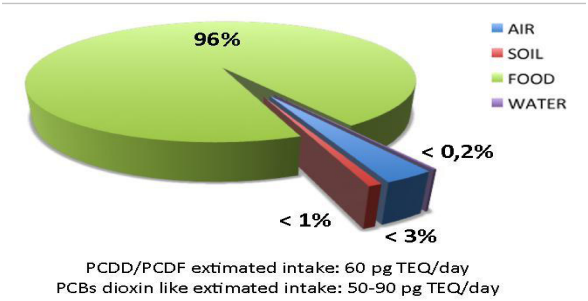


Figure 7: Percentages of Dioxins found in different Sources

Impact on Environment

In synthesis and sources we have already discussed that dioxins are present globally in environment. They have been detected in soil, air, surface water, sediment, plants and animal tissues. They formed during the burning of fuels and wastes are released into the air which causes air pollution. Soil near the burn areas also may be contaminated with dioxins that results in soil pollution. Herbicides contaminated with dioxins also play a role in reaching of dioxins in soil of that area. Surface water bodies can become contaminated when rainwater carries soil containing dioxins into surface water and when some industries discharge their dioxin-contaminated waste directly into surface water which results in to 'Water Pollution'.

Dioxins do not easily dissolve in water, so they tend to settle to the bottom and cling to the sediment. Dioxins last for a very long time in the environment before breaking down. In surface waters and sediments, dioxins can pass into aquatic organisms and eventually find their way into the food chain. Dioxins are easily absorbed by animals and are stored in fatty tissue; therefore accumulate and stored in the fat tissues of body of an organism called as bioaccumulation. Dioxins enterin the food chainwhen organisms of lower trophic level are eaten by organisms of higher trophic level. Ultimately, the dioxins stored in the organisms of lower trophic level transferred to organisms of higher trophic level and get accumulated in their body fat tissues.This transfer of dioxins from lower trophic level to higher trophic levels leads to biomagnifications. Higher the trophic level higher has the higher amount of dioxins accumulate in them (Figure 8). Dioxins and other POPs compounds have globally very

large impact on environment through bioaccumulation and biomagnifications. More than 90 percent of human exposure to dioxins is through food rest is through air.

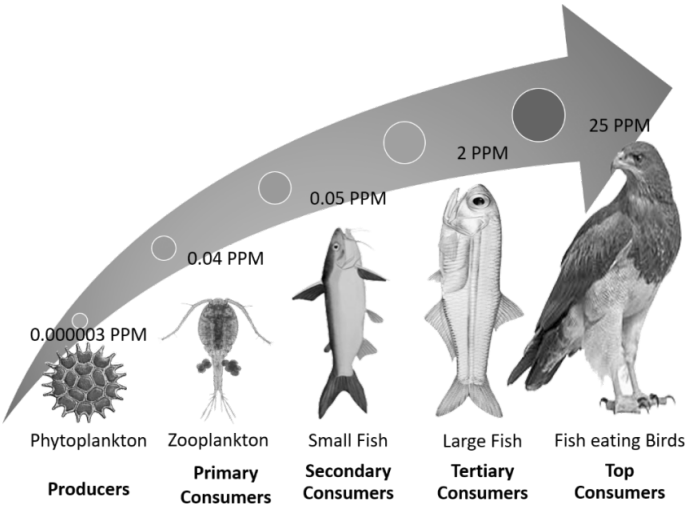


Figure 8: Biomagnification of Dioxin

Mainly three routes are considered for human exposure: eating food, breathing polluted air, and skin contact with contaminated soil and materials. Dioxins are absorbed into the human body through the digestive and respiratory tracts or through skin contact. They are then distributed throughout the body. Most of the PCDDs pass from the gastrointestinal tract to the blood stream after eating food containing PCDDs, and then distributed to the liver and other adipose tissue. PCDDs can also enter our body through the lungs by breathing polluted air and pass into the blood stream. Various health effects associated with exposure to PCDD (primarily 2, 3, 7, 8-TCDD) have been reported. Most effects are considered to occur through PCDDs binding to Ah receptors and subsequent gene activation. Dioxins are found and

prove to be a major cause of malfunction and disease of different organs of the human body. Dioxins can cause short-term liver effects without any visible symptomsand also have caused cancer, immune diseases, reproductive developmental problems, nerve damage, birth defects, increased rates of miscarriages and changes to the immune system (Table 2;).Dioxin exposure can cause a severe skin condition called chloracne, which results in small, pale yellow skin lesions that may last from weeks to years. Dioxins also transfer to infants from mother through breast feeding.

Table 2: Some Human Diseases with their causing compounds

Clinical manifestation	**Chemicals**	**References**
Cancer	2,3,7,8-TCDD	Fingerhut et al. (1991), Steenland et al. (1999)
Cancer mortality	PCDD/F	Flesch-Janys et al. (1995)
Immune deficiency	PCB congeners, PCDD/F	Weisglas-Kuperus et al. (2000)
Reproductive abnormalities	PCBs, PCDFs	Guo et al. (2003)
Developmental abnormalities	TCDD	Guo et al. (2003)
CNS and PNS pathology	PCBs, PCDFs	Guo et al. (2003)
Endocrine pathology Diabetes	2,3,7,8-TCDD	Longnecker and Michalek (2000)
Thyroid	2,3,7,8-TCDD	Pavuk et al. (2003)
Decreased pulmonary function and bronchitis	PCBs, , PCDFs	Shigematsu et al. (1978); Nakanishi et al. (1985)

Clinical manifestation	Chemicals	References
Elevated serum cholesterol and triglycerides	2,3,7,8-TCDD	Kimbrough et al. (1977)
Headache	PCBs, PCDFs	Guo et al. (2003)
Vomiting	2,3,7,8-TCDD	Kimbrough et al. (1977)
Nausea	2,3,7,8-TCDD	Kimbrough et al. (1977)
Fatigue/general malaise	PCBs, PCDFs	Guo et al. (2003)
Change in serum testosterone	2,3,7,8-TCDD	Egeland et al. (1994)
Hypertrichosis	2,3,7,8-TCDD	Kimbrough et al. (1977)
Liver damage	2,3,7,8-TCDD	Kimbrough et al. (1977)
Skin rashes	2,3,7,8-TCDD	Kimbrough et al. (1977)
Death from cardiovascular disease	PCDD/F 2,3,7,8-TCDD	Flesch-Janys et al. (1995)
Hyper pigmented conjunctivae	PCBs	Masuda (2003)
Loss of appetite	2,3,7,8-TCDD	Kimbrough et al. (1977)

Some of the dioxin contamination events have been more significant, with broader implications in many countries. Some examples of such disasters are -

- From 1961 to 1971, during Vietnam war, Agent Orange (A herbicide and defoliant chemical which is a mixture of 2,4,5-T and 2,4-D and traces of Dioxins mainly TCDD) was used by U.S. military which caused damaging effects on environment and dioxins found in the mixture had caused major health problems for many individuals who were exposed to it.

- In 1976, in Seveso, Italy, Large amounts of dioxins were released in a serious accident at a chemical factory. A cloud of toxic chemicals, including TCDD, was released into the air and eventually contaminated an area of 15 square kilometers where 37 000 people lived.
- In 1999, in Belgium, high levels of dioxins were found in poultry and eggs. Subsequently, dioxin-contaminated animal-based food (poultry, eggs, pork) were detected in several other countries. The cause was traced to animal feed contaminated with illegally disposed PCB-based waste industrial oil.
- In late 2008, Ireland recalled many tons of pork meat and pork products when up to 200 times the safe limit of dioxins were detected in samples of pork. This led to one of the largest food recalls related to a chemical contamination. Risk assessments performed by Ireland indicated no public health concern. The contamination was traced back to contaminated feed.

Biodegradation

Dioxins i.e. PCDD and PCDF are stable up to 800°C and are not totally destroyed until 1300°C. In the environment, photolysis is one of the rare pathways by which they decay. Photodechlorination appears to be the most important of these reactions. It involves the most chlorinated congeners in particular and may lead to the formation of 2, 3, 7, 8-tetrachlorodibenzo-*para*-dioxin (TCDD) from octachlorodibenzo-*para*-dioxin (OCDD), the predominant compound in dioxin emissions. Biochemically, these compounds are highly stable, especially the most chlorinated of them. Nonetheless, several studies of their biodegradability have shown

that some microorganisms (bacteria, yeastand fungi) can metabolize them (Table 3).

Table 3. List of the Dioxins compounds and the microorganisms which cause biodegradation in them.

S.No.	Name of the Dioxin Compounds	Organism
1	Polychlorinated dibenzo-*p*-dioxin	Recombinant Yeast
2	2,3-Dichloro dibenzo-*p*-dioxin	*Pseudomonas resinovorans*
3	2,7- Dichloro dibenzo-*p*-dioxin	Wood rusting Fungi
4	Chlorinated dibenzo-*p*-dioxin	*Phlebialindtneri*
5	Chlorinated dibenzo-*p*-dioxin	*Terrabacter* sp.
6	TCDD	Ectomycorrhizal fungi
7	Octachloro dibenzo-*p*-dioxin	Phytoremediation
8	TCDD	*Pleurotus* sp.
9	Chlorinated dibenzo-*p*-dioxin	*Sphingomonas* sp.
10	Dibenzo-*p*-dioxin	*Phanerochaetechrysosporium*

PCDD/F compounds are subject to biodegradation in the environment as part of the natural chlorine cycle. Lower chlorinated dioxins can be degraded by aerobic bacteria from the genera of *Sphingomonas*, *Pseudomonas* and *Burkholderia*. The degradation is usually initiated by unique angular dioxygenases that attack the ring adjacent to the ether oxygen. Chlorinated dioxins can also be attacked cometabolically under aerobic conditions by white-rot fungi that utilize extracellular lignin degrading peroxidases. Recently, bacteria that can grow on monochlorinated dibenzo-p-dioxins as a sole

source of carbon and energy have also been characterized (*Pseudomonas veronii*). Higher chlorinated dioxins are known to be reductively dechlorinated in anaerobic sediments. Similar to PCB and chlorinated benzenes, halorespiring bacteria from the genus *Dehalococcoides* are implicated in the dechlorination reactions. Anaerobic sediments have been shown to convert tetrachloro- to octachlorodibenzo-p-dioxins to lower chlorinated dioxins including monochlorinated congeners. Biodegradation is likely to contribute to the natural attenuation processes affecting PCDD. Both aerobic and anaerobic organisms are known to degrade dioxins.

Because certain aerobic bacteria use oxygen and oxygenase enzymes to degrade aromatic compounds, it has long been thought that these activities might be useful for degrading aromatic pollutants. Some interesting examples of such anaerobic bacteria are mentioned below.

The genus *Sphingornonas* includes many bacteria capable of transforming dioxins; among them, strain RW 1 is of special interest as the only bacterium able to mineralize both DF and DD. Although RW 1 does not mineralize chlorinated dioxins, resting cells transform many mono- and dichlorinated PCDDs and PCDFs to mono- and dichlorinatedcatechols and salicylates. The rate of degradation decreases with increasing chlorine content and tri- and higher chlorinated congeners are not transformed. The strain's ability to degrade several dioxins has been linked to the broad substrate specificity of two enzymes, the DF dioxygenase system and THBD.

Strain HH69 transforms DD and mineralizes DF using a dioxygenase that is functionally identical to the DF dioxygen-

ase system. Several bacteria degrade carboxylated DEs that structurally resemble or are identical to certain pesticides and their primary metabolites. Strain POB3 10, mineralizes 3-POB and 4-POB via initial angular dioxygenation by POB dioxygenas.

Some bacteria use degradative mechanisms to degrade DE. *P. crucivіue* S93B1 utilizes DE as the sole carbon and energy source producing 2-phenoxymuconic acid and phenol as transient metabolites , another strain, *P. cepacia*, mineralizes DE and generates small quantities of 2,3-dihydroxydiphenyl ether, 2-pyrazone-6-carboxylic acid, and phenol during degradation.

Anaerobic degradation process- The Methanogenic consortia may mediate the process of dehalogenation of highly chlorinated PCBs by diverting electrons to the pollutant rather than to carbon sink, carbon dioxide. Although in this process chlorines in Meta and Para positions are removed whereas the chlorines at ortho position remains unaffected. PCDD's and PCDF's can also undergomicrobial mediated reductive dechlorination in anaerobic sediment microcosms, but due to preferential removal of chlorines in theperi positions overall toxicity may increase.

The choice of the organism depends on the extent of chlorination. Similar to the degradation of PCB's, highly chlorinated dioxins (hexa, hepta, and octa) are dechlorinated by the action of anaerobic systems. These less-substituted dioxins are mineralized by aerobic systems. Many reports have appeared in the literature on biodegradation of dioxins. Yeasts, fungi, and bacteria have been found to degrade dioxins.

Conclusion

Dioxins are toxic substances which are causing unwanted changes in environment and diseases and malfunctioning of organs of water and land animals and human beings. More than 90% of dioxins exposes to human beings through the food supply, mainly meat and dairy products, fish etc. Therefore, protecting the food supply is critical. In addition source-directed measures to reduce dioxin emissions, secondary contamination of the food supply needs to be avoided throughout the food chain. WHO has established and regularly re-evaluated toxic equivalency factors (TEFs) for dioxins and related compounds through expert consultations. WHO-TEF values have been established which apply to humans, mammals, birds and fish. We can control the presence of dioxins in the environment by controlling the chlorinated compounds production, burning of industrial and local wastages, incomplete combustion and incinerations of chlorinated compounds. In addition to this, Biodegradation by various microorganisms and phytoremediations are few steps which can degrade and control the presence of dioxins in the environment.

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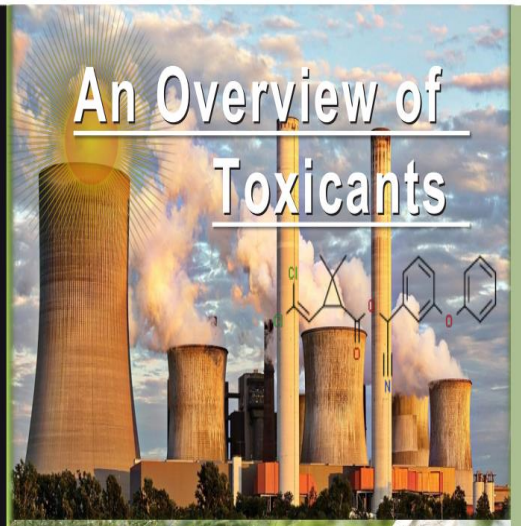
AN OVERVIEW OF TOXICANTS

Dr Payal Mahobiya



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DDT: A Water Insoluble Environmental Toxicant

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Introduction

In the late 19th Century almost all toxic substances like animal and plant poison and natural occurring mineralscontaining heavy metals such as arsenic were called toxins. But by the time or in 1930s and 1940s the new term toxicants came to light in place of toxins to describe pesticides in the scientific and engineering literature (*Ebeling, 1940*). Toxicant became the term of art for industrially manufactured poisons.

The difference between toxins and toxicants is not a matter of degree, but of kind. Furthermore, toxins and toxicants can cause harm differently. There are many types of toxins; they tend to work by destroying or disrupting regular cells activity. Toxins like hemotoxins produced by snakes destroy red blood cells. Neurotoxins like those produced in bacteria destroy cells in tissues. Carcinogens make cells multiply differently and cause cancer. Endocrine disrupting compounds like Bisphenol