Research Journal of Agriculture and Forestry Sciences _____ ISSN 2320-6063
Vol. **1(4),** 10-17, May **(2013)** *Res. J. Agriculture and Forestry Sci.*

Eco Toxins and Their Impacts on Human Health

M. Padmavathi
Department of Biotechnology**,** DVR & DR. HS MIC College of Technology, Kanchikacherla, AP, INDIA

Available online at: www.isca.in
Received 10th February 2013, revised 16th March 2013, accepted 2nd May 2013

Abstract

Every organism depends on the environment. But day by day the pollution increases due to various causative factors which release a number of toxins. These toxins damage the whole ecosystem and impact on the human health. The present study helps to know the toxins produced from the various sources and the effects on human health. This helps to protect the environment for sustainable development. Everyone should help to reduce the waste to protect the environment.

Keywords: Environment, toxins, disorders, effects, human health.

Introduction

Environment is the most important for mankind because each and every organism depends on the nature directly or indirectly. If the toxins released from various industries results the pollution and causes damage to the environment. As a result the organisms which depend upon it show ill health and the life span slowly decreases. These substances may be biological, physical[1,2]. The branch so called environmental toxicology concerned with studying the harmful effects of toxicants at the population and ecosystem levels.

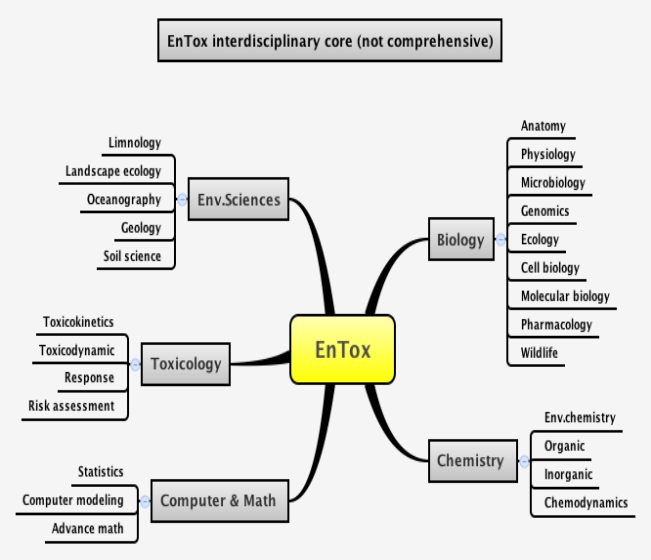

Figure-1
En Tox – An interdisciplinary field

The following are different substances released from various industries, hospitals, house, municipalities and others to cause damage to the ecosystem.

Chlorofluorocarbons

A chlorofluorocarbon is an organic compound that contains only carbon, chlorine, hydrogen and fluorine produced as a volatile derivative of methane and ethane. These compounds are commonly known as Freon. Many CFCs have been widely used as refrigerants, propellants for aerosol applications and solvents. They are having low toxicity, low reactivity, and low flammability of the CFCs and HCFCs. Billions of kilograms of chlorodifluoromethane are produced annually as a precursor to tetrafluoroethylene. The atmospheric impacts of CFCs are plays a main role in active ozone reducer. This anthropogenic compound is also a greenhouse gas, with a much higher potential to enhance the greenhouse effect than CO_2. CFCs and HCFCs are colorless, volatile, toxic liquids and gases with a faintly sweet ethereal odour. Overexposure at concentrations of 11% or more may cause dizziness, loss of concentration, central nervous system depression and/or cardiac arrhythmia. Vapors displace air and can cause asphyxiation in confined spaces. The normal occupational exposure is rated at 0.07% and does not pose any serious health risks[3].

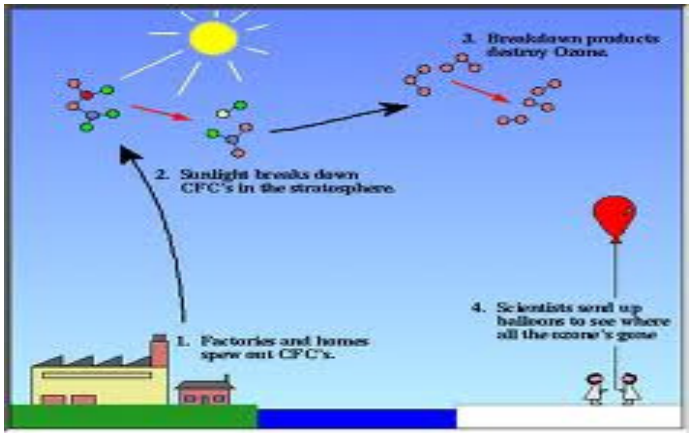

Figure-2
Effect of CFCs in the atmosphere

DDT

DDT (dichlorodiphenyltrichloroethane) is an organochlorine insecticide present in solutions in xylene or petroleum distillates, emulsifiable concentrates, water-wettable powders, granules, aerosols, smoke candles, and charges for vaporizers and lotions[4]. The resistance is conferred by up-regulation of genes expressing cytochrome P450 in insects[5]. In humans, it affects health through genotoxicity or endocrine disruption. It is an endocrine disruptor. The DDT metabolite DDE acts as an antiandrogen. DDT is a persistent organic pollutant that is readily adsorbed to soils and sediments, which can act as sinks. Because of its lipophilic properties, DDT has a high potential to bioaccumulate, especially in predatory birds[6]. DDT, DDE, and DDD magnify through the food chain, with apex predators such as raptor birds concentrating more chemicals than other animals in the same environment. They are very lipophilic and are stored mainly in body fat. DDT and DDE are very resistant to metabolism; in humans, their half-lives are 6 and up to 10 years, respectively.

DDT is toxic to a wide range of living organisms, including marine animals such as fishes. It is less toxic to mammals, but may be moderately toxic to some amphibian species, especially in the larval stage. DDT, through its metabolite DDE, caused eggshell thinning and resulted in severe population declines[7]. Eggshell thinning lowers the reproductive rate of certain bird species by causing egg breakage and embryo deaths[8]. DDT is classified as "moderately toxic" DDT has on rare occasions been administered orally as a treatment for barbiturate poisoning[9]. DDT and DDE have been linked to diabetes. DDT and DDE xenoestrogenic activity, meaning they are chemically similar enough to estrogens to trigger hormonal responses in animals. These effects may cause developmental and reproductive toxicity: DDE exposure cases psychomotor development, decreases semen in men, high levels causes effect pregnancy, miscarriage, hypothyroidism, neurological problems asthma and cretinism. It causes cancers of the liver, pancreas, breast,leukemia, lymphoma, testicular cancer, multiple myeloma, prostate, endometrium, rectum, lung, bladder and stomach. DDT effects the plant extracts such as pyrethrum was sometimes successful in fighting malaria These include antimalarial drugs to prevent or treat infection; improvements in public health. Many residents resist DDT spraying, objecting to the lingering smell, stains on walls, and may exacerbate problems with other insect pests Pyrethroid insecticides. DDT resistant mosquitoes have generally proved susceptible to pyrethroids. Thus far, pyrethroid resistance in *Anopheles* has not been a major problem[10].

Endocrine disruptors

Endocrine disruptors chemicals that interfere with endocrine (or hormone system) in animals, including humans. These disruptions can cause cancerous tumors, birth defects, and other developmental disorders. They cause learning disabilities, severe attention deficit disorder, cognitive and brain development problems, deformations of the body, sexual development problems, feminizing of males or masculine effects on females, etc. Any system in the body controlled by hormones can be derailed by hormone disruptors. The critical period of development for most organisms is between the transition from a fertilized egg, into a fully formed infant. When the cell begins to grow and differentiate, there are critical balances of hormones and protein changes. Therefore, a dose of disrupting chemicals can do substantial damage to a developing fetus (baby).

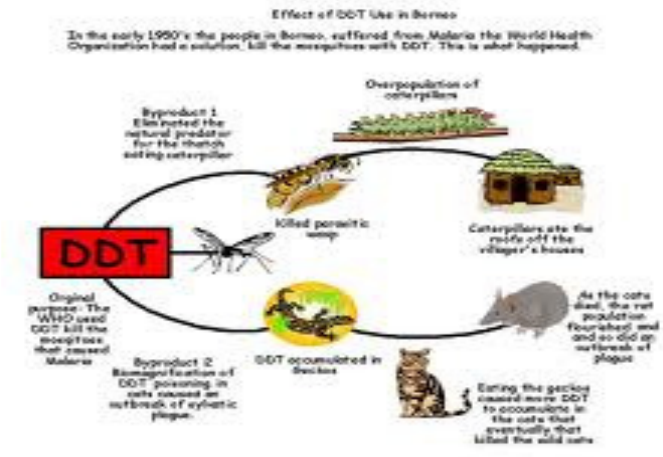

Figure-3
The effect of DDT in humans

Endocrine disruptors are substances that "interfere with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body that are responsible for development, behavior, fertility, and maintenance of homeostasis[11]. They are sometimes also referred to as hormonally active agents[12]. Endocrine disrupting chemicals[13], or endocrine disrupting compounds (EDCs)[14]. EDC shows that endocrine disruptors can cause adverse biological effects in animals, and low-level exposures also cause similar effects in human beings[15]. BPA, perfluorooctanic acid, phthalates, polybrominated diphenyl ethers, polychlorinated diphenyls, DDT, xenoestrognes, alkylphenols, are different types of endocrine disruptors. The most challenging aspect of this is to eliminate these compounds from the environment and to focus remediation efforts. Even pollutants no longer in productions persist in the environment, and bio-accumulate in the food chain. These chemicals, once present in the environment, move through ecosystems, is essential to designing ways to isolate and remove them.

Dioxins

Dioxins and dioxin-like compounds, a diverse range of chemical compounds which are known to exhibit “dioxin-like” toxicity.

In chemistry, a *dioxin* is a heterocyclic 6-membered ring, where 2 carbon atoms have been replaced by oxygen atoms. There are two types in it. They are 1,2-Dioxin and 1,4-Dioxin. Dioxins are a group of chemically-related compounds that are persistent environmental pollutants, found throughout the world in the environment and they accumulate in the food chain, mainly in the fatty tissue of animals, more than 90% of human exposure is through food, mainly meat and dairy products, fish and shellfish. Many national programmes are there in place to monitor the food supply, they are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer, due to the omnipresence of dioxins, all people have background exposure, which is not expected to affect human health. However, due to the highly toxic potential of this class of compounds, efforts need to be undertaken to reduce current background exposure, prevention or reduction of human exposure is best done via source-directed measures, i.e. strict control of industrial processes to reduce formation of dioxins as much as possible.

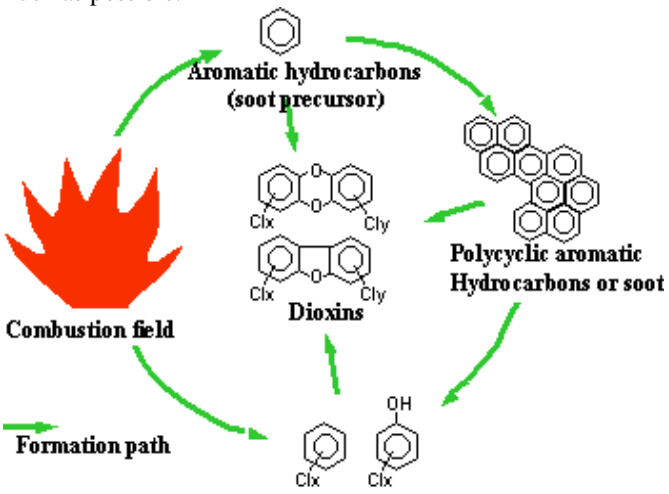

Figure-4
Sources of Dioxins

Toxic Heavy metals

Toxic Heavy metals such as Antimony, Barium, Osmium, Thallium, Arsenic, Beryllium, Lead, Mercury, Vanadium, Radioactive metals such as thorium, Uranium, Radium, Actinium, Polonium, Strontium 90, Cobalt-60 cause damage to the environment in many ways. Aluminum has no biological role and its classification into toxic metals is controversial. Significant toxic effects and accumulation to tissues have been observed in renally impaired patients[16]. However, individuals with healthy kidneys can be exposed to large amounts of aluminum with no ill effects. Thus, aluminum is not considered dangerous to persons with normal elimination capacity[17]. Chromium as hexavalent Cr(VI), Nickel, copper, Zinc, Iron, Fluorine like trace elements cause ecosystem damage.

The environmental impact of the coal industry

This includes the consideration of issues such as land use, waste management, and water and air pollution caused by the coal mining, processing and the use of its products. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash[18], bottom ash, and flue-gas desulfurization sludge, which contain mercury, uranium, thorium, arsenic, and other heavy metals.

Coal and coal waste products including fly ash, bottom ash and boiler slag releases approximately 20 toxic-release chemicals, including arsenic, lead, mercury, nickel, vanadium, beryllium, cadmium, barium, chromium, copper, molybdenum, zinc, selenium and radium, which are dangerous if released into the environment. While these substances are trace impurities, enough coal is burned that significant amounts of these substances are released[19]. During combustion, the reaction between coal and the air produces oxides of carbon, including carbon dioxide (CO_2) (an important greenhouse gas), oxides of sulfur (mainly sulfur dioxide) (SO_2), and various oxides of nitrogen (NOx). Because of the hydrogenous and nitrogenous components of coal, hydrides and nitrides of carbon and sulfur are also produced during the combustion of coal in air. These include hydrogen cyanide (HCN), sulfur nitrate (SNO_3) and other toxic substances. Further, acid rain may occur when sulfur dioxide produced by the combustion of coal reacts with oxygen to form sulfur trioxide (SO_3); this reacts with water molecules in the atmosphere to form sulfuric acid. The sulfuric acid (H_2SO_4) returns to earth as acid rain. Flue-gas desulfurization scrubbing systems, which use lime to remove sulfur dioxide, can reduce the likelihood of acid rain. Sometimes fire occurs in coal bed, when coal beds are exposed, the fire risk is increased. Weathered coal can also increase ground temperatures if it is left on the surface. Mercury emission from coal burning are concentrated as they work their way up the food chain and are converted into methyl mercury, a toxic compound which harms both wildlife and people who consume freshwater fish[20], [21, 22, 23], Coal burning is a key source of methyl mercury in the environment[24]. "Power plants... are responsible for half of... the mercury emissions in the United States26.This also increases the annual excess deaths[25].

Herbicides

Herbicides are also known as weed killers, are pesticides used to kill unwanted plants[26]. Selective herbicides kill specific targets, while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often synthetic "imitations" of plant hormones. Herbicides used to clear waste ground, industrial sites, railways and railway embankments are not selective and kill all plant material with which they come into contact. Smaller quantities are used in forestry, pasture systems, and management of areas set aside as wildlife habitat. Some plants produce natural herbicides, such as

the genus *Juglans* (walnuts), or the tree of heaven; such action of natural herbicides, and other related chemical interactions, is called allelopathy. Herbicides are widely used in agriculture and landscape turf management. In the US, they account for about 70% of all agricultural pesticide use.

Herbicides have widely variable toxicity. In addition to acute toxicity from high exposure levels, there is concern of possible carcinogenicity[26] as well as other long-term problems, such as contributing to Parkinson's disease. Some herbicides cause a range of health effects ranging from skin rashes to death. Phenoxy herbicides are often contaminated with dioxins such as TCDD; Such contamination results in a small rise in cancer risk after exposure to these herbicides[27]. Triazine exposure has been implicated in a likely relationship to increased risk of breast cancer, although a causal relationship remains unclear[28]. The risk of Parkinson's disease is to increase with occupational exposure to herbicides and pesticides[29]. Commercial herbicide use generally has negative impacts on bird populations, the decreases in abundance of species on which birds rely for food or shelter. Herbicide use in silviculture, used to favor certain types of growth following clearcutting, can cause significant drops in bird populations. Even when herbicides which have low toxicity to birds are used, they decrease the abundance of many types of vegetation on which the birds rely.

Pesticides

Pesticides are substances or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. They are a class of biocide. The most common use of pesticides is as plant protection products (also known as crop protection products), which in general protect plants from damaging influences such as weeds, diseases or insects. This use of pesticides is so common that the term *pesticide* is often treated as synonymous with *plant protection product*, although it is in fact a broader term, as pesticides are also used for non-agricultural purposes. A pesticide is generally achemical or biological agent (such as a virus, bacterium, antimicrobial or disinfectant) that through its effect deters, incapacitates, kills or otherwise discourages pests. Target pests can include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes (roundworms), and microbes that destroy property, cause nuisance, spread disease or are vectors for disease. Although there are human benefits to the use of pesticides, some also have drawbacks, such as potential toxicity to humans and other animals. According to the Stockholm Convention on Persistent Organic Pollutants, 9 of the 12 most dangerous and persistent organic chemicals are pesticides. Pesticides are categorized into four main substituent chemicals: herbicides; fungicides; insecticides and bactericides [30, 31.]

Pesticide use raises a number of environmental concerns. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non-target species, air, water and soil[32]. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. Pesticides are one of the causes of water pollution, and some pesticides are persistent organic pollutants and contribute to soil contamination. In addition, pesticide use reduces biodiversity, reduces nitrogen fixation[33], contributes to pollinator decline[34,35,36,37] destroys habitat (especially for birds) and threatens endangered species[38]. Pests can develop a resistance to the pesticide (pesticide resistance), necessitating a new pesticide. Alternatively a greater dose of the pesticide can be used to counteract the resistance, although this will cause a worsening of the ambient pollution problem.

Figure-5
Spraying pesticides

Toxic waste

Toxic waste is waste material that can cause death, injury or birth defects to living creatures[39]. It spreads quite easily and can contaminate lakes and rivers and atmosphere. The term is often used interchangeably with “hazardous waste”, or discarded material that can pose a long-term risk to health or environment. Hazardous wastes are poisonous byproducts of manufacturing, farming, city septic systems, construction, automotive garages, laboratories, hospitals, and other industries. The waste may be liquid, solid, or sludge and contain chemicals, heavy metals, radiation, dangerous pathogens, or other toxins. Even households generate hazardous waste from items such as batteries, used computer equipment, and leftover paints or pesticides[40]. Toxic wastes often contain carcinogens, and exposure to these by some route, such as leakage or evaporation from the storage, causes cancer to appear at increased frequency in exposed individuals. People encounter these toxins buried in the ground, in stream runoff, in groundwater that supplies drinking water, or in floodwaters, as happened after Hurricane Katrina. Some toxins, such as mercury, persist in the environment and accumulate. As a result of the bioaccumulation of mercury in both freshwater and marine ecosystems, predatory fish are a significant source of mercury in human and animal diets[41].

Disposal is the placement of waste into or on the land. Disposal facilities are usually designed to permanently contain the waste and prevent the release of harmful pollutants to the environment. The most common hazardous waste disposal practice is placement in a land disposal unit such as a landfill, surface impoundment, waste pile, land treatment unit, or injection well. Land disposal is subject to requirements under EPA's Land Disposal Restrictions Program[42].

Organic wastes can be destroyed by incineration at high temperatures; however, if the waste contains heavy metals or radioactive isotopes, these must be separated and stored, as they cannot be destroyed. The method of storage will seek to immobilize the toxic components of the waste, possibly through storage in sealed containers, inclusion in a stable medium such as glass or a cement mixture, or burial under an impermeable clay cap. Waste transporters and waste facilities may charge fees; consequently, improper methods of disposal may be used to avoid paying these fees. Where the handling of toxic waste is regulated, the improper disposal of toxic waste may be punishable by fines[43] or prison terms. Burial sites for toxic waste and other contaminated brown field land may eventually be used as green space or redeveloped for commercial or industrial use.

Polychlorinated biphenyl

PCB is an organo chlorides with 1 to 10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. The chemical formula for a PCB is $C_{12}H_{10-x}Cl_x$. 130 of the 209 different PCB arrangements and orientations are used commercially[44, 45].

PCBs were widely used as dielectric and coolant fluids, for example in transformers, capacitors, and electric motors. Due to PCBs' environmental toxicity and classification as a persistent organic pollutant, PCB production was banned by the United States Congress in 1979 and by the Stockholm Convention on Persistent Organic Pollutants in 2001[46]. According to the U.S. Environmental Protection Agency (EPA), PCBs have been shown to cause cancer in animals, and there is also evidence that they can cause cancer in humans. Exposure to PCBs and non-Hodgkin Lymphoma, a frequently fatal form of cancer[47].

PCBs also have shown toxic and mutagenic effects by interfering with hormones in the body. PCBs, inhibit and imitate estradiol, the main sex hormone in females. Imitation of the estrogen compound can feed estrogen-dependent breast cancer cells, and possibly cause other cancers, such as uterine or cervical. Inhibition of estradiol can lead to serious developmental problems for both males and females, including sexual, skeletal, and mental development issues.

A few studies of workers indicate PCBs were associated with specific kinds of cancer in humans, such as cancer of the liver and biliary tract. In addition, evidence shows that PCBs may have a multitude of serious effects on the immune system of exposed individuals, including non-Hodgkin lymphoma, a cancer of the immune system. A number of peer-reviewed health studies have also shown a causal link between elevated blood levels of PCBs and non-Hodgkin lymphoma. PCBs also have been shown to mimic the action of estrogen in breast cancer cells and can enhance breast carcinogenesis[47]. Rats that ate food containing high levels of PCBs for two years developed liver cancer.

Figure-6
Land with PCBs

Bioaccumulation

Bioaccumulation refers to the accumulation of substances, such as pesticides, or other organic chemicals in an organism[48]. Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost. Thus, the longer the biological half-life of the substance the greater the risk of chronic poisoning, even if environmental levels of the toxin are not very high. Bioaccumulation, for example in fish, can be predicted by models. Biotransformation can strongly modify bioaccumulation of chemicals in an organism.

Bioconcentration is a related but more specific term, referring to uptake and accumulation of a substance from water alone. By contrast, bioaccumulation refers to uptake from all sources combined (e.g. water, food, air, etc) . The process for stiffening the felt used in making hats involved mercury, which forms organic species such as methyl mercury, which is lipid soluble, and tends to accumulate in the brain resulting in mercury poisoning. Other lipid (fat) soluble poisons include tetraethyl lead compounds (the lead in leaded petrol), and DDT. These compounds are stored in the body's fat, and when the fatty tissues are used for energy, the compounds are released and cause acute poisoning. Strontium-90, part of the fallout from atomic bombs, is chemically similar enough to calcium that it is utilized in osteogenesis, where its radiation can cause damage for a long time. Naturally produced toxins can also

bioaccumulate. The marine algal blooms known as "red tides" can result in local filter feeding organisms such as mussels and oysters becoming toxic; coral fish can be responsible for the poisoning known as ciguatera when they accumulate a toxin called cigua toxin from reef algae.

Some animal species exhibit bioaccumulation as a mode of defense; by consuming toxic plants or animal prey, a species may accumulate the toxin which then presents a deterrent to a potential predator. One example is the tobacco hornworm, which concentrates nicotine to a toxic level in its body as it consumes tobacco plants. Poisoning of small consumers can be passed along the food chain to affect the consumers later on. Other compounds that are not normally considered toxic can be accumulated to toxic levels in organisms. The classic example is of Vitamin A, which becomes concentrated in carnivore livers of e.g. polar bears: as a pure carnivore that feeds on other carnivores (seals), they accumulate extremely large amounts of Vitamin A in their livers. It was known by the native peoples of the Arctic that the livers of carnivores should not be eaten, but Arctic explorers have suffered Hypervitaminosis A from eating the bear livers (and there has been at least one example of similar poisoning of Antarctic explorers eating husky dog livers Coastal fish (such as the smooth toadfish) and seabirds (such as the Atlantic Puffin) are often monitored for heavy metal bioaccumulation. In some eutrophic aquatic systems, biodilution can occur. This trend is a decrease in a contaminant with an increase in trophic level and is due to higher concentrations of algae and bacteria to "dilute" the concentration of the pollutant.

Biomagnification

It is also known as bioamplification or biological magnification, is the increase in concentration of a substance that occurs in a food chain as a consequence of: Persistence, Food chain energetics, Low (or nonexistent) rate of internal degradation/excretion of the substance (often due to water-insolubility)

Biomagnification takes place in nature, the amounts of mercury that the zooplankton has picked p from the water throughout anchovie's life. A tuna eats many of these anchovies over its life, accumulating the mercury in each of those anchovies into its body. If the mercury stunts the growth of the anchovies, that tuna is required to eat more little fish to stay alive. Because there are more little fish being eaten, the mercury content is magnified.

Biological magnification often refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain. Bioaccumulants are substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. Although sometimes used interchangeably with 'bioaccumulation,' an important distinction is drawn between the two, and with bioconcentration. It is also important to distinguish between sustainable development and overexploitation in biomagnifications. Novel organic substances Some substances such as DDT, HCB, PCBs, Toxaphene, Monomethyl mercury and inorganic substances such as Arsenic, Cadmium, Mercury, Selenium, Lead also cause accumulate in water.

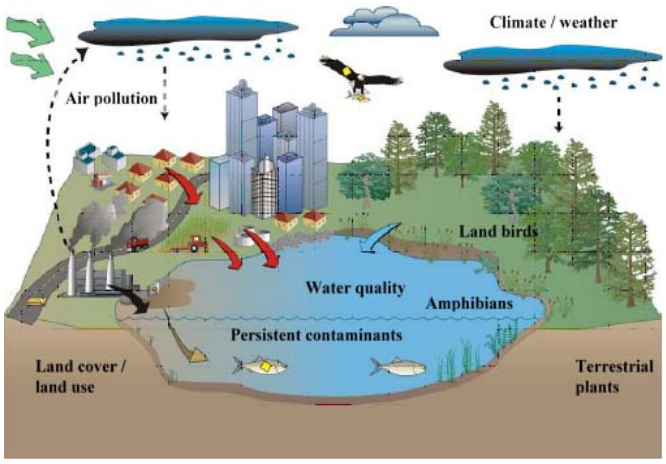

Figure - 7
Biomagnification

Environmental impact of hydraulic fracturing

It includes the potential contamination of ground water, risks to air quality, the potential migration of gases and hydraulic fracturing chemicals to the surface, the potential mishandling of waste, and the health effects of these, like cancer[49]. Hydraulic fracturing causes induced seismicity called microseismic events or microearthquakes.

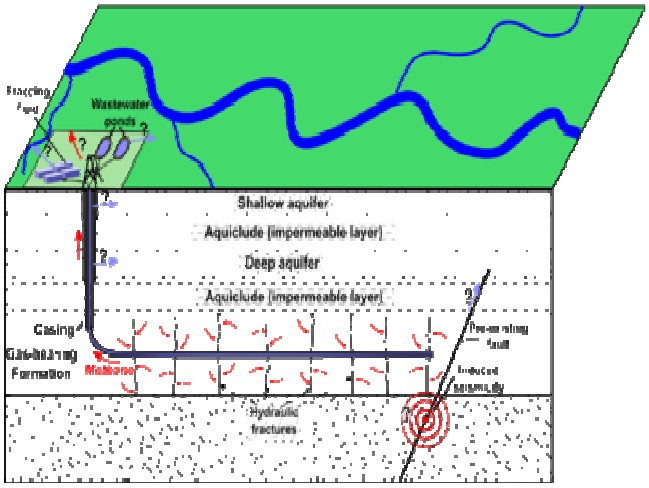

Figure-8
Hydraulic Fracturing

The magnitude of these events is usually too small to be detected at the surface, although the biggest micro-earthquakes may have the magnitude of about -1.6 $(M_w)^{50}$. The injection of waste water from gas operations, including from hydraulic fracturing, into saltwater disposal wells may cause bigger low-magnitude tremors, being registered up to 3.3 (M_w). Hydraulic fracturing also contaminates ground water and surface water.

Conclusion

A number of toxins present in the environment causes damage to the ecosystem. To prevent this everyone should show take care on the nature. To reduce the waste, reuse the waste and recycling processing of the waste helps to protect the environment from the toxins. The industries should follow the rules and regulations of the environment helps to protect the nature from the toxins.

References

1. Günter Siegemund, Werner Schwertfeger, Andrew Feiring, Bruce Smart, Fred Behr, Herward Vogel, Blaine McKusick Fluorine Compounds, Organic, Ullmann's Encyclopedia of Industrial Chemistry, Wiley-VCH, Weinheim**, (2002)**

2. WHO, Fully Halogenated Chlorofluorocarbons, International Programme on Chemical Safety **(2012)**

3. DDT and Its Derivatives. Geneva: World Health Organisation, 83 **(1989)**

4. Vos J.G., Dybing E., Greim H.A., Ladefoged O., Lambré C., Tarazona J.V., et al. Health effects of endocrine-disrupting chemicals on wildlife, with special reference to the European situation, *Crit Rev Toxicol,* **30(1),** 71–133 **(2000)**

5. Toxicological Profile: for DDT, DDE, and DDE. Agency for Toxic Substances and Disease Registry, September **(2002)**

6. Rappolt R.T., Use of oral DDT in three human barbiturate intoxications: hepatic enzyme induction by reciprocal detoxicants, *Clin Toxicol,* **6(2),** 147–51 **(1973)**

7. Curtis Sharma V.P., Current scenario of malaria in India, *Parassitologia,* **41(1-3),** 349–53 **(1999)**

8. Crisp T.M., Clegg E.D., Cooper R.L., Wood W.P., Anderson D.G., Baetcke K.P., Hoffmann JL, Morrow MS, Rodier DJ, Schaeffer JE, Touart LW, Zeeman MG, Patel YM "Environmental endocrine disruption: An effects assessment and analysis". *Environ. Health Perspect,* 106**(Suppl 1)** 11–56 **(1998)**

9. PHA - Production Application and its Bioremediation in Environment Chaudhari Yogesh, Bhavana Pathak and Fulekar M. H. , *I. Res. J. Environmen Sci.,* **1(2),** 46-52**(2012)**

10. Diamanti-Kandarakis E., Bourguignon J.P., Giudice L.C., Hauser R., Prins G.S., Soto A.M., Zoeller R.T. and Gore A.C., Endocrine-disrupting chemicals: an Endocrine Society scientific statement, *Endocr. Rev.,* **30(4),** 293–342 **(2009)**

11. Cohen M., Environmental toxins and health--the health impact of pesticides, *Aust Fam Physician,* **36(12),** 1002–4 (2010)

12. Executive Summary (PDF). *Global assessment of the state-of-the-science of endocrine disruptors*. International Programme on Chemical Safety, World Health Organization, An endocrine disruptor is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub) populations **(2002)**

13. eMedicine-Toxicity, Aluminum: Article by Michael R Edwards Toxic Air: The Case for Cleaning Up Coal-fired Power Plants (Report). American Lung Association, 23-28 **(2011)**

14. Gabbard, Alex Coal Combustion: Nuclear Resource or Danger, Oak Ridge National Laboratory **(2008)**

15. DeKok, David, *Unseen Danger: A Tragedy of People, Government and the Centralia Mine Fire*. University of Pennsylvania Press **(1986)**

16. Chitosan for the Removal of Chromium from Waste Water Singh Dhanesh and Singh Anjali, *I. Res. J. Environmen Sci.,* **1(3),** 55-57 **(2012)**

17. Naseem Ahmad, Malik Nasibullah, Firoj Hassan, Singh A.K., Patel D.K., Khan A.R. and Masihur Rahman, *I. Res. J. Environmen Sci.,* **1(4),** 32-36 **(2012)**

18. Mouratidou, Theoni *et al.*; Kaniougrigoriadou, I; Samara, C; Kouimtzis, T. Detection of the marine toxin okadaic acid in mussels during a diarrhetic shellfish poisoning (DSP) episode in Thermaikos Gulf, Greece, using biological, chemical and immunological methods, *Science of the Total Environment* (Elsevier) **366 (2– 3),** 894–904 **(2012)**

19. Mir Tariq Ahmad, Manderia Sushil and Manderia Krishna, *I. Res. J. Environmen Sci.,* **1(1),** 50-53 **(2012)**

20. Poli, Mark A. *et al.*; Musser, Steven M; Dickey, Robert W; Eilers, Paul P; Hall, Sherwood Neurotoxic shellfish poisoning and brevetoxin metabolites: a case study from Florida, *Toxicon*(Elsevier) **38(7),** 981–993 **(2000)**

21. DePalma, Anthony. Mercury's Harmful Reach Has Grown, Study Suggests, The New York Times New York edition, 34-41 **(2012)**

22. Brigham M.E., Krabbenhoft D.P., Hamilton P.A., Mercury in stream ecosystems—new studies initiated by the U.S. Geological Survey, U.S. Geological Survey **(2003)**

23. Oikawa, Hiroshi *et al.*; Fujita, Tsuneo; Saito, Ken; Satomi, Masataka; Yano, Yutaka Difference in the level of paralytic shellfish poisoning toxin accumulation between the crabs Telmessus acutidens and Charybdis japonica collected in Onahama, Fukushima Prefecture, *Fisheries Science* (Springer) **73(2),** 395–403 **(2008)**

24. Doucet, Erin *et al.*; Ross, Neil N.; Quilliam, Michael A., Enzymatic hydrolysis of esterified diarrhetic shellfish poisoning toxins and pectenotoxins, *Analytical and Bioanalytical Chemistry* (Springer) **389(1),** 335–342 **(2007)**

25. Kellogg R.L., Nehring R., Grube A., Goss D.W., and Plotkin S., Environmental indicators of pesticide leaching and runoff from farm fields, United States Department of Agriculture Natural Resources Conservation Service **(2009)**

26. Gale E., Peterson The Discovery and Development of 2,4-D, *Agricultural History,* **41(3),** 243–254 **(1967)**

27. Kettles M.K., Browning, S.R., Prince T.S., Horstman S.W., Triazine herbicide exposure and breast cancer incidence: An ecologic study of Kentucky counties, *Environmental health perspectives* **105(11),** 1222–7 **(1997)**

28. Gorell J.M., Johnson C.C., Rybicki B.A., Peterson E.L., Richardson R.J., The risk of Parkinson's disease with exposure to pesticides, farming, well water, and rural living, *Neurology,* **50(5),** 1346–50 **(1998)**

29. Gilden R.C., Huffling K., Sattler B., Pesticides and health risks, *J Obstet Gynecol Neonatal Nurs* **39(1),** 103–10 **(2010)**

30. Food and Agriculture Organization of the United Nations International Code of Conduct on the Distribution and Use of Pesticides **(2002)**

31. Council on Scientific Affairs, American Medical Association. Educational and Informational Strategies to Reduce Pesticide Risks. Preventive Medicine, **26(2) (1997)**

32. Miller G.T., *Sustaining the Earth*, 6th edition. Thompson Learning, Inc. Pacific Grove, California, **9,** 211-216 **(2004)**

33. Rockets, Rusty Down on the Farm? Yields, Nutrients and Soil Quality. Scienceagogo.com. **(2007)**

34. Hackenberg D., Letter from David Hackenberg to American growers from, Plattform Imkerinnen — Austria. Archived from the originalon **(2007)**

35. Cooper, Jerry and Hans Dobson, The benefits of pesticides to mankind and the environment, Crop Protection, **26,** 1337-1348 **(2007)**

36. Rao G.V.R., Rupela O.P., Rao V.R. and Reddy Y.V.R., Role of biopesticides in crop protection: present status and future prospects. *Indian Journal of Plant Protection*, **35(1),** 1–9 **(2007)**

37. Bassil K.L., Vakil C., Sanborn M., Cole D.C., Kaur J.S., Kerr K.J., Cancer health effects of pesticides: Systematic review, *Can Fam Physician,* **53(10),** 1704–11 **(2007)**

38. Pimentel David, Environmental and Economic Costs of the Application of Pesticides Primarily in the United States, Environment, Development and Sustainability, **7,** 229-252 **(2005)**

39. David Briggs, et al., Health Impact Assessment of Waste Management Facilities In Three European Countries, Environmental Health: A Global Access Science Source, **10,** 53-65 **(2012)**

40. Toxic Waste, US EPA. National Geographic. Web. 15. <http://environment.nationalgeographic.com, /environment/ global-warming/toxic-waste-overview/(**2012)**

41. Toxic Waste, National Geographic. National Geographic, Web. 26 **(2010)**

42. Szasz, Andrew. *Ecopopulism: Toxic Waste and the Movement for Environmental Justice*. Minnesota: Regents of the University of Minnesota, 137-145 **(1994)**

43. Toxic Waste, National Geographic. National Geographic, 2010. Web. 26 Apr **(2010)**

44. Agarwal R., 'India: the World's final dumpyard, Basel Action News, **1(l), (1998)**

45. Anjello R., Ranawana A., Death in Slow Motion- India has become the dumping ground for the west's toxic waste, Asiaweek **(1996)**

46. Bhattacharya A., Shrivastava R., The night air turned poisonous'. Down to Earth, December **(1994)**

47. Bhide A.D., Sundaresan B.B., Solid Waste Management in Developing Countries, New Delhi: Indian National Scientific Documentation Centre, 222 **(1983)**

48. Stadnicka J., Schirmer K. and Ashauer R., Predicting Concentrations of Organic Chemicals in Fish by Using Toxicokinetic Models. Environ. Sci. Technol, **(2012)**

49. SPE production & operations. **20**. Society of Petroleum Engineers, 87 **(2005)**

50. Patel, Tara The French Public Says No to *'Le Fracking*, *Bloomberg Businessweek* **(2012)**