RESEARCH CONCERNING THE ENVIRONMENT POLLUTION WITH DIOXINS

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Abstract: Dioxins are substances that are formed unintentionally, most of the times by the process of incineration [1,2]. This explains the fact that these substances are omnipresent in the environment, even though in very small quantities. This paper present some aspects regarding the effects of dioxin present specially in atmosphere, the sources of dioxins emissions, the mechanism of action in animal and human organisms and there are proposed some solutions at the dioxins presence in human life.

Keywords: human health, toxic effects, dioxins, coplanar biphenols.

1. INTRODUCTION

The notion of "dioxin" refers to P.C.D.D., P.C.D.F., P.C.B., coplanar. Dibenzo – polychlorinated dioxins (p.c.d.d.) and polychlorinated benzofuran (P.C.D.F.) are all called dioxins. Polychlorinated coplanar biphenols (P.C.B.) possess toxicity similar to that of dioxins and they are named dioxins compounds.

The molecule of dioxin is, in general, composed of 2 nucleus of benzene linked together of two atoms oxygen, having attached atoms of chlorine or of hydrogen. There are 75 types of P.C.D.D., 135 of P.C.D.F., and more of 10 types of P.C.B., coplanars, with the form of the molecule that depends by the number and by the place of the chlorine atoms (in the case of dioxins, 29 of isomers present a toxicity degree.

The dioxins are colorless substances with high degree of instability in water and low pressure of vapors; they have great solubility in grease and oil. These substances are generally stable, they do not easily react with other chemical substances, acids or bases. Under the action of UV rays, some predecessors of dioxins can be transformed in very toxic dioxins. In the presence of acids, under the action of the light, (especial by the sun light), the dioxins are loosing Cl atoms and they become not toxic. Other property is the capacity of being accumulated in earth's particles and subsequent migrates in surface waters [3].

2. TOXIC ACTION OF DIOXINS

Dioxins are chemical substances that are presented in the entire organisms witch live in the industrialised countries. They had been characterised EPA (Protection of the Environment Association) as being possible causers of cancer at human and it is anticipated the fact that they will increase the risk for making cancer even at levels of exposure from environment. The majority of the people are exposed at dioxins almost only through the intermediate of food that is consume, referring to the animal greases associated with the meet consume (beef, pork, chicken, fish) and with milk products. Chlorodioxins are the cause of chloracne and chick edema which killed thousands of broiler chickens in the U.S.A. Furthermore chlorodioxins seem to be fototoxic possible even

for man [7]. The dioxins toxicity is expressed as Toxically Equivalent (TEQ). The toxicity degree of the dioxins varies from element to element. From all the dioxins, tetrachlorinated dibenzo-p-dioxin, witch has atoms of chlorine in the positions 2,3,7 and 8 (2, 3, 7, 8- T.C.D.D. tetraclordibenzodioxin) is recognised to have the highest potential of toxicity. The International Agency of Research of the Cancer belonging to the World Organisation for Health, had identified the dioxin 2,3,7,8 – T.C.D.D. as being the most toxic from all of the dioxins and also, it had been identified their properties which caused cancer on the base of some studies which implied big accidental exposures [4].

In order to evaluate the global toxicity of the dioxins, it is necessary to take in consideration their unit effects. The method used here is to give to each element an Individual Factor of Measure for the Toxicity. These factors are estimations of the toxicity - the toxicity of 2,3, 7,8, T.C.D.D., to whom factor TEF is. In many studies and experiments the concentration of dioxins is presented as Toxic Equivalent (T.E.Q.), witch is determined by the final products resulted by multiplying the concentrations of the individual dioxins with T.E.F. factor of the element in cause.

The toxic action of the dioxins depends by the number of Cl atoms of and of their placement in the structure of the molecules. The dioxins had been classified as a possible cause of human's cancer. The effects of the exposure are: liver and skin cancer, negatives effects of the immunitar system, genital apparatus, digestive tube, thyroid gland, behavioural disorder, bone marrow and affection of the gastric mucous membrane. Some dioxins have a great toxicity that resembles to the one of saccharin and tomatin, poisonous substances, but this effect is not considered the prime negative effect of the dioxins. The major effects of dioxins are the genetically damages. Some researches considered that the dioxins are more toxic than cyanamid and even than, the most toxic chemical substances.

Because the dioxins are not intentionally synthesised and their quantity in the environment and in food is extremely low, it is very improbable that the usual levels of the daily dose goes to a great toxicity, as it happens in case of accidental swallows.

There are made experiments on animals (on rodents) and there had been drawn the conclusion that the exposure in repeated cases during pregnancy leads to the appearing of some malformations as the roof of the mouth split into. The tolerable daily dose is the quantity reported for each kilo by the body by day, from a substance that is suspected of having side effects for human health, and then it is introduced in the body for a long period of time. The tolerable daily dose is established on the base of the effects due to the exposure for a long period of time than the stable value for the tolerable daily dose.

3. SOURCES OF POLLUTION WITH DIOXINS AND THE EFFECTS ON THE ENVIRONEMENTAL

Dioxins are secondary products, generated from the burning of substances that contains C, O, and Cl. Presently, the major cause of their forming is the incineration of wastes. The biggest quantity is generated in the process of combustion and it is released in the atmosphere, without being retained by the equipments of cleaning of the burning gasses. There are also other sources, for example the emissions from the steal evens, in the industry of cellulose, cigar's smoke and the emissions gases from the motor vehicles. Some reports indicates that the dioxins may have been accumulated in the environment because of using, in the past, of PCB and of some forming chemical substances, which were unpurified with dioxins. Dioxins are found in soil and also in sediments. In fig. 1 are represented the most important sources of dioxins emissions. Normally, the dioxins are formed by the mixing of 210 compounds from which 17 have a higher toxicity degree of. The most toxic is considered to be the Sevesso dioxin. These substances are very stables in the environment. The chemical properties of the dioxins make easy their transport on long distances, these compounds being detected in the organisms from Arctic regions. The dioxins are found in a particular way in soil and in sediments. The exposure of the animals at dioxins had as result genetically defects and the death of the embryos.

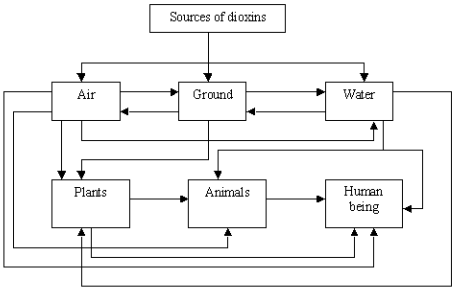

Fig.1. Relation between sources of dioxins and the environment. Influence on the human being

In fig. 2. is represented the dioxin's migration through tropical chains. Side effects of the dioxins are the followings: intercellular transformation of O_2 in O_2^*, H_2O_2, HO^*, that goes to mutagenes and biodegradation of vitamins, lipids and hormones; it can bio activate different xenobiotics substances, from which, the most dangerous are substances which install the cancer, neurotoxin and the predecessors of B_1 aflatoxine; the immunity decreasing and the appearing of ecological diseases at human and animals.

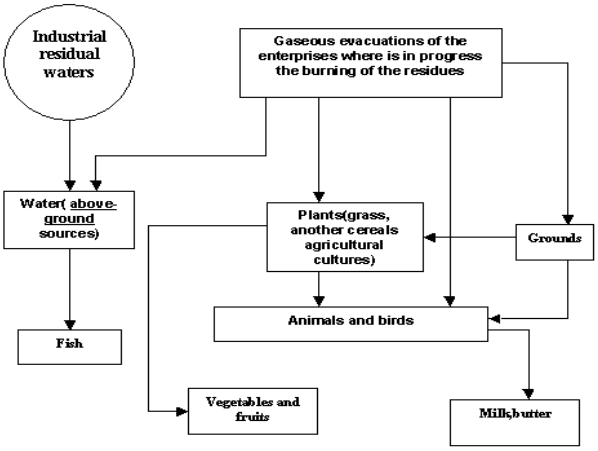

Fig. 2. Dioxin's migration through tropical chains

4. DIOXINS PRESENCE IN FOOD

According to a study made by the Social Insurance and Health Ministry (referring to the daily dose), the medium dose of dioxins, including coplanar PCB, from Japan is 100 pg / day, which means 2,25 pg for each kilo of the body, on the base of a 50 kilos body. Excepting this dose, there is another of 0,05 pg from the air and almost 0,0084 pg, from the soil, the dirt from hands etc. [4]. Although, the normal dose of dioxins took by a person from Japan is of 2,3 pg/kg body / day. Because dioxins are solvable in greases and have the tendency of accumulating in water tissues, the food which is suspected of a big quantity of dioxins are sea fruits, meat, milk products and eggs [5].

In Japan the biggest food source of dioxins is the fish, and in Europe and U.S.A. the meat and the milk products. In any country, almost 70-90% from food dose is from sea fruits, meat, eggs and milk products. Vegetables have a little influence on the dose; once the dioxins had been absorbed in the body, these compounds stay in water tissues and they diminish in half in almost 7 years. The concentration of dioxins differs from one product to another and from one place to another. According to some studies made of the Social Insurance and Health Ministry, the daily dose of exposure to dioxins of a person who has normal diet is considered to be the tolerable daily dose of 4 pg /kg body/day. The samples taken for a study from the region Kansai, indicated the decreasing of concentrations of almost a third from the level from about 20 years ego (fig. 3). As results of the taken measures for the reducing of emissions, new reducing of these concentrations is expected.

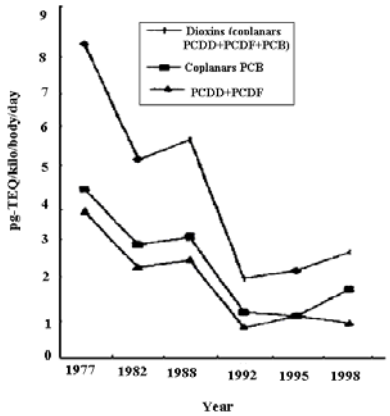

Fig.3. The evolution in time of the daily dose of exposure. Source: Scientific project of study for health and for social insurance. The survailing of the contamination state with dioxins of the diet (food).

5. SOLUTIONS FOR DIOXINS NEGATIVES EFFECTS ELIMINATION

The most important aspect is that each human become concerned of the dioxins problem, trying to reduce the generation of the waste. Because the dioxins are generated in the process if burning, the reducing of the capacity of waste is an efficiently way of reducing the emission of dioxins. Although, in some countries, the burning of waste in open air is interdicted. For reducing the entire quantity of dioxins, the burning of waste using house ovens is not recommends. It is wanted that the waste be treated in town installations, which respects the legal standards. Another way of purifying the environment could be the poplar trees. If the refers are maded to the oxygen, the old poplar trees should be replaced and not destroyed. The poplar tree gives 7 times more oxygen than the fir, and the time tree 2,5 times more, which depolluts the air in one hour; a normal beech releases in air 1700g oxygen, and in one day it satisfies the necessary oxygen for 64 persons [6]. In one hour, some beech could consume 2350 m^3 of carbon dioxide (from the exhausts), purifying 4800 m^3 of air. The beech grows slowly than the poplar that is also named “fast growing” and has a much rapid photosynthesis. Another aspect of purification of the environment regards the stable polluting substances from the soil in that way, the ionic metallic but also chemical compounds of dioxins, accumulates in the body’s plants, of the poplars (in their wood tissue), still remaining and inactivated for decades. An especial efficiency in this case is even the black poplar, which, having a fast growing, it consumes a lot of water from the soil, from which it extracts and blocs in it’s wood, a lot of toxic compounds. The fact that the poplars would send into atmosphere gents which causes cancer is an idea that had not scientifically demonstrated yet; the only inconvenient could be the fact that it causes allergies.

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