

PCDD_F AND PESTICIDES MONITORING IN A DIOXIN CONTAMINATED AREA IN RIO DE JANEIRO - BRAZIL

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Introduction

During the 40's and 50's there had been a hexachlorocyclohexane(HCH) industry in Duque de Caxias, state of Rio de Janeiro, Brazil. Duque de Caxias is a very important borough within the state's political and administrative structure. It is located in a strategic point connecting Minas Gerais and Rio de Janeiro. It also holds one of Brazil's greatest petroleum refineries.

For 20 years, this factory (which is located next to an orphanage called Cidade dos Meninos, an area belonging to the Ministry of Social Assistance) produced thousands of tons of HCH and also other pesticides, such as DDT, DDD and DDE. In the beginning of the 60's, the industry had its activities stopped¹.

In 1989, significant amounts of HCH had been found by local inspectors in Duque de Caxias, where it had been being sold for use in agriculture. Once the product's usage had already been prohibited in Brazil, after a investigation authorities found that it would come from the inactive industry.

Both environmental and public health institutions decided to use a mixture of lime and soil, in order to destroy the residues and organic compounds found in the old plant. Such procedure would cause a greater problem, for the lime used wouldn't meet the right proportions of the large area and its contaminated soil. In addition, it also affected the water supply and the local population.

The consequences have been disastrous. Data referring to breastfeeding and blood revealed alarming pesticide rates that endangered the local people health conditions both in short and long term. After 14 years, monitoring is still necessary in that region so it is possible to control contamination and its damage related to secondary reactions, climatic effects and soil structure.

For this reason, a monitoring program has been developed in order to investigate the rates of certain pesticides and PCDD/F in locations near the contamination field.

Methods and Materials

The collection and preservation methods used were those under the USEPA, in addition to other analytical methods based on gas chromatography and high-low resolution mass spectrometry under the standards 8270 and 8290. Standards marked with C¹³ have also been used in order to quantify target compounds.

Ninety samples have been collected (30 water samples and 60 soil samples). They have been through analyses in order to evaluate the extension of contamination in the neighborhood. One of the adjacent areas would be performing drilling activities for the installation of underground pipelines. The water samples which were collected may be classified as underground samples or surface samples.

Pesticides analysed during this monitoring were: 1,2,4 trichlorobenzene, 2,4,6 trichlorophenol, 2,4,5 trichlorophenol, alfa hexachlorocyclohexane, hexachlorobenzene, beta hexachlorocyclohexane, gama hexachlorocyclohexane, delta hexachlorocyclohexane, pentachlorophenol, DDE (o,p and p,p), DDD (o,p an p,p) and DDT (o,p and p,p). Dioxins and Furans were also analysed.

Results and Discussions

Through the analysis results referring to pesticides, we can see that the neighbour areas do not represent a cause of concern, once only seven samples (7.77%) presented a low level of contamination (see Table 1).

Table 01: Contamination Chart - Pesticides (ppb)

| Pesticides | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 | Sample 6 | Sample 7 |
|------------|----------|----------|----------|----------|----------|----------|----------|
| p,p DDD | 0.05 | 0.81 | 10.40 | 0.95 | 0.35 | 1.97 | 0.72 |
| p,p DDT | - | 3.44 | 66.72 | 2.28 | - | - | - |
| o,p DDT | - | 0.63 | 1.73 | - | - | - | - |
| p,p DDE | - | - | 12.63 | 5.84 | - | 7.63 | - |

The main contaminant analysed, HCH, was not found in the studied samples. Due to the absence of such pesticide (which was mostly found in the plant itself), one can conclude that the neighborhood has not been totally affected.

A similar assumption can be made whilst evaluating the PCDD/F analysis. Only one soil sample (located in the nearest area where the contamination took place) presented drifts of 8 ng/kg. Unfortunately, there are no specific local laws in Brazil related to soil contaminated by PCDD/F.

Conclusions

This study, as well as other evaluations performed in Cidade dos Meninos, made it possible to transport the materials via an underground pipeline to a refinery. Based on these results and the irrelevant contamination in the area associated to PCDD/F and pesticides, the implementation was approved by the environmental control institution in the state of Rio de Janeiro.

References

1. Ecocidade, 20/05/2003 – Ministry of Health, Brazil.