

GENETIC CONSEQUENCES OF PRODUCTION AND USAGE OF ORGANOCHLORINE PESTICIDES IN THE FORMER USSR

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Introduction

Mutagenic activity of many organochlorine pesticides (OCPs) creates a danger for present and future people generations. A high level of OCPs' usage in the agriculture of former USSR caused a persistent environmental pollution in many regions and has created a threat to health of the population. Unfortunately, monitoring of OCPs' genotoxic effects is not yet widespread enough in the countries of former USSR. Therefore a complete estimation of influence of their unlimited usage lies ahead. However the first results are already available.

Production

The data on genetic consequences of OCPs production are not numerous. We shall describe results of study such OCPs, as hexachlorobutadiene (HCBd) and dimethyltetrachloroterephthalat (daktal). It was carried out on a place of production - in Ufa (Bashkir Republic, Russia), at the experimental plant of the herbicide Institute (NITIG).

The fumigant HCBd producing in Ufa since 1960-th is a toxic compound of a top class of danger.

The follow-up, carried out in the first half of 1980-th years, has revealed the following picture. Contamination of air in the facility for HCBd production (from 1.69 up to 12.26 mg/m³) exceeded the hygienic standard in a hundred and thousand time ("preliminary" hygienic standard of those years for the atmosphere in facility - 0,01 mg/m³). In result of long-duration HCBd influence, there are revealed changes of nervous system of the workers, mostly astheno-vegetative syndrome. Sometimes things reached up to vegetative-sensor toxic polyneuritis. Changes in the heart, liver (chronic active hepatitis), respiratory system, blood also were revealed¹.

The repeated follow-up, carried out 4 years later, has found out growth of air contamination in the facility - average HCBd concentration in air of a working zone already came to 16.9 mg/m³. HCBd was found even in urine of workers. No wonder, that it was found out the reliable increase of frequency of chromosome aberrations in the lymphocytes of peripheral blood of workers (4.07% against 1.23% in the control)². After the second follow-up more rigid hygienic standard (0.005 mg/m³) was established, though there are no guarantees, that it is maintained.

During production of herbicide daktal in Ufa in 1980-ths a level of contamination of facility's air came to 0.3-1.3 mg/m³. These figures in a hundred of time exceed hygienic standard (0.002 mg/m³). The cytogenetic investigation has shown reliable increase of a level of chromosome aberrations in lymphocytes of peripheral blood of workers (4.13% against 1.23% in the control)².

Dioxin '97, Indianapolis, Indiana, USA

In result of inspection the workers of HCBD and daktal production were referred to a category of raised genetic risk, and the conditions of their labour were estimated "as adverse and representing real danger to worker's health".

The results of study of experimental animals have appeared the same²⁾.

Pesticide's usage

The estimation of influence of pesticides, contained in objects of external environment, on mutational human processes was carry out at cytogenetic follow-up of teenagers, living in two agricultural zones with a different level of pesticide usage, mainly OCPs - in Ukraine and in Azerbaijan³⁾. Blood of practically healthy teenagers of 14-17 years was investigated.

In Ukraine the pesticide burden of experienced and control zones differed in 3 times.

In Azerbaijan the experienced and control zones differed on a level of pesticide usage in 100 time, and pesticide contamination of environment and food in an experienced zone in 2-50 times exceeded allowable levels (hygienic standards). The table gives some representation of received results.

Table. Results of cytogenetic follow-up of teenagers in rural zones with different pesticide burden³⁾

	Ukraine		Azerbaijan		Spontaneous value
	Expe-rience	Control	Expe-rience	Control	
Average frequency of metaphases with chromosome aberrations, %	2,12	1,74	7,35	4,48	1,19

Teenagers of an experienced zone in Ukraine begin to show a tendency to excess of the average population level of spontaneous chromosome aberrations, however the distinctions between basic cytogenetic parameters for experienced and control zones are still statistically doubtful.

In Azerbaijan the average frequency of metaphases with chromosome aberrations is seriously differed from control and average population values. Here were found out strongly expressed cytogenetic effects, connected to intensive usage of pesticides, which should inevitably conduct to generically caused pathology in following generation³⁾.

It is important however, that in Azerbaijan the frequency of cytogenetic damages in control group also exceeded a level, characteristic for natural mutational process in human lymphocytes. In other words, the pesticide clean zones in Azerbaijan were absent at bottom on a moment of research. It is possible that there were no any territories in Azerbaijan without generically "painted" pesticide burden on the people.

The author of the report³⁾ concluded, that the data, which received by genetic monitoring, serve as a signal of mutagen danger of pesticides not only for limited professional groups, but also for the population as a whole in case of environmental pollution with pesticides-mutagenes. Unfortunately this author's "storm-cone" was hidden from the people by Ministry of Public Health of the USSR.

HUMAN EXPOSURE

Conclusion

The Intensive production and uncontrolled usage of OCPs, accompanying with environmental pollution, render the serious effect on the mutational processes and are generically dangerous for the children and for the whole population.

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