INDICES OF REPRODUCTIVE HEALTH OF MALE POPULATION IN THE INCREASED RISK ZONES OF DIOXIN EXPOSITION

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Introduction

A large group of POPs with estrogenic or antiandrogenic effects which are able to destroy spermatogenesis and androgenopoesis due to either interference into the mechanisms of their regulation or the direct cytotoxic effect. On the one hand there are only single works devoted to analysis of the influence of PCDD/Fs and PCBs over the male reproductive system: statistically proven decrease of spermatozoid number and their morphological change in workers of pesticides production in Chapaevsk[1] and PCB in Serpuchov[2], physical and sexual maturation and the prevalence of minor urogenital abnormalities among a sample of adolescent boys from dioxin contaminated region[3]. On the other hand there are research works on the evaluation of PCDD/Fs in sperm and blood samples of Vietnamese and Americans[4, 5].

The aim of the presented investigation is the evaluation of androgenic state of males of Bashkirian cities, Russia, among which Ufa and Sterlitamak are the increased risk zones according to dioxin contamination due to chlorphenol production. In this connection we used the dioxin level in biological tissues as the index of technogenic loading. the citizens of some Russian cities have been shown previously to have the increased PSDP/Fs background in blood[6, 7]. Sex ratio has also been shown changed in highly exposed workers of the former enterprise 2,4,5-T Ufa city[8].

Materials and methods

There have been screened about 1000 males inhabiting the industrial cities of the southern Urals (Ufa, Sterlitamak, Salavat, Tyimazy). Androgen status was judged by testosterone blood content.

In each of these cities there were formed groups consisting of 50 volunteers whose sperm samples were obtained. 50 ml of pool sperm samples has been taken for the examination.

All samples had been frozen at –18 °C and kept in this state up to the time of analysis. Lipids from and sperm were extracted by the mixture of hexane/ diethylether/ethanol. Purification of the extracts was carried out with the use of a modified silica gel column, basic alumina and graphitized carbon black (Carbopack-C/Celit 545).

Control of the degree of extraction, of purification level and calibration of the measurement system were performed in compliance with the methods of EPA 1613. Recovery from biological samples was 59-98 %. Labeled surrogates PCDD/Fs (CIL) were used.

The system of measurement HRGC/HRMS consisted of a chromatograph Carlo Erba 8035, mass-spectrometer Autospec-Ultima (10000); column DB-5 MS, J&W, 60 m were used. Data collection was performed by selected ion monitoring (SIM).

Results and discussion

The evaluation of the Basal testosterone level in males of industrial cities revealed the number of

conformities, the main of which is the expressed tendency to hypoadrogenaemia both in the whole complex of problems and in separate groups of patients (table 1).

Table 1. Testosterone concentration in blood and the average age of examined males

Group	n	Testosterone, nM/l	%	Age
Sterlitamak	187	9,5±0,3	81	34,9±4,8
Salavat	53	13,4±1,0	114	30,6±2,4
Tyimazy	93	15,5±0,6	132	30,8±3,7
Ufa	624	11,7±0,2	99	33,9±4,1
Total	957	11,1±0,2	100	32,4±2,9

The lowest testosterone level in males have been revealed in the cities of Sterlitamak and Ufa where it was statistically considerably different from serum concentration levels revealed in the cities of Tyimazy and Salavat. Distribution of testosterone over the referent limits of its levels is shown in table 2.

Table 2. The distribution of the donors over the concentration of testosterone to referent levels

Testosterone, nM/l	Sterlitamak		Salavat		Tyimazy		Ufa		Total	
< 12	143	76	25	47	28	30	350	56	546	57
12-30	44	24	27	51	62	67	268	43	401	42
> 30	0	0	1	2	3	3	6	1	10	1
Total	187	100 %	53	100 %	93	100 %	624	100 %	957	100 %

The lowest testosterone level in males have been revealed in the cities of Sterlitamak and Ufa where it was statistically considerably different from serum concentration levels revealed in the cities of Tyimazy and Salavat. Distribution of testosterone over the referent limits of its levels is shown in table 2.

For the majority of examined persons (57 %) the absolute androgen deficiency is characteristic, i.e. the total testosterone level is lower than 12nM/l. The degree of absolute androgen deficiency ranges from 30 % in relatively satisfactory Tyimazy up to 76 % in Sterlitamak. The comparison of these data with the results of research[9], having revealed the signs of absolute deficiency only in 1 % of healthy males of the given age group (20-40 years), certainly indicates the high possibility of the development of deviations from the normal state of reproductive system from the examined contingent of samples.

The results of PCDD/Fs determination in sperm samples are given in table 3. In all samples PCDD/Fs were found at a level of 0.3-0.7 ppt w.w. or 0.5-2.5 ppb lipids.

In our opinion differences in PCD/Fs levels in sperm of donors from different cities including the cities with pollution sources (Ufa, Sterlitamak) are inessential. No relationship was found between the level of testosterone and PCDD/Fs content in sperm of donors. A reverse tendency is rather observed.

Table 3. PCDD/Fs in pool sperm samples from different cities from Bashkiria, Russia

PCDD/Fs	Ufa, n=50		Sterlitamak, n=50		Salavat, n=50		Tujmazi, n=50	
Sample/ lipids	w.w. 50 ml	Lip. w. 0.031%	w.w. 50 ml	Lip. w. 0.052%	w.w. 50 ml	Lip. w. 0.034%	w.w. 50 ml	Lip.w. 0.027%
2378-TCDD	0.003	9.72	0.005	9.62	0.003	14.87	ND	ND
12378-PeCDD	0.008	25.91	0.002	3.85	0.004	29.74	0.001	1.04
123478-HxCDD	0.006	19.43	0.003	5.77	0.003	32.71	0.007	10.36
123678-HxCDD	0.007	22.67	ND	ND	0.004	20.82	0.001	2.07
123789-HxCDD	0.002	6.48	0.003	5.77	0.001	14.87	0.001	2.07
1234678-HpCDD	0.031	100.40	0.006	11.55	0.008	86.25	0.007	11.40
OCDD	0.135	437.25	0.073	140.48	0.057	612.64	0.079	123.32
2378-TCDF	0.084	272.06	0.036	69.28	0.016	166.54	0.016	24.87
12378-PeCDF	0.022	71.26	0.007	13.47	0.01	199.26	0.019	29.02
23478-PeCDF	0.006	19.43	0.023	3.85	0.007	59.48	0.169	262.18
123478-HxCDF	0.007	22.67	0.025	57.73	0.013	59.48	0.124	192.75
123678-HxCDF	0.02	64.78	0.007	13.47	0.024	127.88	0.022	34.20
123789-HxCDF	0.027	97.17	0.033	63.51	0.043	20.82	0.081	126.42
234678-HxCDF	0.004	12.96	0.021	38.49	0.063	29.74	0.053	82.90
1234678-HpCDF	0.054	174.90	0.017	32.71	0.073	44.61	0.056	87.05
1234789-HpCDF	0.04	129.55	0.01	19.24	0.05	270.63	0.023	35.23
OCDF	0.066	213.77	0.028	53.88	0.082	734.57	0.072	111.92
Total, pg/g w.w.	0.522	1700.4	0.282	542.68	0.401	2 524.9	0.731	1136.7
TEQ, pg/g lipids		104.8		42.1		135.7		182.5

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