

EXPOSURE OF FEMALE PRODUCTION WORKERS AND THEIR CHILDREN IN UFA, RUSSIA TO PCDDS/PCDFS/PLANAR PCBS

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Objective: To see if a relationship could be found between elevated dioxin levels in female chemical workers and dioxin levels in their children. At Dioxin '92 we reported that workers involved with 2,4,5-T production over 25 years previously at the Chimprom Manufacturing Complex in Ufa, Russia, had elevated levels of 2,3,7,8-TCDD in their blood (drawn in 1991).¹ In the present study blood was collected from a control group, four exposed workers (three had been diagnosed as having had chloracne), and six of the workers' children. Elevated dioxins have not been documented in previous studies of children of female chemical workers.

Methods: One of us (AS) was invited to the Chimprom Manufacturing Complex by local and factory officials for an occupational medicine consultation regarding dioxin exposure in workers and their children in September, 1992. Whole blood was collected from over 65 persons with the aid of factory doctors. Specimens were placed in chemically clean containers and frozen at -20 degrees centigrade. Samples were analyzed by GC-MS as described previously.²

Results: Congener-specific dioxin (PCDD), dibenzofuran (PCDF), and coplanar polychlorinated biphenyl (PCB) levels are shown in Table I for four women, their six children and a control group from the general Ufa population. The 2,3,7,8-TCDD level from the control group is higher, at 12 ppt on a lipid basis, than our previously reported Russian general population where the level was 4.5.³ In the U.S. we and others have reported general population TCDD levels of between 3 and 5 ppt. As shown in Table I, four exposed workers have elevated TCDD levels, ranging from 61 to 273 with a mean of 168 ppt. The six children of exposed mothers also have elevated TCDD blood levels, ranging from 31 to 80 with a mean of 49 ppt. Table II presents additional data about the individuals sampled along with their TCDD and dioxin toxic equivalent (TEq) levels. It worthy of note that in this series, when the children are from the same family,

the eldest has the highest TCDD level.

Conclusions: Dioxin exposed workers and their children have elevated TCDD blood levels twenty-five years after exposure. A previous report found that in two case studies, unexposed mates had PCB blood patterns matching their occupationally exposed husbands', presumably from washing contaminated clothing.⁴ The most probable route of exposure for these children is through nursing, although this cannot presently be verified. If this is the case, this is the first, to the best of our knowledge, documentation of TCDD exposed mothers transmitting TCDD to nursing infants, leading to elevated TCDD levels in the children years later. The level of TCDD in the general population of Ufa is higher than we previously reported elsewhere in Russia. Sources for this may include the chemical factory. Further research is needed to establish the source of the exposure and is indicated to determine possible health effects, on workers and children.

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References:

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TABLE I: DIOXINS, DIBENZOFURANS AND COPLANAR PCB LEVELS FOR UFA RUSSIA CHEMICAL WORKERS', THEIR CHILDREN AND THE GENERAL POPULATION

| | Control pool N=100 | Mothers' Mean N=4 | Childrens' Mean N=6 | Mother w/Min TCDD | Mother w/Max TCDD | Child w/Min TCDD | Child w/Max TCDD |
|-------------------------------|--------------------------|-------------------------|---------------------------|-------------------------|-------------------------|------------------------|------------------------|
| Dioxins | | | | | | | |
| 2,3,7,8-TCDD | 12 | 168 | 49 | 61 | 273 | 31 | 80 |
| 1,2,3,7,8-PnCDD | 9.5 | 28 | 23 | 11 | 34 | 13 | 30 |
| 1,2,3,4,7,8/1,2,3,6,7,8-HxCDD | 6 | 11 | 11 | 8 | 8.4 | 7.6 | 14 |
| 1,2,3,7,8,9-HxCDD | ND(3) | 3 | 4 | ND(3) | ND(3) | ND(3) | 8.8 |
| 1,2,3,4,6,7,8-HpCDD | 9.7 | 11 | 31 | 9.4 | 13 | 9.4 | 5.7 |
| OCDD | 73 | 170 | 279 | 52 | 461 | 85 | 59 |
| Dibenzofurans | | | | | | | |
| 2,3,7,8-TCDF | ND(2) | 1 | 3 | ND(3) | ND(2) | ND(3) | ND(4) |
| 2,3,4,7,8-PnCDF | 8 | 11 | 10 | 6.6 | 9.4 | 10 | 12 |
| 1,2,3,4,7,8/1,2,3,6,7,8-HxCDF | 7 | 13 | 11 | 8.9 | 13 | 14 | 17 |
| 2,3,4,6,7,8-HxCDF | ND(3) | 2 | 4 | ND(3) | ND(3) | ND(3) | ND(6) |
| 1,2,3,4,6,7,8-HpCDF | 8.4 | 16 | 33 | 6.0 | 31 | 11 | 17 |
| PCBs | | | | | | | |
| 3,3',4,4'-TCB #77 | 44 | 26 | 188 | ND(60) | ND(35) | ND(60) | ND(150) |
| 3,3',4,4',5-PnCB #126 | 65 | 111 | 96 | 107 | 116 | 105 | 153 |
| 3,3',4,4',5,5'-HxCB #169 | 38 | 43 | 43 | 28 | 42 | 41 | 52 |
| TOTAL PCDD | 112 | 391 | 397 | 143 | 791 | 148 | 198 |
| TOTAL PCDF | 26 | 43 | 61 | 25 | 56 | 38 | 51 |
| TOTAL PCDD/F | 138 | 434 | 458 | 168 | 847 | 186 | 249 |
| TOTAL COPLANAR PCBs | 147 | 180 | 327 | 135 | 158 | 146 | 205 |

Note: Numbers rounded. Half of detection limits used for calculation of PCDD/F totals.

TABLE II: WORKERS FROM THE CHIMPROM MANUFACTURING PLANT AND THEIR CHILDREN

| Family | A | A | B | B | C | C | C | D | D | D |
|--------------|---------|----------|---------|---------|---------|----------|----------|---------|----------|----------|
| Relationship | Mother | Daughter | Mother | Son | Mother | Daughter | Son | Mother | Daughter | Daughter |
| Birthdate | 3/31/38 | 11/15/64 | 5/14/41 | 9/21/65 | 5/16/40 | 3/29/71 | 10/24/73 | 12/8/44 | 11/2/69 | 6/2/74 |
| Chloracne | Yes | No | No | No | Yes | No | No | Yes | No | No |
| TCDD Level | 144 | 31 | 61 | 41 | 194 | 80 | 63 | 273 | 41 | 38 |
| PCDD TEq | 154 | 38 | 68 | 47 | 222 | 97 | 93 | 292 | 52 | 46 |
| PCDF TEq | 9 | 7 | 5 | 7 | 9 | 8 | 15 | 6 | 3 | 3 |
| PCB TEq | 13 | 13 | 12 | 15 | 14 | 19 | 21 | 14 | 8 | 7 |
| Total TEq | 176 | 58 | 85 | 69 | 245 | 124 | 129 | 312 | 63 | 56 |

Half of detection limits used for calculation of Dioxin Toxic Equivalents (TEq)

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