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A REVIEW OF THE GASTROINTESTINAL EFFECTS FROM EXPOSURE TO SUBSTANCES CONTAMINATED WITH 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)

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ABSTRACT

Although there is concern regarding the effects of TCDD exposure on the liver and gastrointestinal system, this concern has not been consistently supported by the epidemiologic studies of TCDD-exposed individuals. We have reviewed this epidemiologic evidence.

SUMMARY

Only a few epidemiologic studies have been conducted of individuals with exposure to substances contaminated with 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). These studies provide conflicting evidence regarding an association between gastrointestinal effects and TCDD exposure. The epidemiologic studies are summarized below.

Two cross-sectional medical studies found statistically significant elevations of self-reported ulcers in individuals exposed to TCDD-contaminated substances (Bond, 1983; Suskind and Hertzberg, 1984) whereas a study of the U.S. Air Force Ranch Hands failed to find an elevation (Lathrop, 1987; Wolfe, 1990). Although case reports have described hepatitis (Goldman, 1973), liver damage (Pazderova-Vejlupkova et al., 1981; Schecter, 1986), and hepatomegaly (Bonaccorsi, 1978; Suskind, 1978; Pazderova-Vejlupkova, 1981) among TCDD-exposed individuals, the controlled epidemiologic studies that have examined these conditions have not found statistically significant elevations (Bond, 1983; Wolfe, 1990; Moses, 1984; Hoffman, 1986).

Only a few studies found statistically significant differences in laboratory test results between the TCDD-exposed group and the unexposed group (Table 1). Furthermore, the findings for only three of the laboratory

Table 1 Liver Enzyme and Liver Function Test Changes in Human Populations Exposed to TCDD-Contaminated Substances

Population	Author	LDH	ALT	AST	Alk Phos	GGT	Total Bili-rubin	Total Protein	D-Glucaric Acid
Seveso children Months after accident, Italy	Ideo (1982)	NR	NR	NR	NR	NR	NR	NR	I*
Seveso children 5 years after accident, Italy	Ideo (1985)	NR	NR	NR	NR	NR	NR	NR	I
Seveso children 1 year after accident, Italy	Mocarelli et.al. (1986)	NR	I*	NC	NC	I*	NR	NR	NR
Ranch Hand -Baseline	Lathrop (1984)	I	NC	NC	I	I	NC	NR	NR
Ranch Hand-1st follow up	Lathrop (1987)	NC	D	NC	I*	I	NC	NR	NR
Ranch Hand-2nd follow-up	Wolfe (1990)	NC	NC	NC	I*	I	NC	NR	NR
2,4,5-T workers, Nitro, WV	Suskind, (1984)	ND	NC	NC	NC	NC	NC	NC	NR
2,4,5-T workers, Nitro, WV	Moses (1984)	NR	NC	I*	NC	I*	NR	NR	NR
2,4,5-T workers, Michigan	Bond (1983)	D	I	D	I	NR	D	D	NR
TCP workers, Michigan	Bond (1983)	I	I	I	D	NR	D	I	NR
2,4,5-T workers 10 years after explosion,Britain	May (1982)	NR	NR	NR	I	I	D	NR	I
2,4,5-T workers 10 years after explosion,Britain	Martin (1984)	NR	NR	NR	NR	I	D	D	I*
2,4,5-T workers 17 yrs after explosion,Britain	Jennings (1988)	ND	NC	NR	NR	NC	NR	NR	NR
2,4,5-T workers, Czechoslovakia	Pazdereva-Vejlupkova et al. (1981)	NR	NR	NR	NC	NR	NR	I	NR
Mobile Home residents, MO	Hoffman (1986)	NR	NC	NC	I	I	D*	NR	NC
Residents, MO	Webb (1989)	I	NC	I	NC	I	NC	NR	NR

Notes
NC = No change
NR= Not reported
I=increased
D=decreased
a = p<0.05

2,4,5-T=2,4,5-trichlorophenoxyacetic acid
alk phos = alkaline phosphastase
TCP = trichlorophenol
GGT = gamma glutamyl transpeptidase

LDH = lactic dehydrogenase
AST = aspartate aminotransferase
ALT = alanine aminotransferase

tests were found to be in a consistent direction across the published studies: gamma-glutamyl transferase (GGT), serum total bilirubin level, and D-glucaric acid.

To evaluate the effect of occupational exposure to TCDD on the medical conditions described above, as well as on medical conditions involving other organs, the National Institute for Occupational Safety and Health (NIOSH) conducted a cross-sectional medical study. This cross-sectional study compared living individuals (workers) employed more than 15 years earlier in the production of TCDD-contaminated chemicals with an unexposed comparison group. The workers were employed in one of two plants located in Newark, New Jersey and Verona, Missouri. Workers were employed at the New Jersey facility from 1951 through 1969 in the production of sodium trichlorophenol (NaTCP), 2,4,5-trichlorophenoxyacetic ester (2,4,5-T ester) and other chemicals. At the facility in Missouri, individuals were involved in the production of NaTCP, 2,4,5-T ester or hexachlorophene. Production of NaTCP and 2,4,5-T ester occurred for approximately four months in 1968 and production of NaTCP and hexachlorophene occurred from April 1970 to January 1972. Both plants produced a variety of other chemicals. Based on interviews and serum TCDD levels, these workers have had high TCDD exposure. Among the 281 workers and 260 referents who participated in the study, mean serum TCDD levels at the time of the examination were 220 parts per trillion (ppt) and 7 ppt, respectively. Data from this study of highly exposed workers and unexposed referents is presently under analysis to assess the association between TCDD exposure and effects on the gastrointestinal system, with particular attention to the medical conditions and laboratory tests listed above.

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