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**REVIEW OF WASHINGTON WORKS C-8 DATA
PERSONNEL AIR MONITORING AND BLOOD**

THE REVIEW OF BLOOD DATA VS. CURRENT PERSONNEL AIR MONITORING DATA MUST BE VIEWED AS A TECHNICAL STUDY WHICH DEMONSTRATES THE CORRELATION BETWEEN C-8 IN AIR, C-8 SKIN EXPOSURE, AND BLOOD LEVELS. THE ABSOLUTE LEVELS ARE DIFFICULT TO INTERPRET BECAUSE THE BLOOD LEVELS ARE INFLUENCED BY PEOPLE'S EXPOSURE GOING BACK 10 YEARS (C-8 DROP-OFF RATE IN THE BLOOD IS VERY, VERY SLOW), AND THE PERSONNEL AIR MONITORING RESULTS ARE CURRENT DATA.

C-8 PERSONNEL AIR MONITORING DATA TAKEN OVER THE PERIOD APRIL 1988 THROUGH SEPTEMBER 1989 (220+ SAMPLES COVERING 22 JOBS) AND ALL PERSONNEL C-8 IN BLOOD DATA GOING BACK TO 1979-80, WERE SUMMARIZED AND REVIEWED. WHEN CORRELATING BLOOD DATA WITH AIR MONITORING DATA BY PERS JOBS, THE ONLY PEOPLE INCLUDED IN THE BLOOD DATA BASE WERE THOSE WHO HAD BEEN IN THE INDICATED JOB FOR YEARS; HAD NOT MOVED ALL OVER THE FLUOROPOLYMERS AREA; AND ARE STILL IN THE JOBS. THE TASK OF INTERPRETING THE DATA IS COMPLICATED BY THE FACT THAT THE AIR MONITORING DATA IS RECENT, WHEREAS THE BLOOD DATA (BECAUSE OF THE VERY SLOW DROP-OFF RATE OF C-8 IN THE BLOOD) ESSENTIALLY REFLECTS EXPOSURE DATING BACK TO THE "EARLY DAYS".

CONCLUSIONS

- 1) THERE IS A CORRELATION BETWEEN C-8 PERSONNEL AIR LEVELS AND C-8 IN BLOOD LEVELS, AND BETWEEN SKIN CONTACT AND C-8 IN BLOOD LEVELS.

TABLE 1 SUMMARIZES THE BLOOD DATA/AIR DATA/SKIN CONTACT POTENTIAL BY PERS JOBS. THOSE JOBS SHOWING WIDELY DIVERGENT BLOOD LEVEL POPULATIONS ARE THE JOBS THAT HAVE POTENTIAL FOR SKIN EXPOSURE.

- 2) THE EFFECT OF SKIN CONTACT IS STRONG AND APPARENT AS DEMONSTRATED IN TABLE 1 AND FIGURE 1, ESPECIALLY DOCUMENTED BY JOBS 08PE, 08PH, AND 08PF.
- 3) SKIN CONTACT RESULTS IN BLOOD LEVELS IN THE 7-8 PPM RANGE OR WAY HIGHER. THIS POSITION IS ALSO SUPPORTED BY 3M AND BY REVIEW OF ALL OTHER BLOOD PLOTS WE HAVE; WHERE SOME PEOPLE STAND OUT WITH VERY HIGH BLOOD LEVELS.

FIGURE 1 IS A PLOT OF PERSONNEL AIR LEVELS FOR A PERS JOB CODE VS. BLOOD LEVELS FOR THE SAME JOB CODE. FIGURE 1 ALSO SHOWS THE HIGH BLOOD LEVELS THAT DO NOT FIT THE CURVE WHICH ARE ATTRIBUTED TO SKIN CONTACT ON THE PART OF THE SPECIFIC INDIVIDUALS.

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- 4) FIGURE 1 WOULD INDICATE THAT EXPOSURE AT THE AEL OF 0.56 PPB WOULD EQUATE TO A BLOOD LEVEL OF ~3 PPM.
- 5) BACKGROUND BLOOD LEVELS, FOR PEOPLE JUST WORKING IN THIS AREA OF THE PLANT, ARE IN THE 0.1-0.5 PPM RANGE.
- 6) A SIDE OBSERVATION - PEOPLE WORKING IN A JOB SEEM TO ACHIEVE THE BLOOD LEVEL FOR THE JOB AND STAY THERE UNLESS THERE IS AN INCIDENT (SKIN CONTACT) OR, IN ONE INSTANCE, A PROCESS CHANGE.
- 7) DROP-OFF RATE FOR C-8 IN THE BLOOD IS A HALF LIFE OF ~4-5 YEARS OR MORE. THIS IS BASED ON A VERY SMALL AMOUNT OF DATA ON PENSIONERS AND ON THE OBSERVATION THAT THERE IS A SLIGHT PERCEIVED DECLINE IN WORKERS IN THE VARIOUS JOBS.
- 8) BECAUSE OF THE SLOW DROP-OFF RATE, ANNUAL BLOOD TESTING IS TELLING US NOTHING. WE ARE DISCONTINUING BLOOD TESTING (UNLESS AN EMPLOYEE REQUESTS IT) FOR NOW, AND WILL RECONSIDER TAKING ANOTHER "SNAPSHOT" IN A FEW YEARS AFTER WE HAVE COMPLETED OUR PROCESS IMPROVEMENTS (E.G., USE OF C-8 IN SOLUTION).

WHEN WE ELECT TO DO MORE BLOOD MONITORING, WE SHOULD SAMPLE AS MANY WORKERS AS POSSIBLE. WE WOULD NEED THE PEOPLE NEW TO THE AREA AS WELL AS THE OLDER WORKERS BECAUSE THE OLDER WORKERS WOULD STILL BE ON THE SLOW DECAY C-8 IN BLOOD CURVE. EVEN AT BEST, THE DATA WILL AGAIN BE DIFFICULT TO INTERPRET BECAUSE OF THE FREQUENT JOB-TO-JOB MOVEMENT OF PEOPLE WITHIN THE FLOURPOLYMERS AREA, AND FROM AREA-TO-AREA ON THE WASHINGTON WORKS SITE. OTHER CONFOUNDING FACTORS THAT WILL CONTINUE TO ADD TO VARIABILITY ARE INDIVIDUAL WORK HABITS AND INDIVIDUAL BIOLOGICAL RESPONSES SUCH AS EXCRETION RATE AND RETENTION IN BODY OTHER THAN IN BLOOD (E.G., FAT).

- 9) EIGHTEEN OF THE 22 PERS JOBS WERE IN COMPLIANCE WITH THE AEL FOR C-8. FOUR JOBS WERE OUT OF COMPLIANCE OR MARGINAL; ALL FOUR JOBS INVOLVED POTENTIAL FOR SKIN EXPOSURE. USE OF C-8 IN SOLUTION SHOULD ELIMINATE THE PROBLEM FOR THREE OF THE FOUR JOBS.

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C-8 BLOOD DATA (WASHINGTON WORKS)

STATUS OF EMPLOYEES AS OF:

	≤ 0.5 PPM	≤ 1.0 PPM	≤ 5.0 PPM	≤ 10 PPM	>10 PPM
BASE DATA 1984-1986 (108 PEOPLE)	22% (24)	67% (73)	92% (100)	97% (105)	3% (3)
1987 (31 PEOPLE)	26% (8)	39% (12)	87% (27)	97% (30)	3% (1)
1988 (28 PEOPLE)	43 (12)	61% (17)	93% (26)	100% (28)	0%
1987-1988 COMBINED (58 PEOPLE)	34% (20)	50% (29)	90% (52)	100% (58)	0%
1989 (41 PEOPLE)	34% (14)	59% (23)	83% (34)	98% (40)	2% (1)

- 0 THIS DATA IS ONLY USEFUL TO PROVIDE A GENERAL OVERVIEW (A SNAPSHOT IN TIME).
- 0 NOT USEFUL FOR TRENDS BECAUSE OF PEOPLE MOVEMENT, AND THE COMPOSITION OF PEOPLE TESTED CHANGES EACH YEAR.

H. A. SMITH
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B:44 #4

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WASHINGTON WORKS

"TEFLON" AREA EMPLOYEE BLOOD LEVELS

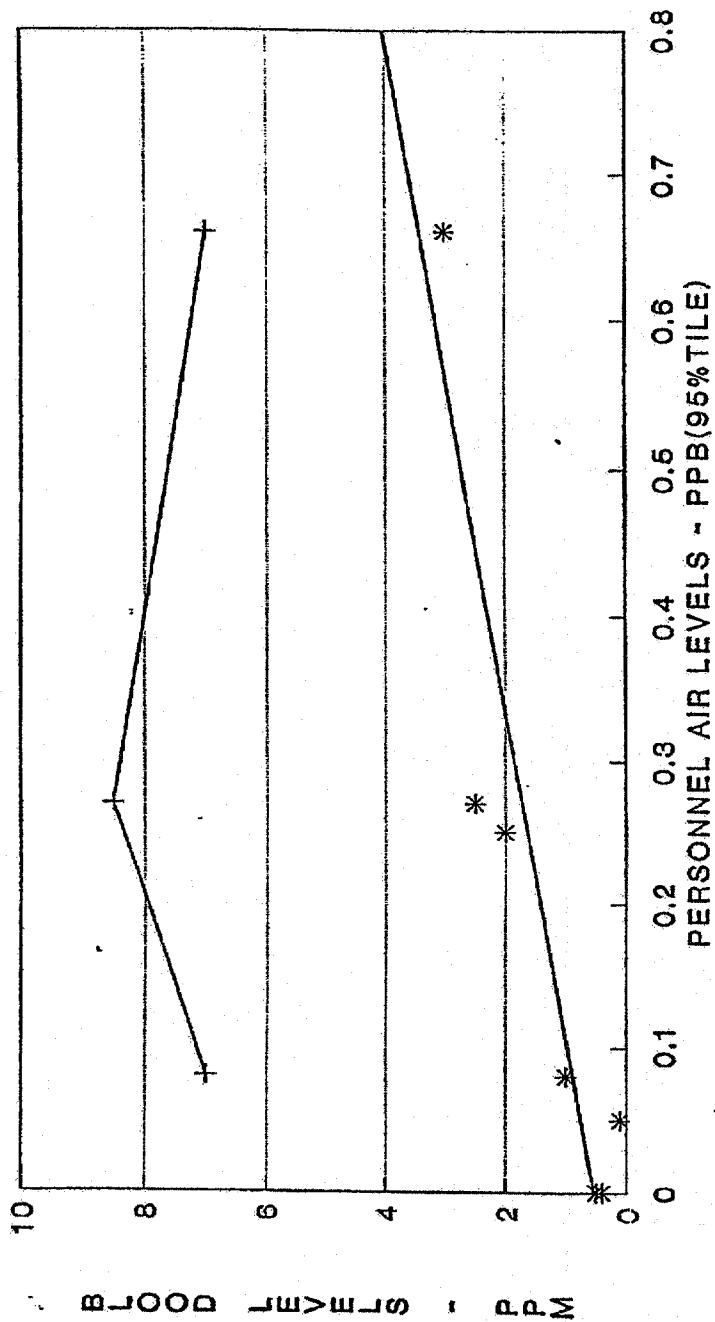
<u>PERIOD</u>	<u>POPULATION</u>	<u><=1PPM (%)</u>	<u><=5PPM (%)</u>
1984-86	108	67	92
1987-88	58	50	90
1989	41	59	83
1990	21	90	100

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WASHINGTON WORKS DATA

BLOOD LEVELS VS. AIR EXPOSURE LEVELS

(BY JOB)



HASmith
Oct 90

1990 C-8 INDUSTRIAL HYGIENE DATA REVIEW

(HA Smith, JG Loschiavo, RD Lanyon, WE Crawley)

CONCLUSIONS (Recognizing the data limitations)

There is a correlation between blood and air C-8 levels that is confused by dermal exposure.

Exposure at the AEL of 0.56 mpb would result in a blood level of about 3 ppm.

Background blood level for the Teflon* area is between 0.1 and 0.5 ppm.

Dermal exposure is the cause for higher blood levels.

Half life for C-8 in blood is about 4 to 5 years.

Annual blood testing is not useful and should be replaced by "snapshots" at longer intervals.

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