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AR226-1617

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July 14, 1982

PERSONAL AND CONFIDENTIAL

TO: R. J. BURGER

FROM: J. G. LOSCHIAVO J.G.L.

TRENDS IN BLOOD C-8 LEVELS FOR VARIOUS TEFLON® EMPLOYEE GROUPS

SUMMARY

Comparison of data for sample results obtained up to October, 1981 with corresponding data up to June, 1982 shows:

- For 40 FEP Operators, blood C-8 levels decreased an average 23%.
- For 85 Fine Powder and Granular Operators, blood C-8 levels decreased an average 18%.
- New TEFLON® employees are accumulating C-8 at a lower rate than in previous years.
- Fine Powder Zone 6 Operators still have the highest blood C-8 levels.
- Blood C-8 levels in females transferred out of TEFLON® are continuing to decrease.

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DISCUSSION

The attached Tables contain C-8 in blood data for various employee groups in the TEFLON® Divisions. Blood C-8 data were obtained from the FLAIR program. The FLAIR program has proven itself as a valuable tool in aiding in the analysis of blood C-8 data. All blood samples were analyzed by the C-8 specific method. Data recorded in FLAIR by 6/24/82 are used in this summary. Comparisons are made between the data recorded in FLAIR up to October, 1981 with corresponding data up to June, 1982. The following observations are made:

- FEP Operators are experiencing an overall drop in blood C-8 levels of 23%. The decrease for those Operators with over 700 days of service is statistically significant at the 0.05 level using the paired t-test.
- Fine Powder Operators are experiencing an overall drop in blood C-8 levels of 12%. Granular Operators are experiencing a drop of 22%. The decreases for Operators with over 700 days of service is not yet statistically significant.
- Blood C-8 levels in new TEFLON® employees (those with less than 700 days of service) are increasing. However, their levels are increasing at a slower rate than they were in previous years. The average rate of increase for TEFLON® Fine Powder Zone 4 Operators using data collected up to October, 1981 was 0.0019 ppm/day. Using only 1982 data, the average rate of increase has dropped to 0.0004 ppm/day.
- Fine Powder Zone 6 Operators continue to have the highest blood C-8 levels. They average 8 ppm and range as high as 26 ppm. TEFLON® Zone 6 Operators have higher blood C-8 levels than TEFLON® Zone 4 Operators. This is because C-8 accumulates in the body over time. Zone 6 Operators have worked in TEFLON® much longer than Zone 4 Operators. Operators from four other Divisions at Washington Works have very low but measurable quantities of C-8 in their blood.
- Blood C-8 levels in females transferred out of TEFLON® dropped an average 19% over an average 161-day period. This includes only females with 0.1 ppm or more C-8 in their blood. The rate of C-8 elimination in females with less than 0.1 ppm is very slow. It is essentially zero for this group.

CONCLUSION

The diligent efforts on the part of TEFLON® Production and Technical to reduce C-8 air levels are paying off. Significant decreases in employee blood C-8 levels are now being seen. Efforts must be continued in the TEFLON® Divisions to control C-8. Both air and blood sampling programs should continue at their present rates. It is important to prevent overconfidence which could lead to overlooking items and thus minimizing effectiveness of current programs.

Attachments

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TABLE 1

BLOOD C-8 LEVELS IN FEMALES TRANSFERRED OUT OF TEFLON®

A. FEMALES WITH BLOOD C-8 LEVELS AT OR ABOVE 0.1 ppm				
AGE AT LATEST BLOOD TEST	C-8 LEVEL WHEN LEAVING TEFLON® (ppm)	C-8 LEVEL AFTER LEAVING TEFLON® (ppm)	NO. OF DAYS SINCE LEAVING TEFLON®	% CHANGE IN C-8 LEVELS
33	0.14	0.086	143	- 38.6
42	1.9	1.2	288	- 36.8
26	1.0	0.65	282	- 35.0
27	0.57	0.39	140	- 31.6
33	1.3	0.98	114	- 24.6
24	0.11	0.086	107	- 21.8
35	0.10	0.080	178	- 20.0
27	2.4	2.0	126	- 16.7
32	0.83	0.70	113	- 15.7
28	0.11	0.093	106	- 15.5
35	0.14	0.12	303	- 14.3
26	5.1	4.4	112	- 13.7
30	0.19	0.17	176	- 10.5
25	0.13	0.12	161	- 7.7
38	4.5	4.2	125	- 6.7
28	2.5	2.6	108	+ 4.0*
AVERAGE =			161	- 19.1 + 11.5
B. FEMALES WITH BLOOD C-8 LEVELS BELOW 0.1 ppm				
27	0.078	0.067	321	- 14.1
22	0.061	0.053	107	- 13.1
25	0.045	0.041	96	- 8.9
24	0.092	0.092	106	0.0
33	0.019	0.019	296	0.0
AVERAGE =			185	- 7.2 + 6.1

* This is probably due to analytical error.

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TABLE 2
SUMMARY OF WASHINGTON WORKS EMPLOYEES' C-8 IN BLOOD LEVELS

<u>GROUP</u>	<u>NO. OF SAMPLES</u>	<u>RANGE (ppm)*</u>	<u>AVERAGE (ppm)*</u>
Fine Powder/Dispersion Zone 6 Operators	21	1.3 - 26.0	8.0
FEP Zone 6 Operators	15	0.3 - 9.6	3.0
Granular Zone 6 Operators	10	0.2 - 9.1	2.7
Fine Powder/Dispersion Zone 4 Operators	37	0.02 - 6.9	1.9
TEFLON® Polymers Production Foremen	23	0.1 - 2.8	1.2
TEFLON® Monomer Operators	31	0.2 - 6.5	1.1
Granular Zone 4 Operators	17	0.01 - 4.3	0.6
Laboratory**	67	0.01 - 3.2	0.6
TEFLON® Copolymers Production Foremen	19	0.03 - 2.1	0.5
TEFZEL®/Telomer "A" Operators	26	0.02 - 1.8	0.5
FEP Zone 4 Operators	25	0.01 - 1.6	0.5
Mechanics	98	0.04 - 1.6	0.4
Research (Engineers & Chemists)	8	0.09 - 0.6	0.3
TEFLON® Polymers Technical	29	0.03 - 0.6	0.2
TEFLON® Polymers Maintenance Supervision	15	0.06 - 0.4	0.2
TEFLON® Copolymers Maintenance Supervision	2		0.2
TEFLON® Copolymers Technical	16	N.D.***- 0.5	0.1
LUCITE® Zone 4 Operators	4	0.02 - 0.2	0.08
DELTRIN® Zone 6 Operators	2	0.02 - 0.1	0.07
Filaments Zone 4 Operators	3	N.D. - 0.09	0.05
ZYTEL® Zone 6 Operators	2	0.02 - 0.04	0.03

* Only the most current blood C-8 sample result for each employee was used to determine ranges and averages.

** The Laboratory group includes Trainees, Senior Laboratorians, Lab Analysts, Research Analysts, and Lab Supervision.

*** N.D. = None Detected (< 0.007 ppm).

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TABLE 3

TRENDS IN BLOOD C-8 AVERAGES FOR TEFLON® ZONE 4 AND ZONE 6 OPERATING GROUPS

GROUP	AVG. C-8 LEVEL USING DATA RECORDED IN FLAIR BY 10/19/81 (ppm)	NO. OF SAMPLES	AVG. C-8 LEVEL USING DATA RECORDED IN FLAIR BY 6/24/82 (ppm)	NO. OF SAMPLES	% CHANGE IN C-8 LEVELS
Fine Powder - Zone 6	9.8	16	8.0	21	-18
FEP - Zone 6	4.4	10	3.0	15	-32
Granular - Zone 6	3.3	9	2.7	10	-18
Fine Powder - Zone 4	2.0	16	1.9	37	- 5
Granular - Zone 4	0.8	14	0.6	17	-25
FEP - Zone 4	0.6	10	0.5	25	-17

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TEFLON® FINE POWDER SERVICE OPERATORS - ZONE 4

REFERENCE NUMBER	DATE OF FIRST SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	DATE OF SECOND SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	WORKED OTHER TEFLON® JOB(S) BEFORE THIS JOB (YES/NO)	AVG. DAILY RATE OF C-8 DECREASE OR INCREASE (ppm/Day)
	4/27/81	0.420	0	10/14/81	1.400	170	YES	+ 0.0058
	4/14/81	1.100	317	9/10/81	1.500	466	NO	+ 0.0027
	4/27/81	0.031	2	7/1/81	0.200	67	NO	+ 0.0026
	8/25/81	0.610	121	1/13/82	0.920	262	NO	+ 0.0022
	7/24/81	0.760	73	2/3/82	1.100	267	YES	+ 0.0018
	4/7/81	3.600	462	3/11/82	3.900	800	NO	+ 0.0009
	10/7/81	0.039	3	12/18/81	0.099	75	NO	+ 0.0008
	8/28/81	0.300	124	1/14/82	0.350	263	YES	+ 0.0004
	10/7/81	0.007	3	12/4/81	0.021	61	NO	+ 0.0002
	8/24/81	1.500	601	2/9/82	1.500	770	NO	0.0000
	4/8/81	3.500	738	8/19/81	3.500	871	NO	0.0000
	8/28/81	0.650	124	12/9/81	0.640	227	YES	- 0.0001
	10/14/81	0.740	531	2/3/82	0.700	643	NO	- 0.0004
	8/31/81	1.700	1,065	1/19/82	1.600	1,206	NO	- 0.0007
	4/6/81	4.300	461	8/26/81	4.000	603	NO	- 0.0021
	5/4/81	3.900	1,310	3/11/82	2.600	1,621	NO	- 0.0042
	5/7/81	4.800	725	12/30/81	3.600	962	NO	- 0.0051

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TABLE 5

TEFLON® TFE PROCESS OPERATORS - FINE POWDER - ZONE 6

REFERENCE NUMBER	DATE OF FIRST SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	DATE OF SECOND SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	WORKED OTHER TEFLON® JOB(S) BEFORE THIS JOB (YES/NO)	AVG. DAILY RATE OF C-8 DECREASE OR INCREASE (ppm/Day)
	8/20/80	24.000	8,846	1/14/82	26.000	9,358	NO	+ 0.0039
	4/6/81	4.300	857	9/1/81	4.400	1,005	NO	+ 0.0007
	8/18/80	29.000	9,726	3/19/82	20.000	10,314	NO	- 0.0153
	7/6/81	32.000	2,105	2/18/82	24.000	2,332	NO	- 0.0352

TABLE 6

TEFLON® COPOLYMERS FEP SERVICE OPERATORS - ZONE 4

4/29/81	0.009	1	9/10/81	0.150	135	NO	+ 0.0011
9/22/81	0.100	295	4/7/82	0.230	492	NO	+ 0.0007
10/7/81	0.021	3	2/5/82	0.053	124	NO	+ 0.0003
10/13/81	0.013	2	3/25/82	0.052	165	NO	+ 0.0002
10/13/81	0.039	2	1/14/82	0.051	95	NO	+ 0.0001
4/21/81	1.250	732	10/9/81	1.200	903	NO	- 0.0003
4/30/81	0.760	115	9/28/81	0.660	266	NO	- 0.0007
4/7/81	1.700	827	8/18/81	1.600	960	NO	- 0.0008

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TABLE 7

TEFLON® COPOLYMERS POLYKETTLE FEP OPERATORS - ZONE 6

REFERENCE NUMBER	DATE OF FIRST SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	DATE OF SECOND SAMPLE	C-8 IN BLOOD (ppm)	DAYS IN JOB AT SAMPLE DATE	WORKED OTHER TEFLON® JOB(S) BEFORE THIS JOB (YES/NO)	AVG. DAILY RATE OF C-8 DECREASE OR INCREASE (ppm/Day)
	8/29/80	4.000	6,846	10/14/81	4.500	7,257	NO	+ 0.0012
	8/29/80	1.900	8,733	1/27/82	1.800	9,249	NO	- 0.0002
	8/19/80	7.800	7,729	9/25/81	7.500	8,131	YES	- 0.0007
	8/29/80	1.500	7,760	8/13/81	1.200	8,109	NO	- 0.0009
	4/1/81	1.300	5,449	3/31/82	0.950	5,813	YES	- 0.0010
	8/26/80	6.600	7,757	8/7/81	5.300	8,103	NO	- 0.0038
	8/26/80	5.500	9,112	8/5/81	4.200	9,456	NO	- 0.0038
	8/20/81	13.000	7,940	7/17/81	9.600	8,271	YES	- 0.0103
	8/27/81	5.800	9,279	2/2/82	3.100	9,438	NO	- 0.0170

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