PERSONNEL EXPOSURE TO

HEXACHLORINATED ORGANICS

AT

THE CHLORINATED SOLVENTS PLANT

1981

ENVIRONMENTAL HEALTH SURVEY REPORT

1981

PERSONNEL EXPOSURE TO HEXACHLORINATED ORGANICS

AT THE CHLORINATED SOLVENTS PLANT

INTRODUCTION

A survey of personnel exposure to chlorinated hex compounds was conducted between August and October, 1981. Chemicals monitored were hexachloroethane (TLV 1,000 ppb), hexachlorobutadiene (TLV 50 ppb), and hexachlorobenzene (TLV 100 ppb). This report describes the time weighted average exposures of plant personnel over an 8 hour period.

ANALYTICAL PARAMETERS

A Varian, Model 4600, gas chromatograph equipped with a Ni^{63} electron capture detector was used for the analyses. Chromatographic conditions were as follows:

COLUMN	6' X ¼" glass column, 3% SP2250 on Supelcoport	
TEMPERATURES	Oven:	120°C (5 minutes) programed at 25°/min to 195°C
	Detector:	300°C
	Injector:	250°C
CARRIER GAS	Nitrogen	
SAMPLE SIZE	1 microliter	

MONITORING PROCEDURE

SP-1 personal sampler pumps were worn by employees while performing their normal duties. A 4" X 0.25" glass tube, prepacked with Poropak QS chromatographic column packing was attached to the end of a 2 foot length of PVC tubing connected to the sample pump inlet. The tube assembly was attached to the employee's clothing in the vicinity of the air breathed by the employee.

SAMPLE PREPARATION

Samples were desorbed by placing the Poropak packing into 10 ml. of Hexane and shaking periodically for 1 hour. Analysis was then performed by electron capture detection gas chromatography and the resulting peak area measured via integrator, calibrated daily.

CALCULATIONS

$$ppb(v) = \frac{ng \times 24.45}{L \times MW \times RR}$$

Where:

- ng = nanograms from integrator data
- 24.45 = liters occupied by 1 mole of gas at sampling conditions
- L = liters of air sampled
- MW = molecular weight of component
- RR = recovery rate of component

RESULTS AND DISCUSSION

Table I gives individual hex exposures, grouped by job classification.

Table II is a summary of 1981 survey results according to the job each person was performing at the time they were monitored.

Table III is a comparison of overall survey results from 1976 through the current survey.

Tables IV, V, and VI are survey comparisons for each of the three hexes broken down by job type.

Table VII gives wipe sampling results.

Table VIII is a summary of hex blood level results from 1974 through 1981. Reading from left to right in a straight line, the average blood level for personnel working in the block for the number of years given at the top of the column is indicated. Directly below is the "high" for that particular group. The next line, labelled "#", indicates the number of people in each group. By reading diagonally, from upper left to lower right, it is possible to follow the yearly progress of each particular group of people. On the right side of the Table are three additional columns. The first gives the percent of all blood levels done each year (excluding those on persons in the block less than 1 year) that were above 150 ppm. The second column gives the number of levels above 150 ppm. The last column is the average of all those levels above 150 ppm in the given year.

Because a change was made in 1981 in the analytical method used to determine blood hex levels, the values used on the chart for '81 are calculated values representing 73% of the blood levels actually reported. (This factor was determined by comparison of values reported on split samples run by both methods.) On next year's report, actual values from this year will be substituted for the calculated figures used in this report.

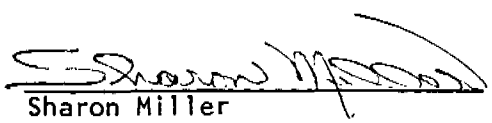
RESULTS AND DISCUSSION (cont.)

Survey results overall seem to indicate a leveling off of hex exposure following the dramatic drop seen after the major block clean-up in mid-'78. 1981 results show only slight variations (±3 ppb) overall from the preceeding two surveys.

The same trend is seen in levels of HCBz in the blood of block employees. Prior to 1978, HCBz blood levels of operations personnel hired into the block normally reached or exceeded 100 ppb within 2 to 3 years. However, of 35 people hired from 1976 to 1980, only 1 has exceeded 100 ppb (in '80) and this level returned to around the 60 to 70 ppb range on subsequent blood tests.

Wipe samples were somewhat lower than in previous years. The highs on the '81 survey were just under 11,000 nanograms per wipe. And all samples exceeding 5,000 ng. were located in the hex area of Per/Tet and in the Thermal Oxidizer area. In the past, levels of 6 figures were common in these areas. Inside samples did not exceed 125 except on the floor just inside the control room outside door which was about 3700 ng.

The good plant housekeeping which has been heavily encouraged for the past 3 years, appears to make a considerable difference, both in levels of hexes in the air and in the blood levels. It no longer seems quite so imperative to determine the exact source of hex accumulation in the blood - inhalation or skin absorption. Good operating practice, which has included respiratory protection and skin protection in the form of protective clothing, gloves and boots, combined with good plant housekeeping which prevents build-ups of hexes on outside equipment, seems to have arrested the climb of blood hex levels somewhere under 100 ppb in recent hires (last 5 years) while persons with previous high concentrations continue to improve-although somewhat more slowly, perhaps, than might have been expected given the 2½ year half-life of HCBz. However, it is a little early - at just under 3 years - to draw any firm conclusions about the effect of the plant clean-up on long-time block personnel with high blood levels. Perhaps the failure of new personnel to build levels above the 150 ppb biological limit can be considered an adequate indication of the effectiveness of the block hex control program.



Sharon Miller
Chlorinated Solvents

TABLE I

CHLORINATED SOLVENTS INDIVIDUAL HEX EXPOSURES BY JOB CLASSIFICATION

1981

COMPONENT:	HCE	HCBd	HCBz	
TLV (ppb):	1,000	50	100	REMARKS:
ENGINEERS/OFFICE				
Bob Rouse	.27	.03	.38	1½ hr.outside block, 1 plant walkthrough, inside
Don Kruelskie	.95	.23	.54	Plnt walkthrough,trip to bone yard,bal.inside
Charlie Heard	.43	.03	.79	Con.rm.4 hr, V_1 1 one hr, bal. in cont. bldg.
Jimmy Junkin	2.75	.51	.46	30 min.plnt tour-TOX & back of plnt,balance inside
Steve Newell	1.20	.23	.42	V201 ½, TOX ½, comp.hs ½, inst.shp½,inside
J.D. Orr	1.37	.50	.36	Hex & acid area walk through, balance inside.
Steve Settle	2.08	.78	.72	Acid sys 1, to warehouse once, balance inside.
Leslee Grace	.57	.25	.96	Secretary. Inside all day.
Brett McLeod	1.24	.44	.97	Inst.shop 2 hr,outside ¼ hr, balance inside
AVERAGE	1.21	.33	.62 ppb	
SHIFT SUPERVISORS				
Wayne DeLaune	1.68	.52	1.09	TOX area ¼, warehs ½,plnt rnd 3/4,inst.shp ¼, maint.shp ¼, D2C 5 min,balance inside.
John Grissom	3.65	1.63	1.83	Meetings 7 hours, shop & cont. rm. 1 hr.
Jesse Chemin	.67	.23	.47	Plant round. Inside balance.
Joe Debetaz	.14	.39	1.00	Walk thr: RiC, TOX, T16-17. AHCl trlr maint.
Cliff Thibodeaux	2.85	.29	.45	Plant rnd and inside.
Wayne Landry	2.80	.44	1.82	Plant rnd and inside.
AVERAGE	1.96	.58	1.11 ppb	

TABLE 1 (Page 2)
INDIVIDUAL HEX EXPOSURE
1981

COMPONENT:	HCE	HCBd	HCBz	REMARKS:
TLV (ppb):	1,000	50	100	
O.S.'s				
James Godeaux	1.32	.32	.74	123 board. Inside all day.
Rickey Vaughn	1.69	.39	1.01	P/T board. Inside all day.
Clayton Duck	4.72	1.79	3.00	P/T board. Inside all day.
Elmer Bourgeois	.67	.24	.57	123 SOT relief. TOX 1 hr, D55A ½, C7D 1, wrehse 1, V_2 area 1, AHCl car ½.
Jesse Theriot	.52	.20	1.49	P/T board. Inside all day.
Neal Donatto	.49	.18	1.03	123 board. Inside all day.
Wayne T. Landry	4.24	1.32	5.19	Rel.S.S. in Cn.Rm 4 hrs, train.in P/T 3½ hrs.
Joe Doucette	5.78	1.85	8.19	Rel.S.S. in Cn.Rm 11 hrs, ck.tnk.area ½ hr.
Don Zeringue	1.41	.54	.77	P/T board. Inside all day.
Glen Rachal	1.00	.36	1.25	P/T board. Inside all day.
Ernest Lee	2.14	.55	1.50	P.T board. Bleed off C42 P.C. loop ½, bal.inside.
Jeff Carpenter	5.70	.83	1.55	Sample man relief.P/T smpls ½, lab 2, inside balance.
John Thibodeaux	3.34	.32	.79	Rel. S.S. Plant walk thr., inside balance.
Sidney Hearns	1.89	.60	.65	EDO. T66 firewtch, E55C reboiler ½, safety mtng 1½.
Wayne Miller	2.50	.78	.65	Lab. catch 2 samples, rep.both crude GC's all day.
AVERAGE	2.49	.67	1.89	

TABLE 1 (Page 3)
INDIVIDUAL HEX EXPOSURE
1981

COMPONENT:	HCE	HCBd	HCBz	REMARKS:
TLV (ppb):	1,000	50	100	
S.O.T.'s				
Ralph Butler	.83	.29	.38	Load.coor. H_2SO_4 area 1½, ck.tnk.area & shop, inside
Art Jackson	5.36	1.56	.93	TOX man. Firewtch in TOX area 2½, balance inside.
Jerry Jackson	1.47	.40	.84	
Sidney Carriere	6.56	1.96	2.93	P/T outside man.
Barry Boudreaux	5.00	1.32	7.16	TOX SOT.Bleed DTH line ½, #'s area ½, TOX maint. 2, C-1002 smple, E16C work, D-13/F-700 area (purge hex line) ½ hr.
Mike Brown	1.25	.39	.94	TOX SOT. D67C hv.evap.2, Unplug D67C vent pot btm. line 2 hr, chk for P/T leak 1 hr, hook N_2 to T96 vent 1 hr.
John Mathis	4.07	.72	.73	TOX SOT. Pull strngr D67C pot - 2 min, ck tnk area ½, TOX area 1, shop ½, balance inside.
Butch Prestonback	6.25	.89	1.02	P/T outside. Rod taps D67C reblr - 1 hr, comp.hse ½, drain C-59 frwrd flow 1½, V201 & 1002 area round and sample.
Huey Young	4.97	1.31	4.42	P/T outside.
Ralph Amar	4.79	1.19	.68	EDO.Stencil lines:T/C rck & Cén.rck, TF to T63, T95 to T/C rack. Safety meeting.
Alton Anderson	2.97	.79	2.42	123 outside SOT. Samples ea. 3 hrs, R52A temp probe, ck.tnk.area samples, C70 samples.
Chip Brown	2.63	.74	1.24	P/T outside man.
Gary May	.31	1.04	.78	TOX SOT.System down. Safety observer 4, HCl & P/T.
Glyn Boudreaux	1.69	.55	1.04	123 outside 3 hrs, 123 board train. balance.
Greg Chustz	6.94	2.57	6.53	P/T SOT. round 1 hr, unplg E16 ½, prime ck.tnk pump 1 hr, C train ½, unplg D2c level ½, comp.rnd 1.
Mac McCraine	.53	.32	1.04	Material Cont. Warehouse all day.
Sharon Miller	.63	.23	1.61	Lab.Sample collect. ½, TOX (down) ¼, bal.inside.
AVERAGE	3.57	1.02	1.99 ppb	

TABLE 1 (Page 4)
INDIVIDUAL HEX EXPOSURE
1981

COMPONENT:	HCE	HCBd	HCBz	REMARKS:
TLV (ppb):	1,000	50	100	
O.T.'s				
Randy Landry	.46	.18	.88	EDO. AHCl/V_2 ½. Tank farm (107A,B) all day.
Craig Landry	7.30	10.23	.45	Sample man. Smple collec. ¼, lab 1½, AHCl car leak 3½, cont. room 1 hr.
Rusty Carpenter	.19	.11	.77	AHCl man. Routine.
Rodney Roubique	2.68	.41	.72	Sample man. Routine sample collection & analysis. Strong hex smell on route between labs.
Bobby Arnold	1.06	.47	.71	AHCl man. Routine.
Jeff Cooper	1.75	.37	.47	123 samples ¼, CR 1, AHCl 4 hrs.
Brian Joffrion	.44	.18	.69	AHCl man.
Dean Hebert	1.45	.45	1.07	Sample man. Smple collec. 2 hr,lab 2, saf.mtng 3/4.
Ken Hall	9.51	.33	.60	Sample man. Routine smpling + T-5&6 (P/T), AHCl aid.
Sidney Hotard	.84	.22	.42	Load Man. Tnk.frm ½, CR 1, lab 3 3/4, Cn.Rck ½, HCl TT rck 2 hr.
AVERAGE	2.57	1.30	.68 ppb	
NOT INCLUDED IN SURVEY:				
Darryl Lafleur	26.81	12.21	2.23	Load man. Wore pump 4 hours then got per spilled on him. Not around concentrated hexes at all.
INSTRUMENT DEPARTMENT				
Leo Dronett	3.16	.60	8.16	Inst. Super.
Mark Rome	.34	.19	2.52	Inst. shop 3 hr, PCS 2 hr, Con.rm. 1, Contr.Rm. 1.
Ernest Garner	1.60	.58	.67	
Mike LeBlanc	1.74	.42	13.76	Calibrate oxygen analyzers 1 hr, block limit 2 hr, balance in C.R. & shop.
Ernest Garner	.15	.07	1.81	Ret.canal pH, Inst. shop, tank farm pH.
AVERAGE	1.40	.37	5.38 ppb	

TABLE I (Page 5)
INDIVIDUAL HEX EXPOSURE
1981

COMPONENT:	HCE	HCBd	HCBz	REMARKS:
TLV (ppb):	1,000	50	100	
MILLWRIGHTS				
Al Bahan	1.61	.26	.52	P22D (acid) 1 hr, P93A & C91 reflx (B-tri), C70 in shop (123), balance inside.
Huey White, Jr.	4.93	2.54	2.40	Change hex pump 1 hr (FF mask), P22D.
AVERAGE	3.27	1.40	1.46 ppb	
PIPEFITTERS				
John Tullier	2.53	.20	.81	
Warren Olivier	.11	.09	.40	AHCl for measurements, balance shop.
Al Falcon	1.06	.22	.63	
Dan Falcon	1.95	.91	2.76	Tank farm, acid system (alot of fumes)
Joe DeRose	.80	.30	.84	Acid area 2 hr, shop 6 hours.
Greg Marks	18.15	10.43	7.14	Remove hex line from 123 to oxydizer 7 hrs.
Greg Marks	3.29	3.87	3.47	P/T 4 hrs., street 4 hrs (AHCl car spill)
Jackie Haydel	5.67	2.50	2.79	In shop all day.
Daryl Levigne	2.10	.50	.93	T14 top ¼, piperack by C.R. ¼, shop rest of day.
Robert Richard	14.62	1.97	2.32	Hex piping removal.
Daryl Levigne	37.09	14.61	21.02	Remove hex line 123 to oxydizer 7 hrs.
AVERAGE	7.94	3.24	3.92 ppb	
PAINTER				
Willie Cooley	8.81	12.19	.86	Worked on TOX ditch putting material in buckets.
SUPERVISOR				
Phil Dozier	1.00	.32	2.68	

TABLE I (Page 6)
INDIVIDUAL HEX EXPOSURE
1981

COMPONENT:	HCE	HCBd	HCBz	REMARKS:
TLV (ppb):	1,000	50	100	
LABORERS				
Willy Hynes	1.61	1.29	1.13	Janitor. Inside all day.
Greg Skidmore	1.65	.24	.99	123 area in AM, street in PM (AHCl car spill)
Dennis Thomas	3.02	1.19	5.36	" "
AVERAGE	2.09	.90	2.49 ppb	
ELECTRICIANS				
Roy Hebert	3.48	.90	4.34	All day in cont. rm. & N.W. motor cont. center.
Ron Ducote	5.62	.53	3.20	
AVERAGE	4.55	.72	3.77 ppb	
OVERALL CONTRACT AVG.	6.22	2.88	3.26	
OVERALL DOW AVERAGE	2.47	.80	1.76	

TABLE II

1981 HEX SURVEY RESULT SUMMARY BY JOB (Results in parts per billion)

	HCE	HCBD	HCBZ
Engineers, office	1.21	.33	.62
Shift Supervisors	1.96	.58	1.11
Relief Supervisors	4.45	1.17	4.72
Lab	1.56	.50	1.13
Loading	.84	.26	.40
EDO	2.38	.66	.74
Per/Tet Board	1.91	.64	.74
123 Board	.90	.25	.89
Per/Tet Outside Man	5.49	1.49	3.23
123 SOT	1.64	.49	1.24
Instrument Men	1.40	.37	5.38
AHCl Man	.86	.28	.66
Sample Man	5.33	2.45	.88
TOX Man	4.52	1.35	2.14
Material Cont.	.53	.32	1.04
Overall Average	2.5	.8	1.8
T.L.V.	1000	50	100
Exp. as % of TLV	0.3%	2%	2%

DO 010810
CONFIDENTIAL

TABLE III

SOLVENTS HEX SURVEY COMPARISON

	'76	'77	'77	'78	'78	'79	'81		TLV
HEXACHLOROETHANE									
DOW	7.3	27.8	56.3	29.2	2.6	6.1	2.5		1000
CONTRACT	3.8	19.8	37.8		1.8	9.4	6.2		
HEXACHLOROBUTADIENE									
DOW	20.3	29.8	11.5	5.6	2.0	2.3	0.8		50
CONTRACT	20.7	29.2	7.1		2.6	3.2	2.9		
HEXACHLOROBENZENE									
DOW	3.5	13.0	10.4	8.9	1.0	1.5	1.8		100
CONTRACT	2.7	10.1	9.8		.6	1.3	3.3		
	BASED ON 76 SAMPLES	BASED ON 73 SAMPLES	BASED ON 80 SAMPLES	BASED ON 14 SAMPLES	BASED ON 84 SAMPLES	BASED ON 55 SAMPLES	BASED ON 83 SAMPLES		

DO 010811
CONFIDENTIAL

TLV 1,000 PPb

TABLE IV

PERSONNEL EXPOSURE TO HEXACHLOROETHANE BY JOB CLASSIFICATION (in PPb)

	'75	'76	'77	'77	'78	'78	'79	'81
Engineers, office	69.8	7.8	9.5	20.3	23.0	2.6	3.3	1.2
Shift Supervisors	32.7	5.9	14.6	42.1	20.0	2.5	6.0	2.0
O.S. Per/Tet			5.2	17.3	18.5	1.4	2.5	1.9
Relief						1.7	4.9	4.5
V_2, 123	17.2				22.0	3.0	2.5	0.9
S.O.T. Per/Tet	23.4		6.5	38.4	40.0	3.5	13.2	5.5
Sample Man			7.6	16.5		2.7	see	O.T.
123								1.6
TOX								4.5
Material Cont.						2.5		0.5
O.T. Sample Man							3.6	5.3
AHCl	10.0				25.5	1.4	5.4	0.9
Lab						2.1	3.6	1.6
Loading								0.8
EDO	30.3					2.6	7.5	2.4
Instrument men		6.4	14.4	19.0		4.1	10.9	1.4
Contract		3.8	16.5	26.5		1.0	4.3	
Laborers			24.4	76.7		3.8	52.8	2.1
Pipefitters				32.9		0.9	4.6	7.9
Millwrights				35.0				3.3
Electrician								4.6
Painter				22.5				8.8
OVERALL AVERAGE, DOW		7.3	27.8	56.3	29.2	2.6	6.1	2.5
OVERALL AVERAGE, CONTRACT		3.8	19.8	37.8		1.8	9.4	6.2

DO 010817
CONFIDENTIAL

TLV 50 PPb

TABLE V

PERSONNEL EXPOSURE TO HEXACHLOROBUTADIENE by JOB CLASSIFICATION (PPb)

	'75	'76	'77	'77	'78	'78	'79	'81
Engineers, office	5.7	14.2	17.9	13.8	5.5	3.3	1.6	0.3
Shift Supervisors	6.2	24.2	9.9	5.9	7.0	1.7	3.5	0.6
O.S.		23.5	39.0	11.5				
Per/Tet (board)	3.4		17.4	22.1	4.5	1.1	0.6	0.6
Relief						1.0	1.3	1.2
V_2, 123	5.0				4.0	1.5	0.7	0.3
S.O.T.		19.6	28.6	17.7				
Per/Tet	10.7		35.6	34.1	5.0	3.0	4.3	1.5
Sample Man	2.0		44.1	19.0		2.0	see "OT"	
123								0.5
TOX								1.4
Material Cont.	1.0							0.3
O.T. Sample Man							1.6	2.5
AHCl	0.6					0.8	2.8	0.3
Lab						1.8	1.3	0.5
Loading								0.3
EDO	4.6					2.6	4.2	0.7
Instrument Men		13.7	23.0	2.7		1.1	3.0	0.4
Contract		20.7	30.0	5.7		0.7	2.0	
Laborers			13.1	22.9		7.1	15.0	0.9
Pipefitters				6.6		0.9	1.9	3.2
Millwrights				4.6				1.4
Electrician								0.7
Painter				2.6				12.2
Overall Avg. DOW		20.3	29.8	11.5	5.6	2.0	2.3	0.8
Overall Avg. CONTRACT		20.7	29.2	7.1		2.6	3.2	2.9

DO 010813
CONFIDENTIAL

TLV 100 PPb (To go to 150 ng in blood)

PERSONNEL EXPOSURE TO HEXACHLOROBENZENE By JOB CLASSIFICATION (in PPb)

	'75	'76	'77	'77	'78	'78	'79	'81
Engineers, office	14.7	1.9	5.7	7.8	4.5	1.2	1.1	0.6
Shift Supervisors	5.4	3.1	13.7	11.6	8.0	0.8	1.3	1.1
O.S.			10.3	10.4		1.1		
Per/Tet (board)	0.8	3.4	2.9	5.5	6.0	1.1	1.2	1.5
Relief						1.0	0.8	4.7
V_2, 123	1.4				8.5	1.1	1.0	0.9
S.O.T.		3.9	8.9	16.7				
Per/Tet	6.0		15.0	8.4	16.0	1.3	2.6	3.2
Sample Man						1.3	see "OT"	
123								1.2
TOX								2.1
Material Cont.			2.1	13.6		1.3		1.0
O.T.	0.7	4.1	24.3	5.2	4.5			
Sample Man							1.5	0.9
AHC1	1.7					0.6	0.8	0.7
Lab						1.1	0.9	1.1
Loading								0.4
EDO	3.3					0.8	1.8	0.7
Instrument men		7.3	10.1	6.4		1.0	1.9	5.4
Contract		2.7	10.8	10.0		0.3	1.0	
Laborers			5.2	11.4		1.2	3.1	2.5
Pipefitters				10.6		0.4	1.1	3.9
Millwrights				7.1				1.5
Electrician								3.8
Painters				0.9				0.9
Overall Avg. DOW		3.5	13.0	10.4	8.9	1.0	1.5	1.8
" " Contract		2.7	10.1	9.8		0.6	1.3	3.3

DO 010814
CONFIDENTIAL

TABLE VIII YEARLY COMPARISON OF BLOOD HEX LEVELS

	No. years in plant→	<1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Percent of tota results >150 (<1 yr. levels excluded)	No. levels >150	Average of all levels >150	
1974	A	20	53	55		367	472	553	666	528	310	434			513		452								73.9	17	555.2	19
	H	65	93			417		698	1121	930		515			707		561											
	#	5	3	1		2	1	3	4	2	1	2			2		2											
1975	A	11	45	148	97		340	266	546	754	418	192	389			529		416							73.1	19	460.2	19
	H	20	72	203			353		940	990	500		420			688		441										
	#	2	4	3	1		2	1	3	3	2	1	2			2		2										
1976	A	5	37	65	106	95		193	280	356	400	267	20	217			273		264						56.3	18	304.9	19
	H	10	60	106	216			200		413	600	430		237			378		305									
	#	4	4	5	3	1		2	1	3	4	2	1	2			2		2									
1977	A	28	38	109	96	139	85		174	235	309	348	309	118	274			202		229					55.3	21	264.2	19
	H	30	55	210	144	163			198		404	467	432		351			261		275								
	#	2	5	6	5	3	1		2	1	3	4	2	1	2			2		2								
1978	A	7	42	44	136	97	114	92		109	256	276	271	281	150	192			199		228				41.8	18	244.3	19
	H	11	54	69	199	128	172			122		319	383	360		234			258		296							
	#	3	3	6	5	5	3	1		2	1	3	4	2	1	2			2		2							
1979	A	<3	18	33	44	93	109	111	93		140	198	217	235	305	115	186			193		192			38.6	17	227.2	19
	H	<3	29	68	71	157	206	170					256	332	451		220			298		264						
	#	11	3	3	6	6	5	3	1		1	1	3	4	2	1	2			2		2						
1980	A	<3	19	42	49	37	75	124	88	39		83	164	223	198	250	59	139			159		122		20.4	10	204.6	19
	H	7	110	54	60	58	127	163	142					235	233			151			218		140					
	#	6	13	3	3	5	6	5	2	1		1	1	2	4	1	1	2			2		2					
1981	A	<3	16	33	48	99	59	110	93	54			83	210	224	236	380	118	173			212		216	23.1	12	232.0	19
	H	6	23	57	53		82	180	133						231	335			174					248				
	#	6	7	13	3	1	6	5	5	1			1	1	2	4	1	1	2			1		2				
1982	A																											
	H																											
	#																											

DO 010816
CONFIDENTIAL

TABLE VIII YEARLY COMPARISON OF BLOOD HEX LEVELS

No. years in plant→		<1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Percent of total results >150 (<1 yr. levels excluded)	No. levels >150	Average of all levels >150	
1974	A	20	53	55		367	472	553	666	528	310	434			513		452								73.9	17	555.2	1974
	H	65	93			417		698	1121	930		515			707		561											
	#	5	3	1		2	1	3	4	2	1	2			2		2											
1975	A	11	45	148	97		340	266	546	754	418	192	389			529		416							73.1	19	460.2	1975
	H	20	72	203			353		940	990	500		420			688		441										
	#	2	4	3	1		2	1	3	3	2	1	2			2		2										
1976	A	5	37	65	106	95		193	280	356	400	267	20	217			273		264						56.3	18	304.9	1976
	H	10	60	106	216			200		413	600	430		237			378		305									
	#	4	4	5	3	1		2	1	3	4	2	1	2			2		2									
1977	A	28	38	109	96	139	85		174	235	309	348	309	118	274			202		229					55.3	21	264.2	1977
	H	30	55	210	144	163			198		404	467	432		351			261		275								
	#	2	5	6	5	3	1		2	1	3	4	2	1	2			2		2								
1978	A	7	42	44	136	97	114	92		109	256	276	271	281	150	192			199		228				41.8	18	244.3	1978
	H	11	54	69	199	128	172			122		319	383	360		234			258		296							
	#	3	3	6	5	5	3	1		2	1	3	4	2	1	2			2		2							
1979	A	<3	18	33	44	93	109	111	93		140	198	217	235	305	115	186			193		192			38.6	17	227.2	1979
	H	<3	29	68	71	157	206	170					256	332	451		220			298		264						
	#	11	3	3	6	6	5	3	1		1	1	3	4	2	1	2			2		2						
1980	A	<3	19	42	49	37	75	124	88	39		83	164	223	198	250	59	139			159		122		20.4	10	204.6	1980
	H	7	110	54	60	58	127	163	142					235	233			151			218		140					
	#	6	13	3	3	5	6	5	2	1		1	1	2	4	1	1	2			2		2					
1981	A	<3	16	33	48	99	59	110	93	54			83	210	224	236	380	118	173			212		216	23.1	12	232.0	1981
	H	6	23	57	53		82	180	133						231	335			174					248				
	#	6	7	13	3	1	6	5	5	1			1	1	2	4	1	1	2			1		2				
1982	A																											
	H																											
	#																											