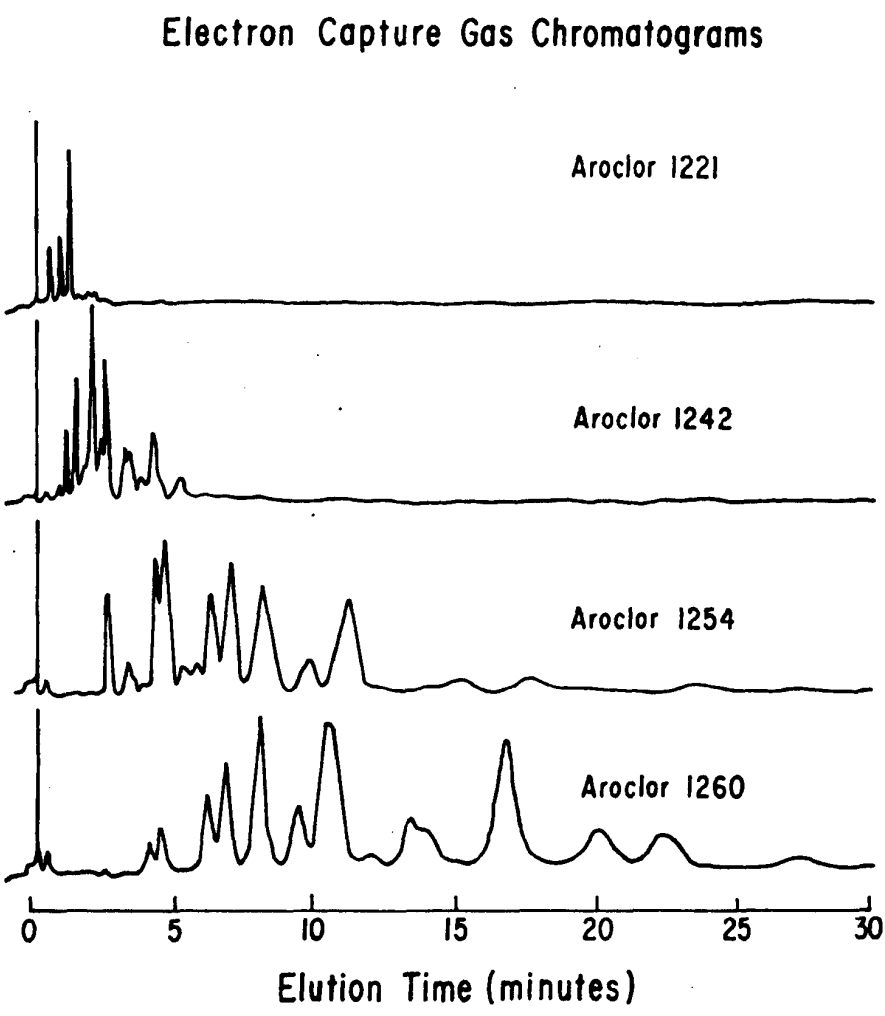
TYPICAL % COMPOSITION OF POLYCHLORINATED BIPHENYL PRODUCTS *

HOMOLOG # Cl/BIPHENYL	AROCLOR 1221	AROCLOR 1016	AROCLOR 1242	AROCLOR 1254
0	11	<0.1	<0.1	<0.1
1	51	1	1	<0.1
2	32	20	16	<0.5
3	4	57	49	1
4	2	21	25	21
5	<0.5	1	8	48
6	ND	<0.1	1	23
7	ND	ND	<0.1	6
8	ND	ND	ND	ND

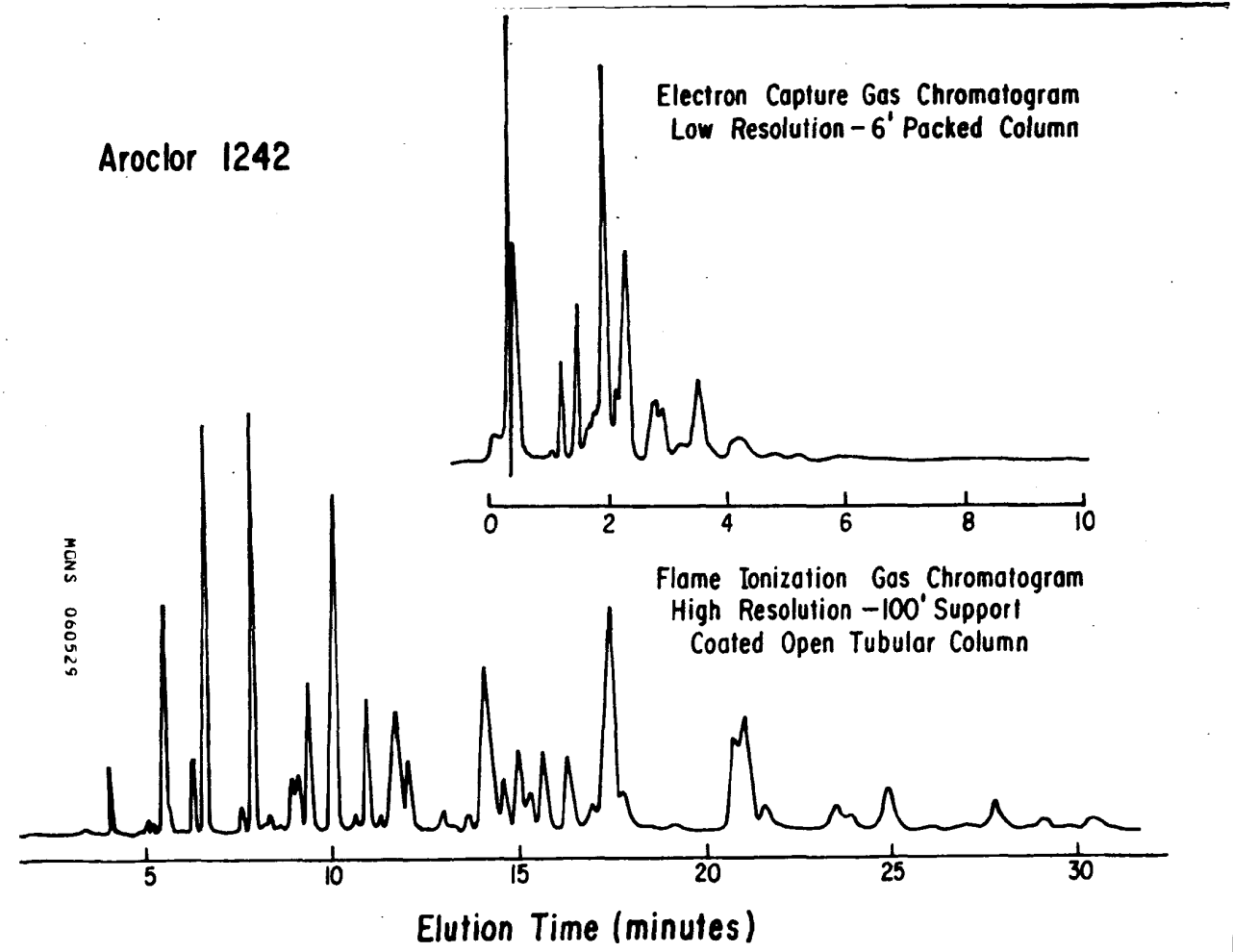
*PER CENT (W/W) BY GC/MASS USING AREA CORRECTION FACTORS BY HOMOLOG RESPONSE

NONE DETECTED, <0.01% = ND

MCNS 060527


Electron Capture Gas Chromatograms
Aroclor 1221
Aroclor 1242
Aroclor 1254
Aroclor 1260
0
5
10
15
20
25
30
Elution Time (minutes)

MONS 060528


Aroclor 1242
Electron Capture Gas Chromatogram
Low Resolution – 6' Packed Column
0
2
4
6
8
10
Flame Ionization Gas Chromatogram
High Resolution – 100' Support
Coated Open Tubular Column
MGNS 060529
5
10
15
20
25
30
Elution Time (minutes)

- PCB PRODUCTS ARE NOT A SINGLE ENTITY, BUT COMPLEX MULTI-COMPONENT MIXTURES

- PCB RESIDUES FOUND IN WILD LIFE ARE DOMINANTLY PENTA-, HEXA-, HEPTA-, AND OCTA-CHLORO BIPHENYLS

- PCB RESIDUE ARE MOST SIMILAR TO AROCLOR 1254 AND AROCLOR 1260 PRODUCTS

PRIMARY BACTERIAL DEGRADATION STUDIES

- SEMI-CONTINUOUS ACTIVATED SLUDGE DEGRADATION

RESIDUE ACCUMULATION STUDIES

- FISH - CATFISH AND BLUEGILLS
- BIRDS - WHITE LEGHORN CHICKENS
- MAMMALS - ALBINO RATS AND BEAGLE DOGS

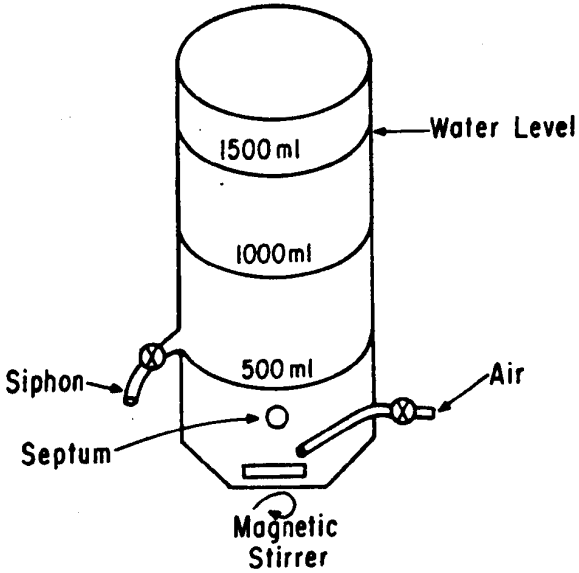
ASSESSMENT OF THE PERSISTENCE OF POLYCHLORINATED BIPHENYLS IN BIOLOGICAL SYSTEMS

MONS 060532

AROCLOR SEMI-CONTINUOUS ACTIVATED SLUDGE PRIMARY DEGRADATION STUDIES

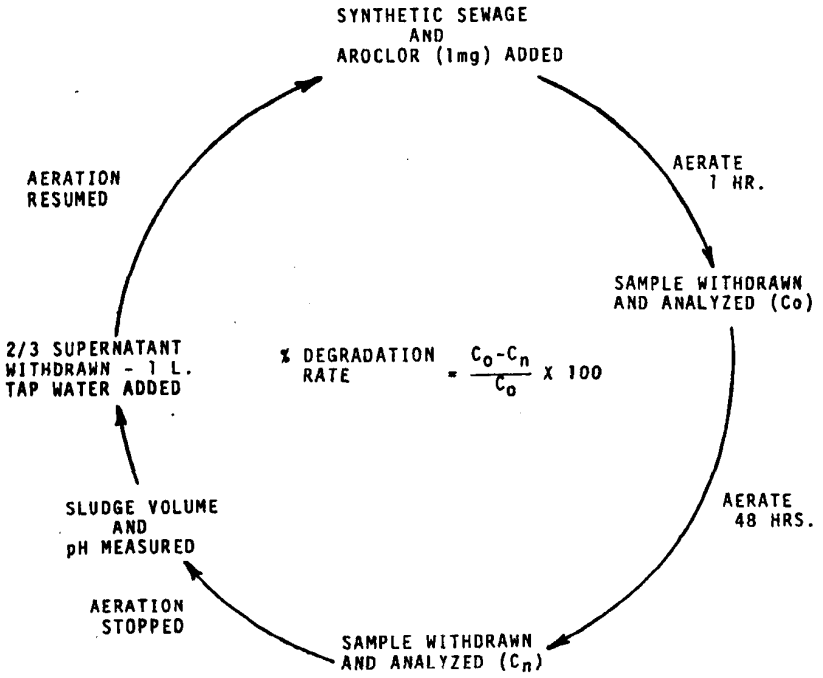
MONS 060533

Semi-Continuous Activated Sludge Test Unit



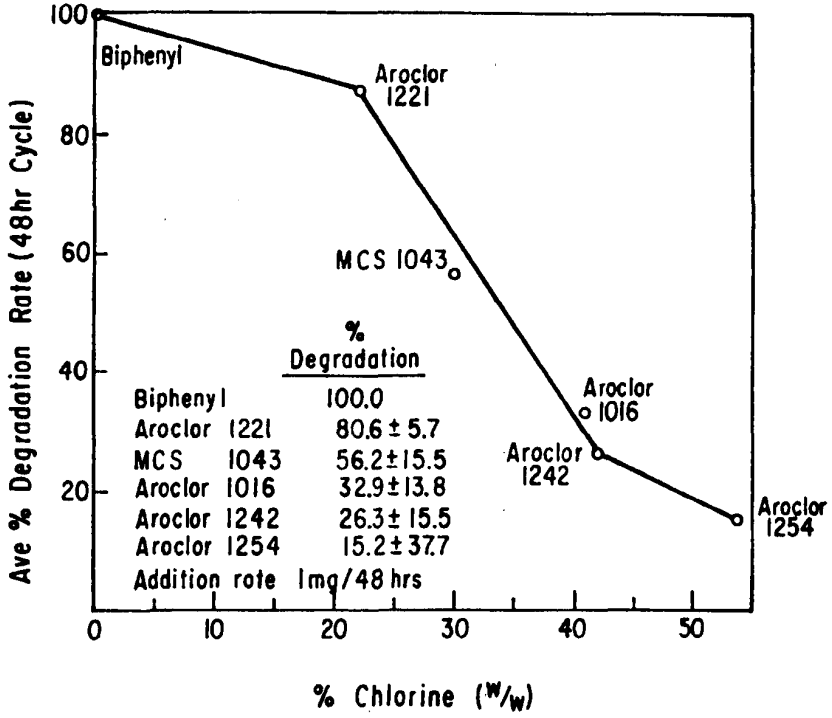
MONS 060534

MECHANICAL CYCLE



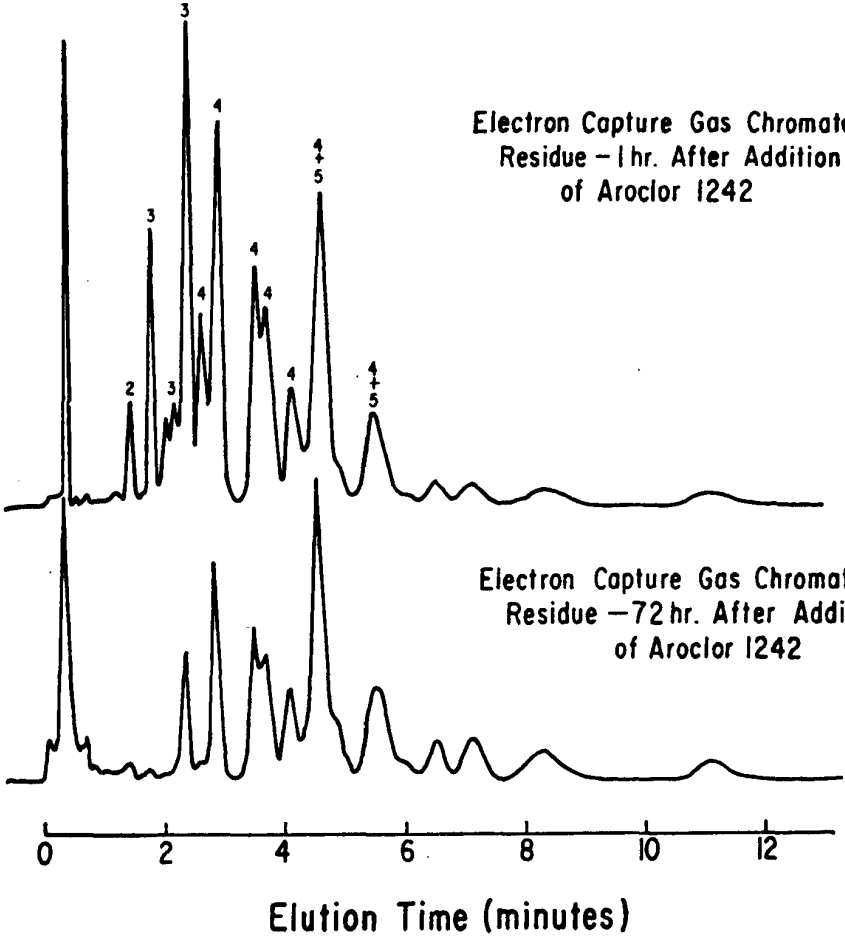
MONS 060535

Semi-Continuous Activated Sludge Degradation of Polychlorinated Biphenyls



MONS 060536

Semi-Continuous Activated Sludge Degradation of Aroclor 1242



MONS 060537

BACTERIAL DEGRADATION STUDIES

CONCLUSIONS

- RATE OF PRIMARY DEGRADATION INCREASES AS THE DEGREE OF CHLORINATION OF THE AROCLOR PRODUCT DECREASES

BIPHENYL>AROCLOR 1221>MCS 1043 >AROCLOR 1016>AROCLOR 1242>AROCLOR 1254

- BIPHENYL, MONO-, DI-, TRI-, AND TETRACHLORO BIPHENYL HOMOLOGS UNDERGO PRIMARY BACTERIAL DEGRADATION

AROCLOR RESIDUE STUDIES

WHITE LEGHORN CHICKEN STUDIES

PRODUCTS STUDIED		90 DAY ORAL AROCLOR 1242 AROCLOR 1254 AROCLOR 1260	90 DAY ORAL AROCLOR 1242
NUMBER OF CHICKENS	FEMALE	200	80
	MALE	40	16
NUMBER OF SAMPLES	MUSCLE	40	8
	LIVER	40	8
	FAT	40	8
	EGGS	~250	~60
	CHICKS	30	10
NUMBER OF SAMPLES ANALYZED	MUSCLE	14	5
	LIVER	12	4
	FAT	18	5
	EGGS	25	8
	CHICKS	11	10
TOTAL SAMPLES COLLECTED		400	121
TOTAL ANALYZED		80	32

ORAL EXPOSURE CARRIED OUT BY
INDUSTRIAL BIO-TEST LABORATORIES, INC.
NORTHBROOK, ILLINOIS

RESIDUE STUDY OF AROCLOR 1242 IN WHITE LEGHORN CHICKENS

90 DAY ORAL

	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	126	1260	12602	-	(2)	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 12 WEEK EXPOSURE	14	136	1312	-	-	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 30 DAY RECOVERY	9	77	749	-	-	(3)	(4)	(5)	(6)	-	-	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 060541

RESIDUE STUDY OF AROCLOR 1254 IN WHITE LEGHORN CHICKENS

90 DAY ORAL

	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	126	1260	12602	-	-	3	(4)	(5)	(6)	7	-	-	-
*RESIDUE, 12 WEEK EXPOSURE	38	362	3506	-	-	-	4	(5)	(6)	7	-	-	-
*RESIDUE, 30 DAY RECOVERY	17	164	1580	-	-	-	-	5	(6)	7	-	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 060542

RESIDUE STUDY OF AROCLOR 1260 IN WHITE LEGHORN CHICKENS

90 DAY ORAL

	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	126	1260	12602	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 12 WEEK EXPOSURE	65	607	5909	-	-	-	-	5	(6)	(7)	8	-	-
*RESIDUE, 30 DAY RECOVERY	26	232	2363	-	-	-	-	5	(6)	(7)	8	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MCNS 060543

ALBINO RAT STUDIES

		30 DAY ORAL	2 YEAR CHRONIC ORAL	3 GENERATION RAT REPRODUCTION	90 DAY SUBACUTE ORAL
PRODUCTS STUDIED		AROCLOR 1242 AROCLOR 1254 AROCLOR 1260	AROCLOR 1242 AROCLOR 1254 AROCLOR 1260	AROCLOR 1242 AROCLOR 1254 AROCLOR 1260	AROCLOR 1221
NUMBER OF RATS)	FEMALE	115	500	~20	60
	MALE	115	500	~20	60
NUMBER OF SAMPLES)	MUSCLE	18	33	-	7
	KIDNEY	18	-	-	-
	LIVER	18	33	-	7
	FAT	18	33	-	7
	PUPS	-	-	10	-
NUMBER OF SAMPLES ANALYZED)	MUSCLE	18	33	-	7
	KIDNEY	18	-	-	-
	LIVER	18	33	-	7
	FAT	18	33	-	7
	PUPS	-	-	10	-
TOTAL SAMPLES COLLECTED		144	198	20	42
TOTAL ANALYZED		72	99	10	21

ORAL EXPOSURE CARRIED OUT BY
INDUSTRIAL BIO-TEST LABORATORIES, INC.
NORTHBROOK, ILLINOIS

MONS 060544

RESIDUE STUDY OF AROCLOR 1242 IN ALBINO RATS

TWO YEAR CHRONIC ORAL EXPOSURE

ORAL EXPOSURE LEVEL	PPM PCBs 1	10	100	HOMOLOG DISTRIBUTION 1	2	3	4	5	6	7	8	9	10
†THEORETICAL RESIDUE	803	8037	80373	-	(2)	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 3 MONTH EXPOSURE	6	23	90	-	-	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 12 MONTH EXPOSURE	9	37	155	-	-	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 24 MONTH EXPOSURE	12	53	240	-	-	(3)	(4)	(5)	6	-	-	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 060545

RESIDUE STUDY OF AROCLOR 1254 IN ALBINO RATS

TWO YEAR CHRONIC ORAL EXPOSURE

	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	803	8037	80373	-	-	3	(4)	(5)	(6)	7	-	-	-
*RESIDUE, 3 MONTH EXPOSURE	13	94	679	-	-	-	4	(5)	(6)	7	-	-	-
*RESIDUE, 12 MONTH EXPOSURE	24	189	1471	-	-	-	4	(5)	(6)	7	-	-	-
*RESIDUE, 24 MONTH EXPOSURE	42	355	3038	-	-	-	4	(5)	(6)	7	-	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 060546

RESIDUE STUDY OF AROCLOR 1260 IN ALBINO RATS

TWO YEAR CHRONIC ORAL EXPOSURE

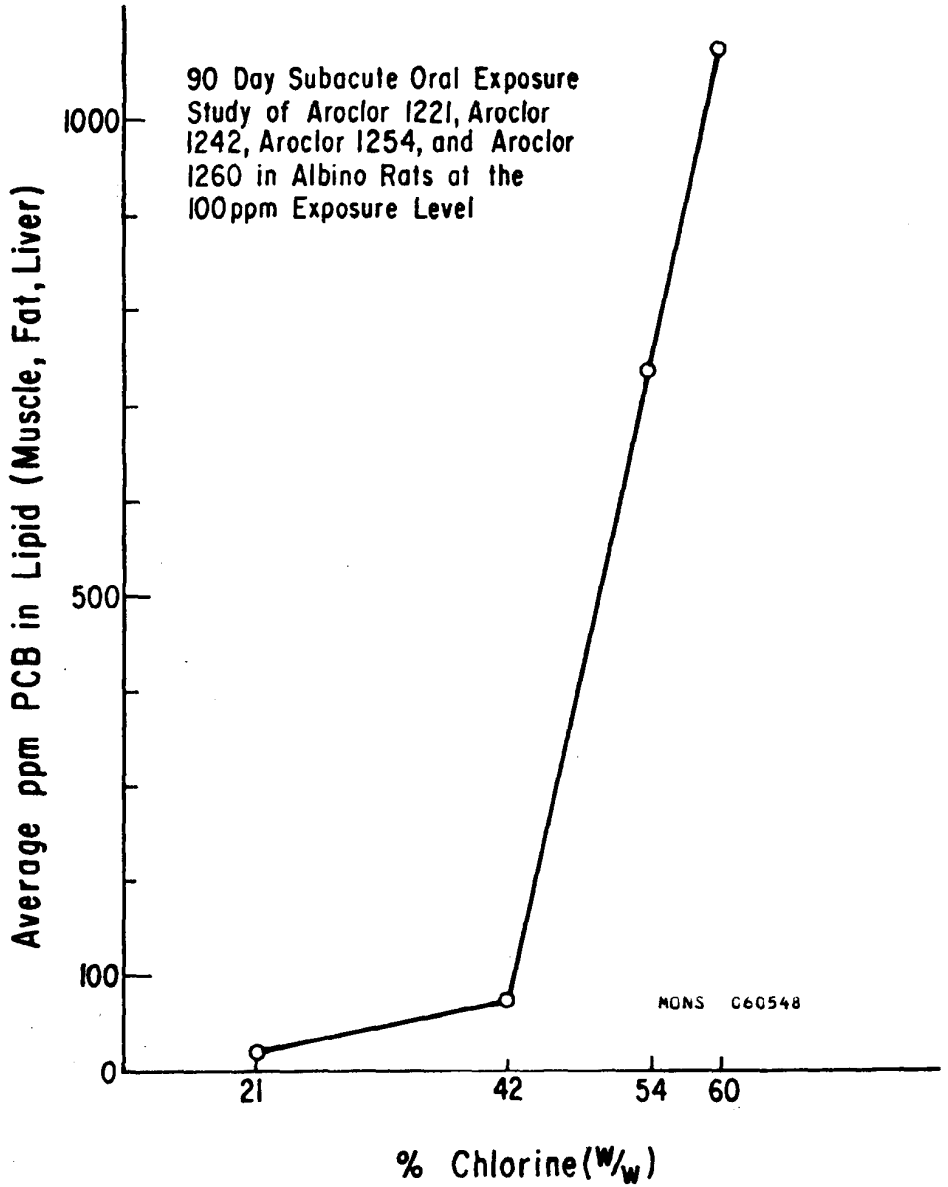
	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	803	8037	80373	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 3 MONTH EXPOSURE	18	134	970	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 12 MONTH EXPOSURE	35	270	2099	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 24 MONTH EXPOSURE	59	507	4338	-	-	-	-	(5)	(6)	(7)	8	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MCNS 060542


90 Day Subacute Oral Exposure Study of Aroclor 1221, Aroclor 1242, Aroclor 1254, and Aroclor 1260 in Albino Rats at the 100ppm Exposure Level
Average ppm PCB in Lipid (Muscle, Fat, Liver)
1000
500
100
0
21
42
54
60
% Chlorine (W/W)
MONS C60548

BEAGLE DOG STUDIES

		2 YEAR CHRONIC ORAL	90 DAY SUBACUTE ORAL
PRODUCTS STUDIED		AROCLOR 1242 AROCLOR 1254 AROCLOR 1260	AROCLOR 1221
NUMBER OF DOGS)	FEMALE	40	14
	MALE	40	14
NUMBER OF SAMPLES)	MUSCLE	54	7
	LIVER	54	7
	FAT	54	7
TOTAL SAMPLES COLLECTED		242	21
NUMBER OF SAMPLES ANALYZED)	MUSCLE	42	7
	LIVER	40	7
	FAT	43	7
TOTAL ANALYZED		125	21

ORAL EXPOSURE CARRIED OUT BY
INDUSTRIAL BIO-TEST LABORATORIES, INC.
NORTHBROOK, ILLINOIS

RESIDUE STUDY OF AROCLOR 1242 IN BEAGLE DOGS

TWO YEAR CHRONIC ORAL EXPOSURE

ORAL EXPOSURE LEVEL	PPM PCBs			HOMOLOG DISTRIBUTION									
	1	10	100	1	2	3	4	5	6	7	8	9	10
†THEORETICAL RESIDUE	519	5186	51865	-	(2)	(3)	(4)	(5)	6	-	-	-	-
*RESIDUE, 2 YEAR EXPOSURE	2	6	12	-	-	(3)	(4)	5	6	(7)	(8)	-	-
*RESIDUE, 30 DAY RECOVERY	1	4	10	-	-	-	-	5	(6)	(7)	(8)	-	-
*RESIDUE, 60 DAY RECOVERY	0.8	3	6	-	-	-	-	5	6	(7)	(8)	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 060550

RESIDUE STUDY OF AROCLOR 1254 IN BEAGLE DOGS

TWO YEAR CHRONIC ORAL EXPOSURE

	PPM PCBs			HOMOLOG DISTRIBUTION									
				1	2	3	4	5	6	7	8	9	10
ORAL EXPOSURE LEVEL	1	10	100										
†THEORETICAL RESIDUE	519	5186	51865	-	-	3	(4)	(5)	(6)	7	-	-	-
*RESIDUE, 2 YEAR EXPOSURE	7	30	132	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 30 DAY RECOVERY	5	24	109	-	-	-	-	5	(6)	(7)	8	-	-
*RESIDUE, 60 DAY RECOVERY	4	20	88	-	-	-	-	5	(6)	(7)	(8)	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MCNS 000551

RESIDUE STUDY OF AROCLOR 1260 IN BEAGLE DOGS

TWO YEAR CHRONIC ORAL EXPOSURE

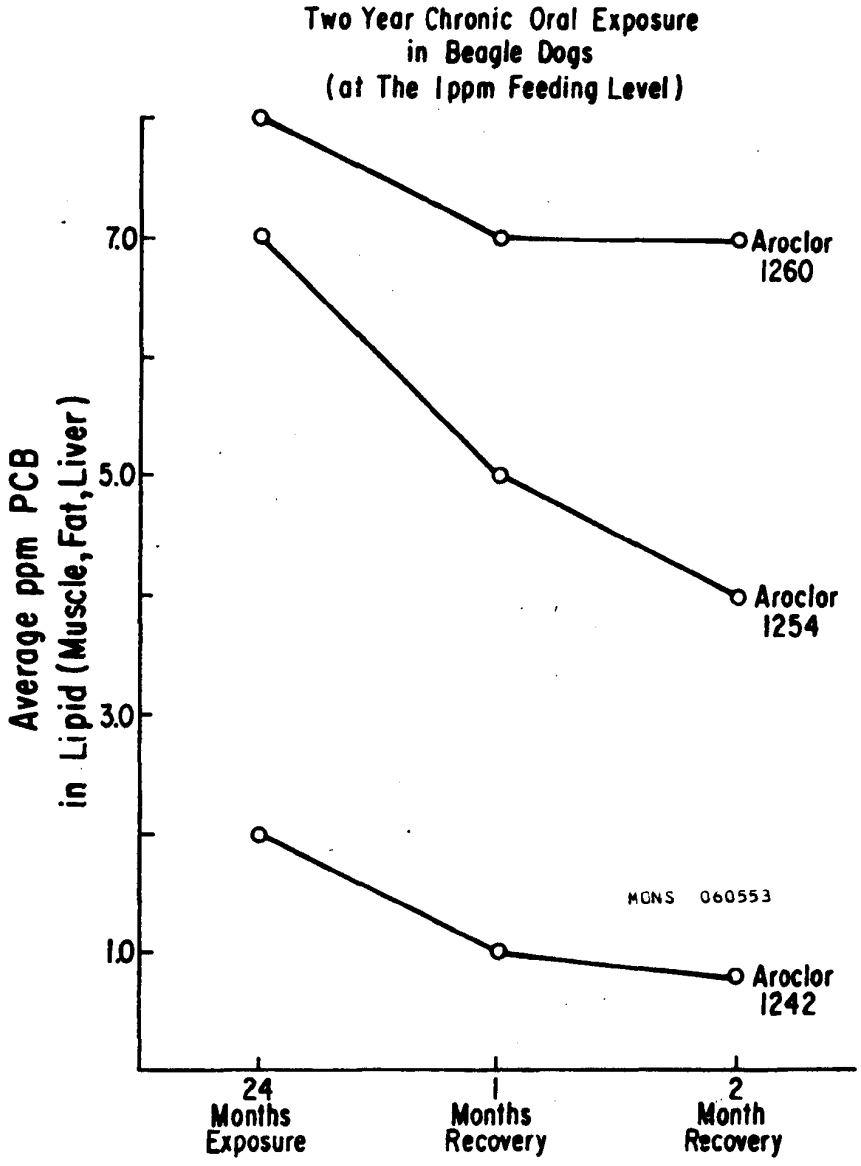
	PPM PCBs			HOMOLOG DISTRIBUTION									
ORAL EXPOSURE LEVEL	1	10	100	1	2	3	4	5	6	7	8	9	10
†THEORETICAL RESIDUE	519	5186	51865	-	-	-	-	(5)	(6)	(7)	8	-	-
*RESIDUE, 2 YEAR EXPOSURE	8	63	388	-	-	-	-	-	(6)	7	(8)	-	-
*RESIDUE, 30 DAY RECOVERY	7	60	363	-	-	-	-	-	(6)	(7)	(8)	-	-
*RESIDUE, 60 DAY RECOVERY	7	55	337	-	-	-	-	-	6	(7)	(8)	-	-

†IF TOTAL PCB CONSUMED WERE RETAINED

*AVERAGE PPM IN LIPID - ALL TISSUES

( )ELECTRON CAPTURE PEAKS GREATER THAN 5% OF TOTAL

MONS 065552


Two Year Chronic Oral Exposure
in Beagle Dogs
(at The 1ppm Feeding Level)
Average ppm PCB
in Lipid (Muscle, Fat, Liver)
7.0
5.0
3.0
1.0
Aroclor
1260
Aroclor
1254
Aroclor
1242
MONS 060553
24
Months
Exposure
1
Months
Recovery
2
Month
Recovery

	EXPOSURE LEVEL (PPM)	EXPOSURE PERIOD	CONCENTRATION FACTOR*
WHITE LEGHORN CHICKENS	1.0 (FEED)	12 WEEKS	20
ALBINO RATS	1.0 (FEED)	2 YEARS	9
BEAGLE DOGS	1.0 (FEED)	2 YEARS	2

*CONCENTRATION FACTORS DO NOT TAKE INTO ACCOUNT EXPOSURE PERIODS

CONCLUSIONS

RESIDUE BUILDUP STUDIES

- FOR ALL PRODUCTS THE PCB RESIDUE LEVEL INCREASED AS THE EXPOSURE LEVEL AND PERIOD INCREASED

- RELATIVE TO AROCLOR 1260, THE HIGHEST CHLORINATED PRODUCT STUDIED, THE PCB RESIDUE LEVEL DECREASED EXPONENTIALLY AS AS THE WEIGHT % CHLORINE OF THE PRODUCT DECREASED

- RELATIVE LEVELS OF PCB RESIDUES FOUND WERE -

  FISH>>>>>CHICKENS>RATS>DOGS

- RELATIVE PCB RESIDUE LEVELS IN TISSUES WERE -

CHICKENS	FAT = MUSCLE>LIVER
RATS	LIVER>FAT = MUSCLE>KIDNEY
DOGS	LIVER>FAT = MUSCLE

- FOR ALL PRODUCTS THE DOGS AND RATS EXCRETED AND/OR METABOLIZED 93 TO 99% OF THE TOTAL AROCLOR ORALLY INGESTED

- CHICKENS EXCRETED AND/OR METABOLIZED PRODUCTS INJESTED ORALLY AS FOLLOWS -

  90% OF AROCLOR 1242
  70% OF AROCLOR 1254
  50% OF AROCLOR 1260

CONCLUSIONS

RESIDUE FALL-OFF

- DOGS AND CHICKENS CONTINUED TO EXCRETE AND/OR METABOLIZE PCB RESIDUES, INCLUDING PENTA AND HEXA HOMOLOGS, RETAINED WHEN PLACED ON PCB FREE RECOVERY DIETS

  DOGS > CHICKENS

- RELATIVE RESIDUE FALL-OFF RATES SHOWED -

  DOGS: AROCLOR 1242>AROCLOR 1254 >AROCLOR 1260

  CHICKENS: AROCLOR 1242≥AROCLOR 1254≥AROCLOR 1260

CONCLUSIONS

RESIDUE STUDIES

ALTERATIONS OF AROCLOR HOMOLOG DISTRIBUTION

- ALTERATION OF THE HOMOLOG DISTRIBUTION OF ALL PRODUCTS WAS OBSERVED IN ALL STUDIES EXCEPT FISH

- LOWER CHLORINATED HOMOLOGS PRESENT IN ALL PRODUCTS WERE PREFERENTIALLY EXCRETED AND/OR METABOLIZED

- ALTERATION OF THE HOMOLOG DISTRIBUTION INCREASED AS THE WEIGHT % CHLORINE OF THE PRODUCTS DECREASED (INCLUDING PENTA AND HEXA HOMOLOGS)

  AROCLOR 1221>>AROCLOR 1242>AROCLOR 1254
  >AROCLOR 1260

  DOGS>RATS>CHICKENS>>>>>FISH