Industrial BIO-TEST Laboratories, Inc.
1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

REPORT TO

MONSANTO COMPANY

TOXICITY, REPRODUCTION AND RESIDUE STUDY WITH AROCLOR 1242, LOT #AK-255 IN WHITE LEGHORN CHICKENS

JUNE 15, 1971

IBT NO. J8746

5/11/71

Scott —
Per our
conversation.
EW

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Industrial BIO-TEST Laboratories, Inc.
1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

June 15, 1971

Mr. Elmer P. Wheeler
Manager, Environmental Health
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63166

Dear Mr. Wheeler:

Re: IBT No. J8746 - Toxicity, Reproduction and Residue Study with Aroclor 1242, Lot No. AK-255 in White Leghorn Chickens

We are submitting herewith our laboratory report dated June 15, 1971, prepared in connection with the above study.

Very truly yours,

J. C. Calandra
President

JCC/kjl

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REPORT TO

MONSANTO COMPANY

TOXICITY, REPRODUCTION AND RESIDUE STUDY WITH
AROCLOR 1242, LOT #AK-255
IN WHITE LEGHORN CHICKENS

JUNE 15, 1971

IBT NO. J8746

I. Introduction

At the request of Monsanto Company, a toxicity, reproduction and residue study with Aroclor 1242, Lot #AK-255 in white Leghorn chickens was initiated. This report presents the results of the investigation conducted at Wedge's Creek Research Farm Division, Industrial BIO-TEST Laboratories, Inc.

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II. Summary

A toxicity, reproduction and residue study was conducted with Aroclor 1242 in white Leghorn chickens. Dosage levels were 2, 4 or 8 ppm mixed in the diet. Eggs were collected for production, quality, physical characteristics and hatchability. Eggs also were collected for residue analyses.

The chickens were observed for toxic effects and their tissues were saved for analysis at the end of the hatch data, as well as after a 30-day (recovery) period during which time they were fed control diet.

There were no effects on the chickens as judged by body weight, food consumption, behavioral reactions and pathology. There were no effects on egg production, quality (candled), specific gravity or egg shell thickness. Although the percent of fertile eggs in all groups was about the same, there was slightly lower percent hatch

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in the T-II (4 ppm) group and in the T-III (8 ppm) group than the percent hatch in the control group. All chicks that hatched were normal.

Respectfully submitted,

INDUSTRIAL BIO-TEST LABORATORIES, INC.

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Scientific Director

June 15, 1971
al:db

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III. Procedure

A. Experimental Animals

The animals employed in this study were white Leghorn chickens. A total of 80 hens and 16 roosters were used.

B. Organization of Groups

The 96 chickens were equally divided into one control group (C) and three test groups (T-I, T-II and T-III), each consisting of four males and twenty females. A structural outline of the experiment is presented in Table I.

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TABLE I

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Outline of Experiment

Group	Number of Animals Males	Females	TestMaterial	Dose Levels (ppm)
Control	4	20	None	-
T-I	4	20	Aroclor 1242 Lot #AK-255	2
T-II	4	20	Aroclor 1242 Lot #AK-255	4
T-III	4	20	Aroclor 1242 Lot #AK-255	8

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C. Dosage and Feeding

All groups received the same base feed*. Test diets were prepared weekly. The test materials were diluted with acetone before addition to the feed to assure even distribution throughout the ration. An equal amount of acetone, without test material, was added to the control feed and the feed was then blended in the same manner as the test feeds.

All animals were allowed water and their respective control or test feed ad libitum. Dosing began when the birds were 12 weeks of age and continued until hatching results were available.

D. Observations

Observations were made daily to ascertain the presence or absence of clinical signs of toxicity indicative of test material effect. All chickens were individually weighed and the group feed consumption determined weekly.

As each group began laying, the eggs were collected daily and the egg weights recorded. When the egg weights were consistently between 50 and 60 grams, and at least 50 percent of the hens in the group were laying, egg collection for that group was started. The time required to meet these criteria was recorded for each group.

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* Purina Flock Chow, Ralston Purina Co., St. Louis, Missouri.

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The egg production was collected for the following studies:

1. Egg Production and Quality

Eggs were collected, weighed and candled for a number of seven-day periods. The total number, the individual weights of eggs collected and the total number of uncracked and unblemished eggs were recorded.

2. Hatchability

One-half of all non-defective eggs were randomly selected for hatching. These eggs were turned twice daily during the seven-day collection period, then placed in an incubator maintained at 99° to 100° F, with a wet bulb reading of 85°. This procedure was followed until a minimum of 100 eggs from the control group and each test group had been set for hatching*. The following was recorded:

a. Number hatched

b. Number unhatched

c. Viability of chicks over a 30-day period during which feed and water were permitted ad libitum.

d. Examination of unhatched eggs for fertility and stage of development.

e. Weight of chicks after Day 1 and Day 30.

* Ninety-three eggs set for hatching on T-1 level due to poor egg production and quality.

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3. Physical Characteristics of Eggs

One-fourth of the non-defective eggs and all of the defective eggs were examined to determine the following:

a. Specific gravity

b. Thickness of shells at equatorial circumference (three measurements/egg).

4. Residue Studies

The remaining one-fourth of the non-defective eggs were quick-frozen and shipped to Monsanto Company for residue analysis (shells and frozen contents separated).

After hatching results were available, one-half of the chickens in each group were sacrificed, defeathered and subjected to a gross pathological examination. Pooled samples of muscle, liver, fat and kidney from each group were collected and shipped to Monsanto Company for analysis. Pooled samples of feathers from each group were also shipped to Monsanto Company for analysis.

The remaining chickens were fed the base diet without test material for 30 days. The eggs were collected, weighed and candled during the recovery period. Ten eggs (minimum) per group per week were quick-frozen and shipped to Monsanto Company for analysis. At the end of the recovery regimen, the remaining chickens were sacrificed and handled in the same manner as at the end of the test feeding period.

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IV. Results

A. Parental Generation

1. Body Weight Data

The average male and female body weights during the test diet period are shown in Tables II, III, IV and V.

The average male and female body weights during the recovery period are shown in Table VI.

These data are summarized in Table VII.

No significant differences in body weights were noted.

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TABLE II

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Test Diet Period Mean Body Weight Data (kilograms)

Control Group

Sex	Week: 0	1	2	3	4	5	6	7	8	9
M	1.31	1.37	1.38	1.49	1.48	1.59	1.65	1.66	1.68	1.57
F	1.03	1.09	1.13	1.21	1.22	1.34	1.41	1.43	1.41	1.35

Sex	Week: 10	11	12	13	14	15	16	17	18	19
M	1.48	1.69	1.79	1.86	1.87	1.96	1.90	1.97	1.95	2.01
F	1.40	1.41	1.45	1.52	1.43	1.52	1.54	1.65	1.55	1.60

Sex	Week: 20	21	22	23	24	25	26	27	28	29
M	2.02	2.07	2.10	2.10	2.12	2.15	2.17	2.20	2.22	2.21
F	1.55	1.68	1.69	1.70	1.69	1.70	1.75	1.77	1.76	1.75

Sex	Week: 30	31	32	33	34	35
M	2.22	2.26	2.31	2.33	2.36	2.35
F	1.75	1.74	1.75	1.76	1.77	1.78

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TABLE III

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Test Diet Period Mean Body Weight Data (kilograms)

Test Group I

Sex	Week: 0	1	2	3	4	5	6	7	8	9
M	1.32	1.40	1.49	1.57	1.59	1.64	1.74	1.75	1.78	1.84
F	1.03	1.13	1.19	1.26	1.29	1.36	1.43	1.43	1.41	1.49

Sex	Week: 10	11	12	13	14	15	16	17	18	19
M	1.77	1.75	1.76	1.82	1.76	1.92	1.97	2.01	2.03	2.03
F	1.44	1.44	1.42	1.51	1.53	1.59	1.58	1.61	1.60	1.62

Sex	Week: 20	21	22	23	24	25	26	27	28	29
M	2.04	2.09	2.09	2.14	2.18	2.16	2.21	2.24	2.27	2.28
F	1.60	1.65	1.64	1.65	1.67	1.67	1.68	1.70	1.69	1.72

Sex	Week: 30	31	32	33	34	35
M	2.25	2.27	2.27	2.24	2.17	2.33
F	1.69	1.69	1.70	1.69	1.72	1.73

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TABLE IV

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Test Diet Period Mean Body Weight Data (kilograms)

Test Group II

Sex	Week: 0	1	2	3	4	5	6	7	8	9
M	1.33	1.40	1.45	1.54	1.56	1.61	1.66	1.70	1.65	1.67
F	1.08	1.17	1.22	1.31	1.37	1.45	1.48	1.45	1.36	1.46

Sex	Week: 10	11	12	13	14	15	16	17	18	19
M	1.65	1.65	1.69	1.85	1.93	2.01	2.08	2.14	2.18	2.18
F	1.41	1.40	1.43	1.47	1.50	1.57	1.60	1.63	1.61	1.65

Sex	Week: 20	21	22	23	24	25	26	27	28	29
M	2.19	2.26	2.29	2.33	2.38	2.35	2.38	2.41	2.45	2.45
F	1.63	1.71	1.72	1.73	1.77	1.73	1.76	1.74	1.75	1.77

Sex	Week: 30	31	32	33	34	35
M	2.19	2.30	2.30	2.29	2.31	2.33
F	1.71	1.74	1.78	1.79	1.79	1.79

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TABLE V

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Test Diet Period Mean Body Weight Data (kilograms)

Test Group III

Sex	Week: 0	1	2	3	4	5	6	7	8	9
M	1.32	1.42	1.45	1.56	1.57	1.68	1.72	1.75	1.75	1.82
F	1.04	1.13	1.16	1.24	1.27	1.35	1.39	1.41	1.40	1.44

Sex	Week: 10	11	12	13	14	15	16	17	18	19
M	1.69	1.87	1.89	1.97	2.07	2.10	2.13	2.21	2.24	2.24
F	1.39	1.40	1.39	1.50	1.48	1.51	1.53	1.54	1.55	1.56

Sex	Week: 20	21	22	23	24	25	26	27	28	29
M	2.28	2.30	2.38	2.42	2.38	2.38	2.44	2.45	2.45	2.52
F	1.55	1.59	1.61	1.62	1.61	1.61	1.66	1.65	1.65	1.67

Sex	Week: 30	31	32	33	34	35
M	2.40	2.45	2.40	2.49	2.40	2.32
F	1.60	1.67	1.65	1.69	1.70	1.68

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TABLE VI

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Recovery Period Mean Body Weight Data (kilograms)

Group	Sex	Week: 36	37	38	39	40	Sacrifice
Control	M	2.42	2.46	2.45	2.48	2.50	2.50
	F	1.72	1.76	1.75	1.77	1.78	1.78
Group	Sex	Week: 36	37	38	39	40	Sacrifice
T-I	M	2.43	2.51	2.51	2.52	2.52	2.52
	F	1.82	1.83	1.82	1.85	1.71	1.71
Group	Sex	Week: 36	37	38	39	40	Sacrifice
T-II	M	2.36	2.38	2.39	2.37	2.40	2.40
	F	1.85	1.84	1.85	1.85	1.85	1.89
Group	Sex	Week: 36	37	38	39	40	Sacrifice
T-III	M	2.41	2.49	2.52	2.51	2.59	2.59
	F	1.60	1.62	1.67	1.61	1.61	1.61

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TABLE VII

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Summary of Mean Body Weight Data (kilograms)

Group	0 Day: Male	0 Day: Female	Test Period Male	Test Period Female	at Sacrifice Male	at Sacrifice Female
C	1.31	1.03	1.92	1.55	2.50	1.78
T-I	1.32	1.03	1.96	1.54	2.52	1.71
T-II	1.33	1.08	2.02	1.58	2.40	1.89
T-III	1.32	1.04	2.10	1.51	2.59	1.61

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2. Food Consumption

The food consumption data are presented in Table VIII.

The food consumption was considered to be normal with no significant differences among groups.

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TABLE VIII

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Average Food Consumption (Grams/Bird/Day)

Week	Group: C	T-I	T-II	T-III
		Test Period		
1	77	107	107	77
2	68	62	83	92
3	76	65	68	80
4	75	71	74	68
5	103	74	92	90
6	91	88	98	88
7	67	82	80	78
8	99	119	98	96
9	82	94	114	107
10	115	107	106	102
11	84	93	76	92
12	105	99	109	109
13	105	130	106	110
14	100	101	90	101
15	156	147	191	176
16	84	90	118	105
17	114	104	128	119
18	113	118	125	108
19	101	119	114	99
20	107	106	120	106
21	163	140	124	112
22	151	121	134	106
23	184	143	195	159
24	105	93	79	66
25	142	123	111	150
26	123	123	125	183
27	180	168	163	183
28	128	126	118	118
29	114	136	113	130
30	113	119	103	129
31	129	124	137	144
32	125	108	132	116
33	115	103	134	148
34	116	93	121	122
35	98	119	97	111
36	194	155	179	145

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TABLE VIII continued

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Average Food Consumption (Grams/Bird/Day)

Week	C	Group: T-I	T-II	T-III
		Recovery Period		
37	144	174	209	130
38	134	147	202	182
39	136	149	152	177
40	136	134	138	117
41*	136	134	138	117

* One day

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3. Mortality and Reactions

There were no untoward behavioral reactions or mortalities attributable to the test material. Mortalities were considered normal and were due principally to the avian leukosis complex (lymphomatosis).

The parental generation mortality, chronology and clinical diagnoses are presented in Table IX.

The mortality data are presented in Table X.

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TABLE IX

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Mortality, Chronology and Diagnoses

Group	Animal No.	Sex	Week Died	Clinical Diagnoses
C	1611	F	9	Egg ruptured
	1601	F	14	Lymphomatosis
	1615	F	15	Egg ruptured
	1616	F	16	Ruptured intestine
	1607	F	19	Marek's Disease
	1605	F	20	Cystic oviduct
	1613	F	29	Lymphomatosis
	1606	F	32	Lymphomatosis
T-I	1628	F	10	Injury
	1585	F	23	Unknown
	1631	F	31	Injury
	1622	F	33	Lymphomatosis
	1515	M	34	Lymphomatosis
T-II	1639	F	9	Egg ruptured
	1654	F	10	Lymphomatosis
	1524	M	13	Cannibalized
	1657	F	15	Lymphomatosis
	1650	F	16	Lymphomatosis
	1648	F	20	Marek's Disease
	1516	M	29	Unknown
T-III	1671	F	9	Lymphomatosis
	1529	M	10	Lymphomatosis
	1674	F	18	Lymphomatosis

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TABLE X

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Mortality Data

Group	Number Tested M	Number Tested F	Number Died M	Number Died F	Total Dead / Total Tested	Percent Dead
C	4	20	0	8	8/24	33.3
T-I	4	20	1	4	4/24	20.8
T-II	4	20	2	5	7/24	29.1
T-III	4	20	1	2	3/24	12.5

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4. Gross Pathology

Postmortem examination of all birds revealed no gross pathological tissue alterations attributable to effects of the test material.

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B. Eggs

1. Egg Production and Quality

The weekly egg production data are presented in Table XI.

The production of Test Group I (T-I) was lower than that of other groups.

The egg quality data are presented in Table XII.

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TABLE XI

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Egg Production Data

	Control		T-I		T-II		T-III	
Week	Average Weight (grams)	Percent Production/Day	Average Weight (grams)	Percent Production/Day	Average Weight (grams)	Percent Production/Day	Average Weight (grams)	Percent Production/Day
				Test Period				
5	33.0	10.0	32.1	7.1	39.4	45.7	37.2	16.4
6	37.3	26.4	41.0	31.4	40.9	60.7	39.2	32.9
7	39.8	40.7	43.0	22.8	42.8	59.2	41.6	47.6
8	41.7	37.1	43.6	43.5	42.0	65.7	43.2	46.4
9	42.5	45.9	43.6	45.7	43.5	60.0	42.9	48.6
10	42.3	48.9	45.1	35.0	43.1	59.5	44.0	47.4
11	44.4	51.1	45.0	39.8	45.2	65.8	44.6	61.7
12	46.2	60.9	46.8	36.0	46.4	73.8	46.9	62.4
13	46.5	57.3	47.5	52.6	46.5	65.8	47.6	60.2
14	48.4	61.1	48.8	54.8	48.5	64.2	49.7	56.4
15	48.9	56.3	48.4	61.6	49.3	63.8	49.0	60.9
16	49.5	74.1	48.9	51.1	49.3	73.2	49.8	63.2
17	50.7	60.7	50.5	64.6	50.4	75.8	49.7	61.2
18	50.9	49.1	50.5	60.1	50.7	69.6	50.5	65.1
19	51.7	67.6	51.6	53.3	50.4	68.7	49.9	67.5
20	51.6	59.6	51.6	50.3	51.1	71.4	52.3	58.7
21	52.4	63.3	52.5	54.8	52.0	71.4	53.3	55.6
22	53.3	67.3	53.3	48.8	52.7	74.2	53.3	56.3
23	54.9	61.2	56.0	39.6	53.1	58.0	54.3	56.3
24	54.1	55.1	54.9	40.0	55.0	62.8	53.1	55.5

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TABLE XI continued

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Egg Production Data

Week	Control Average Weight (grams)	Control Percent Production/Day	T-I Average Weight (grams)	T-I Percent Production/Day	T-II Average Weight (grams)	T-II Percent Production/Day	T-III Average Weight (grams)	T-III Percent Production/Day
				Test Period continued				
25	55.7	54.1	56.2	39.6	55.8	64.7	56.3	51.6
26	54.9	53.1	56.2	43.6	54.8	60.0	56.1	42.8
27	54.4	45.9	55.6	28.5	55.2	61.9	56.7	51.6
28	54.5	53.1	55.7	31.7	54.7	60.9	55.0	47.6
29	54.6	41.9	55.5	23.8	55.3	57.1	55.7	42.1
30	54.8	49.5	55.6	33.3	55.8	56.1	54.5	38.9
31	54.3	48.4	56.0	32.7	55.6	53.3	57.0	36.5
32	54.5	44.9	56.6	20.1	56.0	55.2	57.3	37.6
33	56.3	42.9	57.1	16.8	57.6	48.5	59.5	38.8
34	55.5	38.1	55.7	27.6	56.8	51.4	57.3	31.7
35	55.8	39.3	54.7	35.7	56.8	43.8	57.1	34.1
				Recovery Period				
36	54.4	26.2	57.3	30.1	56.1	50.0	50.9	50.8
37	55.9	33.3	57.4	39.6	56.9	44.6	60.4	39.4
38	56.0	33.3	49.7	46.0	56.5	39.2	55.1	51.6
39	56.5	26.2	60.1	49.2	59.1	32.1	58.2	26.9
40*	57.1	16.7	0	0	57.6	20.0	0	0

* One day

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TABLE XII

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Egg Quality Data

Group	Defective Eggs Number	Defective Eggs Percent	Normal Eggs Number	Normal Eggs Percent	Total Number
C	292	52.9	260	47.1	552
T-I	251	54.8	178	45.2	458
T-II	211	49.5	215	50.5	426
T-III	226	53.4	197	46.6	423

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2. Hatchability

The hatchability data are presented in Table XIII.

The percent of eggs hatched was significantly higher in the control group than in the test groups. The percent of hatch was slightly low in the T-II group and quite low in the T-III group.

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TABLE XIII

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Hatchability Data

Group	Eggs Set	Eggs Hatched	Percent Hatched	Eggs Unhatched	Stage of Incubation				Percent* Infertile
					Full Term	Mid Term	One Week	Infertile	
C	106	43	40.5	63	24	8	6	25	23.5
T-I	93	37	39.7	56	24	10	12	10	10.9
T-II	114	35	30.7	79	41	4	8	26	22.8
T-III	104	15	14.4	89	39	10	13	27	25.9

* Per cent of total set.

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3. Specific Gravity

The specific gravity data of the eggs collected and candled are presented in Table XIV.

There were no significant differences in specific gravity among the groups.

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TABLE XIV

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Specific Gravity Data

	Normal Eggs		Defective Eggs		Total Eggs	
Group	Number	Average Specific Gravity	Number	Average Specific Gravity	Number	Average Specific Gravity
C	260	1.081	292	1.078	552	1.080
T-I	178	1.090	251	1.077	458	1.083
T-II	215	1.082	211	1.082	426	1.082
T-III	197	1.075	226	1.080	423	1.077

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4. Egg Shell Thickness

The shell thickness data are presented in Table XV.

The shell thickness was about the same for all groups including the control group.

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TABLE XV

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Egg Shell Thickness (inches)

	Normal Eggs		Defective Eggs		Total Eggs	
Group	Number	Average Thickness (10^{-3})	Number	Average Thickness (10^{-3})	Number	Average Thickness (10^{-3})
C	90	12.0	201	12.0	291	12.0
T-I	84	12.0	246	12.0	424	12.0
T-II	94	13.0	211	12.0	305	12.0
T-III	98	12.4	225	12.4	323	12.4

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C. F_1 Generation

1. Mean Body Weights and Viability

The mean body weights and viability data are presented in Table XVII.

There were no significant differences between groups in either the Day 1 or Day 30 mean body weights. The percent viability was slightly lower in the treated groups than it was in the control group, but the differences were not significant or reduced in a dose related manner.

2. Gross Pathology

Postmortem examination of all F_1 chicks dying on test and those sacrificed at 30 days revealed no pathological tissue alterations.

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TABLE XVII

TEST MATERIAL: Aroclor 1242

Toxicity, Reproduction & Residue Study - White Leghorn Chickens

Mean Body Weight and Viability Data

Group	Number of Chicks Day 1	Mean Body Weight Day 1 (grams)	Number of Chicks Day 30	Mean Body Weight Day 30 (grams)	Percent Viability
C	43	36.5	40	261.9	93.2
T-I	37	36.0	29	255.0	78.4
T-II	35	35.5	27	242.1	77.0
T-III	15	35.7	12	245.8	80.0

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