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Industrial BIO-TEST Laboratories, Inc.

1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

REPORT TO
ATOMIC ENERGY COMMISSION
TWO-YEAR CHRONIC ORAL TOXICITY STUDY WITH
LOW DOSE IRRADIATED PARAXAS
IN SWISS WHITE MICE

CONTRACT NO. AT (11-1)-2014
REPORT NO. COO-2014-17

OCTOBER 25, 1971

IBT NO. B7040

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Industrial **BIO-TEST** *Laboratories, Inc.*

1810 FRONTAGE ROAD
NORTHBROOK, ILLINOIS 60062

October 25, 1971

Mr. Harold N. Miller, Director
Contracts Division
U. S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Miller:

Re: IBT No. B7040 - Two-Year Chronic Oral
Toxicity Study with Low Dose Irradiated
Papayas in Swiss White Mice - Contract
No. AT (11-1)-2014

We are submitting herewith our laboratory report dated
October 25, 1971, prepared in connection with the above study.

Very truly yours,

J. C. Calandra
President

JCC/kjl

cc: Dr. Murray Schulman
Radiation Biologist, Biology Branch
Division of Biology and Medicine
U. S. Atomic Energy Commission
Washington, D. C. 20545

REPORT TO
ATOMIC ENERGY COMMISSION
TWO-YEAR CHRONIC ORAL TOXICITY STUDY WITH
LOW DOSE IRRADIATED PAPAYAS
IN SWISS WHITE MICE

CONTRACT NO. AT (11-1)-2014
REPORT NO. COO-2014-17

OCTOBER 25, 1971

IBT NO. B7040

I. Introduction

A two-year chronic and three-generation reproduction study employing Swiss white mice subjected to oral administration of low dose irradiated papayas was conducted. This report summarizes the results of the two-year chronic portion of the investigation.

II. Summary

Two years of feeding low dose irradiated papayas to groups of albino mice revealed the following:

A. Body Weights

Statistical comparisons of total weight gains after 10 weeks revealed no significant differences among mice fed the control diet (C), non-irradiated papayas (PC) or irradiated papayas (T-I and T-II). Body weights remained virtually unchanged from the tenth week through the twentieth month. After the twentieth month, body weight losses were observed in all groups. These weight losses resulted from general debilitation due to old age.

B. Food Consumption

Mice fed irradiated papayas ate amounts comparable to the amounts eaten by mice fed non-irradiated papayas or standard mouse ration.

C. Mortality and Reactions

None of the deaths that occurred during the study could be attributed to the ingestion of irradiated papayas.

No untoward behavioral reactions were noted among any of the animals employed in the study.

D. Hematologic and Clinical Blood Chemistry Studies

The results of these studies, which were conducted on two animals of each sex from each group after zero, three, six, 12, 18 and 24 months of feeding, revealed no outstanding differences between mice fed irradiated papayas and mice fed non-irradiated papayas or control ration.

E. Pathologic Studies

Pathologic studies were conducted on animals from all groups after three, six, 12 and 18 months of feeding and again at the time of final sacrifice (24 months). Gross pathologic observation revealed no changes which could be related to the ingestion of irradiated papayas. Organ weights or femur lengths did not differ significantly among treatment and control groups.

Histopathological studies conducted at the same time intervals confirmed the absence of pathologic changes which could be related to the ingestion of irradiated papayas.

Respectfully submitted,

INDUSTRIAL BIO-TEST LABORATORIES, INC.

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October 25, 1971

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III. Procedure

A. Experimental Animals

The animals employed in the study were Charles River* random bred Swiss white mice. Six hundred mice (300 males and 300 females) were selected for the experiment and housed in standard, wire-bottomed steel cages. Each cage bore a color-coded card identifying the animal with respect to project number, treatment, individual animal number and sex.

B. Organization of Groups

A structural outline of the experiment is shown in Table I.

* Charles River Breeding Laboratories, Inc., North Wilmington, Mass.

TABLE I

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Outline of Experiment

Group	Treatment	Number of Animals	
		Males	Females
C	Stock Ration	75	75
PC	Non-irradiated Papayas	75	75
T-I	Irradiated Papayas (75,000 rads)	75	75
T-II	Irradiated Papayas (200,000 rads)	75	75

Note: Positive control mice received 15 percent non-irradiated papayas in their diet. T-I mice and T-II mice received 15 percent of either the 75 Krads or 200 Krads irradiated papayas respectively in their diet.

C. Body Weights

Each animal used in the study was weighed on the first day of the test. Weighings were made weekly for the first year and monthly thereafter. Weight gains were computed weekly for the first ten weeks of testing.

D. Food Consumption and Diet Preparation

Food consumption data were collected for mice of each sex in every group weekly for the first ten weeks of the study. Thereafter, food consumption was measured during the 36th through 39th week, the 52nd through the 55th week and the 77th through the 80th week.

The diet for any given group was prepared by blending the appropriate amount of papaya (15 percent wet weight of the total diet) with standard mouse ration in a Hobart-Mixer.

Fresh diets were prepared each week. Each mouse was offered an amount of diet sufficient for ad libitum feeding. However, checks were made periodically to ensure that the food jars were not empty.

E. Food Utilization (Food Efficiency)

Food efficiency data were computed for the first ten weeks of the study.

F. Mortality and Reactions

Abnormal reactions and deaths were recorded daily during the investigation.

G. Hematologic and Clinical Blood Chemistry Studies

Blood samples collected from four mice of each sex from each group after zero, three, six, 12, 18 and 24 months of feeding were analyzed for the following:

1. Hematologic Studies

- a. Hematocrit Value
- b. Erythrocyte Count
- c. Hemoglobin Concentration
- d. Total Leukocyte Count
- e. Differential Leukocyte Count

2. Clinical Blood Chemistry Studies

Serum Glutamic-Oxalacetic Transaminase (SGOT) Activity

H. Pathologic Studies

Animals which died during the study were examined grossly unless examination was precluded by postmortem autolysis. Following three, six, 12 and 18 months of feeding, two mice of each sex from each group were sacrificed and subjected to complete gross pathologic examinations. At the conclusion of the two-year study, all surviving animals were sacrificed by carbon dioxide asphyxiation and examined. A complete set of organs and other tissues was removed from each rat at the time of gross examination and preserved in formalin solution. Also, at the time of each sacrifice, the weights of the liver, left and right kidneys, spleen, left and right gonads, and heart of each mouse were determined and recorded. The lengths of the left and right femurs were also determined and recorded.

Microscopic examination was conducted on tissues taken from all mice sacrificed from each group. The following tissues, stained with Hematoxylin-Eosin, were included: esophagus, stomach (cardia, fundus and pylorus), small intestine (duodenum, jejunum and ileum), cecum, colon, liver, kidneys, spleen, pancreas, urinary bladder, pituitary gland, adrenal gland, testes, seminal vesicle, ovary, bone marrow, thyroid gland, parathyroid gland, salivary gland, prostate gland, heart, aorta, lung, lymph node (cervical and mesenteric), skeletal muscle, peripheral nerve, bone (femur), spinal cord, uterus, trachea, eye, optic nerve and brain (cerebrum, cerebellum and pons).

I. Statistical Analysis

Statistical analyses (analysis of variance followed by multi-treatment comparisons) were conducted upon data in which quantitative differences were measured. Comparisons were made between the control group and the groups receiving irradiated or non-irradiated papayas. Further comparisons were made between the group receiving non-irradiated papayas and the groups receiving irradiated papayas. Statistically significant differences are noted in the tables discussed in the text.

IV. Results

A. Body Weights and Weight Gains

Mean male and female body weight data are presented weekly through the first 48 weeks and monthly thereafter in Table II.

Mean weekly weight gains for the first ten weeks are presented in Table III.

TABLE II
TEST MATERIAL: Irradiated Papayas
Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Body Weight Data

Summary of Mean Values

Group	Sex	Body Weight (grams) Week:															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	M	20	26	28	32	33	35	36	37	38	38	39	38	39	40	39	40
	F	18	22	23	25	26	27	28	29	30	30	31	30	30	31	30	31
PC	M	20	26	28	31	33	35	35	37	37	38	39	38	39	41	40	40
	F	18	22	23	25	26	28	28	30	30	31	31	30	30	32	32	32
T-I	M	20	25	28	31	33	35	35	36	37	38	38	38	39	40	39	40
	F	18	22	23	24	26	27	28	29	29	30	31	30	31	32	31	31
T-II	M	20	26	29	31	33	35	35	37	38	38	39	39	40	41	40	40
	F	18	21	23	24	25	27	27	29	29	30	30	30	31	32	31	32

TABLE II continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Body Weight Data

Summary of Mean Values

Group	Sex	Body Weight (grams) Week:															
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
C	M	41	40	39	30	40	41	41	41	41	41	42	42	43	43	44	44
	F	31	32	31	31	32	33	33	33	33	33	33	34	34	34	35	35
PC	M	41	41	40	41	42	42	42	42	43	43	43	44	45	44	44	43
	F	33	33	32	33	34	34	35	34	36	35	35	36	36	36	37	36
T-I	M	40	40	40	40	41	41	41	41	42	41	42	42	44	43	43	43
	F	32	33	32	33	33	33	34	34	35	35	36	36	36	37	38	37
T-II	M	42	41	41	40	41	42	42	41	42	40	42	42	44	44	44	42
	F	32	33	33	31	32	32	33	33	34	33	35	34	35	35	36	35

TABLE II continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Body Weight Data

Summary of Mean Values

Group	Sex	Body Weight (grams) Week:																
		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
C	M	43	43	43	46	45	44	45	45	43	45	44	44	45	44	44	45	44
	F	33	35	34	36	36	37	38	38	37	39	39	38	38	38	38	39	38
PC	M	42	43	43	44	44	44	45	45	42	45	45	45	46	45	45	46	45
	F	35	37	37	37	38	38	38	38	36	39	39	39	38	39	39	39	38
T-I	M	41	44	43	45	45	44	45	45	43	46	45	45	46	46	45	46	46
	F	35	37	36	37	38	38	39	39	37	40	41	39	40	40	40	40	40
T-II	M	42	44	42	44	43	44	44	44	40	44	45	44	45	45	44	44	45
	F	33	36	34	36	37	37	38	38	36	39	40	36	39	39	39	39	39

TABLE II continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Body Weight Data

Summary of Mean Values

Group	Sex	Body Weight (grams) Month:												
		12	13	14	15	16	17	18	19	20	21	22	23	24
C	M	44	44	41	43	42	44	41	40	38	37	38	37	27
	F	38	40	38	38	39	38	38	37	40	43	38	35	26
PC	M	45	45	45	44	43	42	42	40	39	40	39	38	-
	F	38	39	39	38	38	39	39	39	39	38	39	39	31
T-I	M	46	45	44	44	43	43	43	42	40	39	38	36	33
	F	40	39	39	39	39	37	37	36	36	35	34	31	25
T-II	M	45	44	43	43	42	42	40	40	39	37	36	36	32
	F	39	40	38	38	37	37	36	35	35	35	34	34	28

- = No survivors.

TABLE III

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Mean Weekly Weight Gain Data

First Ten Weeks

Group	Sex	Weight Gain Data (grams)										Ten Week Total
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	
C	M	6	2	4	1	2	1	1	1	0	1	19
	F	4	1	2	1	1	1	1	1	0	1	13
PC	M	6	2	3	2	2	0	2	0	1	1	19
	F	4	1	2	1	2	0	2	0	1	0	13
T-I	M	5	3	3	2	2	0	1	1	1	0	18
	F	4	1	1	2	1	1	1	0	1	1	13
T-II	M	6	3	2	2	2	0	2	1	0	1	19
	F	3	2	1	1	2	0	2	0	1	0	12

B. Food Consumption and Food Efficiency Data

The mean male and female food consumption data during weeks one through ten, 36 through 39, 52 through 55 and 77 through 80 are presented in Table IV.

Food efficiency data for weeks three through ten are presented in Table V.

TABLE IV

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Food Consumption Data

Summary of Mean Values

Group	Sex	Food Consumption (grams/mouse/week)											
		Week:											
		3	4	5	6	7	8	9	10	36	37	38	39
C	M	42	44	43	49	44	44	45	46	32	32	35	33
	F	41	41	44	50	42	46	48	47	37	41	42	41
PC	M	47	55	49	64	49	48	54	48	41	42	42	42
	F	45	55	49	60	52	50	52	46	42	40	56	48
T-I	M	50	56	52	63	51	53	52	54	42	37	42	40
	F	43	51	47	53	45	47	49	42	42	51	49	50
T-II	M	47	53	51	63	53	52	50	52	42	43	49	46
	F	44	50	56	59	50	47	51	42	49	44	56	50

TABLE IV continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Food Consumption Data

Summary of Mean Values

Group	Sex	Food Consumption (grams/mouse/week)							
		Week:							
		52	53	54	55	77	78	79	80
C	M	27	27	28	35	33	30	32	30
	F	29	37	42	56	34	38	32	34
PC	M	31	26	57	39	34	36	36	30
	F	28	21	23	30	33	34	30	31
T-I	M	33	30	50	49	38	30	30	33
	F	21	25	35	37	36	34	30	32
T-II	M	37	32	30	49	31	34	36	30
	F	32	31	36	58	30	31	34	31

TABLE V

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Food Efficiency Data

Weeks Three through Ten

Group	Sex	Food Efficiency							
		Weight Gain (grams)/Grams of Food Eaten							
		Week:							
		2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
C	M	0.095	0.023	0.046	0.020	0.023	0.023	-	0.022
	F	0.049	0.024	0.023	0.020	0.024	0.022	-	0.021
PC	M	0.064	0.036	0.041	-	0.041	-	0.018	0.021
	F	0.044	0.018	0.041	-	0.038	-	0.019	-
T-I	M	0.060	0.036	0.038	-	0.020	0.019	0.019	-
	F	0.023	0.039	0.021	0.019	0.022	-	0.020	0.024
T-II	M	0.042	0.038	0.039	-	0.038	0.019	-	0.019
	F	0.023	0.020	0.036	-	0.040	-	0.020	-

- = No gain in mean weight; therefore, food efficiency could not be calculated.

C. Mortality and Reactions

The frequency and distribution of deaths are presented in Table VI. There were no unusual reactions noted among treated or untreated animals.

TABLE VI

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Mortality Data

Group	Sex	Frequency and Distribution of Deaths				Total Dead Number Tested (1-12)
		1-3	4-6	Month: 7-9	10-12	
C	M	0	1	4	12	17/69
	F	0	3	0	4	7/69
PC	M	0	0	6	3	9/69
	F	0	3	1	6	10/69
T-I	M	0	0	4	10	14/69
	F	0	5	0	5	10/69
T-II	M	1	0	4	10	15/69
	F	0	4	1	4	9/69

TABLE VI continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Mortality Data

Frequency and Distribution of Deaths							
Group	Sex	Month:				Total Dead	Total Dead
		13-15	16-18	19-21	22-24	Number Tested (13-24)	Number Tested (1-24)
C	M	13	6	20	10	49/50	66/67
	F	9	6	21	17	53/60	60/67
PC	M	8	8	23	19	58/58	67/67
	F	7	6	21	21	55/57	65/67
T-I	M	7	5	23	15	50/53	64/67
	F	10	5	25	15	55/57	65/67
T-II	M	10	12	18	10	50/52	65/67
	F	6	12	30	8	56/58	65/67

D. Hematologic Studies

The results of the blood studies are summarized in Tables VII and VIII. Included in Table VIII are the results from the clinical chemistry determinations of serum glutamic-oxalacetic transaminase (SGOT) activity.

TABLE VII

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Hematologic Data

Summary of Mean Values

Group	Sex	Differential Leukocyte Count (number of cells/hundred)														
		Lymphocytes			Neutrophils			Monocytes			Eosinophils			Basophils		
		Month:			Month:			Month:			Month:			Month:		
		0	3	6	0	3	6	0	3	6	0	3	6	0	3	6
C	M	80	85	72	19	15	27	0	0	0	1	0	1	0	0	0
	F	87	78	77	12	21	21	0	0	0	1	1	2	0	0	0
PC	M	80	71	74	19	29	25	0	0	0	1	0	1	0	0	0
	F	87	87	85	12	12	14	0	0	0	1	1	1	0	0	0
T-I	M	80	72	80	19	28	18	0	0	0	1	0	2	0	0	0
	F	87	77	88	12	23	12	0	0	0	1	0	0	0	0	0
T-II	M	80	82	83	19	17	16	0	0	0	1	1	1	0	0	0
	F	87	86	86	12	13	13	0	0	0	1	1	1	0	0	0

TABLE VII continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Hematologic Data

Summary of Mean Values

Group	Sex	Differential Leukocyte Count (number of cells/hundred)														
		Lymphocytes			Neutrophils			Monocytes			Eosinophils			Basophils		
		Month:			Month:			Month:			Month:			Month:		
		12	18	24	12	18	24	12	18	24	12	18	24	12	18	24
C	M	82	52	60	18	48	40	0	0	0	0	0	0	0	0	0
	F	81	74	54	17	25	46	0	0	0	1	1	0	0	0	0
PC	M	68	47	-	32	52	-	0	0	-	0	1	-	0	0	-
	F	72	67	46	27	32	54	1	0	0	0	1	0	0	0	0
T-I	M	60	64	62	39	35	38	1	0	0	0	1	0	0	0	0
	F	78	46	34	20	54	64	1	0	0	1	0	2	0	0	0
T-II	M	72	55	29	27	44	71	0	0	0	1	1	0	0	0	0
	F	73	58	64	26	41	35	0	0	0	1	1	1	0	0	0

- = No survivors.

TABLE VIII

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Hematologic and Clinical Blood Chemistry Data

Summary of Mean Values

Group	Sex	Total Leukocyte Count (thousands/mm ³)			Erythrocyte Count (millions/mm ³)			Hemoglobin Concentration (g/100 ml)			Hematocrit Value (%)			SGOT (Dade Units)		
		Month:			Month:			Month:			Month:			Month:		
		0	3	6	0	3	6	0	3	6	0	3	6	0	3	6
C	M	4.9	3.0	3.0	7.41	8.59	7.78	15.7	17.7	15.0	48	51	47	146	165	110
	F	8.0	2.6	3.4	7.88	8.86	8.13	17.1	18.8	15.6	52	53	49	131	280	85
PC	M	4.9	3.2	3.2	7.41	8.60	7.90	15.7	18.0	14.8	48	51	46	146	200	108
	F	8.0	3.3	3.4	7.88	9.03	8.46	17.1	18.0	16.3	52	51	51	131	140	124
T-I	M	4.9	4.9	3.6	7.41	9.22	8.26	15.7	18.1	15.7	48	52	49	146	190	107
	F	8.0	8.0	3.6	7.88	8.78	7.95	17.1	17.4	15.3	52	51	48	131	225	102
T-II	M	4.9	4.9	3.2	7.41	7.87	7.78	15.7	16.3	15.0	48	46	47	146	200	94
	F	8.0	8.0	4.2	7.88	8.40	8.22	17.1	17.4	16.5	52	49	52	131	320	105

TABLE VIII continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Hematologic and Clinical Blood Chemistry Data

Summary of Mean Values

Group	Sex	Total Leukocyte Count (thousands/mm ³)			Erythrocyte Count (millions/mm ³)			Hemoglobin Concentration (g/100 ml)			Hematocrit Value (%)			SGOT (Dade Units)		
		Month:			Month:			Month:			Month:			Month:		
		12	18	24	12	18	24	12	18	24	12	18	24	12	18	24
C	M	5.3	5.9	3.7	7.50	9.60	8.61	14.6	17.4	16.4	46	47	40	94	87	157
	F	3.2	4.9	3.6	7.91	8.81	7.34	15.8	15.7	14.6	48	42	37	111	91	158
PC	M	5.3	3.2	-	8.00	9.60	-	15.5	17.6	-	47	47	-	138	109	-
	F	3.8	4.3	4.4	7.80	8.31	7.51	14.9	15.5	13.9	48	40	36	126	78	189
T-I	M	6.5	7.4	3.1	7.30	8.84	8.10	14.0	15.0	15.3	43	43	39	133	93	136
	F	3.7	3.5	1.7	8.05	8.24	8.72	15.3	15.2	15.4	47	40	39	111	101	207
T-II	M	6.3	4.0	3.3	7.93	9.21	8.41	15.4	16.2	14.7	48	44	39	111	117	183
	F	3.5	4.6	2.2	7.68	9.13	7.17	15.3	16.7	14.1	48	44	35	78	109	164

- = No survivors.

E. Autopsy Findings

1. Gross Autopsy Findings

Gross autopsy findings among test animals were not different from controls.

2. Organ Weight and Ratio Data

Final body weights and corresponding organ weight and femur lengths for each interim sacrifice and the final sacrifice are presented in Tables IX through XIII.

Two animals per group of each sex were sacrificed after three, six, 12 and 18 months. All of the animals remaining at 24 months were sacrificed.

TABLE IX

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Three-Month Sacrifice

Summary of Mean Values

Group	Sex	Final Body Weight	Organ Weight (grams)							Femur Length (inches)	
			Liver	Kidney		Gonads		Heart	Spleen	Left	Right
				Left	Right	Left	Right				
C	M	39	2.712	0.478	0.536	0.163	0.176	0.240	0.139	0.650	0.654
	F	34	2.474	0.328	0.344	0.031	0.032	0.240	0.180	0.632	0.641
PC	M	37	2.756	0.474	0.454	0.152	0.164	0.244	0.145	0.649	0.650
	F	33	2.098	0.310	0.322	0.022	0.022	0.242	0.132	0.626	0.626
T-I	M	40	2.636	0.472	0.485	0.126	0.138	0.244	0.166	0.654	0.654
	F	34	2.634	0.331	0.346	0.027	0.027	0.213	0.137	0.612	0.636
T-II	M	38	2.249	0.460	0.476	0.151	0.164	0.240	0.114	0.628	0.644
	F	30	1.956	0.282	0.302	0.016	0.020	0.319	0.164	0.619	0.614

TABLE X

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Six-Month Sacrifice

Summary of Mean Values

Group	Sex	Final Body Weight	Liver	Organ Weight (grams)				Heart	Spleen	Femur Length (inches)	
				Kidney		Gonads				Left	Right
				Left	Right	Left	Right				
C	M	38	2.240	0.426	0.422	0.123	0.139	0.240	0.180	0.669	0.669
	F	31	1.572	0.246	0.268	0.011	0.014	0.168	0.134	0.669	0.669
PC	M	38	2.584	0.470	0.508	0.132	0.135	0.242	0.132	0.630	0.630
	F	30	1.903	0.286	0.276	0.014	0.014	0.184	0.160	0.669	0.669
T-I	M	44	2.944	0.509	0.512	0.147	0.140	0.213	0.137	0.669	0.669
	F	32	1.770	0.257	0.251	0.021	0.018	0.155	0.120	0.669	0.669
T-II	M	44	2.232	0.572	0.568	0.136	0.136	0.319	0.164	0.630	0.630
	F	35	1.592	0.242	0.254	0.017	0.020	0.152	0.106	0.630	0.630

TABLE XI

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Twelve-Month Sacrifice

Summary of Mean Values

Group	Sex	Final Body Weight	Liver	Organ Weight (grams)						Femur Length (inches)	
				Kidney		Gonads		Heart	Spleen	Left	Right
				Left	Right	Left	Right				
C	M	45	2.185	0.405	0.410	0.115	0.120	0.265	0.095	0.625	0.637
	F	38	1.620	0.260	0.260	0.014	0.012*	0.165	0.130	0.659	0.615
PC	M	46	2.710	0.520	0.505	0.140	0.125	0.295	0.150	0.616	0.634
	F	44	2.335	0.330	0.330	0.013	0.025*	0.240	0.220	0.695	0.686
T-I	M	42	2.285	0.145	0.440	0.140	0.165	0.228	0.125	0.629	0.630
	F	50	2.267	0.330	0.340	0.012	0.004	0.225	0.150	0.626	0.655
T-II	M	45	2.820	0.540	0.540	0.140	0.145	0.355	0.130	0.645	0.648
	F	38	1.970	0.310	0.295	0.017	0.020	0.290	0.120	0.636	0.634

* Cystic ovaries were excluded from the mean.

TABLE XII

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Eighteen-Month Sacrifice

Summary of Mean Values

Group	Sex	Final Body Weight	Liver	Organ Weight (grams)				Heart	Spleen	Femur Length (inches)	
				Kidney		Gonads				Left	Right
				Left	Right	Left	Right				
C	M	38	2.145	0.485	0.430	0.115	0.115	0.245	0.135	0.622	0.628
	F	35	2.400	0.355	0.400	0.010	0.020	0.210	0.455	0.666	0.666
PC	M	42	3.065	0.460	0.445	0.120	0.115	0.275	0.310	0.647	0.617
	F	40	2.340	0.340	0.335	0.020	0.020	0.235	0.130	0.662	0.665
T-I	M	43	2.200	0.460	0.460	0.110	0.100	0.255	0.130	0.626	0.626
	F	40	1.915	0.330	0.345	0.020	0.020	0.240	0.130	0.622	0.622
T-II	M	43	2.595	0.500	0.520	0.125	0.135	0.310	0.085	0.634	0.630
	F	45	2.120	0.355	0.360	0.020	0.020	0.260	0.105	0.661	0.652

TABLE XIII

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Final Sacrifice

Summary of Mean Values

Group	Sex	Final Body Weight	Liver	Organ Weight (grams)				Heart	Spleen	Femur Length (inches)	
				Kidney		Gonads				Left	Right
				Left	Right	Left	Right				
C	M	27	0.868	0.252	0.262	0.100	0.101	0.191	0.030	0.657	0.649
	F	26	1.332	0.270	0.281	0.021*	0.021	0.190	0.107	0.661	0.656
PC	M	-	-	-	-	-	-	-	-	-	-
	F	31	1.667	0.330	0.322	0.025*	0.014*	0.208	0.269	0.630	0.632
T-I	M	33	1.670	0.396	0.376	0.103	0.100	0.253	0.125	0.652	0.656
	F	25	1.430	0.340	0.320	0.014	0.024	0.225	0.125	0.662	0.655
T-II	M	32	1.756	0.425	0.400	0.105	0.095	0.230	0.105	0.625	0.615
	F	28	1.760	0.295	0.325	0.043	0.052	0.210	0.170	0.660	0.670

- = No survivors.

* Cystic ovaries were excluded from the mean.

3. Histopathologic Findings

Histopathologic examinations of the tissues from treated mice revealed no changes which could be attributed to the ingestion of irradiated papayas.

The findings noted are considered to be spontaneous lesions. Results of the interim sacrifices are presented in Table XIV. Results of the final sacrifice are presented in Table XV. Tissues not listed appeared normal histologically.

TABLE XIV

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Histopathologic Findings

Interim Sacrifices

Interim Sacrifice	Group	Sex	Tissue	Findings	Incidence
3-Month	T-II	F	Skin	Focal hyperplasia	1
6-Month	C	M	Kidney	Focal lymphoid infiltration	1
			Liver	Hematopoiesis	1
			Colon	Parasites	1
			Skin	Liposarcoma	1
	PC	F	Adrenal gland	Focal lymphoid infiltration	1
	T-I	M	Colon	Parasites	1
	T-II	M	Colon	Parasites	1
		F	Trachea	Tracheitis	1
			Lung	Congestion	1
12-Month	C	F	Kidney	Focal inflammation	2
	PC	M	Bladder	Focal inflammation	1
			Kidney	Focal inflammation	1
		F	Kidney	Focal inflammation	1
				Nephritis	1
			Lung	Focal atelectasis	1
			Uterus	Polypoid cystic endometrium, benign	1

TABLE XIV continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Histopathologic Findings

Interim Sacrifice

Interim Sacrifice	Group	Sex	Tissue	Findings	Incidence
12-Month	T-I	M	Kidney	Focal inflammation	2
			Lung	Focal inflammation	1
		F	Kidney	Focal inflammation	1
				Nephritis	1
	T-II	M	Kidney	Focal inflammation	1
			Lung	Focal inflammation	1
			Trachea	Inflammation	1
		F	Heart	Focal inflammation	1
			Kidney	Focal inflammation	2
			Uterus	Cystic dilatation of endometrium	1
18-Month	C	M	Lung	Inflammation	1
		F	Kidney	Focal lymphoid infiltration	1
			Liver	Lymphosarcoma	1
	PC	M	Colon	Parasites	1
			Kidney	Focal lymphoid infiltration	1
			Lung	Inflammation	1
		F	Liver	Focal lymphoid infiltration	1

TABLE XIV continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Histopathologic Findings

Interim Sacrifice

Interim Sacrifice	Group	Sex	Tissue	Findings	Incidence
18-Month	T-1	M	Kidney	Focal lymphoid infiltration	1
			Lung	Inflammation	1
		F	Ileum	Amyloidosis	1
			Kidney	Focal lymphoid infiltration	1
			Salivary gland	Focal lymphoid infiltration	1
			Uterus	Cystic hyperplasia	1

TABLE XV

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Histopathologic Findings

Final Sacrifice

Group	Sex	Tissue	Findings	Incidence
C	M	Heart	Chronic focal myocarditis	1
		Lung	Inflammation	1
		Kidney	Focal lymphoid infiltration	1
	F	Heart	Chronic focal myocarditis	2
		Lung	Inflammation	4
		Small intestine	Parasites	1
			Amyloidosis	1
		Spleen	Amyloidosis	1
		Kidney	Focal lymphoid infiltration	3
		Ovary	Calculus	1
		Uterus	Metritis	1
		Salivary gland	Focal lymphoid infiltration	1
		PC	F	Heart
Lung	Inflammation			7
Small intestine	Amyloidosis			1
Kidney	Focal lymphoid infiltration			5
	Amyloidosis			2
Urinary bladder	Amyloidosis			1
	Focal nephritis			1
Ovary	Calculus			1
Uterus	Metritis			2
Salivary gland	Focal lymphoid infiltration			1

TABLE XV continued

TEST MATERIAL: Irradiated Papayas

Two-Year Chronic Oral Toxicity Study - Swiss White Mice

Histopathologic Findings

Final Sacrifice

Group	Sex	Tissue	Findings	Incidence
T-I	M	Lung	Inflammation	2
		Liver	Amyloidosis	1
		Small intestine	Amyloidosis	1
		Kidney	Focal lymphoid infiltration	1
		Bone marrow	Atrophy	1
	F	Heart	Chronic focal myocarditis	1
		Trachea	Tracheitis	1
		Lung	Inflammation	2
		Small intestine	Amyloidosis	1
		Kidney	Focal lymphoid infiltration	1
		Ovary	Amyloidosis	1
T-II	M	Heart	Chronic focal myodarditis	1
		Trachea	Tracheitis	1
		Lung	Inflammation	1
		Small intestine	Amyloidosis	2
		Kidney	Focal lymphoid infiltration	1
	F	Small intestine	Amyloidosis	1
		Spleen	Telangiectasis	1
		Kidney	Focal lymphoid infiltration	1