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

MASTER

REPORT TO
ATOMIC ENERGY COMMISSION
THREE-GENERATION REPRODUCTION STUDY WITH
LOW DOSE IRRADIATED PAPAYAS
IN SWISS WHITE MICE
RESULTS OF ALL THREE GENERATIONS

CONTRACT NO. AT (11-1)-2014
REPORT NO. COO-2014-14

OCTOBER 21, 1971

IBT NO. P7040

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

October 21, 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. P7040 - Three-Generation Reproduction
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 21, 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

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ATOMIC ENERGY COMMISSION
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I. Introduction

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

II. Summary

A two-year chronic and three-generation reproduction study employing Swiss albino mice fed low dose irradiated papayas was conducted. The following results were obtained during the reproduction portion of the experiment.

Investigation of the following parameters revealed no differences between test and control animals which could be attributed to the ingestion of low dose irradiated papayas.

A. Parental Animals

1. Body weight gain.
2. Mortality and reactions.
3. Hematologic and clinical blood chemistry.
4. Pathologic studies.
5. Reproductive performance.

B. Progeny

1. Numbers delivered and viable.
2. Survival.
3. Body weight at weaning.
4. Hematologic and clinical blood chemistry.
5. Pathologic studies.
6. Reactions.

Respectfully submitted,

INDUSTRIAL BIO-TEST LABORATORIES, INC.

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October 21, 1971

trm:lampsh

III. Procedure

A. Experimental Animals

The animals employed were Charles River random bred albino mice*. A total of 600 weanling mice (300 males and 300 females) was selected after examination for general physical well-being, to form two test groups, a papaya control and negative control group for the two-year longevity portion of the investigation. Following ten weeks of feeding, 45 males and 45 females were selected from each group to serve as the first generation parental animals. Following breeding, these animals were returned to the longevity portion of the study. Parental animals of each generation, after having reached maturity, were bred and produced two litters. At the time of weaning the second litters (F1b and F2b), weanlings were isolated and maintained on the prescribed diet for one week. Parental animals were then chosen for each succeeding generation (F1 and F2). The reproduction study terminated following the weaning of the F3b weanlings. The design for the production of the three generations is presented in Figure 1.

B. Organization of Groups

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

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

FIGURE 1

TEST MATERIAL: Irradiated Papayas

Design of Experiment

TABLE I

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Outline of Experiment

Group	Treatment	Number of Parental Animals per Generation					
		Fo		F1		F2	
		Male	Female	Male	Female	Male	Female
C	None	45	45	75	75	45	45
PC	Non-irradiated papayas	45	45	75	75	45	45
T-I	Irradiated papayas (75 krads)	45	45	75	75	45	45
T-II	Irradiated papayas (200 krads)	45	45	75	75	45	45

Note: Papayas contributed 15 percent of the wet weight of the diet.

C. Diets and Feeding

Diets were prepared in the central diet room of this laboratory. The diet for any given group was prepared by blending the calculated weight of papayas with a preweighed portion of the stock ration* in a high speed mixer. Papayas contributed 15 percent of the wet weight of the diet.

The amount of food allotted per day to each mouse was sufficient for ad libitum feeding.

D. Body Weight

Parental animals were weighed weekly until mating trials commenced. Females were also weighed one and 21 days post-partum.

E. Mortality, Reactions and General Observations

Animals in each generation were observed daily for mortality and abnormal behavioral reactions. In addition, these animals were observed for fertility, length of gestation and lactation performance.

All pups were examined for physical anomalies at birth and the number of viable and stillborn members of each litter was recorded. Survival indices were calculated at various points during the gestation period. Litters of more than eight pups were reduced to that number (four males and four females when possible) on the fourth day of lactation.

F. Mating Procedure

Mating trials were initiated when the parental animals were 100 days old. Each of the females was mated with a male from within the same dietary level. Daily vaginal examinations were conducted to

* Purina Laboratory Chow, Ralston Purina Company, St. Louis, Mo.

determine if copulation had occurred. Each male was given a one-week mating trial before being replaced by another male from the same group. Males were rotated at weekly intervals until conception was confirmed or until a female was considered sterile.

The first litters (F1a, F2a, F3a) obtained were weaned 21 days post-partum. The females were given a 7-day rest period and rebred, the above procedure being repeated to obtain the second (F1b, F2b, F3b) litters. Females that did not become pregnant during the first mating trials were not rebred.

G. Pathologic Examinations

A complete gross necropsy and histopathological examination were conducted on any animals that were obviously ill or that developed tumors to ascertain the cause of the condition. The second and third generation parental animals were sacrificed following the weaning of the second litters and gross necropsies were conducted. Grossly abnormal tissues were examined histologically.

Gross pathologic examination was performed on all progeny appearing abnormal; no such examination was performed on pups which appeared outwardly normal until the weaning of the final litters (F3b), at which time ten male and ten female weanlings were chosen from each dietary group for pathologic examination. Five male and five female weanlings from each group were examined histologically.

H. Hematologic Studies

Hematological examinations were conducted on the peripheral blood of four male and four female parental animals from each dietary group. These examinations were conducted during each generation after one, three and six months of testing.

Erythrocyte count, hemoglobin concentration, hematocrit and both total and differential leukocyte counts were determined. Serum glutamic-oxalacetic transaminase (SGOT) was also measured at the same intervals.

Investigation of the same parameters was also conducted upon one male and one female weanling from each of the F3b litters obtained.

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. Parental Animals

1. Body Weights

Body weight data are presented in Tables II and III. Included in the tables are the total weight gains for the first 70 days of the feeding period.

Table IV represents the mean weights of females on lactation days one and 21.

TABLE II
 TEST MATERIAL: Irradiated Papayas
 Three-Generation Reproduction Study - Swiss White Mice
 Mean Body Weight and Weight Gain Data

Parental Male Mice													
Group	Generation	Mean Body Weight (grams)											Total Weight Gain (grams)
		0	7	14	21	28	35	42	49	56	63	70	
C	Fo	20	26	28	32	33	35	36	37	38	38	39	19
	F1	20	27	29	31	33	33	35	36	36	38	39	19
	F2	18	26	28	30	32	34	35	36	37	38	38	20
PC	Fo	20	26	28	31	33	35	35	37	37	38	39	19
	F1	18	25	27	30	31	32	33	34	35	36	37	19
	F2	18	26	28	30	30	32	32	33	34	35	36	18
T-I	Fo	20	25	28	31	33	35	35	36	37	38	38	18
	F1	18	26	28	31	32	33	35	35	36	37	38	20
	F2	15	23	27	29	31	32	33	34	35	36	37	22
T-II	Fo	20	26	29	31	33	35	35	37	38	38	39	19
	F1	18	25	27	30	32	33	34	35	36	37	38	20
	F2	18	25	28	30	31	33	34	36	36	37	37	19

TABLE III

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Mean Body Weight and Weight Gain Data

Parental Female Mice

Group	Generation	Mean Body Weight (grams)											Total Weight Gain (grams)
		0	7	14	21	28	35	42	49	56	63	70	
C	Fo	18	22	23	25	26	27	28	29	30	30	31	13
	F1	17	22	23	24	26	26	27	28	29	29	30	13
	F2	16	22	23	24	25	26	27	28	29	29	30	14
PC	Fo	18	22	23	25	26	28	28	30	30	31	31	13
	F1	15	20	20	23	24	24	26	26	27	27	28	13
	F2	15	21	22	23	24	26	26	26	28	28	28	13
T-I	Fo	18	22	23	24	26	27	28	29	29	30	31	13
	F1	16	22	23	24	25	26	27	27	29	29	30	14
	F2	14	20	22	23	24	25	26	26	27	28	28	14
T-II	Fo	18	21	23	24	25	27	27	29	29	30	30	12
	F1	14	21	22	23	24	25	26	27	27	28	28	14
	F2	15	22	23	23	25	26	26	27	28	28	28	13

TABLE IV

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Lactating Female Body Weights

Group	Litter	Body Weight (grams) Lactation Day:	
		1	21
C	F1a	37	40
	F1b	39	42
	F2a	37	40
	F2b	41	42
	F3a	36	38
	F3b	40	41
PC	F1a	37	39
	F1b	41	42
	F2a	36	38
	F2b	39	40
	F3a	37	37
	F3b	39	40
T-I	F1a	35	39
	F1b	42	42
	F2a	38	39
	F2b	40	42
	F3a	34	38
	F3b	39	42
T-II	F1a	36	39
	F1b	40	41
	F2a	36	39
	F2b	40	41
	F3a	36	38
	F3b	38	39

2. Mortality

Mortality data are presented in Tables V and VI.

3. Reactions

No untoward reactions were noted among the parental animals during the investigation.

TABLE V

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Mortality Data

Parental Generation Males

Group	Generation	Mortality Data					Total
		Pre-M	First Mating		Second Mating		
			M	Post-M	M	Post-M	
C	Fo	0	0	0	1	0	1
	F1	0	0	2	0	5	7
	F2	0	0	0	0	0	0
PC	Fo	0	0	0	0	4	4
	F1	0	0	0	0	4	4
	F2	0	0	0	0	0	0
T-I	Fo	0	0	0	0	2	2
	F1	0	0	1	0	6	7
	F2	0	1	0	0	0	1
T-II	Fo	0	0	0	0	1	1
	F1	0	0	1	0	1	2
	F2	0	0	0	0	0	0

Pre-M = Pre-Mating Period

M = Mating Period

Post-M = Post-Mating Period

Note: Animals which died during blood collection for hematology are excluded.

TABLE VI

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Mortality Data

Parental Generation Females

Group	Generation	Pre-M	First Mating					Second Mating					Total
			M	G	P	L	R	M	G	P	L	Post-W	
C	Fo	0	1	0	0	2	0	0	0	0	0	0	3
	F1	0	0	0	0	0	0	0	0	0	0	0	0
	F2	0	0	0	0	0	0	1	0	0	0	1	2
PC	Fo	0	1	0	0	2	0	0	0	0	0	0	3
	F1	0	1	0	0	1	1	0	0	0	0	0	3
	F2	0	0	0	0	2	1	0	0	0	0	0	3
T-I	Fo	0	0	0	0	5	0	0	0	0	0	0	5
	F1	0	0	0	1	1	0	0	0	0	0	0	2
	F2	0	0	0	0	0	0	1	0	0	0	0	1
T-II	Fo	0	0	0	0	4	0	0	0	0	0	0	4
	F1	0	0	0	0	0	0	0	0	0	2	0	2
	F2	0	0	1	0	0	0	0	0	0	0	0	1

Pre-M = Pre-Mating Period

L = Lactation

M = Mating Period

R = Rest Period

G = Gestation Period

Post-W = Post-Weaning

P = Parturition

Note: Animals which died during blood collection for hematology are excluded.

4. Hematologic Studies

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

5. Pathologic Studies

Gross pathologic examinations performed on the second and third generation animals revealed no differences between test and control animals which could be attributed to the ingestion of irradiated papayas.

Pathologic examinations of the first generation parental animals were performed only during the longevity portion of the study.

TABLE VII

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic and Clinical Blood Chemistry Data

Summary of Mean Values

Group	Sex	Generation	Total Leukocyte Count (thousands/mm ²)			Erythrocyte Count (millions/mm ²)			Hemoglobin Concentration (g/100 ml)			Hematocrit (% volume)			SGOT (Dade Units)		
			Month:			Month:			Month:			Month:			Month:		
			1	3	6	1	3	6	1	3	6	1	3	6	1	3	6
C	M	F ₀	4.9	3.0	3.0	7.41	8.59	7.88	15.7	17.7	15.0	48	51	47	146	165	110
		F ₁	4.4	5.0	4.4	8.34	8.46	8.75	16.3	16.0	17.0	53	51	53	73	148	152
		F ₂	4.2	5.4	10.0	7.38	9.24	8.06	14.0	16.8	14.6	42	48	40	117	90	70
	F	F ₀	8.0	2.6	3.4	7.88	8.86	8.13	17.1	18.8	15.6	52	53	49	131	280	85
		F ₁	4.4	3.2	5.9	8.39	8.56	8.80	16.9	16.7	16.5	53	51	51	120	120	147
		F ₂	7.2	7.6	5.2	6.86	8.72	8.52	13.5	16.7	15.4	37	46	42	104	264	85
PC	M	F ₀	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 ₁	2.0	5.0	1.8	8.18	8.80	8.68	16.8	16.3	16.5	53	51	51	120	86	115
		F ₂	7.4	7.0	5.9	6.19	8.90	8.00	12.4	16.0	15.1	35	48	42	178	104	124
	F	F ₀	8.0	3.3	3.4	7.88	9.03	8.46	17.1	18.0	16.3	52	52	51	131	140	124
		F ₁	5.2	4.3	4.2	8.53	8.40	8.86	17.2	16.4	16.6	54	51	51	131	120	173
		F ₂	5.9	4.9	4.4	6.60	8.86	8.82	13.0	17.2	14.8	37	49	42	150	124	130

TABLE VII continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic and Clinical Blood Chemistry Data

Summary of Mean Values

Group	Sex	Generation	Total Leukocyte Count (thousands/mm ²)			Erythrocyte Count (millions/mm ²)			Hemoglobin Concentration (g/100 ml)			Hematocrit (% volume)			SGOT (Dade Units)		
			Month:			Month:			Month:			Month:			Month:		
			1	3	6	1	3	6	1	3	6	1	3	6	1	3	6
T-I	M	Fo	4.9	2.6	3.6	7.41	9.22	8.26	15.7	18.1	15.7	48	52	49	146	190	107
		F1	3.4	5.2	3.5	7.95	8.49	9.14	15.6	16.1	16.7	50	49	52	110	126	144
		F2	4.6	4.9	7.6	6.31	8.86	8.32	12.3	15.9	14.7	36	46	41	102	164	117
	F	Fo	8.0	2.7	3.6	7.88	8.78	7.95	17.1	17.4	15.3	52	51	48	131	225	102
		F1	4.8	6.6	6.2	8.28	8.68	8.68	16.8	16.7	16.4	54	51	50	154	140	260
		F2	6.4	3.8	5.3	6.63	8.34	8.62	13.4	15.7	15.4	37	50	43	117	174	115
	M	Fo	4.9	2.5	3.2	7.41	7.87	7.78	15.7	16.3	15.0	48	46	47	146	200	94
		F1	1.4	6.1	3.9	7.96	8.16	8.66	16.4	14.7	15.4	52	47	48	108	120	161
		F2	5.9	5.2	6.0	6.72	8.68	8.76	12.6	16.2	16.2	38	47	48	203	166	120
T-II	F	Fo	8.0	3.0	4.2	7.88	8.40	8.22	17.1	17.4	16.5	52	49	52	131	320	105
		F1	2.6	4.9	6.5	7.72	8.01	8.87	16.4	14.7	16.8	52	47	52	105	121	253
		F2	6.6	4.8	4.6	6.65	8.60	8.20	13.6	16.0	14.9	40	48	41	213	173	157

TABLE VIII

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic Data

Summary of Mean Values

Group	Sex	Generation	Differential Leukocyte Count (number of cells/hundred)														
			Lymphocytes			Neutrophils			Monocytes			Eosinophils			Basophils		
			Month:			Month:			Month:			Month:			Month:		
			1	3	6	1	3	6	1	3	6	1	3	6	1	3	6
C	M	Fo	78	85	72	21	15	27	0	0	0	1	0	1	0	0	0
		F1	86	76	60	14	23	40	0	0	0	1	1	0	0	0	0
		F2	91	80	86	9	20	14	0	0	0	0	0	0	0	0	0
	F	Fo	86	78	77	12	21	21	0	0	0	2	1	2	0	0	0
		F1	84	82	79	15	18	20	0	0	0	1	0	1	0	0	0
		F2	90	82	83	9	18	16	0	0	0	0	0	1	0	0	0
	M	Fo	78	71	74	21	29	25	<1	0	0	1	0	1	0	0	0
		F1	87	82	78	13	18	22	0	0	0	0	0	0	0	0	0
		F2	93	80	67	7	18	32	0	1	0	0	1	1	0	0	0
PC	F	Fo	86	87	85	12	12	14	0	0	0	2	1	1	0	0	0
		F1	89	85	72	10	13	31	0	0	0	1	2	0	0	0	0
		F2	93	84	76	7	16	23	0	0	0	0	0	0	0	0	0

TABLE VIII continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic Data

Summary of Mean Values

Group	Sex	Generation	Differential Leukocyte Count (number of cells/hundred)														
			Lymphocytes			Neutrophils			Monocytes			Eosinophils			Basophils		
			Month:			Month:			Month:			Month:			Month:		
			1	3	6	1	3	6	1	3	6	1	3	6	1	3	6
T-I	M	Fo	78	72	80	21	28	18	<1	0	0	1	0	2	0	0	0
		F1	80	85	79	20	13	20	0	0	0	0	2	1	0	0	0
		F2	93	80	69	7	19	31	0	0	0	0	0	0	0	0	0
	F	Fo	86	77	88	12	23	12	0	0	0	2	0	0	0	0	0
		F1	81	86	86	18	12	13	0	0	0	1	2	0	0	0	0
		F2	92	84	85	8	15	14	0	0	0	0	0	1	0	0	0
	M	Fo	78	82	83	21	17	16	<1	0	0	1	1	1	0	0	0
		F1	88	95	73	11	4	28	0	0	0	1	0	1	0	0	0
		F2	90	80	56	10	19	43	0	0	0	0	0	0	0	0	0
T-II	F	Fo	86	86	86	12	13	13	0	0	0	2	1	1	0	0	0
		F1	82	94	82	17	6	17	0	0	0	1	0	0	0	0	0
		F2	90	83	76	10	17	23	0	0	0	0	0	1	0	0	0

6. General Data

General data for parental animals are presented in Table IX.

The indices employed are defined below:

$$\text{Mating Index} = \frac{\text{Number of Copulations*}}{\text{Number of Estrus Cycles Required}} \times 100$$

$$\text{Fertility Index} = \frac{\text{Number of Pregnancies}}{\text{Number of Copulations}} \times 100$$

$$\text{Incidence of Pregnancy} = \frac{\text{Number of Pregnancies}}{\text{Number of Females Mated}} \times 100$$

$$\text{Incidence of Parturition} = \frac{\text{Number of Parturitions}}{\text{Number of Pregnancies}} \times 100$$

* Only one copulation counted per estrus cycle.

TABLE IX

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

General Data

Parental Animals

Reproductive Performance

Group	Litter	Mating Index		Incidence of Pregnancy		Fertility Index		Incidence of Parturition		Gestation Time (Days)	
		Fraction	%	Fraction	%	Fraction	%	Fraction	%	Mean	Range
C	F1a	44/48	91.7	44/44	100.0	44/44	100.0	44/44	100.0	18	16-19
	F1b	44/55	80.0	42/42	100.0	42/44	95.5	42/42	100.0	18	17-20
	F2a	75/97	73.3	74/74	100.0	74/75	98.7	74/74	100.0	19	18-21
	F2b	76/111	68.5	72/74	97.3	72/76	94.7	71/72	98.6	19	18-20
	F3a	46/52	88.5	45/45	100.0	45/46	97.8	44/45	97.8	19	18-21
	F3b	45/54	83.3	43/43	100.0	43/45	95.6	42/43	97.7	19	18-20
PC	F1a	49/66	74.2	44/44	100.0	44/49	89.8	44/44	100.0	18	16-21
	F1b	44/59	74.6	42/42	100.0	42/44	95.5	42/42	100.0	18	16-19
	F2a	75/118	63.6	73/75	97.3	73/75	97.3	73/73	100.0	19	17-21
	F2b	72/96	75.0	69/71	97.2	69/72	95.8	68/69	98.6	19	18-20
	F3a	46/54	85.2	45/45	100.0	45/46	97.8	45/45	100.0	19	17-21
	F3b	43/62	69.4	41/42	97.6	41/44	93.2	40/41	97.6	19	18-20

TABLE IX continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

General Data

Parental Animals

Reproductive Performance

Group	Litter	Mating Index		Incidence of Pregnancy		Fertility Index		Incidence of Parturition		Gestation Time (Days)	
		Fraction	%	Fraction	%	Fraction	%	Fraction	%	Mean	Range
T-I	F1a	46/54	85.2	45/45	100.0	45/46	97.8	45/45	100.0	18	16-21
	F1b	45/61	73.8	40/40	100.0	40/45	88.9	40/40	100.0	18	16-19
	F2a	74/114	64.9	69/70	98.6	69/74	93.2	66/69	95.7	18	17-21
	F2b	69/101	68.3	64/66	97.0	64/69	92.8	63/64	98.4	19	18-20
	F3a	45/48	93.8	44/44	100.0	44/45	97.8	44/44	100.0	19	17-21
	F3b	43/61	70.5	42/42	100.0	42/43	97.7	46/42	95.2	19	18-19
T-II	F1a	46/48	95.8	45/45	100.0	45/46	97.8	45/45	100.0	18	16-22
	F1b	43/45	95.6	41/41	100.0	41/43	95.3	41/41	100.0	18	16-20
	F2a	77/88	87.5	75/75	100.0	75/77	97.4	74/75	98.7	18	17-21
	F2b	74/93	79.6	73/73	100.0	73/74	98.6	73/73	100.0	19	17-21
	F3a	46/64	71.9	43/45	95.6	43/46	93.5	42/43	97.7	19	18-20
	F3b	44/85	51.8	39/43	90.7	39/44	88.6	36/39	92.3	19	18-20

B. Progeny

1. Population Data

Population data for all litters are presented in Table X.

Two T-II pups delivered during the first litter of the second generation were abnormal. One pup exhibited acephalia, and the other was taliped. All other pups delivered in both litters appeared outwardly normal and displayed normal growth through their lactation period. At weaning, an examination of each pup for external abnormalities was conducted and all pups were judged to be free of gross external abnormalities.

TABLE X

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Population Data

Progeny

Group	Litter	Number of Pups Delivered		Number of Pups Stillborn		Number of Pups Cannibalized		Number of Viable Pups Born		Number of Pups at Lactation Day 1	
		Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter
C	F1a	543	12.3	10	0.2	1	<0.1	532	12.1	502	11.4
	F1b	511	12.2	2	<0.1	0	-	509	12.1	507	12.1
	F2a	888	12.0	15	0.2	3	<0.1	870	11.8	799	10.8
	F2b	878	11.0	5	0.1	2	<0.1	781	11.0	775	10.6
	F3a	518	11.7	17*	0.4	0	-	501	11.1	446	9.9
	F3b	504	12.0	17*	0.4	1	<0.1	486	10.5	440	9.2
PC	F1a	565	12.8	11	0.3	0	-	554	12.6	516	11.7
	F1b	565	13.5	2	<0.1	0	-	563	13.4	551	13.1
	F2a	788	10.8	15	0.2	5	0.1	768	10.5	725	9.9
	F2b	772	11.4	4	0.1	19**	0.3	749	11.0	694	10.2
	F3a	549	12.2	4	0.1	2	<0.1	543	12.1	491	10.9
	F3b	492	12.3	6	0.1	1	<0.1	485	12.1	454	11.4

* Six pups were delivered stillborn by one female.

** Seventeen pups were cannibalized by one female.

TABLE X continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Population Data

Progeny

Group	Litter	Number of Pups Delivered		Number of Pups Stillborn		Number of Pups Cannibalized		Number of Viable Pups Born		Number of Pups at Lactation Day 1	
		Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter	Total	Mean/Litter
T-I	F1a	527	11.7	32	0.7	5	0.1	490	10.9	452	10.0
	F1b	497	12.4	5	0.1	1	<0.1	491	12.3	478	12.2
	F2a	766	11.6	9	0.1	2	<0.1	755	11.4	686	10.4
	F2b	685	10.0	10	0.2	9	0.2	666	10.6	566	9.0
	F3a	482	11.0	12*	0.3	4	0.1	466	10.6	431	9.8
	F3b	463	11.6	7	0.2	1	<0.1	456	11.4	415	10.4
T-II	F1a	567	12.6	14	0.3	3	0.1	550	12.2	515	11.4
	F1b	510	12.4	8	0.2	3	0.1	499	12.2	470	11.5
	F2a	791	10.8	15	0.2	12**	0.2	764	10.5	699	9.2
	F2b	861	12.0	32	0.4	5	0.1	824	11.4	739	10.3
	F3a	458	10.6	10	0.2	0	-	448	10.4	409	9.5
	F3b	387	10.8	15	0.4	0	-	372	10.3	307	8.5

* Six pups were delivered stillborn by one female.

** Six pups were cannibalized by one female.

TABLE X continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Population Data

Progeny

Group	Litter	Number of Pups at Lactation Day 4		Number of Pups Retained at Lactation Day 4				Number of Pups Weaned at Lactation Day 21			
		Total	Mean/Litter	Males	Females	Total	Mean/Litter	Males	Females	Total	Mean/Litter
C	F1a	400	9.1	136	136	272	6.2	104	112	216	5.1
	F1b	451	10.7	145	157	302	7.2	121	120	241	5.7
	F2a	685	9.3	242	242	484	6.5	214	211	435	5.9
	F2b	711	10.0	244	253	497	7.0	202	211	413	5.8
	F3a	388	8.6	145	144	289	6.4	118	113	231	5.1
	F3b	385	9.2	134	143	277	6.6	76	88	164	3.9
PC	F1a	383	8.7	136	129	265	6.0	80	71	151	3.6
	F1b	482	11.5	153	149	302	7.2	117	105	222	5.3
	F2a	659	9.0	257	232	489	6.7	201	185	386	5.4
	F2b	608	8.9	227	205	432	6.4	186	177	363	5.3
	F3a	427	9.5	136	137	273	6.1	75	80	155	3.4
	F3b	374	9.4	134	130	264	6.6	87	81	168	4.2

TABLE X continued

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Population Data

Progeny

Group	Litter	Number of Pups at Lactation Day 4		Number of Pups Retained at Lactation Day 4				Number of Pups Weaned at Lactation Day 21			
		Total	Mean/Litter	Males	Females	Total	Mean/Litter	Males	Females	Total	Mean/Litter
T-I	F1a	354	7.9	137	123	260	5.8	90	75	165	4.1
	F1b	444	11.1	152	139	291	7.3	113	101	214	5.4
	F2a	594	9.0	224	212	436	6.6	180	165	345	5.3
	F2b	460	7.3	181	260	341	5.4	123	109	232	3.7
	F3a	369	8.4	138	125	263	6.0	100	95	195	4.4
	F3b	349	8.7	118	130	248	6.2	77	90	167	4.2
T-II	F1a	429	9.5	146	155	301	6.7	89	86	165	4.3
	F1b	426	10.4	149	138	287	7.0	122	102	224	5.5
	F2a	548	7.5	202	195	397	5.4	159	151	310	4.3
	F2b	640	8.9	226	220	446	6.2	173	169	342	4.8
	F3a	340	7.9	147	126	273	6.3	115	96	211	4.9
	F3b	250	6.9	101	98	199	5.5	56	60	116	3.2

2. Survival Data

Survival data for progeny are presented in Table XI. The number of pups per female was reduced to eight, four males and four females whenever possible, on the fourth day of the lactation period.

Indices employed are defined below.

$$\text{Live Birth Index} = \frac{\text{Number of Viable Pups Born}}{\text{Total Number of Pups Born}} \times 100$$

$$\text{24-Hour Survival Index} = \frac{\text{Number of Pups Viable at Lactation Day 1}}{\text{Number of Viable Pups Born}} \times 100$$

$$\text{5-Day Survival Index} = \frac{\text{Number of Pups Viable at Lactation Day 4}}{\text{Number of Viable Pups Born}} \times 100$$

$$\text{Lactation Index} = \frac{\text{Number of Pups Viable at Weaning (Day 21)}}{\text{Number of Pups Retained at Lactation Day 4}} \times 100$$

TABLE XI

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Survival Indices

Progeny

Group	Litter	Live Birth Index	24-Hour Survival Index	4-Day Survival Index	Lactation Index
C	F1a	98.0	94.4	75.2	84.4
	F1b	99.6	99.6	88.6	79.8
	F2a	98.0	91.8	78.7	89.9
	F2b	99.1	96.7	91.0	83.1
	F3a	97.0	89.0	74.4	79.9
	F3b	96.4	90.5	79.2	59.2
PC	F1a	98.1	93.1	69.0	60.4
	F1b	99.6	97.9	85.6	73.5
	F2a	97.5	94.4	85.8	80.4
	F2b	97.0	92.6	81.2	92.7
	F3a	98.9	90.4	78.6	56.8
	F3b	98.6	93.6	77.1	63.6
T-I	F1a	93.0	92.2	72.2	75.0
	F1b	98.8	97.4	90.4	73.5
	F2a	98.6	90.9	78.7	80.6
	F2b	97.2	85.0	69.1	68.0
	F3a	96.7	92.5	79.2	74.1
	F3b	98.5	91.0	76.5	67.3
T-II	F1a	97.0	93.6	78.0	63.4
	F1b	97.8	94.2	85.4	78.0
	F2a	96.6	87.6	71.7	79.3
	F2b	95.7	89.7	77.7	76.7
	F3a	97.8	91.3	75.9	77.3
	F3b	96.1	82.5	67.2	58.3

3. Body Weight Data

Body weight data for weanlings are presented in Table XII.

TABLE XII

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Progeny

Weanling Body Weight Data

Group	Litter	Mean Body Weight (grams)	
		Males	Females
C	F1a	11	10
	F1b	11	11
	F2a	10	10
	F2b	10	10
	F3a	10	10
	F3b	11	11
PC	F1a	9	9
	F1b	9	9
	F2a	10	9
	F2b	10	9
	F3a	10	9
	F3b	11	11
T-I	F1a	9	8
	F1b	10	10
	F2a	10	9
	F2b	9	9
	F3a	9	9
	F3b	9	9
T-II	F1a	9	9
	F1b	10	10
	F2a	10	10
	F2b	9	9
	F3a	11	10
	F3b	10	9

4. Hematological Studies

Results of the F3b weanling blood studies are summarized in Tables XIII and XIV. Included in Table XIII are the results obtained from the determinations of serum glutamic-oxalacetic transaminase (SGOT) activity.

TABLE XIII

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic and Clinical Blood Chemistry Data - F3b Weanlings

Summary of Mean Values

Group	Sex	Total Leukocyte Count (thousands/mm ²)	Erythrocyte Count (millions/mm ²)	Hemoglobin Concentration (g/100 ml)	Hematocrit (% volume)	SGOT (Dade Units)
C	M	4.8	8.12	16.3	43	190
	F	4.8	8.15	16.5	44	183
PC	M	4.3	8.38	16.4	45	176
	F	3.0	8.57	16.6	45	189
T-I	M	4.4	8.34	15.6	44	202
	F	3.8	8.44	15.6	44	202
T-II	M	4.8	8.56	16.5	45	228
	F	4.2	8.40	16.2	45	240

TABLE XIV

TEST MATERIAL: Irradiated Papayas

Three-Generation Reproduction Study - Swiss White Mice

Hematologic Data - F3b Weanlings

Summary of Mean Values

Group	Sex	Differential Leukocyte Count (number of cells/hundred)				
		Lymphocytes	Neutrophils	Monocytes	Eosinophils	Basophils
C	M	72	27	0	0	0
	F	72	28	0	1	0
PC	M	67	33	0	0	0
	F	68	31	0	0	0
T-I	M	66	33	0	1	0
	F	76	23	0	1	0
T-II	M	59	40	0	0	0
	F	72	27	0	1	0

5. Pathologic Studies

Gross pathologic examinations were conducted upon ten male and ten female F3b weanlings from each dietary group. Tissues from one-half (five male and five female) of these animals were examined microscopically.

These examinations failed to reveal any differences between the test and control groups which could be attributed to the ingestion of irradiated papayas.

6. Reactions

No untoward reactions were noted among test or control progeny.