DOCUMENT 74

International Research and Development Corporation

SPONSOR: 3M Company

COMPOUND: Fluorad® Fluorochemical FC-143

SUBJECT: Ninety Day Subacute Rat Toxicity Study.

Edwin I. Goldenthal, Ph.D.
Vice President and
Director of Research

Collaborators:

D. C. Jessup, Ph.D., Associate
Director of Research
R. G. Geil, D.V.M., Vice President
and Director of Pathology
N. D. Jefferson, B.A., Acting Director
of Small Animal Toxicology
R. J. Arceo, M.D., Staff Pathologist

Date: November 6, 1978

TABLE OF CONTENTS

	Page
I. Synopsis	1
II. Compound	3
III. Clinical Methods	4
A. Method	4
1. General Procedure	4
2. Compound Administration	4
3. Observations	5
4. Laboratory Tests	5
a. Hematology	5
b. Biochemistry	5
c. Urinalysis	5
d. Serum Samples	5
5. Statistical Analysis	6
B. Results	6
1. General Behavior, Appearance and Survival	6
2. Body Weights	6
3. Food and Compound Consumption	7
4. Laboratory Tests	7
a. Hematology	7
b. Biochemistry	8
c. Urinalysis	8
IV. Pathological Studies	9
A. Methods	9
1. Gross Pathology	9
2. Histopathology	9
B. Results	9
1. Gross Pathology and Organ Weights	9
2. Histopathology	10

TABLE OF CONTENTS
(Continued)

Table No.		Page
1.	Group Mean Body Weights; Weight Ranges; and Survival	12
2.	Individual Weekly Body Weights	13-14
3.	Mean Food Consumption	15
4.	Summary of Means and Significance of Hematological Values	16-17
5- 7.	Individual Hematological Values	18-23
8.	Summary of Means and Significance of Biochemical Values	24-25
9-11.	Individual Biochemical Values	26-31
12-14.	Individual Urinalysis Values	32-37
15.	Summary of Gross Necropsy Observations	38
16.	Absolute and Relative Organ Weights	39
17.	Individual Organ Weights	40-41
18.	Histomorphologic Observations	42-47

I. SYNOPSIS

Fluorad® Fluorochemical FC-143 was fed in the diet at levels of 10, 30, 100, 300 and 1,000 ppm to Charles River CD rats for 90 days. Five male and five female rats were initiated at each dosage level and in the control group. The rats were observed twice daily for overt signs of toxicity and mortality. Individual body weights and sex-group food consumption were recorded weekly. Hematologic, biochemical and urinalysis studies were conducted during the pretest period and at 1 and 3 months of study.

No changes considered to be directly related to the compound were seen in general behavior, appearance or survival. A slight decrease in body weight gain and food consumption was seen for male rats at the 300- and 1,000-ppm dosage levels.

Hematologic, biochemical and urinalysis values for the female rats showed no changes considered to be related to the compound. A few values obtained for the males showed a slight deviation from the control values (i.e. slightly lower erythrocyte count, and elevated blood urea nitrogen and alkaline phosphatase values).

Compound-related gross observations such as enlargement and varying degrees of discoloration on the surface of the liver were observed among male rats in the 1,000-ppm group. There were no such observations amoung female rats from the 1,000-ppm group or in males or females from lower dietary levels.

Statistically significant variations in sex-group mean organ weights, which were considered compound related, occurred in the liver of rats in the 300- and 1,000-ppm dosage groups. All other variations were unaccompanied by any morphologic alterations.

Microscopically, compound-related lesions were confined to the liver. The lesions consisted of focal to multifocal, very slight to slight, cytoplasmic enlargement of hepatocytes located in centrilobular-midzonal regions of the affected liver lobules, accompanied in some instances by increased amount of yellowish-brown pigment resembling lipofuscin in cytoplasm of hepatocytes and occasionally in sinusoidal lining cells. The incidence and relative severity of the above lesions were predominantly amoung males and more pronounced among rats at 1,000 ppm. The other changes recorded in the liver and other tissues were lesions of naturally occurring diseases and they were present in most instances among the control and test rats.

II. COMPOUND

The compound was received from 3M Company, Saint Paul, Minnesota on October 24, 1977 as indicated below:

Label	Description
Fluorad® Flurochemical FC-143 3M Stock No. 98-0211-0008-0 Lot 340	white powder

III. CLINICAL METHODS

A. METHOD:

1. General Procedure:

Thirty male (222 to 254 grams) and 30 female (151 to 179 grams) Charles River CD rats purchased from The Charles River Breeding Laboratories, Inc., Portage, Michigan were used in this study. The rats were distributed among the groups, based upon a computer-generated table of random numbers. The rats were housed individually in suspended wire-mesh cages and maintained in a temperature-, humidity- and light-controlled room. During the pretest period, rats were provided Purina® Laboratory Chow® and water *ad libitum*. During the test period, the rats were provided the appropriate test diet and water *ad libitum*.

This study was initiated on November 1, 1977 and terminated by sacrifice of all remaining rats on January 30, 1978.

2. Compound Administration:

The test compound was mixed weekly with ground Purina® Laboratory Chow® (i.e., ground basal diet) to provide dosage levels of 10, 30, 100, 300 and 1,000 ppm. Five male and five female rats were used at each dosage level and in a control group. The control rats received the basal diet only, on the same regimen as treated rats. Samples of diet (100 grams each) were taken immediately after preparation and after 7 days standing in weeks 1, 4 and 12. The samples were frozen and subsequently shipped to the sponsor. Diets were prepared in the following manner: to produce a premix, the required amount of Fluorad® Fluorochemical FC-143 was mixed with 500 grams of Purina® Laboratory Chow® using a Hobart blender. To provide the proper dosage level diets, appropriate quantities of the premix were combined with additional ground basal diet in a twin-shell blender. The diets were prepared weekly.

3. Observations:

The rats were observed twice daily for overt signs of toxicity and for mortality. Detailed observations were recorded weekly. Individual body weights and food consumption were recorded weekly during the pretest and treatment periods.

4. Laboratory Tests:

Once during the pretest period and at 1 month and 3 months of the study, blood (orbital sinus puncture technique) and urine samples were obtained for analysis from all surviving rats. Food and water were withheld overnight prior to the sample collection.

a. Hematology:

Hematological studies included: hemoglobin[1], hematocrit[2], total erythrocytes[3], reticulocytes[4], and total[3] and differential leucocyte counts.

b. Biochemistry:

Biochemical studies included: fasting glucose[5], blood urea nitrogen (BUN)[5], plasma glutamic pyruvic transaminase (PGPT)[5] and plasma glutamic oxalacetic transaminase (PGOT)[5] activity, plasma alkaline phosphatase[5] activity, γ-glutamyl peptidase[6], creatinine phosphokinase[7] and calcium[8]. Alkaline phosphatase activity was not determined in the pretest period because of interference by the anticoagulant.

c. Urinalysis:

Urinalysis included: description of color and appearance; measurement of volume, pH[9], and specific gravity[9]; qualitative tests for protein[9], glucose[9], ketone[9], bilirubin[9], and occult blood; and microscopic examination of the sediment.

d. Serum Samples:

Serum samples were obtained for all surviving rats at 13 weeks of study. The samples were pooled by sex and group, frozen, and subsequently shipped to the sponsor.

5. Statistical Analysis:

All statistical analyses compared the treatment groups with the control group, by sex. Body weights (week 13) food consumption (weeks 1-13), hematological, biochemical and urinalysis parameters and absolute and relative organ weights were compared by analysis of variance (one-way classification), Bartlett's test for homogeneity of variances and the appropriate t-test (for equal or unequal variances) as described by Steel and Torrie[10] using Dunnett's[11] multiple comparison tables to judge significance of differences.

B. RESULTS:

1. General Behavior, Appearance and Survival:

No changes considered to be related to the compound were observed in general behavior or appearance. Incidental findings noted for control and treated rats included ocular discharge and pupil dilation.

Survival (prior to sacrifice) after 3 months of compound consumption was as follows:

Dosage Level	No. Surviving/No. Initiated	
	Male	Female
Control	5/5	5/5
10 ppm	5/5	5/5
30 ppm	5/5	5/5
100 ppm	5/5	4/5
300 ppm	5/5	4/5
1,000 ppm	5/5	5/5

Both deaths occurred following collection of blood. Neither death was preceded by any signs of toxicity.

2. Body Weights (Tables 1-2):

Comparison of group mean body weights, by sex showed a decrease in body weight gain for male rats at the 300- and 1,000-ppm dosage

levels. Changes in body weight were similar for control and treated female rats. At 13 weeks, the group mean body weight for male rats was significantly ($p<0.05$) lower than the control group mean. The group mean body weights at 13 weeks of study were as follows:

Dosage Level	Mean Body Weights, g	
	Male	Female
Control	466	259
10 ppm	478	260
30 ppm	500	268
100 ppm	457	278
300 ppm	431	263
1,000 ppm	362	255

3. Food Consumption (Table 3):

Declines in food consumption were noted at the higher dosage levels for male rats (100, 300 and 1,000 ppm). Food consumption values were similar for control and treated female rats. The average food consumption through the 13-week study were as shown below:

Dosage Level	Average Food Consumption (g/rat/day)	
	Male	Female
Control	27.0	19.7
10 ppm	26.7	19.2
30 ppm	28.7	20.7
100 ppm	25.8	21.5
300 ppm	25.7	19.6
1,000 ppm	23.0	19.5

4. Laboratory Tests (Tables 5-14):

a. Hematology:

A comparison of male rats, by dosage group, to the control group, showed a slight decrease in erythrocytes at 3 months of study. However, the individual values were within the normal range for Charles River CD rats of this age in this laboratory. A similar comparison of female rats showed no variations that could be attributable to compound consumption.

b. Biochemistry:

A comparison of male rats, at the higher dosage levels, to the control male rats, showed a slight increase in the BUN and alkaline phosphatase values. A similar comparison of female rats showed no variations that could be attributable to compound consumption.

c. Urinalysis:

The presence of occult blood was of a higher frequency in females than males at all dosage levels. No changes considered to be related to compound consumption were observed in urinalysis values.

IV. PATHOLOGICAL STUDIES:

A. METHODS:

1. Gross Pathology:

After 90 days of compound administration, five rats/sex/group were sacrificed with carbon dioxide and were necropsied. At necropsy, organs and tissues were examined for gross abnormalities and collected in 10% neutral buffered formalin (eyes in Russell's fixative). Liver samples, obtained from all of the rats at terminal sacrifice, were frozen and subsequently shipped to the sponsor.

Two female rats which died prior to termination were also necropsied and tissues collected as above.

2. Histopathology:

Microscopic examination of formalin-fixed, hematoxylin and eosin stained, paraffin sections was performed for all rats in control, 100-, 300-, and 1,000-ppm groups. The following tissues were examined histologically.

brain with cervical cord	aorta	pancreas
lumbar spinal cord	spleen	liver
peripheral nerve	mesenteric lymph node	kidneys
eyes	thymus	urinary bladder
pituitary	bone with marrow (sternum)	testes
thyroid with parathyroid	salivary gland	ovaries
adrenals	small intestines (duodenum, jejunum, ileum)	prostate
lung	colon	uterus
heart with coronary vessels		skin (mammary gland)
		any tissue(s) with gross lesions

In addition, the livers from rats from the 10- and 30-ppm dosage level were also microscopically examined.

B. RESULTS:

1. Gross Pathology (Table 15) and Organ Weights (Tables 16-17):

Gross necropsy observations in liver, such as enlargement, and varying degrees of discoloration on the surface were present among male rats at the 1,000-ppm level and were considered compound related. No such observation was present among the females at 1,000 ppm or in males or females from lower dietary-level groups.

Statistically significant variations in sex-group mean weights of several organs occurred between the control and experimental groups. These variations were of unknown biological significance with the exception of the increase in liver weight noted in males at the 300- and 1,000-ppm dosage levels. This variation in liver weights was accompanied by morphologic alterations. One female rat at 1,000-ppm, also had morphologic alterations noted in the liver.

Organ	Group	Sex	Weight	Change	p<
Liver	30 ppm	M	absolute, relative	increase	0.01, 0.05
	300 ppm	M	absolute, relative	increase	0.01, 0.01
	1,000 ppm	M	absolute, relative	increase	0.01, 0.01
		F	absolute, relative	increase	0.05, 0.05
Kidney	10 ppm	F	relative	increase	0.05
	30 ppm	M	absolute	increase	0.05
	100 ppm	M	relative	increase	0.05
	300 ppm	M	relative	increase	0.05
	1,000 ppm	M	relative	increase	0.01
Brain	1,000 ppm	M	relative	increase	0.01

2. Histopathology (Table 18):

Compound-related liver lesions occurred in almost all male test rats at 100, 300 and 1,000 ppm and one female at 1,000 ppm. The lesions consisted of focal to multifocal, very slight to slight cytoplasmic enlargement (hypertrophy) of hepatocytes in centrilobular to midzonal regions of the affected liver lobules. These were accompanied in some instances by increased amount of yellowish-brown pigment resembling lipofuscin in cytoplasm of hepatocytes and occasionally in sinusoidal lining cells. The incidence and relative severity of the above lesions were more pronounced among male rats at the 1,000-ppm dietary level.

References

1. Coulter Hemoglobinometer, Coulter Electronics, 590 W. 20th Street, Hialeah, Florida.

2. Microhematocrit, John B. Miale, 3rd Ed., 1967, The C. V. Mosby Company, p. 1154.

3. Coulter Particle Size Counter, Model Z_B, Coulter Electronics, 590 W. 20th Street, Hialeah, Florida.

4. Gradwhol's Clinical Laboratory Methods and Diagnosis, Frankel and Reitman, Editors 6th Ed., 1963, The C. V. Mosby Company, p. 1132.

5. Technicon Auto Analyzer 6/60 Micro Methodology.

6. Glutamyl Peptidase - Sigma GGTP Procedure Bulletin #545, Sigma Chemical Co., St. Louis, MO.

7. Micro Auto Analyzer II, 6/60 Micro Methodology.

8. Photovolt PV4, Photovolt Corporation.

9. Multistix (Ames Reagent Strips).

10. Steel, R. G. D. and Torrie, J. H. (1960), Principles and Procedures of Statistics, McGraw-Hill, New York, N. Y.

11. Dunnett, C. W., New Tables for Multiple Comparisons with a Control, Biometrics, Sept. 1964.

Fluorad® Fluorochemical FC-141:

TABLE 1.

Ninety Day Subacute Rat Toxicity Study.

Group Mean Body Weights, Grams; Weight Ranges; and Survival.

Week of Study	Control Mean Body Wt.	Control Weight Ranges	Control Survival	10 ppm Mean Body Wt.	10 ppm Weight Ranges	10 ppm Survival	30 ppm Mean Body Wt.	30 ppm Weight Ranges	30 ppm Survival	100 ppm Mean Body Wt.	100 ppm Weight Ranges	100 ppm Survival	300 ppm Mean Body Wt.	300 ppm Weight Ranges	300 ppm Survival	1,000 ppm Mean Body Wt.	1,000 ppm Weight Ranges	1,000 ppm Survival
MALES:																		
-1	218	224-251	5/5	245	233-254	5/5	241	229-250	5/5	244	222-254	5/5	240	234-244	5/5	231	225-245	5/5
0	272	248-293	5/5	271	250-283	5/5	272	262-287	5/5	274	236-297	5/5	271	260-285	5/5	270	257-280	5/5
1	307	285-321	5/5	319	294-338	5/5	325	304-343	5/5	322	305-338	5/5	287	270-310	5/5	245	220-288	5/5
2	342	318-372	5/5	345	310-373	5/5	352	335-380	5/5	345	319-368	5/5	296	275-325	5/5	257	210-310	5/5
3	378	340-406	5/5	380	338-408	5/5	385	364-410	5/5	368	334-384	5/5	316	290-354	5/5	283	210-338	5/5
4	380	340-400	5/5	376	332-404	5/5	382	360-402	5/5	370	334-388	5/5	331	306-364	5/5	298	242-340	5/5
5	404	368-424	5/5	410	368-438	5/5	419	392-445	5/5	387	339-420	5/5	344	308-380	5/5	315	251-378	5/5
6	424	378-450	5/5	436	384-466	5/5	448	418-476	5/5	411	364-444	5/5	374	348-408	5/5	342	274-400	5/5
7	427	383-450	5/5	437	386-468	5/5	449	414-486	5/5	410	368-445	5/5	377	345-418	5/5	331	265-384	5/5
8	460	412-483	5/5	465	373-510	5/5	484	452-528	5/5	441	380-483	5/5	406	371-456	5/5	350	277-414	5/5
9	462	420-490	5/5	467	376-510	5/5	486	450-530	5/5	431	350-484	5/5	408	380-450	5/5	350	286-414	5/5
10	477	428-504	5/5	477	375-527	5/5	501	463-539	5/5	446	355-500	5/5	427	397-475	5/5	368	303-432	5/5
11	479	437-510	5/5	493	392-542	5/5	512	474-556	5/5	420	417-515	5/5	445	412-492	5/5	374	305-432	5/5
12	485	442-512	5/5	501	408-544	5/5	518	479-552	5/5	481	426-518	5/5	448	418-495	5/5	379	320-426	5/5
13	466	420-489	5/5	478	390-523	5/5	500	462-540	5/5	457	403-500	5/5	431	402-478	5/5	362*	305-408	5/5
FEMALES:																		
-1	163	154-174	5/5	163	158-171	5/5	160	151-172	5/5	166	158-179	5/5	168	158-172	5/5	163	154-174	5/5
0	174	166-187	5/5	174	168-185	5/5	177	165-186	5/5	180	172-191	5/5	182	179-186	5/5	179	173-191	5/5
1	207	193-214	5/5	205	198-220	5/5	212	203-220	5/5	217	198-234	5/5	209	206-214	5/5	205	194-226	5/5
2	218	195-228	5/5	217	207-230	5/5	221	208-239	5/5	219	198-245	5/5	218	207-226	5/5	211	190-237	5/5
3	234	214-246	5/5	236	220-252	5/5	236	220-260	5/5	244	216-260	5/5	232	224-240	5/5	225	210-256	5/5
4	234	220-244	5/5	232	218-260	5/5	241	230-260	5/5	251	240-270	4/5	235	230-240	4/5	228	210-256	5/5
5	252	226-265	5/5	251	224-276	5/5	256	241-278	5/5	265	256-275	4/5	247	242-254	4/5	245	234-274	5/5
6	278	218-370	5/5	258	244-294	5/5	266	248-288	5/5	281	268-294	4/5	257	252-264	4/5	253	236-282	5/5
7	245	219-262	5/5	249	232-291	5/5	263	242-288	5/5	271	255-288	4/5	250	238-257	4/5	241	224-264	5/5
8	262	234-293	5/5	263	241-301	5/5	274	259-295	5/5	285	260-303	4/5	262	254-268	4/5	261	241-290	5/5
9	268	234-290	5/5	269	246-310	5/5	282	260-306	5/5	293	270-320	4/5	264	258-270	4/5	260	232-294	5/5
10	274	233-299	5/5	273	253-311	5/5	291	266-324	5/5	309	288-340	4/5	268	261-277	4/5	267	248-298	5/5
11	275	240-311	5/5	278	258-322	5/5	290	277-299	5/5	305	284-336	4/5	275	270-282	4/5	270	254-300	5/5
12	275	240-300	5/5	279	255-326	5/5	290	268-310	5/5	306	290-326	4/5	279	276-285	4/5	276	258-304	5/5
13	259	224-285	5/5	260	237-308	5/5	268	252-285	5/5	287	268-308	4/5	263	256-274	4/5	255	233-284	5/5

*Significantly lower than the control group mean, p<0.05

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 2. Individual Weekly Body Weights, Grams.

Group, Rat No.	Sex	Pretest -2	Pretest 0	Week of Study 1	2	3	4	5	6	7	8	9	10	11	12	13
Control:																
73552	M	244	276	316	340	386	394	418	440	436	471	471	487	502	504	488
73553	M	226	250	296	318	358	364	394	410	420	452	450	464	437	463	444
73554	M	243	283	318	360	400	400	414	442	447	482	490	502	508	512	488
73555	M	231	293	321	372	406	400	424	450	450	483	480	504	510	506	489
73556	M	224	248	293	315	340	340	368	378	383	412	420	428	437	442	420
73557	F	167	177	212	226	240	240	265	280	238	293	290	299	313	300	285
73558	F	154	167	206	228	236	234	258	262	237	258	270	280	272	274	260
73559	F	174	187	214	220	232	232	253	258	248	259	266	272	267	275	254
73560	F	164	173	210	223	246	244	258	270	262	265	282	288	284	286	272
73561	F	154	166	193	195	214	220	226	228	219	234	234	233	240	240	224
10 ppm:																
73562	M	254	273	313	337	366	360	390	414	420	447	454	470	481	488	459
73563	M	233	250	294	310	338	332	368	384	386	373	376	375	392	408	390
73564	M	232	283	338	373	408	404	438	462	433	499	500	503	524	522	498
73565	M	243	280	328	352	394	388	420	452	456	494	494	511	524	543	523
73566	M	239	268	320	353	394	398	434	466	468	510	510	527	542	544	518
73567	F	159	170	200	213	220	220	224	246	237	247	252	262	258	235	240
73568	F	171	185	207	227	244	234	260	258	252	271	278	277	277	282	250
73569	F	163	180	220	230	252	260	276	294	291	301	310	313	322	326	308
73570	F	158	169	202	207	234	226	245	248	232	241	246	253	262	260	237
73571	F	162	168	198	208	228	218	248	244	234	256	260	259	273	274	256
30 ppm:																
73572	M	247	287	336	362	408	386	445	474	486	528	530	539	556	530	538
73573	M	239	262	304	337	364	360	392	418	414	452	450	463	474	479	462
73574	M	242	280	343	380	410	402	440	476	483	509	516	533	546	552	540
73575	M	250	269	313	335	372	384	412	440	420	469	462	482	488	493	474
73576	M	229	263	323	345	370	380	405	422	432	460	470	489	498	517	486
73577	F	160	176	208	220	220	230	244	258	236	264	272	277	284	291	260
73578	F	153	181	220	239	260	260	278	298	298	295	306	324	299	310	285
73579	F	172	186	220	226	244	244	264	276	270	285	294	297	298	297	276
73580	F	151	165	203	212	230	236	255	262	256	267	280	289	290	296	269
73581	F	162	173	210	208	226	236	241	248	242	259	260	266	277	268	252

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 1. Cont. Individual Weekly Body Weights, Grams.

Group. Rat No.	Sex	Premest -1	Premest 0	Week of Study 1	2	3	4	5	6	7	8	9	10	11	12	13
100 ppm:																
73582	M	222	263	316	350	374	380	411	438	423	465	460	473	493	500	480
73583	M	243	273	305	319	334	334	354	372	368	405	405	415	426	426	403
73584	M	232	286	338	351	384	388	420	444	445	483	484	500	515	513	500
73585	M	248	230	320	336	370	360	339	364	375	380	350	355	417	448	426
73586	M	234	297	333	363	380	386	412	438	441	470	458	465	497	514	477
73587	F	179	191	234	243	258	270	275	290	284	301	304	317	314	318	300
73588	F	158	176	220	208	260	244	267	294	268	303	320	340	336	326	308
73589	F	169	184	220	225	240	240	256	268	255	260	270	289	284	290	268
73590	F	164	172	198	198	216	Died									
73591	F	161	175	215	220	244	250	261	270	256	277	277	288	287	290	270
300 ppm:																
73592	M	244	272	270	275	300	312	308	348	345	380	382	397	419	420	402
73593	M	241	260	272	276	290	306	322	350	336	373	380	400	412	418	407
73594	M	239	266	234	232	290	310	329	360	332	385	394	405	423	430	413
73595	M	234	274	310	325	334	364	380	404	412	436	430	475	492	495	479
73596	M	241	285	300	322	348	364	380	408	418	435	436	456	481	477	456
73597	F	170	186	208	226	230	234	249	258	253	268	270	268	276	275	262
73598	F	172	179	206	220	234	234	243	252	250	254	258	261	270	276	260
73599	F	166	180	209	207	224	230	242	252	238	262	260	264	270	278	256
73600	F	172	183	214	221	240	240	234	264	257	262	268	277	282	285	272
73601	F	158	180	208	218	230	Died									
2,000 ppm:																
73602	M	225	257	288	310	338	340	378	400	384	414	414	432	426	426	408
73603	M	245	280	255	251	274	280	276	320	310	309	300	323	320	338	324
73604	M	231	270	220	240	294	314	330	348	333	354	352	362	386	399	366
73605	M	225	268	229	210	210	242	251	274	265	277	296	303	305	320	305
73606	M	230	273	253	273	300	316	342	370	362	394	400	427	432	424	406
73607	F	163	173	194	190	210	210	234	236	224	241	232	248	254	238	234
73608	F	157	174	198	207	220	220	235	242	234	244	248	249	257	259	233
73609	F	174	191	226	237	256	256	274	292	264	290	294	298	300	304	284
73610	F	154	174	200	201	210	220	236	242	230	254	254	263	262	274	252
73611	F	167	183	207	220	230	236	245	264	252	275	270	275	275	286	268

137-139

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 1.

Mean Food Consumption.

Week of Study	Control g/rat/day	Control g/kg/day	10 ppm g/rat/day	10 ppm g/kg/day	30 ppm g/rat/day	30 ppm g/kg/day	100 ppm g/rat/day	100 ppm g/kg/day	300 ppm g/rat/day	300 ppm g/kg/day	1,000 ppm g/rat/day	1,000 ppm g/kg/day
MALES:												
1	26.3	85.6	24.9	77.9	27.4	84.3	25.8	80.1	19.9	69.4	14.7	60.2
2	24.2	70.7	24.4	70.7	25.2	71.6	23.9	69.4	21.1	71.3	18.3	71.4
3	26.1	69.6	24.3	64.1	25.4	65.9	24.1	65.5	22.7	71.8	22.2	78.5
4	27.3	71.8	27.6	71.4	28.2	73.8	27.1	73.3	27.7	83.8	26.5	88.8
5	27.8	68.9	27.9	67.9	28.6	68.3	23.2	59.9	24.2	70.3	21.8	69.2
6	29.0	68.5	28.1	64.5	30.5	68.0	27.9	67.8	28.7	76.9	28.1	82.2
7	26.0	60.8	25.8	59.0	27.7	61.7	25.1	61.3	25.3	67.2	22.7	68.5
8	27.9	60.7	26.8	57.6	29.7	61.5	26.2	59.3	26.9	66.2	20.3	58.1
9	28.9	62.5	28.0	60.0	30.9	63.6	24.8	57.5	27.9	68.3	24.9	71.2
10	25.5	51.4	26.2	54.9	28.6	57.0	25.5	57.3	27.1	63.5	23.6	64.1
11	27.5	57.4	26.8	54.3	30.0	58.6	26.8	57.0	27.2	61.2	24.1	64.5
12	28.4	58.6	29.3	58.5	30.4	58.6	28.1	58.5	28.1	62.8	25.0	65.9
13	25.7	55.1	27.3	57.1	30.2	60.5	26.8	58.7	27.9	64.8	26.5	73.3
FEMALES:												
1	19.6	94.7	19.3	94.4	20.3	95.6	20.3	93.4	20.6	98.6	20.0	97.7
2	17.1	78.2	18.1	83.5	18.9	85.6	20.0	91.5	16.5	75.8	17.4	82.5
3	18.6	79.6	19.3	81.6	20.6	87.4	20.4	83.6	19.0	81.8	19.4	86.3
4	21.9	93.7	20.6	88.8	22.7	94.2	24.8	98.9	20.2	85.8	21.0	92.1
5	19.2	76.2	20.1	79.9	21.3	83.0	19.0	71.8	19.0	77.1	18.3	74.9
6	21.3	76.5	19.6	76.0	22.0	82.7	24.8	88.2	22.2	86.4	21.0	83.1
7	18.9	77.0	17.7	71.3	18.6	70.6	20.4	75.1	18.0	72.0	17.1	70.9
8	20.3	77.4	18.5	70.4	20.2	73.6	21.6	75.8	20.1	76.9	20.2	77.5
9	19.8	73.8	19.8	73.7	21.4	75.8	22.7	77.5	20.4	77.1	20.3	78.0
10	19.5	71.1	18.3	67.2	19.9	68.2	21.5	69.6	18.6	69.4	18.2	68.1
11	19.6	71.2	19.6	70.4	21.4	73.7	21.9	71.8	19.4	70.4	19.6	72.7
12	21.3	77.4	19.6	70.3	20.1	69.4	20.9	68.3	20.1	72.1	20.5	74.3
13	19.0	73.5	19.6	75.4	21.4	80.0	20.6	71.8	20.8	79.1	20.4	80.0

BEST COPY AVAILABLE

EPA 02165

C01634

11/ 089

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 4. MALES: Summary of Means and Significance[a] of Hematological Values.

Hematology	Study Month	Control	10 ppm	30 ppm	100 ppm	300 ppm	1,000 ppm
Erthrocytes, 10^6/cmm	Pretest	6.01	6.55	6.00	5.93	5.91	6.39
	1	6.88	7.36	6.89	6.62	6.34	6.93
	3	7.95	7.46	7.05*	7.16*	6.72**	6.94**
Hematocrit, %	Pretest	47	49	44	46	46	50
	1	50	50	47	47	46	47
	3	49	47	46*	46	45*	47
Hemoglobin, g/100 ml	Pretest	15.9	16.6	15.6	15.0	15.2	16.2
	1	16.4	17.0	16.2	15.7	15.1	15.9
	3	16.2	14.7*	15.0	15.4	14.9	15.1
Leucocytes, 10^3/cmm	Pretest	12.57	10.58	10.39	9.94	8.50	13.01
	1	12.67	12.57	11.27	13.54	10.71	14.13
	3	10.64	8.88	9.33	9.35	7.63*	8.06
Neutrophils, %	Pretest	9	13	12	11	12	9
	1	9	10	9	10	11	8
	3	11	11	16	11	16	17
Lymphocytes, %	Pretest	90	86	87	88	87	90
	1	88	88	90	88	87	89
	3	88	88	82	86	82	82
Eosinophils, %	Pretest	1	1	1	1	1	1
	1	1	1	1	2	1	1
	3	1	1	2	2	2	1
Monocytes, %	Pretest	0	0	0	0	0	0
	1	2	1	0*	0*	1	2
	3	0	0	0	1	0	0
Basophils, %	Pretest	0	0	0	0	0	0
	1	0	0	0	0	0	0
	3	0	0	0	0	0	0
Reticulocytes, %	Pretest	7.7	6.3	7.5	5.5	6.9	6.9
	1	3.1	2.8	3.0	2.8	3.3	2.6
	3	2.4	2.9	3.2	2.8	2.8	2.8

*Significantly different from Control group mean, $p<0.05$.
**Significantly different from Control group mean, $p<0.01$.
[a] Statistical analysis not conducted on pretest values

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 4. Cont. FEMALES: Summary of Means and Significance[a] of Hematological Values.

Hematology	Study Month	Control	10 ppm	30 ppm	100 ppm	300 ppm	1,000 ppm
Erythrocytes, 10^6/cmm	Pretest	6.19	6.35	6.41	6.12	6.18	6.49
	1	6.99	6.96	7.15	6.94	6.74	6.85
	3	7.15	7.07	6.94	6.90	6.86	7.31
Hematocrit, %	Pretest	45	47	46	46	46	49
	1	50	49	52	50	49	48
	3	46	46	47	47	47	47
Hemoglobin, g/100 ml	Pretest	15.6	16.4	16.2	15.2	15.1	16.2
	1	16.3	16.4	17.1	16.5	16.6	16.5
	3	15.6	15.4	15.1	15.3	16.1	15.8
Leucocytes, 10^3/ cmm	Pretest	7.35	8.61	7.22	7.87	7.28	10.72
	1	7.35	9.56	9.35	9.63	9.70	10.89
	3	6.60	5.77	6.74	5.74	5.00	6.04
Neutrophils, %	Pretest	11	9	8	16	11	6
	1	17	11	14	8	18	15
	3	15	17	20	19	19	16
Lymphocytes, %	Pretest	88	90	91	84	88	93
	1	80	86	84	91	80	83
	3	84	82	79	80	79	82
Eosinophils, %	Pretest	1	1	1	0	1	1
	1	2	2	1	1	2	2
	3	1	1	1	1	2	2
Monocytes, %	Pretest	0	0	0	0	0	0
	1	1	1	1	0	0	0
	3	0	0	0	0	0	0
Basophils, %	Pretest	0	0	0	0	0	0
	1	0	0	0	0	0	0
	3	0	0	0	0	0	0
Reticulocytes, %	Pretest	4.7	7.3	3.8	5.2	3.5	3.2
	1	2.7	1.8	2.0	2.6	2.7	2.1
	3	3.0	2.4	3.2	3.3	2.4	2.4

[a] Statistical analysis not conducted on pretest values

EPA 02167

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 5. Individual Hematological Values - Pretest.

Group, Rat Number	Sex	Erythrocytes[a] 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
Control:												
73552	M	5.76[a]	47	15.8	9.19	5	0	94	1	0	0	7.8
73553	M	6.25[a]	50	16.9	12.84	11	0	89	0	0	0	8.2
73554	M	6.14	47	16.2	14.27	12	0	85	3	0	0	9.5
73555	M	6.08	48	16.5	15.48	5	0	93	1	1	0	6.5
73556	M	5.64	43	14.3	11.08	11	0	89	0	0	0	6.4
Mean		6.01	47	15.9	12.57	9	0	90	1	0	0	7.7
73557	F	6.04	46	15.8	7.29	8	0	91	1	0	0	5.6
73558	F	5.91	44	14.6	7.88	9	0	91	0	0	0	6.3
73559	F	5.99	45	15.1	7.86	10	0	89	1	0	0	4.8
73560	F	6.69	49	16.9	7.22	14	0	84	2	0	0	4.7
73561	F	6.32	40	15.7	6.49	13	0	87	0	0	0	2.3
Mean		6.19	45	15.6	7.35	11	0	88	1	0	0	4.7
10 ppm:												
73562	M	7.07	51	17.0	9.84	13	0	85	2	0	0	5.6
73563	M	6.76	52	17.2	11.88	10	0	89	1	0	0	7.3
73564	M	6.46	47	16.5	11.38	17	0	82	1	0	0	6.7
73565	M	6.27	49	16.2	10.12	14	0	85	1	0	0	5.9
73566	M	6.21	47	15.9	9.68	10	0	86	2	1	1	6.0
Mean		6.55	49	16.6	10.58	13	0	86	1	0	0	6.3
73567	F	6.55	50	18.1	13.93	12	0	88	0	0	0	9.3
73568	F	6.26	48	16.2	8.00	6	0	94	0	0	0	12.0
73569	F	5.31	40	13.5	5.43	13	0	87	0	0	0	3.1
73570	F	7.12	50	17.8	6.22	8	0	91	1	0	0	6.4
73571	F	6.53	47	16.6	9.45	6	0	91	3	0	0	5.8
Mean		6.35	47	16.4	8.61	9	0	90	1	0	0	7.3
30 ppm:												
73572	M	6.04	45	15.1	8.29	9	0	90	1	0	0	10.8
73573	M	6.46	46	16.9	10.87	19	0	80	1	0	0	5.0
73574	M	5.85[a]	46	15.6	8.96	12	0	88	0	0	0	3.4
73575	M	5.36	41	14.4	8.67	6	0	94	0	0	0	9.6
73576	M	6.22	44	15.9	15.16	14	0	85	1	0	0	8.5
Mean		6.00	44	15.6	10.39	12	0	87	1	0	0	7.5
73577	F	6.33	43	16.3	7.67	5	0	92	3	0	0	1.2
73578	F	6.20	47	16.6	6.71	14	0	85	1	0	0	4.3
73579	F	6.22	48	16.4	6.74	6	0	94	0	0	0	1.3
73580	F	7.12	49	16.2	7.44	12	0	87	1	0	0	2.9
73581	F	6.19	45	15.3	7.56	5	0	94	1	0	0	5.1
Mean		6.41	46	16.2	7.22	8	0	91	1	0	0	3.8

[a] 11 Polychromatic, all rats
[a] Repeat determination

137-089

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-141:

Ninety Day Subacute Rat Toxicity Study.

TABLE 5. Cont.

Individual Hematological Values - Pretest.

Group, Rat Number	Sex	Erythrocytes 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
100 ppm:												
73582	M	5.87	46	14.8	8.53	13	0	86	1	0	0	5.2
73583	M	6.34	47	15.6	10.65	7	0	93	0	0	0	7.8
73584	M	5.74[a]	49	15.6	9.98	26	0	71	3	0	0	2.1
73585	M	5.71	43	14.0	10.30	2	0	98	0	0	0	6.1
73586	M	6.01	47	15.2	10.25	7	0	92	1	0	0	6.1
Mean		5.91	46	15.0	9.94	11	0	88	1	0	0	5.5
73587	F	5.77	44	14.9	8.89	5	0	95	0	0	0	5.7
73588	F	6.19	46	15.5	7.63	6	0	93	1	0	0	6.4
73589	F	5.91	46	15.1	9.87	15	0	85	0	0	0	6.7
73590	F	6.38	44	14.6	6.52	8	0	92	0	0	0	5.4
73591	F	6.36	49	16.1	6.43	44	0	56	0	0	0	1.9
Mean		6.12	46	15.2	7.87	16	0	84	0	0	0	5.2
300 ppm:												
73592	M	5.76	44	14.9	6.67	11	0	88	1	0	0	9.1
73593	M	6.27	46	15.5	9.08	8	0	92	0	0	0	9.1
73594	M	5.64	45	14.9	7.60	14	0	85	1	0	0	6.4
73595	M	6.08[a]	49	16.1	7.50	20	0	79	1	0	0	2.6
73596	M	5.82	45	14.7	11.64	5	0	95	0	0	0	7.3
Mean		5.91	46	15.2	8.50	12	0	87	1	0	0	6.9
73597	F	6.14	47	15.9	9.58	10	0	89	1	0	0	4.0
73598	F	5.82	43	14.7	4.20	13	0	84	3	0	0	1.2
73599	F	6.00	44	14.1	8.45	8	0	92	0	0	0	4.3
73600	F	6.35	49	15.9	8.71	11	0	89	0	0	0	4.0
73601	F	6.57	46	15.1	5.48	13	0	84	2	1	0	4.1
Mean		6.18	46	15.1	7.28	11	0	88	1	0	0	3.5
1,000 ppm:												
73602	M	6.07	49	16.3	16.93	5	0	93	2	0	0	6.8
73603	M	6.22	51	15.8	9.86	11	0	89	0	0	0	3.2
73604	M	6.65	49	16.0	14.54	12	0	87	1	0	0	10.2
73605	M	6.95[a]	55	17.1	14.13	7	0	93	0	0	0	7.6
73606	M	6.04	42	15.6	9.57	9	0	90	1	0	0	6.9
Mean		6.39	50	16.2	13.01	9	0	90	1	0	0	6.9
73607	F	6.34	50	16.6	14.87	4	0	95	1	0	0	1.3
73608	F	6.51	48	16.2	10.11	5	0	95	0	0	0	3.1
73609	F	6.52	50	16.3	9.95	6	0	94	0	0	0	2.8
73610	F	6.79	48	15.9	9.20	9	0	88	3	0	0	5.0
73611	F	6.27	47	15.9	9.51	5	0	95	0	0	0	3.7
Mean		6.49	49	16.2	10.72	6	0	93	1	0	0	3.2

* 11 Polychromatia, all cells

[a] Repeat determination

137-089

BEST COPY AVAILABLE

EPA 02169

001638

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 6. Individual Hematological Values - 1 Month.

Group, Rat Number	Sex	Erythrocytes* 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
Control:												
73552	M	7.10	51	16.6	15.14	10	0	89	0	1	0	2.9
73553	M	6.54	45	15.3	11.04	8	0	91	0	1	0	4.0
73554	M	6.91	51	17.0	11.86	9	0	86	1	4	0	2.4
73555	M	6.87	50	16.4	13.40	8	0	90	1	1	0	1.1
73556	M	6.99	51	16.6	11.93	11	0	85	1	3	0	1.0
Mean		6.88	50	16.4	12.67	9	0	88	1	2	0	1.1
73557	F	6.72	50	16.3	8.23	23	0	73	3	1	0	1.4
73558	F	6.73	49	15.8	6.43	20	0	77	1	2	0	2.0
73559	F	7.28	50	16.7	8.27	26	0	72	0	2	0	2.5
73560	F	7.19	48	16.1	7.16	11	0	86	2	1	0	3.1
73561	F	7.05	51	16.7	6.68	6	0	91	2	1	0	2.4
Mean		6.99	50	16.3	7.35	17	0	80	2	1	0	2.7
10 ppm:												
73562	M	7.79	51	17.7	7.97	12	0	87	1	0	0	3.2
73563	M	7.76	50	17.8	14.20	9	0	89	1	1	0	2.4
73564	M	7.27	51	17.0	12.54	11	0	88	1	0	0	2.3
73565	M	7.15	50	16.9	15.56	12	0	83	3	2	0	2.8
73566	M	6.83	47	15.8	12.60	7	0	92	0	1	0	3.5
Mean		7.36	50	17.0	12.57	10	0	88	1	1	0	2.8
73567	F	7.03	49	16.9	10.22	5	0	88	4	3	0	1.5
73568	F	7.02	51	17.0	10.96	6	0	94	0	0	0	1.2
73569	F	6.83	48	15.7	9.97	16	0	78	5	1	0	1.6
73570	F	7.11	51	17.1	8.46	15	0	83	1	1	0	2.4
73571	F	6.80	46	15.5	8.21	12	1	85	1	1	0	2.5
Mean		6.96	49	16.4	9.56	11	0	86	2	1	0	1.8
30 ppm:												
73572	M	6.99	47	16.2	9.53	5	0	94	1	0	0	1.8
73573	M	7.48	48	16.4	10.96	12	0	86	2	0	0	1.2
73574	M	6.50	45	15.2	9.41	14	0	85	1	0	0	1.3
73575	M	6.69	47	16.5	11.38	10	0	89	0	1	0	1.0
73576	M	6.79	49	16.3	15.09	6	0	91	3	0	0	1.8
Mean		6.89	47	16.2	11.27	9	0	90	1	0	0	1.0
73577	F	6.94	51	16.6	8.83	11	0	89	0	0	0	2.7
73578	F	6.74	49	16.9	9.12	16	0	80	1	3	0	2.5
73579	F	6.80	50	16.8	11.96	9	0	88	2	1	0	1.2
73580	F	7.95	56	18.0	8.02	16	0	80	2	2	0	2.0
73581	F	7.33	54	17.1	8.83	17	0	81	1	1	0	1.8
Mean		7.15	52	17.1	9.35	14	0	84	1	1	0	2.0

* Normal

137-089

BEST COPY AVAILABLE

EPA 02170

001639

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 6. Cont.

Individual Hematological Values - 1 Month.

Group, Rat Number	Sex	Erythrocytes* 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
100 ppm:												
73587	M	7.53	51	16.6	15.46	14	0	81	5	0	0	2.2
73583	M	6.96	49	16.4	14.97	10	0	88	2	0	0	2.4
73584	M	6.12	46	15.8	16.41	11	0	85	3	1	0	3.6
73585	M	6.13	45	15.2	17.54	10	0	89	1	0	0	3.1
73586	M	6.16	46	14.5	8.32	7	0	92	1	0	0	2.1
Mean		6.62	47	15.7	13.54	10	0	88	2	0	0	2.8
73587	F	6.88	50	16.1	11.79	12	0	88	0	0	0	2.5
73588	F	6.87	48	17.0	8.97	6	0	92	1	1	0	4.8
73589	F	6.65	50	15.8	12.92	5	0	94	1	0	0	2.7
73590	F	7.56	51	17.2	7.83	11	0	86	3	0	0	1.6
73591	F	6.74	49	16.5	6.65	5	0	93	2	0	0	1.2
Mean		6.94	50	16.5	9.63	8	0	91	1	0	0	2.6
300 ppm:												
73592	M	6.01	40	13.9	10.05	13	0	84	2	1	0	4.0
73593	M	6.71	50	16.0	9.50	15	0	81	3	1	0	3.2
73594	M	6.00	45	13.9	10.90	7	0	93	0	0	0	4.1
73595	M	6.69	50	16.3	8.35	13	0	85	1	1	0	2.0
73596	M	6.30	46	15.5	14.76	9	0	91	0	0	0	4.4
Mean		6.34	46	15.1	10.71	11	0	87	1	1	0	3.5
73597	F	6.30	47	15.6	13.70	17	1	82	0	0	0	3.2
73598	F	6.83	49	16.7	7.50	24	0	74	1	1	0	1.2
73599	F	7.15	51	17.1	11.15	13	0	85	2	0	0	2.4
73600	F	6.67	49	16.8	9.39	18	0	78	4	0	0	1.2
73601	F	6.76	49	16.6	6.76	16	0	83	1	0	0	3.6
Mean		6.74	49	16.6	9.70	18	0	80	2	0	0	2.7
1,000 ppm:												
73602	M	7.15	47	15.6	13.59	8	0	90	0	2	0	3.4
73603	M	6.89	48	16.2	10.92	10	0	85	1	4	0	3.2
73604	M	6.84	46	15.8	16.32	9	0	89	1	1	0	2.6
73605	M	7.52	48	17.4	19.34	5	0	92	1	2	0	1.2
73606	M	6.27	47	14.6	10.50	7	0	90	1	0	0	2.5
Mean		6.93	47	15.9	14.13	8	0	89	1	2	0	2.6
73607	F	7.14	49	17.9	17.43	7	0	92	1	0	0	1.0
73608	F	6.81	47	16.3	9.96	21	0	79	0	0	0	2.5
73609	F	7.08	47	15.7	9.64	35	0	64	1	0	0	2.1
73610	F	6.47	46	15.4	7.83	8	0	90	2	0	0	1.1
73611	F	6.76	50	17.0	9.58	5	0	90	4	1	0	1.5
Mean		6.85	48	16.5	10.89	15	0	83	2	0	0	2.1

* Normal

117-089

BEST COPY AVAILABLE

EPA 02171

001640

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 7.

Individual Hematological Values - 3 Months.

Group, Rat Number	Sex	Erythrocytes* 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
Controls												
73552	M	7.96	48	15.2	8.14	4	0	96	0	0	0	2.6
73553	M	8.21	52	16.6	11.07	18	0	79	3	0	0	2.0
73554	M	8.37	50	16.7	13.71	9	0	89	2	0	0	2.5
73555	M	7.72	48	16.3	10.55	6	0	94	0	0	0	3.0
73556	M	7.47	49	16.2	9.72	16	0	84	0	0	0	2.0
Mean		7.95	49	16.2	10.64	11	0	88	1	0	0	2.4
73557	F	6.98	45	15.2	7.04	23	0	73	4	0	0	3.0
73558	F	7.11	46	16.1	5.97	12	0	87	1	0	0	2.7
73559	F	7.42	45	14.8	5.58	9	0	90	1	0	0	2.5
73560	F	7.49	48	16.6	8.41	26	0	73	1	0	0	3.2
73561	F	6.74	44	15.2	5.99	5	0	95	0	0	0	3.8
Mean		7.15	46	15.6	6.60	15	0	84	1	0	0	3.0
10 ppm:												
73562	M	7.05	47	15.2	7.12	10	0	89	1	0	0	2.0
73563	M	7.43	47	13.9	8.90	11	0	88	1	0	0	3.1
73564	M	7.59	50	16.2	10.00	6	0	94	0	0	0	3.5
73565	M	7.95	45	14.2	10.19	19	0	80	1	0	0	2.6
73566	M	7.07	45	13.9	8.01	10	0	88	2	0	0	3.2
Mean		7.46	47	14.7	8.88	11	0	88	1	0	0	2.9
73567	F	6.65	46	16.3	7.11	8	0	92	0	0	0	2.0
73568	F	7.32	47	15.5	5.40	7	0	90	2	1	0	2.1
73569	F	6.92	43	14.0	5.10	10	0	88	2	0	0	2.5
73570	F	7.48	49	16.4	5.41	33	0	66	0	1	0	2.7
73571	F	6.98	45	15.0	5.81	26	0	73	1	0	0	2.6
Mean		7.07	46	15.4	5.77	17	0	82	1	0	0	2.4
30 ppm:												
73572	M	7.05	46	14.7	8.18	16	0	83	1	0	0	3.4
73573	M	7.10	48	15.5	8.47	11	0	86	3	0	0	3.5
73574	M	7.44	45	14.7	8.56	25	0	72	3	0	0	2.3
73575	M	6.54	44	14.6	9.27	12	0	87	1	0	0	3.4
73576	M	7.14	47	15.7	12.17	16	0	83	1	0	0	3.5
Mean		7.05	46	15.0	9.33	16	0	82	2	0	0	3.2
73577	F	6.94	46	14.9	5.92	19	0	81	0	0	0	3.6
73578	F	6.36	46	14.2	5.42	5	0	95	0	0	0	3.5
73579	F	6.88	46	14.3	8.81	20	0	76	4	0	0	3.5
73580	F	7.53	51	16.7	7.24	28	0	70	2	0	0	2.8
73581	F	6.99	47	15.5	6.29	29	0	70	1	0	0	2.7
Mean		6.94	47	15.1	6.74	20	0	79	1	0	0	3.2

* Normal

137-089

EPA 02172

C01641

Fluorad® Fluorochemical FC-141:

Ninety Day Subacute Rat Toxicity Study.

TABLE 7. Cont.

Individual Hematological Values - 3 Months.

Group, Rat Number	Sex	Erythrocytes* 10^6/cmm	Hematocrit %	Hemoglobin g/100 ml	Leucocytes 10^3/cmm	Neutrophils Seg. %	Neutrophils Non-Seg. %	Lymphocytes %	Eosinophils %	Monocytes %	Basophils %	Reticulocytes %
100 ppm:												
73582	M	7.56	46	15.7	7.80	8	0	91	1	0	0	1.0
73583	M	7.42	47	15.4	9.16	20	0	74	3	3	0	2.8
73584	M	7.19	47	16.1	12.34	13	0	85	2	0	0	1.5
73585	M	6.74	45	15.0	9.69	7	0	92	0	1	0	2.8
73586	M	6.91	46	14.9	7.76	8	0	89	3	0	0	2.0
Mean		7.16	46	15.4	9.35	11	0	86	2	1	0	2.8
73587	F	6.77	44	14.6	5.68	21	0	78	1	0	0	4.1
73588	F	7.01	49	16.2	4.24	15	0	83	2	0	0	3.2
73589	F	6.80	45	14.5	7.31	16	1	81	2	0	0	3.0
73590	F	Died										
73591	F	6.98	48	15.9	5.72	18	1	80	1	0	0	3.0
Mean		6.90	47	15.3	5.74	18	1	80	1	0	0	3.3
300 ppm:												
73592	M	6.96	47	15.5	7.55	16	0	80	4	0	0	2.9
73593	M	6.92	47	15.1	8.11	18	0	81	1	0	0	3.0
73594	M	6.19	43	13.8	7.47	11	0	87	2	0	0	2.0
73595	M	6.28	44	14.9	7.29	17	0	82	1	0	0	3.4
73596	M	7.07	45	15.1	7.74	16	0	82	2	0	0	3.0
Mean		6.72	45	14.9	7.63	16	0	82	2	0	0	2.8
73597	F	6.68	44	14.8	6.53	21	0	78	1	0	0	2.6
73598	F	6.95	48	17.6	3.83	19	0	79	2	0	0	1.8
73599	F	7.12	47	15.8	5.29	17	0	83	0	0	0	7.6
73600	F	6.68	48	16.0	4.36	19	0	77	4	0	0	2.5
73601	F	Died										
Mean		6.86	47	16.1	5.00	19	0	79	2	0	0	2.4
1,000 ppm:												
73602	M	6.81	44	14.4	7.24	16	0	84	0	0	0	3.3
73603	M	6.77	47	14.6	7.62	14	0	84	2	0	0	2.6
73604	M	6.66	43	13.8	5.38	20	0	79	1	0	0	2.5
73605	M	8.25	51	16.7	11.18	13	0	87	0	0	0	2.6
73606	M	6.19	48	16.0	8.89	21	0	78	1	0	0	3.2
Mean		6.94	47	15.1	8.06	17	0	82	1	0	0	2.8
73607	F	7.51	48	16.2	7.61	24	0	75	1	0	0	3.1
73608	F	7.28	47	15.3	4.92	16	0	83	1	0	0	2.0
73609	F	7.08	46	15.5	4.60	13	0	83	4	0	0	2.1
73610	F	7.33	47	15.7	5.14	12	0	86	2	0	0	2.7
73611	F	7.35	48	16.1	7.97	13	0	86	1	0	0	2.0
Mean		7.31	47	15.8	6.04	16	0	82	2	0	0	2.4

* Normal

137-089

EPA 02173

C01642

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 8. MALES: Summary of Means and Significance[b] of Biochemical Values.

Biochemistry	Study Month	Control	10 ppm	30 ppm	100 ppm	300 ppm	1,000 ppm
Glucose, mg/100 ml	Pretest	91	92	89	94	106	100
	1	112	112	133*	127	127	121
	3	121	120	136**	134	143*	135**
B.U.N., mg/100 ml	Pretest	24.7	11.3	9.6	10.9	11.0	14.1
	1	15.4	14.8	17.9	17.0	19.6**	20.9*
	3	16.2	18.8	18.0	20.4*	23.9*	35.1
γ-Glutamyl, Peptidase Sigma units/ml	Pretest	19	1	1	1	1	0
	1	3	2	2	2	2	1
	3	1	1	1	1	1	3
C.P.K.[a], Sigma units/ml	Pretest	7	13	15	16	10	12
	1	17	17	14	19	15	13
	3	11	8	10	13	14	15
P.G.O.T., int'l units/l	Pretest	94	89	89	114	106	105
	1	155	143	128	121**	108*	113*
	3	113	105	94	128	108	119
P.G.P.T., int'l units/l	Pretest	78	90	83	67	61	116
	1	89	78	71	76	75	97
	3	38	39	41	63	54	54
Calcium, mg/100 ml	Pretest	9.6	10.4	10.0	9.7	9.5	10.3
	1	12.7	11.6*	11.3*	12.0*	11.8*	12.0*
	3	9.8	9.3	9.2**	9.5	9.3	9.5
Alk. Phos., int'l units/l	Pretest [c]						
	1	194	225	220	216	249	299
	3	104	137	120	147*	204*	212

*Significantly different from Control group mean, $p<0.01$.
**Significantly different from Control group mean $p<0.05$.
[a] Creatinine phosphokinase.
[b] Statistical analysis not conducted on pretest values.
[c] Not determined because of anticoagulant interference

137-089

BEST COPY AVAILABLE

EPA 02174

C01643

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 8. Cont. FEMALES: Summary of Means and Significance[b] of Biochemical Values.

Biochemistry	Study Month	Control	10 ppm	30 ppm	100 ppm	300 ppm	1,000 ppm
Glucose, mg/100 ml	Pretest	91	100	99	108	107	89
	1	111	117	120	124	106	116
	3	119	126	131	127	122	125
B.U.N., mg/100 ml	Pretest	11.7	11.9	8.0	10.6	9.9	12.4
	1	18.1	18.3	17.0	16.1	15.4	19.3
	3	21.4	17.5	16.7	19.4	17.6	20.6
γ-Glutamyl, Peptidase Sigma units/ml	Pretest	1	1	0	0	0	0
	1	2	2	2	2	2	1
	3	1	1	1	2	2	2
C.P.K.**, Sigma units/ml	Pretest	9	13	13	14	17	10
	1	14	17	12	25	17	15
	3	14	9	7	18	12	15
P.G.O.T., int'l units/l	Pretest	75	86	74	96	111	112
	1	156	149	158	135	133	135
	3	110	131	96	109	113	117
P.G.P.T., int'l units/l	Pretest	80	88	75	64	67	103
	1	71	78	80	82	71	89
	3	25	50	26	32	39*	38
Calcium, mg/100 ml	Pretest	10.4	10.3	9.7	9.8	9.5	10.2
	1	11.8	11.6	11.4	12.2*	12.2*	12.1
	3	9.7	9.4	9.4	9.8	9.0	9.4
Alka. Phos., int'l units/l	Pretest[b]						
	1	115	133	121	106	106	112
	3	69	69	57	52	53	64

*Significantly different from Control group mean, $p < 0.05$

**Creatine phosphokinase

[b]Statistical analysis not conducted on pretest values

[c]Not determined because of anticoagulant interference

137-089

BEST COPY AVAILABLE

TABLE 9.

Individual Biochemical Values - Pretest.

Group, Rat Number	Sex	Glucose mg/100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	S.G.O.T. int'l units/l	S.G.P.T. int'l units/l	Calcium meq/liter
Control:								
73552	M	87	12.3	0	9	90	69	9.6
73553	M	93	15.0	1	7	114	96	8.8
73554	M	90	66.0	88	5	87	60	9.2
73555	M	90	14.7	2	9	96	87	10.3
73556	M	93	15.3	2	7	81	78	9.9
Mean		91	24.7	19	7	94	78	9.6
73557	F	90	10.2	1	10	69	78	10.0
73558	F	87	8.7	1	7	78	72	9.3
73559	F	96	9.3	1	14	78	87	9.5
73560	F	90	15.0	1	5	78	78	12.8
73561	F	90	15.3	1	7	72	84	10.2
Mean		91	11.7	1	9	75	80	10.4
10 ppm:								
73562	M	99	14.7	1	13	99	84	9.9
73563	M	102	15.0	0	14	93	117	10.4
73564	M	99	9.3	1	18	84	93	11.1
73565	M	78	9.0	1	12	81	87	10.2
73566	M	81	8.7	2	8	87	69	10.5
Mean		92	11.3	1	13	89	90	10.4
73567	F	90	9.3	1	17	87	90	10.8
73568	F	108	10.8	0	8	75	84	10.2
73569	F	87	11.4	1	19	90	99	10.9
73570	F	111	14.4	1	12	90	87	9.6
73571	F	102	13.5	2	10	90	81	9.9
Mean		100	11.9	1	13	86	88	10.3
30 ppm:								
73572	M	84	9.9	0	16	84	69	10.0
73573	M	78	8.7	2	14	120	90	10.2
73574	M	78	10.2	2	22	90	96	9.7
73575	M	102	7.5	1	13	66	72	9.5
73576	M	102	11.7	1	11	84	87	10.4
Mean		89	9.6	1	15	89	83	10.0
73577	F	120	6.9	0	13	84	87	9.1
73578	F	93	6.6	0	18	84	66	10.2
73579	F	99	7.2	0	16	69	66	9.4
73580	F	93	9.3	0	10	72	84	10.2
73581	F	90	10.2	0	10	63	72	9.5
Mean		99	8.0	0	13	74	75	9.7

*Creatinine phosphokinase

BEST COPY AVAILABLE

TABLE 9. Cont. Individual Biochemical Values - Pretest.

Group. Rat Number	Sex	Glucose mg/100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	[illegible] Int'l units/l	[illegible] Int'l units/l	Calcium meq liter
100 ppm:								
73582	M	111	12.6	1	13	82	93	10.8
73583	M	105	9.3	1	11	114	87	9.4
73584	M	81	11.4	0	13	105	54	9.4
73585	M	81	9.3	0	28	117	66	9.2
73586	M	90	12.7	1	10	150	66	9.8
Mean		94	10.9	1	16	112	67	9.7
73587	F	114	9.0	0	9	90	54	9.7
73588	F	99	9.0	0	20	96	54	10.2
73589	F	108	14.2	1	15	93	54	9.5
73590	F	102	9.3	0	12	102	60	9.6
73591	F	117	11.4	0	22	99	69	10.1
Mean		108	10.6	0	14	96	61	9.8
300 ppm:								
73592	M	90	10.2	0	8	99	60	8.6
73593	M	117	12.0	1	9	111	69	9.7
73594	M	105	9.6	1	10	120	57	10.0
73595	M	111	12.0	1	15	111	60	9.7
73596	M	108	11.4	0	7	87	60	9.7
Mean		106	11.0	1	10	106	61	9.5
73597	F	99	9.0	0	18	111	57	9.5
73598	F	111	9.0	0	14	99	45	9.4
73599	F	102	9.0	0	19	99	73	9.6
73600	F	111	11.4	0	22	129	87	9.9
73601	F	111	11.1	1	10	117	66	9.5
Mean		107	9.9	0	17	111	67	9.5
1,000 ppm:								
73602	M	132	17.4	1	16	123	135	10.7
73603	M	90	15.0	0	10	93	99	10.9
73604	M	99	15.0	0	9	114	129	10.5
73605	M	78	10.3	1	19	102	129	10.4
73606	M	102	12.3	0	6	93	90	9.0
Mean		100	14.1	0	12	105	116	10.3
73607	F	93	12.3	1	12	123	117	10.1
73608	F	102	11.4	0	13	108	117	9.5
73609	F	96	12.0	1	10	120	99	10.1
73610	F	90	11.7	0	7	108	96	10.6
73611	F	63	14.7	0	7	99	84	10.5
Mean		89	12.4	0	10	111	103	10.2

*Creatinine phosphokinase

TABLE 10. Individual Biochemical Values - 1 Month.

Group, Rat Number	Sex	Glucose mg./100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	P.G.O.T. int'l units/l	P.G.P.T. int'l units/l	Calcium meq/liter	Alk. Phos. int'l units/l
Control:									
73552	M	108	15.6	5	11	129	87	13.0	171
73553	M	120	16.8	4	13	180	93	12.8	228
73554	M	108	14.7	3	20	180	93	12.6	156
73555	M	117	14.7	2	19	132	90	12.6	222
73556	M	108	15.0	1	20	156	84	12.6	192
Mean		112	15.4	3	17	155	89	12.7	194
73557	F	111	12.0	2	9	129	66	11.6	114
73558	F	105	9.6	2	14	141	72	11.8	102
73559	F	117	10.8	2	16	180	78	11.8	165
73560	F	108	19.5	1	11	162	63	12.2	87
73561	F	114	38.7	1	20	168	75	11.4	105
Mean		111	18.1	2	14	156	71	11.8	115
10 ppm:									
73562	M	120	12.0	1	20	123	72	11.8	168
73563	M	105	14.7	1	22	153	87	11.4	201
73564	M	111	15.0	2	15	138	66	11.8	318
73565	M	108	17.7	3	11	138	75	11.4	210
73566	M	117	14.4	3	16	165	90	11.4	228
Mean		112	14.8	2	17	143	78	11.6	225
73567	F	117	14.7	1	9	150	96	11.6	105
73568	F	120	17.7	2	18	153	78	11.6	126
73569	F	117	23.7	3	15	144	54	11.8	147
73570	F	114	17.4	3	28	150	93	11.6	138
73571	F	117	18.0	QNS	13	147	69	11.6	150
Mean		117	18.3	2	17	149	78	11.4	133
30 ppm:									
73572	M	117	20.7	3	15	123	60	11.4	267
73573	M	129	16.8	2	16	138	84	11.8	240
73574	M	123	15.3	3	8	114	48	11.2	198
73575	M	144	15.3	1	15	123	69	11.2	177
73576	M	153	21.6	1	15	141	93	11.0	216
Mean		133	17.9	2	14	128	71	11.3	220
73577	F	132	21.0	3	16	129	93	11.6	99
73578	F	123	15.0	3	9	147	60	11.2	117
73579	F	123	18.3	2	13	165	75	11.2	171
73580	F	114	15.3	0	12	195	96	11.5	108
73581	F	108	15.3	3	12	156	78	11.4	108
Mean		120	17.0	2	12	158	80	11.4	121

QNS - Quantity not sufficient
*Creatinine phosphokinase

TABLE 10. Cont. Individual Biochemical Values - 1 Month.

Group, Rat Number	Sex	Glucose mg/100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	P.G.O.T. int'l units/l	P.G.P.T. int'l units/l	Calcium meq/liter	Alk. Phos. int'l units/l
100 ppm:									
73582	M	105	15.0	2	18	135	78	12.4	231
73583	M	135	17.7	2	18	135	90	12.2	246
73584	M	138	15.3	2	17	96	63	11.8	189
73585	M	132	18.3	3	24	126	81	11.6	219
73586	M	123	18.6	1	16	114	66	11.8	195
Mean		127	17.0	2	19	121	76	12.0	216
73587	F	114	14.7	3	12	132	81	12.6	123
73588	F	105	14.7	1	55	132	72	12.0	75
73589	F	138	18.3	3	17	120	87	12.2	111
73590	F	144	17.7	2	31	174	108	11.8	123
73591	F	120	15.0	QNS	11	117	60	12.4	99
Mean		124	16.1	2	25	135	82	12.2	106
300 ppm:									
73592	M	123	20.7	0	11	108	78	11.4	213
73593	M	132	17.7	1	15	117	81	11.8	258
73594	M	123	18.0	1	11	84	48	11.8	186
73595	M	132	20.7	3	10	117	78	12.0	228
73596	M	123	21.0	3	28	114	90	12.2	360
Mean		127	19.6	2	15	108	75	11.8	249
73597	F	102	19.5	3	21	123	63	12.2	132
73598	F	105	15.0	1	10	135	72	11.8	78
73599	F	105	15.3	3	12	108	57	12.6	90
73600	F	117	12.3	1	14	144	96	12.4	105
73601	F	102	15.0	1	28	156	66	12.2	123
Mean		106	15.4	2	17	133	71	12.2	106
1,000 ppm:									
73602	M	126	24.0	1	9	99	93	12.2	168
73603	M	114	20.4	1	14	120	96	12.0	264
73604	M	120	23.4	2	18	126	123	12.0	561
73605	M	120	17.4	1	13	105	96	12.2	246
73606	M	126	19.2	1	11	114	78	11.6	255
Mean		121	20.9	1	13	113	97	12.0	299
73607	F	105	18.9	0	16	183	117	12.2	141
73608	F	120	15.3	1	10	114	66	12.0	108
73609	F	129	18.0	1	10	132	90	12.0	75
73610	F	114	22.8	2	17	120	87	12.2	132
73611	F	114	21.3	1	20	126	87	12.0	105
Mean		116	19.3	1	15	135	89	12.1	112

EPA 02179

QNS - Quantity not sufficient
*Creatinine phosphokinase

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 11. Individual Biochemical Values - 3 Months.

Group, Rat Number	Sex	Glucose mg/100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	P.G.O.T. int'l units/l	P.G.P.T. int'l units/l	Calcium meq/liter	Alk. Phos. int'l units/l
Control:									
73552	M	114	15.9	1	9	95	33	9.8	95
73553	M	125	17.4	1	14	138	31	10.1	125
73554	M	119	17.0	1	10	106	43	9.7	86
73555	M	126	15.0	0	12	111	30	10.3	97
73556	M	123	15.9	0	9	115	55	9.2	119
Mean		121	16.2	1	11	113	38	9.8	104
73557	F	122	18.8	0	7	95	30	10.1	54
73558	F	114	16.1	1	28	99	28	9.4	42
73559	F	125	16.1	1	13	107	17	9.5	101
73560	F	117	19.9	1	10	118	29	9.8	45
73561	F	116	36.1	1	10	130	21	9.9	104
Mean		119	21.4	1	14	110	25	9.7	69
10 ppm:									
73562	M	125	16.6	0	5	88	33	9.2	86
73563	M	104	22.0	1	9	126	36	9.4	127
73564	M	111	17.0	1	12	111	52	9.8	196
73565	M	126	20.4	1	8	115	42	9.5	130
73566	M	134	18.2	0	8	84	30	9.0	144
Mean		120	18.8	1	8	105	39	9.3	137
73567	F	117	16.9	2	6	106	40	9.5	48
73568	F	125	19.0	1	10	96	40	8.8	51
73569	F	135	16.8	0	7	92	37	9.5	86
73570	F	119	16.1	0	16	249	105	9.9	65
73571	F	132	18.9	1	8	111	30	9.1	97
Mean		126	17.5	1	9	131	50	9.4	69
30 ppm:									
73572	M	135	17.0	1	6	90	35	9.0	126
73573	M	129	16.0	1	7	80	32	9.4	124
73574	M	134	17.1	1	5	91	41	9.2	127
73575	M	137	16.9	2	10	102	54	8.7	85
73576	M	145	23.0	1	22	105	44	9.6	139
Mean		136	18.0	1	10	94	41	9.2	120
73577	F	129	16.0	1	6	71	21	9.2	41
73578	F	128	15.9	1	4	80	21	9.1	36
73579	F	124	15.1	2	10	100	25	9.2	71
73580	F	141	16.6	2	9	105	21	10.2	53
73581	F	132	20.0	1	6	123	43	9.2	66
Mean		131	16.7	1	7	96	26	9.4	57

QNS - Quantity not sufficient
*Creatinine phosphokinase

TABLE 11. Cont. Individual Biochemical Values - 3 Months.

Group, Rat Number	Sex	Glucose mg/100 ml	B.U.N. mg/100 ml	γ-Glutamyl Peptidase Sigma units/ml	C.P.K.* Sigma units/ml	P.G.O.T. int'l units/l	P.G.P.T. int'l units/l	Calcium meq/liter	Alk. Phos. int'l units/l
100 ppm:									
73582	M	Tube broke in centrifuge - no sample							
73583	M	121	20.1	2	19	192	101	9.8	150
73584	M	154	20.7	1	14	83	42	9.7	151
73585	M	130	20.0	1	7	106	45	9.2	141
73586	M	130	20.7	1	11	130	62	9.4	144
Mean		134	20.4	1	13	128	63	9.5	147
73587	F	126	16.4	1	20	105	30	9.8	51
73588	F	140	15.9	2	16	110	24	10.3	56
73589	F	125	24.2	2	13	120	42	9.3	44
73590	F	Died							
73591	F	116	21.0	2	24	101	30	9.6	55
Mean		127	19.4	2	18	109	32	9.8	52
300 ppm:									
73592	M	144	29.0	1	22	95	42	9.5	249
73593	M	145	22.1	1	13	143	86	9.1	210
73594	M	144	20.1	1	11	91	57	8.8	148
73595	M	139	23.0	1	13	120	50	9.5	184
73596	M	144	25.5	1	11	91	37	9.6	225
Mean		143	23.9	1	14	108	54	9.3	204
73597	F	121	17.1	2	14	98	29	8.9	59
73598	F	116	17.0	2	12	127	41	8.4	46
73599	F	125	19.1	2	10	117	41	9.2	50
73600	F	127	17.1	1	12	111	44	9.6	56
73601	F	Died							
Mean		122	17.6	2	12	113	39	9.0	53
1,000 ppm:									
73602	M	130	27.0	2	13	90	48	10.0	121
73603	M	136	23.5	2	12	83	26	9.3	182
73604	M	140	79.1	7	16	139	76	9.4	350
73605	M	124	21.1	2	14	141	37	9.9	221
73606	M	144	24.8	1	22	141	81	8.8	181
Mean		135	35.1	3	15	119	54	9.5	212
73607	F	139	21.0	1	16	150	49	9.0	95
73608	F	122	17.0	2	21	112	30	10.0	70
73609	F	121	18.8	2	12	126	45	9.8	34
73610	F	117	22.1	1	17	97	33	8.8	64
73611	F	126	24.0	2	7	99	31	9.4	56
Mean		125	20.6	2	15	117	38	9.4	64

*Creatinine phosphokinase

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 12.

Individual Urinalysis Values - Pretest.

Group, Rat Number	Sex	Volume ml	Color and Appear.	pH	Spec. Grav.	Total Protein	Glucose	Bilirubin	Occult Blood	Ketones	Leucocytes	Erythrocytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bacteria
Control:																	
73552	M	2.0	S-C	7.1	1.031	N	N	N	3+	N				F	F		M
73553	M	3.0	LS-C	7.0	1.036	N	N	N	N	N				occ	F		M
73554	M	3.5	LS-C	7.1	1.032	N	N	N	tr	N				occ	occ		M
73555	M	5.5	DS-cl	7.0	1.032	N	N	N	tr	N				occ	F		M
73556	M	2.5	LS-C	7.1	1.028	N	N	N	tr	N				occ	M		M
73557	F	2.5	DS-cl	6.0	1.045	N	N	N	4+	N			occ	F	F		M
73558	F	3.0	LS-C	7.2	1.024	N	N	N	tr	N				occ	occ		M
73559	F	2.0	DS-cl	8.0	1.025	N	N	N	4+	N			occ	F	F		M
73560	F	2.0	LS-C	6.4	1.032	N	N	N	1+	N		1-3		occ	F		M
73561	F	1.5	S-C	7.0	1.041	N	N	N	2+	N				F	M		M
10 ppm:																	
73562	M	3.0	LS-C	7.2	1.031	N	N	N	N	N		occ		occ	F		M
73563	M	3.5	LS-C	7.2	1.030	N	N	N	tr	N				occ	F		M
73564	M	2.5	LS-cl	7.2	1.029	N	N	N	4+	N				occ	F		M
73565	M	5.0	LS-C	6.4	1.033	N	N	N	N	N				occ	M		M
73566	M	2.5	S-C	6.5	1.037	N	N	N	tr	N				occ	F		M
73567	F	2.0	DS-cl	8.0	1.031	N	N	N	4+	N		1-3		F	F		M
73568	F	1.5	DS-cl	7.9	1.050	N	N	N	4+	N		1-3		F	F		M
73569	F	0.5	LS-C	5.7	1.047	N	N	N	1+	N				occ	F		M
73570	F	2.5	LS-cl	6.8	1.033	N	N	N	tr	N			occ	occ	M		M
73571	F	1.0	S-cl	8.0	1.037	N	N	N	2+	N				occ	F		M
30 ppm:																	
73572	M	4.0	LS-C	6.8	1.037	N	N	N	N	N				occ	F		M
73573	M	2.0	LS-C	6.6	1.039	N	N	N	N	N				occ	occ		M
73574	M	0.5	LS-C	5.6	1.057	N	N	N	1+	N				occ	occ		M
73575	M	4.5	LS-C	6.1	1.035	N	N	N	1+	N			occ	F	F		M
73576	M	5.0	S-C	6.3	1.034	N	N	N	N	N				occ	M		M
73577	F	4.0	LS-C	5.9	1.029	N	N	N	N	N			occ	occ	occ		M
73578	F	3.5	LS-C	6.1	1.021	N	N	N	tr	N				occ	F		M
73579	F	2.5	DS-C	6.2	1.040	N	N	N	tr	N		occ		occ	F		M
73580	F	0.5	LS-C	5.9	1.052	N	N	N	N	N				occ	M		M
73581	F	3.0	S-C	6.5	1.029	N	N	N	3+	N		occ		F	M		M

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional

117-089

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 12. Cont.

Individual Urinalysis Values - Pretest.

Group, Rat Number	Sex	Volume ml	Color and Appear.	pH	Spec. Grav.	Total Protein	Glucose	Bili-rubin	Occult Blood	Ke-tones	Leuco-cytes	Erythro-cytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bac-teria
100 ppm:																	
73582	M	5.0	S-C	7.0	1.028	N	N	N	N	N							
73583	M	6.0	LS-C	7.0	1.026	N	N	N	N	N		occ		F	F		M
73584	M	2.5	LS-C	6.1	1.028	N	N	N	N	N				occ	F		M
73585	M	2.5	S-C	6.7	1.026	N	N	N	N	1+		occ		occ	F		F
73586	M	3.5	DS-cl	6.8	1.045	N	N	N	2+	N				occ	F		M
73587	F	5.0	LS-C	6.7	1.040	N	N	N	tr	N				F	F		M
73588	F	3.5	LS-C	6.8	1.035	N	N	N	1+	N							
73589	F	2.0	DS-C	7.2	1.021	N	N	N	3+	N				occ	M		M
73590	F	3.0	LS-C	7.0	1.028	N	N	N	N	N			occ	occ	M		M
73591	F	5.5	LS-C	6.0	1.030	N	N	N	N	N		1-3		F	F		M
300 ppm:														occ	F		M
73592	M	3.0	S-C	6.5	1.009	N	N	N	tr	N		occ		occ	occ		M
73593	M	3.5	LS-C	7.3	1.020	N	N	N	1+	N				F	F		M
73594	M	3.5	LS-C	6.6	1.040	N	N	N	N	N				occ	occ		M
73595	M	5.5	LS-C	6.9	1.033	N	N	N	N	N				occ	occ		M
73596	M	1.5	DS-cl	7.9	1.034	N	N	N	2+	N				occ	F		M
73597	F	1.0	DS-C	8.0	1.034	N	N	N	4+	N				F	F		M
73598	F	3.5	LS-C	5.9	1.023	N	N	N	tr	N		occ	occ	occ	F		M
73599	F	5.0	LS-C	7.0	1.022	N	N	N	tr	N				occ	occ		M
73600	F	5.0	S-C	7.3	1.036	N	N	N	tr	N				occ	M		M
73601	F	3.0	S-C	7.0	1.036	N	N	N	3+	N				occ	F		M
1,000 ppm:														occ	F		M
73602	M	3.0	S-C	6.8	1.028	N	N	N	tr	N							
73603	M	3.5	LS-C	7.0	1.032	N	N	N	1+	N				F	F		M
73604	M	7.0	LS-C	6.9	1.036	N	N	N	2+	N				occ	occ		M
74605	M	1.5	S-C	6.9	1.027	N	N	N	N	N				occ	F	occ	M
73606	M	7.5	LS-C	6.8	1.023	N	N	N	N	N				occ	F		M
73607	F	1.5	DS-C	6.2	1.045	N	N	N	tr	N				occ	F		F
73608	F	2.0	S-C	6.3	1.038	N	N	N	1+	N				occ	F		
73609	F	1.0	DS-C	6.1	1.060	N	N	N	tr	N			occ	occ	F		M
73610	F	3.0	DS-C	7.6	1.028	N	N	N	1+	N		occ		occ	F		M
73611	F	7.0	LS-C	7.2	1.020	N	N	N	N	N				occ	F		M
														occ	F		M

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional

117-089

EPA 02183

001652

Fluorad® Fluorochemical FC-143:

TABLE 13.

Ninety Day Subacute Rat Toxicity Study.

Individual Urinalysis Values - 1 Month.

Group, Rat Number	Sex	Volume ml	Color and Appear.	pH	Spec. Grav.	Total Protein	Glucose	Bili-rubin	Occult Blood	Ke-tones	Leuco-cytes	Erythro-cytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bac-teria
Control:																	
73552	M	6.0	LS-cl	6.5	1.053	N	N	N	tr	N				occ	occ		F
73553	M	3.0	LS-cl	6.5	1.051	N	N	N	N	N				occ	F		M
73554	M	8.0	LS-cl	7.5	1.037	N	N	N	tr	N				occ	F		F
73555	M	4.0	S-cl	6.1	1.078	N	N	N	N	N		occ		occ	F		F
73556	M	1.5	DS-cl	8.2	1.064	N	N	N	1+	N		1-3	occ	occ	M		M
73557	F	4.0	S-cl	7.2	1.064	N	N	N	tr	N		occ					
73558	F	3.0	LS-C	6.0	1.054	N	N	N	N	N				occ	F		M
73559	F	2.0	LS-C	6.3	1.066	N	N	N	N	N				occ	occ		F
73560	F	1.0	DS-cl	8.2	1.058	N	N	N	2+	N			occ	occ	F		F
73561	F	3.0	LS-C	6.0	1.050	N	N	N	N	N				occ	M		M
10 ppm:														occ	F		F
73562	M	1.0	S-cl	6.1	1.076	N	N	N	N	N		occ					
73563	M	1.5	S-cl	6.4	1.098	N	N	N	N	N				F	M		F
73564	M	2.0	DS-cl	8.2	1.058	N	N	N	1+	N			occ	occ	F		F
73565	M	4.0	DS-cl	8.2	1.060	N	N	N	1+	N		occ	occ	F	F		M
73566	M	8.0	LS-C	6.3	1.041	N	N	N	N	N			occ	F	M		M
73567	F	1.0	DS-cl	7.1	1.080	N	N	N	tr	N				occ	F	M	F
73568	F	2.0	DS-cl	8.5	1.038	N	N	N	3+	N		occ		occ	M		
73569	F	3.0	LS-C	6.2	1.050	N	N	N	N	N				occ	F		M
73570	F	1.0	LS-C	6.0	1.076	N	N	N	1+	N				occ	F		M
73571	F	4.0	LS-C	6.1	1.052	N	N	N	N	N				occ	occ		M
30 ppm:														occ	F		F
73572	M	5.0	LS-C	6.0	1.068	N	N	N	N	N		1-3					
73573	M	1.5	LS-C	6.0	1.088	N	N	N	N	N		1-3		occ	occ		F
73574	M	8.0	LS-C	6.2	1.044	N	N	N	tr	N		1-3		F	F		F
73575	M	9.0	LS-C	6.5	1.041	N	N	N	N	N				occ	occ		F
73576	M	4.0	LS-C	5.9	1.064	N	N	N	N	N		occ		occ	M		M
73577	F	2.0	LS-C	5.9	1.056	N	N	N	N	N				occ	occ		F
73578	F	1.0	LS-cl	6.1	1.049	N	N	N	tr	N		1-3		occ	occ		F
73579	F	1.0	DS-cl	8.8	1.056	N	N	N	3+	N				occ	F		F
73580	F	3.0	DS-cl	8.9	1.050	N	N	N	2+	N		occ		F	F		M
73581	F	2.0	LS-C	5.9	1.080	N	N	N	N	N		occ		occ	occ		M
														occ	occ		F

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional

117-089

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 13. Cont.

Individual Urinalysis Values - 1 Month.

Group, Rat Number	Sex	Volume ml	Color and Appear.	pH	Spec. Grav.	Total Protein	Glucose	Bili-rubin	Occult Blood	Ke-tones	Leuco-cytes	Erythro-cytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bac-teria
100 ppm:																	
73582	M	6.0	DS-cl	8.5	1.055	N	N	N	1+	N				F	occ	F	M
73583	M	8.0	LS-C	7.0	1.038	N	N	N	N	N				occ	M		M
73584	M	6.0	S-C	7.3	1.046	N	N	N	tr	N				F	F		M
73585	M	4.0	DS-cl	8.1	1.062	N	N	N	tr	N				F	M	F	M
73586	M	8.0	LS-C	6.9	1.036	N	N	N	N	N		1-1		occ	F		M
73587	F	6.0	S-cl	8.8	1.037	N	N	N	2+	N							
73588	F	6.0	LS-C	7.9	1.034	N	N	N	N	N		occ		F	occ		M
73589	F	2.5	S-cl	8.3	1.044	N	N	N	1+	N		occ		occ	F		M
73590	F	4.0	S-cl	8.4	1.041	N	N	N	1+	N			occ	F	M	occ	M
73591	F	4.0	LS-C	6.1	1.042	N	N	N	N	N		occ		occ	occ		M
300 ppm:														occ	F		M
73592	M	4.0	DS-cl	8.1	1.045	N	N	N	1+	N							
73593	M	6.0	LS-C	8.2	1.036	N	N	N	N	N				F	F		M
73594	M	2.0	LS-C	6.8	1.060	N	N	N	N	N				occ	occ		M
73595	M	12.0	LS-C	7.1	1.040	N	N	N	N	N				F	M	occ	M
73596	M	10.0	LS-C	6.5	1.041	N	N	N	N	N				F	F		M
73597	F	1.5	DS-cl	8.9	1.043	N	N	N	2+	N				F	M		M
73598	F	2.0	LS-C	5.9	1.064	N	N	N	N	N		1-3					
73599	F	4.0	S-cl	8.0	1.060	N	N	N	1+	N		occ		F	F		M
73600	F	3.0	LS-C	7.1	1.047	N	N	N	tr	N				occ	F	occ	F
73601	F	<0.5	DS-cl	QNS	QNS	QNS	QNS	QNS	QNS	QNS		1-3		occ	M		M
1,000 ppm:														occ	F		F
73602	M	9.0	LS-C	7.2	1.039	N	N	N	N	N				occ	occ		M
73603	M	6.5	LS-C	6.8	1.037	N	N	N	tr	N		occ					
73604	M	9.0	LS-C	7.2	1.040	N	N	N	tr	N				occ	F		M
73605	M	8.5	LS-C	8.8	1.026	N	N	N	tr	N				F	F		M
73606	M	6.0	S-cl	7.2	1.042	N	N	N	tr	N				occ	M		M
73607	F	2.0	LS-cl	7.3	1.049	N	N	N	1+	N				occ	occ		F
73608	F	5.5	DS-C	8.8	1.041	N	N	N	2+	N				occ	F		M
73609	F	8.0	DS-cl	8.7	1.039	N	N	N	2+	N		occ			occ		
73610	F	4.0	S-cl	7.2	1.062	N	N	N	tr	N		1-3		occ	F		M
73611	F	6.0	DS-cl	8.2	1.041	N	N	N	2+	N				occ	occ		F
												occ		F	occ		M

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional
QNS - Quantity not sufficient

137-089

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-141:

TABLE 14.

Ninety Day Subacute Rat Toxicity Study.

Individual Urinalysis Values - 3 Months.

Group, Rat Number	Sex	Volume ml	Color and Appear	pH	Spec. Grav.	Total Protein	Glucose	Bili-rubin	Occult Blood	Ketones	Leuco-cytes	Erythro-cytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bac-teria
Control:																	
71552	M	3.0	DS-cl	6.0	1.080	N	N	N	1+	N				occ	F		F
71553	M	5.5	LS-C	7.0	1.052	N	N	N	tr	N		occ		F	M		M
71554	M	7.5	LS-C	7.3	1.018	N	N	N	tr	N			occ	occ	F		M
71555	M	5.0	LS-C	6.0	1.054	N	N	N	N	N		1-3		F	F		F
71556	M	<0.5	DS-cl	8.0	1.070	N	N	N	3+	N		occ		F	M	occ	M
71557	F	1.5	LS-C	6.1	1.080	N	N	N	N	N				F	F		M
71558	F	1.0	LS-C	6.1	1.094	N	N	N	N	N		1-3		F	M		F
71559	F	<0.5	S-C	6.1	1.094	N	N	N	N	N		occ		F	F	occ	M
71560	F	4.5	LS-cl	6.4	1.042	N	N	N	N	N		1-3		M	F		M
71561	F	1.5	S-cl	6.6	1.070	N	N	N	N	N				F	F		M
10 ppm:																	
71562	M	2.0	S-C	6.5	1.082	N	N	N	N	N		occ		F	F		F
71563	M	4.5	LS-C	6.4	1.044	N	N	N	N	N			occ	occ	F		F
71564	M	2.5	DS-cl	8.0	1.078	N	N	N	1+	N		1-3	occ	M	F		M
71565	M	4.0	S-cl	6.1	1.067	N	N	N	N	N		1-3		F	M		M
71566	M	5.5	LS-cl	6.2	1.042	N	N	N	tr	N		occ		occ	occ		M
71567	F	1.0	DS-cl	8.0	1.054	N	N	N	2+	N				M	M		M
71568	F	2.5	DS-cl	7.0	1.062	N	N	N	1+	N				F	F		M
71569	F	2.0	LS-C	6.0	1.074	N	N	N	tr	N				F	F	F	M
71570	F	1.0	LS-C	6.0	1.076	N	N	N	N	N				occ	F	occ	F
71571	F	2.0	LS-cl	8.0	1.055	N	N	N	tr	N	occ	1-3		F	F	occ	M
40 ppm:																	
71572	M	2.0	DS-cl	6.0	1.092	N	N	N	N	N				occ	F		F
71573	M	1.0	LS-C	6.2	1.096	N	N	N	N	N		occ		occ	M		F
71574	M	6.0	LS-C	6.9	1.066	N	N	N	4+	N		L		F	F		M
71575	M	6.0	S-C	6.1	1.064	N	N	N	tr	N		5-8		occ	occ		F
71576	M	2.5	DS-cl	6.2	1.073	N	N	N	N	N				F	M	occ	M
71577	M	1.5	LS-C	6.0	1.046	N	N	N	tr	N		1-3	occ	F	F		F
71578	F	2.0	LS-C	6.2	1.067	N	N	N	tr	N				occ	F		F
71579	F	2.0	DS-cl	6.9	1.044	N	N	N	4+	N		occ		F	F		F
71580	F	3.0	LS-C	6.9	1.050	N	N	N	tr	N		occ		F	occ		M
71581	F	<0.5	DS-cl	6.3	1.090	N	N	N	N	N		occ		occ	occ	occ	M

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional

117-089

BEST COPY AVAILABLE

001655

Fluorad® Fluorochemical FC-143: Ninety Day Subacute Rat Toxicity Study.

TABLE 14. Cont. Individual Urinalysis Values - 3 Months.

Group, Rat Number	Sex	Volume ml	Color and Appear.	pH	Spec. Grav.	Total Protein	Glucose	Bilirubin	Occult Blood	Ketones	Leucocytes	Erythrocytes	Epi. Cells	Amor. Urates	Triple Phos.	Calc. Ox.	Bacteria
100 ppm:																	
73582	M	4.0	DS-cl	6.3	1.074	N	N	N	N	N				M	F		M
73583	M	6.0	LS-cl	8.4	1.042	tr	N	N	tr	N		1-3	occ	F	F		M
73584	M	6.0	LS-cl	6.8	1.042	N	N	N	tr	N			occ	F	F		F
73585	M	2.0	LS-cl	6.5	1.066	N	N	N	N	N		1-3		F	F		F
73586	M	5.5	LS-cl	6.8	1.045	N	N	N	N	N			occ	F	F	F	M
73587	F	4.5	S-cl	8.0	1.042	N	N	N	3+	N				M	M		M
73588	F	6.0	S-cl	8.7	1.034	N	N	N	3+	N		1-3		M	F		M
73589	F	3.0	LS-cl	7.0	1.052	N	N	N	1+	N				F	M		M
73590	F	Died															
73591	F	1.0	S-cl	7.2	1.065	N	N	N	4+	N		1-3		F	M		M
300 ppm:																	
73592	M	4.5	S-cl	7.0	1.045	N	N	N	2+	N			occ	F	F		F
73593	M	3.5	S-cl	7.5	1.072	N	N	N	N	N				F	F	occ	M
73594	M	3.5	S-cl	6.5	1.062	N	N	N	4+	N				F	F		M
73595	M	4.0	S-cl	6.8	1.080	N	N	N	N	N			1-3	F	F		M
73596	M	7.0	LS-cl	6.8	1.042	N	N	N	N	N				F	F		M
73597	F	0.0															
73598	F	1.0	S-cl	6.0	1.068	N	N	N	2+	N				F	M		M
73599	F	1.0	S-cl	7.3	1.080	N	N	N	2+	N			occ	M	F		F
73600	F	2.0	S-cl	6.8	1.063	N	N	N	tr	N				F	F		M
73601	F	Died															
1,000 ppm:																	
73602	M	7.5	LS-cl	8.2	1.040	N	N	N	N	N		1-3		M	F		M
73603	M	5.0	LS-cl	6.2	1.039	N	N	N	tr	N		1-3	occ	F	H		M
73604	M	8.0	LS-cl	6.8	1.040	N	N	N	tr	N				F	F		M
73605	M	4.0	LS-cl	6.0	1.042	N	N	N	N	N				F	F		F
73606	M	6.0	LS-cl	7.0	1.042	N	N	N	N	N		1-3		F	H		H
73607	F	5.0	LS-cl	7.0	1.038	N	N	N	2+	N		occ		F			
73608	F	1.0	S-cl	6.0	1.080	tr	N	N	4+	N				F	F		M
73609	F	3.0	DS-cl	8.0	1.060	tr	N	N	3+	N			occ	F	F		M
73610	F	1.0	LS-cl	6.0	1.080	N	N	N	N	N				F	F		M
73611	F	3.0	LS-cl	6.5	1.060	N	N	N	N	N			occ	F	M	F	M

Code:

tr - Trace
1+ - Trace to slight
2+ - Slight to moderate
3+ - Moderate
4+ - Marked

S - Straw
LS - Light Straw
DS - Dark Straw
LAm - Light Amber
DAm - Dark Amber
cl - Cloudy
C - Clear

N - Negative
F - Few
L - Loaded
M - Many
R - Rare
occ - Occasional

117-089

BEST COPY AVAILABLE

EPA 02187

C01656

Fluorad® Fluorochemical FC-141:

Ninety Day Subacute Rat Toxicity Study.

TABLE 15.

Summary of Gross Necropsy Observations.

Site / Lesion	Terminal Sacrifice												Deaths	
	Control		10 ppm		30 ppm		100 ppm		300 ppm		1000 ppm		100 ppm	300 ppm
	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Number necropsied	5	5	5	5	5	5	5	4	5	4	5	5	1	1
No gross lesions	2	5	4	2	3	3	3	2	3	3		4		
External														
dark red material around eyes/nose/mouth							1							1
Eyes														
right eye small, lens missing								1						
right eye, cataract											1			
Lung														
white/grayish/yellow foci	1								1					
dark brown foci													1	
Lymph Node														
slightly enlarged - submaxillary								1						
Stomach														
raised white foci	1				1						1		1	1
dark red foci														
Large Intestine - Cecum and Colon														
semi-solid, blood tinged contents					1									
mucosal congestion					1									
Liver														
enlarged											2			
dark brown/brownish in color							1				3			
accentuated lobulation									1		1			
yellow/grayish white foci				1							4			
cyst, yellowish in color														
Kidney														
hydronephrosis	1		1	1				1						
granular surface			1											
Uterus														
hydrometra				2		2		2		1		1		

BEST COPY AVAILABLE

Fluorad® Fluorochemical FC-143:

TABLE 16. Ninety Day Subacute Rat Toxicity Study.

Absolute (Grams) and Relative (% Body Weight) Organ Weights.

Group, Sex	Body Wt. g	Spleen g	Spleen %	Liver g	Liver %	Kidneys g	Kidneys %	Brain g	Brain %	Adrenals mg	Adrenals %x10²	Thyroid Parathyroid mg	Thyroid Parathyroid %x10²	Pituitary mg	Pituitary %x10²
Control:															
M	445	0.70	0.16	13.43	3.01	3.54	0.79	2.25	0.51	80	1.79	40	0.90	17	0.38
F	271	0.47	0.17	7.66	2.85	2.16	0.81	2.02	0.75	101	3.80	35	1.33	18	0.65
10 ppm:															
M	482	0.69	0.14	15.26	3.18	4.13	0.86	2.24	0.47	73	1.50	35	0.72	17	0.36
F	237	0.49	0.20	7.25	3.06	2.50	1.05*	1.95	0.82	79	3.32	27	1.15	17	0.72
30 ppm:															
M	500	0.67	0.14	20.31*	4.09	4.40*	0.88	2.21	0.44	74	1.48	37	0.74	15	0.30
F	254	0.49	0.19	7.73	3.04	2.37	0.94	2.01	0.79	83	3.25	27	1.07	16	0.62
100 ppm:															
M	438	0.75	0.17	18.59	4.21	4.19	0.96*	2.29	0.52	70	1.61	33	0.75	17	0.39
F	271	0.57	0.21	7.97	2.95	2.47	0.91	2.10	0.78	89	3.27	27	0.98	17	0.60
300 ppm:															
M	412	0.64	0.16	20.13**	4.88**	3.91	0.95*	2.13	0.52	67	1.62	36	0.87	16	0.38
F	246	0.45	0.18	7.44	3.03	2.40	0.98	2.00	0.82	89	3.64	25	1.02	17	0.70
1000 ppm:															
M	340	0.49	0.14	19.16**	5.70**	3.47	1.03**	2.17	0.65**	69	2.04	36	1.06	13	0.38
F	240	0.46	0.19	8.76*	3.65*	2.15	0.90	2.08	0.87	92	3.89	28	1.18	18	0.75

Group mean relative organ weights shown in this table were calculated by averaging the individually calculated relative organ weights.

*Significantly different from control group mean, $p<0.05$.
**Significantly different from control group mean, $P<0.01$.

137-089

EPA 02189

C01658

TABLE 17.

Ninety Day Subacute Rat Toxicity Study.

Individual Organ Weights - Terminal Sacrifice.

Group Rat No.	Sex	Body Wt. g	Spleen g	Liver g	Kidneys g	Brain g	Adrenals mg	Thyroid/ Parathyroid mg	Pituitary mg
Control:									
73552	M	457	0.60	14.46	3.83	2.18	91	47	19
73553	M	422	0.62	12.15	2.99	2.41	70	45	16
73554	M	474	0.84	13.84	3.94	2.30	80	36	11
73555	M	471	0.88	15.04	3.73	2.16	82	44	19
73556	M	402	0.54	11.64	3.22	2.21	75	28	19
73557	F	272	0.41	8.30	2.00	2.03	101	32	17
73558	F	251	0.56	7.80	2.25	2.00	130	56	23
73559	F	244	0.42	6.96	2.40	1.97	91	25	12
73560*	F	256	0.47	6.85	2.01	2.22	92	34	20
73561	F	315	0.47	7.57	1.97	2.06	81	28	18
10 ppm:									
73562	M	442	0.53	16.37	3.88	2.16	56	-	21
73563*	M	377	0.66	10.61	3.82	2.36	68	28	17
73564	M	483	0.74	15.87	3.85	2.25	64	40	13
73565	M	503	0.79	21.56	4.14	2.31	99	35	18
73566	M	499	0.68	7.25	4.66	2.23	72	31	16
73567	F	230	0.46	7.05	2.27	1.90	76	30	18
73568*	F	247	0.50	7.82	2.35	1.91	87	25	14
73569*	F	294	0.72	10.72	2.72	1.96	130	25	19
73570*	F	226	0.37	7.78	2.26	1.95	99	23	18
73571	F	243	0.51	7.44	2.72	2.00	81	24	16
30 ppm:									
73572	M	516	0.68	19.91	4.12	2.33	62	33	17
73573*	M	441	0.50	17.80	4.21	2.35	60	47	16
73574	M	519	0.52	18.51	4.74	2.14	93	39	13
73575*	M	449	0.77	16.70	4.22	2.27	88	34	20
73576	M	466	0.82	22.52	4.33	2.17	68	38	15
73577	F	248	0.38	7.93	2.32	2.06	68	32	18
73578	F	273	0.58	8.58	2.46	2.06	97	27	15
73579	F	261	0.48	7.14	2.17	1.85	80	22	15
73580	F	253	0.59	7.51	2.30	2.00	86	28	12
73581	F	235	0.43	7.47	2.62	2.09	82	26	18
100 ppm:									
73582	M	456	0.77	16.12	4.12	2.39	77	25	18
73583	M	384	0.65	14.92	4.01	2.09	57	39	14
73584	M	480	0.77	29.52	5.23	2.27	69	37	20
73585	M	406	0.85	16.30	3.79	2.25	83	29	17
73586	M	462	0.70	16.10	3.79	2.43	64	33	16
73587	F	283	0.59	8.24	2.75	2.16	102	32	22
73588	F	291	0.55	8.61	2.67	2.05	86	31	18
73589	F	254	0.61	7.45	2.13	1.99	80	29	17
73591	F	254	0.53	7.57	2.14	2.18	86	15	9

* - Died following terminal bleeding, not included in statistical analysis
\- Data not available.

Fluorad® Fluorochemical
FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 17. Cont.

Individual Organ Weights - Terminal Sacrifice.

Group Rat No.	Sex	Body Wt. g	Spleen g	Liver g	Kidneys g	Brain g	Adrenals mg	Thyroid/ Parathyroid mg	Pituitary mg
300 ppm:									
73592	M	384	0.78	20.04	4.23	2.31	54	21	15
73593	M	383	0.50	17.53	3.63	1.98	69	30	15
73594	M	394	0.47	17.93	3.88	2.10	59	36	15
73595	M	459	0.73	21.85	3.82	2.11	74	44	18
73596	M	439	0.73	23.31	3.98	2.15	78	47	15
73597	F	247	0.46	7.20	2.42	1.82	78	27	16
73598	F	242	0.47	7.93	2.51	2.07	107	28	18
73599	F	239	0.43	7.26	2.27	2.00	91	22	15
73600	F	255	0.45	7.17	2.40	2.12	81	23	20
4,000 ppm:									
73602	M	383	0.67	19.98	3.89	2.19	79	44	6
73603	M	304	0.38	19.42	3.47	2.05	67	28	13
73604	M	341	0.54	18.29	3.14	2.15	75	36	14
73605	M	288	0.42	17.87	3.20	2.08	60	34	12
73606	M	381	0.42	20.25	3.66	2.19	63	38	19
73607	F	221	0.49	7.90	2.11	2.28	111	32	17
73608	F	223	0.39	8.20	2.10	1.88	93	31	15
73609	F	267	0.52	9.83	2.17	1.96	85	23	17
73610	F	236	0.43	8.59	2.11	2.20	99	24	24
73611	F	252	0.48	9.27	2.26	2.06	73	30	17

Fluorad® Fluorochemical
FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 18.

Histomorphologic Observations.

Tissue Lesion	Group, Rat No. Sex	10 ppm									
		73562 M	73563 M	73564 M	73565 M	73566 M	73567 F	73568 F	73569 F	73570 F	73571 F
Liver											
focal periportal/sinusoidal lymphoid infiltrates		2	2	2	2	2	2	2	2	2	2
focal bile duct proliferation		2	2				2				
congestion, diffuse		2		2	3		2				
focal vacuolation in cytoplasm of hepatocytes						2					

Code: x - Condition present
- = Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

137-089

EPA 02192

001661

Fluorad® Fluorochemical
FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 18. Cont.

Histomorphologic Observations.

Tissue Lesion	Group, Rat No. Sex	30 ppm									
		73572 M	73573 M	73574 M	73575 M	73576 M	73577 F	73578 F	73579 F	73580 F	73581 F
Liver											
focal periportal and sinusoidal lymphoid infiltrates					1			1			
focal sinusoidal dilatation			2	2		3	2		2	2	2
hepatocellular necrosis				2		2			2		2
sinusoidal congestion, diffuse			2	2		2					

Code: x - Condition present
- = Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

Fluorad® Fluorochemical
FC-143:

Ninety Day Subacute Rat Toxicity Study.

TABLE 18. Cont.

Histomorphologic Observations.

Tissue / Lesion	Control										100 ppm										300 ppm										1,000 ppm									
Group, Sex	M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F
Rat No.	73552	73553	73554	73555	73556	73557	73558	73559	73560	73561	73582	73583	73584	73585	73586	73587	73588	73589	73590	73591	73592	73593	73594	73595	73596	73597	73598	73599	73600	73601	73602	73603	73604	73605	73606	73607	73608	73609	73610	73611
Brain (With Cervical Cord)																																								
focal perivascular lymphoid infiltrates	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Spinal Cord (Lumbar)																														2										
	1	-	1	-	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	-	1	1	1	1	1	1	-	1	1	1	1
Peripheral Nerve																																								
focal perivascular lymphoid infiltrates	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	1	1	1		1	1	1	1
Eyes																																				2				
acute focal myositis involving extra-ocular muscles	1		1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	-	1	1	1		1	1	1	1	1	1
focal retinal degeneration		3																			2																			
		2				2	2														2													3						
Pituitary																																								
focal cytoplasmic vacuolation of basophils		1		1	1	1	1	1	1	1						1	1	1	-	1					1	1	1	1	1								1	1	1	1
remnant of craniopharyngeal cyst	2		2									2	2	3		2						2	2	3	2							2	2	2	2						
															x																									
Thyroid																																								
remnant of ultimobranchial rest		1			1		1	1	1				1	1	1			1		1		1	1	1		1		1		1		1			1	1		1	1	1
focal interstitial lymphoid infiltrates	x		x	x		x				x		x			x	x	x								x		x		x	x				x			x			
			2																2																	2				
Parathyroid																																								
	-	-	-	-	-	-	-	-	1	1	1	-	-	1	1	-	-	-	1	1	-	-	-	-	-	1	-	1	-	-	-	-	1	-	1	1	1	-	1	1
Adrenal																																								
focal cytoplasmic vacuolation of cortical cells	1						1		1							1		1	1	1	1				1		1	1			1	1		1		1	1			
hematocyst		3	2	2	2						3	2	2	2	2		2					3	4	3	4								2		2					
congestion						2			2																													2	2	2
								3					2	2										2		2			2											
Lungs																																								
focal peribronchial lymphoid hyperplasia																									1															
focal perivascular lymphoid infiltrates	3	2	2	1	2	3	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2		2	2	3	2		2	2	2	2	2	2	2	2	2	2
focal mineralization of pulmonary artery	2	2	2	3		3					2		2	2	2	2	2	2			2					2	2		2							2	2			
focal interstitial inflammatory cell infiltrates	2								2																															
congestion (agonal)		2		3																																				
focal aggregates of alveolar macrophages			2					2	2	2																			2											
				4		2						2		2	2			3					2			2								2						
Heart																																		2	2					
focal interstitial lymphoid infiltrates myocardium	1			1	1	1	1	1	1	1		1	1	1		1	1		1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
focal necrosis of mononuclear cell infiltrates, myocardium		2	2								2			2				2												2										
Aorta																	3				2																			
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Code: x - Condition present
- = Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

137-089

Ninety Day Subacute Rat Toxicity Study.

TABLE 18. Cont.

Histomorphologic Observations.

Tissue / Lesion	Control										100 ppm										300 ppm										1,000 ppm									
Group, Rat No., Sex	73552 M	73553 M	73554 M	73555 M	73556 M	73557 F	73558 F	73559 F	73560 F	73561 F	73582 M	73583 M	73584 M	73585 M	73586 M	73587 F	73588 F	73589 F	73590 F	73591 F	73592 M	73593 M	73594 M	73595 M	73596 M	73597 F	73598 F	73599 F	73600 F	73601 F	73602 M	73603 M	73604 M	73605 M	73606 M	73607 F	73608 F	73609 F	73610 F	73611 F
Liver																																								
focal periportal and sinusoidal lymphoid infiltrates																										1														
focal portal and sinusoidal extramedullary hematopoiesis	3	2	2		3	2	2	2	3		2			2	2	2		2		2		2			2	2		2	2	2	2		3				1			
focal cytoplasmic vacuolation (probably lipid)	2			2	2				2	2		2	2				2						2										2						2	2
focal capsular fibrosis			2			2																												2						
focal sinusoidal dilatation							2								2																									
focal hepatocellular hypertrophy									2						2							2																		
multifocal hepatocellular hypertrophy											2	2		2																										
hepatocellular necrosis													3																									2		
increased yellowish-brown pigment in cytoplasm of hepatocytes and occasionally in sinusoidal lining cells													2	2							2	3	2	3	3						2	3	3	2	3					
																					2														2	4	2				
sinusoidal congestion, diffuse													2																											
Kidney																									3															
focal interstitial lymphoid infiltrates						1		1					3	2				2				2	2								3	4	5	2						
hydronephrosis	2		2	2	2																							2		2	2	2								2
tubular nephrosis		2					2		2		2			2		1	1	1			1		1		1															
yellowish-brown pigment in cytoplasm of proximal convoluted tubules			2								2		2	2	3	3					2	2						2	2		2		2	2		2	2		2	
proteinaceous tubular casts														2	2								2		2							2				2				
mineralized microconcretions in tubules											2	2																												
Urinary Bladder													2								3		2				2			3										
submucosal edema	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1		1	1	1		1	1	1			1	1	1	1	1	1	1	1	1	1
proteinaceous plug in lumen										2																			2											
focal submucosal lymphoid infiltrates												x									x																			
Testes																									2															
focal testicular degeneration	1	1	1	1	1						1	1	1	1	1						1	1	1	1	1						1	1		1						
Ovary																																2	2							
Prostate					1	1	1	1	1					1	1	1	1	1							1	1	1	1	1						1	1	1	1	1	
focal interstitial lymphoid infiltrates											1	1	1								1	1	1	1																
Uterus	3	2	2	2									2	2									2								1	1	1	1	1					
hydrometra					1	1	1	1	1						1	1	1								1	1	1	1	1							1	1	1	1	
Skeletal Muscle															4																			2						
focal myodegeneration	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1
												2															2													

Code: x - Condition present
- - Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

BEST COPY AVAILABLE

EPA 02195

001664

TABLE 18. Cont.

Ninety Day Subacute Rat Toxicity Study.

Histomorphologic Observations.

Tissue / Lesion	Control									100 ppm										300 ppm										1,000 ppm									
Group, Rat No., Sex	73552 M	73553 M	73554 M	73555 M	73556 M	73557 F	73558 F	73559 F	73560 F	73561 F	73582 M	73583 M	73584 M	73585 M	73586 M	73587 F	73588 F	73589 F	73590 F	73591 F	73592 M	73593 M	73594 M	73595 M	73596 M	73597 F	73598 F	73599 F	73600 F	73601 F	73602 M	73603 M	73604 M	73605 M	73606 M	73607 F	73608 F	73609 F	73610 F	73611 F
Spleen																																								
increased hemosiderin pigment in red pulp	1	1		1							1			1	1				1	1	1		1	1						1										1
			2		2	3	2	2	3	2		2	2			3	2	3				2			2	3	3	3	3		2		3			2	2	3	2	
Mesenteric Lymph Node																																								
focal aggregates of sinusoidal macrophages	1	1	1	1	1	1	1	1			1	1	1		1	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
focal sinusoidal dilatation								2	2				2				2																							
Thymus																																								
																					2																2			
Bone Marrow (Sternum)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salivary Gland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Stomach	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
submucosal edema in glandular portion	1	1		1	1		1	1	1	1	1	1		1	1	1	1		1		1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1
mucosal lymphoid infiltrates in glandular portion					2						1	1	1			1	1	1		1	1	1	1	1	1	1	1		1					1	1	1	1	1			
													2															2												
submucosal cyst in forestomach (non-glandular)			2															2													2	3								
																																	2						2	
Small Intestine (Duodenum, Jejunum, Ileum)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x
Large Intestine (Colon)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
nematode parasite in lumen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pancreas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
focal interstitial lymphoid infiltrates																														x										
focal cytoplasmic vacuolation of acinar cells		1		1			1	1	1		1		1		1	1	1	1			1	1	1	1	1		1	-	1		1	1	1	1	1	1	1	1	1	1
	2			2	2							2		2					2							2														2
																																2								

Code: x - Condition present
. - Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

BEST COPY AVAILABLE

EPA 02196

001665

Fluorad® Fluorochemical
FC-141

Ninety Day Subacute Rat Toxicity Study.

TABLE 18 Cont.

Histomorphologic Observations.

Tissue / Lesion	Group.	Rat No.	Sex	Control										100 ppm										300 ppm										1,000 ppm									
				73552	73553	73554	73555	73556	73557	73558	73559	73560	73561	73582	73583	73584	73585	73586	73587	73588	73589	73590	73591	73592	73593	73594	73595	73596	73597	73598	73599	73600	73601	73602	73603	73604	73605	73606	73607	73608	73609	73610	73611
Skin (Mammary Gland)				M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F	M	M	M	M	M	F	F	F	F	F
focal epidermal acanthosis				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1

117-089

Code: x - Condition present
- = Not available

1 - Not remarkable
2 - Very slight
3 - Slight
4 - Moderate
5 - Marked
6 - Extreme

EPA 02197

G01666