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NEUROSPORA EXPERIMENT P-1037

QUARTERLY PROGRESS REPORT

TO THE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

October 1 - December 31, 1967

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BIOLOGY DIVISION

QUARTERLY PROGRESS REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

October 1 - December 31, 1967

NOVEMBER 1968

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee
operated by
UNION CARBIDE CORPORATION
for the
U.S. ATOMIC ENERGY COMMISSION

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QUARTERLY PROGRESS REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Title of Project:

Mutagenic Effectiveness of Known Doses of Gamma Irradiation in Combination with Zero Gravity on Neurospora

For the Period:

October 1 - December 31, 1967

Principal Investigator:

Frederick J. de Serres

Coinvestigator:

Brooke B. Webber

Technical Staff:

Earle C. Gourley
David S. Carroll
Ida C. Miller
John S. Wassom
Della W. Ramey
Letha Oggs
Linda B. Ralston
Marilyn T. Sheppard
Paula E. Harris
William P. Henry
Arlee P. Teasley
Michael D. Shelby
William K. Barnett
Susan L. Lavender

Consultant:

Diana B. Smith
Biometrics and Statistics
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Name of Institution:

Biology Division
Oak Ridge National Laboratory

Address:

Post Office Box Y
Oak Ridge, Tennessee 37830

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I. INTRODUCTION

The quarterly reports ORNL-TM-1734, ORNL-TM-1959, ORNL-TM-2189, ORNL-TM-2190, and ORNL-TM-2235 provide background information for the data in the present report. ORNL-TM-1734 describes the results of early experiments in the laboratory designed to estimate dose-response curves for the induction of mutations in the ad-3 region and for nuclear inactivation in heterokaryotic conidia, and of experiments designed to assess the possible effects of anoxia during irradiation. The development of the Neurospora housing and modules for use in the Biosatellite experimentation is described, and the results of biological assays with conidia used in the qualification and acceptance tests of the hardware at the General Electric Company facility are also presented in that report. ORNL-TM-1959 describes tests, launch simulations, and gantry exercises at Cape Kennedy in preparation for the Biosatellite I flight, as well as plans and personnel deployment procedures for the Biosatellite I flight. ORNL-TM-2189 describes some of the activities at the time of preparation for the Biosatellite I flight and presents data and an analysis of data derived from conidia irradiated in the ground-control portion of that experiment. Some of the input and output sheets for the electronic data-processing system are also included and described in that report. ORNL-TM-2190 was concerned strictly with dosimetry and described the Con-Rad passive dosimetry system upon which we had been relying and some of the sources of variation and problems associated with the use of this system. ORNL-TM-2235 describes briefly the two gantry exercises immediately preceding the Biosatellite II flight. It also contains a description of ORNL personnel activities during the preparation of material for the Biosatellite II flight and during the flight itself. The experimental plan and the selection of conidia from both the flight and ground-control samples for assays of nuclear inactivation and forward mutation are also described.

In the present report, the data from the Biosatellite II experiment are presented, along with the genetic analysis and tentative conclusions. Much of the presentation will be in the form of data input sheets, or IBM machine print-outs reproducing the same information, and of data print-outs indicating the steps in the regression analyses used to estimate and compare the dose-response curves for various genetic effects measured in the flight and ground-control samples.

II. PASSIVE DOSIMETRY FOR THE NEUROSPORA ASSEMBLIES IN THE BIOSATELLITE II FLIGHT

In the Neurospora assemblies, each conidial sample was positioned immediately adjacent to one of each of the three different types of passive dosimeters for measuring ionizing radiation, namely (1) E.G.&G. CaF_2 half-mini dosimeters, (2) E.G.&G. LiF half-mini dosimeters, and (3) Con-Rad LiF teflon-disk dosimeters. The discussion of techniques and correction factors required to obtain a valid estimate of ionizing radiation exposure with each of these types of dosimeters will be presented in a subsequent report.

The estimate of the exposure in Roentgens to each of the dosimeters in the flight and ground-control vehicles is presented in Table 1. The plots of the logarithm of exposure against logarithm of distance between dosimeter and radiation source are presented in Fig. 1 for the dosimeters in the flight vehicle and in Fig. 2 for the ground-control vehicle. In Table 2, parameters for regression lines fitted to data for each of the three types of dosimeters are presented; the necessary computations are made for the two vehicles separately as well as combined. Since the individual slopes and intercepts are not different from one another and not different from the slope and intercept of a regression line fitted to all 239 points, the estimates based on 239 points are used as the best estimates for the gamma radiation exposures. In Table 3, the gamma radiation exposures from this last regression line for each of the filter positions are listed, and the radiation exposures received by the biological samples on each of the filters used in the genetic analysis are marked with asterisks in that table.

Table 1. Gamma radiation exposure (Roentgens) to each of the dosimeters in irradiated Neurospora housings in the Biosatellite II flight and ground-control vehicles

Housing Position	Filter No.	Distance Between Dosimeter and Radiation Source (cm)	Dosimeters from Flight Vehicle			Dosimeters from Ground-Control Vehicle		
			E.G. & G. CaF_2	E.G. & G. LiF	Con-Rad LiF	E.G. & G. CaF_2	E.G. & G. LiF	Con-Rad
"6000 R"	1	6.12	3367	3443	2875	3236	3387	3250
	2	6.43	2871	3044	2875	2839	2564	2850
	3	6.74	2655	2527	2550	2689	2796	2550
	4	7.05	2492	2515	2300	2391	2150	2375
	5	7.36	2176	2372	2025	2273	2199	2225
	6	7.67	1994	2074	2000	2145	2192	2175
	7	7.98	1796	1641	1725	1978	1799	1950
	8	8.29	1637	1756	1625	1765	1860	1775
	9	8.60	1465	1555	1675	1618	1681	1700
	10	8.91	1477	1367	1425	1441	1406	1625
"2500 R"	1	9.67	1245	1543	1600	1327	1639	1450
	2	9.98	1104	1397	1375	1234	1173	1375
	3	10.29	1132	1363	1275	1171		1275
	4	10.60	1063	1191	1250	1082	1209	1225
	5	10.91	1036	1358	1250	995	1067	1175
	6	11.22	1240	1127	1150	967	940	1025
	7	11.53	911	977	1025	830	1008	1025
	8	11.84	810	981	1000	829	966	1025
	9	12.15	847	1048	990	819	991	970
	10	12.46	764	904	900	711	928	875
"1000 R"	1	15.10	572	632	660	555	632	610
	2	15.41	509	618	575	570	586	575
	3	15.72	545	623	550	554	595	550
	4	16.03	511	516	540	490	542	525
	5	16.34	500	543	540	489	527	530
	6	16.65	499	619	480	487	482	510
	7	16.96	463	526	470	483	539	480
	8	17.27	456	522	460	480	509	480
	9	17.58	397	514	435	446	457	470
	10	17.89	411	471	405	431	433	450
"500 R"	1	20.94	305	352	315	305	289	345
	2	21.25	282	326	325	323	339	310
	3	21.56	307	334	315	306	307	310
	4	21.87	273	313	290	295	301	300
	5	22.18	304	268	300	298	286	300
	6	22.49	258	314	280	278	287	285
	7	22.80	242	313	265	283	310	285
	8	23.11	267	294	265	275	263	270
	9	23.42	255	252	270	264	261	265
	10	23.73	246	253	255	247	244	265

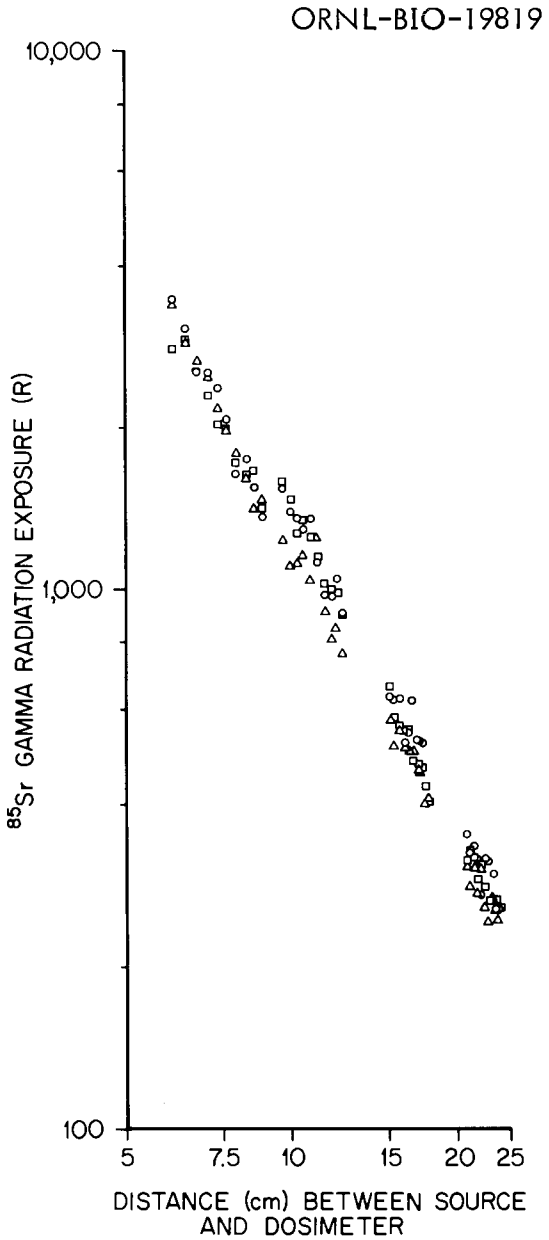

Fig. 1. Radiation Exposure for Flight Vehicle Dosimeters

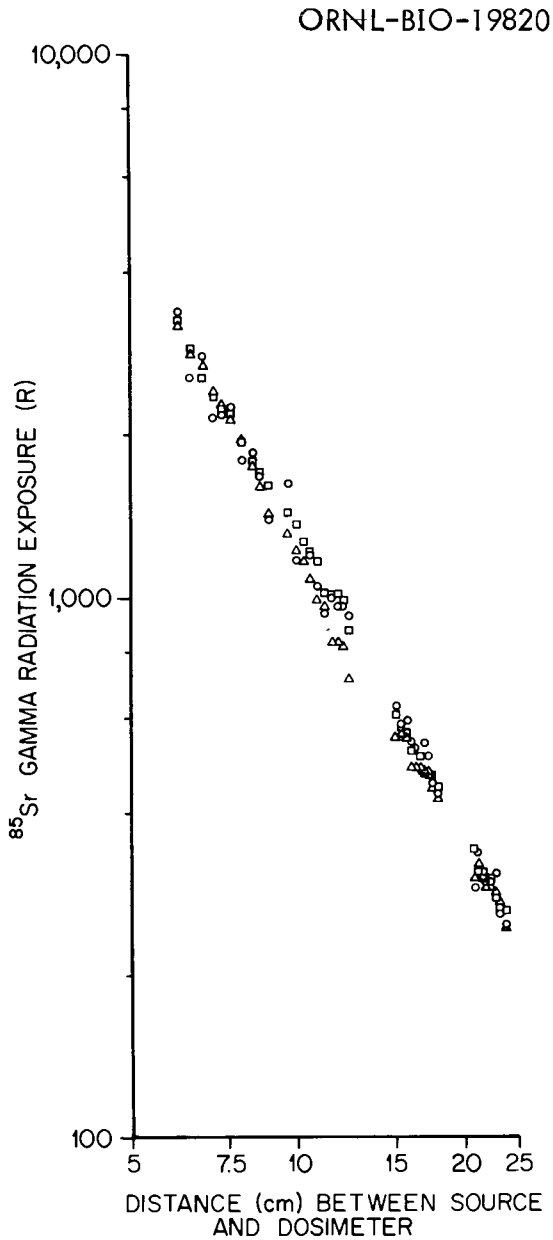

Fig. 2. Radiation Exposure for Ground-Control Vehicle Dosimeters

Logarithm of gamma radiation exposure to each of the dosimeters in the flight vehicle plotted against logarithm of distance (cm) separating each dosimeter from the radiation source. (O = E.G. & G. LiF dosimeters; Δ = E.G. & G. CaF_2 dosimeters; □ = Con-Rad disk dosimeters.

Table 2. Regression coefficient estimates, based on the series of dosimeters indicated below, for logarithm of gamma radiation exposure plotted against logarithm of distance (cm) separating dosimeters from radiation source

Type and Location of Dosimeter	N	Sum of Y	Mean of Y	Sum of X	Mean of X	Slope	Variance of slope ($\times 10^{-4}$)	Intercept	Variance of Intercept ($\times 10^{-3}$)	Residual Variance ($\times 10^{-3}$)
Con-Rad Lithium Fluoride Disk										
1. Flight vehicle	40	265.736	6.64339	103.173	2.57932	-1.82977	6.78723	11.3629	4.63557	4.80414
2. Ground-control vehicle	40	266.469	6.66173	103.173	2.57932	-1.84917	1.52220	11.4314	1.03964	1.07745
3. Flight and ground-control vehicles	80	532.205	6.65256	206.346	2.57932	-1.83947	2.09878	11.3971	1.43343	2.97112
E.G. & G. CaF_2										
1. Flight vehicle	40	263.546	6.58864	103.201	2.58003	-1.86461	6.23904	11.3994	1.43343	4.43507
2. Ground-control vehicle	40	264.379	6.60873	103.173	2.57932	-1.84045	3.64385	11.3558	2.48869	2.57919
3. Flight and ground-control vehicles	80	527.895	6.59869	206.374	2.57968	-1.85257	2.49213	11.3777	1.70264	3.53553
E.G. & G. LiF										
1. Flight vehicle	40	267.583	6.68958	103.173	2.57932	-1.80844	9.96620	11.3541	6.80676	7.05429
2. Ground-control vehicle	39	258.86	6.66384	100.842	2.58568	-1.83028	7.66959	11.37	5.26565	6.51214
3. Flight and ground-control vehicles	79	526.444	6.66384	204.014	2.58246	-1.81967	4.62049	11.3631	3.16388	6.51214
All Three Types of Dosimeters on Flight and Ground-Control Vehicles	239	1586.54	6.63826	616.734	2.58048	-1.83712	1.22594	11.3789	0.838108	5.20265

Table 3. Estimated gamma radiation exposures based on regression curve fitted to combined data (239 pairs of data) for all three types of dosimeters in both flight and ground-control vehicles

Neurospora Assembly Position	Filter Position No.	Distance Between Dosimeter and Radiation Source (cm)	Estimated Gamma Radiation Exposure (roentgens)
"6000 R"	1	6.12	3136.43*
	2	6.43	2864.26*
	3	6.74	2626.91
	4	7.05	2418.62*
	5	7.36	2234.78
	6	7.67	2071.66*
	7	7.98	1926.22
	8	8.29	1795.97
	9	8.6	1678.83*
	10	8.91	1573.09
"2500 R"	1	9.67	1353.46*
	2	9.98	1277.24
	3	10.29	1207.44
	4	10.6	1143.36
	5	10.91	1084.39*
	6	11.22	1029.99
	7	11.53	979.684
	8	11.84	933.078
	9	12.15	889.81*
	10	12.46	849.564
"1000 R"	1	15.1	596.86*
	2	15.41	574.988
	3	15.72	554.329
	4	16.03	534.795
	5	16.34	516.303
	6	16.65	498.781
	7	16.96	482.161
	8	17.27	466.38
	9	17.58	451.383
	10	17.89	437.119
"500 R"	1	20.94	327.342
	2	21.25	318.623
	3	21.56	310.257
	4	21.87	302.226
	5	22.18	294.511
	6	22.49	287.097
	7	22.8	279.966
	8	23.11	273.106
	9	23.42	266.502
	10	23.73	260.141

*Exposures for samples on filters used in the genetic analysis.

III. DATA FROM CONIDIAL PLATINGS

As described previously (in ORNL-TM-2235), conidial samples receiving the exposures indicated by asterisks in Table 3 as well as unirradiated ground-control and flight conidia were selected for genetic analysis. Each filter with its sample of 5×10^7 conidia was soaked in 10 ml of cold sterile 1/15 M phosphate buffer (KH_2PO_4 and Na_2HPO_4) at pH 7.0 to provide a suspension of about 5×10^6 conidia/ml. The estimate of conidial concentration for each suspension is based on the hemocytometer counts which are collected on No. 80211 data sheets. Each of the six counts for each suspension represents 2×10^{-5} ml of suspension (with the exception of treatment #24, for which the conidial sample was suspended accidentally in 20 ml of buffer and so six counts of 4×10^{-5} ml were used). The hemocytometer counts are used in the estimates of survival for the jug data as well as for the plating data.

Hemocytometer Count After Resuspending the Conidia from Millipore Filters

DECK NUMBER 6-8 Wild Type; 9-11 Experiment: 012 073

CARD NUMBER 80211

Treatment 12-14	Dilution 15-18	Counted 19-20	Basic Unit 21-22	Technician 23-24	No. Units 25-26	Count 27-30	No. Units 31-32	Count 33-36	No. Units 37-38	Count 39-42	No. Units 43-44	Count 45-48
001	000	00	13	01	05	0086	05	0083	05	0081	05	0080
001						0082		0081				
002						0074		0084		0098		0092
002						0087		0084				
003						0097		0094		0100		0093
003						0093		0102				
004						0090		0081		0079		0089
004						0095		0079		0085		0086
005						0091		0085		0084		0085
005						0091		0096				
006						0091		0073		0079		0075
006						0084		0085				

Hemocytometer Count After Resuspending the Conidia from Millipore Filters (continued)

DECK NUMBER 6-8 Wild Type: 012; 9-11 Experiment: 073

CARD NUMBER 80211

Treatment 12-14	Dilution Counted 15-18	Basic Unit 21-22	Technician 23-24	No. Units 25-26	Count 27-30	No. Units 31-32	Count 33-36	No. Units 37-38	Count 39-42	No. Units 43-44	Count 45-48
007	00000	13	01	05	0081	05	0086	05	0081	05	0088
007					0077		0080				
008					0107		0083		0087		0087
008					0090		0085				
009					0087		0078		0072		0086
009					0083		0085				
010					0074		0079		0084		0092
010					0080		0092				
011	00000	13	01	05	0084	05	0083	05	0079	05	0085
011					0089		0086				
012					0077		0085		0087		0091
012					0081		0098				
013					0072		0085		0072		0090
013					0084		0095				
014					0092		0100		0084		0089
014					0106		0074				
015					0094		0061		0083		0074
015					0088		0075				
016					0092		0098		0089		0075
016					0088		0103				
017					0080		0086		0092		0075
017					0104		0093				
018					0086		0088		0094		0072
018					0103		0077				
019					0090		0082		0072		0072
019					0085		0081				
020					0085		0091		0099		0106
020					0091		0085				

Hemocytometer Count After Resuspending the Conidia from Millipore Filters (continued)

DECK NUMBER 6-8 Wild Type: 012 | 9-11 Experiment: 073

CARD NUMBER 80211

Treatment 12-14	Dilution Counted 15-18 / 19-20	Basic Unit 21-22	Technician 23-24	No. Units 25-26 / Count 27-30	No. Units 31-32 / Count 33-36	No. Units 37-38 / Count 39-42	No. Units 43-44 / Count 45-48
021	000000	13	01	05 0085	05 0092	05 0080	05 0083
021				0072	0066		0073
022				0076	0076	0080	
022				0067	0091		
023				0079	0077	0091	0074
023				0087	0076		
024				10 0074	10 0085	10 0075	10 0079
024				10 0082	10 0077		
025				05 0092	05 0100	05 0081	05 0091
025				05 0076	05 0076		

The plating procedure is described in some detail in ORNL-TM-2189. In brief, one- or two-ml aliquots of 10^{-4} dilutions of each original conidial suspension were plated in each of four different selective media and incubated until the surviving conidia of the type selected formed colonies, which were then counted. The colony counts were collected on No. 80220 data sheets (pp. 11-14). From the colony counts and hemocytometer counts, it is possible to estimate the incidence of surviving conidia of different classes; the estimates for the Biosatellite II experiment are presented in the form of print-outs (pp. 15-26). The estimates of surviving proportions of different classes of conidia are plotted: these include (1) heterokaryotic conidia (Fig. 3; see p. 27); (2) homokaryotic for component 1 (Fig. 4, p. 27); (3) homokaryotic for component 2 (Fig. 5, p. 28); (4) total survivors, i.e., those capable of growing in a medium supplemented with histidine, adenine, nicotinamide, inositol, and pantothenic acid (Fig. 6, p. 28). Since the survival of the unirradiated ground-control and unirradiated flight conidia do not differ for any of the four classes of conidia, all data on unirradiated conidia were used to obtain an estimate of 100% survival; two platings of seven different suspensions on each of four different media are used to obtain these estimates.

Because both the total gamma radiation exposures and the exposure rates were so low, no appreciable nuclear inactivation was expected. If nuclear inactivation had occurred, the effect would have been a logarithmic decrease in the proportion of heterokaryotic conidia; at low doses, conversion of heterokaryotic conidia to homokaryotic conidia by the inactivation of one or the other of the types of nuclei present causes an increase in homokaryotic conidia; and, at much higher doses, a decrease as the remaining nuclei are also inactivated. The curve for total survival (conidia capable of forming colonies on completely supplemented media) should have a shoulder and then curve downward. On the basis of previous experiments with low doses and low dose rates, the finding (Figs. 3-6) of no appreciable effect of gamma radiation on conidial survival is not surprising. There is no apparent difference between flight and ground-control samples in this regard.

HETEROKARYON
PLATE COUNTS

Wild Type (6-8)	Experiment (9-11)	Deck Number (1-3)	Card Number (4-5)
012	073	802	20

12-13 Technician	14-16 Exp. No.	58-60 Design	17-19 Treatment	20-21 Replic.	22-23 No. of Plates	24-27 Dilution Factor (0000.)	28-29 Exp. of Dil. Factor	30-33 Factor for Percent Survival (0.000)	34-35 Min. Sub. I ml Plat. (0.0)	36-39 Min. Sub. I Col. Counted	40-41 Comp. (I) Sub. II ml Plat. (0.0)	42-45 Comp. (I) Sub. II Col. Counted	46-47 Comp. (II) Sub. III ml Plat. (0.0)	48-51 Comp. (II) Sub. III Col. Counted	52-53 Comp. Sub. IV ml Plat. (0.0)	54-57 Comp. Sub. IV Col. Counted
01		001	001	A	01	0001	04		20	0153	20	0308	10	0205	10	0259
			001	B						0144		0349		0208		0292
			002	A						0152		0328		0190		0235
			002	B						0143		0353		0165		0252
		002	003	A						0168		0354		0201		0267
			003	B						0156		0322		0169		0274
			004	A						0140		0303		0203		0262
			004	B						0150		0335		0199		0272
		001	005	A						0152		0383		0212		0283
			005	B						0131		0353		0219		0294
			006	A						0122		0317		0159		0240
			006	B						0139		0309		0166		0265
			007	A						0139		0395		0214		0254
			007	B						0118		0347		0238		0292
			008	A						0109		0347		0206		0280

UCN-8417
(3 5-68)

HETEROKARYON
PLATE COUNTS

Wild Type (6-8)	Experiment (9-11)	Deck Number (1-3)	Card Number (4-5)
012	073	802	20

12-13 Technician	14-16 Exp. No.	58-60 Design	17-19 Treatment	20-21 Replic.	22-23 No. of Plates	24-27 Dilution Factor (0000.)	28-29 Exp. of Dil. Factor	30-33 Factor for Percent Survival (0.000)	34-35 Min. Sub. I ml Plat. (0.0)	36-39 Min. Sub. I Col. Counted	40-41 Comp. (I) Sub. II ml Plat. (0.0)	42-45 Comp. (I) Sub. II Col. Counted	46-47 Comp. (II) Sub. III ml Plat. (0.0)	48-51 Comp. (II) Sub. III Col. Counted	52-53 Comp. Sub. IV ml Plat. (0.0)	54-57 Comp. Sub. IV Col. Counted
01		001	008	B	01	0001	04		20	0128	20	0380	10	0201	10	0281
		002	009	A						0125		0349		0169		0236
			009	B						0129		0356		0205		0236
			010	A						0119		0282		0183		0245
			010	B						0115		0305		0164		0236
			011	A						0136		0333		0200		0259
			011	B						0109		0293		0178		0256
			012	A						0118		0339		0192		0267
			012	B						0122		0337		0195		0243
			013	A						0149		0305		0183		0225
			013	B						0128		0338		0192		0276
			014	A						0151		0368		0232		0280
			014	B						0167		0355		0199		0283
			015	A						0150		0332		0199		0295
			015	B						0137		0307		0201		0244

UCN-8417
(3 5-68)

HETEROKARYON
PLATE COUNTS

Wild Type (6-8)	Experiment (9-11)	Deck Number (1-3)	Card Number (4-5)
012	073	802	20

12-13 Technician	14-16 Exp. No.	58-60 Design	17-19 Treatment	20-21 Replic.	22-23 No. of Plates	24-27 Dilution Factor (0000.)	28-29 Exp. of Dil. Factor	30-33 Factor for Percent Survival (0.000)	34-35 Min. Sub. I ml Plat. (0.0)	36-39 Min. Sub. I Col. Counted	40-41 Comp. (I) Sub. II ml Plat. (0.0)	42-45 Comp. (I) Sub. II Col. Counted	46-47 Comp. (II) Sub. III ml Plat. (0.0)	48-51 Comp. (II) Sub. III Col. Counted	52-53 Comp. Sub. IV ml Plat. (0.0)	54-57 Comp. Sub. IV Col. Counted
01		001	016	A	01	0001	04		20	0085	20	0309	10	0188	10	0296
			016	B						0092		0348		0193		0272
			017	A						0095		0322		0192		0247
			017	B						0113		0325		0196		0268
			018	A						0086		0323		0174		0268
			018	B						0127		0363		0193		0303
			019	A						0087		0304		0204		0253
			019	B						0100		0267		0176		0218
			020	A						0145		0327		0180		0269
			020	B						0133		0333		0188		0264
		002	021	A						0078		0304		0184		0268
			021	B						0099		0289		0200		0276
			022	A						0103		0313		0169		0247
			022	B						0130		0278		0184		0249
			023	A						0098		0309		0182		0241

UCN-8417
(3 5-68)

HETEROKARYON
PLATE COUNTS

Wild Type (6-8)	Experiment (9-11)	Deck Number (1-3)	Card Number (4-5)
012	073	802	20

12-13 Technician	14-16 Exp. No.	58-60 Design	17-19 Treatment	20-21 Replic.	22-23 No. of Plates	24-27 Dilution Factor (0000.)	28-29 Exp. of Dil. Factor	30-33 Factor for Percent Survival (0.000)	34-35 Min. Sub. I ml Plat. (0.0)	36-39 Min. Sub. I Col. Counted	40-41 Comp. (I) Sub. II ml Plat. (0.0)	42-45 Comp. (I) Sub. II Col. Counted	46-47 Comp. (II) Sub. III ml Plat. (0.0)	48-51 Comp. (II) Sub. III Col. Counted	52-53 Comp. Sub. IV ml Plat. (0.0)	54-57 Comp. Sub. IV Col. Counted
01		002	023	B	01	0001	04		20	0094	20	0314	10	0168	10	0266
			024	A		0005	03			0109		0287		0174		0265
			024	B		0005	03			0121		0315		0173		0275
			025	A		0001	04			0113		0320		0163		0234
			025	B		0001	04			0136		0341		0179		0271

UCN-8417
(3 5-68)

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAE+LTE+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
1	A	29.56	62.04	19.62	18.96	31.28	29.32	49.61	FLT AFT NON-IRRAD CONTROL FILTER 2
1	B	24.66	71.08	17.53	24.55	33.10	35.10	46.58	FLT AFT NON-IRRAD CONTROL FILTER 2
2	A	32.34	54.34	17.57	20.25	26.36	37.45	48.51	FLT AFT NON-IRRAD CONTROL FILTER 9
2	B	28.37	58.27	16.53	24.28	21.62	41.67	37.10	FLT AFT NON-IRRAD CONTROL FILTER 9
3	A	21.46	55.34	17.41	19.27	24.25	34.83	43.82	GND AFT CONTROL GND VEHICLE FILTER 2
3	B	28.47	56.79	16.17	17.20	18.86	30.29	33.21	GND AFT CONTROL GND VEHICLE FILTER 2
15	A	25.42	74.53	18.95	22.99	31.33	30.85	42.03	GND BOX CONTROL AFT TEMP FILTER 2
15	B	28.07	61.64	17.31	21.47	33.47	34.84	54.30	GND BOX CONTROL AFT TEMP FILTER 2
14	A	26.96	61.37	16.55	23.78	34.30	38.75	55.99	GND BOX CONTROL FORE TEMP FILTER 2
14	B	29.51	62.03	18.30	20.60	25.32	33.22	40.81	GND BOX CONTROL FORE TEMP FILTER 2
13	A	33.11	54.22	17.95	18.80	26.14	34.67	48.22	GND BOX CONTROL CONSTANT TEMP FILTER 2
13	B	23.19	66.51	15.42	25.30	30.84	28.04	46.38	GND BOX CONTROL CONSTANT TEMP FILTER 2
4	A	26.72	61.29	16.37	19.06	31.11	31.11	50.76	GND AFT CONTROL GND VEHICLE FILTER 9
4	B	27.57	63.63	17.54	21.64	29.01	34.01	45.59	GND AFT CONTROL GND VEHICLE FILTER 9

DOSE 0.0

HET SURVIVAL 100.00

TOTAL SURVIVAL 100.00

COMP 1 SURVIVAL 100.00

COMP 2 SURVIVAL 100.00

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
24 A	20.57	67.37	13.86	22.63	30.38	33.58	45.09	GND 1000 R PACKAGE FILTER 1
24 B	22.00	69.92	15.38	24.66	28.60	35.27	40.91	GND 1000 R PACKAGE FILTER 1

DOSE 597.

HET SURVIVAL 94.49

TOTAL SURVIVAL 111.22

COMP 1 SURVIVAL 110.87

COMP 2 SURVIVAL 104.00

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
21 A	14.55	67.28	9.79	28.37	36.40	42.16	54.10	GND 2500 R PACKAGE FILTER 1
21 B	17.93	69.29	12.43	23.85	37.78	34.42	54.53	GND 2500 R PACKAGE FILTER 1

DOSE 1352.

HET SURVIVAL 64.21

TOTAL SURVIVAL 110.66

COMP 1 SURVIVAL 122.43

COMP 2 SURVIVAL 130.91

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
22	A	20.85	64.02	13.35	27.21	30.45	42.51	47.57	GND 2500 R PACKAGE FILTER 5
22	B	26.10	64.54	16.85	19.18	30.84	29.72	47.79	GND 2500 R PACKAGE FILTER 5

DOSE 1084.

HET SURVIVAL 87.26

TOTAL SURVIVAL 104.15

COMP 1 SURVIVAL 108.77

COMP 2 SURVIVAL 108.08

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
23	A	20.33	53.75	12.15	26.16	32.98	43.78	55.19	GND 2500 R PACKAGE FILTER 9
23	B	17.47	45.95	11.65	27.27	30.00	41.35	45.49	GND 2500 R PACKAGE FILTER 9

DOSE 920.

HET SURVIVAL 59.79

TOTAL SURVIVAL 101.84

COMP 1 SURVIVAL 125.27

COMP 2 SURVIVAL 111.04

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAE+LIE+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
9 A	26.48	57.68	15.27	27.37	26.03	47.46	45.13	GND 6000 R PACKAGE FILTER 1
9 B	27.33	57.68	15.76	27.74	24.34	48.09	59.53	GND 6000 R PACKAGE FILTER 1

DOSE 3136.

HET SURVIVAL 89.70

TOTAL SURVIVAL 93.46

COMP 1 SURVIVAL 129.22

COMP 2 SURVIVAL 106.44

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAE+LIE+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
10 A	24.22	53.69	14.25	19.52	29.59	33.27	50.41	GND 6000 R PACKAGE FILTER 2
10 B	24.36	54.53	13.77	22.75	25.51	40.25	45.13	GND 6000 R PACKAGE FILTER 2

DOSE 2864.

HET SURVIVAL 80.00

TOTAL SURVIVAL 93.34

COMP 1 SURVIVAL [illegible]

COMP 2 SURVIVAL 27.[illegible]

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
25	A	24.15	54.42	13.14	24.07	24.77	44.23	45.51	GND 6000 R PACKAGE FILTER 4
25	B	25.09	63.02	15.81	23.94	25.81	37.82	40.96	GND 6000 R PACKAGE FILTER 4

DOSE 2419.

HET SURVIVAL 83.67

TOTAL SURVIVAL 95.14

COMP 1 SURVIVAL 112.32

COMP 2 SURVIVAL 99.19

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
11	A	26.25	61.42	16.13	23.36	31.30	38.03	50.97	GND 6000 R PACKAGE FILTER 6
11	B	21.29	60.71	12.92	21.82	29.29	35.94	48.24	GND 6000 R PACKAGE FILTER 6

DOSE 2072.

HET SURVIVAL 83.96

TOTAL SURVIVAL 98.95

COMP 1 SURVIVAL 105.92

COMP 2 SURVIVAL 106.84

EXPERIMENT 73 BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
12	A	22.10	61.73	13.64	25.55	30.75	41.39	49.81	GND 6000 R PACKAGE FILTER 9
12	B	25.10	56.18	14.10	24.86	30.98	44.24	55.14	GND 6000 R PACKAGE FILTER 9

DOSE 1679.

HET SURVIVAL 80.19

TOTAL SURVIVAL 95.53

COMP 1 SURVIVAL 118.18

COMP 2 SURVIVAL 108.85

EXPERIMENT 72 BIOSATELLITE FLIGHT CAE+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
3	A	31.46	55.34	17.41	19.27	24.25	34.93	43.82	GND AFT CONTROL GND VEHICLE FILTER 2
3	B	28.47	56.79	16.17	17.20	18.86	30.29	33.21	GND AFT CONTROL GND VEHICLE FILTER 2
15	A	25.42	74.53	18.95	22.99	31.33	30.85	42.03	GND BOX CONTROL AFT TEMP FILTER 2
15	B	28.07	61.64	17.31	21.47	33.47	34.84	54.30	GND BOX CONTROL AFT TEMP FILTER 2
14	A	26.96	61.37	16.55	23.78	34.30	38.75	55.89	GND BOX CONTROL FORE TEMP FILTER 2
14	B	29.51	62.03	18.30	20.60	25.32	33.22	40.81	GND BOX CONTROL FORE TEMP FILTER 2
13	A	23.11	54.22	17.95	18.80	26.14	34.67	48.22	GND BOX CONTROL CONSTANT TEMP FILTER 2
13	B	23.19	66.51	15.42	25.30	30.84	38.04	46.38	GND BOX CONTROL CONSTANT TEMP FILTER 2
4	A	26.72	61.29	16.37	19.06	31.11	31.11	50.76	GND AFT CONTROL GND VEHICLE FILTER 9
4	B	27.57	63.63	17.54	21.64	29.01	34.01	45.59	GND AFT CONTROL GND VEHICLE FILTER 9
1	A	29.54	63.04	18.62	18.86	31.28	29.92	49.61	FLT AFT NON-IRRAD CONTROL FILTER 2
1	B	26.66	71.09	17.53	24.95	33.10	35.10	46.58	FLT AFT NON-IRRAD CONTROL FILTER 2
2	A	32.34	54.34	17.57	20.35	24.36	37.45	48.51	FLT AFT NON-IRRAD CONTROL FILTER 9
2	B	28.37	58.27	16.53	24.28	21.62	41.67	37.10	FLT AFT NON-IRRAD CONTROL FILTER 9

DOSE 0.0

HET SURVIVAL 100.00

TOTAL SURVIVAL 100.00

COMP 1 SURVIVAL 100.00

COMP 2 SURVIVAL 100.00

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
19 A	17.19	62.99	10.83	27.01	39.96	42.89	63.44	FLT 1000 R PACKAGE FILTER 1
19 B	22.94	54.27	12.45	20.79	31.37	38.30	57.80	FLT 1000 R PACKAGE FILTER 1

DOSE 597.

HET SURVIVAL 67.27

TOTAL SURVIVAL 95.00

COMP 1 SURVIVAL 112.07

COMP 2 SURVIVAL 125.77

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
16 A	14.36	65.17	9.36	24.64	32.04	37.84	49.16	FLT 2500 R PACKAGE FILTER 1
16 B	16.91	50.30	10.13	23.18	32.37	47.06	54.04	FLT 2500 R PACKAGE FILTER 1

DOSE 1353.

HET SURVIVAL 56.31

TOTAL SURVIVAL 101.32

COMP 1 SURVIVAL 123.00

COMP 2 SURVIVAL 113.54

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
17	A	19.23	55.92	10.75	25.70	32.72	45.95	58.50	FLT 2500 R PACKAGE FILTER 5
17	B	21.08	60.69	12.79	24.00	31.58	35.55	52.05	FLT 2500 R PACKAGE FILTER 5

DOSE 1084.

HET SURVIVAL 68.05

TOTAL SURVIVAL 94.47

COMP 1 SURVIVAL 116.52

COMP 2 SURVIVAL 113.38

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
18	A	16.04	61.85	9.92	27.35	30.23	44.22	48.88	FLT 2500 R PACKAGE FILTER 9
18	B	20.96	69.92	14.65	27.23	29.88	38.94	42.74	FLT 2500 R PACKAGE FILTER 9

DOSE 890.

HET SURVIVAL 71.03

TOTAL SURVIVAL 106.75

COMP 1 SURVIVAL 127.96

COMP 2 SURVIVAL 106.00

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
5 A	26.86	63.83	17.14	26.05	30.68	40.81	48.06	FLT 6000 R PACKAGE FILTER 1
5 B	22.28	66.32	14.77	25.04	34.62	37.76	52.21	FLT 6000 R PACKAGE FILTER 1

DOSE 3136.

HET SURVIVAL 92.24

TOTAL SURVIVAL 105.44

COMP 1 SURVIVAL 119.79

COMP 2 SURVIVAL 115.14

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
6 A	25.42	59.14	15.03	24.02	24.15	40.62	40.83	FLT 6000 R PACKAGE FILTER 2
6 B	26.22	65.30	17.13	20.94	23.78	32.08	36.42	FLT 6000 R PACKAGE FILTER 2

DOSE 2864.

HET SURVIVAL 92.03

TOTAL SURVIVAL 100.81

COMP 1 SURVIVAL 105.43

COMP 2 SURVIVAL 94.51

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
20	A	26.95	57.95	15.62	19.61	23.16	33.83	39.96	FLT 6000 R PACKAGE FILTER 4
20	B	25.19	56.88	14.33	21.54	26.19	37.88	46.02	FLT 6000 R PACKAGE FILTER 4

DOSE 2419.

HET SURVIVAL 86.54

TOTAL SURVIVAL 93.03

COMP 1 SURVIVAL 96.48

COMP 2 SURVIVAL 86.99

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

		PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
7	A	27.36	61.83	16.02	31.16	35.17	50.39	56.89	FLT 6000 R PACKAGE FILTER 6
7	B	20.21	71.08	14.36	27.87	43.57	39.21	61.30	FLT 6000 R PACKAGE FILTER 6

DOSE 2072.

HET SURVIVAL 90.39

TOTAL SURVIVAL 107.67

COMP 1 SURVIVAL 136.39

COMP 2 SURVIVAL 139.34

EXPERIMENT 73 BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY DATE 06-10-68

	PC HET	TOT. VIA.	HET. VIA.	COMP 1	COMP 2	PC COMP 1	PC COMP 2	
8 A	19.46	62.34	12.13	26.49	33.73	42.50	54.11	FLT 6000 R PACKAGE FILTER 9
8 B	22.78	62.56	14.25	28.05	30.50	44.84	48.75	FLT 6000 R PACKAGE FILTER 9

DOSE 1679.

HET SURVIVAL 76.24

TOTAL SURVIVAL 101.19

COMP 1 SURVIVAL 127.83

COMP 2 SURVIVAL 113.26

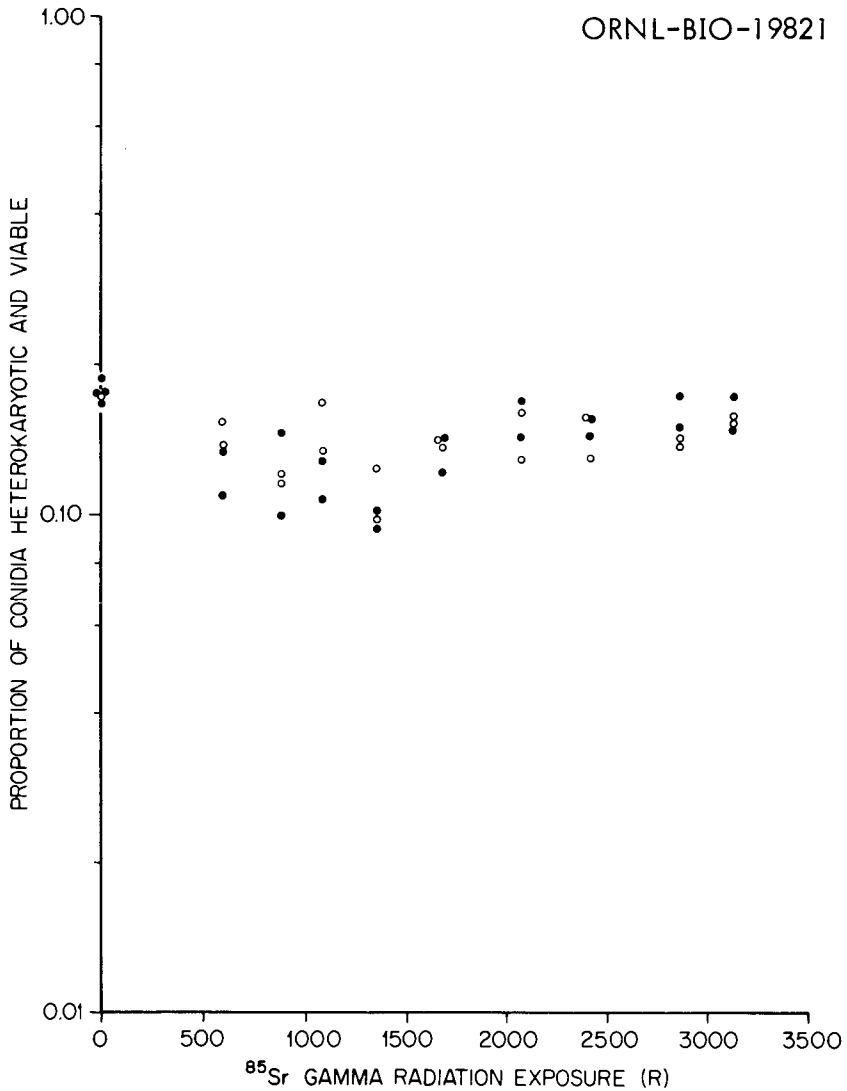

Fig. 3. Survival of Heterokaryotic Conidia

Estimates (based on plating data) of proportion of viable heterokaryotic conidia, plotted on a logarithmic scale against ^{85}Sr gamma radiation exposure on a linear scale. (● = conidia from flight vehicle; O = conidia from ground-control vehicle.)

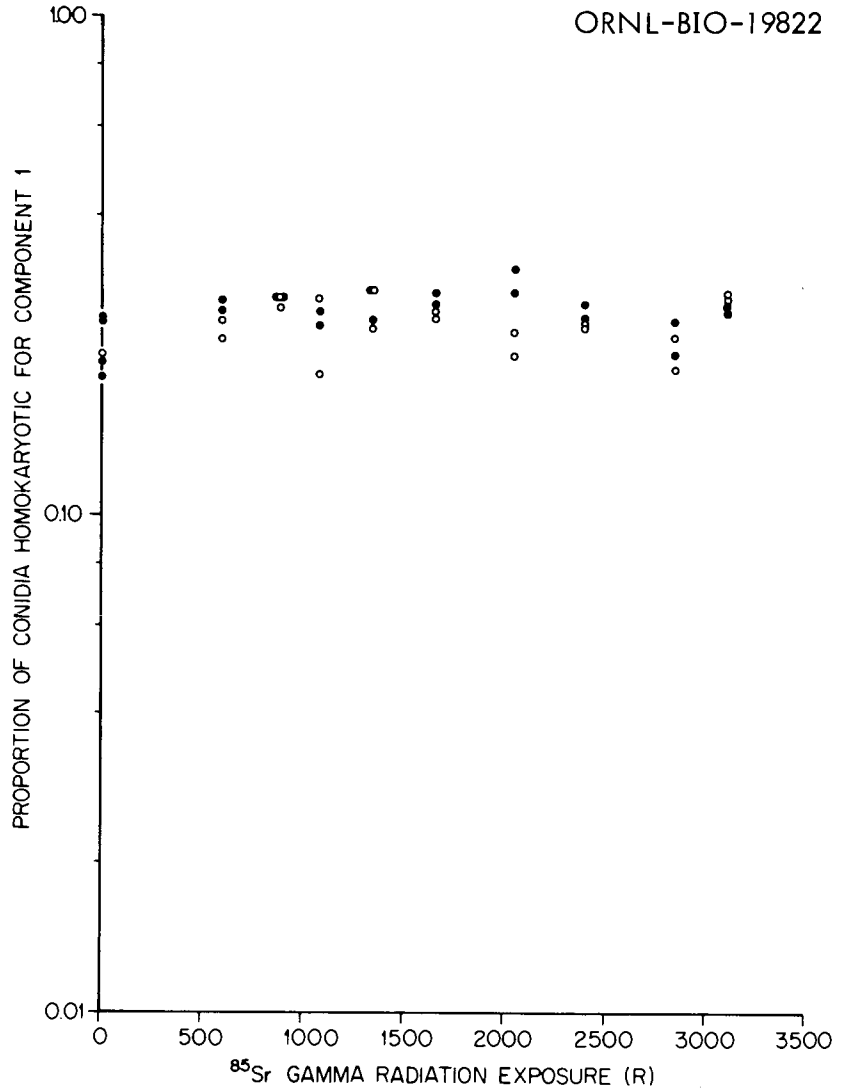

Fig. 4. Survival of Conidia Homokaryotic for Component 1

Estimates (based on plating data) of proportion of viable conidia homokaryotic for component 1, plotted on a logarithmic scale against ^{85}Sr gamma radiation exposure on a linear scale. (● = conidia from flight vehicle; O = conidia from ground-control vehicle.)

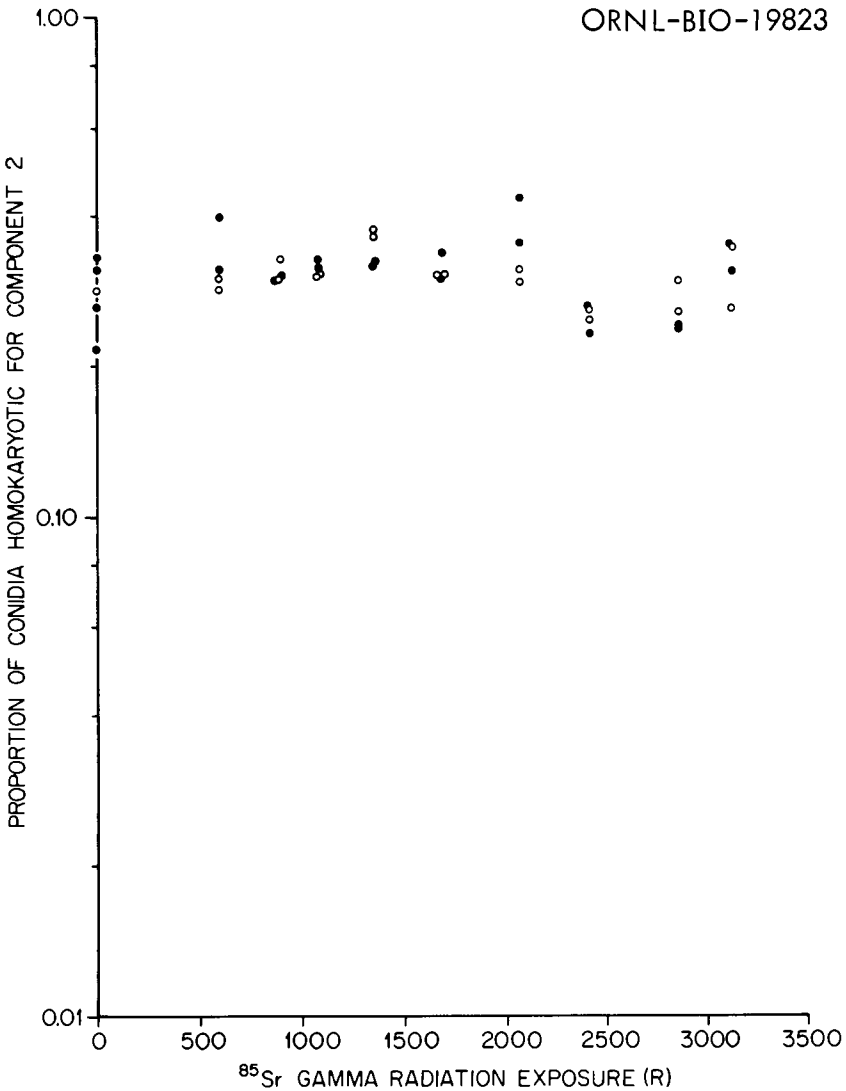

Fig. 5. Survival of Conidia Homokaryotic for Component 2

Estimates (based on plating data) of proportion of viable conidia homokaryotic for component 2, plotted on a logarithmic scale against gamma radiation exposure on a linear scale. (● = conidia from flight vehicle; O = conidia from ground-control vehicle.)

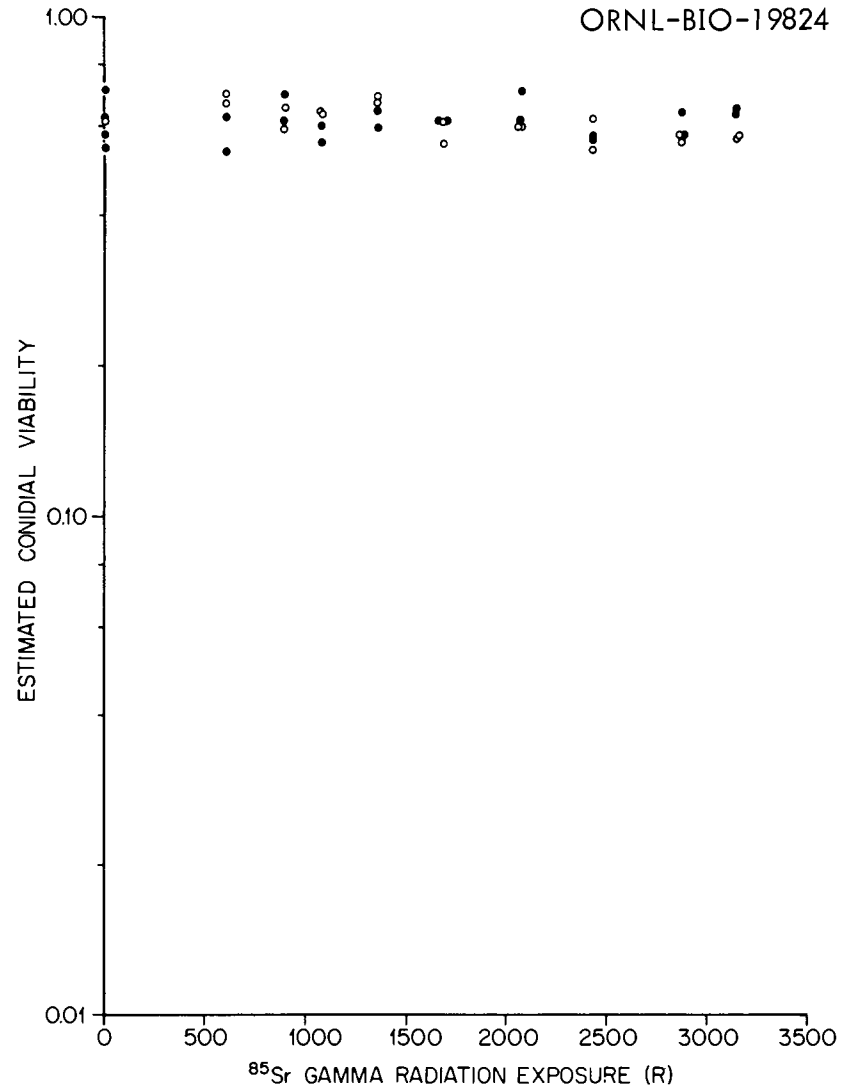

Fig. 6. General Conidia Survival

Estimates (based on plating data) of proportion of conidia which are capable of forming colonies in a completely supplemented medium, plotted on a logarithmic scale against radiation exposure on a linear scale. (● = conidia from flight vehicle; O = conidia from ground-control vehicle.)

IV. DATA FROM EXPERIMENTS WITH SAMPLES ANALYZED IN LIQUID MEDIUM

The procedures for inoculation of conidia into 12-liter flasks of liquid medium and their incubation have been described previously in ORNL-TM-1734, and the data sheet (Form No. 80213) for recording the data from liquid cultures was introduced in ORNL-TM-2189. The experimental plan (ORNL-TM-2235) called for eight flasks for each of the irradiated samples (from nine different total exposures in the flight vehicle and nine in the ground-control vehicle), six flasks for each of the two unirradiated samples from the flight vehicle and two from the ground-control vehicle, and four flasks for each of three unirradiated samples which were incubated under controlled temperature conditions on the ground during flight.

The data from liquid medium cultures are presented and analyzed in four different types of print-outs. Those appearing on pp. 30-36 include the basic data for each flask from which valid data were obtained, as well as estimates of mutation frequency for ad-3 mutants for individual flasks, and for all flasks in a given treatment combined. Those on pp. 37-42 indicate the estimated heterokaryotic surviving proportion for each flask. Those on pp. 43-52 indicate for each treatment the best estimate of survival proportion and forward-mutation frequency, obtained by combining the information from all the flasks representing that treatment. In these print-outs, the latest estimate of gamma radiation exposure is also related to the treatment number. The print-outs on pp. 53-56 indicate, for the flight and ground-control series separately, the regression analyses for logarithm of purple mutant frequency vs. logarithm of exposure, and for logarithm of heterokaryotic survival vs. exposure (linear scale). The additional discussion will be based on the data from these print-outs.

LISTING OF JUG HARVESTING DATA DATE 06-06-68

EXPERIMENT			JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12	73	1	79	1.00	60.	5267.	9525.	0.0	836136.	0.0	0	0		
12	73	1	87	1.00	60.	3434.	9450.	0.0	540855.	0.0	0	0		
12	73	1	109	1.00	60.	3262.	9600.	1.	521920.	0.191600E-05	1	1		
12	73	1	125	1.00	60.	2855.	9750.	0.0	463937.	0.0	0	0		
12	73	1	168	1.00	60.	3154.	9850.	0.0	517782.	0.0	0	0		
								1.	2880628.	0.347147E-06			0.1770E-07	0.1848E-05
12	73	2	9	1.00	60.	4118.	9550.	0.0	655448.	0.0	0	0		
12	73	2	22	1.00	60.	3667.	9350.	0.0	571441.	0.0	0	0		
12	73	2	42	1.00	60.	4255.	9600.	0.0	680800.	0.0	0	0		
12	73	2	95	1.00	60.	3441.	9450.	0.0	541957.	0.0	0	0		
12	73	2	113	1.00	60.	3411.	9450.	1.	537232.	0.186139E-05	2	2		
12	73	2	146	1.00	60.	3832.	9400.	1.	600347.	0.166570E-05	3	3		
								2.	3587224.	0.557534E-06			0.9896E-07	0.1864E-05
12	73	3	30	1.00	60.	3507.	9650.	0.0	564042.	0.0	0	0		
12	73	3	75	1.00	60.	5385.	9500.	0.0	852625.	0.0	0	0		
12	73	3	111	1.00	60.	3391.	9500.	0.0	536908.	0.0	0	0		
12	73	3	129	1.00	60.	3407.	9800.	0.0	556476.	0.0	0	0		
12	73	3	160	1.00	60.	3705.	9650.	0.0	595887.	0.0	0	0		
12	73	3	167	1.00	60.	3405.	9800.	0.0	556150.	0.0	0	0		
								0.0	3662087.	0.0			0.0	0.8970E-06
12	73	4	3	1.00	60.	3741.	9550.	0.0	595442.	0.0	0	0		
12	73	4	46	1.00	60.	4336.	9700.	0.0	700987.	0.0	0	0		
12	73	4	64	1.00	60.	4229.	9550.	0.0	673116.	0.0	0	0		
12	73	4	91	1.00	60.	3635.	9750.	0.0	590687.	0.0	0	0		
12	73	4	132	1.00	60.	3314.	9750.	1.	538525.	0.185692E-05	4	4		
12	73	4	150	1.00	60.	3078.	9550.	1.	489915.	0.204117E-05	5	5		
								2.	3588669.	0.557310E-06			0.9892E-07	0.1863E-05
12	73	5	24	1.00	60.	2830.	9450.	31.	445725.	0.695496E-04	1000	1030		
12	73	5	51	1.00	60.	3576.	8850.	14.	527460.	0.265423E-04	1031	1044		

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES	95 PC CONFIDENCE	
12 73 5	67	1.00	60.	3676.	9500.	20.	582033.	0.343623E-04	1045 1064		
12 73 5	84	1.00	60.	2516.	9450.	17.	396270.	0.429001E-04	1065 1081		
12 73 5	112	1.00	60.	3007.	9600.	17.	481120.	0.353342E-04	1082 1098		
12 73 5	135	0.55	60.	1728.	9600.	12.	276480.	0.434028E-04	1099 1110		
12 73 5	153	1.00	60.	2585.	9550.	22.	411446.	0.534700E-04	1111 1132		
12 73 5	166	1.00	60.	2680.	9750.	27.	435500.	0.619977E-04	1133 1159		
						160.	3556032.	0.449940E-04		0.3822E-04	0.5206E-04
12 73 6	2	1.00	60.	3196.	9400.	18.	500707.	0.359492E-04	1201 1218		
12 73 6	45	1.00	60.	4126.	9550.	28.	656722.	0.426360E-04	1219 1246		
12 73 6	71	1.00	60.	4175.	9600.	21.	668000.	0.314371E-04	1247 1267		
12 73 6	83	1.00	60.	2829.	9500.	13.	447925.	0.290227E-04	1268 1280		
12 73 6	105	1.00	60.	3155.	9400.	15.	494283.	0.303470E-04	1281 1295		
12 73 6	133	1.00	60.	3248.	9750.	17.	527800.	0.322092E-04	1296 1312		
12 73 6	157	1.00	60.	3291.	9550.	18.	523817.	0.343631E-04	1313 1330		
12 73 6	174	0.90	60.	2692.	9600.	8.	430720.	0.185735E-04	1331 1338		
						138.	4249972.	0.324708E-04		0.2702E-04	0.3830E-04
12 73 7	28	1.00	60.	3572.	9800.	16.	583427.	0.274242E-04	1601 1616		
12 73 7	60	1.00	60.	4387.	9150.	14.	669017.	0.209262E-04	1617 1630		
12 73 7	61	1.00	60.	3816.	9700.	21.	616920.	0.340401E-04	1631 1651		
12 73 7	88	1.00	60.	2636.	9500.	15.	417367.	0.359396E-04	1652 1666		
12 73 7	114	1.00	60.	3219.	9600.	15.	515040.	0.291239E-04	1667 1681		
12 73 7	121	1.00	60.	2968.	9650.	12.	477353.	0.251386E-04	1682 1693		
12 73 7	154	1.00	60.	2953.	9500.	6.	467558.	0.128326E-04	1694 1699		
12 73 7	162	0.41	60.	1528.	10000.	11.	254667.	0.431937E-04	1700 1710		
						110.	4001346.	0.274907E-04		0.2230E-04	0.3300E-04
12 73 8	18	1.00	60.	3463.	9400.	18.	542536.	0.331775E-04	1801 1818		
12 73 8	31	1.00	60.	4050.	9400.	16.	634500.	0.252167E-04	1819 1834		
12 73 8	44	1.00	60.	4130.	9750.	11.	671125.	0.163904E-04	1835 1845		
12 73 8	78	1.00	60.	4835.	9650.	11.	777629.	0.141456E-04	1846 1856		

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EXPERIMENT			JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES	95 PC CONFIDENCE	
12	73	9	82	1.00	60.	2565.	9800.	14.	418950.	0.334169E-04	1857 1870		
12	73	8	142	1.00	60.	3095.	9600.	9.	495200.	0.181745E-04	1871 1879		
12	73	8	170	0.70	60.	1715.	9850.	6.	281546.	0.213109E-04	1880 1885		
								85.	3821483.	0.222427E-04		0.1747E-04	0.2732E-04
12	73	9	16	1.00	60.	2397.	9600.	11.	383520.	0.286817E-04	3000 3010		
12	73	9	34	1.00	60.	3456.	9550.	24.	549762.	0.436553E-04	3011 3034		
12	73	9	52	1.00	60.	4073.	9000.	23.	610950.	0.376463E-04	3035 3057		
12	73	9	70	1.00	60.	3494.	9500.	15.	553216.	0.271141E-04	3058 3072		
12	73	9	108	1.00	60.	2616.	9600.	30.	418560.	0.716743E-04	3073 3102		
12	73	9	140	0.78	60.	2476.	9550.	28.	394096.	0.710486E-04	3103 3130		
12	73	9	151	1.00	60.	2845.	9650.	15.	457571.	0.327818E-04	3131 3145		
								146.	3367673.	0.433534E-04		0.3634E-04	0.5042E-04
12	73	10	4	1.00	60.	2869.	9450.	27.	451867.	0.597520E-04	3201 3227		
12	73	10	37	1.00	60.	3583.	9650.	31.	576266.	0.537946E-04	3228 3258		
12	73	10	55	1.00	60.	3853.	9150.	22.	587582.	0.374416E-04	3259 3280		
12	73	10	68	1.00	60.	4028.	9650.	37.	647836.	0.571132E-04	3281 3317		
12	73	10	86	1.00	60.	2583.	9450.	23.	406822.	0.565357E-04	3318 3340		
12	73	10	124	1.00	60.	2705.	9750.	19.	439562.	0.432248E-04	3341 3359		
12	73	10	158	1.00	60.	2959.	9600.	20.	473440.	0.422440E-04	3360 3379		
12	73	10	172	0.90	60.	2081.	9600.	10.	332960.	0.300336E-04	3380 3389		
								189.	3916335.	0.482594E-04		0.4157E-04	0.5536E-04
12	73	11	13	1.00	60.	3605.	9400.	20.	564783.	0.354118E-04	3601 3620		
12	73	11	25	1.00	60.	3692.	9600.	15.	590720.	0.253927E-04	3621 3635		
12	73	11	53	1.00	60.	3899.	9500.	22.	617342.	0.356367E-04	3636 3657		
12	73	11	72	1.00	60.	4272.	9650.	21.	687080.	0.305641E-04	3658 3678		
12	73	11	96	1.00	60.	3422.	9450.	8.	538965.	0.148433E-04	3679 3686		
12	73	11	107	1.00	60.	2922.	9700.	9.	472390.	0.190521E-04	3687 3695		
12	73	11	145	1.00	60.	3243.	9850.	19.	532392.	0.356880E-04	3696 3714		
12	73	11	179	1.00	60.	2448.	9850.	16.	401880.	0.398129E-04	3715 3730		
								130.	4405549.	0.295082E-04		0.2477E-04	0.3472E-04

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES		95 PC CONFIDENCE	
12 73 12	15	1.00	60.	4037.	9350.	11.	629099.	0.174853E-04	3801	3811		
12 73 12	29	1.00	60.	4350.	9500.	7.	688750.	0.101633E-04	3812	3818		
12 73 12	41	1.00	60.	3750.	9650.	12.	603125.	0.198964E-04	3819	3830		
12 73 12	74	1.00	60.	5076.	9600.	14.	812160.	0.172380E-04	3831	3844		
12 73 12	94	1.00	60.	2989.	9150.	9.	455822.	0.197445E-04	3845	3853		
12 73 12	117	1.00	60.	3106.	9550.	6.	494371.	0.121366E-04	3854	3859		
12 73 12	128	1.00	60.	3303.	9450.	11.	520222.	0.211448E-04	3860	3870		
12 73 12	161	0.44	60.	1476.	9800.	4.	241080.	0.165920E-04	3871	3874		
						74.	4444627.	0.166493E-04			0.1321E-04	0.2065E-04
12 73 13	8	1.00	60.	4285.	9400.	0.0	671316.	0.0	0	0		
12 73 13	62	1.00	60.	5042.	9550.	1.	802518.	0.124608E-05	6	6		
12 73 13	90	1.00	60.	3622.	9500.	0.0	573483.	0.0	0	0		
12 73 13	149	1.00	60.	3555.	9600.	0.0	568800.	0.0	0	0		
						1.	2616117.	0.382246E-06			0.1949E-07	0.2035E-05
12 73 14	12	1.00	60.	4670.	9500.	0.0	739416.	0.0	0	0		
12 73 14	23	1.00	60.	4541.	9650.	1.	730344.	0.136922E-05	7	7		
12 73 14	106	1.00	60.	3867.	9550.	1.	615497.	0.162470E-05	8	8		
12 73 14	165	1.00	60.	3642.	9900.	0.0	600930.	0.0	0	0		
						2.	2686186.	0.744550E-06			0.1322E-06	0.2489E-05
12 73 15	11	1.00	60.	4081.	9450.	1.	642757.	0.155580E-05	9	9		
12 73 15	33	1.00	60.	5119.	9550.	0.0	814774.	0.0	0	0		
12 73 15	104	1.00	60.	3396.	9550.	1.	540530.	0.185004E-05	10	10		
12 73 15	127	1.00	60.	3251.	9700.	0.0	525578.	0.0	0	0		
						2.	2523638.	0.792507E-06			0.1407E-06	0.2649E-05
12 73 16	32	1.00	60.	4249.	9450.	13.	669217.	0.194257E-04	2001	2013		
12 73 16	50	1.00	60.	3891.	9600.	9.	622560.	0.144564E-04	2014	2022		
12 73 16	65	1.00	60.	3900.	9500.	4.	617500.	0.647773E-05	2023	2026		
12 73 16	115	1.00	60.	2765.	9650.	10.	444704.	0.224869E-04	2027	2036		
12 73 16	131	1.00	60.	3035.	9700.	14.	490658.	0.285331E-04	2037	2050		

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES	95 PC CONFIDENCE	
12 73 16	148	1.00	60.	2746.	9550.	9.	437071.	0.205916E-04	2051 2059		
12 73 16	173	1.00	60.	3061.	9750.	7.	497412.	0.140728E-04	2060 2066		
						66.	3779122.	0.174644E-04		0.1357E-04	0.2200E-04
12 73 17	14	1.00	60.	3743.	9550.	4.	595761.	0.671410E-05	2201 2204		
12 73 17	35	1.00	60.	3748.	9750.	7.	609050.	0.114933E-04	2205 2211		
12 73 17	48	1.00	60.	3735.	9850.	6.	613162.	0.978534E-05	2212 2217		
12 73 17	66	1.00	60.	3740.	9675.	2.	603075.	0.331634E-05	2218 2219		
12 73 17	81	1.00	60.	2867.	9400.	6.	449163.	0.133582E-04	2220 2225		
12 73 17	103	1.00	60.	2584.	9600.	3.	413440.	0.725619E-05	2026 2028		
12 73 17	141	1.00	60.	2802.	9750.	13.	455325.	0.285510E-04	2229 2241		
12 73 17	169	0.79	60.	2952.	9750.	5.	479700.	0.104232E-04	2242 2246		
						46.	4218673.	0.109039E-04		0.8071E-05	0.1428E-04
12 73 18	10	1.00	60.	4084.	9450.	2.	643230.	0.310931E-05	2401 2402		
12 73 18	49	1.00	60.	3819.	9600.	10.	611040.	0.163655E-04	2403 2412		
12 73 18	69	1.00	60.	4227.	9650.	4.	679842.	0.588372E-05	2413 2416		
12 73 18	92	1.00	60.	3135.	9325.	3.	487231.	0.615724E-05	2417 2419		
12 73 18	102	1.00	60.	2834.	9500.	5.	448716.	0.111429E-04	2420 2424		
12 73 18	138	1.00	60.	3731.	9700.	3.	603178.	0.497365E-05	2425 2427		
12 73 18	156	1.00	60.	3391.	9600.	3.	542560.	0.552934E-05	2428 2430		
						30.	4015796.	0.747050E-05		0.5063E-05	0.1040E-04
12 73 19	17	1.00	60.	3184.	9450.	3.	501480.	0.598229E-05	2601 2603		
12 73 19	26	1.00	60.	3663.	9550.	7.	583027.	0.120063E-04	2604 2610		
12 73 19	59	1.00	60.	4062.	9600.	4.	649920.	0.615460E-05	2611 2614		
12 73 19	85	1.00	60.	2361.	9400.	2.	369890.	0.540702E-05	2615 2616		
12 73 19	118	1.00	60.	3614.	9550.	3.	575228.	0.521532E-05	2617 2619		
12 73 19	123	1.00	60.	4435.	9575.	4.	707752.	0.565170E-05	2620 2623		
12 73 19	159	1.00	60.	3010.	9525.	1.	477837.	0.209276E-05	2624 2624		
12 73 19	177	0.56	60.	2563.	9650.	2.	412216.	0.485183E-05	2625 2626		
						26.	4277348.	0.607853E-05		0.3921E-05	0.8807E-05

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EXPERIMENT	JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES	95 PC CONFIDENCE	
12 73 20	20	1.00	60.	3885.	9450.	17.	611887.	0.277829E-04	1401 1417		
12 73 20	36	1.00	60.	3910.	9550.	18.	622342.	0.289230E-04	1418 1435		
12 73 20	47	1.00	60.	4013.	10100.	15.	675522.	0.222051E-04	1436 1450		
12 73 20	97	1.00	60.	3276.	9550.	10.	521430.	0.191780E-04	1451 1460		
12 73 20	101	1.00	60.	3445.	9350.	20.	536846.	0.372546E-04	1461 1480		
12 73 20	134	1.00	60.	3902.	9600.	17.	624320.	0.272296E-04	1481 1497		
12 73 20	178	0.81	60.	2913.	9650.	10.	468507.	0.213444E-04	1498 1507		
						107.	4060851.	0.263492E-04		0.2154E-04	0.3147E-04
12 73 21	19	1.00	60.	3483.	9575.	4.	555828.	0.719646E-05	4001 4004		
12 73 21	39	1.00	60.	3421.	9600.	5.	547360.	0.913476E-05	4005 4009		
12 73 21	58	1.00	60.	4102.	9500.	8.	649483.	0.123175E-04	4010 4017		
12 73 21	63	1.00	60.	3354.	9475.	14.	529652.	0.264324E-04	4018 4031		
12 73 21	116	1.00	60.	2454.	9450.	6.	386505.	0.155237E-04	4032 4037		
12 73 21	122	1.00	60.	2983.	9650.	6.	479766.	0.125061E-04	4038 4043		
12 73 21	155	1.00	60.	3009.	9400.	13.	471410.	0.275769E-04	4044 4056		
12 73 21	176	0.47	60.	1353.	9550.	6.	215352.	0.278613E-04	4029 4062		
						62.	3835353.	0.161654E-04		0.1243E-04	0.2053E-04
12 73 22	6	1.00	60.	3634.	9425.	5.	570841.	0.875901E-05	4201 4205		
12 73 22	40	1.00	60.	3539.	9400.	9.	554443.	0.162325E-04	4206 4214		
12 73 22	57	1.00	60.	4235.	9650.	8.	681129.	0.117452E-04	4215 4222		
12 73 22	73	1.00	60.	3890.	9725.	6.	630504.	0.951620E-05	4223 4228		
12 73 22	89	1.00	60.	3063.	9550.	8.	487527.	0.164093E-04	4229 4236		
12 73 22	137	1.00	60.	3052.	9700.	6.	493407.	0.121604E-04	4237 4242		
12 73 22	143	1.00	60.	2808.	9725.	9.	455130.	0.197746E-04	4243 4251		
12 73 22	171	0.66	60.	1992.	9650.	9.	320380.	0.280916E-04	4252 4260		
						60.	4193358.	0.143083E-04		0.1080E-04	0.1807E-04
12 73 23	7	1.00	60.	3208.	9450.	4.	505260.	0.791672E-05	4401 4404		
12 73 23	27	1.00	60.	3831.	9600.	7.	612960.	0.114200E-04	4405 4411		
12 73 23	56	1.00	60.	4323.	9400.	5.	677270.	0.738258E-05	4412 4416		

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EXPERIMENT			JUG	VOL-INOC	VOL-CT	BACKGROUND	JUG-VOL	MUTANTS	TOTAL SURVIVORS	MUT.-FREQ.	ISOLATES	95 PC CONFIDENCE	
12	73	23	76	1.00	60.	4370.	9550.	6.	695558.	0.862617E-05	4417 4422		
12	73	23	100	1.00	60.	3286.	9450.	6.	517545.	0.115932E-04	4423 4428		
12	73	23	110	1.00	60.	2921.	9650.	4.	469794.	0.851437E-05	4429 4432		
12	73	23	139	1.00	60.	3096.	9650.	5.	497940.	0.100414E-04	4433 4437		
12	73	23	164	0.40	60.	1383.	9750.	7.	224737.	0.311474E-04	4438 4444		
								44.	4201062.	0.104735E-04		0.7539E-05	0.1398E-04
12	73	24	5	2.00	60.	3616.	9250.	1.	557467.	0.179383E-05	4601 4601		
12	73	24	38	2.00	60.	4072.	9350.	6.	634553.	0.945547E-05	4602 4607		
12	73	24	43	2.00	60.	3952.	9625.	2.	633967.	0.315474E-05	4608 4609		
12	73	24	99	2.00	60.	3825.	9600.	5.	612000.	0.816993E-05	4610 4614		
12	73	24	119	2.00	60.	3193.	9300.	2.	494915.	0.404110E-05	4615 4616		
12	73	24	126	2.00	60.	3447.	9300.	5.	534285.	0.935830E-05	4617 4621		
12	73	24	152	1.10	60.	2026.	9600.	1.	324160.	0.308490E-05	4622 4622		
								22.	3791343.	0.580269E-05		0.3631E-05	0.8513E-05
12	73	25	21	1.00	60.	3496.	9550.	22.	556447.	0.395366E-04	3401 3422		
12	73	25	54	1.00	60.	3965.	9350.	23.	617879.	0.372241E-04	3423 3445		
12	73	25	80	1.00	60.	4265.	9700.	17.	689508.	0.246553E-04	3446 3462		
12	73	25	98	1.00	60.	3336.	9450.	14.	525420.	0.266453E-04	3463 3476		
12	73	25	120	1.00	60.	3366.	9500.	22.	532950.	0.412797E-04	3477 3498		
12	73	25	136	1.00	60.	3425.	9550.	22.	545146.	0.403562E-04	3499 3520		
12	73	25	147	1.00	60.	3249.	9450.	17.	511717.	0.332215E-04	3521 3537		
12	73	25	180	0.26	60.	1087.	9750.	7.	176637.	0.396292E-04	3538 3544		
								144.	4155701.	0.346512E-04		0.2896E-04	0.4075E-04

BIOSATELLITE GROUND CONTROL CAF+LIE+CONRAD DOSIMETRY

EXP.	TR.	DOSE	JUG	ISOLATES	PURPLES		FORWARD MUTATION FREQUENCY	PROPORTION HETEROKARYOTIC SURVIVORS	CONIDIA PER ML	VOLUME (ML) ADDED	CONIDIA IN FLASK
73	3	0.0	30	0	0	0.0	0.0	0.1169	4825000.	1.00	4825000.
73	3	0.0	75	0	0	0.0	0.0	0.1767	4825000.	1.00	4825000.
73	3	0.0	111	0	0	0.0	0.0	0.1113	4825000.	1.00	4825000.
73	3	0.0	129	0	0	0.0	0.0	0.1153	4825000.	1.00	4825000.
73	3	0.0	160	0	0	0.0	0.0	0.1235	4825000.	1.00	4825000.
73	3	0.0	167	0	0	0.0	0.0	0.1153	4825000.	1.00	4825000.
73	15	0.0	11	9	9	1.	0.1555797D-05	0.1624	3958333.	1.00	3958333.
73	15	0.0	33	0	0	0.0	0.0	0.2058	3958333.	1.00	3958333.
73	15	0.0	104	10	10	1.	0.1850036D-05	0.1366	3958333.	1.00	3958333.
73	15	0.0	127	0	0	0.0	0.0	0.1328	3958333.	1.00	3958333.
73	14	0.0	12	0	0	0.0	0.0	0.1621	4562500.	1.00	4562500.
73	14	0.0	23	7	7	1.	0.1369217D-05	0.1601	4562500.	1.00	4562500.
73	14	0.0	106	8	8	1.	0.1624702D-05	0.1349	4562500.	1.00	4562500.
73	14	0.0	165	0	0	0.0	0.0	0.1317	4562500.	1.00	4562500.
73	13	0.0	8	0	0	0.0	0.0	0.1618	4150000.	1.00	4150000.
73	13	0.0	62	6	6	1.	0.1246077D-05	0.1934	4150000.	1.00	4150000.
73	13	0.0	90	0	0	0.0	0.0	0.1382	4150000.	1.00	4150000.
73	13	0.0	149	0	0	0.0	0.0	0.1371	4150000.	1.00	4150000.
73	4	0.0	3	0	0	0.0	0.0	0.1393	4275000.	1.00	4275000.
73	4	0.0	46	0	0	0.0	0.0	0.1640	4275000.	1.00	4275000.
73	4	0.0	64	0	0	0.0	0.0	0.1575	4275000.	1.00	4275000.
73	4	0.0	91	0	0	0.0	0.0	0.1382	4275000.	1.00	4275000.
73	4	0.0	132	4	4	1.	0.1856924D-05	0.1260	4275000.	1.00	4275000.
73	4	0.0	150	5	5	1.	0.2041170D-05	0.1146	4275000.	1.00	4275000.
73	24	597.	5	4601	4601	1.	0.1793829D-05	0.1417	1966667.	2.00	3933333.
73	24	597.	38	4602	4607	6.	0.9455470D-05	0.1613	1966667.	2.00	3933333.
73	24	597.	43	4608	4609	2.	0.3154740D-05	0.1612	1966667.	2.00	3933333.
73	24	597.	99	4610	4614	5.	0.8169935D-05	0.1556	1966667.	2.00	3933333.
73	24	597.	119	4615	4616	2.	0.4041098D-05	0.1258	1966667.	2.00	3933333.

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

Exp.	Tr.	Dose	Jug	Isolates		Purples	Forward Mutation Frequency	Proportion Heterokaryotic Survivors	Conidia per ml	Volume (ml) Added	Conidia in Flask
73	24	597.	126	4617	4621	5.	0.9358301D-05	0.1358	1966667.	2.00	3933333.
73	24	597.	152	4622	4622	1.	0.3084896D-05	0.1498	1966667.	1.10	2163333.
73	21	1353.	19	4001	4004	4.	0.7196461D-05	0.1395	3983333.	1.00	3983333.
73	21	1353.	39	4005	4009	5.	0.9134756D-05	0.1374	3983333.	1.00	3983333.
73	21	1353.	58	4010	4017	8.	0.1231748D-04	0.1631	3983333.	1.00	3983333.
73	21	1353.	63	4018	4031	14.	0.2643243D-04	0.1330	3983333.	1.00	3983333.
73	21	1353.	116	4032	4037	6.	0.1552373D-04	0.0970	3983333.	1.00	3983333.
73	21	1353.	122	4038	4043	6.	0.1250610D-04	0.1204	3983333.	1.00	3983333.
73	21	1353.	155	4044	4056	13.	0.2757684D-04	0.1183	3983333.	1.00	3983333.
73	21	1353.	176	4057	4062	6.	0.2786130D-04	0.1150	3983333.	0.47	1872167.
73	22	1084.	6	4201	4205	5.	0.8759009D-05	0.1480	3858333.	1.00	3858333.
73	22	1084.	40	4206	4214	9.	0.1623250D-04	0.1437	3858333.	1.00	3858333.
73	22	1084.	57	4215	4222	8.	0.1174520D-04	0.1765	3858333.	1.00	3858333.
73	22	1084.	73	4223	4228	6.	0.9516194D-05	0.1634	3858333.	1.00	3858333.
73	22	1084.	89	4229	4236	8.	0.1640933D-04	0.1264	3858333.	1.00	3858333.
73	22	1084.	137	4237	4242	6.	0.1216035D-04	0.1279	3858333.	1.00	3858333.
73	22	1084.	143	4243	4251	9.	0.1977457D-04	0.1180	3858333.	1.00	3858333.
73	22	1084.	171	4252	4260	9.	0.2309164D-04	0.1258	3858333.	0.66	2546500.
73	23	890.	7	4401	4404	4.	0.7916716D-05	0.1253	4033333.	1.00	4033333.
73	23	890.	27	4405	4411	7.	0.1141999D-04	0.1520	4033333.	1.00	4033333.
73	23	890.	56	4412	4416	5.	0.7382580D-05	0.1679	4033333.	1.00	4033333.
73	23	890.	76	4417	4422	6.	0.8626164D-05	0.1725	4033333.	1.00	4033333.
73	23	890.	100	4423	4428	6.	0.1159319D-04	0.1283	4033333.	1.00	4033333.
73	23	890.	110	4429	4432	4.	0.8514367D-05	0.1165	4033333.	1.00	4033333.
73	23	890.	139	4433	4437	5.	0.1004137D-04	0.1235	4033333.	1.00	4033333.
73	23	890.	164	4438	4444	7.	0.3114745D-04	0.1393	4033333.	0.40	1613333.
73	9	3136.	16	3000	3010	11.	0.2868169D-04	0.0937	4091667.	1.00	4091667.
73	9	3136.	34	3011	3034	24.	0.4365528D-04	0.1344	4091667.	1.00	4091667.
73	9	3136.	52	3035	3057	23.	0.3764629D-04	0.1493	4091667.	1.00	4091667.
73	9	3136.	70	3058	3072	15.	0.2711415D-04	0.1352	4091667.	1.00	4091667.
73	9	3136.	108	3073	3102	30.	0.7167431D-04	0.1023	4091667.	1.00	4091667.

73	9	3136.	140	3103	3130	28.	0.7104856D-04	0.1235	4091667.	0.78	3191500.
73	9	3136.	151	3131	3145	15.	0.3278181D-04	0.1118	4091667.	1.00	4091667.
73	10	2864.	4	3201	3227	27.	0.5975203D-04	0.1082	4175000.	1.00	4175000.
73	10	2864.	37	3228	3258	31.	0.5379462D-04	0.1380	4175000.	1.00	4175000.
73	10	2864.	55	3259	3280	22.	0.3744155D-04	0.1407	4175000.	1.00	4175000.
73	10	2864.	68	3281	3317	37.	0.5711316D-04	0.1552	4175000.	1.00	4175000.
73	10	2864.	86	3318	3340	23.	0.5653571D-04	0.0974	4175000.	1.00	4175000.
73	10	2864.	124	3341	3359	19.	0.4322480D-04	0.1053	4175000.	1.00	4175000.
73	10	2864.	158	3360	3379	20.	0.4224400D-04	0.1134	4175000.	1.00	4175000.
73	10	2864.	172	3380	3389	10.	0.3003364D-04	0.0886	4175000.	0.90	3757500.
73	25	2419.	21	3401	3422	22.	0.3953658D-04	0.1294	4300000.	1.00	4300000.
73	25	2419.	54	3423	3445	23.	0.3722411D-04	0.1437	4300000.	1.00	4300000.
73	25	2419.	80	3446	3462	17.	0.2465525D-04	0.1604	4300000.	1.00	4300000.
73	25	2419.	98	3463	3476	14.	0.2664535D-04	0.1222	4300000.	1.00	4300000.
73	25	2419.	120	3477	3498	22.	0.4127967D-04	0.1239	4300000.	1.00	4300000.
73	25	2419.	136	3499	3520	22.	0.4035617D-04	0.1268	4300000.	1.00	4300000.
73	25	2419.	147	3521	3537	17.	0.3322146D-04	0.1190	4300000.	1.00	4300000.
73	25	2419.	180	3538	3544	7.	0.3962918D-04	0.1580	4300000.	0.26	1118000.
73	11	2072.	13	3601	3620	20.	0.3541181D-04	0.1339	4216667.	1.00	4216667.
73	11	2072.	25	3621	3635	15.	0.2539274D-04	0.1401	4216667.	1.00	4216667.
73	11	2072.	53	3636	3657	22.	0.3563667D-04	0.1464	4216667.	1.00	4216667.
73	11	2072.	72	3658	3678	21.	0.3056413D-04	0.1629	4216667.	1.00	4216667.
73	11	2072.	96	3679	3686	8.	0.1484326D-04	0.1278	4216667.	1.00	4216667.
73	11	2072.	107	3687	3695	9.	0.1905205D-04	0.1120	4216667.	1.00	4216667.
73	11	2072.	145	3696	3714	19.	0.3568796D-04	0.1263	4216667.	1.00	4216667.
73	11	2072.	179	3715	3730	16.	0.3981288D-04	0.0953	4216667.	1.00	4216667.
73	12	1679.	15	3801	3811	11.	0.1748532D-04	0.1455	4325000.	1.00	4325000.
73	12	1679.	29	3812	3818	7.	0.1016334D-04	0.1592	4325000.	1.00	4325000.
73	12	1679.	41	3819	3830	12.	0.1989637D-04	0.1395	4325000.	1.00	4325000.
73	12	1679.	74	3831	3844	14.	0.1723798D-04	0.1878	4325000.	1.00	4325000.
73	12	1679.	94	3845	3853	9.	0.1974453D-04	0.1054	4325000.	1.00	4325000.
73	12	1679.	117	3854	3859	6.	0.1213662D-04	0.1143	4325000.	1.00	4325000.
73	12	1679.	128	3860	3870	11.	0.2114480D-04	0.1203	4325000.	1.00	4325000.
73	12	1679.	161	3871	3874	4.	0.1659200D-04	0.1267	4325000.	0.44	1903000.

BIOSATELLITE FLIGHT CAE+LIF+CONRAD DOSIMETRY

EXP.	TR.	DOSE	JUG	ISOLATES	PURPLES						
73	1	0.0	79	0	0	0.0	0.0	0.2035	4108333.	1.00	4108333.
73	1	0.0	87	0	0	0.0	0.0	0.1316	4108333.	1.00	4108333.
73	1	0.0	109	1	1	1.	0.1916002D-05	0.1270	4108333.	1.00	4108333.
73	1	0.0	125	0	0	0.0	0.0	0.1129	4108333.	1.00	4108333.
73	1	0.0	168	0	0	0.0	0.0	0.1260	4108333.	1.00	4108333.
73	2	0.0	9	0	0	0.0	0.0	0.1515	4325000.	1.00	4325000.
73	2	0.0	22	0	0	0.0	0.0	0.1321	4325000.	1.00	4325000.
73	2	0.0	42	0	0	0.0	0.0	0.1574	4325000.	1.00	4325000.
73	2	0.0	95	0	0	0.0	0.0	0.1253	4325000.	1.00	4325000.
73	2	0.0	113	2	2	1.	0.1861391D-05	0.1242	4325000.	1.00	4325000.
73	2	0.0	146	3	3	1.	0.1665704D-05	0.1388	4325000.	1.00	4325000.
73	19	597.	17	2601	2603	3.	0.5982292D-05	0.1248	4016667.	1.00	4016667.
73	19	597.	26	2604	2610	7.	0.1200629D-04	0.1452	4016667.	1.00	4016667.
73	19	597.	59	2611	2614	4.	0.6154604D-05	0.1618	4016667.	1.00	4016667.
73	19	597.	85	2615	2616	2.	0.5407013D-05	0.0921	4016667.	1.00	4016667.
73	19	597.	118	2617	2619	3.	0.5215320D-05	0.1432	4016667.	1.00	4016667.
73	19	597.	123	2620	2623	4.	0.5651697D-05	0.1762	4016667.	1.00	4016667.
73	19	597.	159	2624	2624	1.	0.2092762D-05	0.1190	4016667.	1.00	4016667.
73	19	597.	177	2625	2626	2.	0.4851827D-05	0.1833	4016667.	0.56	2249333.
73	16	1353.	32	2001	2013	13.	0.1942567D-04	0.1474	4541667.	1.00	4541667.
73	16	1353.	50	2014	2022	9.	0.1445644D-04	0.1371	4541667.	1.00	4541667.
73	16	1353.	65	2023	2026	4.	0.6477733D-05	0.1360	4541667.	1.00	4541667.
73	16	1353.	115	2027	2036	10.	0.2248686D-04	0.0979	4541667.	1.00	4541667.
73	16	1353.	131	2037	2050	14.	0.2853309D-04	0.1080	4541667.	1.00	4541667.
73	16	1353.	148	2051	2059	9.	0.2059159D-04	0.0962	4541667.	1.00	4541667.
73	16	1353.	173	2060	2066	7.	0.1407283D-04	0.1095	4541667.	1.00	4541667.
73	17	1084.	14	2201	2204	4.	0.6714104D-05	0.1349	4416667.	1.00	4416667.
73	17	1084.	35	2205	2211	7.	0.1149331D-04	0.1379	4416667.	1.00	4416667.
73	17	1084.	48	2212	2217	6.	0.9785334D-05	0.1388	4416667.	1.00	4416667.

73	17	1084.	66	2218	2219	2.	0.3316337D-05	0.1365	4416667.	1.00	4416667.
73	17	1084.	81	2220	2225	6.	0.1335817D-04	0.1017	4416667.	1.00	4416667.
73	17	1084.	103	2226	2228	3.	0.7256192D-05	0.0936	4416667.	1.00	4416667.
73	17	1084.	141	2229	2241	13.	0.2855103D-04	0.1031	4416667.	1.00	4416667.
73	17	1084.	169	2242	2246	5.	0.1042318D-04	0.1375	4416667.	0.79	3489167.
73	18	890.	10	2401	2402	2.	0.3109308D-05	0.1484	4333333.	1.00	4333333.
73	18	890.	49	2403	2412	10.	0.1036554D-04	0.1410	4333333.	1.00	4333333.
73	18	890.	69	2413	2416	4.	0.5883716D-05	0.1569	4333333.	1.00	4333333.
73	18	890.	92	2417	2419	3.	0.6157241D-05	0.1124	4333333.	1.00	4333333.
73	18	890.	102	2420	2424	5.	0.1114289D-04	0.1035	4333333.	1.00	4333333.
73	18	890.	138	2425	2427	3.	0.4973653D-05	0.1392	4333333.	1.00	4333333.
73	18	890.	156	2428	2430	3.	0.5529342D-05	0.1252	4333333.	1.00	4333333.
73	5	3136.	24	1000	1030	31.	0.6954961D-04	0.1005	4433333.	1.00	4433333.
73	5	3136.	51	1031	1044	14.	0.2654230D-04	0.1190	4433333.	1.00	4433333.
73	5	3136.	67	1045	1064	20.	0.3436229D-04	0.1313	4433333.	1.00	4433333.
73	5	3136.	84	1065	1081	17.	0.4290004D-04	0.0894	4433333.	1.00	4433333.
73	5	3136.	112	1082	1098	17.	0.3533422D-04	0.1085	4433333.	1.00	4433333.
73	5	3136.	135	1099	1110	12.	0.4340278D-04	0.1134	4433333.	0.55	2438333.
73	5	3136.	153	1111	1132	22.	0.5346998D-04	0.0928	4433333.	1.00	4433333.
73	5	3136.	166	1133	1159	27.	0.6199770D-04	0.0982	4433333.	1.00	4433333.
73	6	2864.	2	1201	1218	18.	0.3594919D-04	0.1234	4058333.	1.00	4058333.
73	6	2864.	45	1219	1246	28.	0.4263602D-04	0.1618	4058333.	1.00	4058333.
73	6	2864.	71	1247	1267	21.	0.3143713D-04	0.1646	4058333.	1.00	4058333.
73	6	2864.	83	1268	1280	13.	0.2902272D-04	0.1104	4058333.	1.00	4058333.
73	6	2864.	105	1281	1295	15.	0.3034697D-04	0.1218	4058333.	1.00	4058333.
73	6	2864.	133	1296	1312	17.	0.3220917D-04	0.1301	4058333.	1.00	4058333.
73	6	2864.	157	1313	1330	18.	0.3436311D-04	0.1291	4058333.	1.00	4058333.
73	6	2864.	174	1331	1338	8.	0.1857355D-04	0.1179	4058333.	0.90	3652500.
73	20	2419.	20	1401	1417	17.	0.2778288D-04	0.1318	4641667.	1.00	4641667.
73	20	2419.	36	1418	1435	18.	0.2892302D-04	0.1341	4641667.	1.00	4641667.
73	20	2419.	47	1436	1450	15.	0.2220506D-04	0.1455	4641667.	1.00	4641667.

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

Exp.	Tr.	Dose	Jug	Isolates	Purples					
73	20	2419.	97	1451	1460	10.	0.1917803D-04	0.1123	4641667.	1.00	4641667.
73	20	2419.	101	1451	1480	20.	0.3725464D-04	0.1157	4641667.	1.00	4641667.
73	20	2419.	134	1481	1497	17.	0.2722963D-04	0.1345	4641667.	1.00	4641667.
73	20	2419.	178	1493	1507	10.	0.2134438D-04	0.1246	4641667.	0.81	3759750.
73	7	2072.	28	1601	1616	16.	0.2742418D-04	0.1420	4108333.	1.00	4108333.
73	7	2072.	50	1617	1630	14.	0.2092621D-04	0.1628	4108333.	1.00	4108333.
73	7	2072.	61	1631	1651	21.	0.3404007D-04	0.1502	4108333.	1.00	4108333.
73	7	2072.	88	1652	1666	15.	0.3593962D-04	0.1016	4108333.	1.00	4108333.
73	7	2072.	114	1667	1681	15.	0.2912395D-04	0.1254	4108333.	1.00	4108333.
73	7	2072.	121	1682	1693	12.	0.2513861D-04	0.1162	4108333.	1.00	4108333.
73	7	2072.	154	1694	1699	6.	0.1283262D-04	0.1138	4108333.	1.00	4108333.
73	7	2072.	162	1700	1710	11.	0.4319372D-04	0.1512	4108333.	0.41	1684417.
73	8	1679.	13	1801	1818	18.	0.3317748D-04	0.1208	4491667.	1.00	4491667.
73	8	1679.	31	1819	1834	16.	0.2521671D-04	0.1413	4491667.	1.00	4491667.
73	8	1679.	44	1835	1845	11.	0.1639039D-04	0.1494	4491667.	1.00	4491667.
73	8	1679.	78	1846	1856	11.	0.1414556D-04	0.1731	4491667.	1.00	4491667.
73	8	1679.	82	1857	1870	14.	0.3341688D-04	0.0933	4491667.	1.00	4491667.
73	8	1679.	142	1871	1879	9.	0.1817447D-04	0.1102	4491667.	1.00	4491667.
73	8	1679.	170	1880	1885	6.	0.2131092D-04	0.0895	4491667.	0.70	3144167.

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 3

NUMBER OF JUGS	24.	
MEAN JUG VOLUME	9610.42	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.0
MEAN CONIDIA PER JUG		0.43868056D 07
VOLUME INOCULATED	1.00	
FIRST ISOLATE	4	
LAST ISOLATE	10	
BACKGROUND MEAN	3925.17	
CSS		0.94566473D 07
VAR. MEAN		0.17131607D 05
PURPLE MUTANT MEAN	0.29	
CSS		0.49583333D 01
VAR. MEAN		0.89824879D-02
MUTANT/SURVIVOR		0.48099684D-06
VARIANCE		0.25311977D-13
S.E.		0.15909734D-06
CI	0.48099684D-06	0.48099684D-06
C.V.		0.33076588D 02
SURVIVAL FRACTION		0.14396386D 00
VARIANCE		0.26749663D-04
S.E.		0.51720031D-02
CI	0.14396386D 00	0.14396386D 00
C.V.		0.35925704D 01
SURVIVAL RATIO	1.00000000	
VARIANCE		0.0
S.E.		0.0
CI	0.10000000D 01	0.10000000D 01
C.V.		0.0

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 24

NUMBER OF JUGS	7.	
MEAN JUG VOLUME	9432.14	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.59700000D 03
MEAN CONIDIA PER JUG		0.36804762D 07
VOLUME INOCULATED	1.87	
FIRST ISOLATE	4601	
LAST ISOLATE	4622	
BACKGROUND MEAN	3447.29	
CSS		0.29008514D 07
VAR. MEAN		0.69067891D 05
PURPLE MUTANT MEAN	3.14	
CSS		0.26857143D 02
VAR. MEAN		0.63945578D 00
MUTANT/SURVIVOR		0.55797528D-05
VARIANCE		0.15431744D-11
S.E.		0.12422452D-05
CI	0.28455706D-05	0.83139349D-05
C.V.		0.22263444D 02
SURVIVAL FRACTION		0.14733300D 00
VARIANCE		0.25909847D-04
S.E.		0.50901696D-02
CI	0.13612953D 00	0.15853646D 00
C.V.		0.34548742D 01
SURVIVAL RATIO	1.02340264	
VARIANCE		0.26019128D-02
S.E.		0.51008947D-01
CI	0.10924933D 08	-0.10924931D 08
C.V.		0.49842501D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 21

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9525.00	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.13530000D 04
MEAN CONIDIA PER JUG		0.37194375D 07
VOLUME INOCULATED	0.93	
FIRST ISOLATE	4001	
LAST ISOLATE	4062	
BACKGROUND MEAN	3019.87	
CSS		0.47581849D 07
VAR. MEAN		0.84967587D 05
PURPLE MUTANT MEAN	7.75	
CSS		0.97500000D 02
VAR. MEAN		0.17410714D 01
MUTANT/SURVIVOR		0.17318637D-04
VARIANCE		0.92904947D-11
S.E.		0.30480305D-05
CI	0.10734891D-04	0.23902384D-04
C.V.		0.17599713D 02
SURVIVAL FRACTION		0.12797706D 00
VARIANCE		0.49153558D-04
S.E.		0.70109554D-02
CI	0.11283339D 00	0.14312072D 00
C.V.		0.54782908D 01
SURVIVAL RATIO	0.88895266	
VARIANCE		0.33915616D-02
S.E.		0.58237117D-01
CI	-0.13114034D 16	0.13114034D 16
C.V.		0.65512056D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 22

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9603.12	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.10840000D 04
MEAN CONIDIA PER JUG		0.36943542D 07
VOLUME INOCULATED	0.96	
FIRST ISOLATE	4201	
LAST ISOLATE	4260	
BACKGROUND MEAN	3276.62	
CSS		0.34572319D 07
VAR. MEAN		0.61736283D 05
PURPLE MUTANT MEAN	7.50	
CSS		0.18000000D 02
VAR. MEAN		0.32142857D 00
MUTANT/SURVIVOR		0.15336100D-04
VARIANCE		0.50797952D-11
S.E.		0.22538397D-05
CI	0.10467806D-04	0.20204394D-04
C.V.		0.14696303D 02
SURVIVAL FRACTION		0.14120106D 00
VARIANCE		0.53006880D-04
S.E.		0.72805807D-02
CI	0.12547500D 00	0.15692711D 00
C.V.		0.51561801D 01
SURVIVAL RATIO	0.98080903	
VARIANCE		0.37991525D-02
S.E.		0.61637264D-01
CI	-0.13879690D 16	0.13879690D 16
C.V.		0.62843287D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 23

NUMBER OF JUGS 8.

MEAN JUG VOLUME 9562.50

MEAN SAMPLE VOLUME 60.00

DOSE 0.89000000D 03

MEAN CONIDIA PER JUG 0.37308333D 07

VOLUME INOCULATED 0.92

FIRST ISOLATE 4401

LAST ISOLATE 4444

BACKGROUND MEAN 3302.25

CSS 0.63421555D 07

VAR. MEAN 0.11325278D 06

PURPLE MUTANT MEAN 5.50

CSS 0.10000000D 02

VAR. MEAN 0.17857143D 00

MUTANT/SURVIVOR 0.12080230D-04

VARIANCE 0.77221009D-11

S.E. 0.27788665D-05

CI 0.60778778D-05 0.18082581D-04

C.V. 0.23003424D 02

SURVIVAL FRACTION 0.14064580D 00

VARIANCE 0.56313029D-04

S.E. 0.75041987D-02

CI 0.12443673D 00 0.15685487D 00

C.V. 0.53355298D 01

SURVIVAL RATIO 0.97695215

VARIANCE 0.39489271D-02

S.E. 0.62840462D-01

CI -0.14150631D 16 0.14150631D 16

C.V. 0.64322968D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 9

NUMBER OF JUGS 7.

MEAN JUG VOLUME 9492.86

MEAN SAMPLE VOLUME 60.00

DOSE 0.31360000D 04

MEAN CONIDIA PER JUG 0.39630714D 07

VOLUME INOCULATED 0.97

FIRST ISOLATE 3000

LAST ISOLATE 3145

BACKGROUND MEAN 3050.71

CSS 0.23931434D 07

VAR. MEAN 0.56979605D 05

PURPLE MUTANT MEAN 20.86

CSS 0.31485714D 03

VAR. MEAN 0.74965986D 01

MUTANT/SURVIVOR 0.44657441D-04

VARIANCE 0.51918700D-10

S.E. 0.72054618D-05

CI 0.28798216D-04 0.60516665D-04

C.V. 0.16134964D 02

SURVIVAL FRACTION 0.12146051D 00

VARIANCE 0.56292174D-04

S.E. 0.75028092D-02

CI 0.10494682D 00 0.13797419D 00

C.V. 0.61771595D 01

SURVIVAL RATIO 0.84368747

VARIANCE 0.36347723D-02

S.E. 0.60289074D-01

CI 0.12912520D 08 -0.12912519D 08

C.V. 0.71459013D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 10

NUMBER OF JUGS 8.

MEAN JUG VOLUME 9537.50

MEAN SAMPLE VOLUME 60.00

DOSE 0.28640000D 04

MEAN CONIDIA PER JUG 0.41228125D 07

VOLUME INOCULATED 0.99

FIRST ISOLATE 3201

LAST ISOLATE 3389

BACKGROUND MEAN 3082.62

CSS 0.31939839D 07

VAR. MEAN 0.57035426D 05

PURPLE MUTANT MEAN 23.62

CSS 0.46787500D 03

VAR. MEAN 0.83549107D 01

MUTANT/SURVIVOR 0.47517438D-04

VARIANCE 0.14570322D-10

S.E. 0.38171083D-05

CI 0.39272484D-04 0.55762393D-04

C.V. 0.80330684D 01

SURVIVAL FRACTION 0.11836327D 00

VARIANCE 0.68986844D-04

S.E. 0.83058290D-02

CI 0.10042267D 00 0.13630386D 00

C.V. 0.70172355D 01

SURVIVAL RATIO 0.82217346

VARIANCE 0.42010277D-02

S.E. 0.64815283D-01

CI -0.14595328D 16 0.14595328D 16

C.V. 0.78834074D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 25

NUMBER OF JUGS 8.

MEAN JUG VOLUME 9537.50

MEAN SAMPLE VOLUME 60.00

DOSE 0.24190000D 04

MEAN CONIDIA PER JUG 0.39022500D 07

VOLUME INOCULATED 0.91

FIRST ISOLATE 3401

LAST ISOLATE 3544

BACKGROUND MEAN 3273.62

CSS 0.63275479D 07

VAR. MEAN 0.11299193D 06

PURPLE MUTANT MEAN 18.00

CSS 0.21200000D 03

VAR. MEAN 0.37857143D 01

MUTANT/SURVIVOR 0.35318472D-04

VARIANCE 0.52543803D-11

S.E. 0.22922432D-05

CI 0.30367226D-04 0.40269717D-04

C.V. 0.64902105D 01

SURVIVAL FRACTION 0.13541984D 00

VARIANCE 0.33690540D-04

S.E. 0.58043525D-02

CI 0.12288244D 00 0.14795724D 00

C.V. 0.42861906D 01

SURVIVAL RATIO 0.94065163

VARIANCE 0.27675600D-02

S.E. 0.52607603D-01

CI -0.11846361D 16 0.11846361D 16

C.V. 0.55926766D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 11

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9625.00	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.20720000D 04
MEAN CONIDIA PER JUG		0.42166667D 07
VOLUME INOCULATED	1.00	
FIRST ISOLATE	3601	
LAST ISOLATE	3730	
BACKGROUND MEAN	3437.87	
CSS		0.22851189D 07
VAR. MEAN		0.40805694D 05
PURPLE MUTANT MEAN	16.25	
CSS		0.19950000D 03
VAR. MEAN		0.356250000D 01
MUTANT/SURVIVOR		0.29550187D-04
VARIANCE		0.998599510-11
S.E.		0.31600621D-05
CI	0.22724453D-04	0.36375922D-04
C.V.		0.10693882D 02
SURVIVAL FRACTION		0.13059938D 00
VARIANCE		0.53824966D-04
S.E.		0.73365495D-02
CI	0.11475243D 00	0.14644633D 00
C.V.		0.56175989D 01
SURVIVAL RATIO	0.90716782	
VARIANCE		0.36591808D-02
S.E.		0.60491163D-01
CI	-0.13621608D 16	0.13621608D 16
C.V.		0.66681337D 01

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 12

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9506.25	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.16790000D 04
MEAN CONIDIA PER JUG		0.40222500D 07
VOLUME INOCULATED	0.93	
FIRST ISOLATE	3801	
LAST ISOLATE	3874	
BACKGROUND MEAN	3510.87	
CSS		0.81079409D 07
VAR. MEAN		0.14478466D 06
PURPLE MUTANT MEAN	9.25	
CSS		0.79500000D 02
VAR. MEAN		0.14196429D 01
MUTANT/SURVIVOR		0.16800120D-04
VARIANCE		0.18505749D-11
S.E.		0.13603576D-05
CI	0.13861748D-04	0.19738493D-04
C.V.		0.80973087D 01
SURVIVAL FRACTION		0.13732543D 00
VARIANCE		0.90187583D-04
S.E.		0.94967112D-02
CI	0.11681253D 00	0.15783833D 00
C.V.		0.69154789D 01
SURVIVAL RATIO	0.95388822	
VARIANCE		0.55258816D-02
S.E.		0.74336231D-01
CI	-0.16739287D 16	0.16739287D 16
C.V.		0.77929708D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 1

NUMBER OF JUGS	11.	
MEAN JUG VOLUME	9543.18	
MEAN SAMPLE VOLUME	60.00	
DOSE	0.0	
MEAN CONIDIA PER JUG	0.42265152D 07	
VOLUME INOCULATED	1.00	
FIRST ISOLATE	1	
LAST ISOLATE	3	
BACKGROUND MEAN	3699.64	
CSS	0.43820925D 07	
VAR. MEAN	0.39837205D 05	
PURPLE MUTANT MEAN	0.27	
CSS	0.21818182D 01	
VAR. MEAN	0.19834711D-01	
MUTANT/SURVIVOR	0.49482711D-06	
VARIANCE	0.65609289D-13	
S.E.	0.25614298D-06	
CI 0.0	0.10309345D-05	
C.V.	0.51764137D 02	
SURVIVAL FRACTION	0.13914400D 00	
VARIANCE	0.55979562D-04	
S.E.	0.74819475D-02	
CI 0.12348428D 00	0.15480372D 00	
C.V.	0.53771254D 01	
SURVIVAL RATIO	1.00000000	
VARIANCE *	0.0	
S.E.	0.0	
CI 0.10000000D 01	0.10000000D 01	
C.V.	0.0	

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 19

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9537.50	
MEAN SAMPLE VOLUME	60.00	
DOSE	0.59700000D 03	
MEAN CONIDIA PER JUG	0.37957500D 07	
VOLUME INOCULATED	0.94	
FIRST ISOLATE	2601	
LAST ISOLATE	2626	
BACKGROUND MEAN	3361.50	
CSS	0.35914220D 07	
VAR. MEAN	0.64132536D 05	
PURPLE MUTANT MEAN	3.25	
CSS	0.23500000D 02	
VAR. MEAN	0.41964286D 00	
MUTANT/SURVIVOR	0.59202262D-05	
VARIANCE	0.95932794D-12	
S.E.	0.97945212D-06	
CI 0.38046095D-05	0.80358429D-05	
C.V.	0.16544167D 02	
SURVIVAL FRACTION	0.14319196D 00	
VARIANCE	0.11751132D-03	
S.E.	0.10840263D-01	
CI 0.11977699D 00	0.16660693D 00	
C.V.	0.75704410D 01	
SURVIVAL RATIO	1.02909189	
VARIANCE	0.91314952D-02	
S.E.	0.95558822D-01	
CI 0.10290919D 01	0.10290919D 01	
C.V.	0.92857424D 01	

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 16

NUMBER OF JUGS	7.	
MEAN JUG VOLUME	9600.00	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.13530000D 04
MEAN CONIDIA PER JUG		0.45416667D 07
VOLUME INOCULATED	1.00	
FIRST ISOLATE	2001	
LAST ISOLATE	2066	
BACKGROUND MEAN	3378.14	
CSS		0.22876249D 07
VAR. MEAN		0.54467259D 05
PURPLE MUTANT MEAN	9.43	
CSS		0.69714286D 02
VAR. MEAN		0.16598639D 01
MUTANT/SURVIVOR		0.18006316D-04
VARIANCE		0.71563980D-11
S.E.		0.26751441D-05
CI	0.12118323D-04	0.23894309D-04
C.V.		0.14856698D 02
SURVIVAL FRACTION		0.11887153D 00
VARIANCE		0.61689802D-04
S.E.		0.78542829D-02
CI	0.10158425D 00	0.13615881D 00
C.V.		0.66073707D 01
SURVIVAL RATIO	0.85430584	
VARIANCE		0.52965011D-02
S.E.		0.72777033D-01
CI	0.70875177D 00	0.99985990D 00
C.V.		0.85188500D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 17

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9665.62	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.10840000D 04
MEAN CONIDIA PER JUG		0.43007292D 07
VOLUME INOCULATED	0.97	
FIRST ISOLATE	2026	
LAST ISOLATE	2246	
BACKGROUND MEAN	3271.37	
CSS		0.18424759D 07
VAR. MEAN		0.32901355D 05
PURPLE MUTANT MEAN	5.75	
CSS		0.79500000D 02
VAR. MEAN		0.14196429D 01
MUTANT/SURVIVOR		0.11362208D-04
VARIANCE		0.72504537D-11
S.E.		0.26926664D-05
CI	0.55460481D-05	0.17178367D-04
C.V.		0.23698444D 02
SURVIVAL FRACTION		0.12300543D 00
VARIANCE		0.48589930D-04
S.E.		0.69706440D-02
CI	0.10794884D 00	0.13806202D 00
C.V.		0.56669401D 01
SURVIVAL RATIO	0.88401532	
VARIANCE		0.47692142D-02
S.E.		0.69059491D-01
CI	0.88401532D 00	0.88401532D 00
C.V.		0.78120242D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 18

NUMBER OF JUGS	7.	
MEAN JUG VOLUME	9546.43	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.89000000D 03
MEAN CONIDIA PER JUG		0.43333333D 07
VOLUME INOCULATED	1.00	
FIRST ISOLATE	2401	
LAST ISOLATE	2430	
BACKGROUND MEAN	3603.00	
CSS		0.15391060D 07
VAR. MEAN		0.36645381D 05
PURPLE MUTANT MEAN	4.29	
CSS		0.43428571D 02
VAR. MEAN		0.10340136D 01
MUTANT/SURVIVOR		0.75945271D-05
VARIANCE		0.29944138D-11
S.E.		0.17304374D-05
CI	0.37858336D-05	0.11403220D-04
C.V.		0.22785321D 02
SURVIVAL FRACTION		0.13238897D 00
VARIANCE		0.53801279D-04
S.E.		0.73349327D-02
CI	0.11624478D 00	0.14853316D 00
C.V.		0.55404409D 01
SURVIVAL RATIO	0.95145294	
VARIANCE		0.53962709D-02
S.E.		0.73459268D-01
CI	0.80453440D 00	0.10983715D 01
C.V.		0.77207463D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 5

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9468.75	
MEAN SAMPLE VOLUME	60.00	
DOSE		0.31360000D 04
MEAN CONIDIA PER JUG		0.41839583D 07
VOLUME INOCULATED	0.94	
FIRST ISOLATE	1000	
LAST ISOLATE	1159	
BACKGROUND MEAN	2824.75	
CSS		0.26988655D 07
VAR. MEAN		0.48194027D 05
PURPLE MUTANT MEAN	20.00	
CSS		0.29200000D 03
VAR. MEAN		0.52142857D 01
MUTANT/SURVIVOR		0.45944865D-04
VARIANCE		0.26972134D-10
S.E.		0.51934703D-05
CI	0.34726969D-04	0.57162762D-04
C.V.		0.11303701D 02
SURVIVAL FRACTION		0.10664225D 00
VARIANCE		0.25101413D-04
S.E.		0.50101280D-02
CI	0.95820371D-01	0.11746413D 00
C.V.		0.46980705D 01
SURVIVAL RATIO	0.76641642	
VARIANCE		0.29948515D-02
S.E.		0.54725237D-01
CI	0.76641642D 00	0.76641642D 00
C.V.		0.71404051D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 6

NUMBER OF JUGS	8.	
MEAN JUG VOLUME	9543.75	
MEAN SAMPLE VOLUME	60.00	
DOSE	0.28640000D 04	
MEAN CONIDIA PER JUG	0.40076042D 07	
VOLUME INOCULATED	0.99	
FIRST ISOLATE	1201	
LAST ISOLATE	1338	
BACKGROUND MEAN	3339.00	
CSS	0.20618640D 07	
VAR. MEAN	0.36819000D 05	
PURPLE MUTANT MEAN	17.25	
CSS	0.23950000D 03	
VAR. MEAN	0.42767857D 01	
MUTANT/SURVIVOR	0.31817232D-04	
VARIANCE	0.58261610D-11	
S.E.	0.24137435D-05	
CI	0.26603546D-04	0.37030918D-04
C.V.	0.75862773D 01	
SURVIVAL FRACTION	0.13237675D 00	
VARIANCE	0.50136084D-04	
S.E.	0.70806816D-02	
CI	0.11708248D 00	0.14767103D 00
C.V.	0.53488860D 01	
SURVIVAL RATIO	0.95136515	
VARIANCE	0.52064802D-02	
S.E.	0.72155893D-01	
CI	0.95136515D 00	0.95136515D 00
C.V.	0.75844583D 01	

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 20

NUMBER OF JUGS	7.	
MEAN JUG VOLUME	9607.14	
MEAN SAMPLE VOLUME	60.00	
DOSE	0.24190000D 04	
MEAN CONIDIA PER JUG	0.45156786D 07	
VOLUME INOCULATED	0.97	
FIRST ISOLATE	1401	
LAST ISOLATE	1507	
BACKGROUND MEAN	3620.57	
CSS	0.10371057D 07	
VAR. MEAN	0.24692993D 05	
PURPLE MUTANT MEAN	15.29	
CSS	0.91428571D 02	
VAR. MEAN	0.21768707D 01	
MUTANT/SURVIVOR	0.26273949D-04	
VARIANCE	0.52855247D-11	
S.E.	0.22990262D-05	
CI	0.21213791D-04	0.31334106D-04
C.V.	0.87502119D 01	
SURVIVAL FRACTION	0.12836371D 00	
VARIANCE	0.19274435D-04	
S.E.	0.43902621D-02	
CI	0.11870074D 00	0.13802668D 00
C.V.	0.34201738D 01	
SURVIVAL RATIO	0.92252423	
VARIANCE	0.34562115D-02	
S.E.	0.58789531D-01	
CI	0.80494513D 00	0.10401033D 01
C.V.	0.63726837D 01	

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 7

NUMBER OF JUGS	8.
MEAN JUG VOLUME	9612.50
MEAN SAMPLE VOLUME	60.00
DOSE	0.20720000D 04
MEAN CONIDIA PER JUG	0.38053437D 07
VOLUME INOCULATED	0.93
FIRST ISOLATE	1601
LAST ISOLATE	1710
BACKGROUND MEAN	3134.87
CSS	0.51217529D 07
VAR. MEAN	0.91459873D 05
PURPLE MUTANT MEAN	13.75
CSS	0.13150000D 03
VAR. MEAN	0.23482143D 01
MUTANT/SURVIVOR	0.28577373D-04
VARIANCE	0.11028079D-10
S.E.	0.33208544D-05
CI	0.21404328D-04 0.35750419D-04
C.V.	0.11620572D 02
SURVIVAL FRACTION	0.13289515D 00
VARIANCE	0.58802926D-04
S.E.	0.76683052D-02
CI	0.11633161D 00 0.14945869D 00
C.V.	0.57701918D 01
SURVIVAL RATIO	0.95509078
VARIANCE	0.56746599D-02
S.E.	0.75330237D-01
CI	0.95509078D 00 0.95509078D 00
C.V.	0.78872353D 01

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73 TREATMENT 8

NUMBER OF JUGS	7.
MEAN JUG VOLUME	9635.71
MEAN SAMPLE VOLUME	60.00
DOSE	0.16790000D 04
MEAN CONIDIA PER JUG	0.42991667D 07
VOLUME INOCULATED	0.96
FIRST ISOLATE	1801
LAST ISOLATE	1885
BACKGROUND MEAN	3407.57
CSS	0.66476677D 07
VAR. MEAN	0.15827780D 06
PURPLE MUTANT MEAN	12.14
CSS	0.10285714D 03
VAR. MEAN	0.24489796D 01
MUTANT/SURVIVOR	0.23118915D-04
VARIANCE	0.86936660D-11
S.E.	0.29485018D-05
CI	0.16629261D-04 0.29608569D-04
C.V.	0.12753634D 02
SURVIVAL FRACTION	0.12537978D 00
VARIANCE	0.13511337D-03
S.E.	0.11623826D-01
CI	0.99795731D-01 0.15096382D 00
C.V.	0.92708937D 01
SURVIVAL RATIO	0.90107928
VARIANCE	0.93262297D-02
S.E.	0.96572340D-01
CI	0.70793460D 00 0.10942240D 01
C.V.	0.10717408D 02

BIOSATELLITE FLIGHT CAE+LIE+CONRAD DOSIMETRY

EXPERIMENT 73

WEIGHTED REGRESSION ANALYSIS LOG MUTANTS ON LOG DOSE

NUMBER OF X= 9. NUMBER OF JUGS= 68.

X TOTAL= 0.50074679D 03 X MEAN= 0.73639234D 01

Y TOTAL= -0.74137327D 03 Y MEAN= -0.10902548D 02

XSS= 0.37071223D 04 XCSS= 0.19661315D 02 REC = 0.50861298D-01

XYSS= -0.54358163D 04 XYCSS= 0.23599661D 02

YSS= 0.81123912D 04 YCSS= 0.29533500D 02

REDUCTION SS= 28.32689593

RESIDUAL SS= 1.20660378

RESIDUAL MEAN SQUARE= 0.17237197

F= 164.33586140 WITH 1 AND 7 DEGREES OF FREEDOM

STANDARD ERROR OF SLOPE= 0.93632579D-01

CONSTANT = 0.26690816D-08 SLOPE= 0.12003094D 01PLUS OR MINUS 0.20224638D 00 95 PER CENT CONFIDENCE INTERVAL

OBSERVED		EXPECTED
DOSE	MR	MR
0.597000D 03	0.592023D-05	0.573309D-05
0.135300D 04	0.180063D-04	0.153069D-04
0.108400D 04	0.113622D-04	0.117310D-04
0.890000D 03	0.759453D-05	0.925852D-05
0.313600D 04	0.459449D-04	0.419850D-04
0.286400D 04	0.318172D-04	0.376529D-04
0.241900D 04	0.262739D-04	0.307447D-04
0.207200D 04	0.285774D-04	0.255302D-04
0.167900D 04	0.231189D-04	0.198344D-04

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73

WEIGHTED REGRESSION ANALYSIS LOG MUTANTS ON LOG DOSE

NUMBER OF X= 9. NUMBER OF JUGS= 70.

X TOTAL= 0.51552254D 03 X MEAN= 0.73646076D 01

Y TOTAL= -0.75480631D 03 Y MEAN= -0.10782947D 02

XSS= 0.38154040D 04 XCSS= 0.18782810D 02 REC = 0.53240171D-01

XYSS= -0.55361878D 04 XYCSS= 0.22664512D 02

YSS= 0.81676697D 04 YCSS= 0.28633090D 02

REDUCTION SS= 27.34841655

RESIDUAL SS= 1.28467373

RESIDUAL MEAN SQUARE= 0.18352482

F= 149.01753743 WITH 1 AND 7 DEGREES OF FREEDOM

STANDARD ERROR OF SLOPE= 0.98847806D-03

CONSTANT = 0.28683169D-08 SLOPE= 0.12066625D 01PLUS OR MINUS 0.21351127D 00 95 PER CENT CONFIDENCE INTERVAL

OBSERVED		EXPECTED
DOSE	MR	MR
0.597000D 03	0.557975D-05	0.641639D-05
0.135300D 04	0.173186D-04	0.172205D-04
0.108400D 04	0.153361D-04	0.131790D-04
0.890000D 03	0.120802D-04	0.103883D-04
0.313600D 04	0.446574D-04	0.474867D-04
0.286400D 04	0.475174D-04	0.425624D-04
0.241900D 04	0.353185D-04	0.347163D-04
0.207200D 04	0.295502D-04	0.287998D-04
0.167900D 04	0.168001D-04	0.223447D-04

BIOSATELLITE FLIGHT CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73

WEIGHTED REGRESSION ANALYSIS LOG SURVIVAL RATIO ON DOSE

NUMBER OF X= 9. NUMBER OF JUGS= 68.

X TOTAL= 0.12241100D 06 X MEAN= 0.18001618D 04

Y TOTAL= -0.63957643D 01 Y MEAN= -0.94055364D-01

XSS= 0.26994630D 09 XCSS= 0.49586703D 08 REC = 0.37044404D-08

XYSS= -0.13901384D 05 XYCSS= -0.23879726D 04

YSS= 0.10434894D 01 YCSS= 0.44193341D 00

REDUCTION SS= 0.71587744

RESIDUAL SS= 0.32761195

RESIDUAL MEAN SQUARE= 0.04680171

F= 15.29596848 WITH 1 AND 8 DEGREES OF FREEDOM

STANDARD ERROR OF SLOPE= 0.13167161D-04

CONSTANT = 0.10000000D 01 SLOPE= -0.51496848D-04PLUS OR MINUS 0.28059218D-04 95 PER CENT CONFIDENCE INTERVAL

OBSERVED		EXPECTED
DOSE	S	S
0.597000D 03	0.102909D 01	0.969724D 00
0.135300D 04	0.854306D 00	0.932697D 00
0.108400D 04	0.884015D 00	0.945707D 00
0.890000D 03	0.951453D 00	0.955202D 00
0.313600D 04	0.766416D 00	0.850872D 00
0.286400D 04	0.951365D 00	0.862874D 00
0.241900D 04	0.922524D 00	0.882876D 00
0.207200D 04	0.955091D 00	0.898794D 00
0.167900D 04	0.901079D 00	0.917169D 00

BIOSATELLITE GROUND CONTROL CAF+LIF+CONRAD DOSIMETRY

EXPERIMENT 73

WEIGHTED REGRESSION ANALYSIS LOG SURVIVAL RATIO ON DOSE

NUMBER OF X= 9. NUMBER OF JUGS= 70.

X TOTAL= 0.12501900D 06 X MEAN= 0.17859857D 04

Y TOTAL= -0.55241210D 01 Y MEAN= -0.78916014D-01

XSS= 0.27104871D 09 XCSS= 0.47766563D 08 REC = 0.36893738D-08

XYSS= -0.13162088D 05 XYCSS= -0.32960864D 04

YSS= 0.75461003D 00 YCSS= 0.31866842D 00

REDUCTION SS= 0.63914913

RESIDUAL SS= 0.11546089

RESIDUAL MEAN SQUARE= 0.01649441

F= 38.74943190 WITH 1 AND 8 DEGREES OF FREEDOM

STANDARD ERROR OF SLOPE= 0.78008998D-05

CONSTANT = 0.10000000D 01 SLOPE= -0.48559860D-04PLUS OR MINUS 0.16623716D-04 95 PER CENT CONFIDENCE INTERVAL

OBSERVED		EXPECTED
DOSE	S	S
0.597000D 03	0.102340D 01	0.971426D 00
0.135300D 04	0.888953D 00	0.936410D 00
0.108400D 04	0.980809D 00	0.948723D 00
0.890000D 03	0.976952D 00	0.957702D 00
0.313600D 04	0.843687D 00	0.858745D 00
0.286400D 04	0.822173D 00	0.870162D 00
0.241900D 04	0.940652D 00	0.889171D 00
0.207200D 04	0.907168D 00	0.904280D 00
0.167900D 04	0.953688D 00	0.921703D 00

V. ASSAYS WITH UNIRRADIATED CONIDIA

Samples of unirradiated conidia were assayed for heterokaryotic survival and forward-mutation frequency in the ad-3 region after the following three types of treatment: (1) incubation in the aft compartment of the ground-control vehicle at a temperature of 72° F; (2) incubation in the aft compartment of the flight vehicle (subjected to flight accelerations and vibrations) at a temperature of about 64-66° F; (3) incubation in one of three different controlled temperature incubators operating in the temperature range of 64-72° F. The data from the various ground-control samples of unirradiated conidia can be used as a basis of comparison to ascertain the effect of flight alone on the unirradiated conidia in the aft compartment of the flight vehicle. The appropriate data are taken from the print-outs and summarized in Table 4. The heterokaryotic survival estimates and ad-3 mutation frequencies in the flight samples are not different from the comparable ground-control samples. Furthermore, the flight samples exhibit the same ad-3 mutation frequency (0.5×10^{-6}) as have been obtained from control conidia (not subjected to a mutagenic treatment) in a large number of experiments in the laboratory (ca. 0.4×10^{-6}). It is concluded that there is no detectable effect of flight by itself upon the survival of heterokaryotic conidia and none upon frequency of specific locus mutations in the ad-3 region.

Table 4. Results of assays with unirradiated conidia

Sample Location	Treatment Numbers	Average Heterokaryotic Surviving Proportion		ad-3 Mutants	Colonies Tested	ad-3 Mutation Frequency
		Plate Data	Flask Data			
Ground-Control Vehicle	3, 4	0.1688	0.1332	2	7, 250, 756	0.3×10^{-6}
Ground-Control Incubators	13, 14, 15	0.1744	0.1550	4	7, 825, 941	0.6×10^{-6}
Flight Vehicle	1, 2	0.1756	0.1391	3	6, 467, 852	0.5×10^{-6}

VI. DOSE-RESPONSE CURVES FOR SURVIVAL OF IRRADIATED CONIDIA ASSAYED IN LIQUID MEDIUM

In previous experiments with ionizing radiation at low dose rates, but with higher total doses, the heterokaryotic survival estimates from assays involving liquid medium were about 70% of the unirradiated controls after exposure to 20,000 Roentgens, about 82% after 10,000 Roentgens, and about 92% after 5000 Roentgens. In the Biosatellite II experiment, where the maximum exposure is estimated to be 3136 Roentgens, it is not surprising that the total effect on heterokaryotic survival should be a small one. In the print-outs on pp. 55 and 56 the estimates of the slopes of the survival curves (logarithm of percent survival vs. exposure) are shown for ground-control samples and for flight samples, respectively. In both cases, the slopes are different from zero (at 95% confidence level) but are not different from each other. In Figs. 7 and 8, a plot of the estimates of heterokaryotic surviving proportion for ground-control and flight samples, respectively, with the regression line transposed to the different position on the graph (from 100% at zero dose to 0.1440 or to 0.1391) will give some indication of dispersion about the line. There appears to be no detectable difference between flight and ground-control samples with respect to nuclear inactivation as assayed in liquid culture.

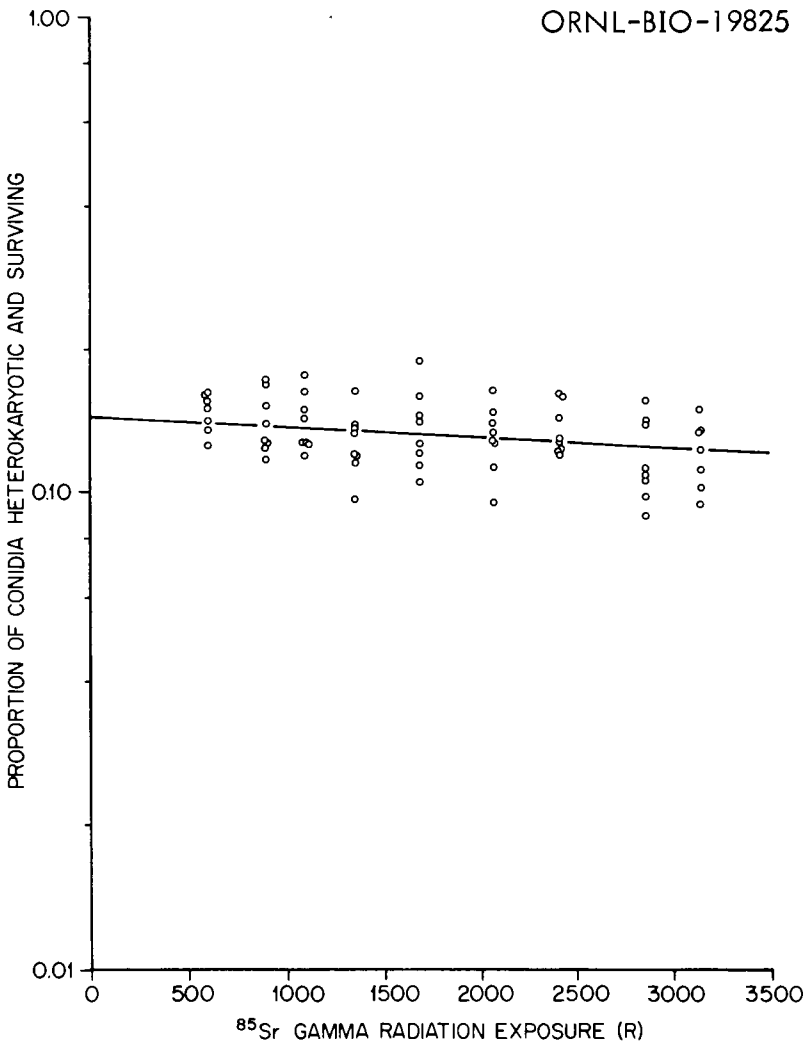

Fig. 7. Survival of Heterokaryotic Conidia in the Ground-Control Vehicle

Estimates (based on assays in liquid medium) of proportion of heterokaryotic and viable conidia from the ground-control vehicle plotted on a logarithmic scale against ^{85}Sr gamma radiation exposure on a linear scale. Each point represents the estimate from a single assay flask (jug), except the zero dose estimate which is the mean of data from 24 jugs.

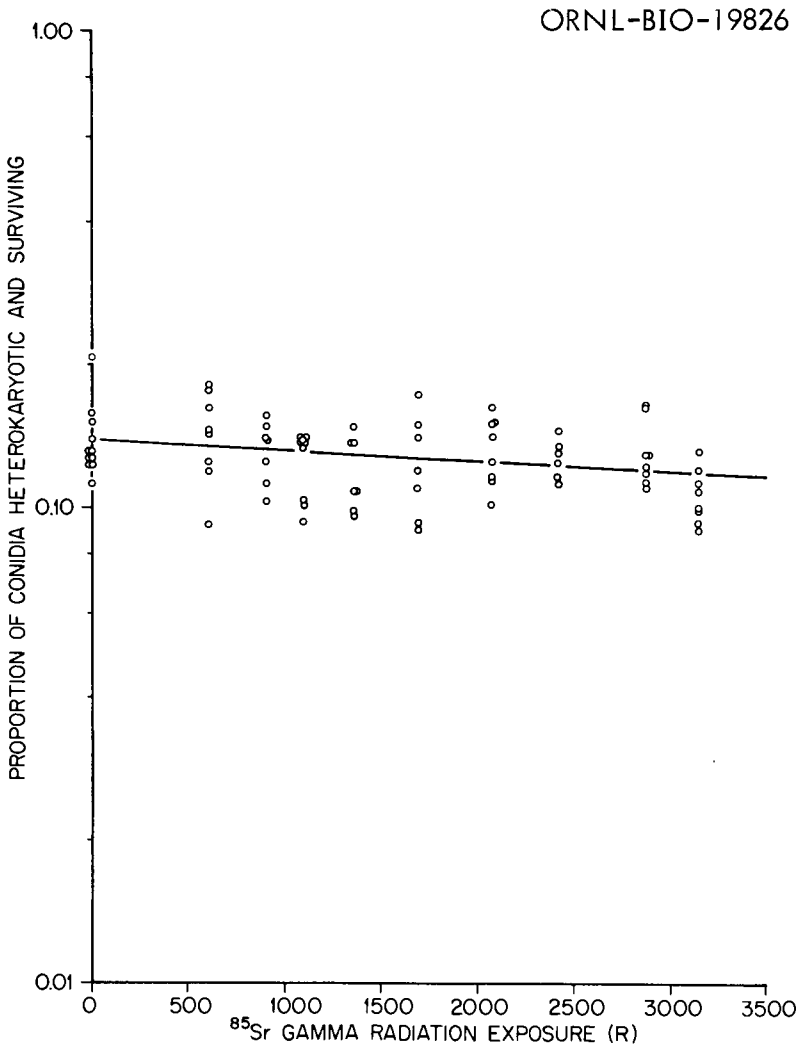

Fig. 8. Survival of Heterokaryotic Conidia from the Flight Vehicle

Estimates (based on assays in liquid medium) of proportion of heterokaryotic and viable conidia from the flight vehicle plotted on a logarithmic scale against ^{85}Sr gamma radiation exposure on a linear scale. Each point represents the estimate from a single assay flask (jug).

VII. DOSE-RESPONSE CURVES FOR SPECIFIC LOCUS MUTATIONS IN THE ad-3 REGION

The estimated frequency of gamma-radiation-induced specific locus mutations in the ad-3 region for each dose point is plotted for the conidia from the flight vehicle (Fig. 9) and from the ground control vehicle (Fig. 10), and the estimated regression line is included in each figure. Visual inspection of the plots and consideration of the slopes with standard errors of the regression lines in these log-log plots (1.2003 ± 0.0936 for flight, and 1.2067 ± 0.0988 for the ground-control vehicle) indicate that there is no detectable effect attributable to the accelerations, vibrations, and weightlessness occurring in orbital flight upon the induction of specific locus mutations in the ad-3 region. After mutants are obtained from such an experiment, they are subjected to a series of tests designed to classify them as resulting from point mutations or multilocus deletions. The genetic analysis is not complete until this classification has been made. It is possible to obtain marked differences in the spectrum of mutations without marked differences in the overall induction curves. When these genetic tests have been completed, it will be possible to determine whether the spectrum of mutant types is the same or different in the flight and ground-control samples.

VIII. INDUCTION OF RECESSIVE LETHAL MUTATIONS IN THE GENERAL POPULATION

Conidia from the aft compartments (unirradiated) and from three different radiation exposures in the forward compartments of both the flight vehicle and the ground-control vehicle were plated in minimal medium so that only heterokaryotic conidia would be detected as colonies. About 200 colonies from each group were isolated onto slants

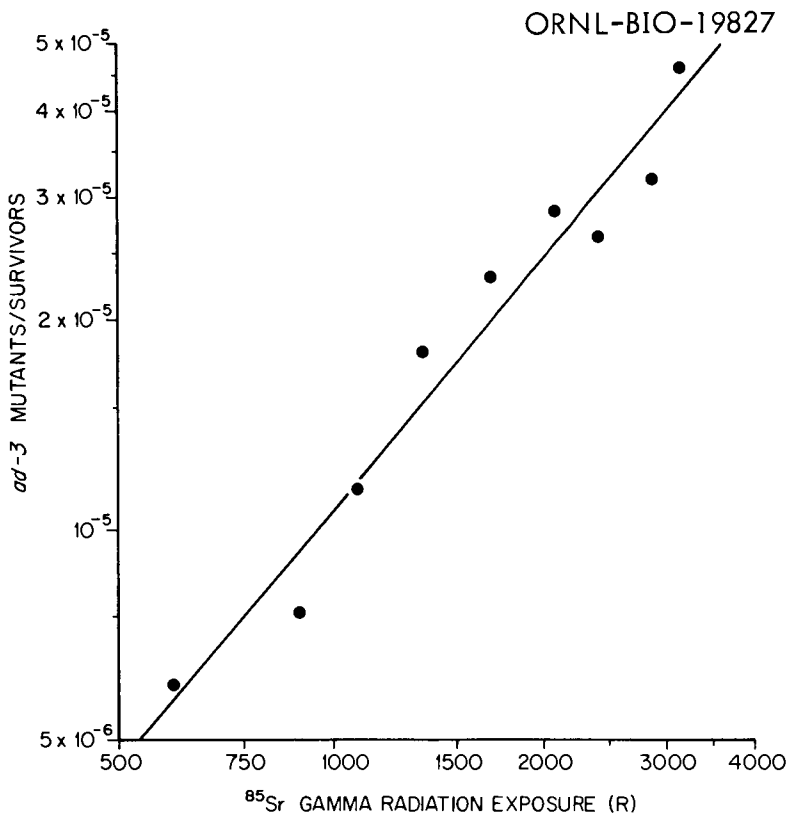

Fig. 9. ad-3 Mutation Frequency in Conidia from the Flight Vehicle

Estimated frequency of specific locus mutations in the ad-3 region induced in conidia from the flight vehicle, plotted on a logarithmic scale against logarithm of gamma radiation exposure.

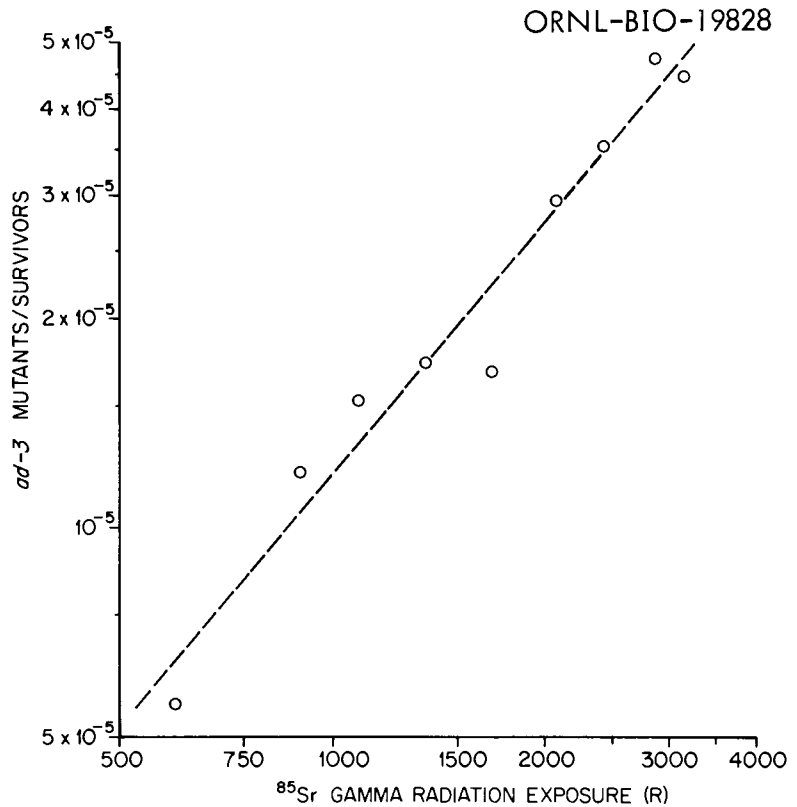

Fig. 10. ad-3 Mutation Frequency in Conidia from the Ground-Control Vehicle

Estimated frequency of specific locus mutation in the ad-3 region induced in conidia from the ground-control vehicle, plotted on a logarithmic scale against logarithm of gamma radiation exposure.

of minimal medium and allowed to form cultures and conidia. Conidia from each culture were then plated in medium supplemented with pantothenic acid, and the plates were incubated at 35° C so that colonies were formed. Each plate was examined for colonies homokaryotic for component 2, i.e., homokaryotic for the cot marker and therefore colonial in morphology at 35° C. The absence of cot colonies was attributed to the presence of a recessive lethal mutant site in the original heterokaryotic conidium from which the colony in the minimal medium was derived. The results from such tests for conidia from the flight and control vehicles subjected to gamma radiation exposures of 0, 890, 2072, and 3136 Roentgens are shown in Table 5. There is no obvious difference between comparable samples from the different vehicles.

The detection of 4.0 and 6.5% recessive lethal mutations in the two unirradiated samples was unexpected and subjected to further examination. Cultures of 21 strains containing such recessive lethal mutations were cultured in all possible combinations in pairs, and the resulting trikaryotic cultures were plated to see whether in each such culture the recessive lethal mutations in each strain were identical or different. Among the 13 recessive lethal mutations from the flight vehicle, 12 of the recessive lethal mutants were identical by this test and the 13th was different. Among the unirradiated conidia from the ground-control vehicle, there were seven identical and one different recessive lethal mutant present. Such results indicate that a high background of identical recessive lethal mutations arose in the population during the growth of the cultures from which the conidia were harvested several days before the flight.

Tests are in progress to adjust the remaining data for preexisting recessive lethal mutations of spontaneous origin. Even in the absence of these data, it seems likely that the increase in recessive lethals from about 5% in the unirradiated samples to about 9% in the 3136 Roentgen samples is due to induced recessive lethals. However, this has not as yet been verified by direct trikaryon tests. The difference between

Table 5. The effect of gamma radiation upon the incidence of recessive lethal mutants in the heterokaryotic conidial population in both the flight and ground-control vehicles

Treatment Number	Test Position	Gamma Radiation Exposure (Roentgens)	Conidia Tested	Conidia Carrying Recessive Lethals	Percent Recessive Lethals
1	Flight vehicle - aft	Unirradiated	200	13	6.5
3	Control vehicle - aft	Unirradiated	199	8	4.0
18	Flight vehicle - fore	890	199	9	4.5
23	Control vehicle - fore	890	176	9	5.1
7	Flight vehicle - fore	2072	199	14	7.0
11	Control vehicle - fore	2072	199	13	6.5
5	Flight vehicle - fore	3136	198	20	10.1
9	Control vehicle - fore	3136	199	17	8.5

pairs of samples receiving the same gamma radiation exposure in the flight and ground-control vehicle is not statistically significant. Thus we have tentatively concluded that the effect of gamma radiation in flight, as indicated by incidence of recessive lethal mutations, is not different from that in the ground-control vehicle.

IX. SUMMARY

The assays completed thus far with conidia from heterokaryotic cultures of Neurospora crassa fail to reveal a difference between those conidia subjected to orbital flight and exposed to gamma radiation in the weightless condition and those conidia similarly irradiated in a duplicate vehicle on the ground under normal gravity conditions. The assays provide estimates of survival of each type of conidia obtained in a heterokaryotic culture, estimates of the incidence of specific locus mutations in the ad-3 region among surviving heterokaryotic conidia, and estimates of the incidence of recessive lethal mutations among the surviving heterokaryotic conidia. The results with specific locus mutations must be considered tentative pending the completion of tests permitting the classification of mutants and estimation of the incidence of ad-3 mutants from each of the different distinguishable classes.

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