



**¹⁴CO₂ PRODUCTION TEST IN SOIL
FROM A SEPTIC TANK DRAINAGE FIELD**

V 2648G

**THE SOAP AND DETERGENT ASSOCIATION (SDA)
New York, NY**

FINAL REPORT

WESTON Study N° 96-001

Kay H. Marks 6/14/96
Kay H. Marks Date
Study Director

WESTON W.O. N° 05821-007-001

Kathleen C. Crapo 6/14/96
Kathleen C. Crapo Date
Quality Assurance Coordinator

Jon Doi 6-14-96
Jon Doi, Ph.D. Date
Laboratory Manager

Testing Facility
ROY F. WESTON, INC.
Fate and Effect Laboratory
254 Welsh Pool Road
Lionville, Pennsylvania 19341-1345

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PROJECT PARTICIPANTS

The following staff members of The Soap and Detergent Association (SDA) and Roy F. Weston, Inc., had major roles in the execution of this testing program:

Alvaro J. DeCarvalho Principal Investigator	The Soap and Detergent Association
Drew McAvoy, Ph.D. Alternate Principal Investigator	The Soap and Detergent Association
Jon Doi, Ph.D. Laboratory Manager	Roy F. Weston, Inc.
Kay H. Marks Study Director	Roy F. Weston, Inc.
Kathleen C. Crapo Quality Assurance Coordinator	Roy F. Weston, Inc.
John Hash Associate Project Scientist	Roy F. Weston, Inc.



COMPLIANCE STATEMENT

WESTON Study N° 96-001

Referenced Study: ¹⁴CO₂ Production Test in Soil from a Septic Tank Drainage Field: V 2648G

Compliance Statement

The above-referenced study was conducted in accordance with all pertinent United States Environmental Protection Agency (USEPA) Good Laboratory Practice (GLP) Regulations (40 CFR, Part 792) with the following exceptions: the Sponsor accepted full responsibility for appropriate characterization and stability verification of the test substance in addition to collection (with appropriate documentation) of the test system. The dosing solutions were assayed by WESTON using liquid scintillation counting (LSC), but were not analyzed for stability or uniformity. The purity of the dosing solution prepared from the primary solution of the radiolabelled material was determined by WESTON.

Kay H. Marks 6/14/96
Kay H. Marks Date
Study Director

Quality Assurance Statement

<u>Type of Audit</u>	<u>Date of Audit</u>	<u>Date Findings Reported to Management and Study Director</u>
Calculations	18 January 1996	18 January 1996
Spike test flasks	19 January 1996	19 January 1996
Raw data/draft report	12 April 1996	12 April 1996

Results: The Quality Assurance Unit reviewed this report for accuracy and adherence to Environmental Protection Agency Good Laboratory Practice Regulations (EPA GLP) and laboratory SOPs. The Quality Assurance Review indicates that the final report accurately presents the raw data as developed during Study N° 96-001.

Kathleen C. Crapo
Kathleen C. Crapo
Quality Assurance Coordinator

6/14/96
Date



¹⁴CO₂ PRODUCTION TEST IN SOIL FROM A SEPTIC TANK DRAINAGE FIELD

V 2648G

1.0 EXECUTIVE SUMMARY

Roy F. Weston, Inc. (WESTON®) conducted a ¹⁴CO₂ production test on test substance V 2648G using soil collected from the Jacksonville, Florida SDA septic tank field study site as the test system. The test was designed to determine the rate and extent of ultimate biodegradation of the test substance in three distinct soil samples.

The test system consisted of soil (core) samples collected and shipped to WESTON by Ayres Associates, 3901 Coconut Palm Drive, Tampa, Florida 33619. The chain of custody accompanying the samples identified the collection sites as follows:

- Soil from Site 1, consisting of cores SC1-A through D, was collected one foot below the trench (gravel).
- Soil from Site 2, consisting of cores SC2-A through D, was collected four feet below the trench.
- Soil from Site 3, consisting of cores SC3-A through D, was collected down gradient 20 feet and four feet below ground surface.

The samples from each designated site were composited, passed through a 2 mm screen, and refrigerated at ~4°C. An aliquot of each composited sample was sent to A & L Great Lakes Laboratories, Inc., 3505 Conestoga Drive, Fort Wayne, Indiana 46808-4413 for characterization.

The test apparatus consisted of 27 glass 500-mL Erlenmeyer flasks each containing 100 g dry weight equivalent of the appropriate soil. The test substance was dosed to triplicate flasks (for each soil) at concentrations of 50 and 2000 $\mu\text{g}/\text{kg}$. The water content of each treatment was adjusted to approximately 30% with deionized water.

During the study the flasks were aerated continuously with a CO_2 -free air source. CO_2 evolved from the flasks was trapped in 1.5 N KOH. Samples were periodically collected and assayed for ^{14}C activity by liquid scintillation counting (LSC). After 45 days the contents of the flasks containing soil from sites 1 and 2 were acidified with 1 N hydrochloric acid (HCl) and allowed to incubate for three days. A final set of samples was collected and analyzed on day 48. The remaining flasks were acidified on day 59 and treated as above.

The cumulative percent (%) T^{14}CO_2 produced for the individual test flasks was as follows:

Soil Site #	Concentration ($\mu\text{g}/\text{kg}$)	Flask #	Final % T^{14}CO_2	Centrate % $\text{H}^{14}\text{CO}_3^-$ & $^{14}\text{CO}_3^-$	Soil % ^{14}C	Mass Balance (%)
1	50	1	68.85	na	na	nc
		2	71.70	na	na	nc
		3	70.39	4.09	35.06	109.54
1	2000	4	53.92	na	na	nc
		5	73.16	4.86	28.07	106.09
		6	75.11	na	na	nc
2	50	10	22.76	na	na	nc
		11	68.37	6.36	25.35	100.08
		12	49.85	na	na	nc
2	2000	13	74.68	na	na	nc
		14	72.86	8.32	27.15	108.33
		15	71.53	na	na	nc
3	50	19	78.46	na	na	nc
		20	69.86	6.81	15.56	92.23
		21	76.34	6.97	18.76	102.07
3	2000	22	74.50	8.90	21.74	105.14
		23	68.35	na	na	nc
		24	83.47	na	na	nc

na = not analyzed; nc = not calculated

A first order statistical model was applied to the mineralization data. All data points were included in the analysis for Site 3 treatments. Only the data points up to the point of deflection from first order were used for the treatments from Sites 1 and 2.

Parameter Estimates (\pm standard error)

Soil Site #	Concentration ($\mu\text{g}/\text{kg}$)	Flask #	Asymptote % TCO_2	Rate Day^{-1}	Lag Days
1	50	1	38.2 ± 0.7	2.01 ± 0.28	0.11 ± 0.03
		2	37.2 ± 1.8	2.09 ± 1.02	0.00 ± 0.14
		3	37.1 ± 1.3	2.17 ± 0.77	0.00 ± 0.10
1	2000	4	not analyzed	not analyzed	not analyzed
		5	35.4 ± 0.9	0.74 ± 0.10	0.21 ± 0.05
		6	34.6 ± 1.3	0.88 ± 0.19	0.14 ± 0.09
2	50	10	not analyzed	not analyzed	not analyzed
		11	38.4 ± 3.0	0.41 ± 0.12	0.05 ± 0.22
		12	23.8 ± 0.9	0.62 ± 0.11	0.20 ± 0.09
2	2000	13	42.4 ± 5.1	0.20 ± 0.07	0.22 ± 0.34
		14	32.0 ± 0.6	0.52 ± 0.05	0.71 ± 0.08
		15	30.6 ± 0.8	0.55 ± 0.08	0.73 ± 0.10
3	50	19	77.9 ± 0.6	0.09 ± 0.00	5.2 ± 0.2
		20	68.5 ± 0.9	0.09 ± 0.01	5.1 ± 0.3
		21	75.6 ± 0.8	0.09 ± 0.00	6.6 ± 0.2
3	2000	22	74.1 ± 0.9	0.08 ± 0.00	9.1 ± 0.2
		23	67.0 ± 0.8	0.10 ± 0.01	9.1 ± 0.2
		24	84.2 ± 0.5	0.08 ± 0.00	9.8 ± 0.1

The data from flasks 4 (site 1 @ 2000 $\mu\text{g}/\text{kg}$) and 10 (site 2 @ 50 $\mu\text{g}/\text{kg}$) was not included in the respective analyses. In both cases the final $^{14}\text{CO}_2$ evolved was considerably less than other flasks of the same treatment. There were no visual observations during test set-up or throughout the sampling period to explain the lower results.

2.0 INTRODUCTION

WESTON conducted a $^{14}\text{CO}_2$ production test on test substance V 2648G using soil collected from a septic tank drainage field. Many synthetic chemicals may reside in soil as a result of their discharge from septic tank systems, amendments of sewage sludge to soil, or

landfilling of industrial and consumer wastes. This test system was designed to determine the ultimate biodegradation of ^{14}C -labelled substrate in soil by monitoring $^{14}\text{CO}_2$ production.

3.0 OBJECTIVE

The objective of this study was to determine the rate and extent of ultimate biodegradation of the test substance in soils of the saturated and unsaturated zones at the Jacksonville, Florida SDA septic tank field study site.

4.0 PROCEDURE

4.1 TEST SET-UP

CO_2 -free air was provided to the test flasks through a scrubbing apparatus prepared as follows:

One empty 1-liter plastic bottle to prevent backflow into the air line.

Three 1-liter plastic bottles containing 700 mL 10 N NaOH (EM Science, Lot 35214).

One empty 1-liter plastic bottle to prevent liquid carryover into the test containers.

Two 1-liter plastic bottles containing deionized water used to saturate the CO_2 -free air.

Twenty-seven glass 500-mL Erlenmeyer flasks were used as the test vessels for this study. Triplicate flasks were required for each treatment (test substance concentration/test system). All flasks were pretreated with the unlabelled form of the test substance using a rinsing solution prepared at a concentration of 5 mg active/L. The flasks were filled with the rinsing solution and allowed to stand overnight. The following day the flasks were rinsed five times with deionized water and allowed to air dry. Prior to use, the flasks were identified by test substance identification number (TSIN), test concentration, study number, replicate number, and soil collection site.

4.2 SOIL ADDITION

One hundred grams dry weight equivalent of the appropriate soil was added to each test flask. Twelve milliliters of deionized water was added to the flasks containing soil from sites 1 and 3. Flasks containing Site 2 soil received 11 mL water. The test vessels were connected to the scrubbing train and purged overnight with CO₂-free air.

4.3 TEST SUBSTANCE ADDITION

The test substance was dosed to the flasks via dosing solutions using an Eppendorf microliter pipette. Each solution was added drop by drop thus distributing the test substance over the surface of the soil. The volume of the primary solution added to the flasks dosed at a concentration of 2000 µg/kg was 193 µL. Ninety-three microliters of the subsequent solution was added to each of the flasks dosed at 50 µg/kg. No additional deionized water was added (Protocol Amendment #2). The flasks were shaken gently to mix.

Three alkali traps containing 100 mL of 1.5 N KOH were connected to each of the flasks and the air flow was adjusted to 1-2 bubbles/second.

4.4 ¹⁴CO₂ MEASUREMENTS

Samples were periodically collected and assayed for ¹⁴C activity by the following procedure:

- a. The first two alkali traps in each train were removed and capped tightly. The third trap was moved two slots closer to the test flask and two new traps containing fresh caustic were added to the second and third slots. Starting on day 7, only the first trap was removed when sampling.

- b. To determine the amount of $^{14}\text{CO}_2$ in the sacrificed traps, 1 mL of alkali was transferred to a vial, 15 mL Ultima Gold was added, and the vial was counted by LSC.
- c. The background ^{14}C -activity evolved from the soil and from the Ultima Gold cocktail was determined by counting the alkali traps from the blank soil treatments. The average of the respective replicates was used to correct for background levels in the respective flasks.

4.5 TEST TERMINATION

To terminate the study, all three alkali traps were removed, subsampled, and assayed by LSC. One new trap was added to the first alkali position and 100 mL of 1 N HCl (1 mL/g dry weight soil) was added to each flask. The flasks were then purged for 3 days and the traps were assayed to determine the final $^{14}\text{CO}_2$ produced. The flasks containing Site 1 and Site 2 soils were terminated on day 45. The remaining flasks were terminated on day 59. A mass balance was determined on one flask per treatment using the following procedure:

- a. The flask contents were transferred to a pre-weighed centrifuge tube.
- b. The tubes were centrifuged for ~30 minutes @ ~5000 rpm.
- c. The centrate was transferred to a graduate cylinder and the volume was documented.
- d. Triplicate one milliliter aliquots of the centrate were cocktailed with Ultima Gold and assayed by LSC.
- e. The weight of the remaining soil pellet was documented; five aliquots of the soil pellet were combusted using a Packard Sample Oxidizer.

5.0 EXPERIMENTAL PROTOCOL

The measurements of the CO₂ evolution were determined in accordance with the following protocol and referred test methods:

WESTON protocol entitled "¹⁴CO₂ Production Test in Soil from a Septic Tank Drainage Field," signed by Mr. Alvaro J. DeCarvalho (Sponsor) on 16 January 1996 and by Ms. K. H. Marks (Study Director) on 18 January 1996.

Ms. Marks' protocol amendment #1 dated 18 January 1996: Test system information.

Ms. Marks' protocol amendment #2 dated 16 April 1996: Study information.

Ms. Marks' protocol amendment #3 dated 20 May 1996: Statistics.

The water content of the soil was performed per Methods of Soil Analysis, Volume 1, Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling. Ed. C.A. Black, Am. Soc. Agron., Madison, Wisconsin, pages 82-96.

Samples generated during testing were counted by LSC per WESTON SOP 16-16-FE007.

Combustions were performed per WESTON SOP 16-16-FE051.

RAD-TLC analysis was performed per WESTON SOP 16-16-FE031.

6.0 TEST SUBSTANCE

6.1 RADIOLABELLED

CLIENT TSIN	V 2648G^a
Test substance name	dodecylbenzene sulfonic acid, sodium salt [Ring- ¹⁴ C(U)]
Specific activity, $\mu\text{Ci}/\text{mg}$	77.0
Radiochemical concentration, $\mu\text{Ci}/\text{mL}$	93.3
Purity, %	>92 ^b
CAS number	25155-30-0
Molecular formula	$\text{C}_{18}\text{H}_{29}\text{SO}_3\text{Na}$
Molecular weight	348 mg/mmole
Lot number	2599-075 (8/3/89)
Sample form	Methanol solution (clear)
Storage conditions	Refrigerate ($\sim 4^\circ\text{C}$) in the dark in a closed container
Date received	12/06/95
Expiration date	01/01/2000
WESTON TSIN	FE95-0140

6.2 UNLABELLED

CLIENT TSIN	V 2649G
Test substance name	dodecylbenzene sulfonic acid, sodium salt
Percent active	54.08
Sample form	White slurry
Storage conditions	Refrigerate ($\sim 4^\circ\text{C}$) in the dark in a closed container
Lot number	VO-382-167-2
Date received	12/06/95
Expiration date	01/01/2000
WESTON TSIN	FE95-0139

7.0 TEST CONDITIONS

7.1 TEMPERATURE RANGE

22.5°C - 23.0°C

^a Provided by Vista Chemical Company, Austin, Texas.

^b RAD-TLC analysis performed by WESTON on 7 February 1996.

7.2 TEST SYSTEM

The test system used in this study consisted of soil samples obtained from the saturated and unsaturated zones at the Jacksonville, Florida SDA septic tank field study site. The samples were collected on 16 January 1996 and shipped overnight to WESTON by Ayres Associates. Per a chain of custody included with the samples, WESTON treated the soils as follows:

- Cores SC1-A through SC1-D, collected one foot below the trench, were screened, composited, and identified as Site 1.
- Cores SC2-A through SC2-D, collected four feet below the trench, were screened, composited, and identified as Site 2.
- Cores SC3-A through SC3-D, collected down gradient 20 feet and 4 feet below the ground surface, were screened, composited, and identified as Site 3.

The dry weight fraction of sieved soils was determined in percent to be 77.9, 75.9, and 77.3 for Sites 1, 2, and 3, respectively. The soils were stored at approximately 4°C.

An approximately one kilogram aliquot of each composited soil was sent to A & L Great Lakes Laboratories, Inc., 3505 Conestoga Drive, Fort Wayne 46808-4413 for the following analyses: pH, cation exchange capacity (CEC), organic matter (O.M.), water holding capacity (WHC), bulk density, textural classification (Table 26).

7.3 TEST SUBSTANCE PREPARATION/ADDITION

A primary solution of V 2648G was provided at a radiochemical concentration of 93.3 $\mu\text{Ci/mL}$. On 18 January 1996, a subsequent solution was prepared by adding 73 μL of the primary solution to 1427 μL methanol. Both solutions were assayed for ^{14}C activity.

The 19 January 1996 results were used to determine appropriate spiking volumes and to calculate the dpm in initial spike for use in data reduction.

7.4 TEST DESIGN

7.4.1 Site 1

Flask N ^o	Concentration (µg/kg)	Primary Solution (µL)	Subsequent Solution (µL)	Site 1 Soil (g)	DI Water (mL)
1	50	-	93	128.4	12
2	50	-	93	128.4	12
3	50	-	93	128.5	12
4	2000	193	-	128.5	12
5	2000	193	-	128.4	12
6	2000	193	-	128.4	12
7	blank	-	-	128.5	12
8	blank	-	-	128.5	12
9	blank	-	-	128.4	12

7.4.2 Site 2

Flask N ^o	Concentration (µg/kg)	Primary Solution (µL)	Subsequent Solution (µL)	Site 2 Soil (g)	DI Water (mL)
10	50	-	93	131.9	11
11	50	-	93	131.8	11
12	50	-	93	131.8	11
13	2000	193	-	131.7	11
14	2000	193	-	131.7	11
15	2000	193	-	131.9	11
16	blank	-	-	131.8	11
17	blank	-	-	131.8	11
18	blank	-	-	131.8	11

7.4.3 Site 3

Flask Nº	Concentration (µg/kg)	Primary Solution (µL)	Subsequent Solution (µL)	Site 3 Soil (g)	DI Water (mL)
19	50	-	93	129.4	12
20	50	-	93	129.4	12
21	50	-	93	129.4	12
22	2000	193	-	129.6	12
23	2000	193	-	129.8	12
24	2000	193	-	129.5	12
25	blank	-	-	129.4	12
26	blank	-	-	129.4	12
27	blank	-	-	129.3	12

8.0 MISCELLANEOUS STUDY INFORMATION

8.1 FACILITY AND PERSONNEL

The testing was performed at WESTON's Laboratory, 254 Welsh Pool Road, Lionville, Pennsylvania 19341-1345. Ms. Marks was the Study Director and conducted the study. Mr. Hash sieved and composited the soils.

8.2 STUDY DATES

Soil collected: 16 January 1996

Soil added to test flasks: 18 January 1996

Test substance added to test flasks: 19 January 1996

Flasks containing soils from Site 1 and 2 acidified: 4 March 1996

Flasks containing soil from Site 3 acidified: 18 March 1996

Final data collected: 10 April 1996

8.3 DATA STORAGE

Test data may be found in WESTON Laboratory Notebook FE574. A copy of the final report, protocol, and all pertinent raw data and documentation will be maintained at Roy F. Weston, Inc., 254 Welsh Pool Road, Lionville, Pennsylvania 19341-1345.

9.0 RESULTS

The cumulative percent (%) $T^{14}CO_2$ produced for all test flasks and final mass balance values for one flask per treatment follows:

Soil Site #	Concentration ($\mu\text{g}/\text{kg}$)	Flask #	Final % $T^{14}CO_2$	Centrate % $H^{14}CO_3^-$ & % $^{14}CO_3$	Soil % ^{14}C	Mass Balance (%)
1	50	1	68.85	na	na	nc
		2	71.70	na	na	nc
		3	70.39	4.09	35.06	109.54
1	2000	4	53.92	na	na	nc
		5	73.16	4.86	28.07	106.09
		6	75.11	na	na	nc
2	50	10	22.76	na	na	nc
		11	68.37	6.36	25.35	100.08
		12	49.85	na	na	nc
2	2000	13	74.68	na	na	nc
		14	72.86	8.32	27.15	108.33
		15	71.53	na	na	nc
3	50	19	78.46	na	na	nc
		20	69.86	6.81	15.56	92.23
		21	76.34	6.97	18.76	102.07
3	2000	22	74.50	8.90	21.74	105.14
		23	68.35	na	na	nc
		24	83.47	na	na	nc

A first order statistical model was applied to the mineralization data. All data points were included in the analysis for Site 3 treatments. Only the data points up to the point of deflection from first order were used for the treatments from Sites 1 and 2.

Parameter Estimates (\pm standard error)

Soil Site #	Concentration ($\mu\text{g}/\text{kg}$)	Flask #	Asymptote % TCO_2	Rate Day ⁻¹	Lag Days
1	50	1	38.2 \pm 0.7	2.01 \pm 0.28	0.11 \pm 0.03
		2	37.2 \pm 1.8	2.09 \pm 1.02	0.00 \pm 0.14
		3	37.1 \pm 1.3	2.17 \pm 0.77	0.00 \pm 0.10
1	2000	4	not analyzed	not analyzed	not analyzed
		5	35.4 \pm 0.9	0.74 \pm 0.10	0.21 \pm 0.05
		6	34.6 \pm 1.3	0.88 \pm 0.19	0.14 \pm 0.09
2	50	10	not analyzed	not analyzed	not analyzed
		11	38.4 \pm 3.0	0.41 \pm 0.12	0.05 \pm 0.22
		12	23.8 \pm 0.9	0.62 \pm 0.11	0.20 \pm 0.09
2	2000	13	42.4 \pm 5.1	0.20 \pm 0.07	0.22 \pm 0.34
		14	32.0 \pm 0.6	0.52 \pm 0.05	0.71 \pm 0.08
		15	30.6 \pm 0.8	0.55 \pm 0.08	0.73 \pm 0.10
3	50	19	77.9 \pm 0.6	0.09 \pm 0.00	5.2 \pm 0.2
		20	68.5 \pm 0.9	0.09 \pm 0.01	5.1 \pm 0.3
		21	75.6 \pm 0.8	0.09 \pm 0.00	6.6 \pm 0.2
3	2000	22	74.1 \pm 0.9	0.08 \pm 0.00	9.1 \pm 0.2
		23	67.0 \pm 0.8	0.10 \pm 0.01	9.1 \pm 0.2
		24	84.2 \pm 0.5	0.08 \pm 0.00	9.8 \pm 0.1

The data from flasks 4 (site 1 @ 2000 $\mu\text{g}/\text{kg}$) and 10 (site 2 @ 50 $\mu\text{g}/\text{kg}$) was not included in the respective analyses. In both cases the final $^{14}\text{CO}_2$ evolved was considerably less than other flasks of the same treatment. There were no visual observations during test set-up or throughout the sampling period to explain the lower results.

10.0 TREATMENT OF RESULTS

The background ^{14}C -activities evolved from the soil and from the Ultima Gold cocktail were determined by counting the alkali traps from the blank soil treatments. The average of the three replicates were used to correct for background levels in the respective flasks.

The cumulative % T^{14}CO_2 produced was determined at each sampling period by the following equation:

$$\%T^{14}\text{CO}_2 = \frac{\text{Cumulative } ^{14}\text{CO}_2 \text{ (dpm) vs. time}}{\text{dpm in initial spike}} \times 100$$

The $\%^{14}\text{C}$ trapped as inorganic carbonates at test termination was determined by the following equation:

$$\% \text{H}^{14}\text{CO}_3^- \text{ and } ^{14}\text{CO}_3 = \frac{^{14}\text{C-evolved after acidification (dpm)}}{\text{dpm in initial spike}} \times 100$$

The $\%^{14}\text{C}$ associated with the soil at test termination was determined by the following equation:

$$\text{Soil } \%^{14}\text{C} = \frac{^{14}\text{C-evolved soil combustion (dpm)}}{\text{dpm in initial spike}} \times 100$$

Kinetic Analysis

Data from the $^{14}\text{CO}_2$ curves was analyzed by a nonlinear first order regression model¹ to estimate rate constants and extent of biodegradation.

$$y = a(1 - e^{-k_1(t-c)})$$

where:

- a = asymptote for $^{14}\text{CO}_2$ production (%)
- k_1 = first order rate constant (day^{-1})
- t = time of incubation (days)
- c = lag period, if any (days)
- y = cumulative % TCO_2

¹ Base SAS® and SAS/STAT®: Release 6.04, SAS Institute Inc., Cary, NC, 1990.

Table 1: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 μg/kg
 Test system: Soil from site #1

Flask No.: 1
 dpm dosed per flask: 854700

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date	day	trap 1 (a) dpm/mL	trap 1 (b) dpm/mL	trap 1 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	785	6	na	8	8	—	77500	9.07
01/20/96	1	1930	51	na	16	17	—	272300	31.86
01/22/96	3	420	12	na	18	15	—	312200	36.53
01/24/96	5	160	19	na	11	11	—	327900	38.36
01/26/96	7	111	na	na	13	—	—	337700	39.51
01/29/96	10	363	na	na	14	—	—	372600	43.59
02/02/96	14	528	na	na	21	—	—	423300	49.53
02/06/96	18	450	na	na	22	—	—	466100	54.53
02/09/96	21	216	na	na	13	—	—	486400	56.91
02/16/96	28	368	na	na	20	—	—	521200	60.98
02/23/96	35	330	na	na	14	—	—	552800	64.68
03/04/96 (1)	45	360	16	15	11	19	18	587100	68.69
03/07/96	48	27			13			588500	68.85

(1) Flask was acidified following sampling the alkali traps.

Table 2: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
 Test system: Soil from site #1

Flask No.: 2
 dpm dosed per flask: 854700

date	day	trap 2 (a) dpm/mL	trap 2 (b) dpm/mL	trap 2 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	1471	13	na	8	8	—	146800	17.18
01/20/96	1	1132	13	na	16	17	—	258000	30.19
01/22/96	3	402	10	na	18	15	—	295900	34.62
01/24/96	5	236	13	na	11	11	—	318600	37.28
01/26/96	7	310	na	na	13	—	—	348300	40.75
01/29/96	10	626	na	na	14	—	—	409500	47.91
02/02/96	14	569	na	na	21	—	—	464300	54.32
02/06/96	18	389	na	na	22	—	—	501000	58.62
02/09/96	21	217	na	na	13	—	—	521400	61.00
02/16/96	28	320	na	na	20	—	—	551400	64.51
02/23/96	35	299	na	na	14	—	—	579900	67.85
03/04/96 (1)	45	330	22	9	11	19	18	611200	71.51
03/07/96	48	24	na	na	8	—	—	612800	71.70

(1) Flask was acidified following sampling the alkali traps.

Table 3: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
 Test system: Soil from site #1

Flask No.: 3
 dpm dosed per flask: 854700

date	day	trap 3 (a) dpm/mL	trap 3 (b) dpm/mL	trap 3 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	1437	16	na	8	8	—	143700	16.81
01/20/96	1	1254	20	na	16	17	—	267800	31.33
01/22/96	3	391	22	na	18	15	—	305800	35.78
01/24/96	5	159	17	na	11	11	—	321200	37.58
01/26/96	7	176	na	na	13	—	—	337500	39.49
01/29/96	10	485	na	na	14	—	—	384600	45.00
02/02/96	14	603	na	na	21	—	—	442800	51.81
02/06/96	18	430	na	na	22	—	—	483600	56.58
02/09/96	21	215	na	na	13	—	—	503800	58.94
02/16/96	28	347	na	na	20	—	—	536500	62.77
02/23/96	35	330	na	na	14	—	—	568100	66.47
03/04/96 (1)	45	336	16	11	11	19	18	599600	70.15
03/07/96	48	33	na	na	13	—	—	601600	70.39

(1) Flask was acidified following sampling the alkali traps.

Centrate: (393/383/390)/3 = 388 dpm/mL * 90 mL = 34920 dpm in centrate = 4.09%
¹⁴C recovered from soil pellet: 35.06% (Table 22)

Mass balance in percent: 109.54

Table 4: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 μg/kg
 Test system: Soil from site #1

Flask No.: 4
 dpm dosed per flask: 34,188,000

date	day	trap 4 (a) dpm/mL	trap 4 (b) dpm/mL	trap 4 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	7414	109	na	8	8	—	750700	2.20
01/20/96	1	39379	386	na	16	17	—	4723900	13.82
01/22/96	3	14863	101	na	18	15	—	6217000	18.18
01/24/96	5	10672	71	na	11	11	—	7289100	21.32
01/26/96	7	5229	na	na	13	—	—	7810700	22.85
01/29/96	10	22016	na	na	14	—	—	10010900	29.28
02/02/96	14	25766	na	na	21	—	—	12585400	36.81
02/06/96	18	13800	na	na	22	—	—	13963200	40.84
02/09/96	21	7268	na	na	13	—	—	14688700	42.96
02/16/96	28	12659	na	na	20	—	—	15952600	46.66
02/23/96	35	11328	na	na	14	—	—	17084000	49.97
03/04/96 (1)	45	12759	56	8	11	19	18	18361500	53.71
03/07/96	48	731	na	na	13	—	—	18433300	53.92

(1) Flask was acidified following sampling the alkali traps.

Table 5: Cumulative ¹⁴CO₂ Production
Study No.: 96-001

Test substance: V 2648G @ 2000 µg/kg
Test system: Soil from site #1

Flask No.: 5
dpm dosed per flask: 34,188,000

date	day	trap 5 (a) dpm/mL	trap 5 (b) dpm/mL	trap 5(c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	1439	6	na	8	8	—	142900	0.42
01/20/96	1	57428	140	na	16	17	—	5896400	17.25
01/22/96	3	41225	194	na	18	15	—	10035000	29.35
01/24/96	5	15172	57	na	11	11	—	11555700	33.80
01/26/96	7	4744	na	na	13	—	—	12028800	35.18
01/29/96	10	5520	na	na	14	—	—	12579400	36.79
02/02/96	14	28181	na	na	21	—	—	15395400	45.03
02/06/96	18	28968	na	na	22	—	—	18290000	53.50
02/09/96	21	13361	na	na	13	—	—	19624800	57.40
02/16/96	28	23756	na	na	20	—	—	21998400	64.35
02/23/96	35	16050	na	na	14	—	—	23602000	69.04
03/04/96 (1)	45	13249	36	14	11	19	18	24927100	72.91
03/07/96	48	876	na	na	13	—	—	25013400	73.16

(1) Flask was acidified following sampling the alkali traps.

Centrate: $(18125/18004/18007)/3 = 18045$ dpm/mL * 92 mL = 1660140 dpm in centrate = 4.86%
14 C recovered from soil pellet: 28.07% (Table 22)

Mass balance in percent: 106.09

Table 6: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 µg/kg
 Test system: Soil from site #1

Flask No.: 6
 dpm dosed per flask: 34,188,000

date	day	trap 6 (a) dpm/mL	trap 6 (b) dpm/mL	trap 6 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	9034	117	na	8	8	—	913500	2.67
01/20/96	1	59506	492	na	16	17	—	6910000	20.21
01/22/96	3	31344	172	na	18	15	—	10058300	29.42
01/24/96	5	13003	60	na	11	11	—	11362400	33.24
01/26/96	7	2992	na	na	13	—	—	11660300	34.11
01/29/96	10	11266	na	na	14	—	—	12785500	37.40
02/02/96	14	35065	na	na	21	—	—	16289900	47.65
02/06/96	18	28219	na	na	22	—	—	19109600	55.90
02/09/96	21	13578	na	na	13	—	—	20466100	59.86
02/16/96	28	22249	na	na	20	—	—	22689000	66.37
02/23/96	35	14932	na	na	14	—	—	24180800	70.73
03/04/96 (1)	45	14160	54	6	11	19	18	25598000	74.87
03/07/96	48	808	na	na	13	—	—	25677500	75.11

(1) Flask was acidified following sampling the alkali traps.

Table 7: Cumulative $^{14}\text{CO}_2$ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 $\mu\text{g}/\text{kg}$
 Test system: Soil from site #2

Flask No.: 10
 dpm dosed per flask: 854,700

date	day	trap 10 (a) dpm/mL	trap 10 (b) dpm/mL	trap 10 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	$^{14}\text{CO}_2$ %
01/19/96	0.25	14	10	na	4	10	—	1000	0.12
01/20/96	1	468	16	na	17	19	—	45800	5.36
01/22/96	3	139	8	na	13	13	—	57900	6.77
01/24/96	5	194	13	na	14	18	—	75400	8.82
01/26/96	7	119	na	na	16	—	—	85700	10.03
01/29/96	10	304	na	na	14	—	—	114700	13.42
02/02/96	14	197	na	na	14	—	—	133000	15.56
02/06/96	18	111	na	na	21	—	—	142000	16.61
02/09/96	21	107	na	na	14	—	—	151300	17.70
02/16/96	28	187	na	na	14	—	—	168600	19.73
02/23/96	35	180	na	na	13	—	—	185300	21.68
03/04/96 (1)	45	112	17	17	19	13	29	193800	22.67
03/07/96	48	20	na	na	13	—	—	194500	22.76

(1) Flask acidified following sampling the alkali traps.

Table 8: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
 Test system: Soil from site #2

Flask No.: 11
 dpm dosed per flask: 854,700

date	day	trap 11 (a) dpm/mL	trap 11 (b) dpm/mL	trap 11 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	87	8	na	4	10	—	8100	0.95
01/20/96	1	1260	19	na	17	19	—	132400	15.49
01/22/96	3	1033	12	na	13	13	—	234300	27.41
01/24/96	5	257	24	na	14	18	—	259200	30.33
01/26/96	7	352	na	na	16	—	—	292800	34.26
01/29/96	10	577	na	na	14	—	—	349100	40.84
02/02/96	14	796	na	na	14	—	—	427300	49.99
02/06/96	18	425	na	na	21	—	—	467700	54.72
02/09/96	21	211	na	na	14	—	—	487400	57.03
02/16/96	28	345	na	na	14	—	—	520500	60.90
02/23/96	35	343	na	na	13	—	—	553500	64.76
03/04/96 (1)	45	314	15	16	19	13	29	581900	68.08
03/07/96	48	38	na	na	13	—	—	584400	68.37

(1) Flask acidified following sampling the alkali traps.

Centrate: $(614/580/580)/3 = 591$ dpm/mL * 92 mL = 54372 dpm in centrate = 6.36%
 14 C recovered from soil pellet: 25.35% (Table 22)

Mass balance in percent: 100.08

Table 9: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
 Test system: Soil from site #2

Flask No.: 12
 dpm dosed per flask: 854,700

date	day	trap 12 (a) dpm/mL	trap 12 (b) dpm/mL	trap 12 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	43	10	na	4	10	—	3900	0.46
01/20/96	1	821	28	na	17	19	—	85200	9.97
01/22/96	3	858	19	na	13	13	—	170300	19.93
01/24/96	5	123	19	na	14	18	—	181300	21.21
01/26/96	7	139	na	na	16	—	—	193600	22.65
01/29/96	10	263	na	na	14	—	—	218500	25.56
02/02/96	14	513	na	na	14	—	—	268400	31.40
02/06/96	18	443	na	na	21	—	—	310600	36.34
02/09/96	21	154	na	na	14	—	—	324600	37.98
02/16/96	28	404	na	na	14	—	—	363600	42.54
02/23/96	35	346	na	na	13	—	—	396900	46.44
03/04/96 (1)	45	306	12	18	19	13	29	424400	49.65
03/07/96	48	30	na	na	13	—	—	426100	49.85

(1) Flask acidified following sampling the alkali traps.

Table 10: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 μg/kg
 Test system: Soil from site #2

Flask No.: 13
 dpm dosed per flask: 34,188,000

date	day	trap 13 (a) dpm/mL	trap 13 (b) dpm/mL	trap 13 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ CO ₂ %
01/19/96	0.25	211	6	na	4	10	—	20300	0.06
01/20/96	1	14557	121	na	17	19	—	1484500	4.34
01/22/96	3	63287	144	na	13	13	—	7825000	22.89
01/24/96	5	14788	84	na	14	18	—	9309000	27.23
01/26/96	7	5722	na	na	16	—	—	9879600	28.90
01/29/96	10	13162	na	na	14	—	—	11194400	32.74
02/02/96	14	37167	na	na	14	—	—	14909700	43.61
02/06/96	18	38104	na	na	21	—	—	18718000	54.75
02/09/96	21	13690	na	na	14	—	—	20085600	58.75
02/16/96	28	22190	na	na	14	—	—	22303200	65.24
02/23/96	35	14664	na	na	13	—	—	23768300	69.52
03/04/96 (1)	45	16624	67	12	19	13	29	25432500	74.39
03/07/96	48	1013	na	na	13	—	—	25532500	74.68

(1) Flask acidified following sampling the alkali traps.

Table 11: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 μg/kg
 Test system: Soil from site #2

Flask No.: 14
 dpm dosed per flask: 34,188,000

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date	day	trap 14 (a) dpm/mL	trap 14 (b) dpm/mL	trap 14 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ CO ₂ %
01/19/96	0.25	302	9	na	4	10	—	29700	0.09
01/20/96	1	14184	30	na	17	19	—	1447500	4.23
01/22/96	3	64287	101	na	13	13	—	7883700	23.06
01/24/96	5	16203	138	na	14	18	—	9514600	27.83
01/26/96	7	6370	na	na	16	—	—	10150000	29.69
01/29/96	10	5686	na	na	14	—	—	10717200	31.35
02/02/96	14	6859	na	na	14	—	—	11401700	33.35
02/06/96	18	33809	na	na	21	—	—	14780500	43.23
02/09/96	21	25550	na	na	14	—	—	17334100	50.70
02/16/96	28	35533	na	na	14	—	—	20886000	61.09
02/23/96	35	20715	na	na	13	—	—	22956200	67.15
03/04/96 (1)	45	18123	101	11	19	13	29	24773600	72.46
03/07/96	48	1380	na	na	13	—	—	24910300	72.86

(1) Flask acidified following sampling the alkali traps.

Centrate: (30405/30793/30561)/3 = 30586 dpm/mL * 93 mL = 2844498 dpm in centrate = 8.32%
 14 C recovered from soil pellet: 27.15% (Table 22)

Mass balance in percent: 108.33

Table 12: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 µg/kg
 Test system: Soil from site #2

Flask No.: 15
 dpm dosed per flask: 34,188,000

date	day	trap 15 (a) dpm/mL	trap 15 (b) dpm/mL	trap 15 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ CO ₂ %
01/19/96	0.25	92	4	na	4	10	—	8200	0.02
01/20/96	1	13498	82	na	17	19	—	1362600	3.99
01/22/96	3	63956	152	na	13	13	—	7770800	22.73
01/24/96	5	14385	77	na	14	18	—	9213800	26.95
01/26/96	7	4927	na	na	16	—	—	9704900	28.39
01/29/96	10	4399	na	na	14	—	—	10143400	29.67
02/02/96	14	10048	na	na	14	—	—	11146800	32.60
02/06/96	18	20680	na	na	21	—	—	13212700	38.65
02/09/96	21	23620	na	na	14	—	—	15573300	45.55
02/16/96	28	48249	na	na	14	—	—	20396800	59.66
02/23/96	35	20903	na	na	13	—	—	22485800	65.77
03/04/96 (1)	45	18398	86	16	19	13	29	24331000	71.17
03/07/96	48	1244	na	na	13	—	—	24454100	71.53

(1) Flask acidified following sampling the alkali traps.

Table 13: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
 Test system: Soil from site #3

Flask No.: 19
 dpm dosed per flask: 854,700

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date	day	trap 19 (a) dpm/mL	trap 19 (b) dpm/mL	trap 19 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	1	13	na	3	8	—	300	0.04
01/20/96	1	21	15	na	16	13	—	1000	0.12
01/22/96	3	9	19	na	11	15	—	1200	0.14
01/24/96	5	47	46	na	18	14	—	7300	0.85
01/26/96	7	926	na	na	18	—	—	98100	11.48
01/29/96	10	1269	na	na	19	—	—	223100	26.10
02/02/96	14	1403	na	na	20	—	—	361400	42.28
02/06/96	18	969	na	na	17	—	—	456600	53.42
02/09/96	21	593	na	na	18	—	—	514100	60.15
02/16/96	28	481	na	na	26	—	—	559600	65.47
02/23/96	35	415	na	na	28	—	—	598300	70.00
03/04/96	45	430	na	na	11	—	—	640200	74.90
03/11/96	52	173	na	na	17	—	—	655800	76.73
03/18/96 (1)	59	174	9	5	41	14	8	668300	78.19
03/21/96	62	37	na	na	14	—	—	670600	78.46

(1) Flasks acidified following sampling the alkali traps.

Table 14: Cumulative ¹⁴CO₂ Production
Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
Test system: Soil from site #3

Flask No.: 20
dpm dosed per flask: 854,700

date	day	trap 20 (a) dpm/mL	trap 20 (b) dpm/mL	trap 20 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ CO ₂ %
01/19/96	0.25	1	4	na	3	8	—	-600	-0.07
01/20/96	1	12	5	na	16	16	—	-2100	-0.25
01/22/96	3	19	4	na	11	15	—	-2400	-0.28
01/24/96	5	66	19	na	18	14	—	2900	0.34
01/26/96	7	747	na	na	18	—	—	75800	8.87
01/29/96	10	1490	na	na	19	—	—	222900	26.08
02/02/96	14	1151	na	na	20	—	—	336000	39.31
02/06/96	18	769	na	na	17	—	—	411200	48.11
02/09/96	21	369	na	na	18	—	—	446300	52.22
02/16/96	28	438	na	na	26	—	—	487500	57.04
02/23/96	35	385	na	na	28	—	—	523200	61.21
03/04/96	45	397	na	na	11	—	—	561800	65.73
03/11/96	52	196	na	na	17	—	—	579700	67.82
03/18/96 (1)	59	185	20	14	41	14	8	595300	69.65
03/21/96	62	32	na	na	14	—	—	597100	69.86

(1) Flask was acidified following sampling the alkali traps.

Centrate: $(602/566/578)/3 = 582 * 100 \text{ mL} = 58200 \text{ dpm in centrate} = 6.81\%$
14 C recovered from soil pellet: 15.56% (Table 23)

Mass balance in percent: 92.23

Table 15: Cumulative ¹⁴CO₂ Production
Study No.: 96-001

Test substance: V 2648G @ 50 µg/kg
Test system: Soil from site #3

Flask No.: 21
dpm dosed per flask: 854,700

date	day	trap 21 (a) dpm/mL	trap 21 (b) dpm/mL	trap 21 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	5	6	na	3	8	—	0	0.00
01/20/96	1	13	16	na	16	16	—	-300	-0.04
01/22/96	3	31	8	na	11	15	—	1000	0.12
01/24/96	5	21	13	na	18	14	—	1200	0.14
01/26/96	7	249	na	na	18	—	—	24300	2.84
01/29/96	10	1265	na	na	19	—	—	148900	17.42
02/02/96	14	1666	na	na	20	—	—	313500	36.68
02/06/96	18	1128	na	na	17	—	—	424600	49.68
02/09/96	21	532	na	na	18	—	—	476000	55.69
02/16/96	28	566	na	na	26	—	—	530000	62.01
02/23/96	35	439	na	na	28	—	—	571100	66.82
03/04/96	45	460	na	na	11	—	—	616000	72.07
03/11/96	52	206	na	na	17	—	—	634900	74.28
03/18/96(1)	59	196	20	8	41	14	8	651000	76.17
03/21/96	62	29	na	na	14	—	—	652500	76.34

(1) Flask acidified following sampling the alkali traps.

Centrate: $(566/607/616)/3 = 596 * 100 \text{ mL} = 59600 \text{ dpm in centrate} = 6.97\%$
¹⁴C recovered from soil pellet: 18.76 % (Table 23)

Mass balance in percent: 102.07

Table 16: Cumulative ¹⁴CO₂ Production
Study No.: 96-001

Test substance: V 2648G @ 2000 μg/kg
Test system: Soil from site #3

Flask No.: 22
dpm dosed per flask: 34,188,000

date	day	trap 22 (a) dpm/mL	trap 22 (b) dpm/mL	trap 22 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	10	5	na	3	8	—	400	0.00
01/20/96	1	80	13	na	16	16	—	6500	0.02
01/22/96	3	177	15	na	11	15	—	23100	0.07
01/24/96	5	150	15	na	18	14	—	36400	0.11
01/26/96	7	135	na	na	18	—	—	48100	0.14
01/29/96	10	12152	na	na	19	—	—	1261400	3.69
02/02/96	14	72573	na	na	20	—	—	8516700	24.91
02/06/96	18	51600	na	na	17	—	—	13675000	40.00
02/09/96	21	18907	na	na	18	—	—	15563900	45.52
02/16/96	28	36841	na	na	26	—	—	19245400	56.29
02/23/96	35	20687	na	na	28	—	—	21311300	62.34
03/04/96	45	20771	na	na	11	—	—	23387300	68.41
03/11/96	52	10392	na	na	17	—	—	24424800	71.44
03/18/96(1)	59	9667	43	13	41	14	8	25390800	74.27
03/21/96	62	801	na	na	14	—	—	25469500	74.50

(1) Flask acidified following sampling the alkali traps.

Centrate: (30977/30306/30479)/3 = 30587 * 100 mL = 3058700 dpm in centrate = 8.9%

14C recovered from soil pellet: 21.74% (Table 23)

Mass balance in percent: 105.14

Table 17: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 µg/kg
 Test system: Soil from site #3

Flask No.: 23
 dpm dosed per flask: 34,188,000

date	day	trap 23 (a) dpm/mL	trap 23 (b) dpm/mL	trap 23 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/L	bkg. subtract trap "c" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	20	4	na	3	8	—	1300	0.00
01/20/96	1	78	14	na	16	16	—	7300	0.02
01/22/96	3	168	11	na	11	15	—	22600	0.07
01/24/96	5	193	13	na	18	14	—	40000	0.12
01/26/96	7	230	na	na	18	—	—	61200	0.18
01/29/96	10	13829	na	na	19	—	—	1442200	4.22
02/02/96	14	75924	na	na	20	—	—	9032600	26.42
02/06/96	18	50129	na	na	17	—	—	14043800	41.08
02/09/96	21	15604	na	na	18	—	—	15602400	45.64
02/16/96	28	28444	na	na	26	—	—	18444200	53.95
02/23/96	35	18414	na	na	28	—	—	20282800	59.33
03/04/96	45	15564	na	na	11	—	—	21838100	63.88
03/11/96	52	6445	na	na	17	—	—	22480900	65.76
03/18/96 (1)	59	8279	89	7	41	14	8	23312100	68.19
03/21/96	62	564	na	na	14	—	—	23367100	68.35

(1) Flask acidified following sampling the alkali traps.

Table 18: Cumulative ¹⁴CO₂ Production
 Study No.: 96-001

Test substance: V 2648G @ 2000 µg/kg
 Test system: Soil from site #3

Flask No.: 24
 dpm dosed per flask: 34,188,000

date	day	trap 24 (a) dpm/mL	trap 24 (b) dpm/mL	trap 24 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "b" dpm/mL	cumulative dpm/100 mL	¹⁴ TCO ₂ %
01/19/96	0.25	22	5	na	3	8	—	1600	0.00
01/20/96	1	80	19	na	16	16	—	8300	0.02
01/22/96	3	222	26	na	11	15	—	30500	0.09
01/24/96	5	189	19	na	18	14	—	48100	0.14
01/26/96	7	73	na	na	18	—	—	53600	0.16
01/29/96	10	4136	na	na	19	—	—	465300	1.36
02/02/96	14	71656	na	na	20	—	—	7628900	22.31
02/06/96	18	62629	na	na	17	—	—	13890100	40.63
02/09/96	21	28733	na	na	18	—	—	16761600	49.03
02/16/96	28	48335	na	na	26	—	—	21592500	63.16
02/23/96	35	26071	na	na	28	—	—	24196800	70.78
03/04/96	45	21976	na	na	11	—	—	26393300	77.20
03/11/96	52	10590	na	na	17	—	—	27450600	80.29
03/18/96(1)	59	10159	81	10	41	14	8	28469100	83.27
03/21/96	62	684	na	na	14	—	—	28536100	83.47

(1) Flask acidified following sampling the alkali traps.

Table 19: Background 14C--activity
Study No.: 96-001

Test system: Soil from site #1
Flask Nos.: 7, 8, 9

date	day	trap 7 (a) dpm/mL	trap 7 (b) dpm/mL	trap 7 (c) dpm/mL	trap 8 (a) dpm/mL	trap 8 (b) dpm/mL	trap 8 (c) dpm/mL	trap 9 (a) dpm/mL	trap 9 (b) dpm/mL	trap 9 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL
01/19/96	0.25	12	9	na	2	14	na	10	2	na	8	8	-
01/20/96	1	10	22	na	16	17	na	22	13	na	16	17	-
01/22/96	3	15	12	na	19	16	na	21	16	na	18	15	-
01/24/96	5	9	11	na	11	15	na	13	8	na	11	11	-
01/26/96	7	17	na	na	9	na	na	13	na	na	13	-	-
01/29/96	10	10	na	na	15	na	na	16	na	na	14	-	-
02/02/96	14	20	na	na	25	na	na	18	na	na	21	-	-
02/06/96	18	22	na	na	22	na	na	22	na	na	22	-	-
02/09/96	21	17	na	na	20	na	na	2	na	na	13	-	-
02/16/96	28	21	na	na	17	na	na	21	na	na	20	-	-
02/23/96	35	23	na	na	9	na	na	10	na	na	14	-	-
03/04/96 (1)	45	14	25	24	16	15	12	2	16	17	11	19	18
03/07/96	48	16			14	na	na	8	na	na	13	-	-

(1) Flasks acidified following sampling the alkali traps.

Table 20: Background 14C—activity
Study No.: 96—001

Test system: Soil from site #2
Flask Nos.: 16, 17, 18

date	day	trap 16 (a) dpm/mL	trap 16 (b) dpm/mL	trap 16 (c) dpm/mL	trap 17 (a) dpm/mL	trap 17 (b) dpm/mL	trap 17 (c) dpm/mL	trap 18 (a) dpm/mL	trap 18 (b) dpm/mL	trap 18 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL
01/19/96	0.25	1	12	na	11	5	na	0	12	na	4	0	—
01/20/96	1	19	15	na	15	25	na	18	18	na	17	0	—
01/22/96	3	8	outlier	na	10	13	na	20	13	na	13	13	—
01/24/96	5	15	29	na	11	15	na	15	10	na	14	0	—
01/26/96	7	18	na	na	20	na	na	10	na	na	16	—	—
01/29/96	10	11	na	na	15	na	na	16	na	na	14	—	—
02/02/96	14	10	na	na	17	na	na	14	na	na	14	—	—
02/06/96	18	20	na	na	26	na	na	16	na	na	21	—	—
02/09/96	21	16	na	na	14	na	na	13	na	na	14	—	—
02/16/96	28	16	na	na	9	na	na	18	na	na	14	—	—
02/23/96	35	14	na	na	5	na	na	21	na	na	13	—	—
03/04/96 (1)	45	10	15	19	22	15	16	24	9	53	19	13	29
03/07/96	48	16	na	na	10	na	na	12	na	na	13	—	—

(1) Flasks acidified following sampling the alkali traps.

Table 21: Background 14C—activities
Study No.: 96—001

Test system: Soil from site #3
Flask Nos.: 25, 26, 27

date	day	trap 25 (a) dpm/mL	trap 25 (b) dpm/mL	trap 25 (c) dpm/mL	trap 26 (a) dpm/mL	trap 26 (b) dpm/mL	trap 26 (c) dpm/mL	trap 27 (a) dpm/mL	trap 27 (b) dpm/mL	trap 27 (c) dpm/mL	bkg. subtract trap "a" dpm/mL	bkg. subtract trap "b" dpm/mL	bkg. subtract trap "c" dpm/mL
01/19/96	0.25	2	0	na	1	10	na	6	14	na	3	8	—
01/20/96	1	15	19	na	16	18	na	16	11	na	16	16	—
01/22/96	3	16	11	na	2	16	na	16	19	na	11	15	—
01/24/96	5	23	13	na	17	12	na	14	16	na	18	14	—
01/26/96	7	22	na	na	17	na	na	14	na	na	18	—	—
01/29/96	10	26	na	na	17	na	na	14	na	na	19	—	—
02/02/96	14	16	na	na	28	na	na	17	na	na	20	—	—
02/06/96	18	10	na	na	15	na	na	26	na	na	17	—	—
02/09/96	21	18	na	na	19	na	na	16	na	na	18	—	—
02/16/96	28	19	na	na	20	na	na	39	na	na	26	—	—
02/23/96	35	19	na	na	36	na	na	29	na	na	28	—	—
03/04/96	45	16	na	na	6	na	na	12	na	na	11	—	—
03/11/96	52	20	na	na	9	na	na	21	na	na	17	—	—
03/18/96 (1)	57	84	19	9	20	9	6	20	14	10	41	14	8
03/21/96	60	13	na	na	12	na	na	17	na	na	14	—	—

(1) Flasks acidified following sampling the alkali traps.

Table 22: Combustion Data
 Study: 96-001

Sites 1 and 2

flask #	site #	combustion cup #	aliquot wgt,mg	total dpm/aliquot	dpm/mg	total mg	dpm/soil pellet	% 14C	average %14C
3	1	6	131.4	226	2	136200	272400	31.87	35.06
		7	70.0	208	3	136200	408600	47.81	
		8	86.2	134	2	136200	272400	31.87	
		9	70.2	144	2	136200	272400	31.87	
		10	84.4	144	2	136200	272400	31.87	
5	1	11	85.8	4639	54	136700	7381800	21.59	28.07
		12	91.8	4823	53	136700	7245100	21.19	
		13	87.8	8728	99	136700	13533300	39.58	
		14	61.6	4388	71	136700	9705700	28.39	
		15	71.2	5274	74	136700	10115800	29.59	
11	2	22	84.2	95	1	135400	135400	15.84	25.35
		23	74.8	176	2	135400	270800	31.68	
		24	99.8	146	1	135400	135400	15.84	
		25	85.6	152	2	135400	270800	31.68	
		26	104.8	233	2	135400	270800	31.68	
14	2	27	107.3	6444	60	136900	8214000	24.03	27.15
		28	88.8	6367	72	136900	9856800	28.83	
		29	110.0	8343	76	136900	10404400	30.43	
		30	82.6	5098	62	136900	8487800	24.83	
		31	87.4	5999	69	136900	9446100	27.63	

Table 23: Combustion Data
 Study: 96-001

Site 3

flask #	cup #	aliquot wgt,mg	total dpm/aliquot	dpm/mg	total mg	dpm/soil pellet	% 14C	average %14C
20	6	152.9	179	1	133000	133000	15.56	15.56
	7	144.1	149	1	133000	133000	15.56	
	8	137.3	138	1	133000	133000	15.56	
	9	159.8	119	1	133000	133000	15.56	
	10	136.7	136	1	133000	133000	15.56	
21	11	171.5	193	1	133600	133600	15.63	18.76
	12	155.5	194	1	133600	133600	15.63	
	13	174.2	152	1	133600	133600	15.63	
	14	177.9	283	2	133600	267200	31.26	
	15	154.0	200	1	133600	133600	15.63	
22	16	166.4	6457	39	131300	5120700	14.98	21.74
	17	172.3	4573	27	131300	3545100	10.37	
	18	170.1	14232	84	131300	11029200	32.26	
	19	135.6	6218	46	131300	6039800	17.67	
	20	159.9	16498	103	131300	13523900	39.56	
	1	194.1	10151	52	131300	6827600	19.97	
	2	164.5	8597	52	131300	6827600	19.97	
	3	180.0	10053	56	131300	7352800	21.51	
	4	155.2	8463	55	131300	7221500	21.12	
	5	177.8	9178	52	131300	6827600	19.97	

Table 24: Combustion Data
 Study: 96-001

Soil blanks for Sites 1, 2, 3

flask #	site #	centrate dpm/mL	combustion cup #	aliquot wgt,mg	total dpm/aliquot	dpm/mg
9	1	0	1	117.8	3	0
			2	123.3	0	0
			3	128.2	3	0
			4	136.8	0	0
			5	130.8	0	0
17	2	3	17	101.7	25	0
			18	95.6	8	0
			19	79.6	8	0
			20	94.2	4	0
			21	83.7	0	0
26	3	2	1	190.3	8	0
			2	138.0	6	0
			3	113.0	10	0
			4	130.6	18	0
			5	150.4	2	0

Table 25

LS Counts of Radiolabelled Stock Solutions: Mean \pm Std Dev

V 2648G

TSIN	Aliquot (μL)	(dpm)^a	Mean \pm Std Dev	% RSD
Primary solution ^b	10	1777582 1706566 1772928	1752359 \pm 39726	2.3
Subsequent solution ^c	20	179967 180873 178018	179619 \pm 1459	0.8
Primary solution ^d	10	1767475 1736487 1797876	1767279 \pm 30695	1.7
Subsequent solution ^d	20	179716 180034 189615	183122 \pm 5626	3.1
Subsequent solution ^e	20	183169 196779 188190	189379 \pm 6883	3.6

RSD = Relative Standard Deviation

^a Counted in Ultima Gold cocktail.

^b Solution provided by Sponsor was assayed on 17 January 1996.

^c Prepared and assayed 18 January 1996.

^d Solution reassayed on 19 January 1996: results used to determine spiking volumes and in subsequent calculations.

^e Solution analyzed on 7 February 1996 prior to determining purity.

Table 26

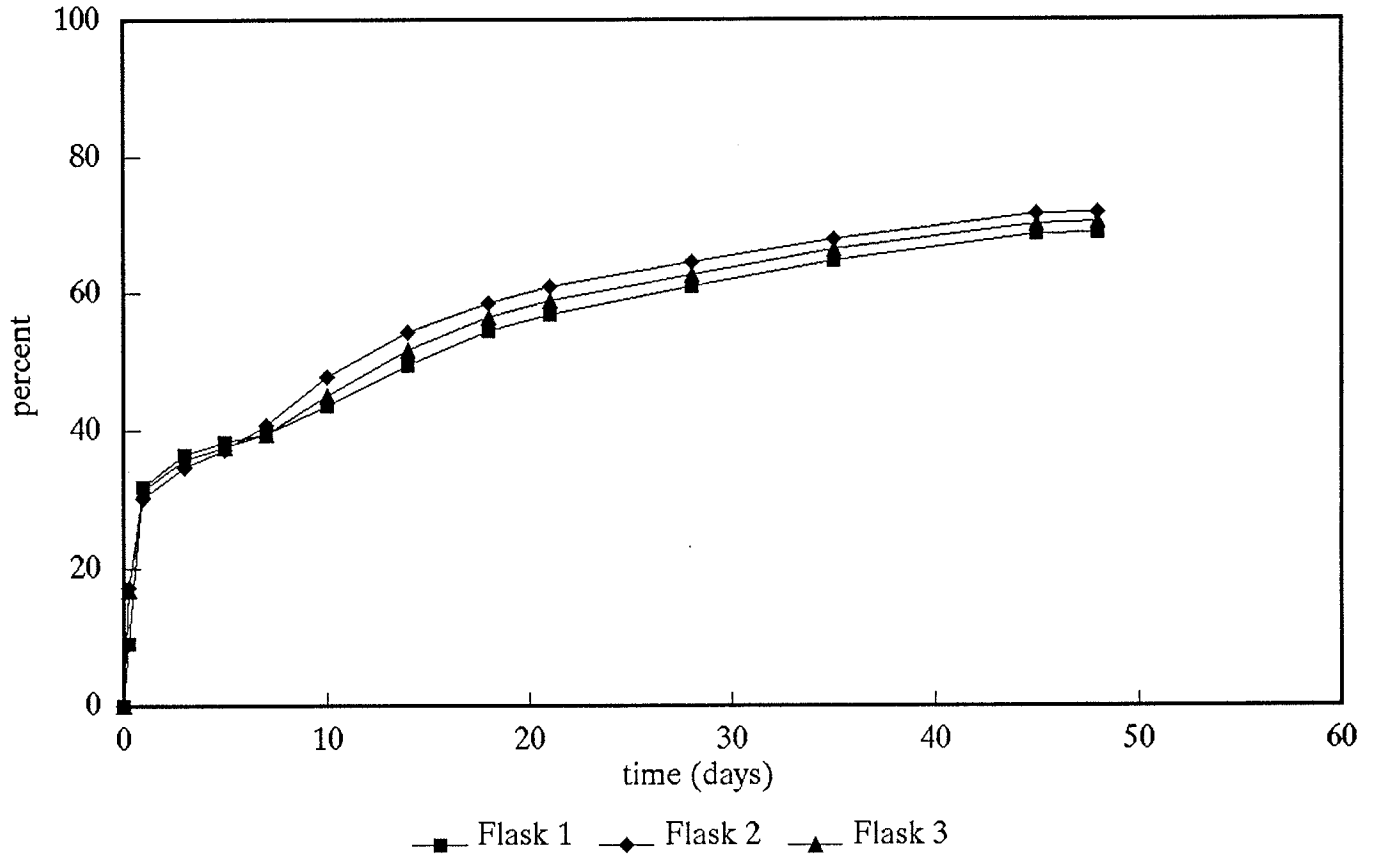
Soil Characterization Data

Sample ID	Site 1	Site 2	Site 3
pH	6.1	6.3	6.9
CEC (meq/100g)	0.99	0.75	0.78
O.C. (%)	0.13	0.03	<0.01
O.M. (%)	0.22	0.05	<0.01
WHC (%) 1/3 Bar	2.12	1.34	1.22
WHC (%) 15 Bar	1.03	0.82	0.37
Sand (%)	93.2	93.2	93.2
Silt (%)	4.0	4.0	4.0
Clay (%)	2.8	2.8	2.8
Soil Classification	Sand	Sand	Sand
Bulk Density (g/cc)	1.45	1.51	1.47
Iron Oxides (%) ¹	0.022	0.009	0.009

CEC = cation exchange capacity
 O.C. = organic carbon
 O.M. = organic matter
 WHC = water holding capacity

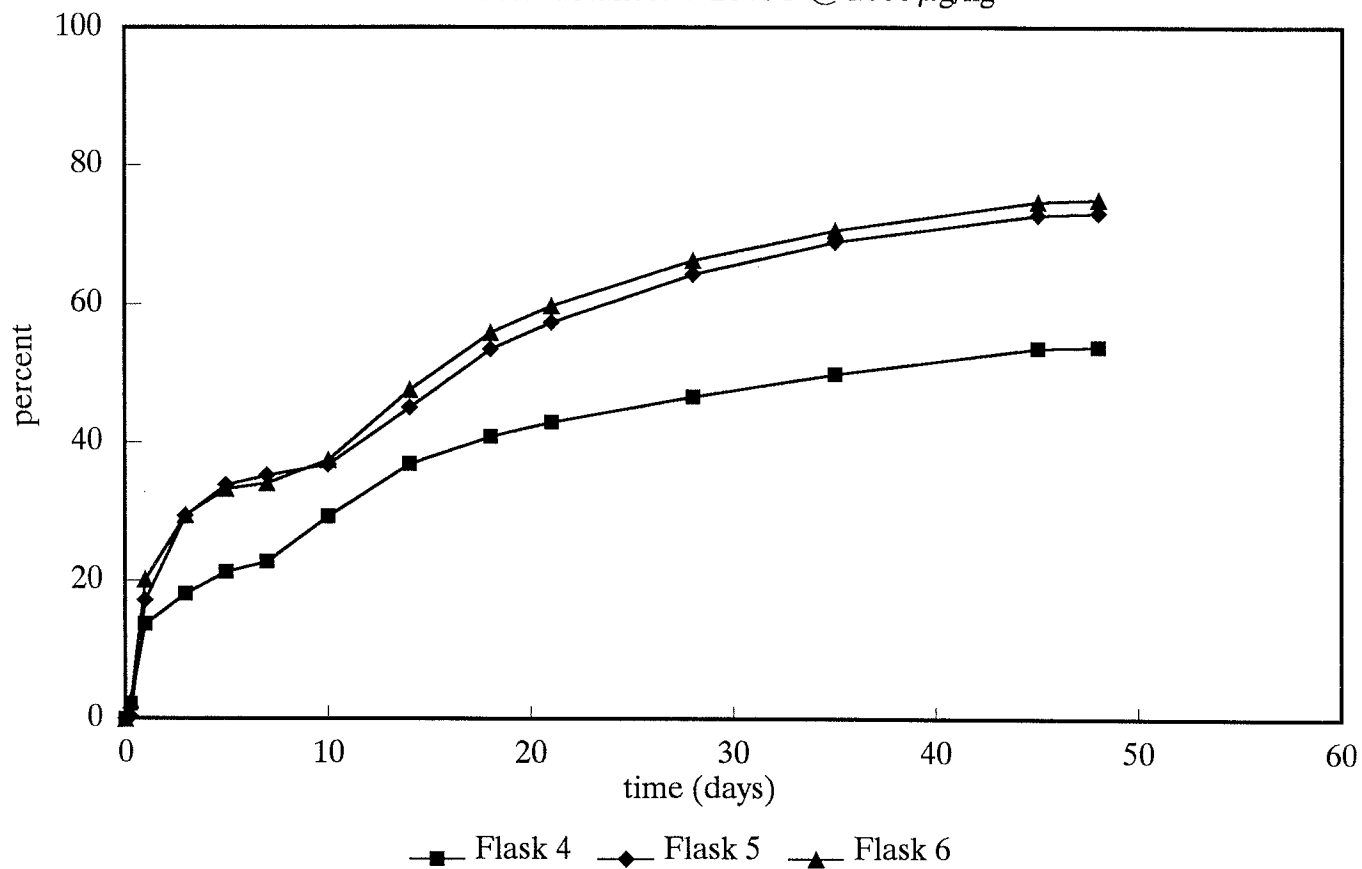
¹ Represents the % of Fe in soil as free Fe oxides.

Figure 1: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ $50 \mu\text{g}/\text{kg}$



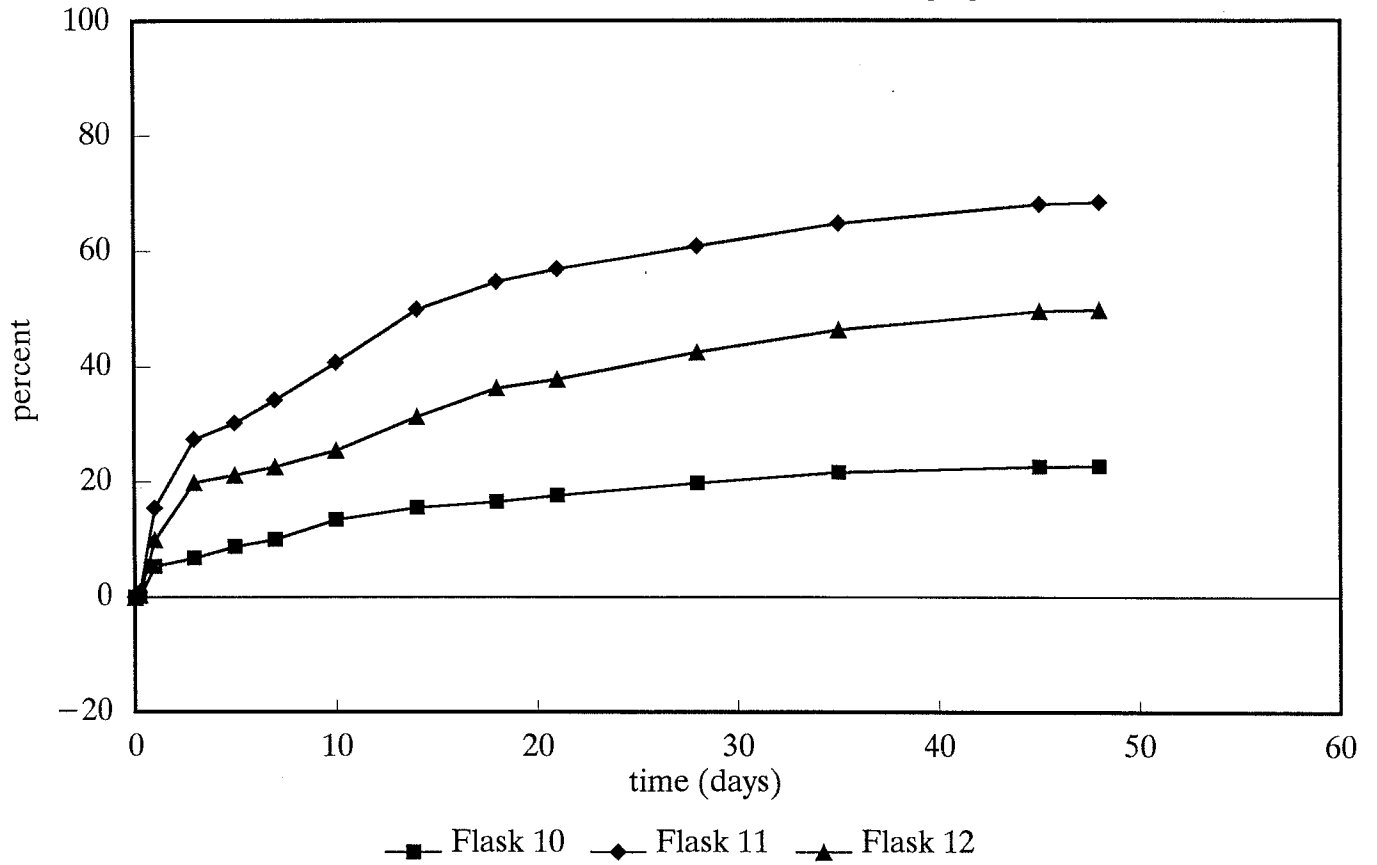
Study 96-001
Test system: Site 1

Figure 2: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ 2000 $\mu\text{g}/\text{kg}$



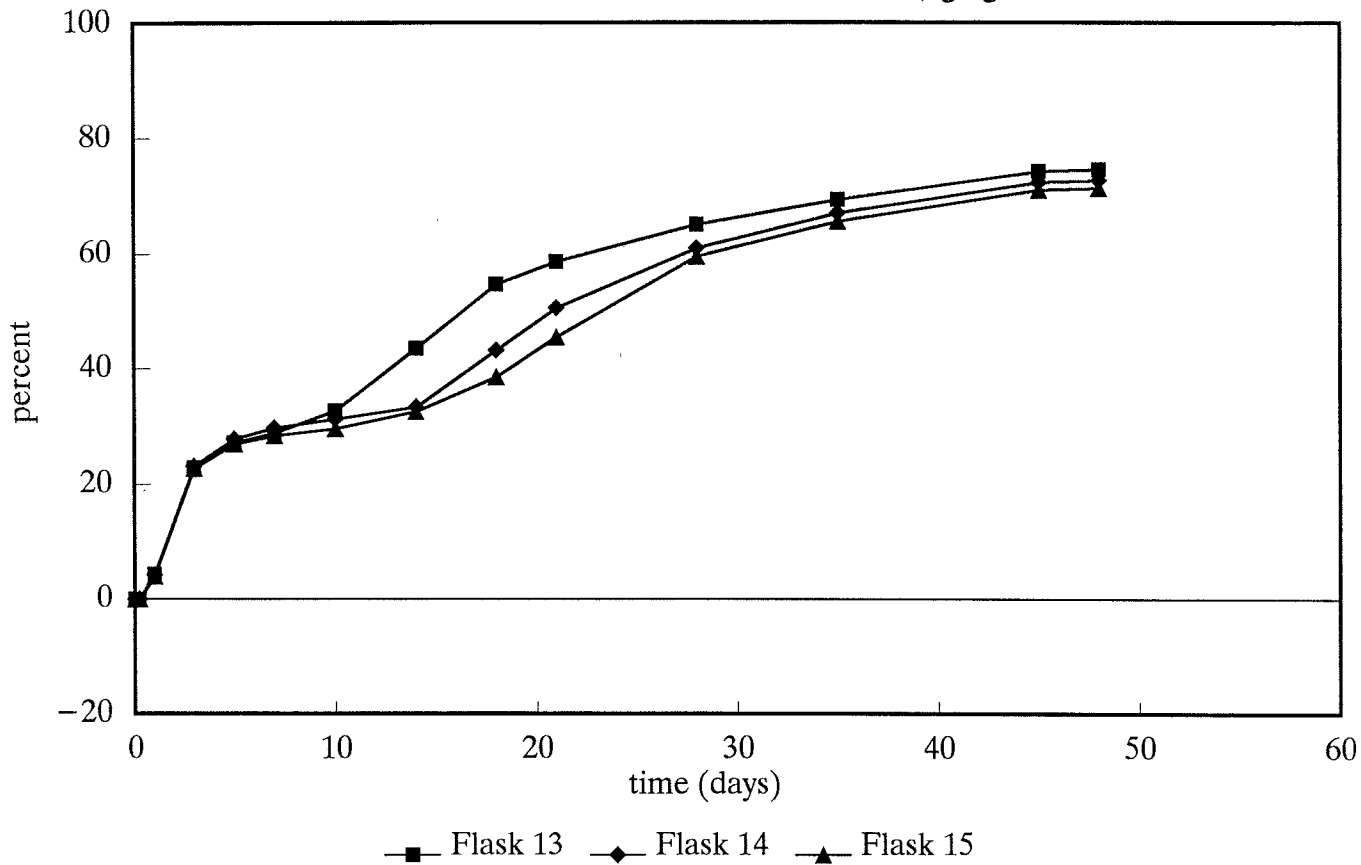
Study 96-001
Test system: Site 1

Figure 3: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ $50 \mu\text{g}/\text{kg}$



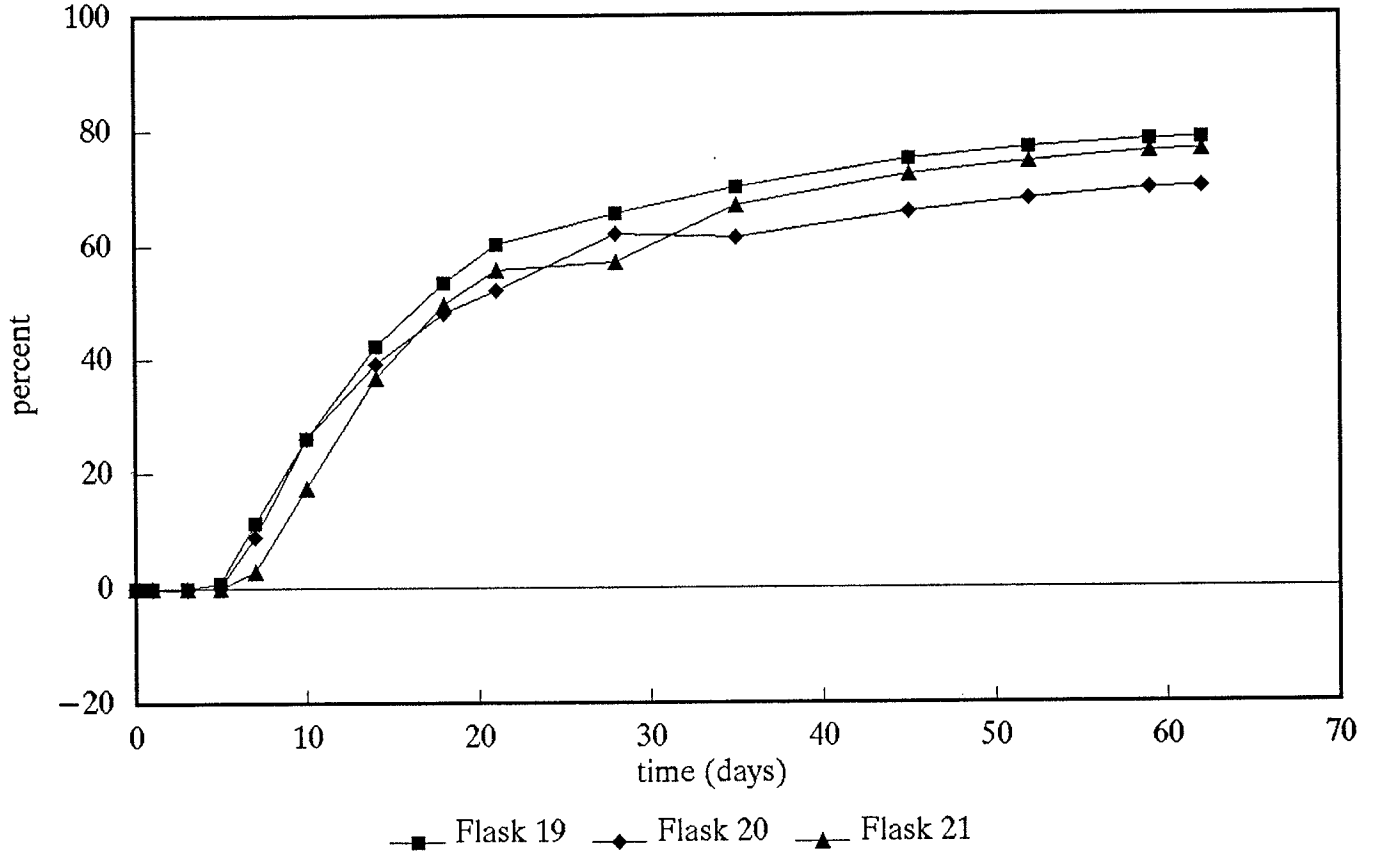
Study 96-001
Test system: Site 2

Figure 4: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ 2000 $\mu\text{g}/\text{kg}$



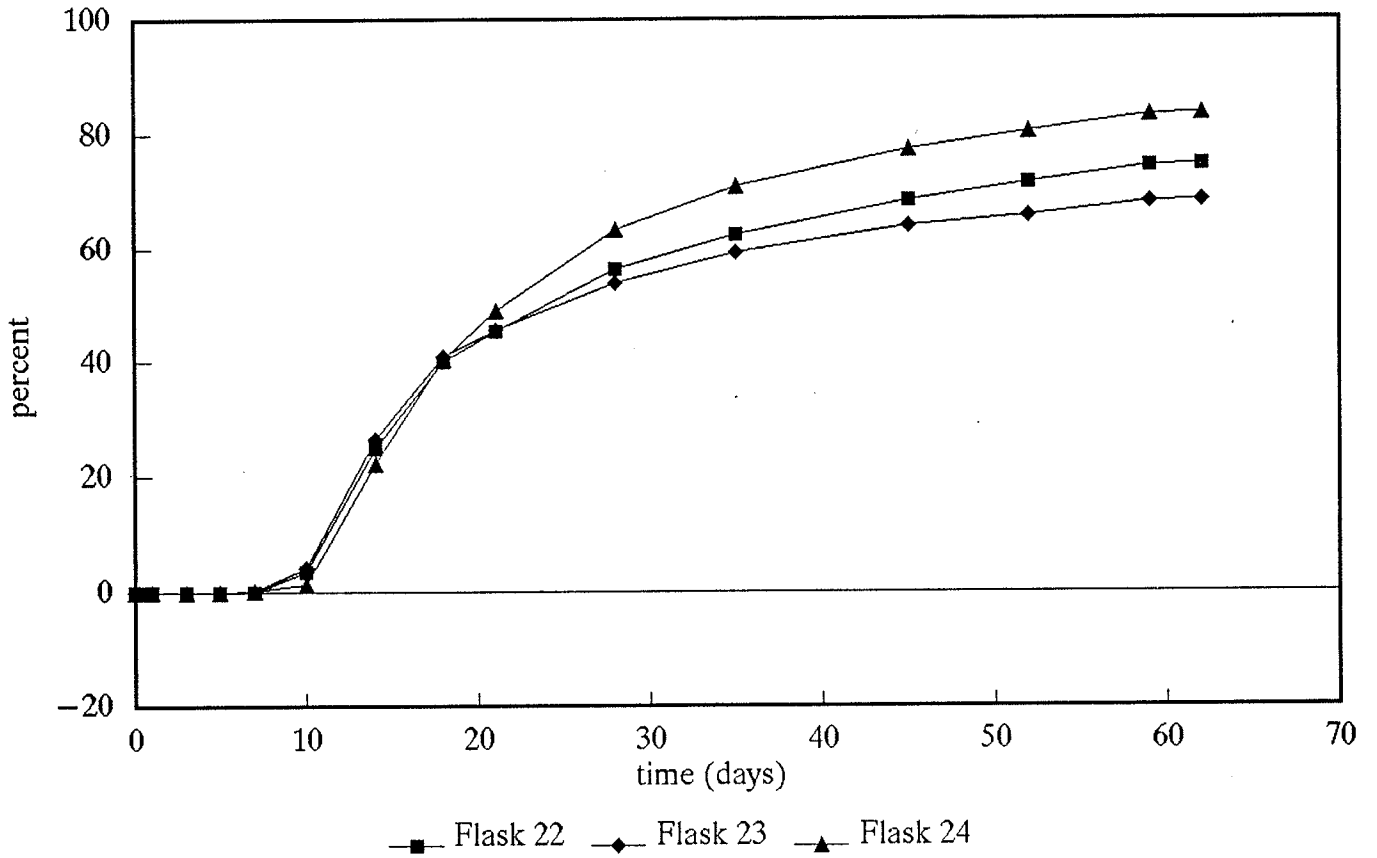
Study 96-001
Test system: Site 2

Figure 5: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ $50 \mu\text{g}/\text{kg}$



Study 96-001
Test system: Site 3

Figure 6: Percent of Theoretical $^{14}\text{CO}_2$ Production
Test substance: V 2648G @ 2000 $\mu\text{g}/\text{kg}$



Study 96-001
Test system: Site 3



APPENDIX A
STATISTICAL ANALYSIS

Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
 Test Substance V 2648G, 50 ug/kg, Site No. 1
 Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
 Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 1	V 2648G, Flask No. 2	V 2648G, Flask No. 3
0	0.00	0.00	0.00	0.00
1	0.25	9.07	17.18	16.81
2	1.00	31.86	30.19	31.33
3	3.00	36.53	34.62	35.00
4	5.00	38.36	37.28	37.58
5	7.00	39.51	40.75	39.49

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 1
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	40.000000	0.200000	0	1256.728287
1	31.744074	0.300383	0	1239.280509
2	23.337761	0.722149	0	1184.658820
3	36.765848	1.638861	0.022825	21.955611
4	38.207414	1.987831	0.137661	6.429446
5	38.202336	2.008553	0.115097	4.170545
6	38.201131	2.010903	0.114924	4.169957
7	38.200992	2.011034	0.114935	4.169957

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	5460.1251429	1820.0417143
Residual	3	4.1699571	1.3899857
Uncorrected Total	6	5464.2951000	
(Corrected Total)	5	1443.0602833	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	38.20099165	0.69409146175	35.992045577	40.409937731
KONSTANT	2.01103387	0.27730568266	1.128508534	2.893559204
DELAY	0.11493454	0.02934548417	0.021542534	0.208326541

Asymptotic Correlation Matrix

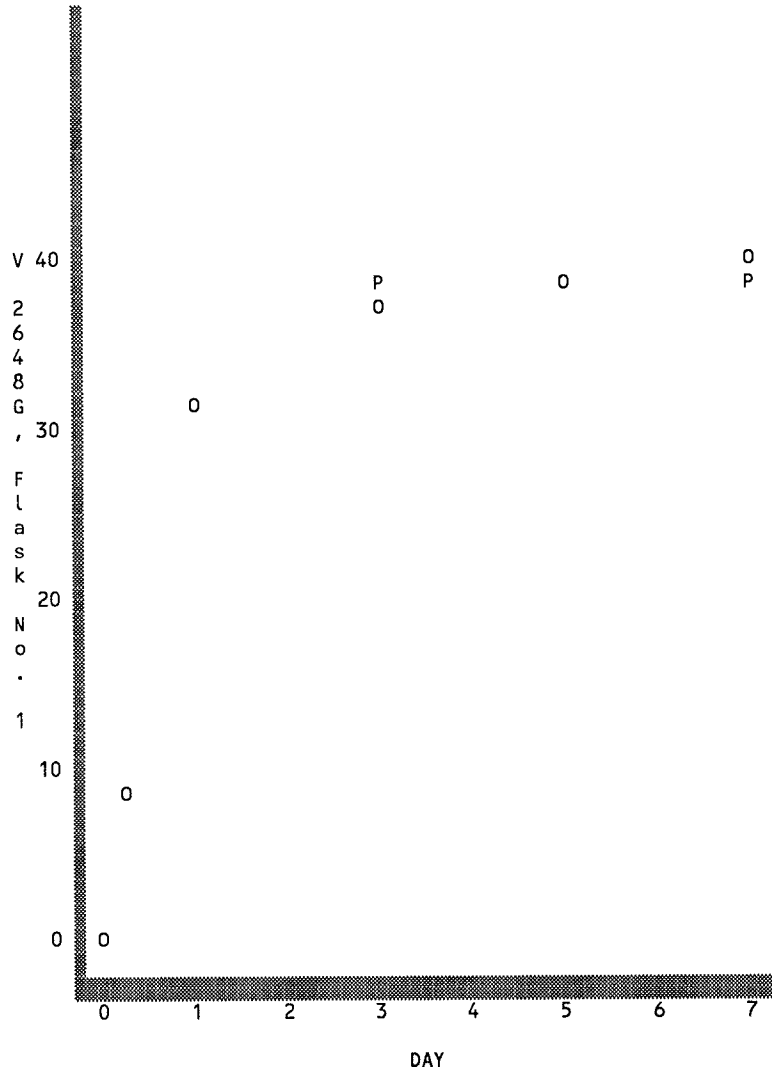
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.437631079	-0.185835487
KONSTANT	-0.437631079	1	0.7276057516
DELAY	-0.185835487	0.7276057516	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 3
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 1
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 2	V 2648G, Flask No. 3
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	9.0864	9.07	-0.01638	0.25	17.18	16.81
2	31.7582	31.86	0.10182	1.00	30.19	31.33
3	38.0856	36.53	-1.55556	3.00	34.62	35.00
4	38.1989	38.36	0.16108	5.00	37.28	37.58
5	38.2010	39.51	1.30905	7.00	40.75	39.49

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 1
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

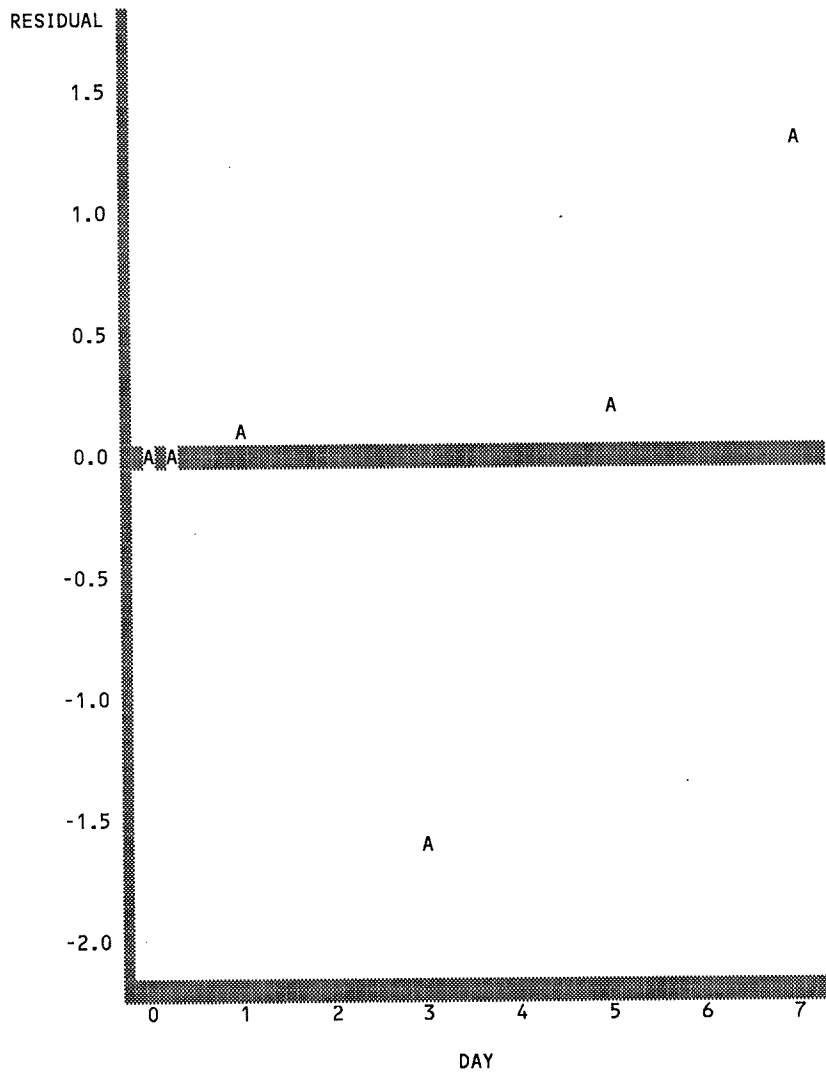
Plot of V2648G1*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 4 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 1
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 2
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G2 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	41.000000	0.200000	0	1234.613140
1	33.413046	0.290528	0	1198.087976
2	24.278900	0.668992	0	1173.119996
3	35.587260	1.603834	0	62.549311
4	37.327993	1.940588	0	29.633367
5	37.221286	2.047945	0	28.917604
6	37.181130	2.077318	0	28.871715
7	37.169822	2.084516	0	28.869065
8	37.167031	2.086224	0	28.868917

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G2

Source	DF	Sum of Squares	Mean Square
Regression	3	5426.6248831	1808.8749610
Residual	3	28.8689169	9.6229723
Uncorrected Total	6	5455.4938000	
(Corrected Total)	5	1187.7604000	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	37.16703119	1.8213610531	31.370549644	42.963512746
KONSTANT	2.08622414	1.0173006253	-1.151335101	5.323783380
DELAY	0.00000000	0.1448739892	-0.461061471	0.461061471

Asymptotic Correlation Matrix

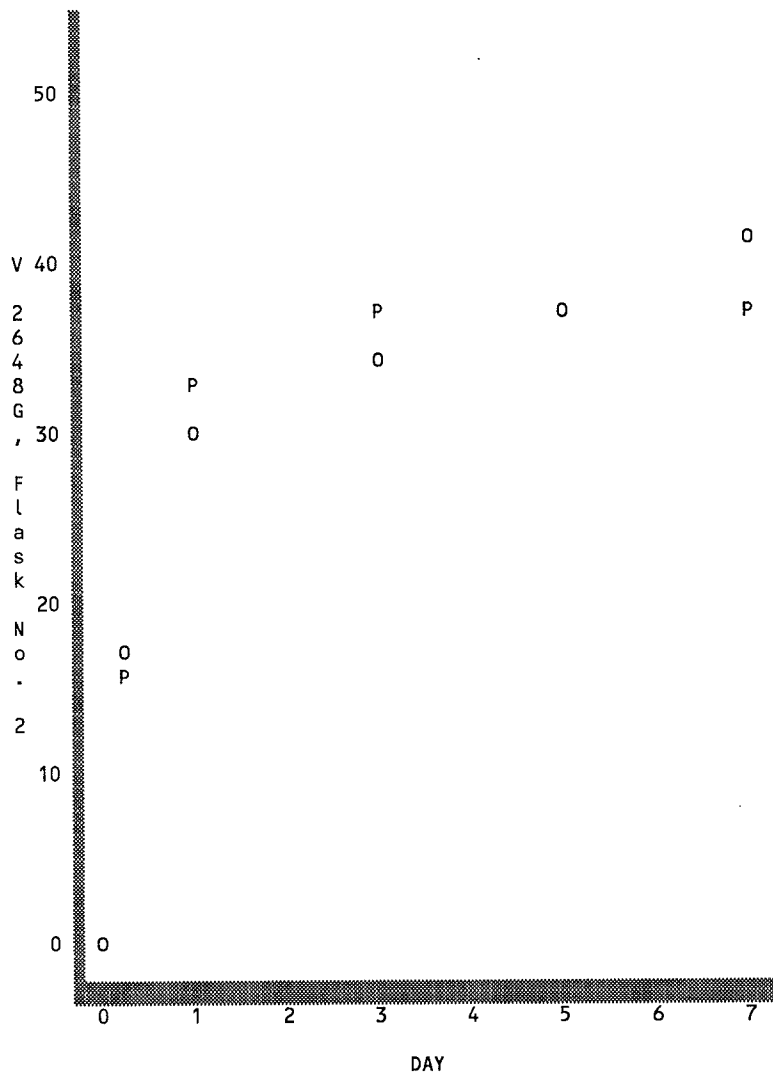
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.438573519	-0.260340379
KONSTANT	-0.438573519	1	0.8793215379
DELAY	-0.260340379	0.8793215379	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 2
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 1	V 2648G, Flask No. 3
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	15.1048	17.18	2.07518	0.25	9.07	16.81
2	32.5526	30.19	-2.36256	1.00	31.86	31.33
3	37.0959	34.62	-2.47590	3.00	36.53	35.00
4	37.1659	37.28	0.11407	5.00	38.36	37.58
5	37.1670	40.75	3.58299	7.00	39.51	39.49

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 2
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

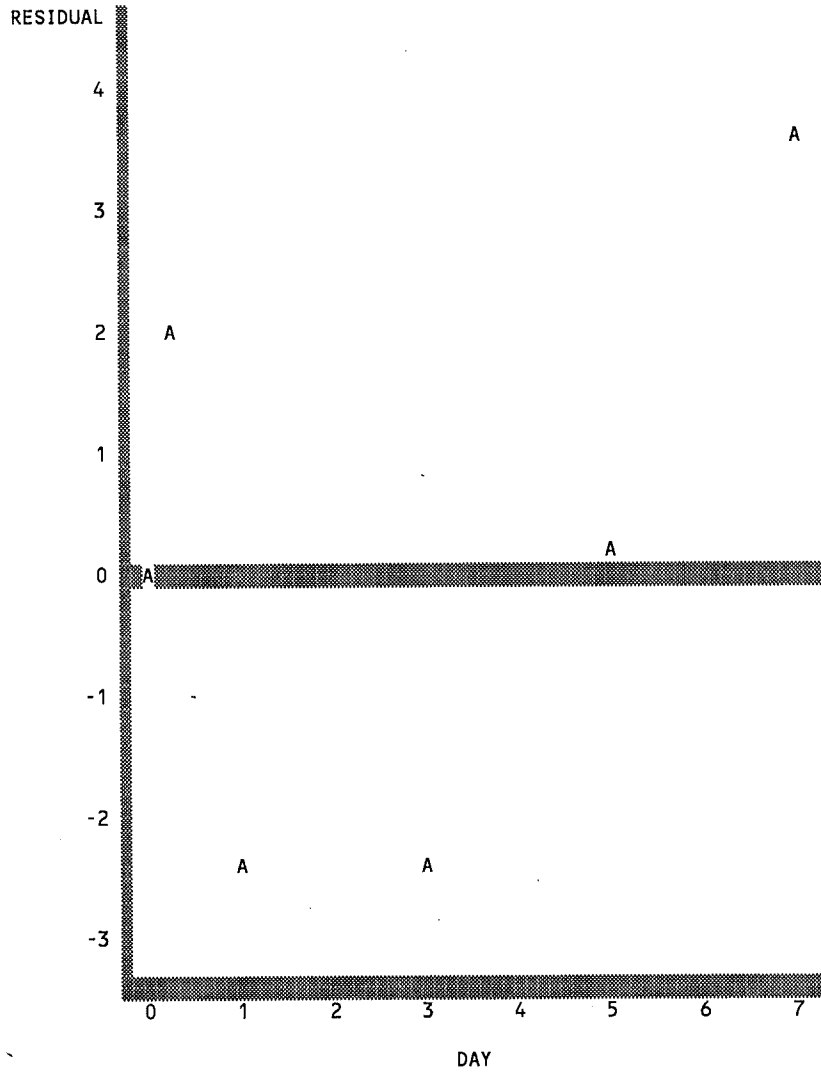
Plot of V2648G2*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 2 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 2
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 10
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 3
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G3 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	39.000000	0.200000	0	1382.978076
1	30.793005	0.302783	0	1368.257296
2	22.435410	0.744686	0	1316.252191
3	35.513309	1.874160	0	34.278611
4	37.159719	2.116260	0	14.206574
5	37.112205	2.161969	0	14.108315
6	37.101472	2.169740	0	14.105675
7	37.099598	2.170967	0	14.105610

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G3

Source	DF	Sum of Squares	Mean Square
Regression	3	5446.7558898	1815.5852966
Residual	3	14.1056102	4.7018701
Uncorrected Total	6	5460.8615000	
(Corrected Total)	5	1182.9874833	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	37.09959836	1.2698573946	33.058277200	41.140919517
KONSTANT	2.17096668	0.7744372962	-0.293680020	4.635613370
DELAY	0.00000000	0.1038024784	-0.330351388	0.330351388

Asymptotic Correlation Matrix

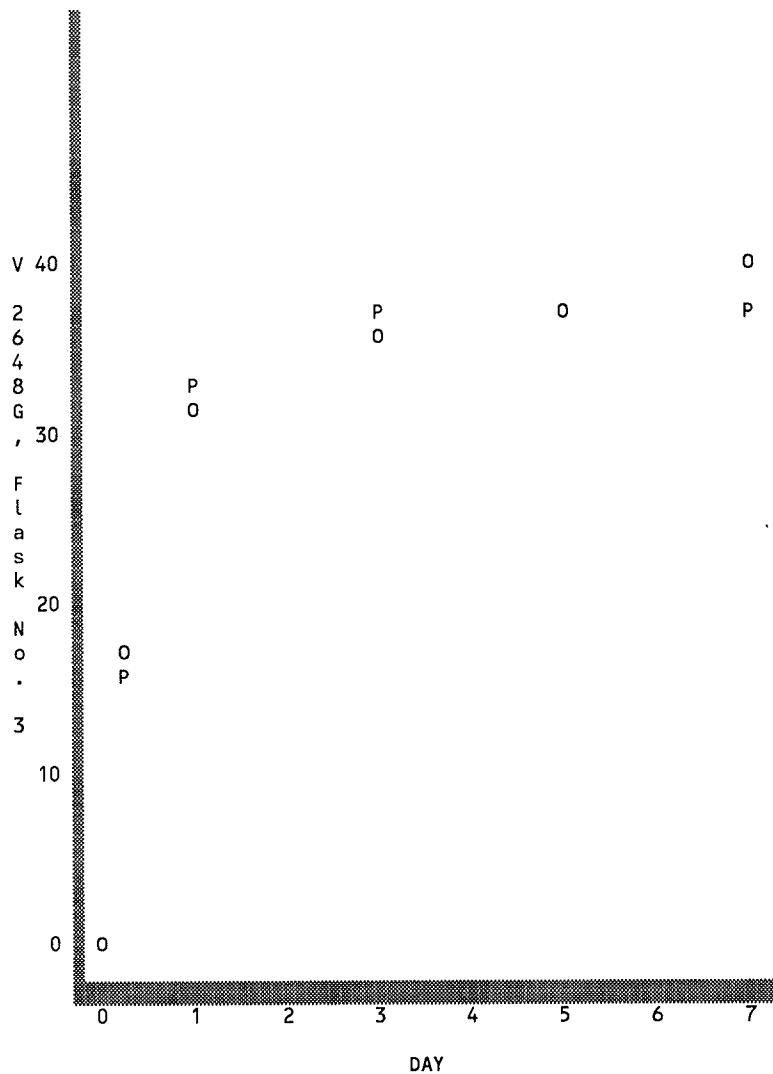
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.440050611	-0.270347806
KONSTANT	-0.440050611	1	0.8888857349
DELAY	-0.270347806	0.8888857349	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 11
 Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 3
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 1	V 2648G, Flask No. 2
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	15.5391	16.81	1.27093	0.25	9.07	17.18
2	32.8677	31.33	-1.53775	1.00	31.86	30.19
3	37.0445	35.00	-2.04454	3.00	36.53	34.62
4	37.0989	37.58	0.48112	5.00	38.36	37.28
5	37.0996	39.49	2.39041	7.00	39.51	40.75

Laboratory Analysis Curve Fitting Report for Study No. 96-001 12
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 3
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

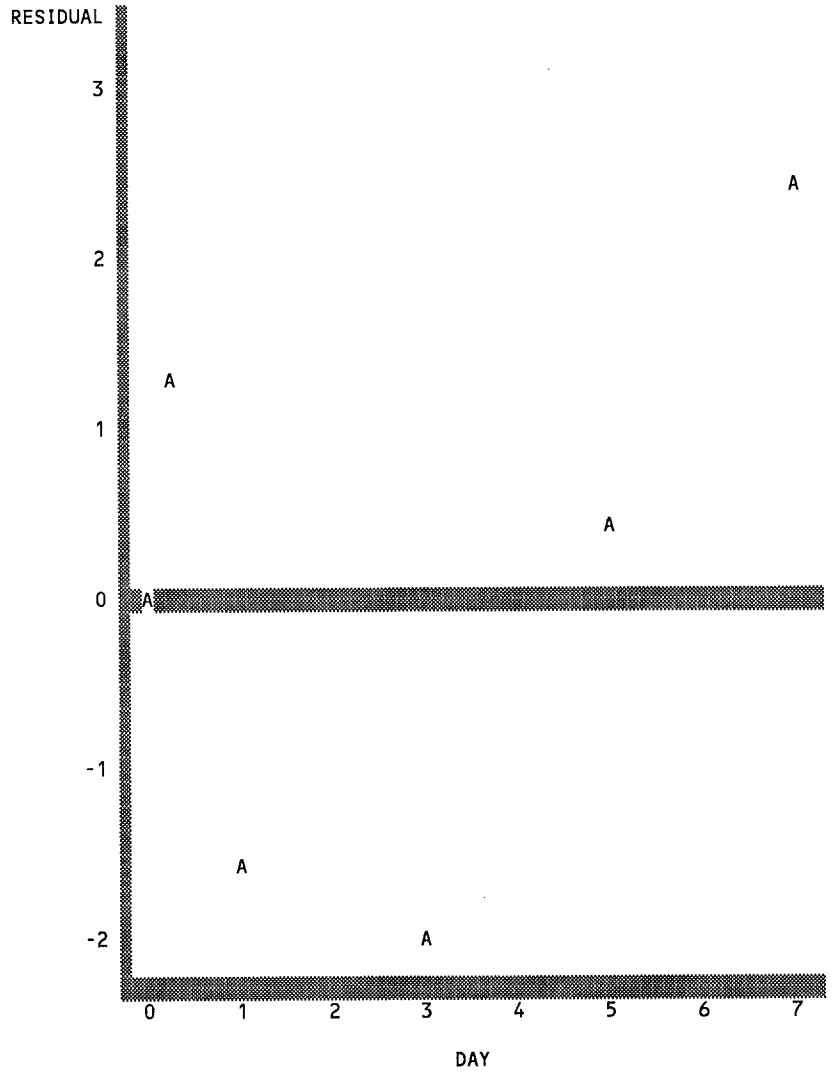
Plot of V2648G3*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 2 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 13
Test Substance V 2648G, 50 ug/kg, Site No. 1, Flask No. 3
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
Test Substance V 2648G, 2000 ug/kg, Site No. 1
Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 5	V 2648G, Flask No. 6
0	0.00	0.00	0.00
1	0.25	0.42	2.67
2	1.00	17.25	20.21
3	3.00	29.35	29.42
4	5.00	33.80	33.24
5	7.00	35.18	34.11
6	10.00	36.79	37.40

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 5
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	37.000000	2.000000	0	487.950805
1	35.481451	0.812068	0	55.430175
2	35.334609	0.745469	0.213999	7.673656
3	35.430191	0.742382	0.209071	7.625255
4	35.434224	0.741655	0.208848	7.625121
5	35.435168	0.741483	0.208799	7.625113

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	4885.1127869	1628.3709290
Residual	4	7.6251131	1.9062783
Uncorrected Total	7	4892.7379000	
(Corrected Total)	6	1557.7687429	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	35.43516760	0.88560049771	32.976379706	37.893955502
KONSTANT	0.74148291	0.09620228886	0.474386148	1.008579668
DELAY	0.20879933	0.05486653651	0.056467463	0.361131194

Asymptotic Correlation Matrix

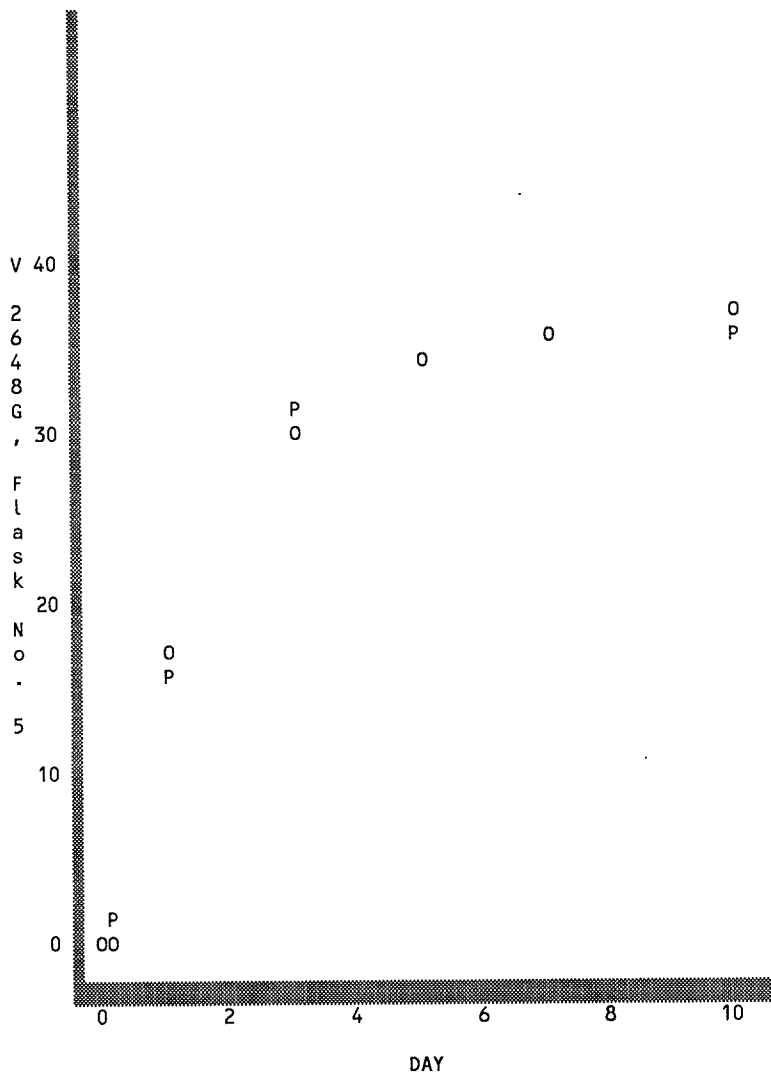
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.593220913	-0.163549955
KONSTANT	-0.593220913	1	0.4988964864
DELAY	-0.163549955	0.4988964864	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 3
 Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 5
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 6
0	0.0000	0.00	0.00000	0.00	0.00
1	1.0662	0.42	-0.64616	0.25	2.67
2	15.7268	17.25	1.52319	1.00	20.21
3	30.9621	29.35	-1.61209	3.00	29.42
4	34.4199	33.80	-0.61994	5.00	33.24
5	35.2047	35.18	-0.02475	7.00	34.11
6	35.4103	36.79	1.37975	10.00	37.40

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 5
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

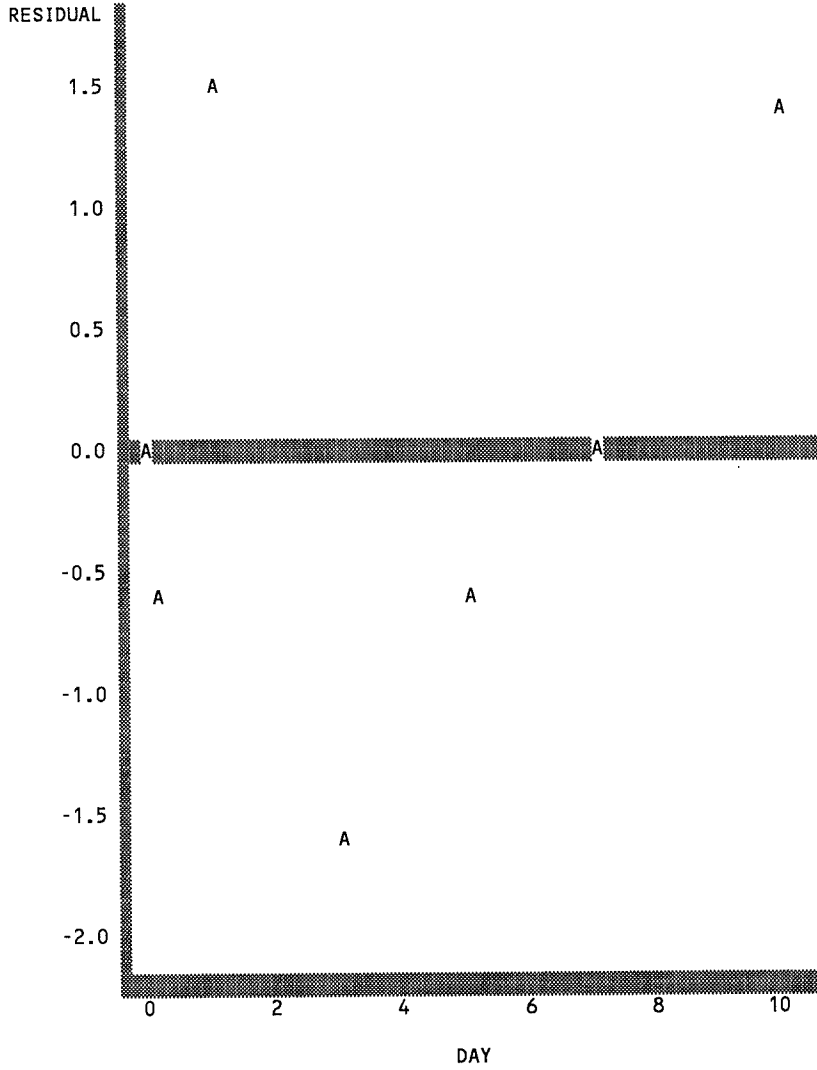
Plot of V2648G1*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 3 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 5
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 6
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G2 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	37.000000	2.000000	0	358.874093
1	35.373285	1.086195	0.003494	72.536457
2	34.390064	0.916022	0.135372	18.351909
3	34.596508	0.894384	0.138847	18.148401
4	34.624112	0.887100	0.136858	18.139559
5	34.633441	0.884467	0.136112	18.138391
6	34.636816	0.883504	0.135841	18.138234

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G2

Source	DF	Sum of Squares	Mean Square
Regression	3	4930.1208658	1643.3736219
Residual	4	18.1382342	4.5345586
Uncorrected Total	7	4948.2591000	
(Corrected Total)	6	1424.7301714	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	34.63681635	1.2627415155	31.130931285	38.142701410
KONSTANT	0.88350373	0.1912809828	0.352429767	1.414577692
DELAY	0.13584124	0.0878777886	-0.108143315	0.379825794

Asymptotic Correlation Matrix

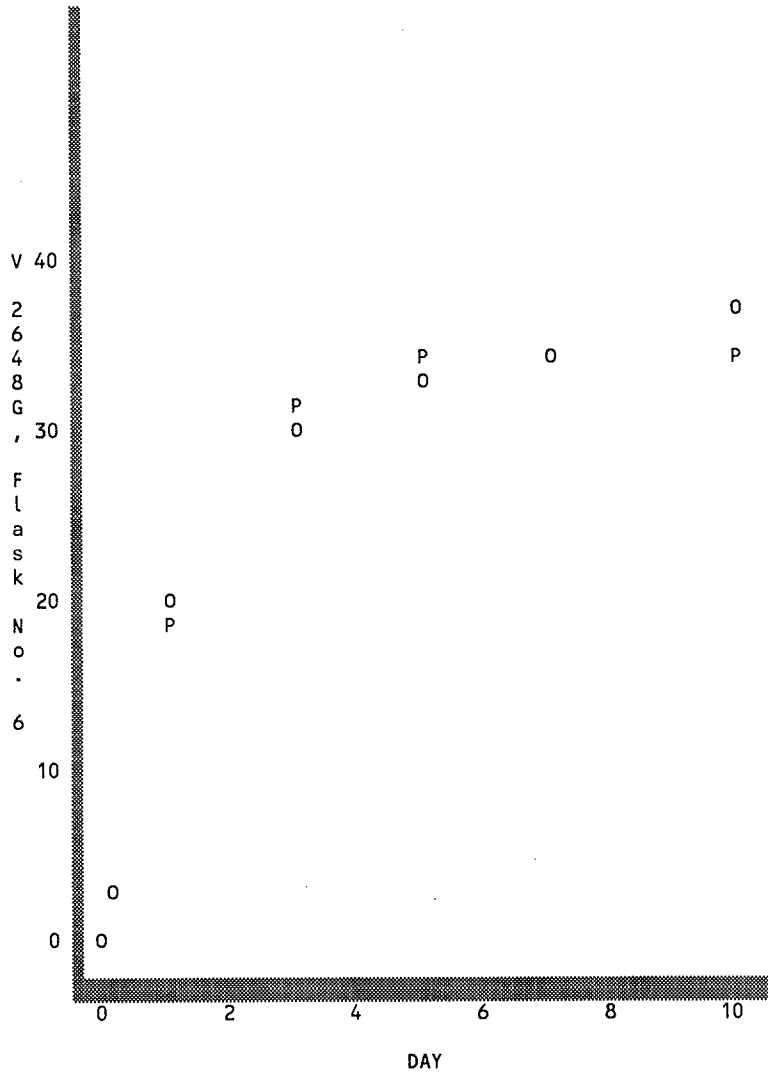
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.526782742	-0.182517847
KONSTANT	-0.526782742	1	0.6092440591
DELAY	-0.182517847	0.6092440591	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 6
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 5
0	0.0000	0.00	0.00000	0.00	0.00
1	3.3231	2.67	-0.65306	0.25	0.42
2	18.4947	20.21	1.71527	1.00	17.25
3	31.8790	29.42	-2.45905	3.00	29.35
4	34.1657	33.24	-0.92567	5.00	33.80
5	34.5563	34.11	-0.44632	7.00	35.18
6	34.6311	37.40	2.76887	10.00	36.79

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 6
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

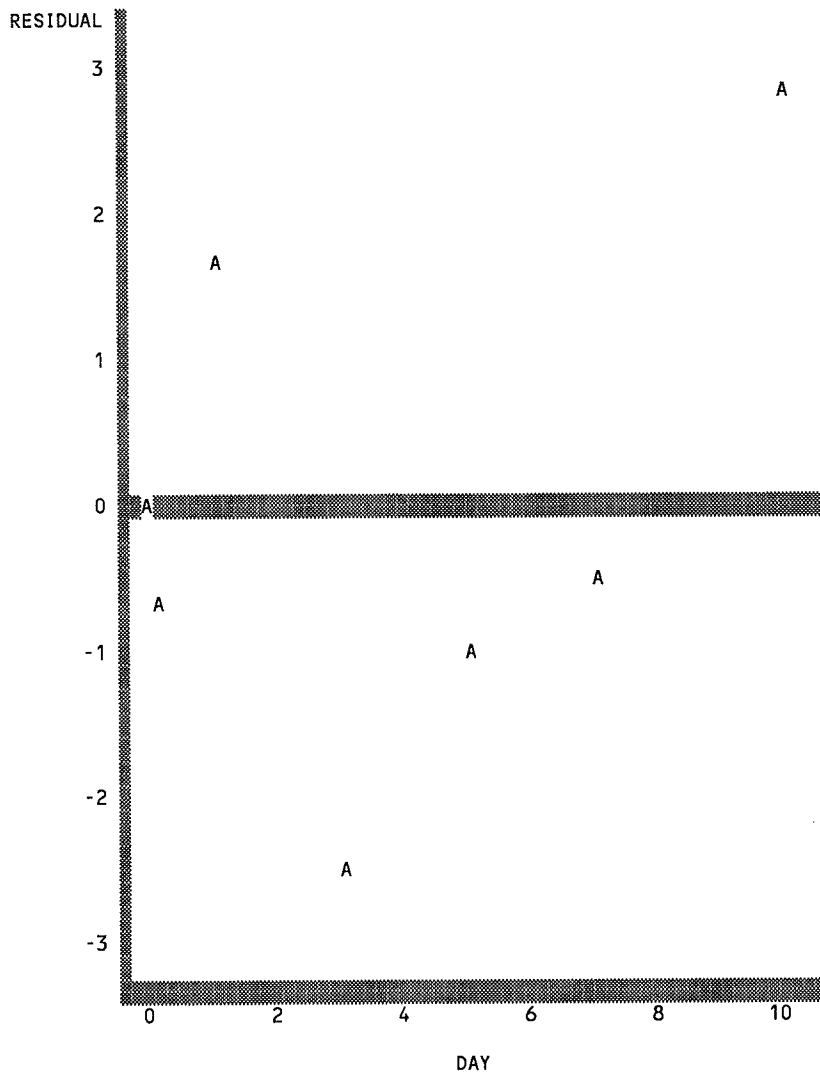
Plot of V2648G2*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 3 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 2000 ug/kg, Site No. 1, Flask No. 6
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
Test Substance V 2648G, 50 ug/kg, Site No. 2
Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 11	V 2648G, Flask No. 12
0	0.00	0.00	0.00
1	0.25	0.95	0.46
2	1.00	15.49	9.97
3	3.00	27.41	19.93
4	5.00	30.33	21.21
5	7.00	34.26	22.65
6	10.00	40.84	25.56

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 11
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	41.000000	0.800000	0	331.493663
1	35.758233	0.516532	0.081997	43.309009
2	37.503408	0.444070	0.089412	37.090775
3	38.088058	0.421907	0.067114	36.554840
4	38.269377	0.413458	0.057640	36.494746
5	38.337630	0.410126	0.053969	36.485530
6	38.364322	0.408801	0.052522	36.484065
7	38.374901	0.408271	0.051947	36.483831

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	4717.2289694	1572.4096565
Residual	4	36.4838306	9.1209576
Uncorrected Total	7	4753.7128000	
(Corrected Total)	6	1570.2101714	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	38.37490064	3.0309669354	29.959701192	46.790100088
KONSTANT	0.40827146	0.1234918339	0.065407797	0.751135114
DELAY	0.05194661	0.2168747415	-0.550186055	0.654079279

Asymptotic Correlation Matrix

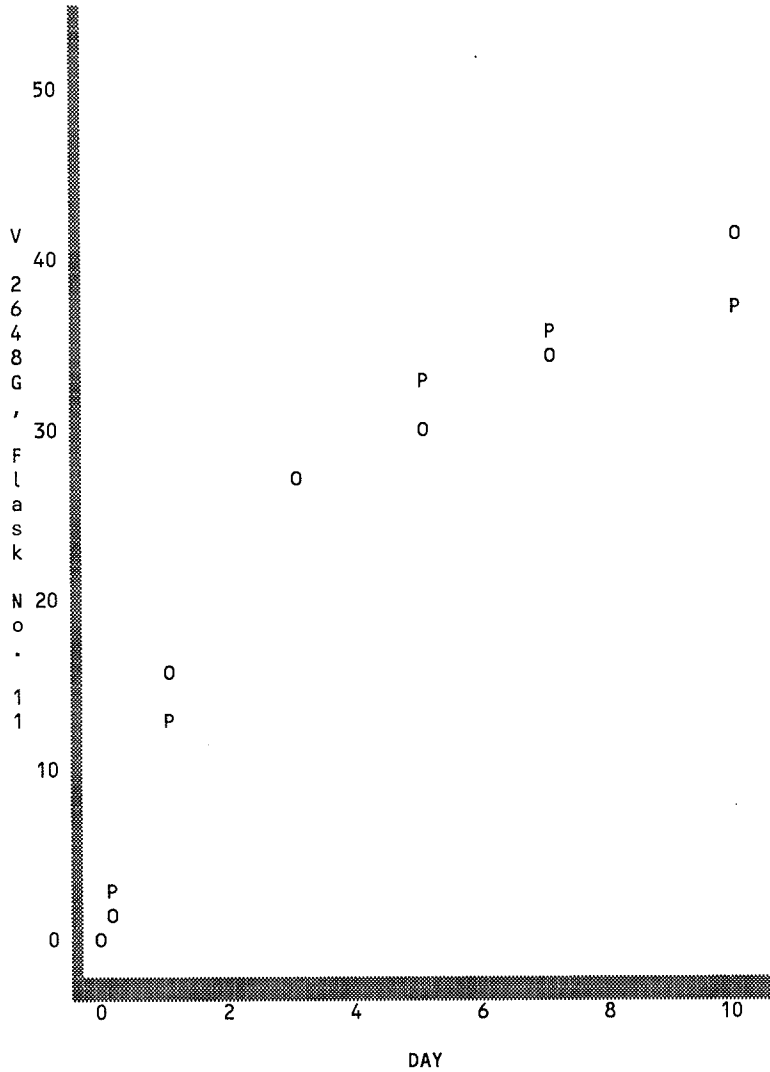
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.808878983	-0.35036013
KONSTANT	-0.808878983	1	0.6171225564
DELAY	-0.35036013	0.6171225564	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 3
 Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 11
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 12
0	0.0000	0.00	0.00000	0.00	0.00
1	2.9808	0.95	-2.03084	0.25	0.46
2	12.3165	15.49	3.17351	1.00	9.97
3	26.8582	27.41	0.55179	3.00	19.93
4	33.2850	30.33	-2.95502	5.00	21.21
5	36.1254	34.26	-1.86539	7.00	22.65
6	37.7140	40.84	3.12603	10.00	25.56

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 11
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

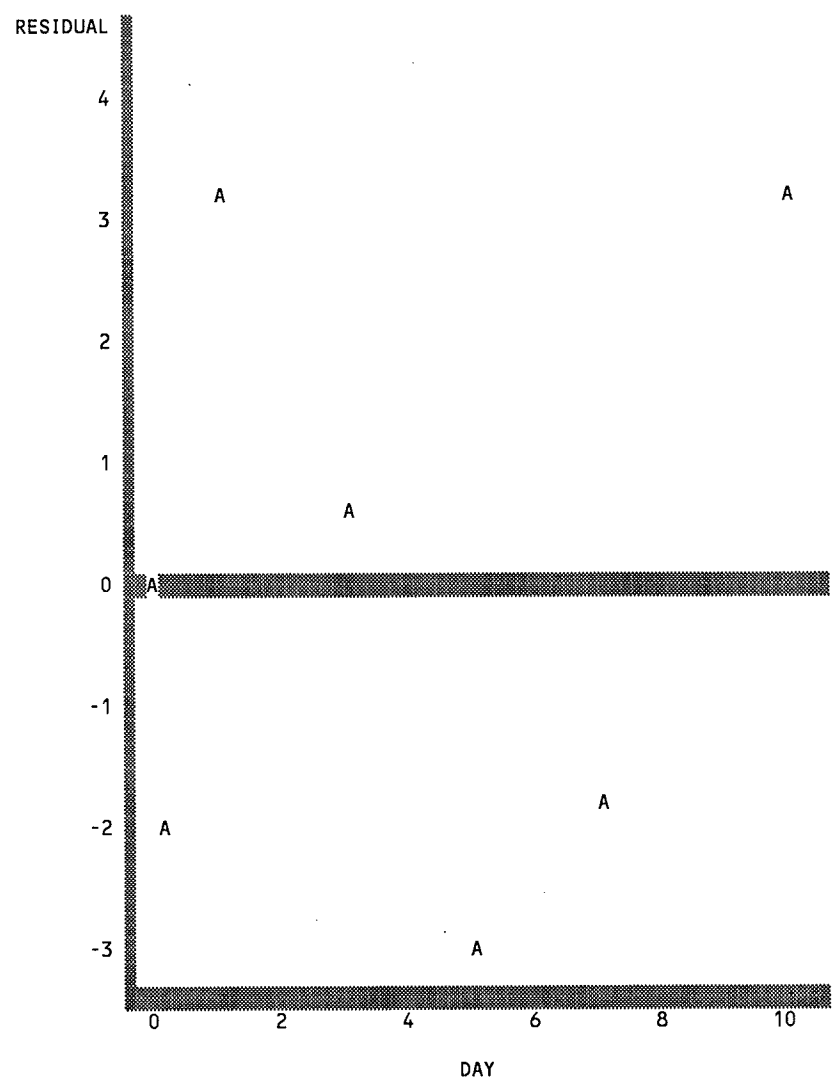
Plot of V2648G1*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 2 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 11
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 12
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G2 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	26.000000	0.800000	0	80.144692
1	23.585988	0.632071	0.159756	6.934480
2	23.829306	0.624324	0.197256	6.419250
3	23.839246	0.622804	0.196165	6.418792
4	23.841169	0.622446	0.196017	6.418772

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G2

Source	DF	Sum of Squares	Mean Square
Regression	3	2106.5988284	702.1996095
Residual	4	6.4187716	1.6046929
Uncorrected Total	7	2113.0176000	
(Corrected Total)	6	690.7249714	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	23.84116900	0.89825315891	21.347252160	26.335085844
KONSTANT	0.62244570	0.11196886190	0.311574512	0.933316896
DELAY	0.19601680	0.08830561335	-0.049155571	0.441189170

Asymptotic Correlation Matrix

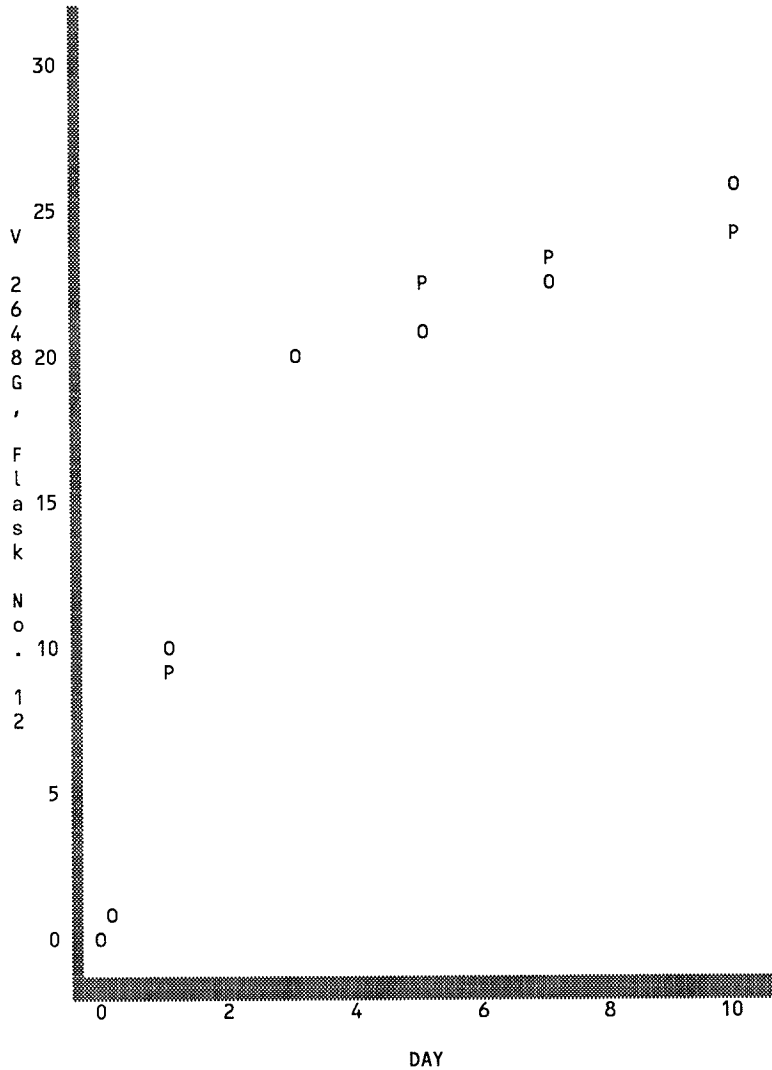
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.661285546	-0.20303128
KONSTANT	-0.661285546	1	0.5161871005
DELAY	-0.20303128	0.5161871005	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 12
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 11
0	0.0000	0.00	0.00000	0.00	0.00
1	0.7878	0.46	-0.32779	0.25	0.95
2	9.3871	9.97	0.58293	1.00	15.49
3	19.6788	19.93	0.25121	3.00	27.41
4	22.6425	21.21	-1.43252	5.00	30.33
5	23.4960	22.65	-0.84599	7.00	34.26
6	23.7878	25.56	1.77217	10.00	40.84

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
 Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 12
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

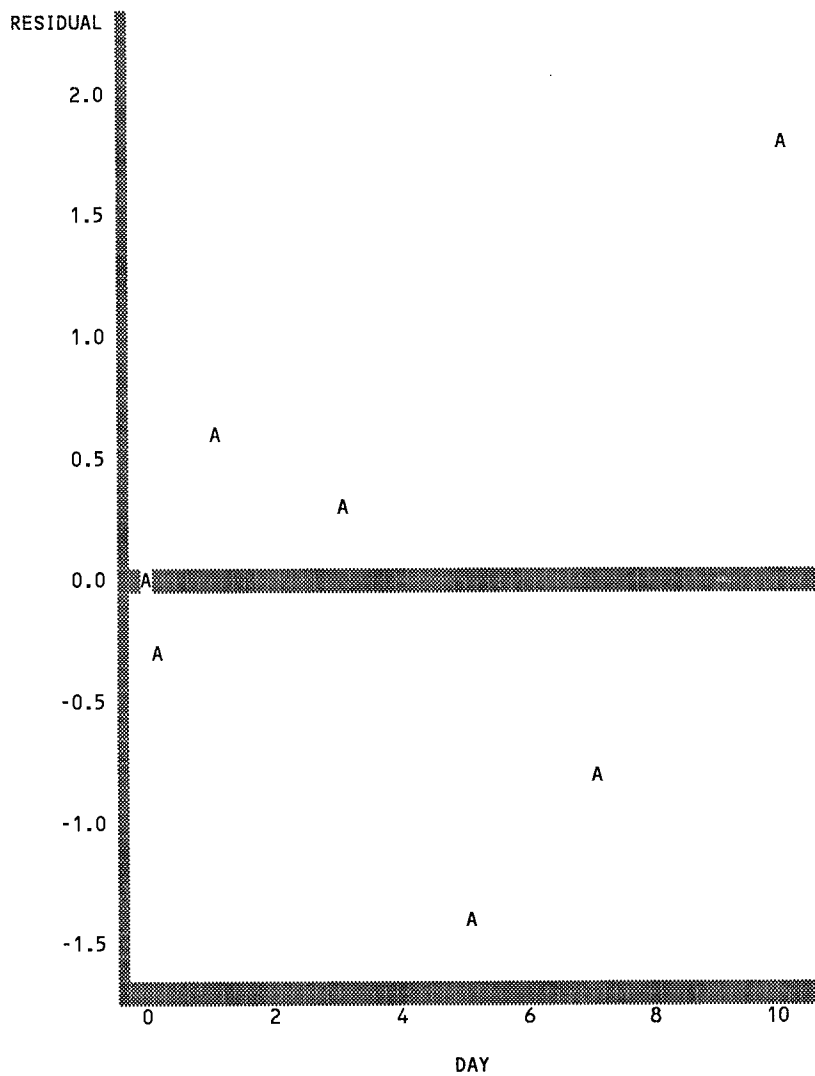
Plot of V2648G2*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 3 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 50 ug/kg, Site No. 2, Flask No. 12
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
Test Substance V 2648G, 2000 ug/kg, Site No. 2
Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 13	V 2648G, Flask No. 14	V 2648G, Flask No. 15
0	0.00	0.00	0.00	0.00
1	0.25	0.06	0.09	0.02
2	1.00	4.34	4.23	3.99
3	3.00	22.89	23.06	22.73
4	5.00	27.23	27.83	26.95
5	7.00	28.90	29.69	28.39
6	10.00	32.74	31.35	29.67
7	14.00	43.61	33.35	32.60

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 13
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	44.000000	0.800000	0	1355.876488
1	39.280389	0.419206	0	301.071111
2	38.294151	0.195219	0.139369	121.948217
3	42.578784	0.203334	0.230027	62.416244
4	42.446003	0.204527	0.223236	62.395680
5	42.424875	0.204843	0.224076	62.395313

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	5030.8185870	1676.9395290
Residual	5	62.3953130	12.4790626
Uncorrected Total	8	5093.2139000	
(Corrected Total)	7	1902.4072875	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	42.42487520	5.0853527779	29.352749195	55.497001215
KONSTANT	0.20484320	0.0656422768	0.036106801	0.373579599
DELAY	0.22407580	0.3401639906	-0.650330902	1.098482501

Asymptotic Correlation Matrix

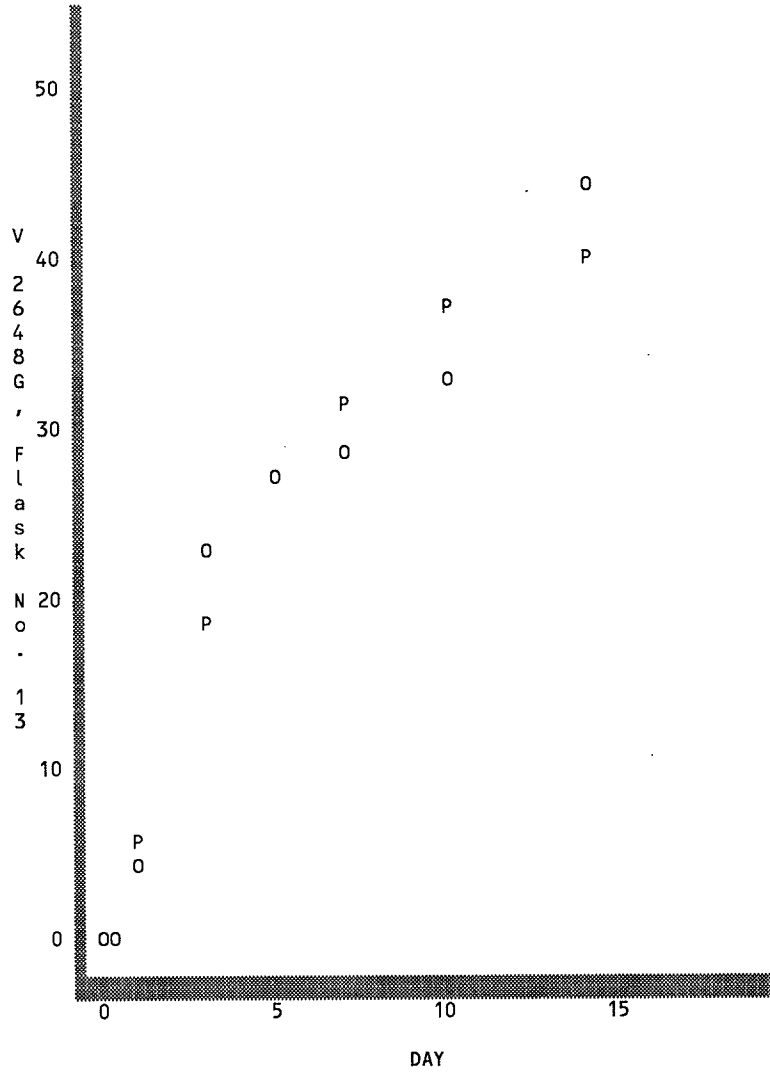
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.89282253	-0.304297351
KONSTANT	-0.89282253	1	0.5085012552
DELAY	-0.304297351	0.5085012552	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 3
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 13
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 14	V 2648G, Flask No. 15
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.2247	0.06	-0.16470	0.25	0.09	0.02
2	6.2345	4.34	-1.89454	1.00	4.23	3.99
3	18.3996	22.89	4.49038	3.00	23.06	22.73
4	26.4755	27.23	0.75449	5.00	27.83	26.95
5	31.8368	28.90	-2.93675	7.00	29.69	28.39
6	36.6978	32.74	-3.95781	10.00	31.35	29.67
7	39.9009	43.61	3.70909	14.00	33.35	32.60

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 13
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

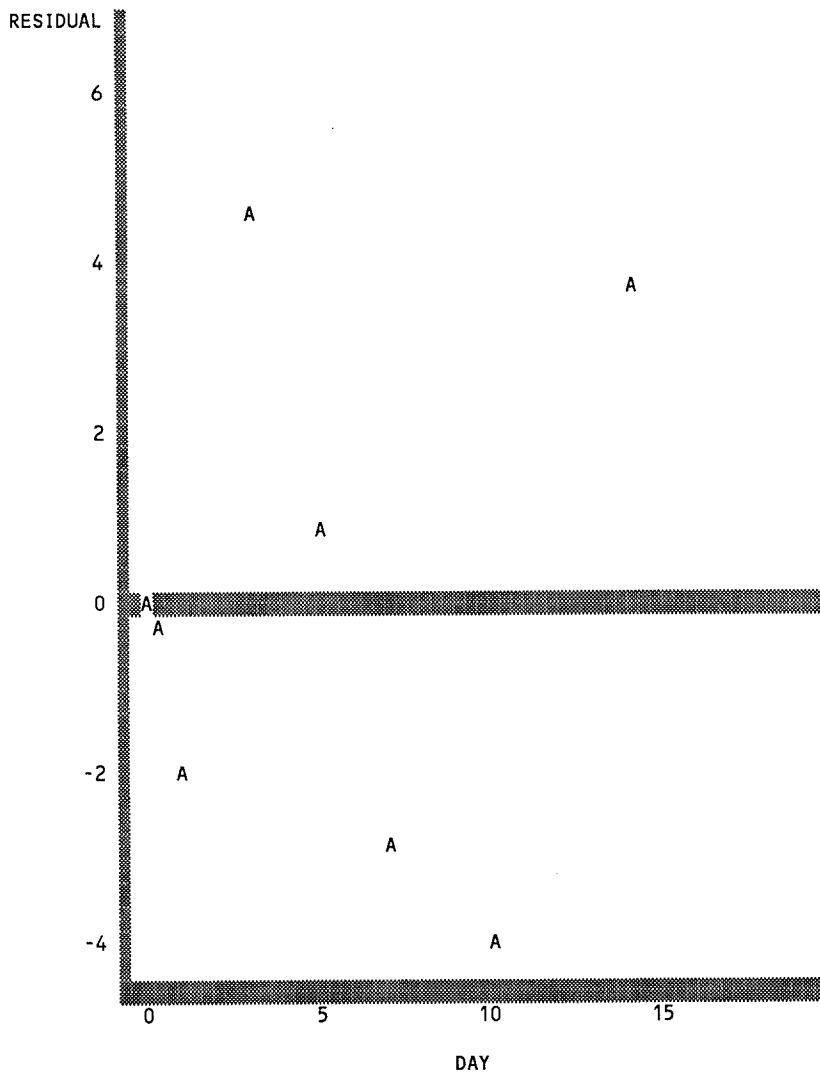
Plot of V2648G1*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 3 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 13
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 14
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G2 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	33.000000	0.800000	0	311.165503
1	32.411278	0.387578	0.009634	47.348869
2	32.934367	0.386910	0.392692	13.301960
3	31.997935	0.487316	0.760173	6.426284
4	32.024402	0.510175	0.706050	4.479991
5	31.999813	0.515224	0.711681	4.469221
6	31.993577	0.516049	0.712325	4.468969
7	31.992533	0.516180	0.712435	4.468963

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G2

Source	DF	Sum of Squares	Mean Square
Regression	3	4296.2456369	1432.0818790
Residual	5	4.4689631	0.8937926
Uncorrected Total	8	4300.7146000	
(Corrected Total)	7	1503.1946000	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	31.99253341	0.64103706291	30.344719063	33.640347755
KONSTANT	0.51618041	0.05320563752	0.379412946	0.652947872
DELAY	0.71243510	0.07830816638	0.511140466	0.913729731

Asymptotic Correlation Matrix

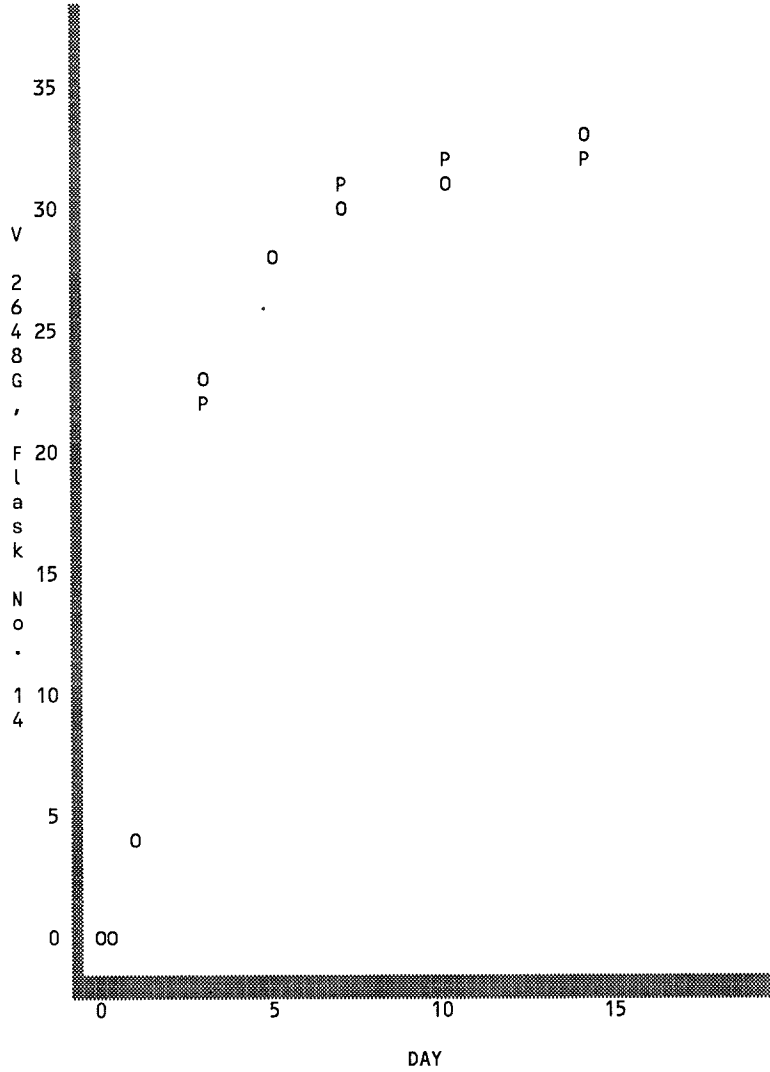
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.668403507	-0.230304203
KONSTANT	-0.668403507	1	0.5739546485
DELAY	-0.230304203	0.5739546485	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 14
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 13	V 2648G, Flask No. 15
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.09	0.09000	0.25	0.06	0.02
2	4.4132	4.23	-0.18319	1.00	4.34	3.99
3	22.1697	23.06	0.89027	3.00	22.89	22.73
4	28.4940	27.83	-0.66399	5.00	27.23	26.95
5	30.7465	29.69	-1.05648	7.00	28.90	28.39
6	31.7277	31.35	-0.37767	10.00	32.74	29.67
7	31.9589	33.35	1.39106	14.00	43.61	32.60

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 14
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

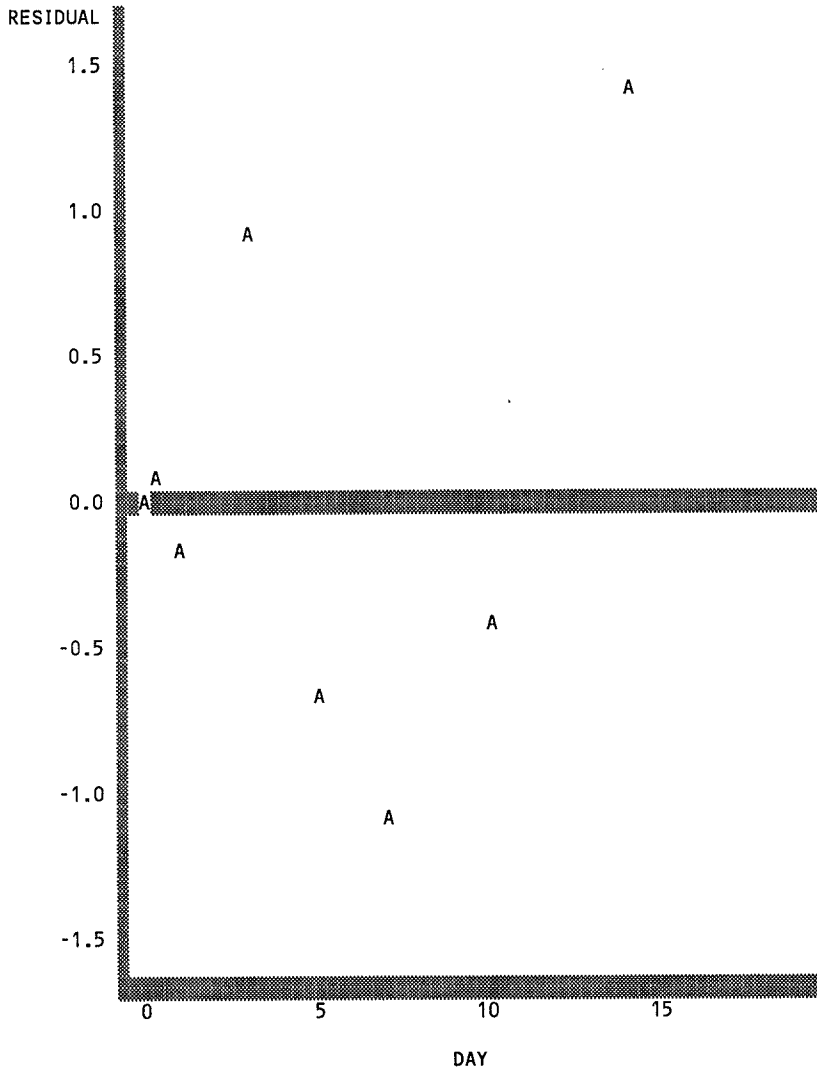
Plot of V2648G2*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 4 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 14
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 10
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 15
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G3 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	33.000000	0.800000	0	350.593137
1	31.824845	0.414574	0.016842	59.892154
2	31.625992	0.392834	0.372994	17.925161
3	30.694364	0.504278	0.786900	10.370065
4	30.687634	0.535899	0.721694	7.603141
5	30.650378	0.544998	0.730707	7.573491
6	30.638364	0.546903	0.731961	7.572364
7	30.635790	0.547286	0.732236	7.572320

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G3

Source	DF	Sum of Squares	Mean Square
Regression	3	4000.3645804	1333.4548601
Residual	5	7.5723196	1.5144639
Uncorrected Total	8	4007.9369000	
(Corrected Total)	7	1403.3215875	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	30.63579033	0.81099960417	28.551079700	32.720500970
KONSTANT	0.54728575	0.07728893603	0.348611098	0.745960409
DELAY	0.73223611	0.09989796872	0.475443928	0.989028291

Asymptotic Correlation Matrix

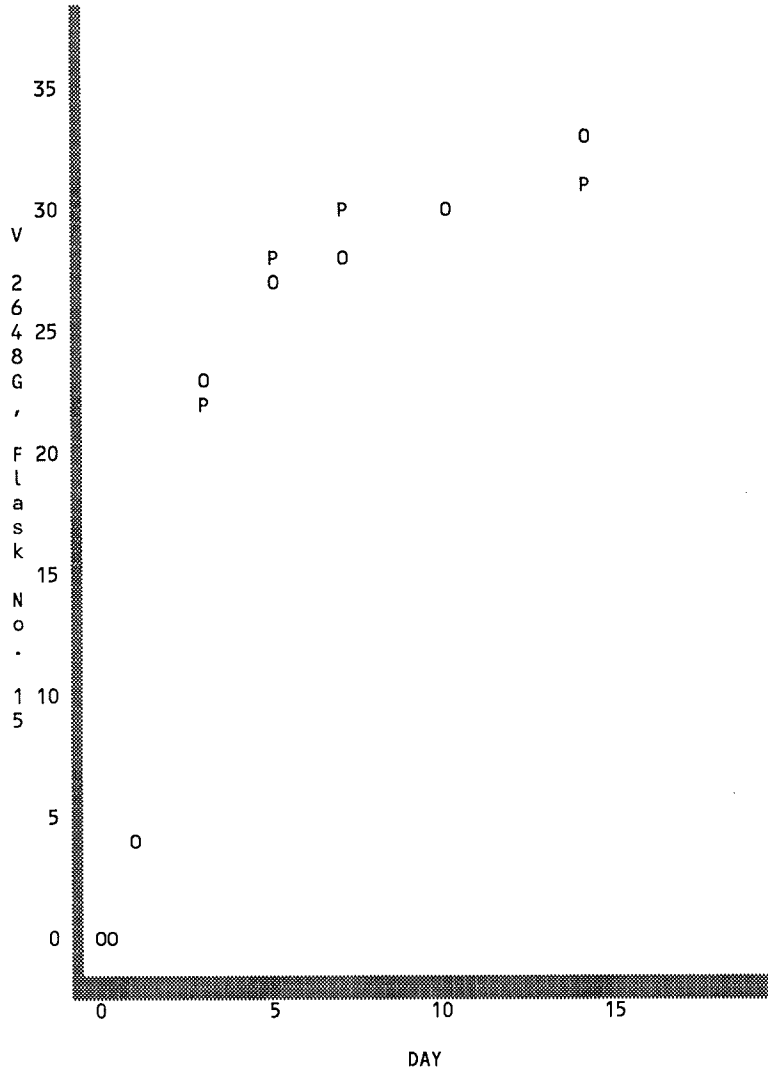
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.653876897	-0.221176445
KONSTANT	-0.653876897	1	0.5647869876
DELAY	-0.221176445	0.5647869876	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 11
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 15
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 13	V 2648G, Flask No. 14
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.02	0.02000	0.25	0.06	0.09
2	4.1760	3.99	-0.18602	1.00	4.34	4.23
3	21.7802	22.73	0.94985	3.00	22.89	23.06
4	27.6720	26.95	-0.72196	5.00	27.23	27.83
5	29.6438	28.39	-1.25385	7.00	28.90	29.69
6	30.4437	29.67	-0.77373	10.00	32.74	31.35
7	30.6143	32.60	1.98572	14.00	43.61	33.35

Laboratory Analysis Curve Fitting Report for Study No. 96-001 12
 Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 15
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

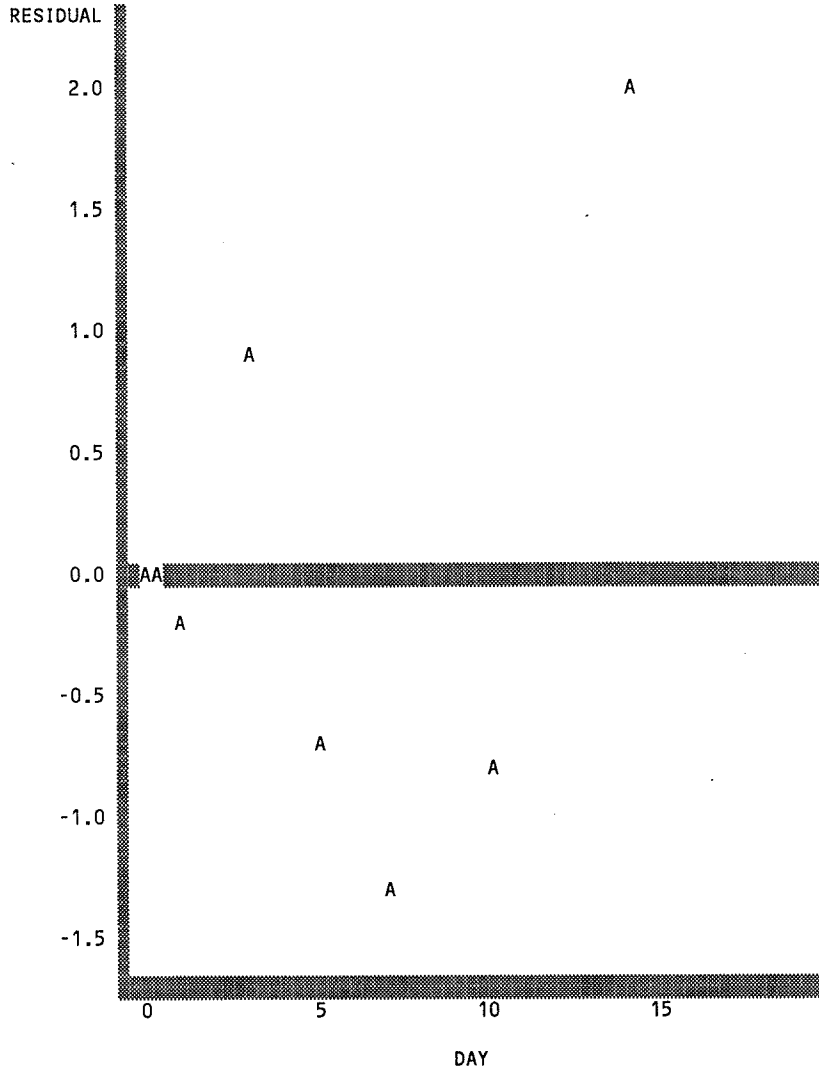
Plot of V2648G3*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 4 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 13
Test Substance V 2648G, 2000 ug/kg, Site No. 2, Flask No. 15
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
 Test Substance V 2648G, Site No. 3, 50 ug/kg
 Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
 Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 19	V 2648G, Flask No. 20	V 2648G, Flask No. 21
0	0.00	0.00	0.00	0.00
1	0.25	0.04	-0.07	0.00
2	1.00	0.12	-0.25	-0.04
3	3.00	0.14	-0.28	0.12
4	5.00	0.85	0.34	0.14
5	7.00	11.48	8.87	2.84
6	10.00	26.10	26.08	17.42
7	14.00	42.28	39.31	36.68
8	18.00	53.42	48.11	49.68
9	21.00	60.15	52.22	55.69
10	28.00	65.47	57.04	62.01
11	35.00	70.00	61.21	66.82
12	45.00	74.90	65.73	72.07
13	52.00	76.73	67.82	74.28
14	59.00	78.19	69.65	76.17
15	62.00	78.46	69.86	76.34

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 19
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	80.000000	0.080000	5.000000	28.311878
1	77.880710	0.086573	5.145288	16.235520
2	77.895044	0.087342	5.165679	16.023656
3	77.889811	0.087388	5.167590	16.023401
4	77.889459	0.087391	5.167708	16.023400

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	42010.523900	14003.507967
Residual	13	16.023400	1.232569
Uncorrected Total	16	42026.547300	
(Corrected Total)	15	16559.972994	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	77.88945858	0.64390007233	76.498397876	79.280519278
KONSTANT	0.08739073	0.00338089587	0.080086752	0.094694706
DELAY	5.16770809	0.20711261024	4.720268767	5.615147415

Asymptotic Correlation Matrix

Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.705326325	-0.331901834
KONSTANT	-0.705326325	1	0.7319357862
DELAY	-0.331901834	0.7319357862	1

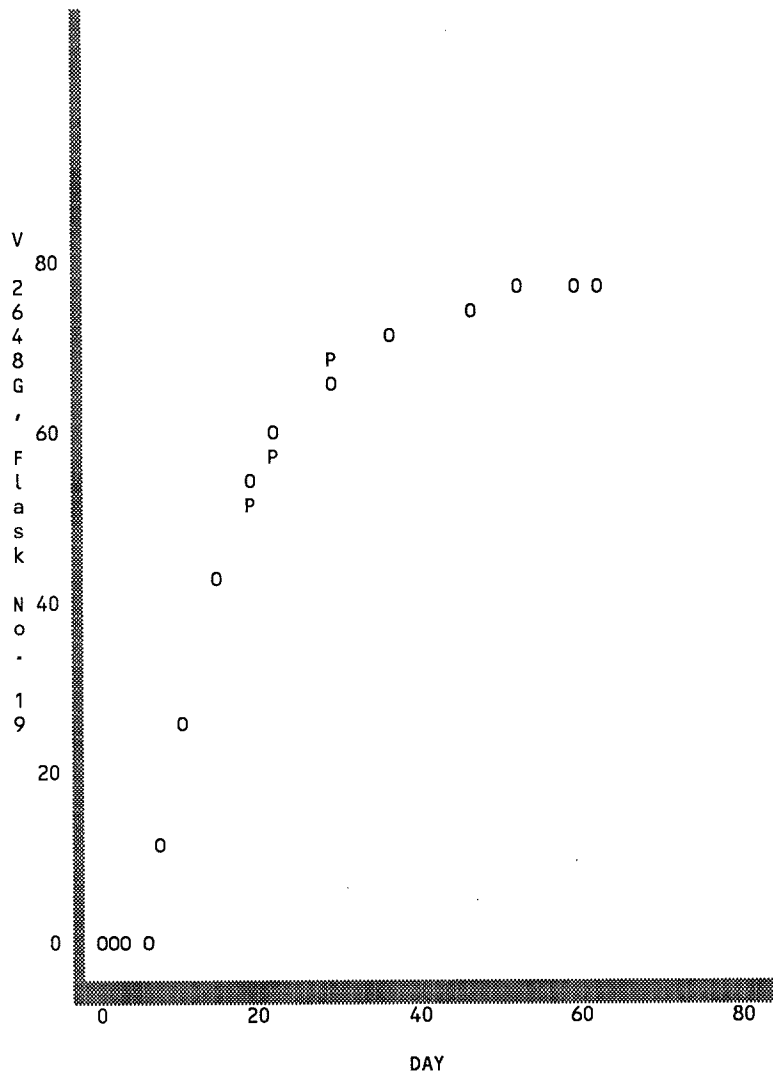
3

Laboratory Analysis Curve Fitting Report for Study No. 96-001
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 19
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 20	V 2648G, Flask No. 21
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.04	0.04000	0.25	-0.07	0.00
2	0.0000	0.12	0.12000	1.00	-0.25	-0.04
3	0.0000	0.14	0.14000	3.00	-0.28	0.12
4	0.0000	0.85	0.85000	5.00	0.34	0.14
5	11.5248	11.48	-0.04476	7.00	8.87	2.84
6	26.8299	26.10	-0.72988	10.00	26.08	17.42
7	41.8927	42.28	0.38735	14.00	39.31	36.68
8	52.5118	53.42	0.90815	18.00	48.11	49.68
9	58.3645	60.15	1.78553	21.00	52.22	55.69
10	67.2989	65.47	-1.82893	28.00	57.04	62.01
11	72.1451	70.00	-2.14506	35.00	61.21	66.82
12	75.4922	74.90	-0.59222	45.00	65.73	72.07
13	76.5892	76.73	0.14083	52.00	67.82	74.28
14	77.1842	78.19	1.00583	59.00	69.65	76.17
15	77.3468	78.46	1.11317	62.00	69.86	76.34

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 19
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

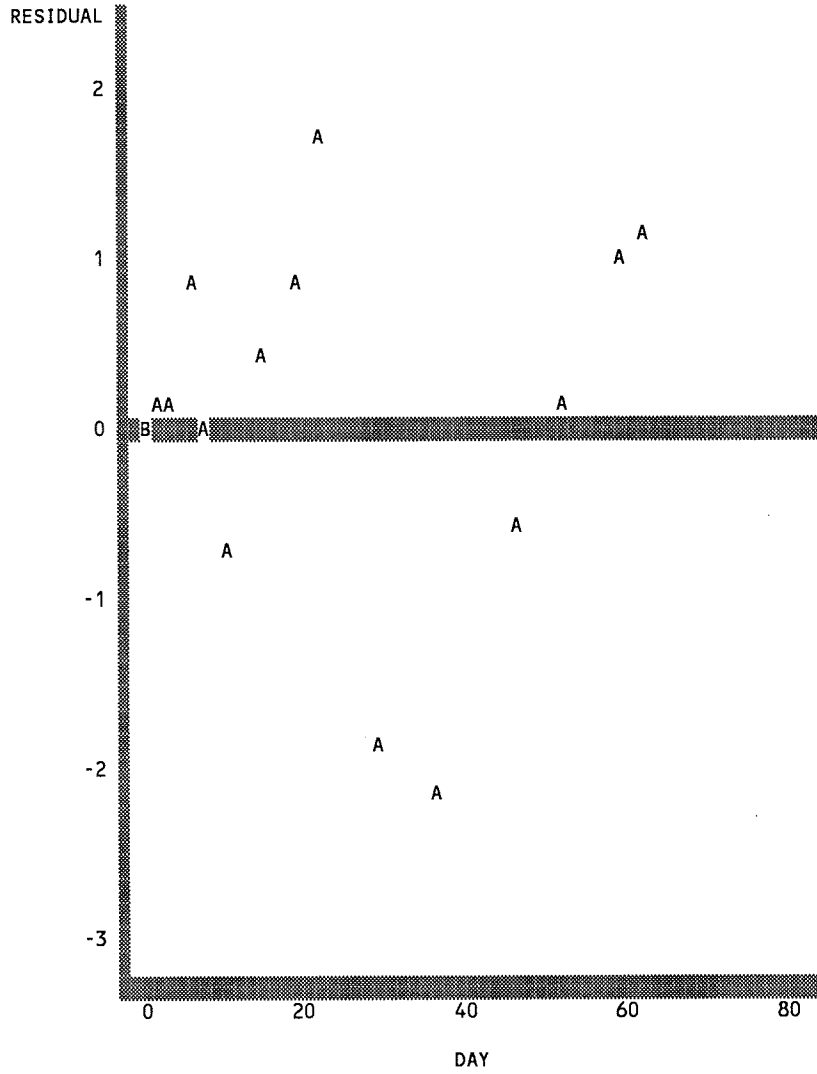
Plot of V2648G1*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 14 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 19
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 20
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G2 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	70.000000	0.080000	5.000000	46.218654
1	68.542373	0.088189	5.030300	32.013310
2	68.496101	0.089991	5.101234	31.502299
3	68.470258	0.090263	5.111847	31.495317
4	68.465973	0.090303	5.113550	31.495174

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G2

Source	DF	Sum of Squares	Mean Square
Regression	3	32966.139226	10988.713075
Residual	13	31.495174	2.422706
Uncorrected Total	16	32997.634400	
(Corrected Total)	15	13000.846300	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	68.46597297	0.88139541602	66.561835083	70.370110865
KONSTANT	0.09030328	0.00557632381	0.078256368	0.102350184
DELAY	5.11355042	0.32819772287	4.404522771	5.822578069

Asymptotic Correlation Matrix

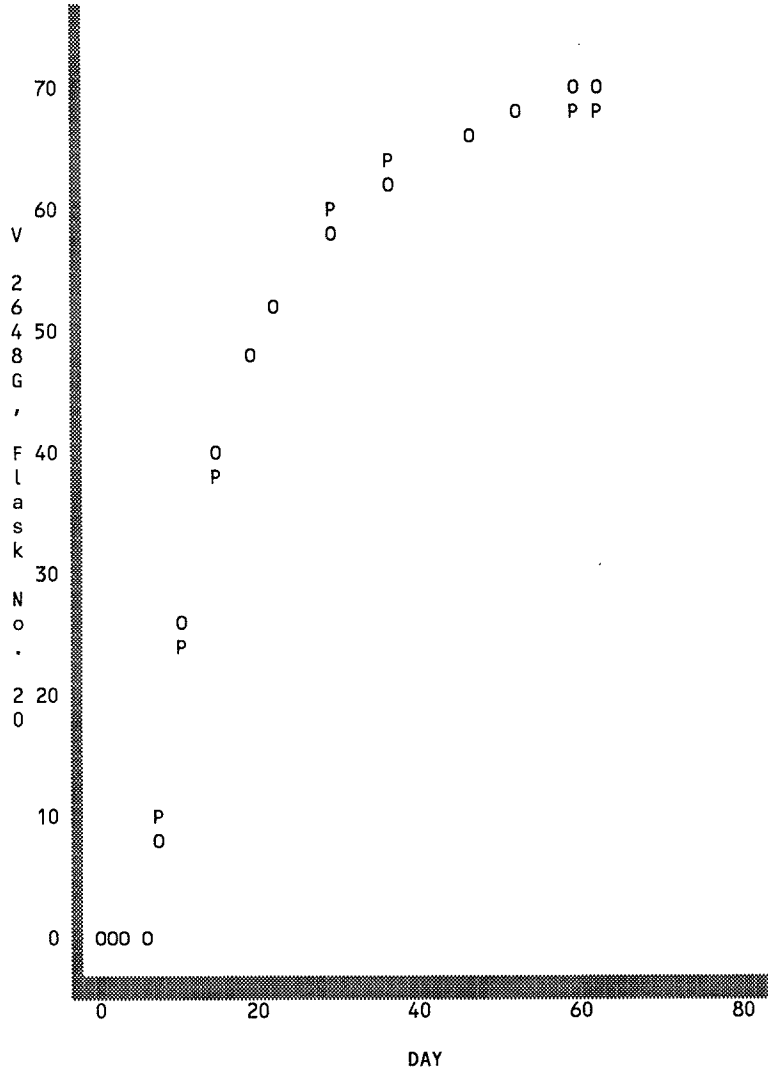
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.69427721	-0.326608322
KONSTANT	-0.69427721	1	0.7364454665
DELAY	-0.326608322	0.7364454665	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 20
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 19	V 2648G, Flask No. 21
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	-0.07	-0.07000	0.25	0.04	0.00
2	0.0000	-0.25	-0.25000	1.00	0.12	-0.04
3	0.0000	-0.28	-0.28000	3.00	0.14	0.12
4	0.0000	0.34	0.34000	5.00	0.85	0.14
5	10.7240	8.87	-1.85400	7.00	11.48	2.84
6	24.4270	26.08	1.65298	10.00	26.10	17.42
7	37.7783	39.31	1.53171	14.00	42.28	36.68
8	47.0819	48.11	1.02814	18.00	53.42	49.68
9	52.1566	52.22	0.06337	21.00	60.15	55.69
10	59.7982	57.04	-2.75817	28.00	65.47	62.01
11	63.8594	61.21	-2.64936	35.00	70.00	66.82
12	66.5987	65.73	-0.86874	45.00	74.90	72.07
13	67.4736	67.82	0.34639	52.00	76.73	74.28
14	67.9386	69.65	1.71143	59.00	78.19	76.17
15	68.0637	69.86	1.79627	62.00	78.46	76.34

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 20
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

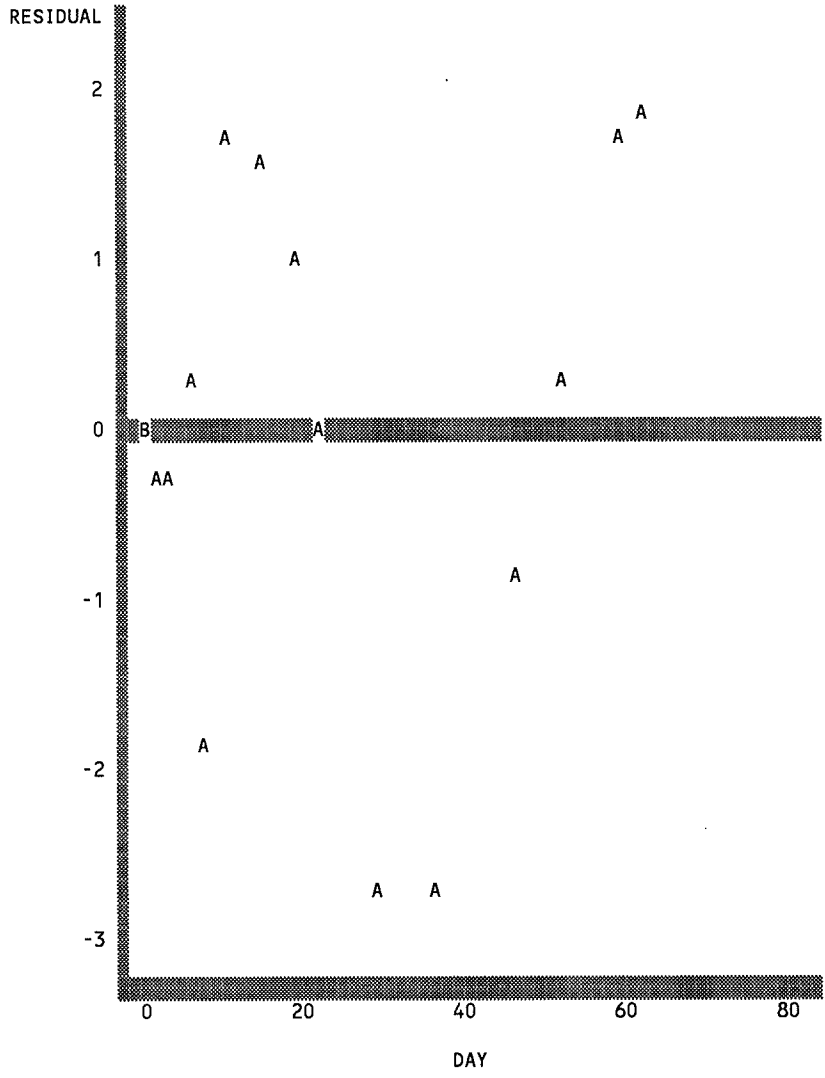
Plot of V2648G2*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 10 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 20
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 10
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 21
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G3 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	75.000000	0.080000	5.000000	141.884983
1	75.584475	0.088138	6.901189	31.058913
2	75.595438	0.087819	6.639611	25.212581
3	75.598227	0.087794	6.635064	25.211271
4	75.598437	0.087792	6.635018	25.211270

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G3

Source	DF	Sum of Squares	Mean Square
Regression	3	37852.667530	12617.555843
Residual	13	25.211270	1.939328
Uncorrected Total	16	37877.878800	
(Corrected Total)	15	16105.400775	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	75.59843690	0.80491623762	73.859522131	77.337351671
KONSTANT	0.08779237	0.00385640094	0.079461127	0.096123613
DELAY	6.63501813	0.19559032989	6.212471161	7.057565092

Asymptotic Correlation Matrix

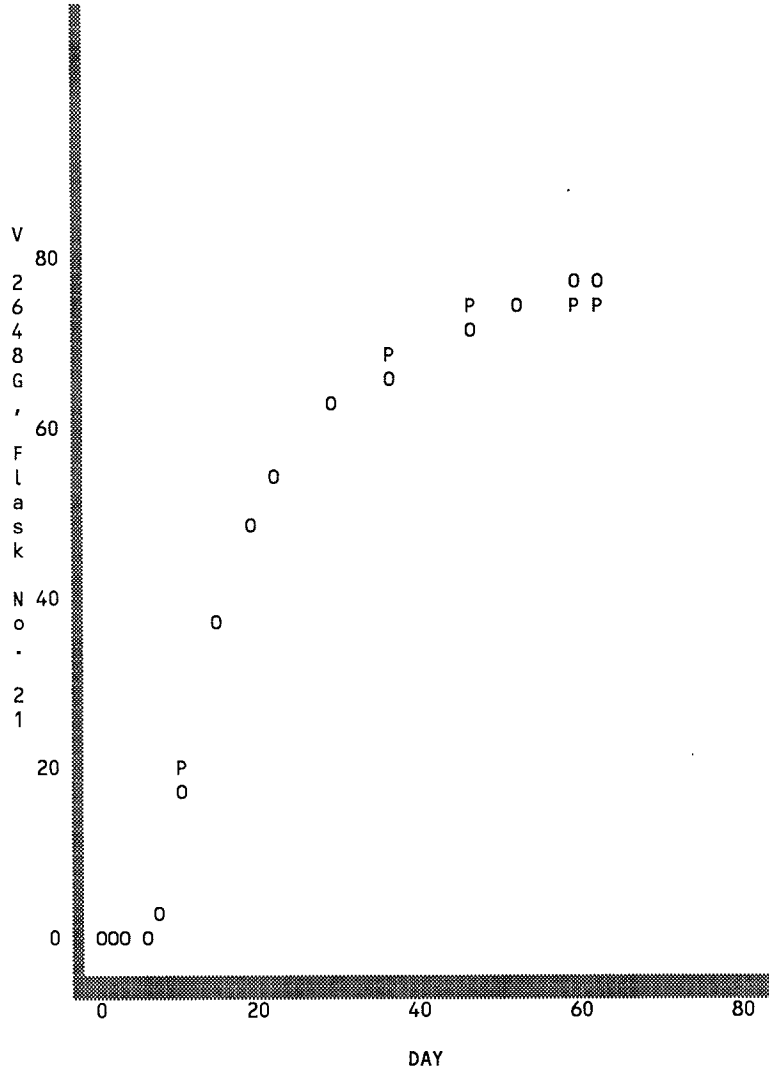
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.703766411	-0.239932664
KONSTANT	-0.703766411	1	0.6016595738
DELAY	-0.239932664	0.6016595738	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 11
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 21
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 19	V 2648G, Flask No. 20
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.00	0.00000	0.25	0.04	-0.07
2	0.0000	-0.04	-0.04000	1.00	0.12	-0.25
3	0.0000	0.12	0.12000	3.00	0.14	-0.28
4	0.0000	0.14	0.14000	5.00	0.85	0.34
5	2.3840	2.84	0.45603	7.00	11.48	8.87
6	19.3366	17.42	-1.91663	10.00	26.10	26.08
7	35.9978	36.68	0.68225	14.00	42.28	39.31
8	47.7249	49.68	1.95508	18.00	53.42	48.11
9	54.1790	55.69	1.51102	21.00	60.15	52.22
10	64.0129	62.01	-2.00295	28.00	65.47	57.04
11	69.3320	66.82	-2.51201	35.00	70.00	61.21
12	72.9938	72.07	-0.92383	45.00	74.90	65.73
13	74.1896	74.28	0.09036	52.00	76.73	67.82
14	74.8364	76.17	1.33356	59.00	78.19	69.65
15	75.0129	76.34	1.32712	62.00	78.46	69.86

Laboratory Analysis Curve Fitting Report for Study No. 96-001 12
 Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 21
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

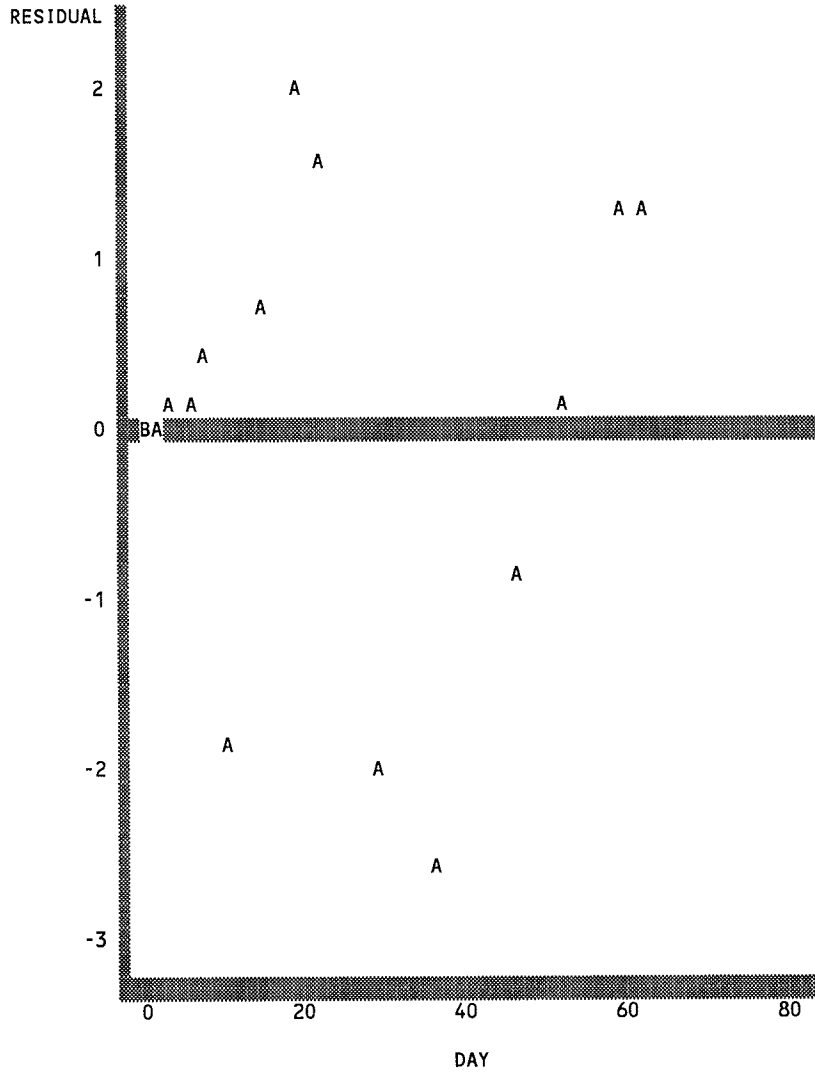
Plot of V2648G3*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 12 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 13
Test Substance V 2648G, 50 ug/kg, Site No. 3, Flask No. 21
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 1
 Test Substance V 2648G, 2000 ug/kg, Site No. 3
 Model = SAMPLE * (1 - EXP(-KONSTANT* (DAY - DELAY)))
 Input Data 16:07 Monday, May 13, 1996

ID	DAY	V 2648G, Flask No. 22	V 2648G, Flask No. 23	V 2648G, Flask No. 24
0	0.00	0.00	0.00	0.00
1	0.25	0.00	0.00	0.00
2	1.00	0.02	0.02	0.02
3	3.00	0.07	0.07	0.09
4	5.00	0.11	0.12	0.14
5	7.00	0.14	0.18	0.16
6	10.00	3.69	4.22	1.36
7	14.00	24.91	26.42	22.31
8	18.00	40.00	41.08	40.36
9	21.00	45.52	45.64	49.03
10	28.00	56.29	53.95	63.16
11	35.00	62.34	59.33	70.78
12	45.00	68.41	63.88	77.20
13	52.00	71.44	65.76	80.29
14	59.00	74.27	68.19	83.27
15	62.00	74.50	68.34	83.47

Laboratory Analysis Curve Fitting Report for Study No. 96-001 2
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 22
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G1 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	75.000000	0.080000	7.000000	300.350187
1	74.106065	0.079392	9.243638	24.222857
2	74.117569	0.079416	9.098322	22.831830
3	74.117126	0.079419	9.097653	22.831790

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G1

Source	DF	Sum of Squares	Mean Square
Regression	3	32188.124110	10729.374703
Residual	13	22.831790	1.756292
Uncorrected Total	16	32210.955900	
(Corrected Total)	15	15199.623144	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	74.11712596	0.89181002534	72.190488683	76.043763229
KONSTANT	0.07941893	0.00391345960	0.070964419	0.087873440
DELAY	9.09765251	0.24161462444	8.575676162	9.619628860

Asymptotic Correlation Matrix

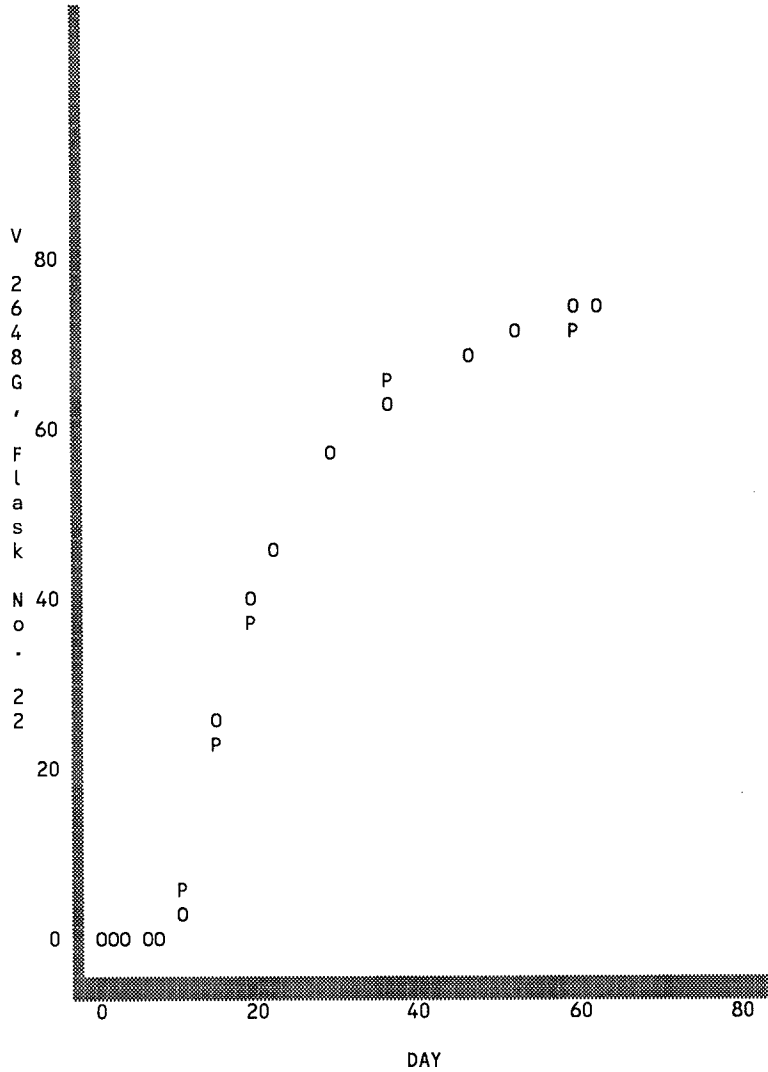
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.752350559	-0.321427889
KONSTANT	-0.752350559	1	0.664557435
DELAY	-0.321427889	0.664557435	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 3
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 22
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 23	V 2648G, Flask No. 24
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.00	0.00000	0.25	0.00	0.00
2	0.0000	0.02	0.02000	1.00	0.02	0.02
3	0.0000	0.07	0.07000	3.00	0.07	0.09
4	0.0000	0.11	0.11000	5.00	0.12	0.14
5	0.0000	0.14	0.14000	7.00	0.18	0.16
6	5.1256	3.69	-1.43564	10.00	4.22	1.36
7	23.9024	24.91	1.00756	14.00	26.42	22.31
8	37.5689	40.00	2.43107	18.00	41.08	40.36
9	45.3171	45.52	0.20286	21.00	45.64	49.03
10	57.5993	56.29	-1.30926	28.00	53.95	63.16
11	64.6435	62.34	-2.30352	35.00	59.33	70.78
12	69.8356	68.41	-1.42555	45.00	63.88	77.20
13	71.6615	71.44	-0.22148	52.00	65.76	80.29
14	72.7087	74.27	1.56128	59.00	68.19	83.27
15	73.0073	74.50	1.49270	62.00	68.34	83.47

Laboratory Analysis Curve Fitting Report for Study No. 96-001 4
Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 22
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

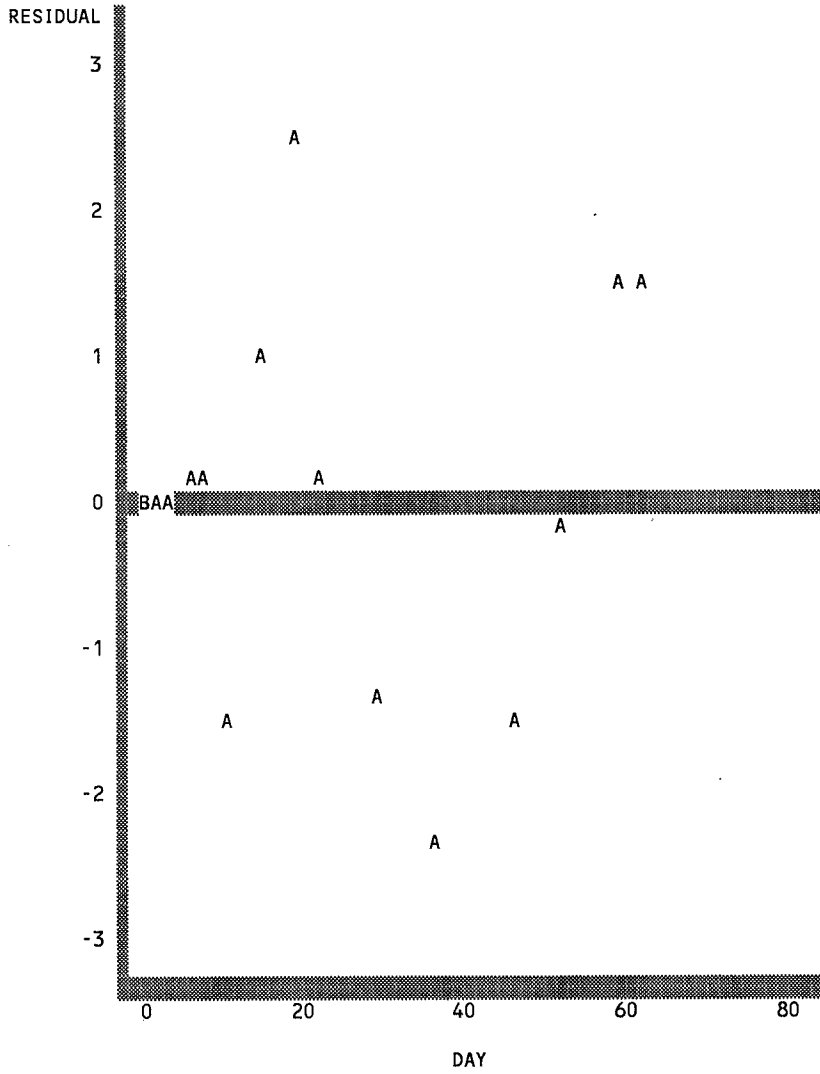
Plot of V2648G1*DAY. Symbol used is 'O'.
Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 12 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 5
Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 22
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 6
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 23
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	82.000000	0.080000	7.000000	1464.700223
1	67.012117	0.092797	9.100569	29.447573
2	67.076292	0.095871	9.087841	26.189819
3	67.043062	0.096317	9.101792	26.172326
4	67.037203	0.096375	9.103519	26.172048
5	67.036419	0.096383	9.103749	26.172044

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Sum of Squares	Mean Square
Regression	3	28616.195956	9538.731985
Residual	13	26.172044	2.013234
Uncorrected Total	16	28642.368000	
(Corrected Total)	15	13191.878000	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	67.03641940	0.81222097669	65.281723710	68.791115089
KONSTANT	0.09638304	0.00528957756	0.084955610	0.107810471
DELAY	9.10374891	0.24759285159	8.568857397	9.638640428

Asymptotic Correlation Matrix

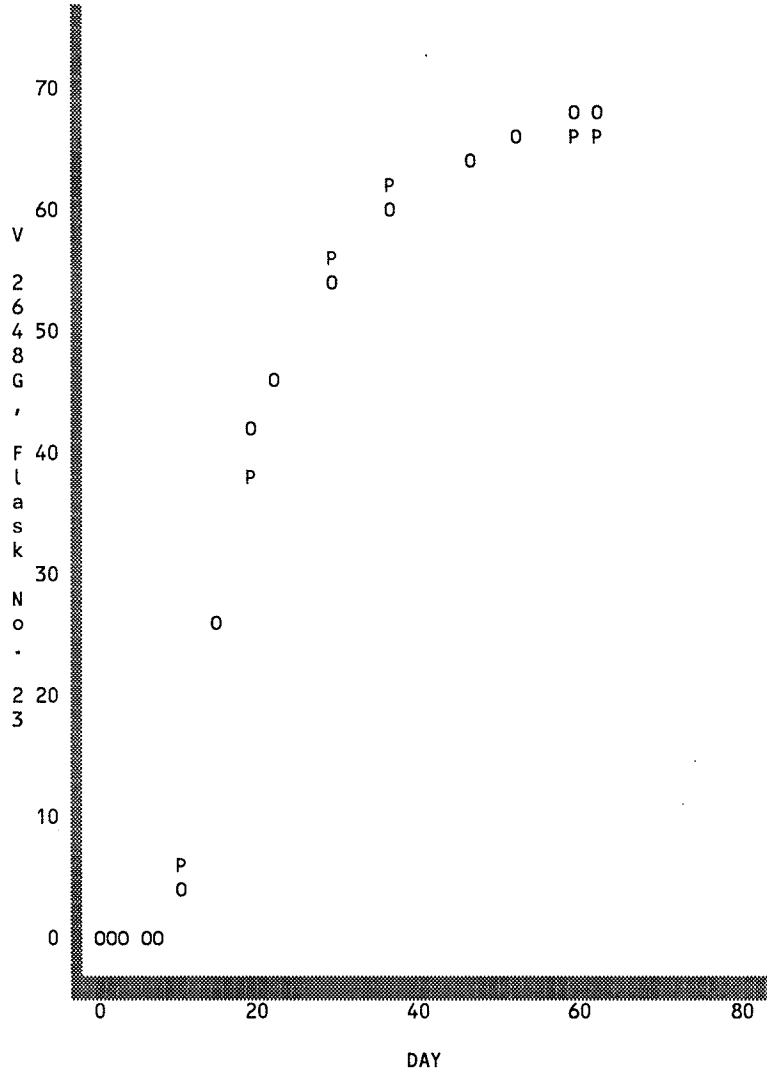
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.679101731	-0.259535193
KONSTANT	-0.679101731	1	0.6540589632
DELAY	-0.259535193	0.6540589632	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 7
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 23
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 22	V 2648G, Flask No. 24
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.00	0.00000	0.25	0.00	0.00
2	0.0000	0.02	0.02000	1.00	0.02	0.02
3	0.0000	0.07	0.07000	3.00	0.07	0.09
4	0.0000	0.12	0.12000	5.00	0.11	0.14
5	0.0000	0.18	0.18000	7.00	0.14	0.16
6	5.5478	4.22	-1.32777	10.00	3.69	1.36
7	25.2187	26.42	1.20131	14.00	24.91	22.31
8	38.5967	41.08	2.48334	18.00	40.00	40.36
9	45.7379	45.64	-0.09787	21.00	45.52	49.03
10	56.1887	53.95	-2.23867	28.00	56.29	63.16
11	61.5115	59.33	-2.18146	35.00	62.34	70.78
12	64.9290	63.88	-1.04904	45.00	68.41	77.20
13	65.9631	65.76	-0.20309	52.00	71.44	80.29
14	66.4898	68.19	1.70025	59.00	74.27	83.27
15	66.6270	68.34	1.71298	62.00	74.50	83.47

Laboratory Analysis Curve Fitting Report for Study No. 96-001 8
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 23
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

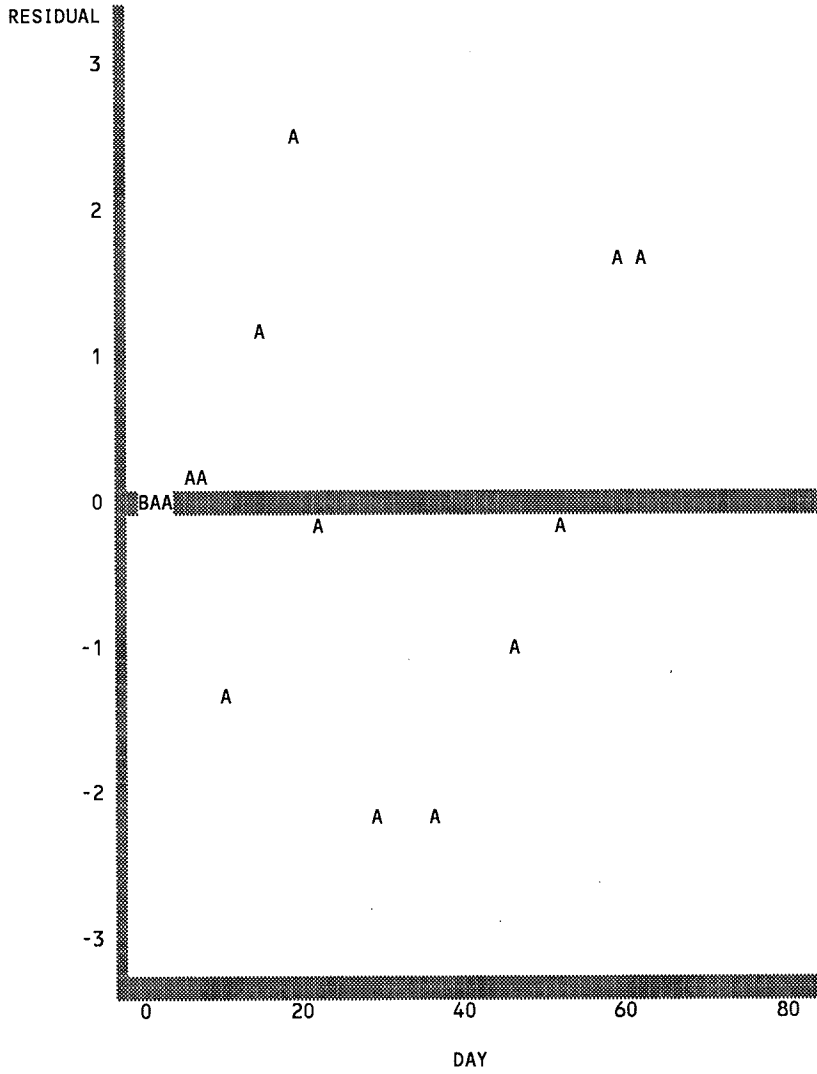
Plot of V2648G2*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 11 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 9
Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 23
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.



Laboratory Analysis Curve Fitting Report for Study No. 96-001 10
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 24
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

Non-Linear Least Squares Iterative Phase
 Dependent Variable V2648G3 Method: Gauss-Newton

Iter	SAMPLE	KONSTANT	DELAY	Sum of Squares
0	83.000000	0.080000	7.000000	597.397892
1	84.139281	0.075150	9.983251	14.007688
2	84.207312	0.076039	9.770824	7.402327
3	84.202548	0.076086	9.773044	7.401764
4	84.202188	0.076088	9.773102	7.401763

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable V2648G3

Source	DF	Sum of Squares	Mean Square
Regression	3	39831.560037	13277.186679
Residual	13	7.401763	0.569366
Uncorrected Total	16	39838.961800	
(Corrected Total)	15	19415.693700	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval	
			Lower	Upper
SAMPLE	84.20218760	0.53010889517	83.056957644	85.347417556
KONSTANT	0.07608758	0.00181790523	0.072160237	0.080014923
DELAY	9.77310178	0.10981691527	9.535856905	10.010346664

Asymptotic Correlation Matrix

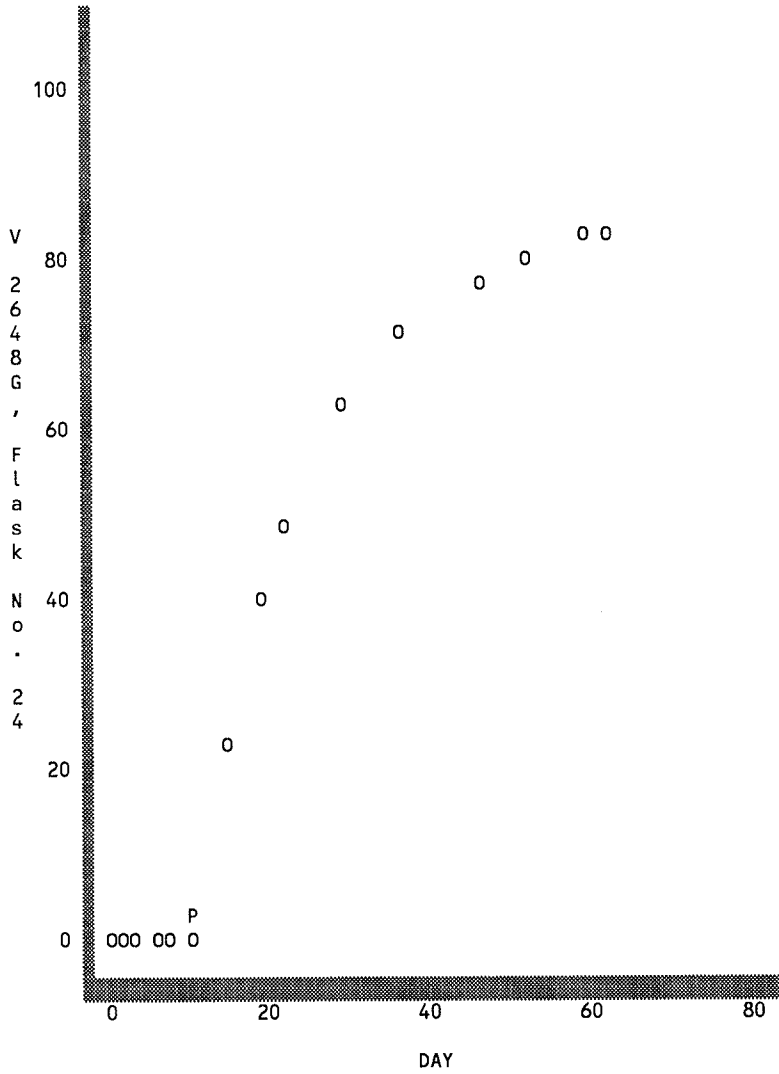
Corr	SAMPLE	KONSTANT	DELAY
SAMPLE	1	-0.768814432	-0.288451028
KONSTANT	-0.768814432	1	0.6031480111
DELAY	-0.288451028	0.6031480111	1

Laboratory Analysis Curve Fitting Report for Study No. 96-001 11
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 24
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

CASE ID	PREDICTED CO2	OBSERVED CO2	RESIDUAL	DAY	V 2648G, Flask No. 22	V 2648G, Flask No. 23
0	0.0000	0.00	0.00000	0.00	0.00	0.00
1	0.0000	0.00	0.00000	0.25	0.00	0.00
2	0.0000	0.02	0.02000	1.00	0.02	0.02
3	0.0000	0.09	0.09000	3.00	0.07	0.07
4	0.0000	0.14	0.14000	5.00	0.11	0.12
5	0.0000	0.16	0.16000	7.00	0.14	0.18
6	1.4412	1.36	-0.08120	10.00	3.69	4.22
7	23.1575	22.31	-0.84748	14.00	24.91	26.42
8	39.1755	40.36	1.18453	18.00	40.00	41.08
9	48.3647	49.03	0.66526	21.00	45.52	45.64
10	63.1631	63.16	-0.00314	28.00	56.29	53.95
11	71.8508	70.78	-1.07081	35.00	62.34	59.33
12	78.4309	77.20	-1.23092	45.00	68.41	63.88
13	80.8141	80.29	-0.52406	52.00	71.44	65.76
14	82.2131	83.27	1.05688	59.00	74.27	68.19
15	82.6191	83.47	0.85094	62.00	74.50	68.34

Laboratory Analysis Curve Fitting Report for Study No. 96-001 12
 Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 24
 Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
 16:07 Monday, May 13, 1996

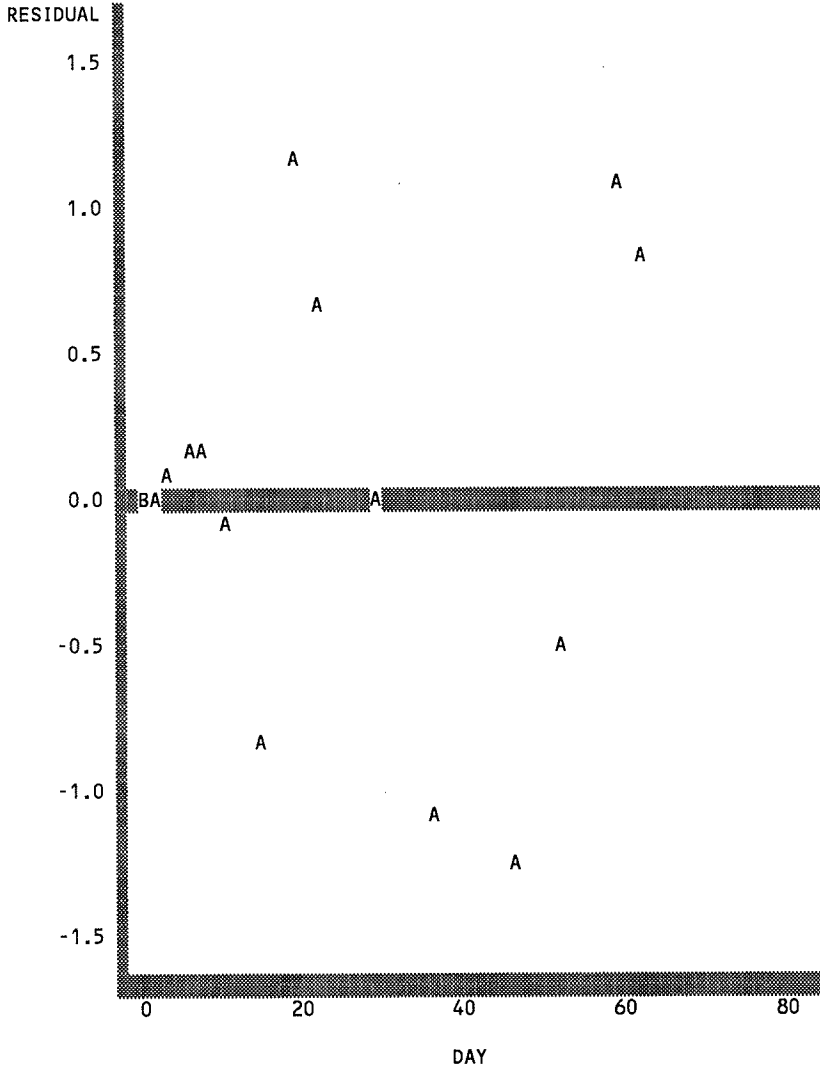
Plot of V2648G3*DAY. Symbol used is 'O'.
 Plot of PREDICT*DAY. Symbol used is 'P'.



NOTE: 16 obs hidden.

Laboratory Analysis Curve Fitting Report for Study No. 96-001 13
Test Substance V 2648G, 2000 ug/kg, Site No. 3, Flask No. 24
Model = SAMPLE * (1-EXP(-KONSTANT*(DAY - DELAY)))
16:07 Monday, May 13, 1996

Plot of RESIDUAL*DAY. Legend: A = 1 obs, B = 2 obs, etc.





APPENDIX B

**PROTOCOL
PROTOCOL AMENDMENTS
CHAIN OF CUSTODY: SOIL COLLECTION
TEST SUBSTANCE IDENTIFICATION SHEETS**

PROTOCOL

SPONSOR: The Soap and Detergent Association (SDA)
475 Park Avenue South
New York, NY 10016

LABORATORY Roy F. Weston, Inc.
Environmental Fate & Effect Laboratory
254 Welsh Pool Road
Lionville, PA 19341-1345

TITLE: $^{14}\text{CO}_2$ Production Test in Soil from a Septic Tank Drainage Field

1.0 PRINCIPLE OF THE TEST

A small sample of soil is dosed with a known concentration of ^{14}C -labelled test substance. Release of $^{14}\text{CO}_2$ from the test substance is measured by means of alkali absorption and liquid scintillation counting.

2.0 OBJECTIVE

The objective of the study is to determine the rate and extent of the ultimate biodegradation of the test substance in soils of the saturated and unsaturated zones at the Jacksonville, Florida SDA septic tank field study site.

3.0 JUSTIFICATION FOR TEST SYSTEM

Many synthetic chemicals may reside in soil as a result of their discharge from septic tank systems, amendments of sewage sludge to soil, or landfilling of industrial and consumer wastes. This test is designed to determine the ultimate biodegradation of ^{14}C -labelled substrates in soil by monitoring $^{14}\text{CO}_2$ production.

4.0 GOOD LABORATORY PRACTICE STANDARDS

The test will be conducted in accordance with United States Environmental Protection Agency (USEPA) and Good Laboratory Practice (GLP) Regulations (40 CFR Part 792). The Sponsor accepts full responsibility for appropriate characterization and stability verification of this test substance(s). Stock solution(s) of the test substance(s) will be assayed by Roy F. Weston, Inc., (WESTON®) for ^{14}C content, as noted in this protocol, but the stock solution(s) will not be analyzed for stability or uniformity.

5.0 RADIOLABELLED TEST SUBSTANCE(S) (Supplied by Sponsor)

TSIN¹: V 26486 (Radioactive C₁₂ LAS)

Specific Activity ($\mu\text{Ci}/\text{mg}$): 77.0 $\mu\text{Ci}/\text{mg}$

Radiochemical Purity (%): —

Mass concentration, mg/mL (if applicable): 1.2 mg/mL

Radiochemical concentration, $\mu\text{Ci}/\text{mL}$ (if applicable): 93.3 $\mu\text{Ci}/\text{mL}$

Sample form: Methanol solution (clear)

Solubility in water, mg/L: Miscible

Storage Conditions: Keep in the dark, refrigerated (4°C) closed container

Safe Handling Precautions: See MSDS

Expiration Date: 1/1/2000

6.0 UNLABELLED TEST SUBSTANCE(S): (Supplied by Sponsor)

TSIN: V 2649B (non radioactive C₁₂ LAS)

Percent Active²: 54.08

Sample form: White slurry

Solubility in water, mg/L: Miscible

Storage Conditions: Keep in the dark, in a well closed container, at cool (4°C) temperature

Safe Handling Precautions: See MSDS

Expiration Date: 1/1/2000

The Sponsor accepts full responsibility for appropriate characterization and stability verification of this test substance(s).

¹ TSIN = Test Substance Identification Number/Name.

² Test compound mass divided by the total mass which includes test compound, any impurities, and solvent (if present).

7.0 TEST SUBSTANCE PREPARATION

Test concentrations: 50 and 2000 $\mu\text{g}/\text{kg}$

Solvent: Deionized water

Using the radiolabelled form (and unlabelled form as needed), prepare a stock solution(s) in an appropriate solvent at active concentrations and specific activity levels to facilitate liquid scintillation counting (LSC) and additions to the test vessels.

Count triplicate aliquots of the radiolabelled stock solution(s) in Ultima Gold cocktail by LSC following laboratory standard operating procedure (SOP). Average the counts for the three replicates and use as "initial spike"

8.0 TEST SYSTEM

8.1 SOIL

Collect three samples from each of three sites within the septic tank discharge plume. Site #1 is directly below the trench ($\frac{1}{2}$ - 1 foot below the gravel), in the infiltration zone (in the biomat), in what would historically be the unsaturated zone. Site #2 is directly below Site #1 and in the saturated zone at approximately 4 foot depth. Site #3 is slightly down gradient of and in between well points TW-4 and TW-5 in the saturated zone at 4 foot depth. Composite samples of each location and sieve the soil through a 2 mm sieve. Determine the percent moisture content following the procedure in reference 1. Store the soil under refrigeration until used in this study.

9.0 TEST DESIGN

Test vessels: 500-mL Erlenmeyer flasks containing 100 g dry weight equivalent of soil at a final target water content of ~35%.

Test temperature: $22 \pm 3^\circ\text{C}$.

The following flasks are required:

- Soil from site #1: triplicate flasks containing the test substance @ 50 $\mu\text{g}/\text{kg}$
- Soil from site #1: triplicate flasks containing the test substance @ 2000 $\mu\text{g}/\text{kg}$
- Soil from site #1: triplicate flasks without test substance present (soil blank)

- Soil from site #2: triplicate flasks containing the test substance @ 50 $\mu\text{g}/\text{kg}$
- Soil from site #2: triplicate flasks containing the test substance @ 2000 $\mu\text{g}/\text{kg}$
- Soil from site #2: triplicate flasks without test substance present (soil blank)

- Soil from site #3: triplicate flasks containing the test substance @ 50 $\mu\text{g}/\text{kg}$
- Soil from site #3: triplicate flasks containing the test substance @ 2000 $\mu\text{g}/\text{kg}$
- Soil from site #3: triplicate flasks without test substance present (soil blank)

10.0 APPARATUS/EQUIPMENT

See Attachment 1.

11.0 CHEMICALS/REAGENTS

See Attachment 2.

12.0 TEST PROCEDURE

12.1 TEST SET-UP

1. Set up the $^{14}\text{CO}_2$ scrubbing train(s), test vessels, and alkali traps as described in Attachment 1. Identify the vessels by TSIN, test concentration, study number, flask number, replicate number, and soil collection site.
2. Add 100 g (dry weight basis) of soil. Add half of the water required to adjust the moisture content to ~35%.
3. Connect the test vessels to the scrubbing train and purge with CO_2 -free air for up to 36 hours.
4. At the end of this time, attach the alkali traps and adjust the air flow for each treatment (see attachment 1).
5. Add the required volume(s) of test substance stock solution (with the remaining water required for moisture adjustment) to the appropriate flasks and mix.
6. Sample all flasks between 6-8 hours and at days 1, 3, 5, 7, 10, 14, 21, and 28. Sampling after day 28 is at the Study Director's discretion. Continue the study until a $^{14}\text{CO}_2$ asymptote is achieved and/or concurrence to stop is obtained verbally from the Principal Investigator.
7. At each sampling time, remove the first and second $^{14}\text{CO}_2$ alkali traps in each train and tightly cap. Move the third traps two slots closer to the flask and add a two new traps in the second and third positions. Based on results through day 3, the sampling procedure may be changed to sacrifice the first traps only (not the second) for the remainder of the study.
8. To determine the amount of $^{14}\text{CO}_2$ in the sacrificed traps, transfer one milliliter of the alkali to a LSC vial, add 15 mL Ultima Gold or equivalent and assay by LSC following laboratory SOP.
9. The background ^{14}C -activities evolved from the soil and the Ultima Gold cocktail are determined by counting the alkali traps from the blank soil treatments. The average of the respective replicates are used to correct for background levels in the individual treated flasks.

10. For each treatment and test concentration, plot %T¹⁴CO₂ vs. time while the study is in progress. The curves can be used in selecting appropriate subsequent sampling times.
11. To terminate the study, all three alkali traps from each flask are removed, subsampled, and counted. One fresh alkali trap is added in the first position and the flask is terminated by the addition of 100 mL 1 N HCl (1 mL/g). The flasks are purged for 2-3 days and a final ¹⁴CO₂ determination is performed.

One flask per treatment will be submitted to the following:

- a. Transfer the flask contents to a centrifuge tube.
- b. Centrifuge to obtain a clear centrate.
- c. Transfer centrate to a clean container.
- d. Cocktail duplicate 5 mL aliquots of centrate in Ultima Gold XR; assay by LSC.
- e. Combust 5 representative soil samples.

13.0 TREATMENT OF RESULTS

$$\% T \text{ } ^{14}\text{CO}_2 = \frac{\text{Cumulative } ^{14}\text{CO}_2 \text{ (dpm) vs. time}}{\text{dpms in initial spike}} \times 100 \quad \text{Equation 1}$$

$$\% H \text{ } ^{14}\text{CO}_3^- \text{ \& } ^{14}\text{CO}_3 = \frac{.^{14}\text{C-evolved after acidification (dpm)}}{\text{dpms in initial spike}} \times 100 \quad \text{Equation 2}$$

$$\text{Soil } ^{14}\text{C} = \frac{.^{14}\text{C-evolved after soil cumbustion/soluble (dpm)}}{\text{dpms in initial spike}} \times 100 \quad \text{Equation 3}$$

STATISTICAL ANALYSIS

Data from the ¹⁴CO₂ curves will be analyzed by a nonlinear regression model to estimate rate constants and extent of biodegradation.

$$\% \text{ } ^{14}\text{CO}_2 = a(1 - e^{-k_1(t-c)})$$

where:

- | | | |
|----------------|---|--|
| a | = | asymptote for ¹⁴ CO ₂ production (%) |
| k ₁ | = | first order rate constant (day ⁻¹) |
| t | = | time of incubation (days) |
| c | = | lag period, if any (days) |

14.0 RECORDS TO BE MAINTAINED

All records necessary to reconstruct the study and to demonstrate adherence to the protocol are maintained.

15.0 PROTOCOL CHANGES

If changes in the approved protocol become necessary, verbal agreement should be made between the Study Director and the Sponsor's Principal Investigator. As soon as practical thereafter, these changes and the reasons for them should be put in writing, approved by both persons, and attached as addenda to the protocol.

16.0 REPORTING

The final report should conform to all requirements outlined in Part 792 - Good Laboratory Practice Standards; Subpart J, Section 792.185. It is to be signed and dated by the Study Director, Quality Assurance Officer, and Laboratory Manager, and is to include, but is not limited to the following:

1. Identification of test substance by test substance identification number, specific activity, radiochemical purity, mass concentration if applicable, percent active, form, and date received.
2. Procedures followed for test substance preparation and addition.
3. Source for obtaining soil and dates of collections.
4. Temperature range over the entire test period.
5. Tables listing
 - a. replicate counts (LSC) \pm standard deviations of stock solutions.
 - b. distribution of ^{14}C -activity at each sampling period as described in Equation 1 and final distribution as described in Equation 2 and 3.
6. A graphical representation of % T $^{14}\text{CO}_2$ vs. time for each test flask across the entire test period.
7. Results of the statistical analyses including the %T $^{14}\text{CO}_2$ asymptote, rate constant, and lag time.
8. Laboratory study number.
9. Reference to the laboratory notebook and other files containing raw and/or processed data.

10. Reference to the Protocol (title, P.I., date), and any standard test methods or analytical procedures used.
11. Any protocol deviations and their scientific implications.
12. Dates test was conducted and persons responsible for the execution of the study.

17.0 REFERENCES

Klute, A. 1965. Water Capacity. In Methods of Soil Analysis. Vol. 1. Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling. Ed. C.A. Black, Am. Soc. Agron., Madison, WI.

APPROVED

DREW McAVOY
Alternate Principal Investigator
(Sponsor)

1/16/96
Date

(513) 627-5570
Phone

ALVARO J. DE CARVALHO
Alvaro J. De Carvalho
Sponsor's Principal Investigator

1/16/96
Date

(212) 725-1262
Phone

TO BE COMPLETED BY LABORATORY

Study No. 96-001

Estimated Experimental Start Date 1/19/96 Spiked test substance

Estimated Experimental Termination Date ~ 28 days

Estimated Reporting Date 5/19/96 (dependent on termination date)

Date Test Substance(s) Received 12/6/95

APPROVED

Kayf Mark
Study Director

1/18/96
Date

1-610-701-6170
Phone

ATTACHMENT 1

APPARATUS/EQUIPMENT

a. CO₂ Scrubbing Apparatus

One empty 1-liter plastic/glass bottle to prevent backflow into air line.

Three 1-liter plastic/glass bottles containing 700 mL 10 N NaOH or KOH.

One empty 1-liter plastic/glass bottle to prevent overflow of alkali into test containers.

Two 1-liter plastic/glass bottles containing 700 mL water to saturate CO₂-free air.

Two-hole rubber stoppers with appropriate size tubing are inserted into all bottles to serve as inlet and outlet ports. The bottles are connected in series with Tygon tubing to a pressurized air source (~10-15 psi). Air is purged through the scrubbing train at a constant rate that is adequate to provide 1-2 bubbles/second in the alkali traps (see Section C).

b. Test Vessels

500 mL Erlenmeyer flasks.

Two-hole rubber stoppers with appropriate size tubing are inserted into each container. The containers are connected with Tygon tubing to the CO₂ scrubbing train using a manifold distribution device.

c. CO₂ Alkali Traps

~4 oz. French squares

Two-hole rubber stoppers with appropriate size tubing are inserted into each square. From each test container, four squares are connected in series with Tygon tubing. The first square is empty to prevent backflow into the test container. 100 mL of 1.5 N KOH is added to the last three squares to trap the evolved ¹⁴CO₂ from the test containers.

ATTACHMENT 2

CHEMICALS/REAGENTS

Reagent grade NaOH
Reagent grade KOH
Ultima Gold (Packard)
Ultima Gold XR (Packard)

Sponsor: The Soap and Detergent Association (SDA), 475 Park Avenue South,
New York, NY 10016

Laboratory: ROY F. WESTON, INC., 254 Welsh Pool Road, Lionville, PA 19341-1345

PROTOCOL AMENDMENT #1

Study N^o: 96-001

Study Title: ¹⁴CO₂ Production Test in Soil from a Septic Tank Drainage Field

Test Substance: V 2648G (Radioactive C₁₂ LAS)

Protocol Amendment:

1) Protocol Section 8.1 page 3 of 10: Soil (core) samples were collected and shipped iced overnight (01/16/96) to WESTON by Ayres Associates, 3901 Coconut Palm Drive, Tampa, Florida 33619. A chain of custody was included.

WESTON received the shipment on 01/17/96. The core samples were passed through a 2 mm screen prior to compositing as follows:

- 1) Cores SC1-A through D composited and identified as test system Site 1.
- 2) Cores SC2-A through D composited and identified as test system Site 2.
- 3) Cores SC3-A through D composited and identified as test system Site 3.

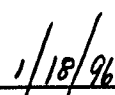
A one kilogram aliquot from each composite sample to be sent to A & L Great Lakes Laboratories, Inc., 3505 Conestoga Drive, Fort Wayne, Indiana 46808-4413 for the following analyses: pH, cation exchange capacity, organic matter, water holding capacity, bulk density, textural classification.

Reason for Protocol Amendment

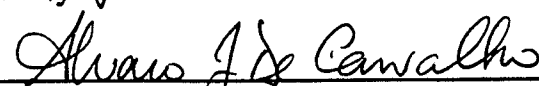
Sponsor requested test system characterization.



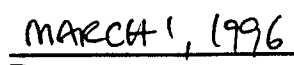
Study Director



Date



Sponsor Approval



Date

SPONSOR: The Soap and Detergent Association (SDA), 475 Park Avenue South,
New York, NY 10016

LABORATORY: Roy F. Weston, INC., 254 Welsh Pool Road, Lionville, PA 19341-1345

PROTOCOL AMENDMENT #2

Study N°: 96-001

Study Title: $^{14}\text{CO}_2$ Production Test in Soil from a Septic Tank Drainage Field

Test Substance: V 2648G (Radioactive C_{12} LAS).

Protocol Amendment:

1) Per a conversation with Alan Neilson on 15 January 1996: V 2648G to be added to the test vessels as a methanol solution; test vessels to be pretreated with a 5 mg active/L solution of the unlabelled form of the test substance (V 2649G)

2) Protocol Section 9.0, page 3: The flasks contained 100 g dry weight equivalent of soil at a final water content of ~30% instead of 35%.

3) Per a conversation with SDA members on 2 February 1996:

Purity of V 2648G (dosing solution spiked to the flasks containing 50 $\mu\text{g}/\text{kg}$) determined using RAD-TLC. The mobile phase used was chloroform/methanol/water/formic acid (80:25:3:1). This was a qualitative procedure to determine whether the parent material was intact.

Protocol Section 12.1 #6, page 4: Add testing day 18.

4) Per a conversation with SDA members on 29 February 1996:

Terminate Site 1 and Site 2 flasks at next sampling. Continue Site 3 flasks at least two additional samplings.

Decision made that data from flasks 4 and 10 would not be treated to kinetic analysis.

5) Protocol Section 12.1 #11, page 5: Triplicate 1-mL aliquots of centrate were cocktailed in Ultima Gold and assayed by LSC.

6) An aliquot of each soil composite was submitted to the WESTON analytical laboratory for iron oxide determination.

Protocol Amendment
(page 2)

7) The mineralization data were fitted to various production equations using nonlinear regression. Regression analyses were performed using Jandel Table Curve 2D software. The production equations included were as follows where:

Y = % mineralization
X = time (days)

<u>UDF No.</u> ¹	<u>Function Name</u>	<u>Equation</u>
UDF1:	Three-Half Order without Growth	$Y = [a(1-\exp^{-bX})] + cX$

where:

a = deflection point at which the rate changes from first to zero order, A (%)
b = first order rate constant, k_1 (days⁻¹)
c = zero order rate constant

UDF2:	First-Order	$Y = a(1-\exp^{-bX})$
-------	-------------	-----------------------

where:

a = asymptotic yield of total gas evolved, A (%)
b = first order rate constant, k_1 (days⁻¹)

UDF3:	First Order with a Lag Period	$Y = a[1-\exp^{-b(X-c)}]$
-------	-------------------------------	---------------------------

where:

a = asymptotic yield of total gas evolved, A (%)
b = first order rate constant, k_1 (days⁻¹)
c = lag time, c (days)

UDF4:	Three Half Order with Growth	$Y = a[1 - \exp^{\frac{-bX - cX^2}{2}}] + dX$
-------	------------------------------	---

where:

a = deflection point at which the rate changes from first order to zero order, A (%)
b = first order rate constant, k_1 (days⁻¹)
c = linear growth term, k_2 (days⁻²)
d = zero order rate constant, k_0 (days⁻¹)

¹ UDF = user defined function

**Protocol Amendment
(page 3)**

UDF5: Zero Order

$$Y = aX$$

where:

a = zero order rate constant, k_0 (days⁻¹)

UDF6: First Order Logistic Function

$$Y = a(1 - \exp^{-bx})^{-\frac{1}{c}}$$

where:

a = asymptotic yield of total gas evolved, A (%)

b = first order rate constant, k_1 (days⁻¹)

c = empirical constant. n (unitless)

The three best fitting UDF's were identified and ranked as defined by R^2 .

Reason for Protocol Amendment:

- 1) Clarify dosing carrier; eliminate sorption to the test vessels.
- 2) At 30% the mixture was a slurry.
- 3) Available purity data was from 1989; provide an additional data point.
- 4) Sponsor request.
- 5) Procedural change.
- 6) Sponsor request.
- 7) Change in statistical package.

Kay H. Marks
Study Director

4/16/96
Date

Alvaro J. de Carvalho
Sponsor Approval

23 APR 96
Date

SPONSOR: The Soap and Detergent Association (SDA), 475 Park Avenue South,
New York, NY 10016

LABORATORY: Roy F. Weston, INC., 254 Welsh Pool Road, Lionville, PA 19341-1345

PROTOCOL AMENDMENT #3

Study №: 96-001

Study Title: $^{14}\text{CO}_2$ Production Test in Soil from a Septic Tank Drainage Field

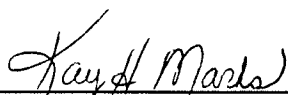
Test Substance: V 2648G (Radioactive C_{12} LAS)

Protocol Amendment:


A first order statistical model was applied to the mineralization data. All data points were included in the analysis for Site 3 treatments. Only the data points up to the point of deflection from first order were used for the treatments from Sites 1 and 2. A decision was made not to use the Jandel Table Curve 2D software as specified in Protocol Amendment 2.

Reason for Protocol Amendment:

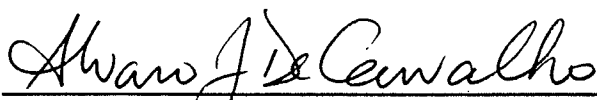
Sponsor request based on the production data generated during the study and purpose for which the statistical data will be used.



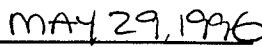
Study Director



Date



Sponsor Approval



Date

*W.D. 05821-007-001***VISTA**

December 4, 1995

Jon Doi, Ph.D.
Laboratory Manager
Environmental Fate and Effects Laboratory
Roy F. Weston, Inc.
254 Welsh Pool Road
Lionville, PA 19341-1345

Dear Jon:

We are sending you today by overnight courier the [¹⁴C]- C₁₂ LAS and "cold" LAS samples that are needed for the SDA biodegradation and adsorption coefficient studies. This letter contains the sample information that you requested in your September 28, 1995 letter to Al DeCarvalho.

RADIOACTIVE C₁₂ LAS

1. Test Substance Identification Number (TSIN) - V 2648 G
2. Test Substance Name - Dodecylbenzene sulfonic acid, sodium salt [Ring - ¹⁴C (U)]
3. Chemical Abstract Service (CAS) number - 25155-30-0
4. Molecular Formula - C₁₈H₂₉SO₃Na
5. Molecular Weight - 348 mg/mole
6. Lot or Batch number - NEN Research Products - 2599-075(8/3/89)
7. Material Data Safety Data Sheet (MSDS) - Attached to letter - This MSDS is for Vista C-550 Slurry which contains C₁₂ LAS homolog. All of the precautions required for handling C-550 slurry apply to handling of C₁₂ LAS homolog.
8. Storage Conditions - Keep in the dark, refrigerated (4°C), in a well-closed container
9. Expiration Date - January 1, 2000. Our experience is that LAS solutions in methanol will store indefinitely if kept in the dark, in well-closed containers and at cool temperatures.
10. Solubility in water - Miscible
11. Color / Form - Dissolved in HPLC grade methanol/ clear solution

*95-0140
Rec'd 12/16/95-4*

12. Percent chemical purity - Not available - TLC analysis by NEN Research Products (8/3/89) demonstrated that the radiochemical purity is greater than 97.5%. A copy of the analysis data provided by NEN Research Products is attached to this letter.
13. Percent active - $60.49\% = 1.2117 \text{ ug LAS} / (1.2117 \text{ ug LAS} + 0.7914 \text{ ug methanol}) \times 100$
14. Certificate of Analysis - See item 12.
15. Theoretical total organic carbon (TOC) content, in mg carbon/mg active = $.6207 = 216 \text{ mg C} / 348 \text{ mg LAS}$.
16. Theoretical CO_2 (TCO_2), in mg CO_2 / mg active = $2.276 \text{ mg CO}_2 / \text{mg LAS} = 18 \text{ C} \times 44 \text{ mg CO}_2 / 348 \text{ mg LAS} = 792 \text{ mg CO}_2 / 348 \text{ mg LAS}$.
17. Quantities sent - volume of sample = 3917 uL ; mass of LAS in sample = 4746 ug ; radioactivity of LAS in sample = 365.5 u Ci

NON RADIOACTIVE C_{12} LAS

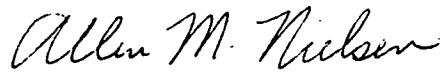
95-0139
Rec'd 2/6/95

1. Test Substance Identification Number (TSIN) - V 2649G
2. Test Substance Name - Dodecylbenzene sulfonic acid, sodium salt
3. Chemical Abstract Service (CAS) number - 25155 - 30-0
4. Molecular Formula - $\text{C}_{18}\text{H}_{29}\text{SO}_3\text{Na}$
5. Molecular Weight - 348 mg/mmmole
6. Lot or Batch number VO - 382 - 167- 2
7. Material Data Safety Data Sheet (MSDS) - Attached to Letter - This MSDS is for Vista C-550 Slurry which contains C_{12} LAS homolog. All of the precautions required for handling Vista C-550 Slurry apply to handling the C_{12} LAS homolog.
8. Storage Conditions - Keep in the dark, in a well-closed container and at cool (4°C) temperatures
9. Expiration Date - January 1, 2000. Our experience is that LAS slurries (kept in well - closed bottles, in the dark , and at cool temperatures) will keep indefinitely without decomposition.
10. Solubility in water - Miscible
11. Color/Form - White slurry (solvent is water)
12. Percent chemical purity - Current desulfonation/ GC analysis shows it to be 95.81 % pure LAS and 100% of the LAS is C_{12} LAS homolog. GC analysis of LAB before sulfonation showed it to be > 99% pure LAS. The current analysis sheet is attached to this letter.
13. Percent active - 54.08 %
14. Certificate of Analysis - See item 12.
15. Theoretical total organic carbon (TOC) content is $.6207 \text{ mg C} / \text{mg LAS}$
16. Theoretical CO_2 (TCO_2) is $2.276 \text{ mg CO}_2 / \text{mg LAS}$
17. Quantities sent - mass of sample = 92.75 grams of slurry; 50.158 grams of LAS

Please find attached to this letter all the appropriate paper work for shipment of the radioactive sample and the analyses mentioned above.

If there are any questions, please call at 512-331-2461

Best Regards,



Allen M. Nielsen
Senior Research Microbiologist
Research and Development
Vista Chemical Company

cc:
Vista - L.N. Britton, M.F. Cox, R.B. Martin
SDA - Al DeCarvalho

Preparation of Dodecylbenzenesulfonic acid [ring-¹⁴C(U)], sodium salt

Lot No. 2599-075

Benzene [¹⁴C(U)] was reacted with 1-dodecene and aluminum chloride to produce dodecylbenzene [ring-¹⁴C(U)]. The product was reacted with fuming sulfuric acid to produce dodecylbenzenesulfonic acid [ring-¹⁴C(U)]. The acid was then converted to its sodium salt with sodium hydroxide and purified by column chromatography.

VISTA CHEMICAL COMPANY

Research & Development Department
Analysis Report

20-Nov-95

To A. NIELSEN

Project Number 6940-05

Location _____

Reference V0926;60

Sample LAS SLURRY

Notes * % ACTIVE= MEQ/G*MW LAS/10 ** DESULF SENT FOR GC 11-20-95

ANALYSIS CODES: ACTIVE DESULF
METHOD (NUMBER OR TECHNIQUE): MBAS
ASSAY AND UNITS: MEQ/G* **

Analytical
Number

Sample Number

= V 26 49 G

V0906-49-1

1.554

54.0792 % Active

Analyst (MEB) W. Paul Rose

Approved _____

SAMPLE AMN906-49-1 - V2649G
FILE B9630-2

POSITIONAL % TOTALS*

6,7 PHENYL 15.62
5 PHENYL 15.72
4 PHENYL 15.96
3 PHENYL 19.67
2 PHENYL 33.03

100

HOMOLOG DISTRIBUTION (LINEAR ONLY)*

PRE C10 0.00
C10 0.00
C11 0.00
C12 100.00
C13 0.00
C14 0.00
POST C13 NA
POST C14 NA

*NORMALIZED TO 100%

100

AVERAGE MOLECULAR WEIGHT

246.00

LINEARITY

95.81

PARAFFINS 0.00
PRE C10 0.00
POST C13 0.00
POST C14 0.00
BRANCHING AND TETRAL 4.19

AREAS

	C10	C11	C12	C13	C14
6,7 PHENYL		0	782509	0	0
5 PHENYL	0	0	787341	0	0
4 PHENYL	0	0	799255	0	0
3 PHENYL	0	0	985083	0	0
2 PHENYL	0	0	1654169	0	0
	0	0	5008357	0	0
PARAFFINS		0			
PRE C10		0			
ALKYLATE		5227520			
POST C13		0			
POST C14		0			
GRAND TOTAL AREA		5227520		LESS PARAFFINS	5227520

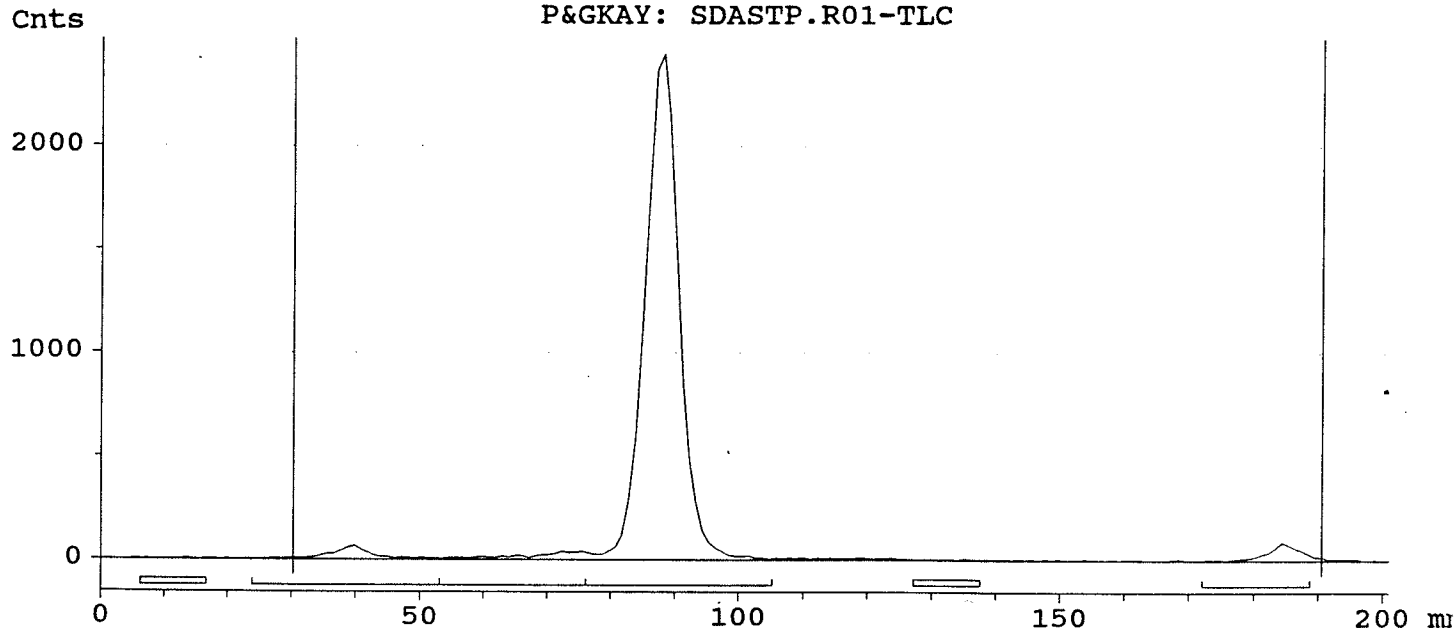
AREA %

	C10	C11	C12	C13	C14	TOTAL
6,7 PHENYL		0.00	14.97	0.00	0.00	
5 PHENYL	0.00	0.00	15.06	0.00	0.00	
4 PHENYL	0.00	0.00	15.29	0.00	0.00	
3 PHENYL	0.00	0.00	18.84	0.00	0.00	
2 PHENYL	0.00	0.00	31.64	0.00	0.00	
TOTALS	0.00	0.00	95.81	0.00	0.00	95.81

B22



APPENDIX C
PURITY DATA



tegrals: SDASTP.R01

Channel: TLC Detector:

Name	Start (mm)	End (mm)	Max (mm)	RF	Region Counts	Region CPM	% of Total	% of ROIs
Bkg 1	6.2	16.7	11.5	-0.118				
ROI 1	24.0	53.2	39.6	0.059	425	447.2	2.68	2.69
ROI 2	53.2	76.1	75.1	0.281	356	374.9	2.25	2.26
ROI 3	76.1	105.3	87.6	0.359	14553	15318.8	91.75	92.19
Bkg 2	127.2	137.7	132.5	0.641				
ROI 4	172.1	188.8	183.6	0.961	451	474.7	2.84	2.86
					15785	16615.6	99.51	100.00
Total Area	=	15862 Counts		=	16696.8 CPM			
Bkg Area	=	163 Counts		=	171.6 CPM			
Unallocated	=	77 Counts		(0.49%)				

*Study 96-001
 low concentration dosing solution
 prepared on 1/18/96
 dosed to 50 ug/kg on 1/19/96
 analyzed:*

*REP
 JMW*

Trace Parameters: SDASTP.R01 TLC

Trace Display Smoothing : 0 chan
Trace Display Shift : 0.0 mm
Trace Display Factor : 1.000
Channel Factor : 1.000

PW_{1/2}HT Factor : 6.3 mm Area Reject : 0
Sensitivity : 100 Height Reject : 0
Bkg Length : 10.4 mm Delay : 0.0 mm
Smoothing : 3 point moving average.

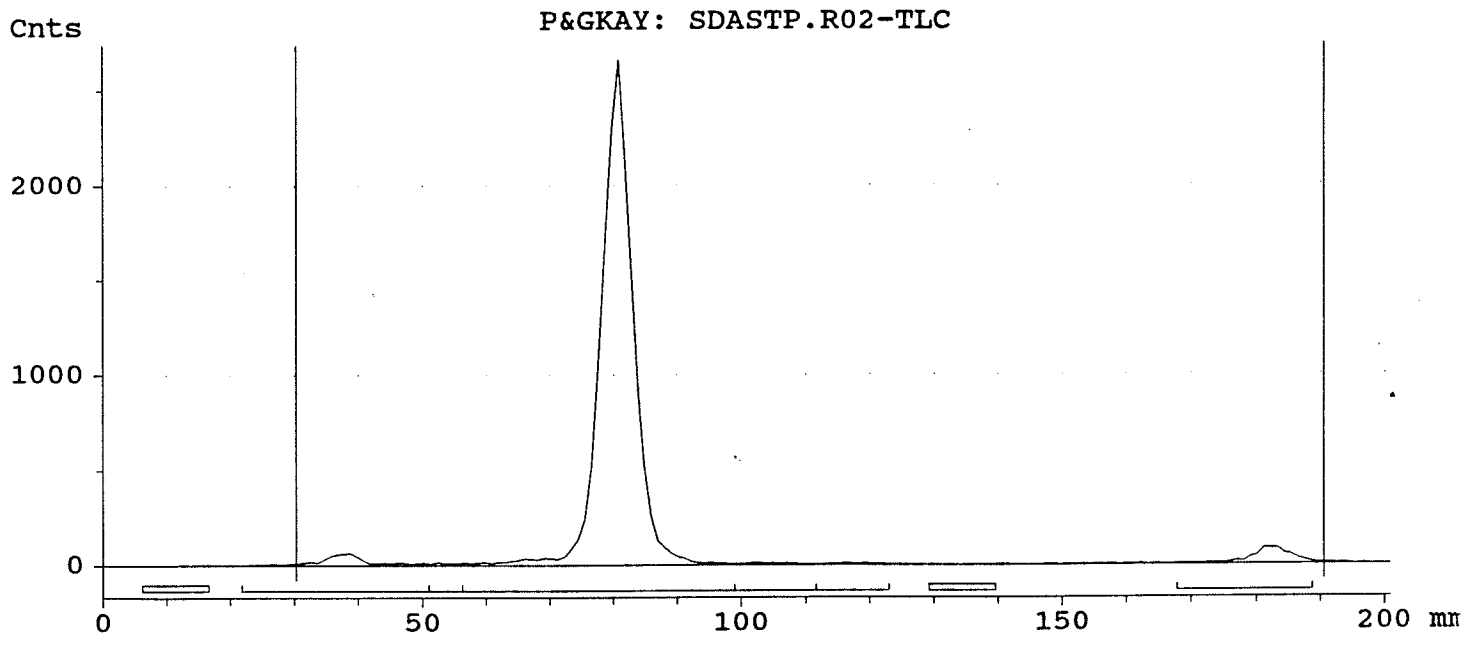
Comments: SDASTP.R01

Analysed : Wed Feb 07 17:44:13 1996

Instrument Parameters: SDASTP.R01

Origin : 30.2 mm Front : 189.8 mm

Collimator type : Hi Effic Width: 10 mm
Resolution : 256 chan (0.1043 cm/chan)
Lane Position : 1 Run Time : 1.0 min
Electronic res. : Normal Amp. Range : 0 - 2047
Plate position : Tab 1



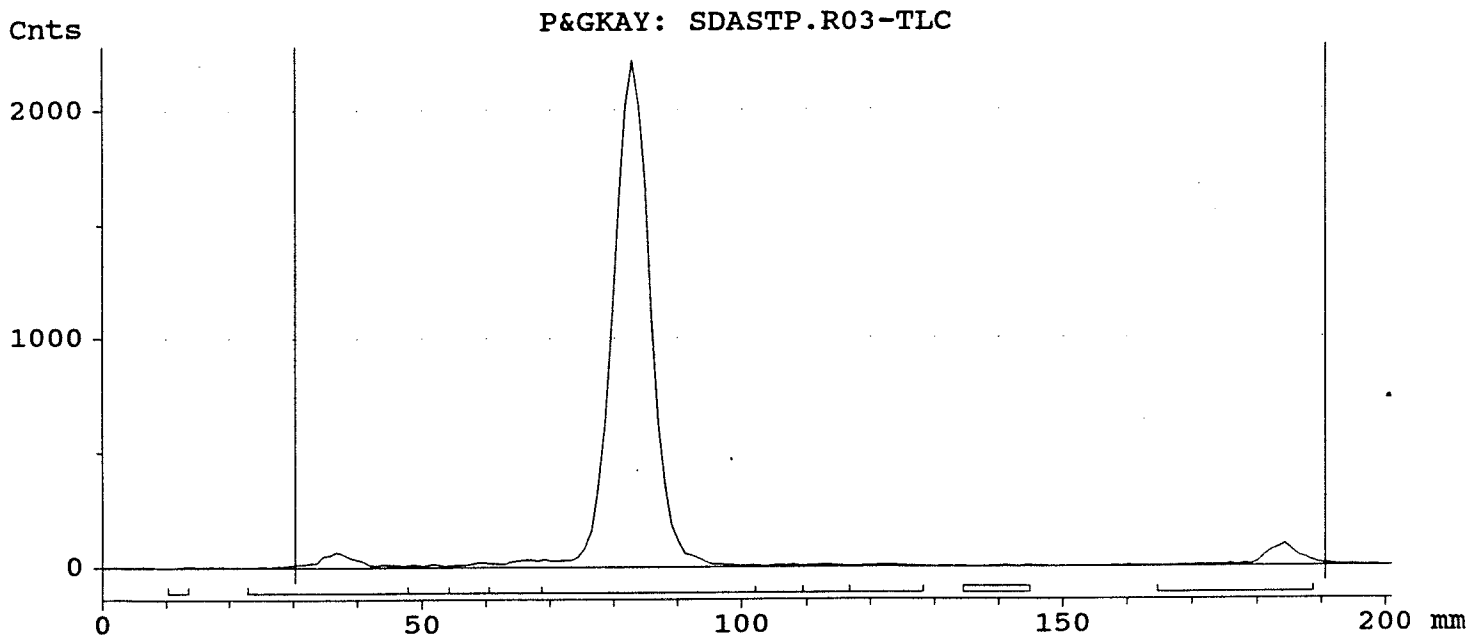
Integrals: SDASTP.R02

Channel: TLC Detector:

Name	Start (mm)	End (mm)	Max (mm)	RF	Region Counts	Region CPM	% of Total	% of ROIs
Bkg 1	6.2	16.7	11.5	-0.118				
ROI 1	21.9	51.1	38.6	0.052	457	517.4	2.86	2.87
ROI 2	51.1	56.3	52.1	0.137	42	47.5	0.26	0.26
ROI 3	56.3	99.1	80.3	0.314	14791	16744.9	92.63	92.77
ROI 4	99.1	111.6	102.2	0.451	63	71.6	0.40	0.40
ROI 5	111.6	123.1	115.8	0.536	42	47.8	0.26	0.27
Bkg 2	129.3	139.8	134.5	0.654				
ROI 6	167.9	188.8	180.4	0.941	548	619.8	3.43	3.43
					15943	18049.1	99.84	100.00

Total Area = 15968 Counts = 18077.4 CPM
 Bkg Area = 55 Counts = 61.8 CPM
 Unallocated = 25 Counts (0.16%)

*Rep 2
 xmw*



Integrals: SDASTP.R03

Channel: TLC Detector:

Name	Start (mm)	End (mm)	Max (mm)	RF	Region Counts	Region CPM	% of Total	% of ROIs
ROI 1	10.4	13.5	12.5	-0.111	-1	-1.4	-0.01	-0.01
ROI 2	22.9	48.0	36.5	0.039	425	463.6	2.68	2.68
ROI 3	48.0	54.2	52.1	0.137	49	52.9	0.31	0.31
ROI 4	54.2	60.5	58.4	0.176	74	80.2	0.46	0.46
ROI 5	60.5	68.8	66.7	0.229	165	180.0	1.04	1.04
ROI 6	68.8	102.2	82.4	0.327	14532	15853.1	91.77	91.70
ROI 7	102.2	109.5	107.4	0.484	30	32.5	0.19	0.19
ROI 8	109.5	116.8	112.6	0.516	34	36.8	0.21	0.21
ROI 9	116.8	128.3	121.0	0.569	30	32.5	0.19	0.19
Bkg 1	134.5	145.0	139.8	0.686				
ROI 10	164.8	188.8	183.6	0.961	511	557.2	3.23	3.22
					15847	17287.4	100.07	100.00

Total Area = 15835 Counts = 17274.8 CPM
 Bkg Area = 160 Counts = 174.3 CPM
 Unallocated = -12 Counts (-0.07%)

*Rep 3
mm*



APPENDIX D

COPIES OF SOIL CLASSIFICATION REPORT

A & L GREAT LAKES LABORATORIES, INC.

3505 Conestoga Drive • Fort Wayne, Indiana 46808-4413 • Phone (219)483-4759 • FAX (219)483-5274



GLP SOIL CHARACTERIZATION

Report Number: F96031-016
Date of Report: 02/26/96

Protocol Number: 96-001

ROY F. WESTON, INC.
KAY H. MARKS
ENVIRONMENTAL FATE AND EFFECT LABORATORY
254 WELSH POOL ROAD
LIONVILLE PA 19341-1345

Sample ID:	A&L Contol	Site 1	Site 2	Site 3
Lab Number:	50720	50721	50722	50723
pH	6.6	6.1	6.3	6.9
CEC (meq/100g)	7.62	0.99	0.75	0.78
O.C. (%)	1.11	0.13	0.03	<0.01
O.M. (%)	1.90	0.22	0.05	<0.01
WHC (%) 1/3 Bar	18.03	2.12	1.34	1.22
WHC (%) 15 Bar	6.59	1.03	0.82	0.37
Sand (%)	45.2	93.2	93.2	93.2
Silt (%)	32.0	4.0	4.0	4.0
Clay (%)	22.8	2.8	2.8	2.8
Soil Classification	Loam	Sand	Sand	Sand
Bulk Density (g/cc)	1.52	1.45	1.51	1.47

Verified By: Kaylene M. Smith Date: 2-26-96

A & L GREAT LAKES LABORATORIES, INC.

3505 Conestoga Drive • Fort Wayne, Indiana 46808-4413 • Phone (219)483-4759 • FAX (219)483-5274



DUPLICATE ANALYSIS

Report Number: F96031-016
Date of Report: 02/26/96

Protocol Number: 96-001

ROY F. WESTON, INC.
KAY H. MARKS
ENVIRONMENTAL FATE AND EFFECT LABORATORY
254 WELSH POOL ROAD
LIONVILLE PA 19341-1345

	<u>Sample I.D.</u>	<u>Original Analysis</u>	<u>Duplicate Analysis</u>
pH	SITE 1	6.1	6.1
CEC (meq/100g)	SITE 3	0.78	0.71
O.C. (%)	SITE 2	0.03	0.06
O.M. (%)	SITE 2	0.05	0.11
WHC (%) 1/3 Bar	SITE 1	2.12	2.41
WHC (%) 15 Bar	SITE 3	0.37	0.38
Sand (%)	SITE 2	93.2	93.2
Silt (%)	SITE 2	4.0	4.0
Clay (%)	SITE 2	2.8	2.8
Soil Classification	SITE 2	Sand	Sand
Bulk Density (g/cc)	SITE 3	1.47	1.48

Verified By: Kay Jane M. Smith Date: 2-27-96

A & L CONTROL DATA

<u>Parameter</u>	<u>Control Value</u>	<u>Range</u>
pH	6.6	6.5 - 6.7
CEC (meq/100g)	8.27	7.27 - 9.27
O.M. (%)	1.90	1.70 - 2.10
WHC (%) @ 1/3 Bar	18.15	15.15 - 21.15
WHC (%) @ 15 bar	6.62	5.62 - 7.62
Sand (%)	44.0	41.8 - 46.2
Silt (%)	31.1	29.1 - 33.1
Clay (%)	22.2	20.2 - 24.2
Bulk Density (g/cc)	1.51	1.43 - 1.59

Control sample values obtained fell within allowable variation established in analytical SOP GEN-0-001.

Runs Accepted:

Kaylene M. Smith
Kaylene M. Smith
Study Coordinator

2.26.96
Date

METHOD IDENTIFICATION

<u>Parameter</u>	<u>A & L SOP Number</u>
Acidity (pH)	AGL-10-001
Cation Exchange Capacity (CEC)	AGL-10-002
Organic Matter (OM) / Organic Carbon (OC)	AGL-10-003
Water Holding Capacity (1/3 & 15 Bar)	AGL-10-004
Particle Size Distribution	AGL-10-011
Bulk Density	AGL-10-006

SOIL pH

SOP AGL-10-001 uses a 1:1, soil to water, mixture. The mixture is stirred and allowed to stand for a period of time. After soaking, the sample is stirred again just before reading the pH. The pH is measured with an electronic meter and electrodes.

Reference: "Recommended Soil Test Procedures for the North Central Region", Number 499 (Revised), pp. 5-6, 1980. North Dakota State University.

CATION EXCHANGE CAPACITY (CEC)

SOP AGL-10-002 involves the saturation of the cation exchange sites present in the soil sample with ammonium ions obtained from a solution of ammonium acetate. After saturation, the excess ammonium acetate is washed from the soil using several portions of a 70% methanol solution. The washed soil is then mixed with an acidified 1N KCl solution to drive the ammonium ions off the exchange sites. In a closed environment, the soil mixture is mixed with MgO to raise the pH. The now basic solution is steam distilled and the ammonia is trapped in an acid catch solution and titrated to determine the CEC.

Reference: This method is a modification of the method described in: "Methods of Soil Analysis", Part 2, Chemical and Microbiological Properties, 1965, pp. 894-899. American Society of Agronomy.

SOIL ORGANIC MATTER (OM) BY TITRATION

SOP AGL-10-003 utilizes the heat of reaction generated from the combination of a mixture of the soil and a 1 N Dichromate solution with concentrated sulfuric acid to oxidize the organic matter in the soil. The oxidation process reduces a portion of the dichromate in solution. The remaining, unreduced dichromate, is titrated with ferrous ammonium sulfate to determine the % OM.

Reference: "Methods of Soil Analysis", Part 2, Chemical and Microbiological Properties, Second Edition, 1982, pp. 570-571. American Society of Agronomy.

WATER HOLDING CAPACITY (WHC)

SOP AGL-10-004 involves placement of saturated soil samples on a porous ceramic plate. The samples and the plates are placed in a pressure chamber. The ceramic plate is backed with rubber membrane and the space between the plate and the membrane is connected, by way of a small tube, to the outside of the tank. The tank can then be sealed and pressurized. The resulting pressure will then force the water from the soil through the ceramic plate into the space between the plate and the membrane, and from there to the outside of the tank. After equilibrium is achieved, as evidenced by lack of expressed water, the pressure is released. The soils are removed from the tank and the % moisture is determined.

Reference: Soil Moisture Equipment Company's modification to: "Methods of Soil Analysis", Part 1, Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling, 1965, pp. 273-278. American Society of Agronomy.

PARTICLE SIZE ANALYSIS (TEXTURE)

SOP AGL-10-011 utilizes a hydrometer to determine the density changes in a soil solution as the particles settle to the bottom. Stokes Law can be applied to determine the percent sand, silt and clay sized particles remaining in solution at selected time intervals. A standard soil texture triangle is used to identify the texture class based on the values obtained for percent sand, silt and clay.

Reference: "Methods of Soil Analysis", Part 1, Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling, 1965, pp. 549-566. American Society of Agronomy.

BULK DENSITY OF DISTURBED SOIL

SOP AGL-10-006 was developed by A & L to provide a method for determination of soil bulk density which could be used in the laboratory. Dry soil, ground to pass a ten mesh sieve, is placed into a tared graduated cylinder. The cylinder is then tapped on a solid surface and more soil added until the soil has reached the 100 cc mark and no further compaction is observed. The weight of the 100 cc of soil is obtained and a weight per unit volume is calculated.