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Acute Lethality of Inhaled Hydrogen Cyanide in the Laboratory Rat: Impact of Concentration × Time Profile and Evaluation of the Predictivity of "Toxic Load" Models

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14. ABSTRACT

Toxic load models are mathematical calculations (e.g., $C^n \times t$) that are used to estimate consequences (e.g., casualties) from exposure of humans to toxic materials. Hypothetically, any combination of concentration and time that yields the same "toxic load" (cumulative exposure) will give a constant biological response. These formulas have been developed using controlled, constant concentration animal studies, but the validity of applying these assumptions to time-varying exposures has not been tested. The objective of the current study was to generate data to test the validity of toxic load models for extrapolation from constant exposures to time-varying exposures. An inhalation system was developed to create exposure profiles where concentration varied over time. This system proved to be a versatile inhalation exposure system with the ability to control the testing conditions of time-varying exposures as specified in the study protocol to accomplish the specific goals of the study; the system performed very well. Analyses evaluating the fit to the probit model indicated that the data developed using this system are suitable for the dose-response modeling that will be integral to the hypothesis testing.

15. SUBJECT TERMS
Hydrogen cyanide, nose-only, inhalation, acute lethality, rats, non-constant concentrations, pulsed exposures, toxic load modeling, probit analysis

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SUMMARY

Toxic load models are mathematical calculations (e.g., $C^n \times t$) that are used to estimate consequences (e.g., casualties) from exposure of humans to toxic materials. Hypothetically, any combination of concentration and time that yields the same "toxic load" (cumulative exposure) will give a constant biological response. These formulas have been developed using controlled, constant concentration animal studies, but the validity of applying these assumptions to time-varying exposures has not been tested. The objective of the current study was to generate data to test the validity of toxic load models for extrapolation from constant exposures to time-varying exposures. An inhalation system was developed to create exposure profiles where concentration varied over time. This system proved to be a versatile inhalation exposure system with the ability to control the testing conditions of time-varying exposures as specified in the study protocol to accomplish the specific goals of the study; the system performed very well. Analyses evaluating the fit to the probit model indicated that the data developed using this system are suitable for the dose-response modeling that will be integral to the hypothesis testing.

KEY WORDS AND PHRASES

Hydrogen cyanide, nose-only, inhalation, acute lethality, rats, non-constant concentrations, pulsed exposures, toxic load modeling, probit analysis

INTRODUCTION

An accurate understanding of the potential lethality of chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) is needed for a variety of applications including military operational risk management and civilian consequence management. The hazard posed by inhalation of CWAs/TICs (from either accidental or deliberate releases) is a function of the manner of the dispersion and transport of the compound to the exposed personnel, the intensity and duration of that exposure, and the toxicological properties of the given chemical. Typically, laboratory animals are exposed for a specified time to a constant concentration of the compound of concern, effects are observed, and these results guide estimates of human lethality.

In contrast, real-world human exposures typically involve concentrations that vary with time. One of the key assumptions in the human risk estimation is that all human exposures that yield the same cumulative exposure, regardless of the concentration-time profile, will produce the same outcome. To date, the validity of this assumption has not been tested.

Traditionally, the exposure magnitude was empirically quantified by taking the assumed average concentration (C) multiplied by the total exposure duration (t) to derive the cumulative "dosage" ($C \times t$). It is well-known that the lethality of a chemical (e.g., a CWA or a TIC) can vary as a function of duration, as expressed by the concept of the LCt_{50} (product of concentration and exposure duration producing 50% lethality). The toxic load model was developed to empirically account for this time dependence, and it is commonly used for both civilian and military applications (Sommerville et al., 2005). Instead of using a dosage ($C \times t$), a toxic load is used, that equals $C^n \times t$ (Bushnell, 1997). The toxic load exponent, n, is an empirically fitted coefficient that accounts for such time dependence, and its value is specific to the chemical, toxicity endpoint, and exposure scenario. For many TICs and CWAs, the toxic load exponent is larger than one. In these cases, the LCt_{50} increases as the duration increases (i.e. a larger mass of chemical will need to be inhaled to produce the same toxicity when an individual's exposure is spread out over a longer duration, if all other factors are equal). The Department of Defense (DOD) (2005) publication "Potential Military Chemical/Biological Agents and Compounds" currently uses the toxic load model to model to estimate the time-dependency of human (military) toxicity. For civilian applications, the toxic load model is used by the U.S. Environmental Protection Agency in the development of their Acute Exposure Guideline Levels (AEGLs) (National Research Council, 2001).

However, it is currently unclear if the toxic load model where n is derived from the constant concentration experimental design is valid for the real world scenarios encountered by personnel exposed to CWA/TIC. In addition, certain mathematical aspects in the application of the toxic load model reveal a critical gap in our ability to "validate" the predictions from laboratory studies for extrapolation and risk assessment for military operational personnel.

Despite exhaustive search, there are currently no known experimental inhalation animal studies with non-constant concentration-time profiles suitable for comparison with the theoretical

predictions. Typical whole-body exposure chambers could not adequately generate such profiles. However, current technology now permits the generation of such profiles using nose-only exposure systems. This project addresses this critical gap and places human risk assessment on a solid scientific foundation.

Hydrogen cyanide (HCN, military designation AC) was selected for the initial effort based on its well-characterized toxicity from constant-concentration studies, the ease with which the vapor can be generated, and its relatively large toxic load exponent value (ranging from 1.7 to 2.5 from past studies; Sommerville et al., 2012). A toxic load exponent that demonstrably differs from 1 is expected to enhance the likelihood that deviations from a constant-concentration exposure will yield results that differ from the current forms of the toxic load model. Also, lethality of HCN occurs fairly quickly during or just after exposure, minimizing the need to observe the rats for more than 24 hours post-exposure (thereby simplifying logistics, allowing day-to-day adjustments in target concentrations, and improving the dose-response characterization). The minimization of test animal suffering is a legitimate concern with respect to test chemical selection. Lethality as a consequence of HCN inhalation is known to be rapid and minimally painful. This effort seeks to demonstrate the quantitative relationship between non-constant concentration-time profiles (reflective of reality) and standard fixed concentration-time profiles that have been the historical norm in laboratory toxicity studies. This study utilizes a systemically-acting blood agent; future efforts may involve a pulmonary agent with effects at the portal of entry, as exposure profile variations may have different impacts on toxicity at distant (systemic) sites as compared to the initial site of contact.

OBJECTIVE/HYPOTHESIS

The objective of the current study was to generate data to test the validity of toxic load models for extrapolation from constant exposures to time-varying exposures. The model validity will be tested by comparing outcomes from rat studies with standard (constant) profiles with outcomes from studies where rats are exposed to time varying concentrations. The hypothesis is that exposures where rats are exposed to time-varying concentrations of HCN will yield the same mortality as an exposure to a constant concentration of HCN that yields the same cumulative exposure, as determined by the toxic load model ($C^n \times t$).

MATERIALS AND METHODS

Overview of Experimental Design

Laboratory rats were exposed to an atmosphere containing HCN using a nose-only exposure system. A variety of C × t profiles were generated in order to discern the impact (or lack thereof) of the following factors on HCN lethality: constant concentration exposure vs. variable concentration exposure (i.e., two pulses with different concentrations), the relative heights of the two pulses, the gap between the two pulses, and the total duration of the test (exposure durations plus gap). Three baseline (conventional) profiles as well as 8 non-constant (nonconventional)

exposure profiles were chosen to validate or invalidate the toxic load model. For each profile, at least 5 runs (with different initial concentrations) were conducted, with 10 rats per run. The baseline profiles consisted of exposures of 5, 15, or 30 minutes in duration to a constant concentration of HCN, in order to rigorously identify n, the toxic load exponent in the equation $C^n \times t$. The non-constant test profiles were 5 or 30 minutes in duration, with two pulses of equal duration (with concentrations in a ratio of 5:1 or 2:1), with a gap between pulses of either 0 minutes (no gap) or 30 percent of the total duration (i.e., 1.5 minutes or 9 minutes) (see Table 1). The pulse ratios were selected to provide one case where the second pulse would be expected to only minimally contribute to the additional body burden of toxicant (5:1 ratio), and another case with a more substantial contribution to the body burden (2:1 ratio).

Table 1. Test Profiles

Profile Number	Total Duration (min.)	Pulse 1 Duration (min.)	Pulse 1 Concen-tration[a]	Gap Duration (min.)	Pulse 2 Duration (min.)	Pulse 2 Concentration[b] (min.)
1	5	5	Ci	Not applicable	Not applicable	Not applicable
2	5	2.5	Ci	0	2.5	0.5 × Ci
3	5	2.5	Ci	0	2.5	0.2 × Ci
4	5	1.75	Ci	1.5	1.75	0.5 × Ci
5	5	1.75	Ci	1.5	1.75	0.2 × Ci
6	30	30	Ci	Not applicable	Not applicable	Not applicable
7	30	15	Ci	0	15	0.5 × Ci
8	30	15	Ci	0	15	0.2 × Ci
9	30	10.5	Ci	9	10.5	0.5 × Ci
10	30	10.5	Ci	9	10.5	0.2 × Ci
11	15	15	Ci	Not applicable	Not applicable	Not applicable

[a]Each test profile was run at least five times, with different initial concentrations (Ci). Initial concentrations differed among the multiple runs of the 11 profiles.
[b]Pulse 2 concentrations were at a specified fraction of the initial concentration, either at half of the initial concentration (Ci × 0.5) or $1/5^{th}$ of the initial concentration (Ci × 0.2).

For each profile, at least 5 exposure concentrations were tested, which included trials approximating the median lethal concentration (LC_{50}) plus additional concentrations selected to provide coverage of a dose-response range, ideally with response rates neither 0% nor 100%.

Animal Exposures and Monitoring

The animal protocol was approved by the Wright-Patterson Air Force Base (WPAFB) Institutional Animal Care and Use Committee (IACUC). A total of 670 male Sprague-Dawley (*Rattus norvegicus*) rats [Crl:CD(SD) BR rats]], 5-6 weeks old, were purchased from Charles River Laboratories (Wilmington, MA). Rats were maintained in an animal facility approved by

the Association for Assessment and Accreditation of Laboratory Animal Care International, singly housed, and provided husbandry in accordance with the National Research Council's *Guide for the Care and Use of Laboratory Animals*. Food and water were made available for all animals *ad libitum* during periods of non-exposure. Rats were quarantined and acclimated to the facility for 10 days. Following release from quarantine, all animals were weighed. This weight was used to randomize the rats to their respective exposure group (10 rats per exposure). For a given shipment (lot number) of animals, the heaviest were assigned to the first exposure, followed by the next heaviest animals to the second exposure, and so on. The lightest animals from a given shipment were assigned to the final exposure group. If more than one exposure was planned for a study day, the animals were distributed evenly by weight among the exposures for that day. Due to the span of time that exposures were to be carried out, animals were ordered in batches to avoid having large numbers of animals in the facility at any one time and so that the animals were similar in age and weight at exposure.

Rats were delivered from the Vivarium under a tarp in a closed box delivery truck to the exposure laboratory each morning that testing was scheduled. Exposures occurred Monday through Thursday with one to three groups being exposed each day, except for Thursday, when a maximum of two groups were exposed. Animals were exposed one time via nose-only inhalation (described in detail below). Acclimation to the nose-only tubes was not done prior to the exposure day, due to the short duration of the exposures (a single 5-30 minute exposure). Tube acclimation on the exposure day involved placing each of the animals in an open nose-only tube on a laboratory counter top for 30 minutes prior to the initiation of HCN exposures. Time of death and appearance of severe effects were monitored and recorded when possible during exposure, for 1 hour following exposure, and during a 24-hour post-exposure observation period. Surviving animals were returned to the Vivarium after exposures and a one-hour post-exposure observation period. Rats surviving the exposures were periodically monitored for a period of 24 hours by animal husbandry staff and by study staff at 24 hours post-exposure. After the 24 hour observation period, surviving rats were euthanized by carbon dioxide inhalation followed by decapitation.

Test Chemical

The rats were exposed to a mix of HCN with 21% oxygen, balance nitrogen from a cylinder diluted by clean breathing air to attain the desired concentration. The dilution and clean control air for the exposure system was supplied by an air compressor filtered for oils, organics, and particulates by a compressed breathing air purification system (Model No.: RP050, MST® Inc., Hicksville, OH). Five cylinders of HCN/oxygen/nitrogen mix exposure gas were obtained from Weiler Welding (Moraine, OH); two at 1000 ppm, two at 2000 ppm, and one at 5000 ppm HCN concentration. All of the gas cylinders came with an analytical report that certified the concentrations of the gases to within ± 2% with the gravimetric method of analysis.

Chamber

Animals were exposed using a single 12-position Cannon style nose-only exposure unit (NOEU) (constructed in house). The exposure atmosphere flowed at approximately 0.5 L/min per open port through a central, inner plenum and out through the delivery nozzles that directed the HCN gas mix into the breathing zone of each animal. A total of 6 L/min was the target supply air flow rate for the NOEU. The nose-only exposure system was fitted with connections for a differential pressure gauge to monitor static pressure. The outer plenum of the nose-only exposure system carried the animals' exhaled breath and excess test atmosphere into the exhaust system. The NOEU operated as a push-pull system where the air supply was positive and the exhaust flow was negative. The air supply was set at the target flow rate and the exhaust was adjusted to maintain a static pressure (Magnehelic® Gauge, Dwyer Instrument Co., Michigan City, IN) in the range of -0.05 to -0.10 inches of water for the exposures. Open nose-only tubes with a plastic butt pusher were used for animal containment during the exposures.

Test Atmosphere Generation

Test atmospheres of HCN gas were generated with a clean air dilution system. Two parallel dilution systems were used (Figure 1). Each dilution system was capable of being turned on or off independently from the other with a trio of 3-way electric solenoid valves (Model No.: SV31, Circle Valve Technologies Inc., Harleysville, PA). This configuration gave the ability to produce a clean air gap in the exposure. In each system, HCN study gas and the clean breathing air from the breathing air system were regulated by a pair of electronic mass flow controllers (MFCs) (Model No.: HFC-202, Teledyne Hastings Instruments, Hampton, VA) which were controlled by a Power Pod power supply (Model No.: THPS-400, Teledyne Hastings Instruments, Hampton, VA). Once the HCN and breathing air gas flows passed through the MFCs, they were mixed and then flowed through the solenoid valves that directed the gases to either the nose-only tower or a bypass tube that dumped into the system exhaust. Vacuum for the nose-only tower was supplied by an air-operated vacuum generator (Model No.: TD260M, Air-Vac Engineering, Seymour, CT).

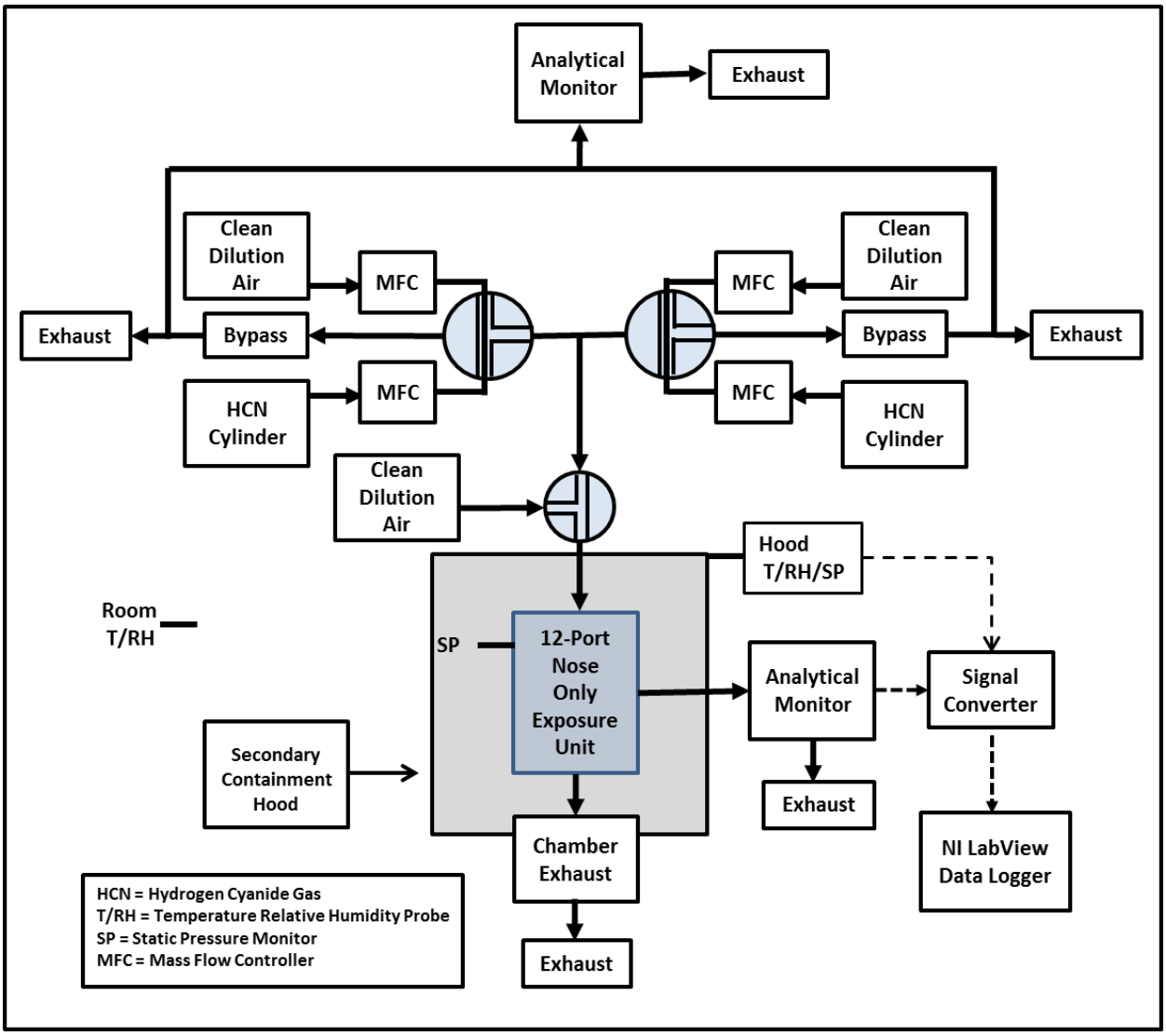


Figure 1. Representation of the hydrogen cyanide exposure system

Environmental Parameters

Temperature and relative humidity were measured by a certified Rotronic temperature/relative humidity monitor (Model No.: HF53W, ROTRONIC AG, Switzerland) and logged with LabVIEW data collection software (National Instruments Corp., Austin, TX). Static pressure was measured by a certified BAPI static pressure sensor (Model No.: ZPS-05, Building Automation Products Inc., Gays Mills, WI). Temperature, humidity, and static pressure were monitored in the vented hood containing the NOEU. Pre-study testing showed there was little difference in the temperature readings based on location (hood area or nose-only port). To the extent possible, the temperature was maintained between 64 and 79 °F (18 and 26 °C) and the relative humidity was maintained between 30 and 70%.

Gas Concentration

The concentration of the HCN gas was measured with a Nicolet 380 Fourier Transform Infrared Spectrometer (FT-IR) (Thermo Fisher Scientific Inc., Waltham, MA) tuned to a peak at approximately 3339.5 cm^{-1}. The FT-IR sampled at 500 mL/min from the intake tube leading to the NOEU. The validity of sampling from this location was verified by sampling from the intake, exhaust, and a port on the NOEU at both 250 and 500 mL/min to confirm uniformity of readings. These results were also measured against readings from the Interscan Analyzers (Model No.: RM28, Interscan Corporation, Chatsworth, CA) while they sampled from the intake to the NOEU and the bypassed intake gas stream before it dumped into the exhaust. The Interscan analyzers were initially used to determine study concentrations but were replaced by the FT-IR because the response time of the Interscan analyzers was deemed too slow to give an accurate representation of the concentrations in the NOEU probably due to overloading of the chemical sensor. The Interscan analyzers were still used as a backup to the FT-IR in case of instrument failure and as a secondary verification of the concentrations.

HCN concentration, HCN cylinder gas flow, and clean dilution air flow were monitored using LabVIEW software once per second during the exposure, as well as for the 5 minutes before and after exposure. Exposure gas concentration data was collected via the FT-IR using Omnic Software (Thermo Fisher Scientific Inc., Waltham, MA) software.

Uniformity of HCN Distribution

The HCN exposure NOEU was checked once for uniformity of distribution of gas concentration. The uniformity of the HCN atmospheres at individual exposure ports was verified by recording the concentration at a minimum of 5 different exposure ports without animals to show the similarity at a single port and between individual ports.

Study Day

A study day was defined as the exposure period from approximately 8:30 a.m. until 12:00 p.m. The animals, in their polycarbonate domiciliary cages on a rack, were delivered from the Vivarium via a closed box delivery truck to the exposure laboratory around 8:30 a.m. After arrival all animals were weighed and the first group was loaded into the nose-only tubes. All other animals were loaded at 30 minutes prior to their intended exposure time. he period following the exposures was used to unload animals from the nose only tubes and return each animal to its domiciliary cage where food and water were available *ad libitum*. No food or water was available during the exposure. Exposure groups were numbered consecutively from 1 to 67. The exposures were conducted from July 9 through August 29 and from November 26 through December 4, 2012.

Selection of Exposure Concentrations

The first exposures were conducted as single pulses for 5, 15, or 30 minutes (i.e., profiles 1, 6, and 11) at concentrations approximating previously reported LC_{50} values for young adult male Sprague-Dawley rats exposed to HCN by head-only or whole-body inhalation for the durations of interest (Lapin, 1981). No exposure-related deaths were observed, so concentrations in subsequent exposures were increased, until concentrations producing ~50 percent lethality in single-pulse exposures were identified. For the remaining profiles, concentrations expected to yield ~50 percent lethality were estimated from the approximate single-pulse LC_{50} and incorporating consideration of the duration and concentration ratio of the two pulses. Additional target concentrations for a previously-tested profile were derived using expert judgment, taking into consideration the observed steepness of the dose-response relationship across profiles, previous results for the profile in question, and the desired spacing of responses across the dose-response continuum for the profile in question.

Dose-Response Analysis

The goal of this study was to generate data suitable for testing hypotheses regarding the applicability of the toxic load model under non-constant exposure scenarios. While in-depth, comprehensive statistical analyses of the data were beyond the scope of the current effort (and will be the subject of a follow-up report generated by collaborators at the U.S. Army's Edgewood Chemical Biological Center), a limited test of the suitability of the current data for dose-response analysis was conducted. The traditional approach to the analysis of acute lethality data is to estimate the LC_{50} or median lethal concentration × time product (LCt_{50}) via probability unit (probit) analysis (Eaton and Gilbert, 2008). The lethality results for each profile were evaluated using the U.S. Environmental Protection Agency's (U.S. EPA) Benchmark Dose Software (BMDS, version 2.2.0). Dose was expressed as $C_{avg} \times t$ (in ppm × min.). The data for each profile were evaluated using the Cochrane Armitage trend test to establish the existence of a statistically significant dose-response relationship. Outputs from the dose-response analysis included a graphical presentation of the dose-response relationship (including 95 percent Wald confidence limits on the fraction affected), an estimate of the goodness-of-fit, the best estimate of the dose producing a 50 percent response (LCt_{50}), the 97.5^{th} percent lower confidence limit on the LCt_{50} (LCt_{50LCL}), and standardized residual errors (SRE). BMDS software does not provide an upper confidence limit, so the upper confidence limit was estimated by assuming that the uncertainty distribution is symmetrical. The range between the 97.5^{th} percent lower and upper confidence limits was therefore assumed to encompass the 95^{th} percent confidence limits on the LCt_{50}. The goodness-of-fit was characterized by a p-value. In the event of $p < 0.10$ (a poor fit, per U.S. EPA, 2012), the datum with the highest standardized residual error was eliminated and the analysis repeated with the reduced data set. If necessary, a second datum with the highest remaining residual error was eliminated to see if the data could be reduced to a data set yielding an acceptable p-value. The analysis was interpreted as identifying an outlier if the resulting LCt_{50} confidence limits of the reduced data set were narrower than for the full data set.

Estimation of the Toxic Load Exponent

An estimate of the toxic load exponent ("n" in $C^n \times t$) for HCN was derived as follows. The toxic load equation, $C^n \times t = k$ (where k is a constant for a specific response level), is applied to the median lethal concentration, so $(LC_{50})^n \times t$ = Toxic Load for 50 percent lethality = TL_{50}. Taking the natural logarithm of this equation and rearranging,

$$\ln(t) = \ln(TL_{50}) - n \times \ln (LC_{50})$$

The natural logarithms of the LC_{50} estimates and durations for the three constant concentration profiles (Profiles 1, 6, and 11; Table 1) were used as inputs to a linear regression to derive the TL_{50} (the intercept) and n (the slope, multiplied by -1).

RESULTS

NOEU Port Concentration Distribution

The variation in concentrations between the random sampling of ports on the NOEU was shown to be <1%. Supporting data are provided in the Appendix, Table A-1.

Environmental and Operating Conditions

The environmental and operating conditions for each exposure are reported in the Appendix (Table A-2, Table A-3, and Tables A-3A to A-3K). Overall, the environmental conditions were highly consistent among the 67 exposures, and within the specified ranges, with the exception of humidity. Humidity was below 30 percent for three study days during which five exposures were conducted. The reported achieved concentrations represent the averages of the last 2 minutes of each pulse and were within 5 percent of the target concentrations (Table A-2). Sample traces of the FT-IR outputs for each profile are provided in the Appendix (Appendix Figures A-1 to A-11).

Test Animals

Individual animal data (age, weight, exposure, exposure outcome) are provided in the Appendix (Table A-4).

The rats used in these experiments ranged in age from 53 to 63 days and weighed between 213.8 and 325.1 g at exposure. The body weights and ages of the rats used in the 67 trials (5-8 trials per profile) are summarized in Table 2.

Table 2. Animal Body Weights and Ages at Exposure (Mean ± standard deviation, range; 10 rats per trial)

Profile	Number of Trials	Body weight (by individual) (g)	Body weight (by trial mean) (g)	Age at exposure (Days)
1	7	266.6 ± 15.2 (223.1 - 297.2)	266.6 ± 13.6 (237.3 - 277.6)	56.4 ± 3.2 (53-62)
2	6	259.1 ± 14.4 (233.9 - 298.6)	259.2 ± 13.8 (241.6 - 275.0)	55.3 ± 1.0 (54-57)
3	5	270.3 ± 16.0 (223.2 - 291.4)	270.3 ± 13.2 (247.4 - 280.1)	56.4 ± 3.5 (53-61)
4	6	266.7 ± 24.2 (222.2 - 324.5)	266.7 ± 24.1 (235.3-304.1)	54.7 ± 2.5 (53-60)
5	5	273.5 ± 7.0 (260.2 - 286.1)	273.5 ± 4.4 (268.1 - 279.1)	54.4 ± 1.0 (53-56)
6	6	259.9 ± 16.0 (219.6 - 285.5)	259.9 ± 14.6 (239.4 - 275.2)	55.8 ± 2.1 (53-60)
7	5	262.9 ± 18.4 (231.5 - 297.8)	262.9 ± 19.0 (240.6 - 283.0)	53.8 ± 0.8 (53-55)
8	8	274.9 ± 14.2 (244.6 - 315.0)	274.9 ± 11.6 (258.5 - 289.5)	57.4 ± 3.6 (53-63)
9	5	262.3 ± 9.2 (239.0 - 282.3)	262.3 ± 3.1 (257.8 - 266.1)	55.4 ± 0.8 (54-56)
10	7	265.8 ± 19.0 (213.8 - 319.1)	265.8 ± 16.8 (243.9 - 293.8)	56.3 ±3.1 (54-62)
11	7	269.4 ± 21.4 (235.6 - 325.1)	269.4 ± 19.9 (243.0 - 297.8)	56.6 ± 2.9 (54-61)

Exposure Outcomes Summary

Out of 670 exposed rats, slightly fewer than half died within 24 hrs (327 out of 670) (Table 3). For dose-response analysis (below), all deaths were assumed to be due to inhalation of HCN. Of the 327 animal deaths, all but 5 occurred during exposure or during the postexposure period (5 minutes) between the cessation of HCN exposure and removal of the rats from the exposure tower. (Removal of the animals was delayed to allow for the clearance of HCN from the exposure tower prior to equipment and animal handling by study personnel.) Of the 5 postexposure deaths, none occurred during the 1 hr period after exposure designated for close observation of the animals; all of the postexposure deaths occurred in rats that were exposed for 30 minutes (including a gap, if present). Many of the rats that survived the exposure initially displayed clinical signs such as labored breathing, impaired/uncoordinated movement, lethargy, and tremors/twitching (Table 4), but most appeared fully recovered within 24 hrs or less.

Table 3. Rat Deaths Attributed to Hydrogen Cyanide Inhalation

Profile	Number of animals exposed	Number surviving 24 hr postexposure period	Total deaths	Timing of deaths		
				During exposure	0-1 hr postexposure	1-24 hrs postexposure
1	70	39	31	31	0	0
2	60	21	39	39	0	0
3	50	30	20	20	0	0
4	60	31	29	29	0	0
5	50	26	24	24	0	0
6	60	38	22	20	0	2
7	50	23	27	27	0	0
8	80	42	38	37	0	1
9	50	20	30	28	0	2
10	70	30	40	40	0	0
11	70	43	27	27	0	0
Total	670	343	327	322	0	5

Table 4. Initial Clinical Signs Observed in Rats Surviving Hydrogen Cyanide Exposure

Clinical Sign[a]	Profile										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Lethargy	15	3	2	2	2	13	0	12	5	7	12
Labored Breathing	14	10	15	17	17	24	22	26	12	10	18
Gasping	1	1	0	0	0	2	0	0	0	0	0
Tremors/Twitching	7	7	9	9	4	6	6	6	5	1	5
Impaired Movement/Uncoordinated	6	9	10	7	7	13	20	19	14	8	9
Inability to Remain Upright	3	1	1	6	3	3	1	1	0	0	0
Bloody Mouth and Nose	1	0	2	0	0	0	0	0	0	0	0
Total survivors observed	39	21	30	31	26	40	23	43	22	30	43

[a]Reflects only the initial postexposure observations; more than one sign may have been observed per rat.

Dose-Response Analysis: Suitability of Data for Dose-Response Analysis and Choice of Dose-Response Model

Very strong, statistically-significant dose-response trends were identified for all 11 profiles, as indicated by the Cochrane-Armitage test (p no greater than 0.0043). Therefore the results for each profile (5-8 trials per profile) were deemed suitable for dose-response analysis. Dose-response analyses were limited to the probit model, which has traditionally been used for the determination of median lethal doses and concentrations (Eaton and Gilbert, 2008). For each

trial, the dose was approximated by the time-weighted average concentration multiplied by the exposure duration (Cavg × t).

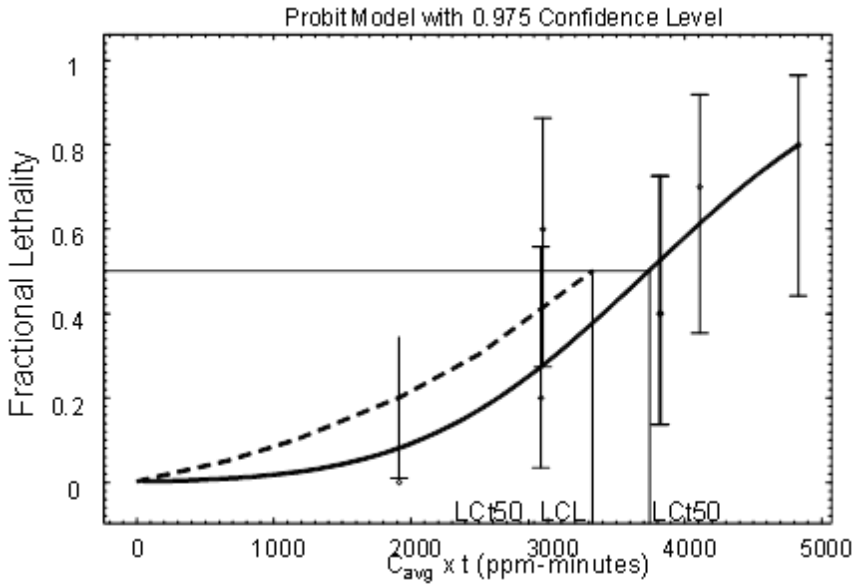
Dose-Response Analysis: Profile 1

Profile 1 consists of a 5-minute, constant-concentration exposure. The dose-response data for Profile 1 are found in tabular form in Table 5, and in graphical form in Figure 2. When the datum with the largest standardized residual error (SRE = 2.284) was excluded, the probit model goodness of fit statistic (p-value) increased substantially (from 0.1589 to 0.8621). The reduced data set also exhibited a decreased $LCt_{50}/LCt_{50,LCL}$ ratio, indicating greater certainty in the LCt_{50} estimate. Using the reduced data set, the LCt_{50} (95 percent confidence limits) for Profile 1 was 3922 (3561-4283) ppm-minutes.

Table 5. Dose-Response Data for Profile 1

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
383.0	1915	0/10
590.0	2950	2/10
593.0	2965	6/10[a]
763.1	3815.5	4/10
765.0	3825	4/10
821.8	4109	7/10
966.1	4830.5	8/10

[a]This datum was excluded from an alternative analysis.



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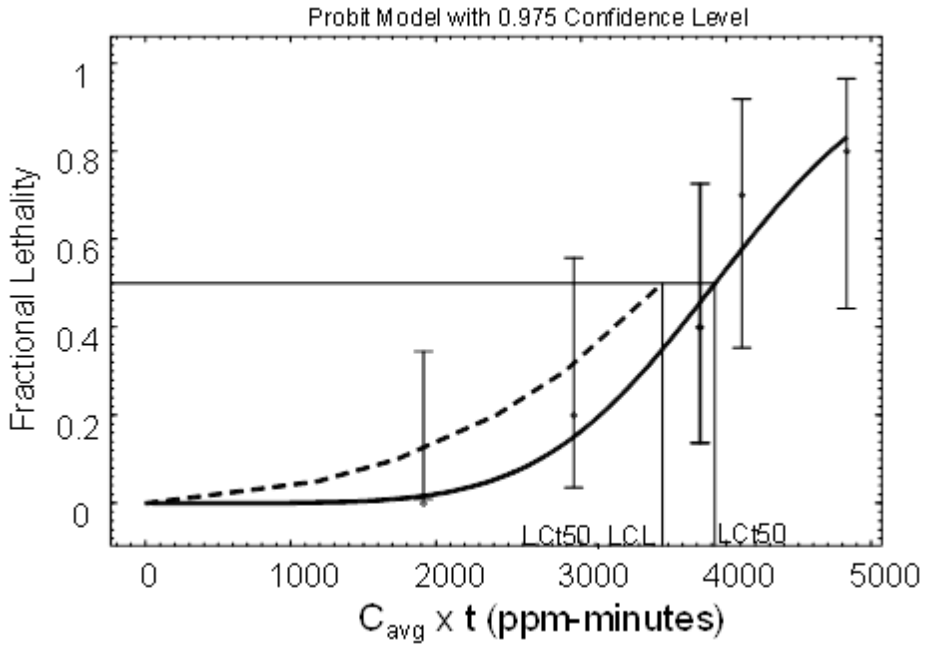


(b)

Figure 2. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 5 minutes (Profile 1). Symbols: experimentally-determined response. Solid line: best-fit probit model as determined by BMDS. Dashed line: lower confidence limit of the probit model. (a) Full data set (probit model goodness of fit: p = 0.1589), (b) reduced data set with one datum eliminated (see Table 5) (goodness of fit: p = 0.8621).

Dose-Response Analysis: Profile 2

Profile 2 consists of 2.5 minute exposure to a given concentration (Ci) followed immediately by a 2.5 minute exposure to a concentration of 0.5 × Ci, for a total exposure duration of 5 minutes. The dose-response data for Profile 2 are found in tabular form in Table 6, and in graphical form in Figure 3. The full data set did not meet the criterion for an adequate dose-response relationship (p = 0.0634 for the full data set, p > 0.1 for acceptability). When the datum with the largest standardized residual error (SRE = 2.235) was excluded, the probit model goodness of fit statistic (p-value) increased substantially (from 0.0634 to 0.4789). Using the reduced data set, the LCt_{50} (95 percent confidence limits) for Profile 2 was 4040 (3475-4606) ppm-minutes.

Table 6. Dose-Response Data for Profile 2

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
897.8/452.7	3376.25	2/10
1041.5/535.6	3942.75	4/10

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
1128.6/573.6	4255.5	8/10
1132.8/574.6	4268.5	10/10[a]
1239.4/626.7	4665.25	7/10
1347.8/686.5	5085.75	8/10

[a]This datum was excluded from an alternative analysis.

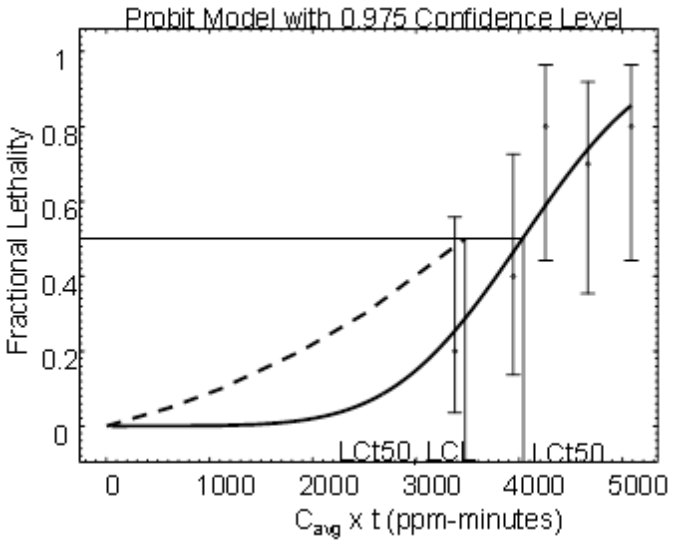


Figure 3. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 5 minutes, Profile 2 (reduced data set). For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model (p =0.4789) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

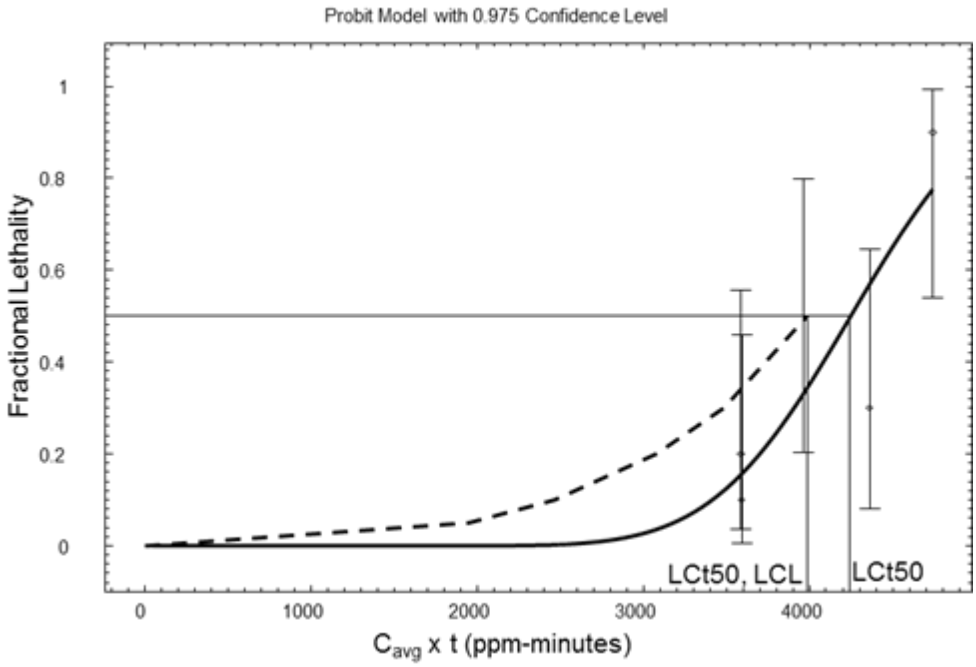
Dose-Response Analysis: Profile 3

Profile 3 consists of 2.5 minute exposure to a given concentration (Ci) followed immediately by a 2.5 minute exposure to a concentration of 0.2 × Ci, for a total exposure duration of 5 minutes. The dose-response data for Profile 3 are found in tabular form in Table 7, and in graphical form in Figure 4. While the full data set did meet the criterion for an adequate dose-response relationship (p = 0.1389 for the full data set, p > 0.1 for acceptability), an alternative analysis with a reduced data set was also conducted. When the datum with the largest standardized residual error (SRE = -1.751) was excluded, the probit model goodness of fit statistic (p-value) increased substantially (from 0.1389 to 0.7047). The reduced data set also exhibited a decreased $LCt_{50}/LCt_{50,LCL}$ ratio, indicating greater certainty in the LCt_{50} estimate. Using the reduced data set, the LCt_{50} (95 percent confidence limits) for Profile 3 was 4056 (3831-4280) ppm-minutes.

Table 7. Dose-Response Data for Profile 3

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
1189.3/245.7	3587.5	2/10
1192.8/244.5	3593.25	1/10
1312.9/273.5	3966	5/10
1447.3/297.3	4361.5	3/10[a]
1572.5/324.8	4743.25	9/10

[a]This datum was excluded from an alternative analysis.



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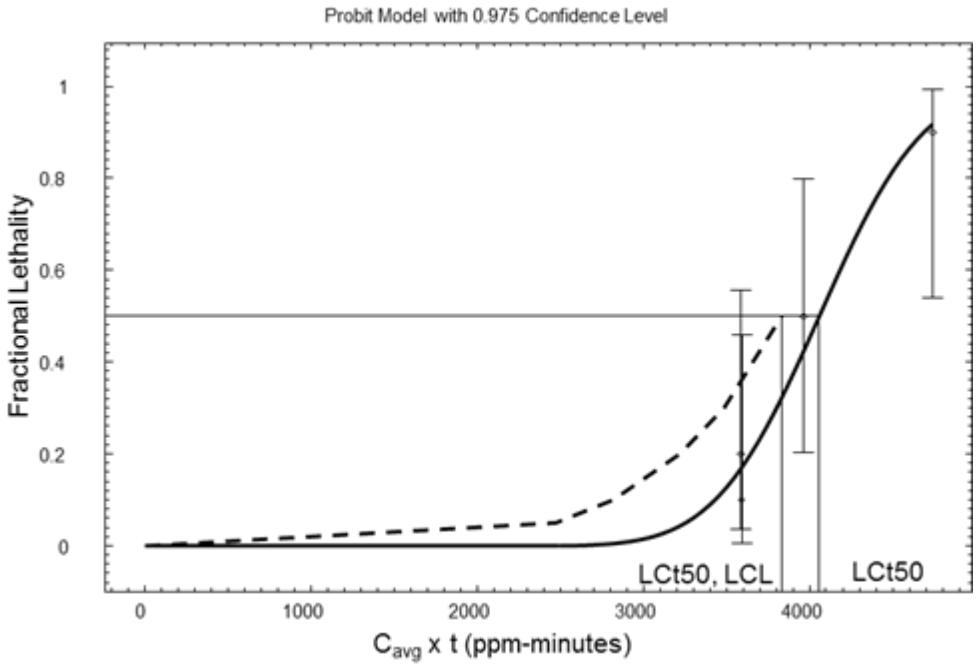


(b)

Figure 4. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 5 minutes, Profile 3. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model as determined by BMDS. Dashed line: lower confidence limit of the probit model. (a) Full data set (probit model goodness of fit: p = 0.1389), (b) reduced data set with one datum eliminated (see Table 7) (goodness of fit: p = 0.7047).

Dose-Response Analysis: Profile 4

Profile 4 consists of 1.75 minute exposure to a given concentration (Ci) followed 1.5 minutes at a concentration of 0 ppm, then a 1.75 minute exposure to a concentration of 0.5 × Ci, for a total exposure duration (including a gap) of 5 minutes. The dose-response data for Profile 4 are found in tabular form in Table 8, and in graphical form in Figure 5. The full data set demonstrated a good fit to the probit model (p = 0.5638). The LCt_{50} (95 percent confidence limits) for Profile 4 was 5890 (4820-6960) ppm-minutes.

Table 8. Dose-Response Data for Profile 4

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
1293.2/659.2	3416.7	1/10
1460.8/737.0	3846.15	4/10
1751.5/874.7	4595.85	5/10
1906.0/945.0	4989.25	5/10

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
2503.0/1220.0	6515.25	5/10
3885.0/1935.0	10185	9/10

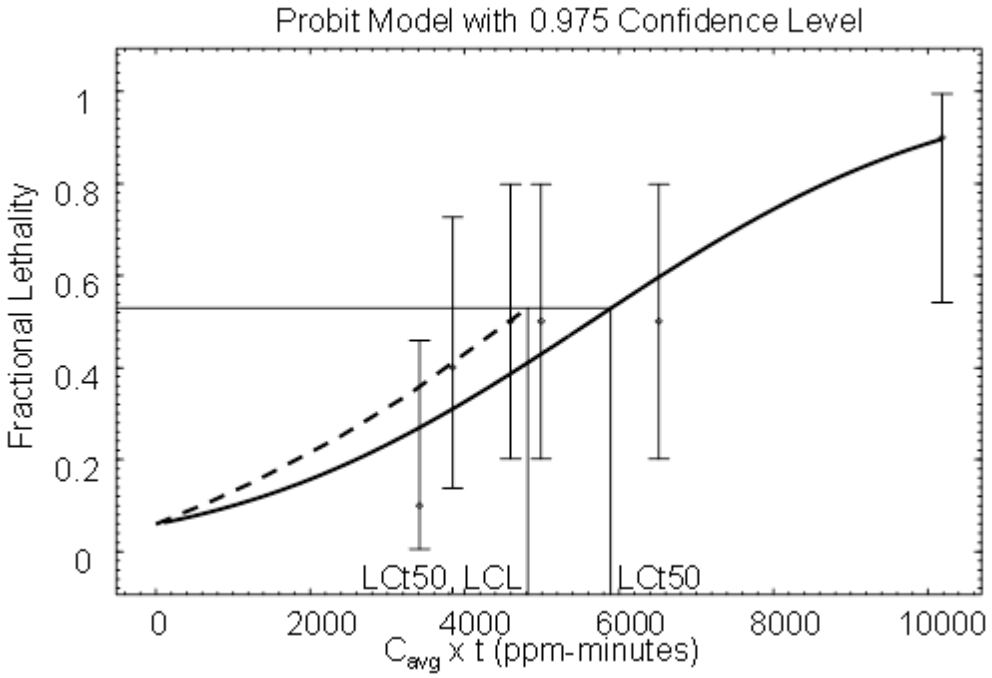


Figure 5. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 5 minutes, Profile 4. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model (p =0.5638) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

Dose-Response Analysis: Profile 5

Profile 5 consists of 1.75 minute exposure to a given concentration (Ci) followed 1.5 minutes at a concentration of 0 ppm, then a 1.75 minute exposure to a concentration of 0.2 × Ci, for a total exposure duration (including a gap) of 5 minutes. The dose-response data for Profile 5 are found in tabular form in Table 9, and in graphical form in Figure 6. The full data set demonstrated a good fit to the probit model (p = 0.5837). The LCt_{50} (95 percent confidence limits) for Profile 5 was 5826 (4813-6939) ppm-minutes.

Table 9. Dose-Response Data for Profile 5

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
1667.4/338.1	3509.625	3/10
1863.2/378.6	3923.15	3/10
2347.0/484.0	4954.25	3/10
3124.4/632.6	6574.75	5/10
4947.0/996.4	10400.95	10/10

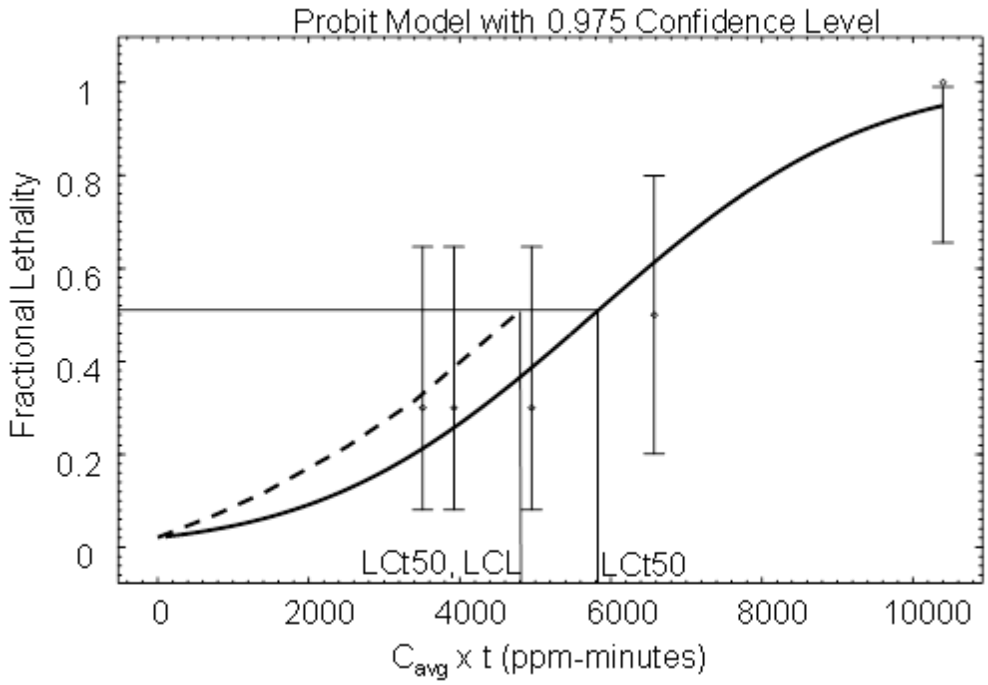


Figure 6. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 5 minutes, Profile 5. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model (p =0.5837) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

Dose-Response Analysis: Profile 6

Profile 6 consists of a 30 minute constant-concentration exposure. The dose-response data for Profile 6 are found in tabular form in Table 10, and in graphical form in Figure 7. The full data set demonstrated a very good fit to the probit model (p = 0.7497). The LCt_{50} (95 percent confidence limits) for Profile 6 was 7824 (7315-8333) ppm-minutes.

Table 10. Dose-Response Data for Profile 6

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
141.6	4248	0/10
200.8	6024	1/10
226.1	6783	1/10
254.6	7638	6/10
273.5	8205	6/10
303.0	9090	8/10

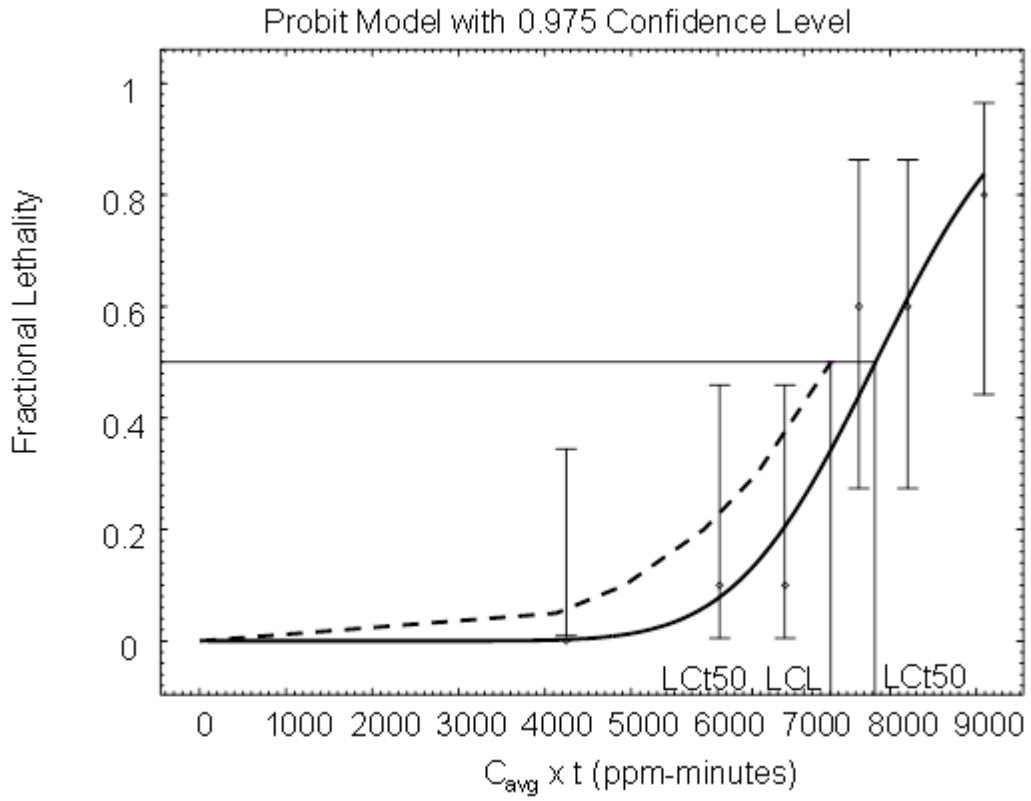


Figure 7. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 30 minutes, Profile 6. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model (p =0.7497) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

Dose-Response Analysis: Profile 7

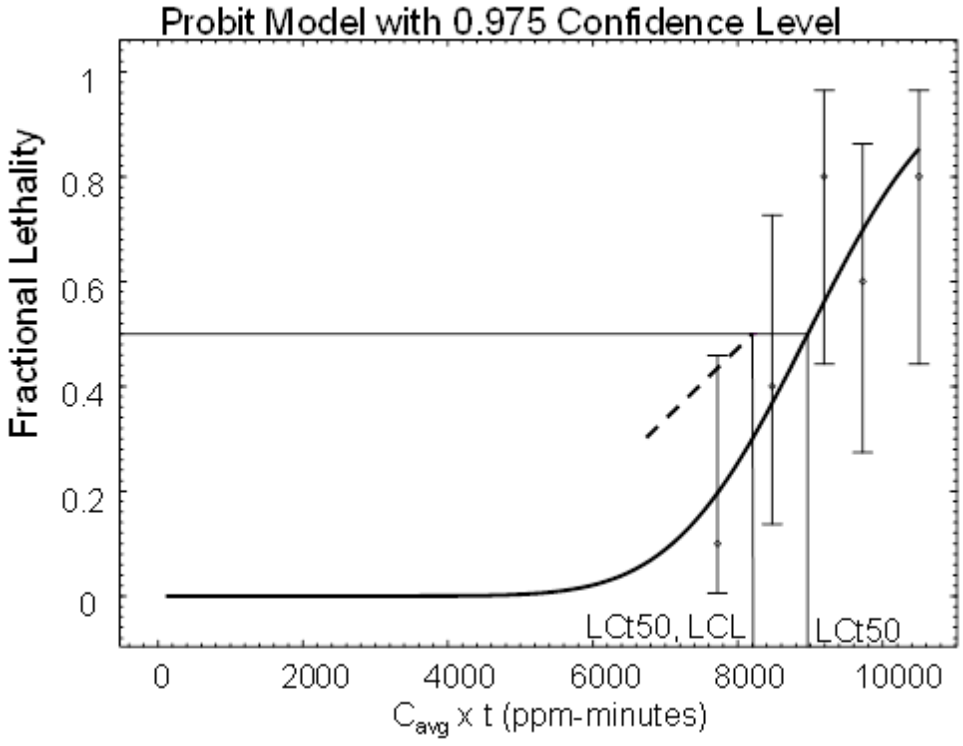
Profile 7 consists of a 15 minute exposure to a given concentration (Ci) followed immediately by a 15 minute exposure to a concentration of 0.5 × Ci, for a total exposure duration of 30 minutes.

The dose-response data for Profile 7 are found in tabular form in Table 11, and in graphical form in Figure 8. While the full data set did meet the criterion for an adequate dose-response relationship ($p = 0.3045$ for the full data set, $p > 0.1$ for acceptability), an alternative analysis with a reduced data set was also conducted. When the datum with the largest standardized residual error (SRE = 1.517) was excluded, the probit model goodness of fit statistic (p-value) increased from 0.3045 to 0.7088. The reduced data set also exhibited a decreased $LCt_{50}/LCt_{50,LCL}$ ratio, indicating greater certainty in the LCt_{50} estimate. Using the reduced data set, the LCt_{50} (95 percent confidence limits) for Profile 7 was 9229 (8502-9956) ppm-minutes.

Table 11. Dose-Response Data for Profile 7

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
349.7/165.0	7720.5	1/10
376.4/188.6	8475	4/10
406.4/206.4	9192	8/10 [a]
431.3/216.9	9723	6/10
466.2/233.8	10500	8/10

[a]This datum was excluded from an alternative analysis.



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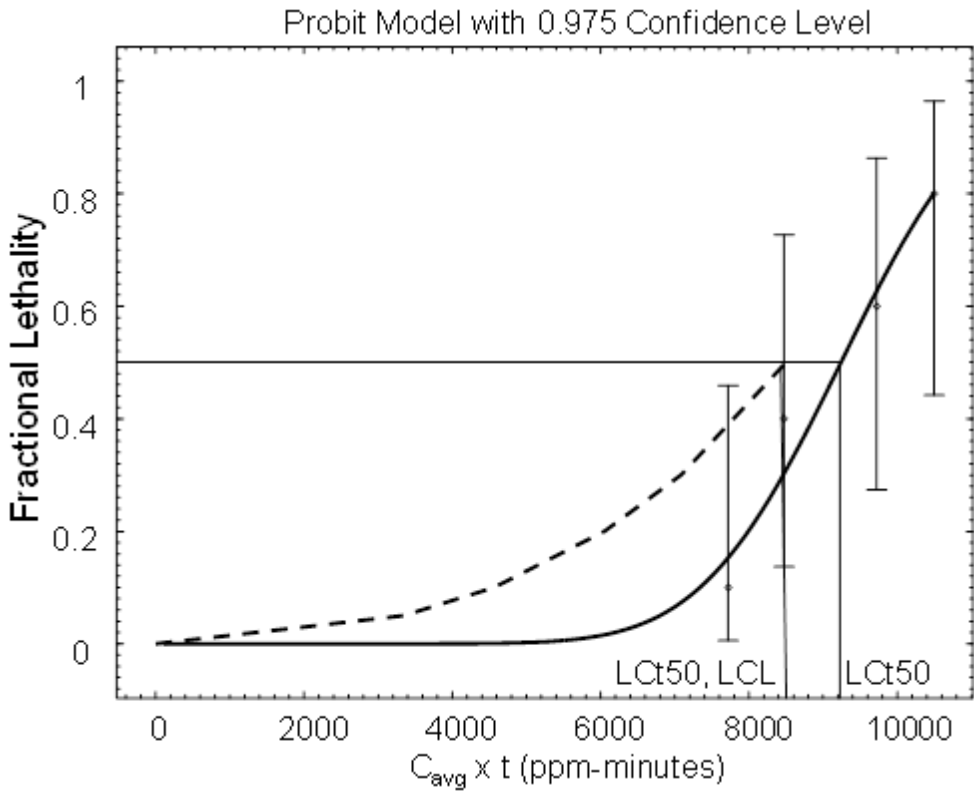

(b)

Figure 8. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 30 minutes, Profile 7. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model as determined by BMDS. ashed line: lower confidence limit of the probit model. (a) Full data set (probit model goodness of fit: p = 0.3045) (lower confidence limits were unstable for part of the dose-response range), (b) reduced data set with one datum eliminated (see Table 11) (goodness of fit: p = 0.7088).

Dose-Response Analysis: Profile 8

Profile 8 consists of a 15 minute exposure to a given concentration (Ci) followed immediately by a 15 minute exposure to a concentration of 0.2 × Ci, for a total exposure duration of 30 minutes. The dose-response data for Profile 8 are found in tabular form in Table 12, and in graphical form in Figure 9. While the full data set did meet the criterion for an adequate dose-response relationship (p = 0.1901 for the full data set, p > 0.1 for acceptability), alternative analyses with reduced data sets was also conducted. When the data with the largest standardized residual errors (SRE = -1.507, -1.702) were excluded, the probit model goodness of fit statistics (p-value) increased, but the reduced data sets did not exhibit decreased $LCt_{50}/LCt_{50,LCL}$ ratios (i.e., greater certainty in the LCt_{50} estimate was not observed), so only the analysis of the full data set is

presented. Using the full data set, the LCt_{50} (95 percent confidence limits) for Profile 8 was 8239 (7287-9191) ppm-minutes.

Table 12. Dose-Response Data for Profile 8

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
255.0/50.6	4584	1/10
322.9/64.2	5806.5	4/10
404.7/80.6	7279.5	4/10
432.2/86.0	7773	6/10
473.8/94.6	8526	3/10[a]
508.6/101.6	9153	4/10[a]
515.9/103.0	9283.5	6/10
633.5/127.8	11419.5	10/10

[a]These data were excluded from alternative analyses.

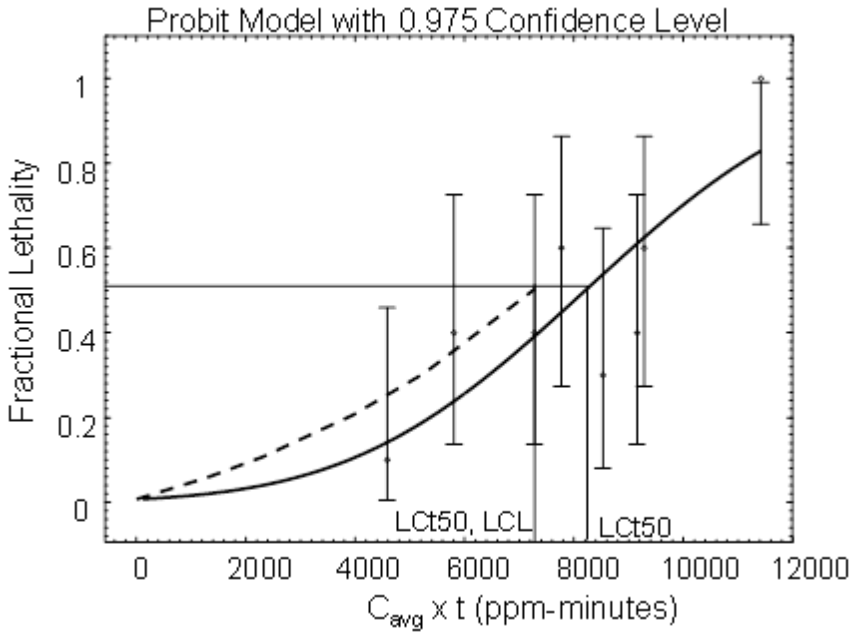

Figure 9. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 30 minutes, Profile 8. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model as determined by BMDS (p = 0.1901). Dashed line: lower confidence limit of the probit model.

Dose-Response Analysis: Profile 9

Profile 9 consists of a 10.5 minute exposure to a given concentration (Ci), followed by 9 minutes exposure to 0 ppm HCN, followed by a 10.5 minute exposure to a concentration of 0.5 × Ci, for a total exposure duration of 30 minutes, including a gap. The dose-response data for Profile 9 are found in tabular form in Table 13, and in graphical form in Figure 10. The full data set met the criterion for an adequate dose-response relationship ($p = 0.2451$ for the full data set, $p > 0.1$ for acceptability). While agreement with the probit model was only fair, alternative analyses with reduced data sets were not conducted because elimination of the datum with the largest SRE would leave a reduced data set with no responses equal to or less than 50 percent, and thus decrease the certainty of any LCt_{50} estimates derived from the data. Using the full data set, the LCt_{50} (95 percent confidence limits) for Profile 9 was 7597 (6402-8792) ppm-minutes.

Table 13. Dose-Response Data for Profile 9

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
444.9/223.8	7021.35	2/10
468.3/236.0	7395.15	6/10
496.1/249.6	7829.85	7/10
554.1/280.7	8765.4	6/10
608.4/309.9	9642.15	9/10

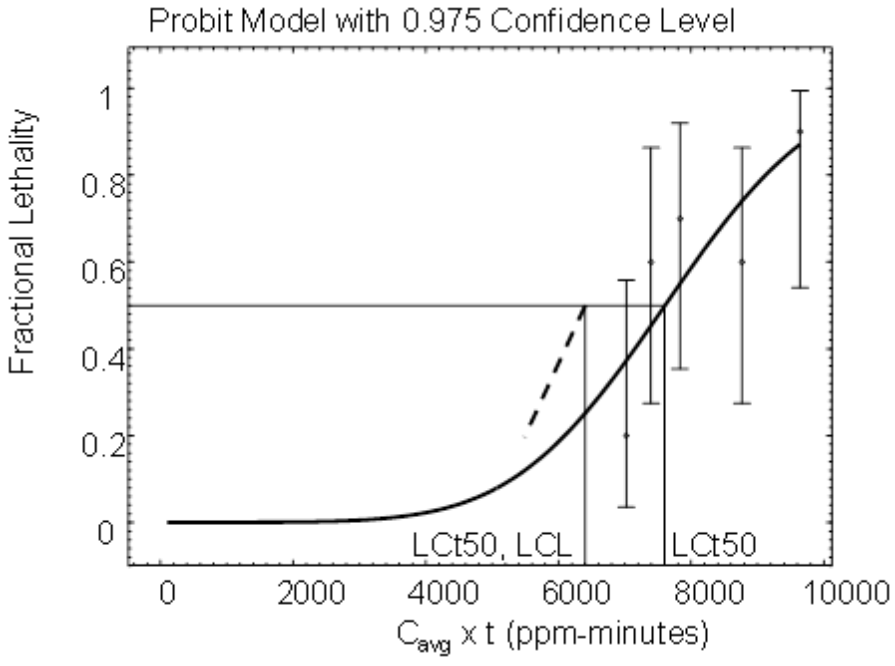

Figure 10. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 30 minutes, Profile 9. For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model as determined by BMDS (p = 0.2451). Dashed line: lower confidence limit of the probit model (was not stable).

Dose-Response Analysis: Profile 10

Profile 9 consists of a 10.5 minute exposure to a given concentration (Ci), followed by 9 minutes exposure to 0 ppm HCN, followed by a 10.5 minute exposure to a concentration of 0.2 × Ci, for a total exposure duration of 30 minutes, including a gap. The dose-response data for Profile 10 are found in tabular form in Table 14, and in graphical form in Figure 11. The full data set did not meet the criterion for an adequate dose-response relationship (p = 0.0012 for the full data set, p > 0.1 for acceptability). When the datum with the largest standardized residual error (SRE = 2.812) was excluded, the probit model goodness of fit statistic (p-value) increased substantially, but still did not meet the acceptability criterion (to 0.0399). When a second datum was excluded (SRE = 1.743), the goodness of fit was acceptable (p = 0.1297). While agreement with the probit model was only fair, alternative analysis with a further reduced data set was not conducted because elimination of the datum with the next largest SRE would leave a reduced data set with no responses greater than 50 percent, and thus decrease the certainty of any LCt_{50} estimates derived from the data. Using the data set with two trials excluded, the LCt_{50} (95 percent confidence limits) for Profile 10 was 7498 (6875-8121) ppm-minutes.

Table 14. Dose-Response Data for Profile 10

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
427.3/85.0	5379.15	1/10
511.3/101.8	6437.55	6/10[a]
558.3/110.9	7026.6	4/10
675.9/NA	7096.95	10/10[a]
611.6/122.7	7710.15	4/10
643.5/128.0	8100.75	5/10
674.4/135.2	8500.8	10/10

[a]These data were excluded from alternative analyses.

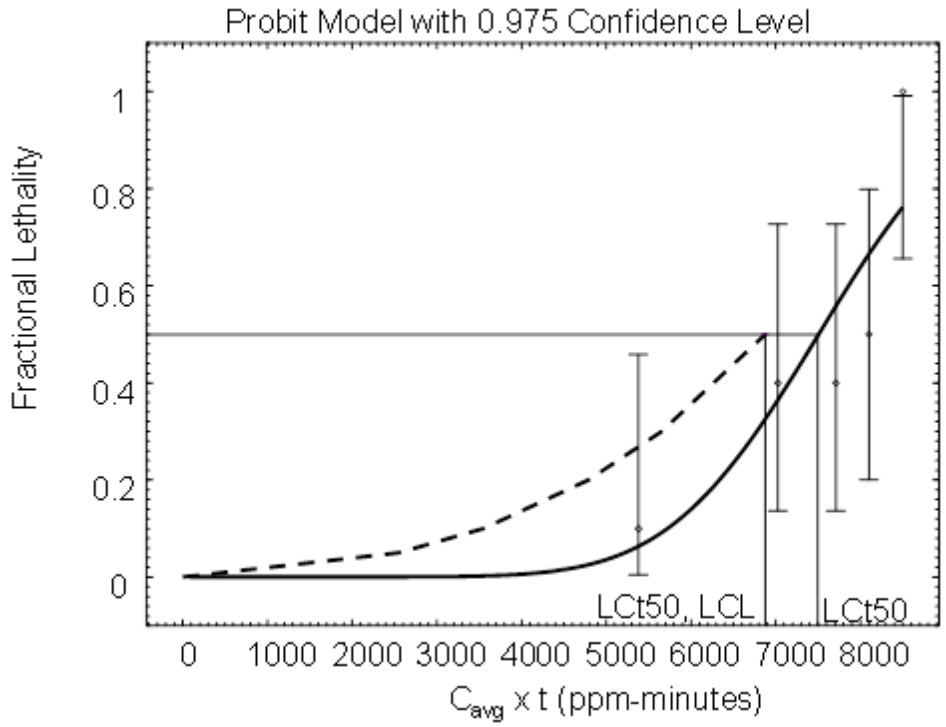

Figure 11. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 30 minutes, Profile 10 (reduced data set). For Profile description, see Table 1. Symbols: experimentally-determined response. Solid line: best-fit probit model (p = 0.1297) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

Dose-Response Analysis: Profile 11

Profile 11 consists of a 15-minute, constant-concentration exposure. The dose-response data for Profile 11 are found in tabular form in Table 15, and in graphical form in Figure 12. The full

data set demonstrated a good fit to the probit model (p = 0.683). The LCt_{50} (95 percent confidence limits) for Profile 11 was 6425 (5759-7090) ppm-minutes.

Table 15. Dose-Response Data for Profile 11

Concentration (ppm)	Cavg × t (ppm-min.)	Lethality
198.0	2970	0/10
272.3	4084.5	2/10
340.3	5104.5	3/10
407.4	6111	5/10
450.3	6754.5	4/10
453.7	6805.5	5/10
493.5	7402.5	8/10

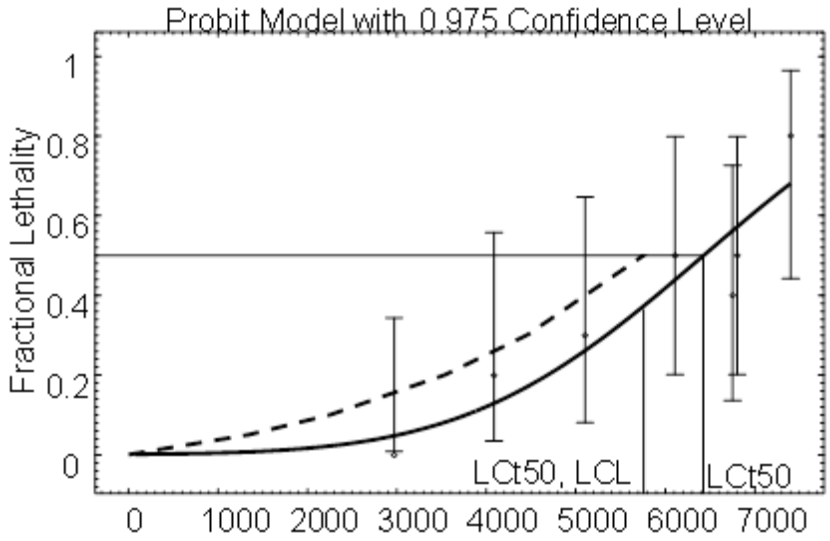

Figure 12. Dose-lethality relationship for young adult male Sprague-Dawley rats (n = 10/trial) to exposed to HCN via nose-only inhalation for 15 minutes (Profile 11). Symbols: experimentally-determined response. Solid line: best-fit probit model (p =0.6830) as determined by BMDS. Dashed line: lower confidence limit of the probit model.

Summary of Dose-Response Analyses

The results of the dose-response analyses of HCN lethality are summarized in Table 16. Clear differences in the LCt_{50} values of the baseline profiles (Profiles 1, 6, and 11, which consist of a single, constant-concentration pulse) are evident, consistent with a toxic load exponent n that differs from 1 for HCN.

Table 16. Summary of Dose-Response Analyses of HCN Lethality

Total Duration	Profile	Probit model goodness-of-fit	LCt_{50} (range [a]) (ppm-min)
5 minutes	1 [b]	p = 0.8621	3922 (3561-4283)
	2 [b]	p = 0.4789	4040 (3475-4606)
	3 [b]	p = 0.7047	4056 (3831-4280)
	4	p = 0.5638	5890 (4820-6960)
	5	p = 0.5837	5826 (4813-6939)
30 minutes	6	p = 0.7497	7824 (7315-8333)
	7 [b]	p = 0.7088	9229 (8502-9956)
	8	p = 0.1901	8239 (7287-9191)
	9	p = 0.2451	7597 (6402-8792)
	10 [b]	p = 0.1297	7498 (6875-8121)
15 minutes	11	p = 0.6830	6425 (5759-7090)

[a] 95% confidence limits

[b] Alternative analyses with worst-fit datum or data removed.

Determination of the Toxic Load Exponent and Median Toxic Load for HCN

The LC_{50} values of the three "baseline" profiles with constant-concentration exposures (Profiles 1, 6, 11; $LC_{50} = LCt_{50}/t$) were used to determine the toxic load exponent ("n" in $C^n \times t$), and the TL_{50} ($(LC_{50})^n \times t$) via linear regression of ln(t) vs. ln(LC_{50}). The r^2 of the regression was 0.992, n was determined to be 1.75, and TL_{50} was 573,779 $ppm^{1.75}$-minutes.

DISCUSSION

An unexpected finding in this study was that the median lethal concentrations for the "baseline" profiles (constant-concentration exposures) determined in this laboratory were substantially higher than expected (approximately double the expected LC_{50}s) based on the previous studies conducted with the same sex and strain (Lapin, 1981; Vernot et al., 1977) (Table 17). Because of this unexpected occurrence, sufficiently high concentrations of HCN for the profiles with the least exposure time (Profile 4 and 5) could not be achieved with the gas mixture on hand at the beginning of the study. Delays in receiving a higher concentration gas cylinder resulted in suspension of testing, and thus the study as a whole was conducted in two series of runs (July-August and November-December 2012). No reason for the difference in lethality is readily apparent, but it may relate to genetic drift. To avoid the influence of genetic drift in cancer analyses, it has been recommended that only data from the last 3-7 years be used as historical controls (Baldrick, 2005). The stability of historical control incidence of spontaneous neoplasms has been assessed for three strains of laboratory rats, and while tumor drift was not found to be common, it "occurred far more often in outbred rat strains (Wistar and Sprague-Dawley) than in the inbred rat strain (F344)" (Tennekes et al., 2004). A comprehensive restructuring and repopulation of Charles River Laboratories' breeding programs was initiated in the 1990s, in

response to a trend toward reduced longevity of Sprague-Dawley rats in the late 1980s. Founder Sprague-Dawley rats for Charles River Laboratories had been obtained in the 1950s, and prior to the restructuring and repopulating, the company had 23 separate production colonies in 8 different countries (White and Lee, 1998). Thus it is possible that the Sprague-Dawley rats used by Lapin (1981) and Vernot et al. (1977), prior to the repopulation of the colonies, had genetic differences from those used in the work reported here.

Table 17. Estimates of the median lethal inhaled concentration of HCN in male Sprague-Dawley rats

Duration	LC_{50} (ppm)	Exposure System	Reference
5 min.	784	Nose-only	This study
	369	Whole-body	Lapin (1981)
	398	Head-only	Lapin (1981)
	484	Not stated	Vernot et al. (1977)
15 min.	428	Nose-only	This study
	196	Whole-body	Lapin (1981)
	163	Head-only	Lapin (1981)
30 min.	280	Nose-only	This study
	173	Whole-body	Lapin (1981)
	85	Head-only	Lapin (1981)

The primary objective of this study was to develop data sets that could be used for the assessment of the toxic load model under conditions of non-constant exposure. A key consideration in the selection of the test compound was that the toxic load exponent was not 1, because if n = 1 in $C1^n \times t1 + C2^n \times t2$, then $C1^n \times t1 + C2^n \times t2$ does not differ from $Cavg \times t$. Based on the 3 baseline profiles, the toxic load exponent was determined to be 1.75, validating the choice of chemical.

A limited assessment of the predictivity of the toxic load model can be made by comparing LCt_{50} values from profiles with the same total duration, but different profile shapes (e.g., one vs. two pulses, presence or absence of a gap). For exposures of the same length (that is, 5 minutes or 30 minutes), in general, the shape of the profile does not appear to have had a significant impact on the LCt_{50}. All of the 30-minute profiles (Profiles 6-10, Table 16) have overlapping confidence regions, with the exception of Profile 7 (does not overlap with Profile 6 or 10). The five-minute profiles (Profiles 1-5) have an interesting dichotomy. The 5-minute profiles with continuous exposure (no gaps), Profiles 1-3, have very similar LC_{50}s and the slopes appear similar as well (Table 16, Figures 2-4). In contrast, the two profiles with a "gap" have LC_{50}s similar to each other, but much higher than Profiles 1-3, and the dose-response curves are much less steep. In Profiles 4 and 5, the rats were exposed for 1.75 minutes during each pulse, for a total of 3.5 minutes of exposure during a 5-minute window. The inclusion of a gap appears to have contributed to an increased LCt_{50} for the 5-minute exposures, but not the 30-minute exposures.

We theorize that during the 1.75-minute pulses prior to the gap in Profiles 4 and 5 (Table 1), some rats may have been able to successfully engage in breath holding (effectively reducing their exposure), a response that may have been harder to sustain without succumbing to hypoxia during the longer (2.5- or 5-minute) pulses associated with Profiles 1-3 (Table 1).

In summary, an inhalation system was developed to create exposure profiles where concentration varied over time. This system proved to be a versatile inhalation exposure system with the ability to control the testing conditions. In the current study, we generated data to test the validity of toxic load models for extrapolation from constant exposures to time-varying exposures. The validity of applying formulas developed using controlled, constant concentration animal studies to time-varying exposures has not previously been tested. Analyses evaluating the fit to the probit model indicated that the data developed using this system are suitable for the dose-response modeling that will be integral to the hypothesis testing.

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APPENDIX

Table A-1. Chamber HCN Distribution Port-to-Port Variability

Chamber Homogenity for Port-to-Port Variability for a 12-Port Nose-Only Exposure Unit

Chamber ID No.: 12 port NOEU Sample Location (Port No.)	**Total** Port Concentration (TP) FT-IR	**Temporal** or Within Port Concentration (WP) FT-IR	**Spacial** or Between Port Concentration (BP)
2 (home)		936.00	Calculated Below
5	915.00		
6	927.00		
2 (home)		933.00	
3	928.00		
7	916.00		
2 (home)		934.00	
11	929.00		
4	909.00		
2 (home)		930.00	
2 (Mean of WP)	933.25		
Mean	922.46	933.25	
Std. Dev.	9.03	2.50	
N	7	4	

Coefficient of variation (CV) for :

Total Port Concentration (TPCV) = 0.98 %

Within Port Concentration (WPCV) = 0.27 %

Between Port Concentration (BPCV) = 0.94 %

Where: TPCV = [Std. Dev. (TP) / Mean (TP)] * 100

WPCV = [Std. Dev. (WP) / Mean (WP)] * 100

BPCV = Square Root [(TPCV)2 - (WPCV)2]

Table A-2. Hydrogen Cyanide Concentrations: Target vs. Actual

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
1	20120709	P1	396	N/A	Mean[a]	383.1	N/A	96.7	N/A
					Std. Dev.[a]	5.1	N/A		
2	20120710	P11	196	N/A	Mean[a]	198.0	N/A	101.0	N/A
					Std. Dev.[a]	0.8	N/A		
3	20120711	P6	140	N/A	Mean	138.5	N/A	98.9	N/A
					Std. Dev.	2.6	N/A		
4	20120712	P11	495	N/A	Mean	517.2	N/A	104.5	N/A
					Std. Dev.	6.0	N/A		
5	20120716	P1	585	N/A	Mean	590.0	N/A	100.9	N/A
					Std. Dev.	5.7	N/A		
6	20120716	P11	400	N/A	Mean	407.5	N/A	101.9	N/A
					Std. Dev.	4.1	N/A		
7	20120717	P1	760	N/A	Mean	763.1	N/A	100.4	N/A
					Std. Dev.	8.2	N/A		
8	20120717	P6	270	N/A	Mean	273.5	N/A	101.3	N/A
					Std. Dev.	3.5	N/A		
9	20120718	P6	200	N/A	Mean	200.8	N/A	100.4	N/A
					Std. Dev.	3.1	N/A		
10	20120718	P1	980	N/A	Mean	966.1	N/A	98.6	N/A
					Std. Dev.	12.0	N/A		
11	20120719	P2	1056	528	Mean	1041.5	535.6	98.6	101.4
					Std. Dev.	19.4	12.4		

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
12	20120719	P8	432	86	Mean	432.2	86.0	100.0	100.0
					Std. Dev.	4.9	2.5		
13	20120723	P3	1320	264	Mean	1312.9	273.5	99.5	103.6
					Std. Dev.	13.0	10.5		
14	20120723	P7	346	173	Mean	349.7	165.0	101.1	95.4
					Std. Dev.	4.1	2.6		
15	20120723	P4	1312	656	Mean	1293.2	659.2	98.6	100.5
					Std. Dev.	16.2	4.6		
16	20120724	P7	466	233	Mean	466.2	233.8	100.0	100.3
					Std. Dev.	5.4	3.2		
17	20120725	P4	1772	886	Mean	1751.5	874.7	98.8	98.7
					Std. Dev.	21.2	11.8		
18	20120726	P5	1886	377	Mean	1863.2	378.6	98.8	100.4
					Std. Dev.	27.6	3.9		
19	20120725	P10	616	123	Mean	611.6	122.7	99.3	99.8
					Std. Dev.	5.3	2.3		
20	20120725	P9	616	308	Mean	608.4	309.9	98.8	100.6
					Std. Dev.	7.3	3.8		
21	20120725	P2	1250	625	Mean	1239.4	626.7	99.2	100.3
					Std. Dev.	15.4	6.8		
22	20120726	P9	494	247	Mean	496.1	249.6	100.4	101.1
					Std. Dev.	5.7	3.7		
23	20120726	P11	340	N/A	Mean	340.3	N/A	100.1	N/A
					Std. Dev.	4.2	N/A		

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
24	20120730	P3	1200	240	Mean	1192.8	244.5	99.4	101.9
					Std. Dev.	14.4	3.1		
25	20120730	P3	1452	290	Mean	1447.3	297.3	99.7	102.5
					Std. Dev.	17.0	7.5		
26	20120730	P7	405	203	Mean	406.4	206.4	100.3	101.7
					Std. Dev.	3.9	2.6		
27	20120731	P10	560	112	Mean	558.3	110.9	99.7	99.0
					Std. Dev.	4.5	2.0		
28	20120731	P10	678	136	Mean	675.9	N/A	99.7	N/A
					Std. Dev.	5.0	N/A		
29	20120731	P5	1693	339	Mean	1667.4	338.1	98.5	99.7
					Std. Dev.	4.3	4.3		
30	20120801	P8	405	81	Mean	404.7	80.6	99.9	99.5
					Std. Dev.	3.9	1.8		
31	20120801	P8	475	95	Mean	473.8	94.6	99.7	99.6
					Std. Dev.	3.8	1.9		
32	20120801	P2	906	453	Mean	897.8	452.7	99.1	99.9
					Std. Dev.	9.1	3.8		
33	20120802	P9	445	223	Mean	444.9	223.8	100.0	100.4
					Std. Dev.	3.5	2.5		
34	20120802	P9	555	278	Mean	554.1	280.7	99.8	101.0
					Std. Dev.	4.6	2.8		
35	20120806	P6	250	N/A	Mean	254.6	N/A	101.8	N/A
					Std. Dev.	2.4	N/A		

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
36	20120806	P4	1927	964	Mean	1906.0	945.0	98.9	98.0
					Std. Dev.	10.9	14.3		
37	20120806	P6	301	N/A	Mean	303.0	N/A	100.7	N/A
					Std. Dev.	2.7	N/A		
38	20120807	P7	430	215	Mean	431.3	216.9	100.3	100.9
					Std. Dev.	3.4	2.5		
39	20120807	P11	450	N/A	Mean	453.7	N/A	100.8	N/A
					Std. Dev.	3.6	N/A		
40	20120807	P2	1146	573	Mean	1132.8	574.6	98.8	100.3
					Std. Dev.	11.7	4.4		
41	20120808	P7	375	188	Mean	376.4	188.6	100.4	100.3
					Std. Dev.	3.0	2.3		
42	20120808	P2	1375	688	Mean	1347.8	686.5	98.0	99.8
					Std. Dev.	13.9	5.1		
43	20120808	P4	1490	745	Mean	1460.8	737.0	98.0	98.9
					Std. Dev.	14.8	4.4		
44	20120809	P6	225	N/A	Mean	226.1	N/A	100.5	N/A
					Std. Dev.	2.4	N/A		
45	20120809	P1	831	N/A	Mean	821.8	N/A	98.9	N/A
					Std. Dev.	4.8	N/A		
46	20120813	P10	646	129	Mean	643.5	128.0	99.6	99.2
					Std. Dev.	5.1	2.2		
47	20120813	P8	510	102	Mean	508.6	101.6	99.7	99.6
					Std. Dev.	4.2	1.9		

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
48	20120813	P3	1598	320	Mean	1572.5	324.8	98.4	101.5
					Std. Dev.	12.9	3.5		
49	20120814	P8	640	128	Mean	633.5	127.8	99.0	99.9
					Std. Dev.	5.0	1.9		
50	20120814	P9	470	235	Mean	468.3	236.0	99.6	100.4
					Std. Dev.	4.0	2.5		
51	20120814	P10	678	136	Mean	674.4	135.2	99.5	99.4
					Std. Dev.	5.6	2.2		
52	20120815	P10	510	102	Mean	511.3	101.8	100.3	99.8
					Std. Dev.	3.4	1.7		
53	20120815	P3	1193	244	Mean	1189.3	245.7	99.7	100.7
					Std. Dev.	8.3	2.8		
54	20120822	P10	425	85	Mean	427.3	85.0	100.5	100.0
					Std. Dev.	3.5	1.8		
55	20120822	P8	322	65	Mean	322.9	64.2	100.3	98.7
					Std. Dev.	2.9	1.8		
56	20120823	P8	255	51	Mean	255.0	50.6	100.0	99.2
					Std. Dev.	2.8	1.9		
57	20120823	P2	1132	566	Mean	1128.6	573.6	99.7	101.3
					Std. Dev.	6.1	4.6		
58	20120827	P8	510	102	Mean	515.9	103.0	101.2	100.9
					Std. Dev.	3.3	2.1		
59	20120828	P11	270	N/A	Mean	272.3	N/A	100.9	N/A
					Std. Dev.	2.8	N/A		

Exposure Group	Date YYYYMMDD	Profile	Pulse 1 HCN target conc. (ppm)	Pulse 2 HCN target conc. (ppm)	Data type	Pulse 1 FTIR HCN conc. (ppm)	Pulse 2 FTIR HCN conc. (ppm)	Pulse 1 HCN conc. percent of nominal	Pulse 2 HCN conc. percent of nominal
60	20120829	P1	590	N/A	Mean	593.0	N/A	100.5	N/A
					Std. Dev.	4.6	N/A		
61	20121126	P4	2500	1250	Mean	2503.4	1220.4	100.1	97.6
					Std. Dev.	14.2	7.6		
62	20121126	P5	2350	470	Mean	2346.9	483.8	99.9	102.9
					Std. Dev.	11.1	7.8		
63	20121126	P1	763	N/A	Mean	765.2	N/A	100.3	N/A
					Std. Dev.	4.6	N/A		
64	20121128	P5	3100	620	Mean	3124.4	632.6	100.8	102.0
					Std. Dev.	17.9	5.0		
65	20121129	P5	5000	1000	Mean	4947.0	996.4	98.9	99.6
					Std. Dev.	114.0	8.3		
66	20121203	P4	4000	2000	Mean	3885.2	1934.9	97.1	96.7
					Std. Dev.	25.0	10.1		
67	20121204	P11	453	N/A	Mean	450.3	N/A	99.4	N/A
					Std. Dev.	3.6	N/A		

[a]These values were calculated from measurements taken by the Interscan hydrogen cyanide analyzers

Table A-3. Environmental Parameter Data

Data Type	Temperature (ºF)	Temperature (ºC)	Relative Humidity (Percent)	Static Pressure (inches of water)
Study minimum mean[a]	71.1	21.7	20	-0.015
Study maximum mean[b]	76.5	24.7	67	-0.003

[a]Mean values computed for each of the 67 exposures (see below); study minimum mean refers to the lowest of the 67 means.
[b]Study maximum mean refers to the highest of the 67 means.

Table A-3A. Environmental Parameter Data of Profile 1

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
1	20120709	Mean	72.2	22.3	54	-0.010	4.690	1.081	N/A[b]	N/A
		Std. Dev.	0.02	0.01	0.0	0.0004	0.020	0.010	N/A	N/A
5	20120716	Mean	72.0	22.2	67	-0.011	2.691	3.737	N/A	N/A
		Std. Dev.	0.02	0.01	0.1	0.0006	0.012	0.016	N/A	N/A
7	20120717	Mean	72.8	22.7	66	-0.008	4.034	2.446	N/A	N/A
		Std. Dev.	0.05	0.03	0.3	0.0003	0.023	0.020	N/A	N/A
10	20120718	Mean	74.4	23.6	61	-0.009	3.21	3.110	N/A	N/A
		Std. Dev.	0.02	0.01	0.1	0.0003	0.013	0.011	N/A	N/A
45	20120809	Mean	73.1	22.9	55	-0.007	3.701	2.636	N/A	N/A
		Std. Dev.	0.09	0.05	0.2	0.0003	0.009	0.007	N/A	N/A
60	20120829	Mean	71.9	22.2	60	-0.008	2.625	3.759	N/A	N/A
		Std. Dev.	0.20	0.11	0.3	0.0005	0.005	0.312	N/A	N/A
63	20121126	Mean	71.8	22.1	23	-0.014	4.364	1.954	N/A	N/A
		Std. Dev.	0.01	0.01	0.2	0.0003	0.006	1.165	N/A	N/A
	MINIMUM MEAN		71.8	22.1	23	-0.014				
	MAXIMUM MEAN		74.4	23.6	67	-0.007				

[a] SLM: Standard Liters per Minute flow rate
[b] N/A: Not applicable

Table A-3B. Environmental Parameter Data of Profile 2

Exposure Group	Date YYYYMMDD	Data Type	Temp. (°F)	Temp. (°C)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
11	20120719	Mean	72.0	22.2	67	-0.008	2.967	3.354	3.028	3.333
		Std. Dev.	0.02	0.01	0.1	0.0006	0.016	0.012	0.010	0.010
21	20120725	Mean	73.0	22.8	53	-0.008	2.373	4.092	2.424	4.051
		Std. Dev.	0.10	0.05	0.3	0.0005	0.008	0.010	0.005	0.005
32	20120801	Mean	73.6	23.1	56	-0.007	3.444	2.872	3.484	2.211
		Std. Dev.	0.07	0.04	0.2	0.0006	0.008	0.008	0.009	1.134
40	20120807	Mean	73.0	22.8	54	-0.009	2.654	3.688	2.695	3.648
		Std. Dev.	0.08	0.04	0.2	0.0004	0.007	0.008	0.008	0.009
42	20120808	Mean	73.0	22.8	55	-0.008	1.925	4.228	1.947	4.426
		Std. Dev.	0.12	0.07	0.5	0.0004	0.006	0.834	0.006	0.009
57	20120823	Mean	72.8	22.7	51	-0.009	2.698	3.567	2.724	3.358
		Std. Dev.	0.12	0.06	0.2	0.0004	0.006	0.008	0.007	0.689
	MINIMUM MEAN		72.0	22.2	51	-0.009				
	MAXIMUM MEAN		73.6	23.1	67	-0.007				

[a] SLM: Standard Liters per Minute flow rate

Table A-3C. Environmental Parameter Data of Profile 3

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
13	20120723	Mean	72.3	22.4	63	-0.008	2.190	4.294	4.801	1.691
		Std. Dev.	0.19	0.10	0.7	0.0009	0.005	0.005	0.005	0.005
24	20120730	Mean	72.5	22.5	60	-0.007	2.471	3.858	4.919	1.450
		Std. Dev.	0.18	0.10	1.1	0.0003	0.007	0.008	0.009	0.205
25	20120730	Mean	72.9	22.7	58	-0.007	1.661	4.718	4.577	1.792
		Std. Dev.	0.12	0.07	0.5	0.0003	0.005	0.009	0.009	0.006
48	20120813	Mean	72.9	22.7	53	-0.008	1.221	5.206	4.351	1.990
		Std. Dev.	0.08	0.05	0.5	0.0003	0.003	0.007	0.006	0.005
53	20120815	Mean	72.6	22.6	55	-0.008	2.457	3.835	4.898	1.229
		Std. Dev.	0.09	0.05	0.1	0.0004	0.006	0.008	0.007	0.532
	MINIMUM MEAN		72.3	22.4	53	-0.008				
	MAXIMUM MEAN		72.9	22.7	63	-0.007				

[a] SLM: Standard Liters per Minute flow rate

Table A-3D. Environmental Parameter Data of Profile 4

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
15	20120723	Mean	73.5	23	61	-0.008	2.21	4.262	2.223	4.253
		Std. Dev.	0.11	0.06	1.4	0.0007	0.006	0.005	0.004	0.006

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
17	20120725	Mean	73.6	23.1	62	-0.006	0.675	5.802	0.689	5.796
		Std. Dev.	0.13	0.07	0.6	0.0004	0.009	0.016	0.007	0.011
36	20120806	Mean	72.9	22.7	56	-0.006	0.311	6.320	0.304	6.328
		Std. Dev.	0.10	0.05	0.8	0.0003	0.009	0.009	0.009	0.008
43	20120808	Mean	73.2	22.9	54	-0.008	1.534	4.860	1.575	3.256
		Std. Dev.	0.08	0.04	0.3	0.0004	0.006	0.007	0.006	2.152
61	20121126	Mean	71.4	21.9	22	-0.015	3.499	1.592	2.643	2.813
		Std. Dev.	0.03	0.02	0.5	0.0004	0.063	1.829	0.001	2.102
66	20121203	Mean	71.9	22.2	52	-0.015	1.296	2.443	0.408	4.333
		Std. Dev.	0.08	0.04	0.2	0.0004	0.002	2.579	0.782	3.029
	MINIMUM MEAN		71.4	21.9	22	-0.015				
	MAXIMUM MEAN		73.6	23.1	62	-0.006				

[a] SLM: Standard Liters per Minute flow rate

Table A-3E. Environmental Parameter Data of Profile 5.

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
18	20120726	Mean	73.9	23.3	62	-0.006	0.283	6.203	4.048	2.435
		Std. Dev.	0.10	0.05	0.7	0.0005	0.005	0.006	0.004	0.004
29	20120731	Mean	73.4	23.0	55	-0.008	0.917	5.557	4.220	2.094
		Std. Dev.	0.13	0.07	0.6	0.0004	0.005	0.009	0.011	0.006
62	20121126	Mean	71.6	22.0	23	-0.015	3.690	1.545	5.391	1.026

Exposure Group	Date YYYYMMDD	Data Type	Temp. (°F)	Temp. (°C)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
		Std. Dev.	0.04	0.02	0.4	0.0005	0.001	1.754	0.001	0.794
64	20121128	Mean	71.2	21.8	20	-0.014	2.676	1.785	4.878	1.306
		Std. Dev.	0.08	0.05	0.2	0.0004	0.001	2.140	0.001	1.051
65	20121129	Mean	71.2	21.8	20	-0.014	0.000	2.860	3.247	2.703
		Std. Dev.	0.12	0.07	0.5	0.0006	0.002	3.048	0.001	1.197
	MINIMUM MEAN		71.2	21.8	20	-0.015				
	MAXIMUM MEAN		73.9	23.3	62	-0.006				

[a] SLM: Standard Liters per Minute flow rate

Table A-3F. Environmental Parameter Data of Profile 6

Exposure Group	Date YYYYMMDD	Data Type	Temp. (°F)	Temp. (°C)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
3	20120711	Mean	76.5	24.7	46	-0.003	4.920	0.737	N/A[b]	N/A
		Std. Dev.	0.12	0.07	0.4	0.0004	0.023	0.004	N/A	N/A
8	20120717	Mean	73.7	23.2	60	-0.008	4.722	1.667	N/A	N/A
		Std. Dev.	0.04	0.02	0.7	0.0004	0.015	0.013	N/A	N/A
9	20120718	Mean	74.1	23.4	60	-0.005	4.992	1.166	N/A	N/A
		Std. Dev.	0.06	0.03	0.6	0.0004	0.016	0.009	N/A	N/A
35	20120806	Mean	72.2	22.3	58	-0.007	4.854	1.566	N/A	N/A
		Std. Dev.	0.25	0.14	1.0	0.0005	0.009	0.005	N/A	N/A
37	20120806	Mean	73.1	22.8	52	-0.007	4.519	1.867	N/A	N/A
		Std. Dev.	0.05	0.03	1.0	0.0004	0.009	0.006	N/A	N/A

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
44	20120809	Mean	72.6	22.5	59	-0.007	5.028	1.391	N/A	N/A
		Std. Dev.	0.24	0.13	0.9	0.0004	0.009	0.150	N/A	N/A
	MINIMUM MEAN		72.2	22.3	46	-0.008				
	MAXIMUM MEAN		76.5	24.7	60	-0.003				

[a] SLM: Standard Liters per Minute flow rate
[b]N/A: Not applicable

Table A-3G. Environmental Parameter Data of Profile 7

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
14	20120723	Mean	73.1	22.8	61	-0.008	5.391	1.099	5.396	1.101
		Std. Dev.	0.14	0.08	0.4	0.0006	0.011	0.007	0.004	0.003
16	20120724	Mean	72.8	22.7	62	-0.007	4.989	1.499	4.999	1.495
		Std. Dev.	0.26	0.14	0.9	0.0005	0.005	0.004	0.004	0.004
26	20120730	Mean	73.4	23	57	-0.008	5.175	1.240	5.162	1.267
		Std. Dev.	0.07	0.04	0.6	0.0006	0.009	0.112	0.009	0.005
38	20120807	Mean	72.2	22.3	57	-0.009	5.101	1.292	5.102	1.292
		Std. Dev.	0.21	0.12	1.9	0.0004	0.007	0.261	0.008	0.260
41	20120808	Mean	72.3	22.4	60	-0.007	5.284	1.143	5.278	1.144
		Std. Dev.	0.24	0.13	2.4	0.0003	0.008	0.197	0.008	0.186
	MINIMUM MEAN		72.2	22.3	57	-0.009				
	MAXIMUM MEAN		73.4	23.0	62	-0.007				

[a] SLM: Standard Liters per Minute flow rate

Table A-3H. Environmental Parameter Data of Profile 8

Exposure Group	Date YYYYMMDD	Data Type	Temp. (°F)	Temp. (°C)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
12	20120719	Mean	73.0	22.7	63	-0.008	4.821	1.241	5.619	0.490
		Std. Dev.	0.20	0.12	0.4	0.0004	0.015	0.009	0.016	0.004
30	20120801	Mean	72.3	22.4	61	-0.008	5.167	1.237	6.000	0.550
		Std. Dev.	0.31	0.17	0.8	0.0006	0.008	0.207	0.008	0.004
31	20120801	Mean	73.3	22.9	58	-0.007	4.938	4.438	5.914	0.615
		Std. Dev.	0.14	0.08	1.4	0.0004	0.008	0.263	0.008	0.085
47	20120813	Mean	72.5	22.5	52	-0.008	4.803	1.605	5.851	0.680
		Std. Dev.	0.07	0.04	0.9	0.0004	0.008	0.005	0.008	0.004
49	20120814	Mean	72.1	22.3	57	-0.008	4.357	2.000	5.673	0.830
		Std. Dev.	0.19	0.11	1.0	0.0005	0.007	0.006	0.008	0.004
55	20120822	Mean	73.4	23.0	52	-0.008	5.462	1.030	6.111	0.468
		Std. Dev.	0.09	0.05	0.4	0.0004	0.009	0.004	0.008	0.015
56	20120823	Mean	72.4	22.5	53	-0.009	5.671	0.834	6.177	0.390
		Std. Dev.	0.23	0.13	2.1	0.0004	0.007	0.005	0.007	0.040
58	20120827	Mean	72.6	22.6	58	-0.007	4.839	1.572	5.894	0.684
		Std. Dev.	0.30	0.17	1.3	0.0003	0.008	0.244	0.007	0.004
	MINIMUM MEAN		72.1	22.3	52	-0.009				
	MAXIMUM MEAN		73.4	23.0	63	-0.007				

[a] SLM: Standard Liters per Minute flow rate

Table A-3I. Environmental Parameter Data of Profile 9

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
20	20120725	Mean	73.0	22.8	52	-0.008	4.509	1.975	4.499	1.981
		Std. Dev.	0.06	0.03	0.8	0.0004	0.005	0.005	0.004	0.004
22	20120726	Mean	73.4	23	64	-0.006	4.877	1.609	4.893	1.602
		Std. Dev.	0.29	0.16	1.1	0.0004	0.006	0.004	0.003	0.003
33	20120802	Mean	72.2	22.4	57	-0.008	5.051	1.395	5.034	1.387
		Std. Dev.	0.28	0.16	0.5	0.0004	0.007	0.003	0.007	0.004
34	20120802	Mean	73.2	22.9	55	-0.008	4.661	1.730	4.667	1.732
		Std. Dev.	0.12	0.07	1.3	0.0006	0.007	0.005	0.007	0.005
50	20120814	Mean	72.9	22.7	54	-0.008	4.933	1.463	4.938	1.465
		Std. Dev.	0.11	0.06	0.6	0.0004	0.007	0.004	0.007	0.004
	MINIMUM MEAN		72.2	22.4	52	-0.008				
	MAXIMUM MEAN		73.4	23.0	64	-0.006				

[a] SLM: Standard Liters per Minute flow rate

Table A-3J. Environmental Parameter Data of Profile 10.

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
19	20120725	Mean	72.6	22.6	58	-0.008	4.508	1.974	5.676	0.772
		Std. Dev.	0.23	0.13	2.7	0.0005	0.006	0.005	0.008	0.004
27	20120731	Mean	72.5	22.5	57	-0.008	4.639	1.753	5.782	0.729
		Std. Dev.	0.23	0.13	1.8	0.0005	0.008	0.005	0.008	0.003

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 air flow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
28	20120731	Mean	73.1	22.8	56	-0.008	4.226	2.130	N/A	N/A
		Std. Dev.	0.13	0.07	0.3	0.0004	0.007	0.006	N/A	N/A
46	20120813	Mean	71.9	22.1	55	-0.008	4.338	2.023	5.669	0.835
		Std. Dev.	0.16	0.09	0.9	0.0004	0.008	0.010	0.008	0.004
51	20120814	Mean	73.2	22.9	54	-0.008	4.203	2.034	5.611	0.870
		Std. Dev.	0.07	0.04	0.4	0.0004	0.007	0.394	0.007	0.004
52	20120815	Mean	72.0	22.2	61	-0.008	4.783	1.527	5.847	0.658
		Std. Dev.	0.24	0.13	2.4	0.0005	0.006	0.306	0.007	0.110
54	20120822	Mean	72.6	22.6	54	-0.008	5.104	1.337	5.969	0.579
		Std. Dev.	0.30	0.17	0.3	0.0004	0.007	0.005	0.008	0.004
	MINIMUM MEAN		71.9	22.1	54	-0.008				
	MAXIMUM MEAN		73.2	22.9	61	-0.008				

[a] SLM: Standard Liters per Minute flow rate

Table A-3K. Environmental Parameter Data of Profile 11

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 airflow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
2	20120710	Mean	71.9	22.1	55	-0.011	4.592	1.040	N/A	N/A
		Std. Dev.	0.05	0.03	0.6	0.0003	0.013	0.005	N/A	N/A
4	20120712	Mean	71.1	21.7	57	-0.012	3.079	3.013	N/A	N/A
		Std. Dev.	0.04	0.02	0.1	0.0004	0.008	0.008	N/A	N/A
6	20120716	Mean	73.0	22.8	64	-0.009	3.763	2.472	N/A	N/A
		Std. Dev.	0.10	0.03	0.6	0.0003	0.017	0.016	N/A	N/A

Exposure Group	Date YYYYMMDD	Data Type	Temp. (ºF)	Temp. (ºC)	Relative humidity (percent)	Static pressure (inches of water)	Pulse 1 airflow (SLM[a])	Pulse 1 HCN flow (SLM)	Pulse 2 air flow (SLM)	Pulse 2 HCN flow (SLM)
23	20120726	Mean	74.2	23.5	60	-0.006	4.280	2.205	N/A	N/A
		Std. Dev.	0.13	0.07	0.3	0.0004	0.004	0.004	N/A	N/A
39	20120807	Mean	72.8	22.7	54	-0.009	3.505	2.845	N/A	N/A
		Std. Dev.	0.09	0.05	0.3	0.0005	0.008	0.008	N/A	N/A
59	20120828	Mean	72.6	22.6	59	-0.008	4.791	1.707	N/A	N/A
		Std. Dev.	0.26	0.14	1.4	0.0005	0.004	0.002	N/A	N/A
67	20121204	Mean	71.7	22.1	47	-0.013	5.018	1.143	N/A	N/A
		Std. Dev.	0.21	0.11	0.5	0.0004	0.004	0.608	N/A	N/A
	MINIMUM MEAN		71.1	21.7	47	-0.013				
	MAXIMUM MEAN		74.2	23.5	64	-0.006				

[a] SLM: Standard Liters per Minute flow rate
[b] N/A: Not applicable

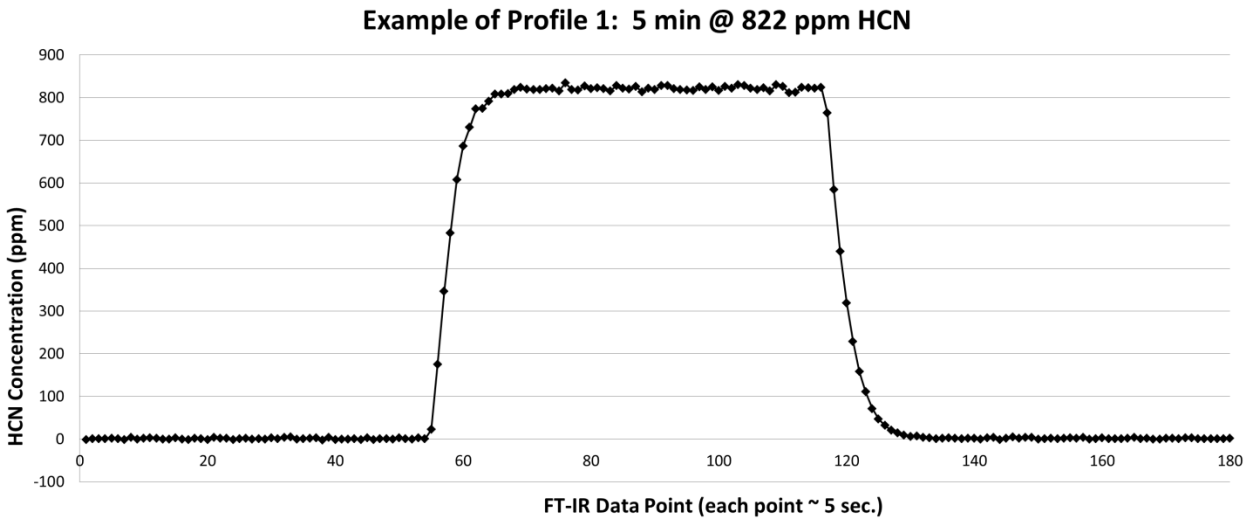

Figure A-1. Sample FT-IR output for Profile 1.

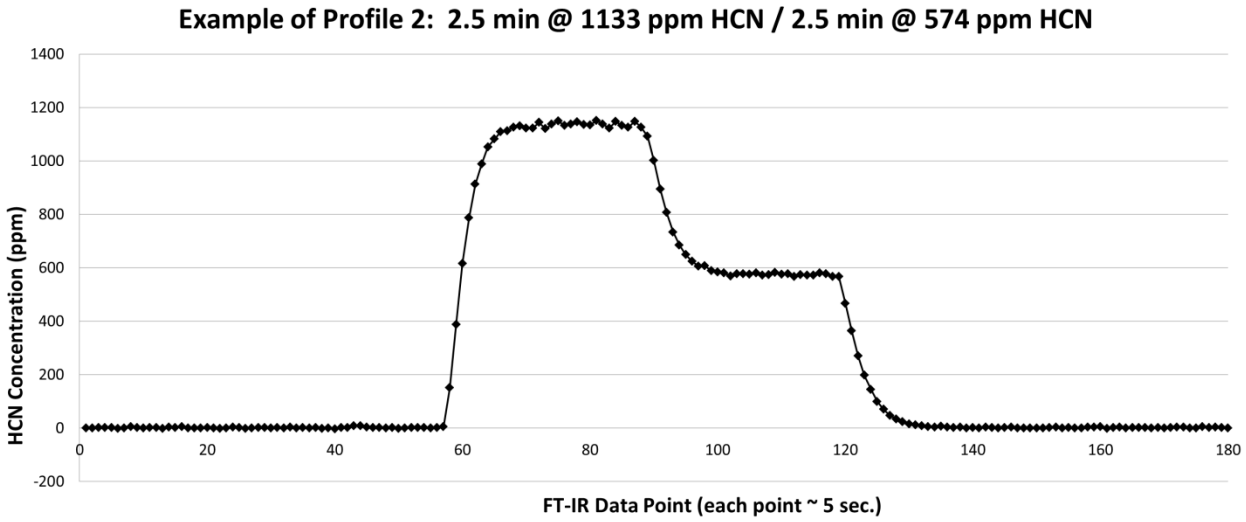

Figure A-2. Sample FT-IR output for Profile 2.

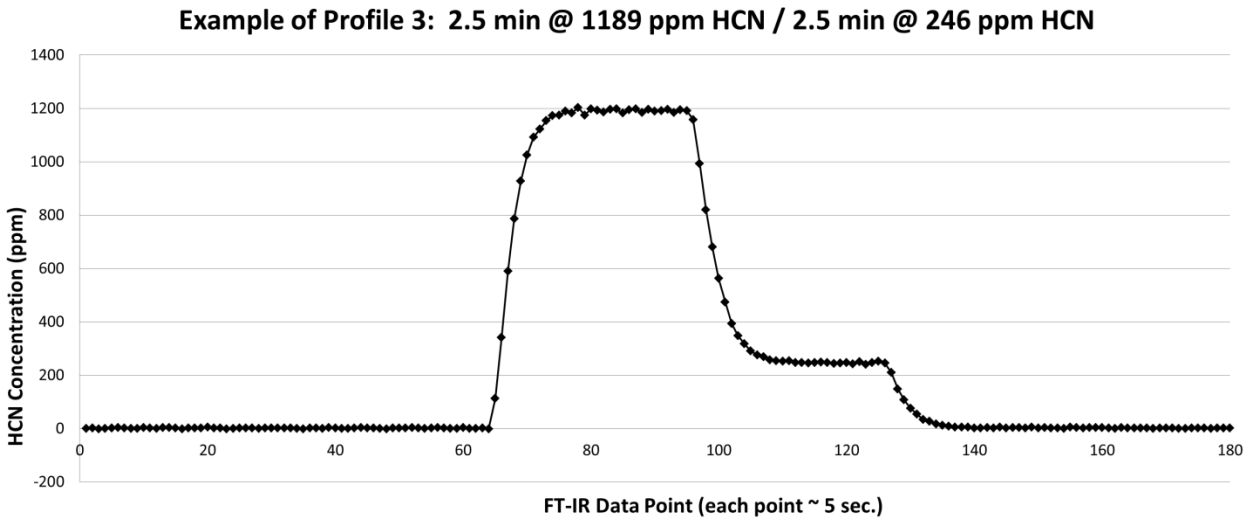

Figure A-3. Sample FT-IR output for Profile 3.

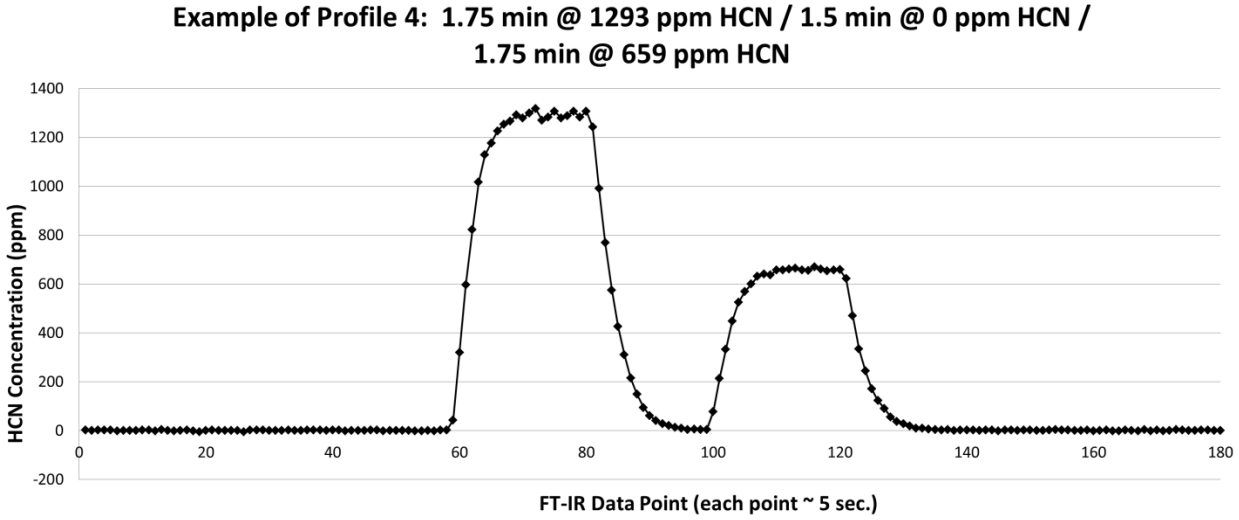

Figure A-4. Sample FT-IR output for Profile 4.

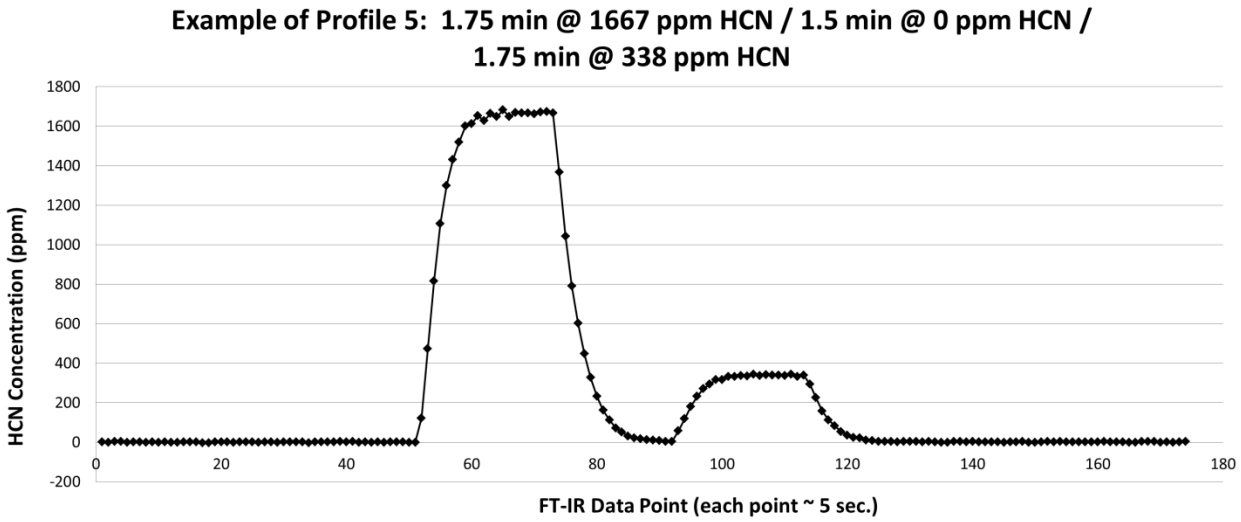

Figure A-5. Sample FT-IR output for Profile 5.

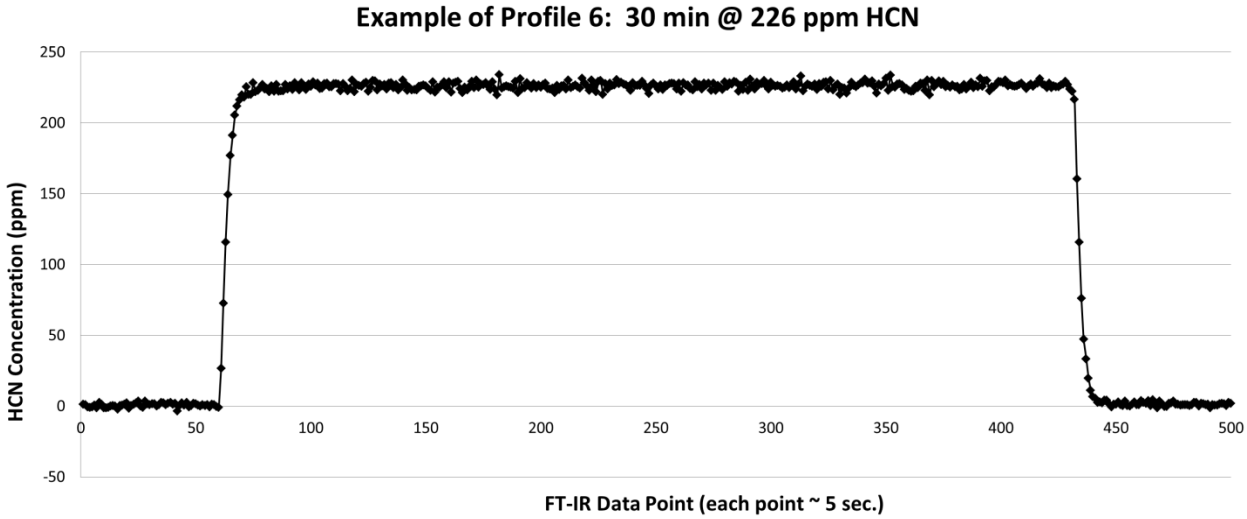

Figure A-6. Sample FT-IR output for Profile 6.

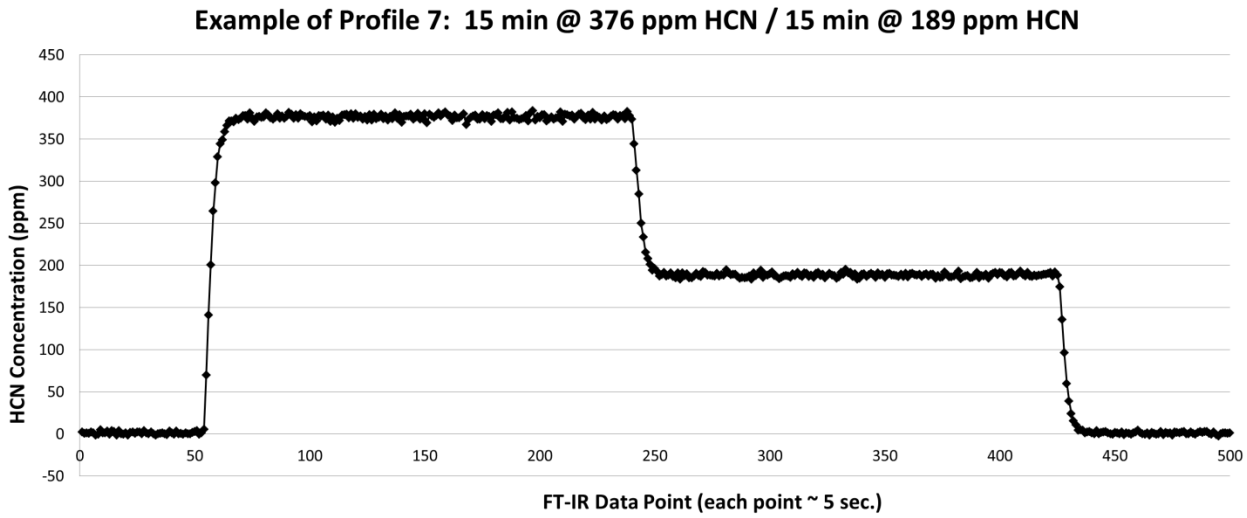

Figure A-7. Sample FT-IR output for Profile 7.

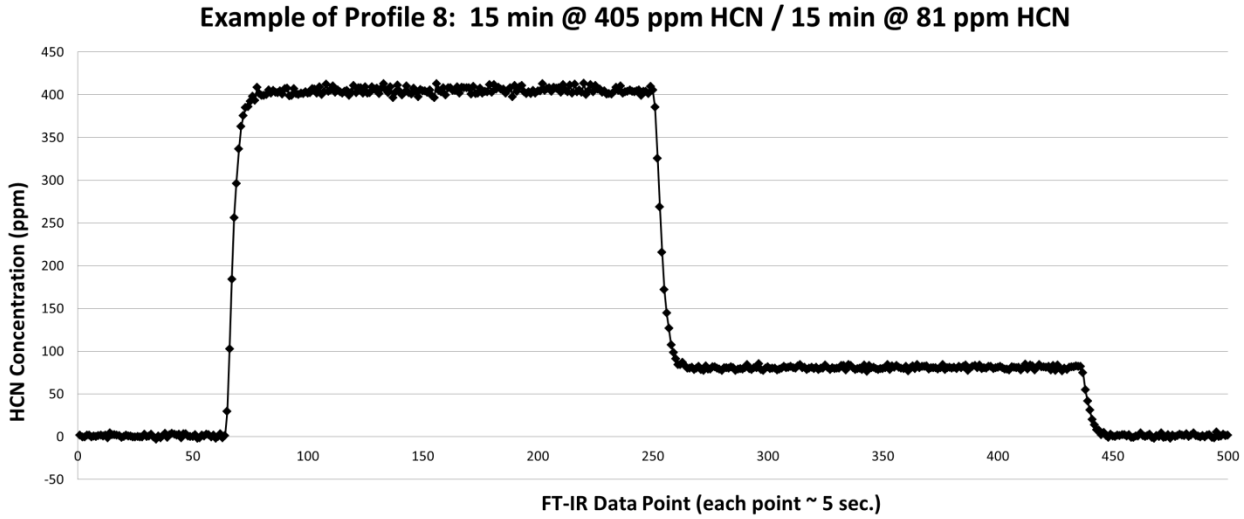

Figure A-8. Sample FT-IR output for Profile 8.

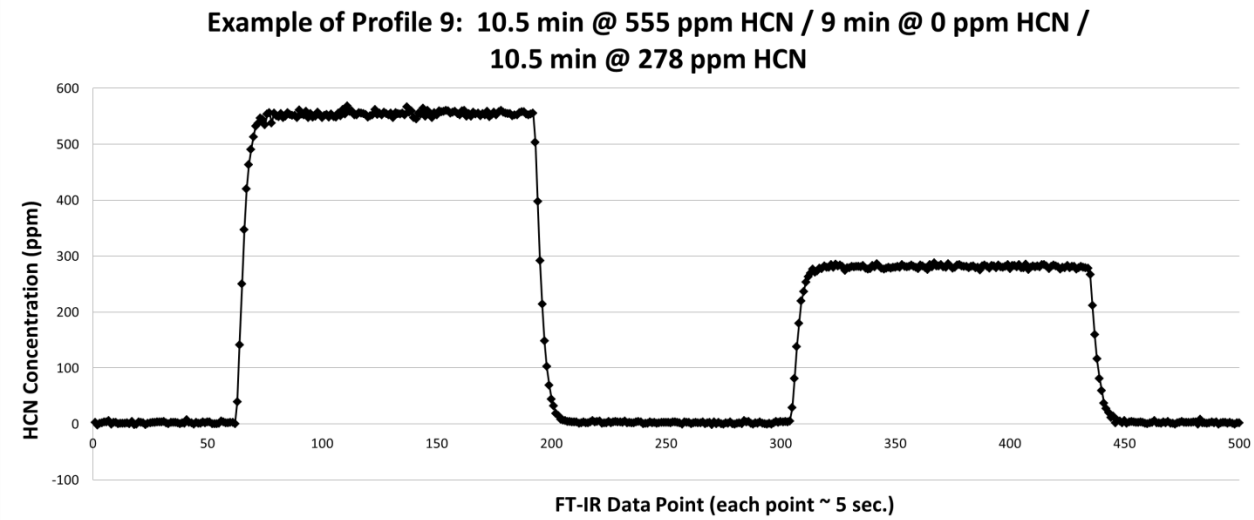

Figure A-9. Sample FT-IR output for Profile 9.

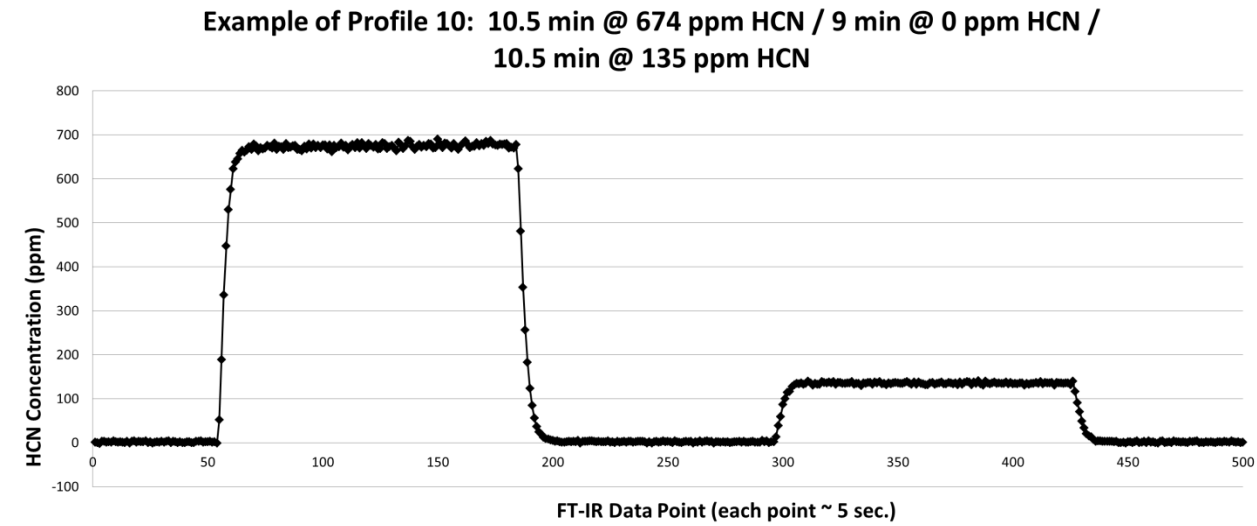

Figure A-10. Sample FT-IR output for Profile 10.

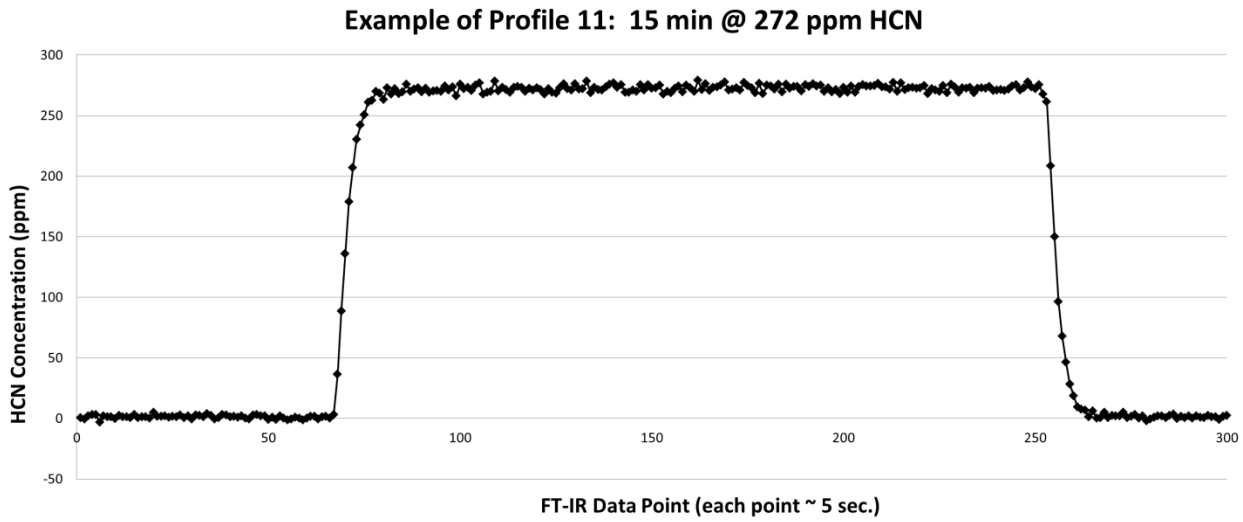

Figure A-11. Sample FT-IR output for Profile 11.

Table A-4. Individual Animal Data

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
1	Trial 1	383.0	0015	5/17/2012	7/6/2012	242.7	53	7/9/2012	274.0	Euthanasia
1	Trial 1	383.0	0019	5/17/2012	7/6/2012	243.4	53	7/9/2012	270.8	Euthanasia
1	Trial 1	383.0	0027	5/17/2012	7/6/2012	237.7	53	7/9/2012	269.1	Euthanasia
1	Trial 1	383.0	0029	5/17/2012	7/6/2012	238.4	53	7/9/2012	265.5	Euthanasia
1	Trial 1	383.0	0033	5/17/2012	7/6/2012	245.4	53	7/9/2012	268.2	Euthanasia
1	Trial 1	383.0	0057	5/17/2012	7/6/2012	250.1	53	7/9/2012	280.3	Euthanasia
1	Trial 1	383.0	0067	5/17/2012	7/6/2012	237.4	53	7/9/2012	260.6	Euthanasia
1	Trial 1	383.0	0073	5/17/2012	7/6/2012	239.5	53	7/9/2012	271.6	Euthanasia
1	Trial 1	383.0	0085	5/17/2012	7/6/2012	238.4	53	7/9/2012	271.2	Euthanasia
1	Trial 1	383.0	0091	5/17/2012	7/6/2012	242.3	53	7/9/2012	272.4	Euthanasia
1	Trial 2	590.0	0003	5/17/2012	7/6/2012	211.3	60	7/16/2012	269.6	Euthanasia
1	Trial 2	590.0	0011	5/17/2012	7/6/2012	209.9	60	7/16/2012	273.4	Euthanasia
1	Trial 2	590.0	0047	5/17/2012	7/6/2012	208.4	60	7/16/2012	243.6	Euthanasia
1	Trial 2	590.0	0061	5/17/2012	7/6/2012	210.9	60	7/16/2012	269.5	Euthanasia
1	Trial 2	590.0	0071	5/17/2012	7/6/2012	207.6	60	7/16/2012	264.5	Euthanasia
1	Trial 2	590.0	0077	5/17/2012	7/6/2012	206.1	60	7/16/2012	265.4	Euthanasia
1	Trial 2	590.0	0079	5/17/2012	7/6/2012	206.2	60	7/16/2012	280.3	Euthanasia
1	Trial 2	590.0	0087	5/17/2012	7/6/2012	211.0	60	7/16/2012	281.8	Euthanasia
1	Trial 2	590.0	0075	5/17/2012	7/6/2012	201.4	60	7/16/2012	260.6	HCN
1	Trial 2	590.0	0095	5/17/2012	7/6/2012	207.2	60	7/16/2012	256.6	HCN
1	Trial 3	763.1	0141	5/23/2012	7/13/2012	234.5	55	7/17/2012	265.0	Euthanasia
1	Trial 3	763.1	0161	5/23/2012	7/13/2012	234.6	55	7/17/2012	271.5	Euthanasia
1	Trial 3	763.1	0227	5/23/2012	7/13/2012	241.4	55	7/17/2012	272.9	Euthanasia
1	Trial 3	763.1	0229	5/23/2012	7/13/2012	242.5	55	7/17/2012	276.6	Euthanasia
1	Trial 3	763.1	0239	5/23/2012	7/13/2012	237.2	55	7/17/2012	275.5	Euthanasia
1	Trial 3	763.1	0243	5/23/2012	7/13/2012	235.6	55	7/17/2012	272.0	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
1	Trial 3	763.1	0123	5/23/2012	7/13/2012	240.2	55	7/17/2012	280.2	HCN
1	Trial 3	763.1	0135	5/23/2012	7/13/2012	243.3	55	7/17/2012	277.1	HCN
1	Trial 3	763.1	0151	5/23/2012	7/13/2012	236.5	55	7/17/2012	297.2	HCN
1	Trial 3	763.1	0233	5/23/2012	7/13/2012	241.5	55	7/17/2012	282.8	HCN
1	Trial 4	966.1	0107	5/23/2012	7/13/2012	219.1	56	7/18/2012	262.0	Euthanasia
1	Trial 4	966.1	0191	5/23/2012	7/13/2012	227.8	56	7/18/2012	265.1	Euthanasia
1	Trial 4	966.1	0125	5/23/2012	7/13/2012	226.7	56	7/18/2012	269.3	HCN
1	Trial 4	966.1	0153	5/23/2012	7/13/2012	227.1	56	7/18/2012	268.0	HCN
1	Trial 4	966.1	0177	5/23/2012	7/13/2012	233.8	56	7/18/2012	286.5	HCN
1	Trial 4	966.1	0183	5/23/2012	7/13/2012	220.1	56	7/18/2012	264.2	HCN
1	Trial 4	966.1	0187	5/23/2012	7/13/2012	224.3	56	7/18/2012	267.4	HCN
1	Trial 4	966.1	0197	5/23/2012	7/13/2012	218.6	56	7/18/2012	251.0	HCN
1	Trial 4	966.1	0217	5/23/2012	7/13/2012	232.2	56	7/18/2012	282.3	HCN
1	Trial 4	966.1	0249	5/23/2012	7/13/2012	222.0	56	7/18/2012	263.3	HCN
1	Trial 5	821.8	0747	6/14/2012	8/3/2012	186.6	56	8/9/2012	241.0	Euthanasia
1	Trial 5	821.8	0765	6/14/2012	8/3/2012	188.2	56	8/9/2012	236.8	Euthanasia
1	Trial 5	821.8	0825	6/14/2012	8/3/2012	194.4	56	8/9/2012	242.5	Euthanasia
1	Trial 5	821.8	0727	6/14/2012	8/3/2012	191.5	56	8/9/2012	235.8	HCN
1	Trial 5	821.8	0751	6/14/2012	8/3/2012	190.8	56	8/9/2012	223.1	HCN
1	Trial 5	821.8	0759	6/14/2012	8/3/2012	190.3	56	8/9/2012	236.0	HCN
1	Trial 5	821.8	0767	6/14/2012	8/3/2012	196.0	56	8/9/2012	237.6	HCN
1	Trial 5	821.8	0777	6/14/2012	8/3/2012	190.5	56	8/9/2012	233.9	HCN
1	Trial 5	821.8	0817	6/14/2012	8/3/2012	192.9	56	8/9/2012	242.8	HCN
1	Trial 5	821.8	0861	6/14/2012	8/3/2012	195.6	56	8/9/2012	243.6	HCN
1	Trial 6	593.0	1125	6/28/2012	8/17/2012	192.2	62	8/29/2012	279.9	Euthanasia
1	Trial 6	593.0	1161	6/28/2012	8/17/2012	180.9	62	8/29/2012	282.2	Euthanasia
1	Trial 6	593.0	1167	6/28/2012	8/17/2012	198.1	62	8/29/2012	269.1	Euthanasia
1	Trial 6	593.0	1199	6/28/2012	8/17/2012	195.1	62	8/29/2012	279.1	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
1	Trial 6	593.0	1127	6/28/2012	8/17/2012	190.5	62	8/29/2012	267.7	HCN
1	Trial 6	593.0	1129	6/28/2012	8/17/2012	196.0	62	8/29/2012	288.8	HCN
1	Trial 6	593.0	1143	6/28/2012	8/17/2012	191.3	62	8/29/2012	287.5	HCN
1	Trial 6	593.0	1145	6/28/2012	8/17/2012	193.6	62	8/29/2012	283.6	HCN
1	Trial 6	593.0	1159	6/28/2012	8/17/2012	191.3	62	8/29/2012	282.8	HCN
1	Trial 6	593.0	1181	6/28/2012	8/17/2012	186.7	62	8/29/2012	255.1	HCN
1	Trial 7	765.0	1215	10/4/2012	11/23/2012	233.10	53	11/26/2012	262.42	Euthanasia
1	Trial 7	765.0	1237	10/4/2012	11/23/2012	252.60	53	11/26/2012	280.00	Euthanasia
1	Trial 7	765.0	1279	10/4/2012	11/23/2012	234.48	53	11/26/2012	259.50	Euthanasia
1	Trial 7	765.0	1289	10/4/2012	11/23/2012	241.11	53	11/26/2012	273.50	Euthanasia
1	Trial 7	765.0	1319	10/4/2012	11/23/2012	239.12	53	11/26/2012	268.83	Euthanasia
1	Trial 7	765.0	1333	10/4/2012	11/23/2012	238.68	53	11/26/2012	269.81	Euthanasia
1	Trial 7	765.0	1245	10/4/2012	11/23/2012	249.57	53	11/26/2012	282.97	HCN
1	Trial 7	765.0	1251	10/4/2012	11/23/2012	236.66	53	11/26/2012	263.89	HCN
1	Trial 7	765.0	1273	10/4/2012	11/23/2012	243.89	53	11/26/2012	266.43	HCN
1	Trial 7	765.0	1321	10/4/2012	11/23/2012	235.48	53	11/26/2012	267.38	HCN
2	Trial 1	1041.5/ 535.6	0109	5/23/2012	7/13/2012	213.7	57	7/19/2012	268.0	Euthanasia
2	Trial 1	1041.5/ 535.6	0117	5/23/2012	7/13/2012	216.2	57	7/19/2012	269.6	Euthanasia
2	Trial 1	1041.5/ 535.6	0119	5/23/2012	7/13/2012	208.1	57	7/19/2012	257.1	Euthanasia
2	Trial 1	1041.5/ 535.6	0121	5/23/2012	7/13/2012	218.2	57	7/19/2012	276.1	Euthanasia
2	Trial 1	1041.5/ 535.6	0203	5/23/2012	7/13/2012	216.4	57	7/19/2012	271.1	Euthanasia
2	Trial 1	1041.5/ 535.6	0207	5/23/2012	7/13/2012	207.9	57	7/19/2012	262.5	Euthanasia
2	Trial 1	1041.5/ 535.6	0113	5/23/2012	7/13/2012	209.4	57	7/19/2012	258.8	HCN
2	Trial 1	1041.5/ 535.6	0137	5/23/2012	7/13/2012	212.5	57	7/19/2012	256.4	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
2	Trial 1	1041.5/ 535.6	0149	5/23/2012	7/13/2012	213.3	57	7/19/2012	258.8	HCN
2	Trial 1	1041.5/ 535.6	0259	5/23/2012	7/13/2012	211.8	57	7/19/2012	265.1	HCN
2	Trial 2	1239.4/ 626.7	0283	5/31/2012	7/20/2012	222.1	55	7/25/2012	272.2	Euthanasia
2	Trial 2	1239.4/ 626.7	0331	5/31/2012	7/20/2012	214.0	55	7/25/2012	253.7	Euthanasia
2	Trial 2	1239.4/ 626.7	0355	5/31/2012	7/20/2012	225.8	55	7/25/2012	264.9	Euthanasia
2	Trial 2	1239.4/ 626.7	0319	5/31/2012	7/20/2012	225.0	55	7/25/2012	264.4	HCN
2	Trial 2	1239.4/ 626.7	0323	5/31/2012	7/20/2012	218.3	55	7/25/2012	265.0	HCN
2	Trial 2	1239.4/ 626.7	0341	5/31/2012	7/20/2012	220.7	55	7/25/2012	257.0	HCN
2	Trial 2	1239.4/ 626.7	0405	5/31/2012	7/20/2012	224.4	55	7/25/2012	258.3	HCN
2	Trial 2	1239.4/ 626.7	0421	5/31/2012	7/20/2012	223.6	55	7/25/2012	270.1	HCN
2	Trial 2	1239.4/ 626.7	0431	5/31/2012	7/20/2012	213.0	55	7/25/2012	259.3	HCN
2	Trial 2	1239.4/ 626.7	0437	5/31/2012	7/20/2012	210.0	55	7/25/2012	253.6	HCN
2	Trial 3	897.8/ 452.7	0491	6/7/2012	7/27/2012	233.9	55	8/1/2012	274.1	Euthanasia
2	Trial 3	897.8/ 452.7	0493	6/7/2012	7/27/2012	236.6	55	8/1/2012	279.5	Euthanasia
2	Trial 3	897.8/ 452.7	0507	6/7/2012	7/27/2012	229.8	55	8/1/2012	270.4	Euthanasia
2	Trial 3	897.8/ 452.7	0557	6/7/2012	7/27/2012	228.4	55	8/1/2012	264.8	Euthanasia
2	Trial 3	897.8/ 452.7	0617	6/7/2012	7/27/2012	231.8	55	8/1/2012	272.1	Euthanasia
2	Trial 3	897.8/ 452.7	0623	6/7/2012	7/27/2012	231.3	55	8/1/2012	269.3	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
2	Trial 3	897.8/ 452.7	0665	6/7/2012	7/27/2012	226.5	55	8/1/2012	267.3	Euthanasia
2	Trial 3	897.8/ 452.7	0693	6/7/2012	7/27/2012	233.4	55	8/1/2012	266.9	Euthanasia
2	Trial 3	897.8/ 452.7	0639	6/7/2012	7/27/2012	230.6	55	8/1/2012	268.6	HCN
2	Trial 3	897.8/ 452.7	0691	6/7/2012	7/27/2012	228.8	55	8/1/2012	256.8	HCN
2	Trial 4	1132.8/ 574.6	0709	6/14/2012	8/3/2012	212.0	54	8/7/2012	239.3	HCN
2	Trial 4	1132.8/ 574.6	0717	6/14/2012	8/3/2012	215.7	54	8/7/2012	249.0	HCN
2	Trial 4	1132.8/ 574.6	0743	6/14/2012	8/3/2012	212.8	54	8/7/2012	243.8	HCN
2	Trial 4	1132.8/ 574.6	0779	6/14/2012	8/3/2012	209.5	54	8/7/2012	240.7	HCN
2	Trial 4	1132.8/ 574.6	0781	6/14/2012	8/3/2012	208.2	54	8/7/2012	241.9	HCN
2	Trial 4	1132.8/ 574.6	0805	6/14/2012	8/3/2012	207.5	54	8/7/2012	239.4	HCN
2	Trial 4	1132.8/ 574.6	0841	6/14/2012	8/3/2012	211.2	54	8/7/2012	243.1	HCN
2	Trial 4	1132.8/ 574.6	0853	6/14/2012	8/3/2012	206.6	54	8/7/2012	233.9	HCN
2	Trial 4	1132.8/ 574.6	0871	6/14/2012	8/3/2012	214.3	54	8/7/2012	247.5	HCN
2	Trial 4	1132.8/ 574.6	0881	6/14/2012	8/3/2012	210.1	54	8/7/2012	237.5	HCN
2	Trial 5	1347.8/ 686.5	0755	6/14/2012	8/3/2012	201.7	55	8/8/2012	246.3	Euthanasia
2	Trial 5	1347.8/ 686.5	0915	6/14/2012	8/3/2012	205.8	55	8/8/2012	246.9	Euthanasia
2	Trial 5	1347.8/ 686.5	0703	6/14/2012	8/3/2012	205.2	55	8/8/2012	248.4	HCN
2	Trial 5	1347.8/ 686.5	0705	6/14/2012	8/3/2012	199.4	55	8/8/2012	237.7	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
2	Trial 5	1347.8/ 686.5	0721	6/14/2012	8/3/2012	202.7	55	8/8/2012	242.0	HCN
2	Trial 5	1347.8/ 686.5	0771	6/14/2012	8/3/2012	196.5	55	8/8/2012	237.5	HCN
2	Trial 5	1347.8/ 686.5	0807	6/14/2012	8/3/2012	200.9	55	8/8/2012	236.5	HCN
2	Trial 5	1347.8/ 686.5	0819	6/14/2012	8/3/2012	197.1	55	8/8/2012	246.7	HCN
2	Trial 5	1347.8/ 686.5	0863	6/14/2012	8/3/2012	201.2	55	8/8/2012	241.4	HCN
2	Trial 5	1347.8/ 686.5	0887	6/14/2012	8/3/2012	203.7	55	8/8/2012	246.8	HCN
2	Trial 6	1128.6/ 573.6	1193	6/28/2012	8/17/2012	219.2	56	8/23/2012	267.9	Euthanasia
2	Trial 6	1128.6/ 573.6	1197	6/28/2012	8/17/2012	238.3	56	8/23/2012	278.5	Euthanasia
2	Trial 6	1128.6/ 573.6	1137	6/28/2012	8/17/2012	223.8	56	8/23/2012	256.6	HCN
2	Trial 6	1128.6/ 573.6	1141	6/28/2012	8/17/2012	227.2	56	8/23/2012	276.4	HCN
2	Trial 6	1128.6/ 573.6	1147	6/28/2012	8/17/2012	227.3	56	8/23/2012	274.2	HCN
2	Trial 6	1128.6/ 573.6	1165	6/28/2012	8/17/2012	216.1	56	8/23/2012	262.2	HCN
2	Trial 6	1128.6/ 573.6	1169	6/28/2012	8/17/2012	220.9	56	8/23/2012	275.2	HCN
2	Trial 6	1128.6/ 573.6	1187	6/28/2012	8/17/2012	243.5	56	8/23/2012	298.6	HCN
2	Trial 6	1128.6/ 573.6	1191	6/28/2012	8/17/2012	235.6	56	8/23/2012	286.4	HCN
2	Trial 6	1128.6/ 573.6	1195	6/28/2012	8/17/2012	221.8	56	8/23/2012	273.5	HCN
3	Trial 1	1312.9/ 273.5	0199	5/23/2012	7/13/2012	200.3	61	7/23/2012	276.9	Euthanasia
3	Trial 1	1312.9/ 273.5	0213	5/23/2012	7/13/2012	192.5	61	7/23/2012	273.4	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
3	Trial 1	1312.9/ 273.5	0221	5/23/2012	7/13/2012	203.1	61	7/23/2012	278.9	Euthanasia
3	Trial 1	1312.9/ 273.5	0247	5/23/2012	7/13/2012	202.3	61	7/23/2012	290.6	Euthanasia
3	Trial 1	1312.9/ 273.5	0257	5/23/2012	7/13/2012	197.7	61	7/23/2012	291.1	Euthanasia
3	Trial 1	1312.9/ 273.5	0101	5/23/2012	7/13/2012	201.8	61	7/23/2012	274.8	HCN
3	Trial 1	1312.9/ 273.5	0131	5/23/2012	7/13/2012	200.9	61	7/23/2012	267.0	HCN
3	Trial 1	1312.9/ 273.5	0245	5/23/2012	7/13/2012	202.3	61	7/23/2012	277.8	HCN
3	Trial 1	1312.9/ 273.5	0251	5/23/2012	7/13/2012	126.5	61	7/23/2012	223.2	HCN
3	Trial 1	1312.9/ 273.5	0253	5/23/2012	7/13/2012	197.5	61	7/23/2012	287.2	HCN
3	Trial 2	1192.8/ 244.5	0279	5/31/2012	7/20/2012	188.9	60	7/30/2012	256.9	Euthanasia
3	Trial 2	1192.8/ 244.5	0281	5/31/2012	7/20/2012	197.4	60	7/30/2012	280.5	Euthanasia
3	Trial 2	1192.8/ 244.5	0291	5/31/2012	7/20/2012	199.4	60	7/30/2012	291.4	Euthanasia
3	Trial 2	1192.8/ 244.5	0293	5/31/2012	7/20/2012	193.3	60	7/30/2012	270.5	Euthanasia
3	Trial 2	1192.8/ 244.5	0333	5/31/2012	7/20/2012	200.2	60	7/30/2012	282.5	Euthanasia
3	Trial 2	1192.8/ 244.5	0369	5/31/2012	7/20/2012	196.7	60	7/30/2012	277.6	Euthanasia
3	Trial 2	1192.8/ 244.5	0411	5/31/2012	7/20/2012	181.1	60	7/30/2012	277.6	Euthanasia
3	Trial 2	1192.8/ 244.5	0441	5/31/2012	7/20/2012	198.9	60	7/30/2012	283.8	Euthanasia
3	Trial 2	1192.8/ 244.5	0427	5/31/2012	7/20/2012	187.0	60	7/30/2012	266.4	Euthanasia
3	Trial 2	1192.8/ 244.5	0295	5/31/2012	7/20/2012	178.2	60	7/30/2012	289.6	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
3	Trial 3	1447.3/ 297.3	0531	6/7/2012	7/27/2012	258.9	53	7/30/2012	288.6	Euthanasia
3	Trial 3	1447.3/ 297.3	0587	6/7/2012	7/27/2012	254.4	53	7/30/2012	284.2	Euthanasia
3	Trial 3	1447.3/ 297.3	0627	6/7/2012	7/27/2012	250.8	53	7/30/2012	284.0	Euthanasia
3	Trial 3	1447.3/ 297.3	0631	6/7/2012	7/27/2012	249.5	53	7/30/2012	272.9	Euthanasia
3	Trial 3	1447.3/ 297.3	0681	6/7/2012	7/27/2012	251.2	53	7/30/2012	278.1	Euthanasia
3	Trial 3	1447.3/ 297.3	0687	6/7/2012	7/27/2012	249.1	53	7/30/2012	277.2	Euthanasia
3	Trial 3	1447.3/ 297.3	0697	6/7/2012	7/27/2012	249.7	53	7/30/2012	273.5	Euthanasia
3	Trial 3	1447.3/ 297.3	0529	6/7/2012	7/27/2012	256.9	53	7/30/2012	285.8	HCN
3	Trial 3	1447.3/ 297.3	0533	6/7/2012	7/27/2012	252.8	53	7/30/2012	280.7	HCN
3	Trial 3	1447.3/ 297.3	0541	6/7/2012	7/27/2012	248.6	53	7/30/2012	275.9	HCN
3	Trial 4	1572.5/ 324.8	1045	6/21/2012	8/10/2012	248.6	53	8/13/2012	277.0	Euthanasia
3	Trial 4	1572.5/ 324.8	0933	6/21/2012	8/10/2012	245.2	53	8/13/2012	270.3	HCN
3	Trial 4	1572.5/ 324.8	0967	6/21/2012	8/10/2012	244.6	53	8/13/2012	273.6	HCN
3	Trial 4	1572.5/ 324.8	0985	6/21/2012	8/10/2012	246.5	53	8/13/2012	274.3	HCN
3	Trial 4	1572.5/ 324.8	0987	6/21/2012	8/10/2012	243.4	53	8/13/2012	271.8	HCN
3	Trial 4	1572.5/ 324.8	0997	6/21/2012	8/10/2012	239.9	53	8/13/2012	269.2	HCN
3	Trial 4	1572.5/ 324.8	1003	6/21/2012	8/10/2012	253.4	53	8/13/2012	278.9	HCN
3	Trial 4	1572.5/ 324.8	1049	6/21/2012	8/10/2012	240.7	53	8/13/2012	260.8	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
3	Trial 4	1572.5/ 324.8	1053	6/21/2012	8/10/2012	240.6	53	8/13/2012	265.6	HCN
3	Trial 4	1572.5/ 324.8	1089	6/21/2012	8/10/2012	254.3	53	8/13/2012	279.9	HCN
3	Trial 5	1189.3/ 245.7	0953	6/21/2012	8/10/2012	212.4	55	8/15/2012	248.8	Euthanasia
3	Trial 5	1189.3/ 245.7	0963	6/21/2012	8/10/2012	215.0	55	8/15/2012	247.5	Euthanasia
3	Trial 5	1189.3/ 245.7	0975	6/21/2012	8/10/2012	203.7	55	8/15/2012	237.9	Euthanasia
3	Trial 5	1189.3/ 245.7	1005	6/21/2012	8/10/2012	216.6	55	8/15/2012	255.4	Euthanasia
3	Trial 5	1189.3/ 245.7	1007	6/21/2012	8/10/2012	209.1	55	8/15/2012	231.9	Euthanasia
3	Trial 5	1189.3/ 245.7	1023	6/21/2012	8/10/2012	205.3	55	8/15/2012	245.4	Euthanasia
3	Trial 5	1189.3/ 245.7	1071	6/21/2012	8/10/2012	218.3	55	8/15/2012	246.2	Euthanasia
3	Trial 5	1189.3/ 245.7	1081	6/21/2012	8/10/2012	211.6	55	8/15/2012	261.3	Euthanasia
3	Trial 5	1189.3/ 245.7	0931	6/21/2012	8/10/2012	207.3	55	8/15/2012	252.8	HCN
3	Trial 5	1189.3/ 245.7	1107	6/21/2012	8/10/2012	211.1	55	8/15/2012	246.4	HCN
4	Trial 1	1293.2/ 659.2	0267	5/31/2012	7/20/2012	249.9	53	7/23/2012	282.4	Euthanasia
4	Trial 1	1293.2/ 659.2	0269	5/31/2012	7/20/2012	243.0	53	7/23/2012	269.0	Euthanasia
4	Trial 1	1293.2/ 659.2	0271	5/31/2012	7/20/2012	244.2	53	7/23/2012	276.1	Euthanasia
4	Trial 1	1293.2/ 659.2	0287	5/31/2012	7/20/2012	252.7	53	7/23/2012	279.2	Euthanasia
4	Trial 1	1293.2/ 659.2	0347	5/31/2012	7/20/2012	239.0	53	7/23/2012	265.2	Euthanasia
4	Trial 1	1293.2/ 659.2	0451	5/31/2012	7/20/2012	252.4	53	7/23/2012	277.5	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
4	Trial 1	1293.2/ 659.2	0455	5/31/2012	7/20/2012	256.5	53	7/23/2012	281.6	Euthanasia
4	Trial 1	1293.2/ 659.2	0459	5/31/2012	7/20/2012	247.0	53	7/23/2012	276.6	Euthanasia
4	Trial 1	1293.2/ 659.2	0475	5/31/2012	7/20/2012	240.2	53	7/23/2012	266.1	Euthanasia
4	Trial 1	1293.2/ 659.2	0335	5/31/2012	7/20/2012	238.3	53	7/23/2012	268.3	HCN
4	Trial 2	1751.5/ 874.7	0313	5/31/2012	7/20/2012	234.9	54	7/24/2012	254.6	Euthanasia
4	Trial 2	1751.5/ 874.7	0357	5/31/2012	7/20/2012	226.7	54	7/24/2012	262.3	Euthanasia
4	Trial 2	1751.5/ 874.7	0387	5/31/2012	7/20/2012	235.3	54	7/24/2012	275.5	Euthanasia
4	Trial 2	1751.5/ 874.7	0449	5/31/2012	7/20/2012	232.8	54	7/24/2012	263.1	Euthanasia
4	Trial 2	1751.5/ 874.7	0471	5/31/2012	7/20/2012	233.6	54	7/24/2012	266.6	Euthanasia
4	Trial 2	1751.5/ 874.7	0289	5/31/2012	7/20/2012	236.1	54	7/24/2012	277.8	HCN
4	Trial 2	1751.5/ 874.7	0395	5/31/2012	7/20/2012	228.0	54	7/24/2012	268.9	HCN
4	Trial 2	1751.5/ 874.7	0435	5/31/2012	7/20/2012	229.0	54	7/24/2012	267.3	HCN
4	Trial 2	1751.5/ 874.7	0463	5/31/2012	7/20/2012	230.5	54	7/24/2012	258.7	HCN
4	Trial 2	1751.5/ 874.7	0473	5/31/2012	7/20/2012	237.2	54	7/24/2012	273.0	HCN
4	Trial 3	1906.0/ 945.0	0739	6/14/2012	8/3/2012	217.6	53	8/6/2012	243.0	Euthanasia
4	Trial 3	1906.0/ 945.0	0801	6/14/2012	8/3/2012	219.3	53	8/6/2012	241.0	Euthanasia
4	Trial 3	1906.0/ 945.0	0803	6/14/2012	8/3/2012	222.4	53	8/6/2012	248.3	Euthanasia
4	Trial 3	1906.0/ 945.0	0823	6/14/2012	8/3/2012	216.8	53	8/6/2012	238.5	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
4	Trial 3	1906.0/ 945.0	0867	6/14/2012	8/3/2012	217.4	53	8/6/2012	242.2	Euthanasia
4	Trial 3	1906.0/ 945.0	0741	6/14/2012	8/3/2012	216.5	53	8/6/2012	240.4	HCN
4	Trial 3	1906.0/ 945.0	0791	6/14/2012	8/3/2012	223.8	53	8/6/2012	251.2	HCN
4	Trial 3	1906.0/ 945.0	0815	6/14/2012	8/3/2012	226.8	53	8/6/2012	254.5	HCN
4	Trial 3	1906.0/ 945.0	0847	6/14/2012	8/3/2012	218.6	53	8/6/2012	246.3	HCN
4	Trial 3	1906.0/ 945.0	0911	6/14/2012	8/3/2012	225.5	53	8/6/2012	255.8	HCN
4	Trial 4	1460.8/ 737.0	0715	6/14/2012	8/3/2012	199.2	55	8/8/2012	236.8	Euthanasia
4	Trial 4	1460.8/ 737.0	0855	6/14/2012	8/3/2012	201.7	55	8/8/2012	233.7	Euthanasia
4	Trial 4	1460.8/ 737.0	0893	6/14/2012	8/3/2012	201.2	55	8/8/2012	237.9	Euthanasia
4	Trial 4	1460.8/ 737.0	0897	6/14/2012	8/3/2012	196.5	55	8/8/2012	223.9	Euthanasia
4	Trial 4	1460.8/ 737.0	0905	6/14/2012	8/3/2012	202.6	55	8/8/2012	242.7	Euthanasia
4	Trial 4	1460.8/ 737.0	0919	6/14/2012	8/3/2012	197.1	55	8/8/2012	222.2	Euthanasia
4	Trial 4	1460.8/ 737.0	0711	6/14/2012	8/3/2012	205.0	55	8/8/2012	244.5	HCN
4	Trial 4	1460.8/ 737.0	0719	6/14/2012	8/3/2012	203.3	55	8/8/2012	241.8	HCN
4	Trial 4	1460.8/ 737.0	0729	6/14/2012	8/3/2012	200.8	55	8/8/2012	237.8	HCN
4	Trial 4	1460.8/ 737.0	0763	6/14/2012	8/3/2012	205.5	55	8/8/2012	231.3	HCN
4	Trial 5	2503.0/ 1220.0	1211	10/4/2012	11/23/2012	239.00	53	11/26/2012	268.40	Euthanasia
4	Trial 5	2503.0/ 1220.0	1243	10/4/2012	11/23/2012	252.50	53	11/26/2012	275.68	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
4	Trial 5	2503.0/ 1220.0	1265	10/4/2012	11/23/2012	240.99	53	11/26/2012	271.07	Euthanasia
4	Trial 5	2503.0/ 1220.0	1281	10/4/2012	11/23/2012	247.41	53	11/26/2012	277.90	Euthanasia
4	Trial 5	2503.0/ 1220.0	1315	10/4/2012	11/23/2012	243.61	53	11/26/2012	278.00	Euthanasia
4	Trial 5	2503.0/ 1220.0	1207	10/4/2012	11/23/2012	276.92	53	11/26/2012	315.33	HCN
4	Trial 5	2503.0/ 1220.0	1231	10/4/2012	11/23/2012	235.03	53	11/26/2012	262.26	HCN
4	Trial 5	2503.0/ 1220.0	1247	10/4/2012	11/23/2012	233.62	53	11/26/2012	259.79	HCN
4	Trial 5	2503.0/ 1220.0	1287	10/4/2012	11/23/2012	235.66	53	11/26/2012	260.90	HCN
4	Trial 5	2503.0/ 1220.0	1313	10/4/2012	11/23/2012	237.07	53	11/26/2012	266.56	HCN
4	Trial 6	3885.0/ 1935.0	1241	10/4/2012	11/23/2012	218.45	60	12/3/2012	285.36	Euthanasia
4	Trial 6	3885.0/ 1935.0	1217	10/4/2012	11/23/2012	218.09	60	12/3/2012	324.51	HCN
4	Trial 6	3885.0/ 1935.0	1221	10/4/2012	11/23/2012	219.01	60	12/3/2012	305.50	HCN
4	Trial 6	3885.0/ 1935.0	1255	10/4/2012	11/23/2012	225.36	60	12/3/2012	315.25	HCN
4	Trial 6	3885.0/ 1935.0	1259	10/4/2012	11/23/2012	218.72	60	12/3/2012	296.37	HCN
4	Trial 6	3885.0/ 1935.0	1275	10/4/2012	11/23/2012	217.42	60	12/3/2012	293.10	HCN
4	Trial 6	3885.0/ 1935.0	1283	10/4/2012	11/23/2012	219.60	60	12/3/2012	307.43	HCN
4	Trial 6	3885.0/ 1935.0	1311	10/4/2012	11/23/2012	217.80	60	12/3/2012	289.74	HCN
4	Trial 6	3885.0/ 1935.0	1327	10/4/2012	11/23/2012	222.46	60	12/3/2012	311.39	HCN
4	Trial 6	3885.0/ 1935.0	1335	10/4/2012	11/23/2012	223.81	60	12/3/2012	312.66	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
5	Trial 1	1863.2/ 378.6	0329	5/31/2012	7/20/2012	234.5	54	7/24/2012	269.7	Euthanasia
5	Trial 1	1863.2/ 378.6	0361	5/31/2012	7/20/2012	229.3	54	7/24/2012	268.0	Euthanasia
5	Trial 1	1863.2/ 378.6	0367	5/31/2012	7/20/2012	226.6	54	7/24/2012	265.7	Euthanasia
5	Trial 1	1863.2/ 378.6	0403	5/31/2012	7/20/2012	235.2	54	7/24/2012	267.0	Euthanasia
5	Trial 1	1863.2/ 378.6	0409	5/31/2012	7/20/2012	236.0	54	7/24/2012	277.0	Euthanasia
5	Trial 1	1863.2/ 378.6	0447	5/31/2012	7/20/2012	236.7	54	7/24/2012	274.0	Euthanasia
5	Trial 1	1863.2/ 378.6	0465	5/31/2012	7/20/2012	228.0	54	7/24/2012	262.3	Euthanasia
5	Trial 1	1863.2/ 378.6	0265	5/31/2012	7/20/2012	233.5	54	7/24/2012	263.4	HCN
5	Trial 1	1863.2/ 378.6	0309	5/31/2012	7/20/2012	230.9	54	7/24/2012	267.3	HCN
5	Trial 1	1863.2/ 378.6	0375	5/31/2012	7/20/2012	228.5	54	7/24/2012	266.6	HCN
5	Trial 2	1667.4/ 338.1	0495	6/7/2012	7/27/2012	238.5	54	7/31/2012	272.8	Euthanasia
5	Trial 2	1667.4/ 338.1	0509	6/7/2012	7/27/2012	246.7	54	7/31/2012	277.4	Euthanasia
5	Trial 2	1667.4/ 338.1	0523	6/7/2012	7/27/2012	241.3	54	7/31/2012	270.6	Euthanasia
5	Trial 2	1667.4/ 338.1	0543	6/7/2012	7/27/2012	239.7	54	7/31/2012	260.2	Euthanasia
5	Trial 2	1667.4/ 338.1	0603	6/7/2012	7/27/2012	240.8	54	7/31/2012	275.2	Euthanasia
5	Trial 2	1667.4/ 338.1	0673	6/7/2012	7/27/2012	242.0	54	7/31/2012	284.4	Euthanasia
5	Trial 2	1667.4/ 338.1	0679	6/7/2012	7/27/2012	248.2	54	7/31/2012	280.4	Euthanasia
5	Trial 2	1667.4/ 338.1	0595	6/7/2012	7/27/2012	237.1	54	7/31/2012	266.6	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
5	Trial 2	1667.4/ 338.1	0655	6/7/2012	7/27/2012	247.6	54	7/31/2012	278.2	HCN
5	Trial 2	1667.4/ 338.1	0695	6/7/2012	7/27/2012	243.1	54	7/31/2012	275.0	HCN
5	Trial 3	2347.0/ 484.0	1227	10/4/2012	11/23/2012	249.91	53	11/26/2012	278.87	Euthanasia
5	Trial 3	2347.0/ 484.0	1249	10/4/2012	11/23/2012	235.53	53	11/26/2012	267.94	Euthanasia
5	Trial 3	2347.0/ 484.0	1261	10/4/2012	11/23/2012	244.23	53	11/26/2012	278.22	Euthanasia
5	Trial 3	2347.0/ 484.0	1291	10/4/2012	11/23/2012	234.88	53	11/26/2012	264.42	Euthanasia
5	Trial 3	2347.0/ 484.0	1299	10/4/2012	11/23/2012	233.49	53	11/26/2012	265.34	Euthanasia
5	Trial 3	2347.0/ 484.0	1309	10/4/2012	11/23/2012	236.80	53	11/26/2012	263.07	Euthanasia
5	Trial 3	2347.0/ 484.0	1331	10/4/2012	11/23/2012	254.01	53	11/26/2012	286.06	Euthanasia
5	Trial 3	2347.0/ 484.0	1209	10/4/2012	11/23/2012	239.48	53	11/26/2012	264.74	HCN
5	Trial 3	2347.0/ 484.0	1213	10/4/2012	11/23/2012	241.59	53	11/26/2012	267.53	HCN
5	Trial 3	2347.0/ 484.0	1337	10/4/2012	11/23/2012	238.82	53	11/26/2012	266.70	HCN
5	Trial 4	3124.4/ 632.6	1201	10/4/2012	11/23/2012	229.22	55	11/28/2012	274.32	Euthanasia
5	Trial 4	3124.4/ 632.6	1229	10/4/2012	11/23/2012	232.20	55	11/28/2012	275.60	Euthanasia
5	Trial 4	3124.4/ 632.6	1239	10/4/2012	11/23/2012	228.54	55	11/28/2012	274.53	Euthanasia
5	Trial 4	3124.4/ 632.6	1295	10/4/2012	11/23/2012	229.61	55	11/28/2012	267.21	Euthanasia
5	Trial 4	3124.4/ 632.6	1339	10/4/2012	11/23/2012	231.11	55	11/28/2012	280.15	Euthanasia
5	Trial 4	3124.4/ 632.6	1219	10/4/2012	11/23/2012	231.66	55	11/28/2012	274.04	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
5	Trial 4	3124.4/ 632.6	1269	10/4/2012	11/23/2012	228.18	55	11/28/2012	269.06	HCN
5	Trial 4	3124.4/ 632.6	1303	10/4/2012	11/23/2012	231.00	55	11/28/2012	278.38	HCN
5	Trial 4	3124.4/ 632.6	1325	10/4/2012	11/23/2012	229.84	55	11/28/2012	284.90	HCN
5	Trial 4	3124.4/ 632.6	1329	10/4/2012	11/23/2012	230.08	55	11/28/2012	282.31	HCN
5	Trial 5	4947.0/ 996.4	1205	10/4/2012	11/23/2012	227.19	56	11/29/2012	280.82	HCN
5	Trial 5	4947.0/ 996.4	1223	10/4/2012	11/23/2012	227.08	56	11/29/2012	279.22	HCN
5	Trial 5	4947.0/ 996.4	1225	10/4/2012	11/23/2012	227.39	56	11/29/2012	275.32	HCN
5	Trial 5	4947.0/ 996.4	1253	10/4/2012	11/23/2012	225.63	56	11/29/2012	280.38	HCN
5	Trial 5	4947.0/ 996.4	1257	10/4/2012	11/23/2012	227.02	56	11/29/2012	268.52	HCN
5	Trial 5	4947.0/ 996.4	1267	10/4/2012	11/23/2012	226.33	56	11/29/2012	279.13	HCN
5	Trial 5	4947.0/ 996.4	1277	10/4/2012	11/23/2012	226.94	56	11/29/2012	277.95	HCN
5	Trial 5	4947.0/ 996.4	1301	10/4/2012	11/23/2012	226.44	56	11/29/2012	284.00	HCN
5	Trial 5	4947.0/ 996.4	1305	10/4/2012	11/23/2012	226.81	56	11/29/2012	280.95	HCN
5	Trial 5	4947.0/ 996.4	1317	10/4/2012	11/23/2012	226.91	56	11/29/2012	284.44	HCN
6	Trial 1	141.6	0001	5/17/2012	7/6/2012	226.6	55	7/11/2012	269.5	Euthanasia
6	Trial 1	141.6	0005	5/17/2012	7/6/2012	232.1	55	7/11/2012	270.9	Euthanasia
6	Trial 1	141.6	0009	5/17/2012	7/6/2012	222.9	55	7/11/2012	256.3	Euthanasia
6	Trial 1	141.6	0051	5/17/2012	7/6/2012	221.3	55	7/11/2012	250.0	Euthanasia
6	Trial 1	141.6	0053	5/17/2012	7/6/2012	222.3	55	7/11/2012	257.9	Euthanasia
6	Trial 1	141.6	0059	5/17/2012	7/6/2012	228.2	55	7/11/2012	267.2	Euthanasia
6	Trial 1	141.6	0063	5/17/2012	7/6/2012	232.2	55	7/11/2012	265.3	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
6	Trial 1	141.6	0065	5/17/2012	7/6/2012	226.2	55	7/11/2012	265.8	Euthanasia
6	Trial 1	141.6	0081	5/17/2012	7/6/2012	221.6	55	7/11/2012	254.7	Euthanasia
6	Trial 1	141.6	0093	5/17/2012	7/6/2012	228.6	55	7/11/2012	261.4	Euthanasia
6	Trial 2	273.5	0111	5/23/2012	7/13/2012	236.8	55	7/17/2012	272.1	Euthanasia
6	Trial 2	273.5	0167	5/23/2012	7/13/2012	241.6	55	7/17/2012	275.1	Euthanasia
6	Trial 2	273.5	0185	5/23/2012	7/13/2012	240.1	55	7/17/2012	273.9	Euthanasia
6	Trial 2	273.5	0235	5/23/2012	7/13/2012	241.5	55	7/17/2012	276.3	Euthanasia
6	Trial 2	273.5	0129	5/23/2012	7/13/2012	234.2	55	7/17/2012	272.0	HCN
6	Trial 2	273.5	0147	5/23/2012	7/13/2012	235.1	55	7/17/2012	270.3	HCN
6	Trial 2	273.5	0169	5/23/2012	7/13/2012	236.3	55	7/17/2012	270.2	HCN
6	Trial 2	273.5	0171	5/23/2012	7/13/2012	241.1	55	7/17/2012	283.0	HCN
6	Trial 2	273.5	0209	5/23/2012	7/13/2012	234.6	55	7/17/2012	274.5	HCN
6	Trial 2	273.5	0211	5/23/2012	7/13/2012	243.2	55	7/17/2012	284.1	HCN
6	Trial 3	200.8	0103	5/23/2012	7/13/2012	233.8	56	7/18/2012	273.2	Euthanasia
6	Trial 3	200.8	0115	5/23/2012	7/13/2012	224.2	56	7/18/2012	243.8	Euthanasia
6	Trial 3	200.8	0143	5/23/2012	7/13/2012	227.0	56	7/18/2012	266.5	Euthanasia
6	Trial 3	200.8	0159	5/23/2012	7/13/2012	233.6	56	7/18/2012	274.0	Euthanasia
6	Trial 3	200.8	0181	5/23/2012	7/13/2012	219.6	56	7/18/2012	269.0	Euthanasia
6	Trial 3	200.8	0189	5/23/2012	7/13/2012	220.5	56	7/18/2012	268.1	Euthanasia
6	Trial 3	200.8	0201	5/23/2012	7/13/2012	227.4	56	7/18/2012	278.4	Euthanasia
6	Trial 3	200.8	0219	5/23/2012	7/13/2012	225.4	56	7/18/2012	271.6	Euthanasia
6	Trial 3	200.8	0225	5/23/2012	7/13/2012	219.0	56	7/18/2012	246.2	Euthanasia
6	Trial 3	200.8	0241	5/23/2012	7/13/2012	228.3	56	7/18/2012	264.3	HCN
6	Trial 4	250	0481	6/7/2012	7/27/2012	191.4	60	8/6/2012	257.6	Euthanasia
6	Trial 4	254.6	0483	6/7/2012	7/27/2012	188.8	60	8/6/2012	248.6	Euthanasia
6	Trial 4	254.6	0551	6/7/2012	7/27/2012	149.5	60	8/6/2012	255.3	Euthanasia
6	Trial 4	254.6	0593	6/7/2012	7/27/2012	208.8	60	8/6/2012	285.5	Euthanasia
6	Trial 4	254.6	0511	6/7/2012	7/27/2012	206.5	60	8/6/2012	281.0	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
6	Trial 4	254.6	0559	6/7/2012	7/27/2012	209.2	60	8/6/2012	281.0	HCN
6	Trial 4	254.6	0571	6/7/2012	7/27/2012	209.8	60	8/6/2012	275.2	HCN
6	Trial 4	254.6	0619	6/7/2012	7/27/2012	209.8	60	8/6/2012	283.4	HCN
6	Trial 4	254.6	0685	6/7/2012	7/27/2012	203.8	60	8/6/2012	280.4	HCN
6	Trial 4	254.6	0577	6/7/2012	7/27/2012	209.0	60	8/6/2012	273.8	HCN (postexposure)
6	Trial 5	303.0	0839	6/14/2012	8/3/2012	224.5	53	8/6/2012	249.0	Euthanasia
6	Trial 5	303.0	0907	6/14/2012	8/3/2012	217.4	53	8/6/2012	241.9	Euthanasia
6	Trial 5	303.0	0789	6/14/2012	8/3/2012	226.1	53	8/6/2012	254.3	HCN
6	Trial 5	303.0	0793	6/14/2012	8/3/2012	217.5	53	8/6/2012	244.8	HCN
6	Trial 5	303.0	0811	6/14/2012	8/3/2012	216.7	53	8/6/2012	239.9	HCN
6	Trial 5	303.0	0833	6/14/2012	8/3/2012	216.2	53	8/6/2012	244.6	HCN
6	Trial 5	303.0	0849	6/14/2012	8/3/2012	218.3	53	8/6/2012	242.0	HCN
6	Trial 5	303.0	0903	6/14/2012	8/3/2012	219.2	53	8/6/2012	240.0	HCN
6	Trial 5	303.0	0909	6/14/2012	8/3/2012	219.5	53	8/6/2012	247.1	HCN
6	Trial 5	303.0	0829	6/14/2012	8/3/2012	222.6	53	8/6/2012	246.3	HCN (postexposure)
6	Trial 6	226.1	0701	6/14/2012	8/3/2012	186.6	56	8/9/2012	219.6	Euthanasia
6	Trial 6	226.1	0725	6/14/2012	8/3/2012	191.8	56	8/9/2012	242.5	Euthanasia
6	Trial 6	226.1	0757	6/14/2012	8/3/2012	190.6	56	8/9/2012	238.7	Euthanasia
6	Trial 6	226.1	0827	6/14/2012	8/3/2012	194.3	56	8/9/2012	236.3	Euthanasia
6	Trial 6	226.1	0851	6/14/2012	8/3/2012	190.5	56	8/9/2012	247.4	Euthanasia
6	Trial 6	226.1	0865	6/14/2012	8/3/2012	191.3	56	8/9/2012	230.6	Euthanasia
6	Trial 6	226.1	0879	6/14/2012	8/3/2012	189.8	56	8/9/2012	233.6	Euthanasia
6	Trial 6	226.1	0895	6/14/2012	8/3/2012	195.8	56	8/9/2012	243.6	Euthanasia
6	Trial 6	226.1	0913	6/14/2012	8/3/2012	195.3	56	8/9/2012	258.0	Euthanasia
6	Trial 6	226.1	0835	6/14/2012	8/3/2012	196.2	56	8/9/2012	243.9	HCN
7	Trial 1	349.7/ 165.0	0263	5/31/2012	7/20/2012	253.0	53	7/23/2012	282.7	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
7	Trial 1	349.7/ 165.0	0299	5/31/2012	7/20/2012	238.5	53	7/23/2012	266.9	Euthanasia
7	Trial 1	349.7/ 165.0	0301	5/31/2012	7/20/2012	239.4	53	7/23/2012	267.8	Euthanasia
7	Trial 1	349.7/ 165.0	0397	5/31/2012	7/20/2012	243.9	53	7/23/2012	268.6	Euthanasia
7	Trial 1	349.7/ 165.0	0399	5/31/2012	7/20/2012	249.8	53	7/23/2012	277.9	Euthanasia
7	Trial 1	349.7/ 165.0	0433	5/31/2012	7/20/2012	252.6	53	7/23/2012	280.3	Euthanasia
7	Trial 1	349.7/ 165.0	0445	5/31/2012	7/20/2012	242.9	53	7/23/2012	273.9	Euthanasia
7	Trial 1	349.7/ 165.0	0457	5/31/2012	7/20/2012	252.1	53	7/23/2012	278.3	Euthanasia
7	Trial 1	349.7/ 165.0	0469	5/31/2012	7/20/2012	246.7	53	7/23/2012	278.8	Euthanasia
7	Trial 1	349.7/ 165.0	0467	5/31/2012	7/20/2012	263.7	53	7/23/2012	297.8	HCN
7	Trial 2	466.2/ 233.8	0407	5/31/2012	7/20/2012	228.5	54	7/24/2012	264.4	Euthanasia
7	Trial 2	466.2/ 233.8	0413	5/31/2012	7/20/2012	227.0	54	7/24/2012	252.5	Euthanasia
7	Trial 2	466.2/ 233.8	0261	5/31/2012	7/20/2012	235.3	54	7/24/2012	278.3	HCN
7	Trial 2	466.2/ 233.8	0297	5/31/2012	7/20/2012	233.6	54	7/24/2012	276.8	HCN
7	Trial 2	466.2/ 233.8	0303	5/31/2012	7/20/2012	233.4	54	7/24/2012	268.8	HCN
7	Trial 2	466.2/ 233.8	0305	5/31/2012	7/20/2012	229.0	54	7/24/2012	261.2	HCN
7	Trial 2	466.2/ 233.8	0353	5/31/2012	7/20/2012	237.8	54	7/24/2012	270.8	HCN
7	Trial 2	466.2/ 233.8	0453	5/31/2012	7/20/2012	236.6	54	7/24/2012	271.2	HCN
7	Trial 2	466.2/ 233.8	0477	5/31/2012	7/20/2012	230.8	54	7/24/2012	266.9	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
7	Trial 2	466.2/ 233.8	0479	5/31/2012	7/20/2012	235.0	54	7/24/2012	269.9	HCN
7	Trial 3	406.4/ 206.4	0505	6/7/2012	7/27/2012	255.4	53	7/30/2012	283.2	Euthanasia
7	Trial 3	406.4/ 206.4	0689	6/7/2012	7/27/2012	250.2	53	7/30/2012	282.8	Euthanasia
7	Trial 3	406.4/ 206.4	0517	6/7/2012	7/27/2012	250.9	53	7/30/2012	282.0	HCN
7	Trial 3	406.4/ 206.4	0519	6/7/2012	7/27/2012	249.4	53	7/30/2012	280.9	HCN
7	Trial 3	406.4/ 206.4	0545	6/7/2012	7/27/2012	252.6	53	7/30/2012	279.2	HCN
7	Trial 3	406.4/ 206.4	0583	6/7/2012	7/27/2012	249.6	53	7/30/2012	286.1	HCN
7	Trial 3	406.4/ 206.4	0585	6/7/2012	7/27/2012	248.5	53	7/30/2012	279.5	HCN
7	Trial 3	406.4/ 206.4	0605	6/7/2012	7/27/2012	257.9	53	7/30/2012	287.0	HCN
7	Trial 3	406.4/ 206.4	0607	6/7/2012	7/27/2012	248.8	53	7/30/2012	282.3	HCN
7	Trial 3	406.4/ 206.4	0625	6/7/2012	7/27/2012	253.8	53	7/30/2012	287.3	HCN
7	Trial 4	431.3/ 216.9	0787	6/14/2012	8/3/2012	215.8	54	8/7/2012	250.8	Euthanasia
7	Trial 4	431.3/ 216.9	0809	6/14/2012	8/3/2012	209.3	54	8/7/2012	239.7	Euthanasia
7	Trial 4	431.3/ 216.9	0831	6/14/2012	8/3/2012	207.0	54	8/7/2012	238.0	Euthanasia
7	Trial 4	431.3/ 216.9	0859	6/14/2012	8/3/2012	212.4	54	8/7/2012	245.3	Euthanasia
7	Trial 4	431.3/ 216.9	0745	6/14/2012	8/3/2012	210.8	54	8/7/2012	250.1	HCN
7	Trial 4	431.3/ 216.9	0753	6/14/2012	8/3/2012	211.5	54	8/7/2012	237.6	HCN
7	Trial 4	431.3/ 216.9	0799	6/14/2012	8/3/2012	208.1	54	8/7/2012	242.0	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
7	Trial 4	431.3/ 216.9	0837	6/14/2012	8/3/2012	209.8	54	8/7/2012	243.6	HCN
7	Trial 4	431.3/ 216.9	0873	6/14/2012	8/3/2012	214.2	54	8/7/2012	255.0	HCN
7	Trial 4	431.3/ 216.9	0889	6/14/2012	8/3/2012	214.9	54	8/7/2012	250.5	HCN
7	Trial 5	376.4/ 188.6	0713	6/14/2012	8/3/2012	200.9	55	8/8/2012	232.4	Euthanasia
7	Trial 5	376.4/ 188.6	0723	6/14/2012	8/3/2012	204.6	55	8/8/2012	244.9	Euthanasia
7	Trial 5	376.4/ 188.6	0775	6/14/2012	8/3/2012	201.3	55	8/8/2012	250.1	Euthanasia
7	Trial 5	376.4/ 188.6	0783	6/14/2012	8/3/2012	199.8	55	8/8/2012	233.1	Euthanasia
7	Trial 5	376.4/ 188.6	0813	6/14/2012	8/3/2012	196.6	55	8/8/2012	231.5	Euthanasia
7	Trial 5	376.4/ 188.6	0917	6/14/2012	8/3/2012	197.6	55	8/8/2012	234.4	Euthanasia
7	Trial 5	376.4/ 188.6	0773	6/14/2012	8/3/2012	203.2	55	8/8/2012	246.8	HCN
7	Trial 5	376.4/ 188.6	0785	6/14/2012	8/3/2012	206.3	55	8/8/2012	240.1	HCN
7	Trial 5	376.4/ 188.6	0821	6/14/2012	8/3/2012	202.0	55	8/8/2012	244.4	HCN
7	Trial 5	376.4/ 188.6	0843	6/14/2012	8/3/2012	205.4	55	8/8/2012	248.3	HCN
8	Trial 1	432.2/ 86.0	0193	5/23/2012	7/13/2012	208.1	57	7/19/2012	261.5	Euthanasia
8	Trial 1	432.2/ 86.0	0205	5/23/2012	7/13/2012	214.7	57	7/19/2012	262.0	Euthanasia
8	Trial 1	432.2/ 86.0	0223	5/23/2012	7/13/2012	216.3	57	7/19/2012	278.3	Euthanasia
8	Trial 1	432.2/ 86.0	0255	5/23/2012	7/13/2012	210.6	57	7/19/2012	266.8	Euthanasia
8	Trial 1	432.2/ 86.0	0127	5/23/2012	7/13/2012	218.1	57	7/19/2012	269.8	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
8	Trial 1	432.2/ 86.0	0133	5/23/2012	7/13/2012	208.8	57	7/19/2012	266.1	HCN
8	Trial 1	432.2/ 86.0	0139	5/23/2012	7/13/2012	213.3	57	7/19/2012	270.3	HCN
8	Trial 1	432.2/ 86.0	0175	5/23/2012	7/13/2012	203.8	57	7/19/2012	252.8	HCN
8	Trial 1	432.2/ 86.0	0215	5/23/2012	7/13/2012	213.3	57	7/19/2012	262.7	HCN
8	Trial 1	432.2/ 86.0	0237	5/23/2012	7/13/2012	211.9	57	7/19/2012	263.8	HCN
8	Trial 2	404.7/ 80.6	0487	6/7/2012	7/27/2012	229.2	55	8/1/2012	260.0	Euthanasia
8	Trial 2	404.7/ 80.6	0489	6/7/2012	7/27/2012	231.7	55	8/1/2012	270.1	Euthanasia
8	Trial 2	404.7/ 80.6	0503	6/7/2012	7/27/2012	228.7	55	8/1/2012	268.2	Euthanasia
8	Trial 2	404.7/ 80.6	0521	6/7/2012	7/27/2012	232.6	55	8/1/2012	271.7	Euthanasia
8	Trial 2	404.7/ 80.6	0633	6/7/2012	7/27/2012	237.1	55	8/1/2012	271.3	Euthanasia
8	Trial 2	404.7/ 80.6	0647	6/7/2012	7/27/2012	230.5	55	8/1/2012	275.7	Euthanasia
8	Trial 2	404.7/ 80.6	0537	6/7/2012	7/27/2012	230.8	55	8/1/2012	267.7	HCN
8	Trial 2	404.7/ 80.6	0575	6/7/2012	7/27/2012	227.3	55	8/1/2012	265.3	HCN
8	Trial 2	404.7/ 80.6	0613	6/7/2012	7/27/2012	234.1	55	8/1/2012	273.9	HCN
8	Trial 2	404.7/ 80.6	0629	6/7/2012	7/27/2012	233.7	55	8/1/2012	277.2	HCN
8	Trial 3	473.8/ 94.6	0497	6/7/2012	7/27/2012	231.9	55	8/1/2012	270.7	Euthanasia
8	Trial 3	473.8/ 94.6	0499	6/7/2012	7/27/2012	229.9	55	8/1/2012	269.3	Euthanasia
8	Trial 3	473.8/ 94.6	0643	6/7/2012	7/27/2012	229.2	55	8/1/2012	261.1	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
8	Trial 3	473.8/ 94.6	0651	6/7/2012	7/27/2012	237.1	55	8/1/2012	279.6	Euthanasia
8	Trial 3	473.8/ 94.6	0659	6/7/2012	7/27/2012	233.4	55	8/1/2012	276.6	Euthanasia
8	Trial 3	473.8/ 94.6	0675	6/7/2012	7/27/2012	227.2	55	8/1/2012	267.2	Euthanasia
8	Trial 3	473.8/ 94.6	0699	6/7/2012	7/27/2012	231.5	55	8/1/2012	264.7	Euthanasia
8	Trial 3	473.8/ 94.6	0501	6/7/2012	7/27/2012	228.6	55	8/1/2012	264.9	HCN
8	Trial 3	473.8/ 94.6	0535	6/7/2012	7/27/2012	230.6	55	8/1/2012	273.7	HCN
8	Trial 3	473.8/ 94.6	0653	6/7/2012	7/27/2012	234.0	55	8/1/2012	272.4	HCN
8	Trial 4	508.6/ 101.6	0927	6/21/2012	8/10/2012	240.3	53	8/13/2012	267.5	Euthanasia
8	Trial 4	508.6/ 101.6	0995	6/21/2012	8/10/2012	240.6	53	8/13/2012	271.5	Euthanasia
8	Trial 4	508.6/ 101.6	1029	6/21/2012	8/10/2012	241.8	53	8/13/2012	265.6	Euthanasia
8	Trial 4	508.6/ 101.6	1031	6/21/2012	8/10/2012	245.5	53	8/13/2012	258.6	Euthanasia
8	Trial 4	508.6/ 101.6	1067	6/21/2012	8/10/2012	256.2	53	8/13/2012	280.2	Euthanasia
8	Trial 4	508.6/ 101.6	1095	6/21/2012	8/10/2012	244.0	53	8/13/2012	265.1	Euthanasia
8	Trial 4	508.6/ 101.6	0977	6/21/2012	8/10/2012	253.4	53	8/13/2012	280.0	HCN
8	Trial 4	508.6/ 101.6	0989	6/21/2012	8/10/2012	249.9	53	8/13/2012	278.8	HCN
8	Trial 4	508.6/ 101.6	1027	6/21/2012	8/10/2012	246.9	53	8/13/2012	272.2	HCN
8	Trial 4	508.6/ 101.6	1035	6/21/2012	8/10/2012	245.1	53	8/13/2012	274.3	HCN
8	Trial 5	633.5/ 127.8	0941	6/21/2012	8/10/2012	232.8	54	8/14/2012	259.4	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
8	Trial 5	633.5/ 127.8	0949	6/21/2012	8/10/2012	227.3	54	8/14/2012	251.3	HCN
8	Trial 5	633.5/ 127.8	0957	6/21/2012	8/10/2012	229.8	54	8/14/2012	244.6	HCN
8	Trial 5	633.5/ 127.8	1033	6/21/2012	8/10/2012	236.2	54	8/14/2012	272.5	HCN
8	Trial 5	633.5/ 127.8	1047	6/21/2012	8/10/2012	228.3	54	8/14/2012	256.1	HCN
8	Trial 5	633.5/ 127.8	1051	6/21/2012	8/10/2012	230.5	54	8/14/2012	269.3	HCN
8	Trial 5	633.5/ 127.8	1065	6/21/2012	8/10/2012	222.1	54	8/14/2012	258.0	HCN
8	Trial 5	633.5/ 127.8	1069	6/21/2012	8/10/2012	229.2	54	8/14/2012	255.0	HCN
8	Trial 5	633.5/ 127.8	1079	6/21/2012	8/10/2012	238.7	54	8/14/2012	271.1	HCN
8	Trial 5	633.5/ 127.8	1097	6/21/2012	8/10/2012	219.6	54	8/14/2012	248.1	HCN
8	Trial 6	322.9/ 64.2	0921	6/21/2012	8/10/2012	202.5	62	8/22/2012	270.0	Euthanasia
8	Trial 6	322.9/ 64.2	1001	6/21/2012	8/10/2012	201.8	62	8/22/2012	309.7	Euthanasia
8	Trial 6	322.9/ 64.2	1011	6/21/2012	8/10/2012	198.2	62	8/22/2012	298.5	Euthanasia
8	Trial 6	322.9/ 64.2	1061	6/21/2012	8/10/2012	191.8	62	8/22/2012	283.4	Euthanasia
8	Trial 6	322.9/ 64.2	1101	6/21/2012	8/10/2012	190.5	62	8/22/2012	271.6	Euthanasia
8	Trial 6	322.9/ 64.2	1103	6/21/2012	8/10/2012	198.6	62	8/22/2012	296.1	Euthanasia
8	Trial 6	322.9/ 64.2	0943	6/21/2012	8/10/2012	203.0	62	8/22/2012	282.5	HCN
8	Trial 6	322.9/ 64.2	0971	6/21/2012	8/10/2012	196.4	62	8/22/2012	282.9	HCN
8	Trial 6	322.9/ 64.2	0993	6/21/2012	8/10/2012	192.5	62	8/22/2012	286.3	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
8	Trial 6	322.9/ 64.2	1021	6/21/2012	8/10/2012	198.5	62	8/22/2012	279.0	HCN
8	Trial 7	255.0/ 50.6	0955	6/21/2012	8/10/2012	198.5	63	8/23/2012	280.6	Euthanasia
8	Trial 7	255.0/ 50.6	0965	6/21/2012	8/10/2012	191.7	63	8/23/2012	296.0	Euthanasia
8	Trial 7	255.0/ 50.6	0981	6/21/2012	8/10/2012	192.1	63	8/23/2012	274.8	Euthanasia
8	Trial 7	255.0/ 50.6	1009	6/21/2012	8/10/2012	196.6	63	8/23/2012	303.4	Euthanasia
8	Trial 7	255.0/ 50.6	1057	6/21/2012	8/10/2012	199.6	63	8/23/2012	294.4	Euthanasia
8	Trial 7	255.0/ 50.6	1059	6/21/2012	8/10/2012	196.2	63	8/23/2012	298.9	Euthanasia
8	Trial 7	255.0/ 50.6	1111	6/21/2012	8/10/2012	202.1	63	8/23/2012	293.4	Euthanasia
8	Trial 7	255.0/ 50.6	1115	6/21/2012	8/10/2012	202.7	63	8/23/2012	315.0	Euthanasia
8	Trial 7	255.0/ 50.6	1117	6/21/2012	8/10/2012	198.4	63	8/23/2012	275.9	Euthanasia
8	Trial 7	255.0/ 50.6	1109	6/21/2012	8/10/2012	188.4	63	8/23/2012	262.3	HCN
8	Trial 8	515.9/ 103.0	1123	6/28/2012	8/17/2012	211.5	60	8/27/2012	301.5	Euthanasia
8	Trial 8	515.9/ 103.0	1163	6/28/2012	8/17/2012	207.4	60	8/27/2012	292.5	Euthanasia
8	Trial 8	515.9/ 103.0	1171	6/28/2012	8/17/2012	213.4	60	8/27/2012	289.6	Euthanasia
8	Trial 8	515.9/ 103.0	1173	6/28/2012	8/17/2012	207.5	60	8/27/2012	302.4	Euthanasia
8	Trial 8	515.9/ 103.0	1133	6/28/2012	8/17/2012	207.4	60	8/27/2012	274.7	HCN
8	Trial 8	515.9/ 103.0	1153	6/28/2012	8/17/2012	214.8	60	8/27/2012	280.4	HCN
8	Trial 8	515.9/ 103.0	1175	6/28/2012	8/17/2012	211.8	60	8/27/2012	277.5	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
8	Trial 8	515.9/ 103.0	1183	6/28/2012	8/17/2012	212.1	60	8/27/2012	290.4	HCN
8	Trial 8	515.9/ 103.0	1189	6/28/2012	8/17/2012	208.2	60	8/27/2012	287.7	HCN
8	Trial 8	515.9/ 103.0	1149	6/28/2012	8/17/2012	212.2	60	8/27/2012	288.8	HCN (post exposure)
9	Trial 1	608.4/ 309.9	0275	5/31/2012	7/20/2012	218.7	55	7/25/2012	261.8	Euthanasia
9	Trial 1	608.4/ 309.9	0285	5/31/2012	7/20/2012	222.6	55	7/25/2012	264.2	HCN
9	Trial 1	608.4/ 309.9	0307	5/31/2012	7/20/2012	224.7	55	7/25/2012	263.0	HCN
9	Trial 1	608.4/ 309.9	0317	5/31/2012	7/20/2012	216.7	55	7/25/2012	262.0	HCN
9	Trial 1	608.4/ 309.9	0321	5/31/2012	7/20/2012	211.1	55	7/25/2012	258.0	HCN
9	Trial 1	608.4/ 309.9	0339	5/31/2012	7/20/2012	221.0	55	7/25/2012	270.1	HCN
9	Trial 1	608.4/ 309.9	0365	5/31/2012	7/20/2012	225.5	55	7/25/2012	267.2	HCN
9	Trial 1	608.4/ 309.9	0383	5/31/2012	7/20/2012	226.0	55	7/25/2012	270.3	HCN
9	Trial 1	608.4/ 309.9	0391	5/31/2012	7/20/2012	223.7	55	7/25/2012	268.6	HCN
9	Trial 1	608.4/ 309.9	0415	5/31/2012	7/20/2012	213.9	55	7/25/2012	251.8	HCN
9	Trial 2	496.1/ 249.6	0345	5/31/2012	7/20/2012	208.8	56	7/26/2012	263.8	Euthanasia
9	Trial 2	496.1/ 249.6	0371	5/31/2012	7/20/2012	203.9	56	7/26/2012	256.3	Euthanasia
9	Trial 2	496.1/ 249.6	0401	5/31/2012	7/20/2012	209.7	56	7/26/2012	254.5	Euthanasia
9	Trial 2	496.1/ 249.6	0315	5/31/2012	7/20/2012	205.1	56	7/26/2012	257.5	HCN
9	Trial 2	496.1/ 249.6	0325	5/31/2012	7/20/2012	202.2	56	7/26/2012	260.8	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
9	Trial 2	496.1/ 249.6	0363	5/31/2012	7/20/2012	208.1	56	7/26/2012	261.5	HCN
9	Trial 2	496.1/ 249.6	0373	5/31/2012	7/20/2012	204.6	56	7/26/2012	245.6	HCN
9	Trial 2	496.1/ 249.6	0385	5/31/2012	7/20/2012	205.8	56	7/26/2012	253.9	HCN
9	Trial 2	496.1/ 249.6	0393	5/31/2012	7/20/2012	203.6	56	7/26/2012	259.4	HCN
9	Trial 2	496.1/ 249.6	0419	5/31/2012	7/20/2012	207.6	56	7/26/2012	264.8	HCN (postexposure)
9	Trial 3	444.9/ 223.8	0527	6/7/2012	7/27/2012	226.3	56	8/2/2012	275.7	Euthanasia
9	Trial 3	444.9/ 223.8	0539	6/7/2012	7/27/2012	217.2	56	8/2/2012	255.7	Euthanasia
9	Trial 3	444.9/ 223.8	0563	6/7/2012	7/27/2012	225.3	56	8/2/2012	280.2	Euthanasia
9	Trial 3	444.9/ 223.8	0609	6/7/2012	7/27/2012	215.5	56	8/2/2012	268.4	Euthanasia
9	Trial 3	444.9/ 223.8	0635	6/7/2012	7/27/2012	220.4	56	8/2/2012	254.7	Euthanasia
9	Trial 3	444.9/ 223.8	0663	6/7/2012	7/27/2012	216.0	56	8/2/2012	253.5	Euthanasia
9	Trial 3	444.9/ 223.8	0677	6/7/2012	7/27/2012	222.3	56	8/2/2012	276.2	Euthanasia
9	Trial 3	444.9/ 223.8	0683	6/7/2012	7/27/2012	218.6	56	8/2/2012	264.2	Euthanasia
9	Trial 3	444.9/ 223.8	0573	6/7/2012	7/27/2012	222.9	56	8/2/2012	275.2	HCN
9	Trial 3	444.9/ 223.8	0525	6/7/2012	7/27/2012	211.4	56	8/2/2012	256.9	HCN (postexposure)
9	Trial 4	554.1/ 280.7	0485	6/7/2012	7/27/2012	224.3	56	8/2/2012	267.7	Euthanasia
9	Trial 4	554.1/ 280.7	0645	6/7/2012	7/27/2012	225.8	56	8/2/2012	276.9	Euthanasia
9	Trial 4	554.1/ 280.7	0661	6/7/2012	7/27/2012	222.8	56	8/2/2012	268.7	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
9	Trial 4	554.1/ 280.7	0669	6/7/2012	7/27/2012	222.1	56	8/2/2012	282.3	Euthanasia
9	Trial 4	554.1/ 280.7	0555	6/7/2012	7/27/2012	216.4	56	8/2/2012	266.0	HCN
9	Trial 4	554.1/ 280.7	0561	6/7/2012	7/27/2012	212.1	56	8/2/2012	261.8	HCN
9	Trial 4	554.1/ 280.7	0565	6/7/2012	7/27/2012	220.2	56	8/2/2012	240.6	HCN
9	Trial 4	554.1/ 280.7	0581	6/7/2012	7/27/2012	215.5	56	8/2/2012	259.6	HCN
9	Trial 4	554.1/ 280.7	0597	6/7/2012	7/27/2012	210.6	56	8/2/2012	239.0	HCN
9	Trial 4	554.1/ 280.7	0637	6/7/2012	7/27/2012	218.3	56	8/2/2012	266.9	HCN
9	Trial 5	468.3/ 236.0	0951	6/21/2012	8/10/2012	230.0	54	8/14/2012	263.4	Euthanasia
9	Trial 5	468.3/ 236.0	0959	6/21/2012	8/10/2012	235.4	54	8/14/2012	270.6	Euthanasia
9	Trial 5	468.3/ 236.0	0983	6/21/2012	8/10/2012	228.4	54	8/14/2012	264.0	Euthanasia
9	Trial 5	468.3/ 236.0	1099	6/21/2012	8/10/2012	228.2	54	8/14/2012	260.7	Euthanasia
9	Trial 5	468.3/ 236.0	0937	6/21/2012	8/10/2012	218.9	54	8/14/2012	246.6	HCN
9	Trial 5	468.3/ 236.0	0945	6/21/2012	8/10/2012	232.1	54	8/14/2012	255.9	HCN
9	Trial 5	468.3/ 236.0	0973	6/21/2012	8/10/2012	237.4	54	8/14/2012	271.9	HCN
9	Trial 5	468.3/ 236.0	0991	6/21/2012	8/10/2012	221.5	54	8/14/2012	257.3	HCN
9	Trial 5	468.3/ 236.0	1073	6/21/2012	8/10/2012	226.6	54	8/14/2012	259.5	HCN
9	Trial 5	468.3/ 236.0	1087	6/21/2012	8/10/2012	229.4	54	8/14/2012	260.9	HCN
10	Trial 1	611.6/ 122.7	0273	5/31/2012	7/20/2012	219.6	55	7/25/2012	255.8	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
10	Trial 1	611.6/ 122.7	0359	5/31/2012	7/20/2012	216.8	55	7/25/2012	257.8	Euthanasia
10	Trial 1	611.6/ 122.7	0377	5/31/2012	7/20/2012	224.2	55	7/25/2012	265.5	Euthanasia
10	Trial 1	611.6/ 122.7	0379	5/31/2012	7/20/2012	213.9	55	7/25/2012	252.1	Euthanasia
10	Trial 1	611.6/ 122.7	0381	5/31/2012	7/20/2012	226.5	55	7/25/2012	279.0	Euthanasia
10	Trial 1	611.6/ 122.7	0429	5/31/2012	7/20/2012	225.6	55	7/25/2012	258.7	Euthanasia
10	Trial 1	611.6/ 122.7	0327	5/31/2012	7/20/2012	212.5	55	7/25/2012	260.4	HCN
10	Trial 1	611.6/ 122.7	0349	5/31/2012	7/20/2012	224.9	55	7/25/2012	265.2	HCN
10	Trial 1	611.6/ 122.7	0443	5/31/2012	7/20/2012	222.8	55	7/25/2012	263.9	HCN
10	Trial 1	611.6/ 122.7	0461	5/31/2012	7/20/2012	221.7	55	7/25/2012	266.0	HCN
10	Trial 2	558.3/ 110.9	0513	6/7/2012	7/27/2012	241.8	54	7/31/2012	267.7	Euthanasia
10	Trial 2	558.3/ 110.9	0579	6/7/2012	7/27/2012	242.3	54	7/31/2012	273.6	Euthanasia
10	Trial 2	558.3/ 110.9	0589	6/7/2012	7/27/2012	238.3	54	7/31/2012	276.2	Euthanasia
10	Trial 2	558.3/ 110.9	0599	6/7/2012	7/27/2012	248.0	54	7/31/2012	278.1	Euthanasia
10	Trial 2	558.3/ 110.9	0615	6/7/2012	7/27/2012	245.0	54	7/31/2012	275.7	Euthanasia
10	Trial 2	558.3/ 110.9	0667	6/7/2012	7/27/2012	239.3	54	7/31/2012	273.0	Euthanasia
10	Trial 2	558.3/ 110.9	0547	6/7/2012	7/27/2012	240.6	54	7/31/2012	266.1	HCN
10	Trial 2	558.3/ 110.9	0549	6/7/2012	7/27/2012	247.0	54	7/31/2012	280.9	HCN
10	Trial 2	558.3/ 110.9	0569	6/7/2012	7/27/2012	248.4	54	7/31/2012	282.3	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
10	Trial 2	558.3/ 110.9	0621	6/7/2012	7/27/2012	241.0	54	7/31/2012	276.4	HCN
10	Trial 3	675.9/ NA	0515	6/7/2012	7/27/2012	242.2	54	7/31/2012	276.6	HCN
10	Trial 3	675.9/ NA	0553	6/7/2012	7/27/2012	240.9	54	7/31/2012	284.6	HCN
10	Trial 3	675.9/ NA	0567	6/7/2012	7/27/2012	247.9	54	7/31/2012	275.1	HCN
10	Trial 3	675.9/ NA	0591	6/7/2012	7/27/2012	243.3	54	7/31/2012	271.9	HCN
10	Trial 3	675.9/ NA	0601	6/7/2012	7/27/2012	248.2	54	7/31/2012	279.8	HCN
10	Trial 3	675.9/ NA	0611	6/7/2012	7/27/2012	241.6	54	7/31/2012	267.1	HCN
10	Trial 3	675.9/ NA	0641	6/7/2012	7/27/2012	246.9	54	7/31/2012	282.1	HCN
10	Trial 3	675.9/ NA	0649	6/7/2012	7/27/2012	239.1	54	7/31/2012	271.0	HCN
10	Trial 3	675.9/ NA	0657	6/7/2012	7/27/2012	237.5	54	7/31/2012	270.5	HCN
10	Trial 3	675.9/ NA	0671	6/7/2012	7/27/2012	239.9	54	7/31/2012	273.4	HCN
10	Trial 4	643.5/ 128.0	0707	6/14/2012	8/3/2012	185.3	60	8/13/2012	262.6	Euthanasia
10	Trial 4	643.5/ 128.0	0797	6/14/2012	8/3/2012	174.2	60	8/13/2012	246.2	Euthanasia
10	Trial 4	643.5/ 128.0	0857	6/14/2012	8/3/2012	159.9	60	8/13/2012	256.3	Euthanasia
10	Trial 4	643.5/ 128.0	0869	6/14/2012	8/3/2012	134.0	60	8/13/2012	227.3	Euthanasia
10	Trial 4	643.5/ 128.0	0875	6/14/2012	8/3/2012	183.6	60	8/13/2012	248.5	Euthanasia
10	Trial 4	643.5/ 128.0	0731	6/14/2012	8/3/2012	168.1	60	8/13/2012	279.1	HCN
10	Trial 4	643.5/ 128.0	0735	6/14/2012	8/3/2012	157.7	60	8/13/2012	243.0	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
10	Trial 4	643.5/ 128.0	0761	6/14/2012	8/3/2012	153.3	60	8/13/2012	229.2	HCN
10	Trial 4	643.5/ 128.0	0883	6/14/2012	8/3/2012	140.6	60	8/13/2012	233.3	HCN
10	Trial 4	643.5/ 128.0	0899	6/14/2012	8/3/2012	117.8	60	8/13/2012	213.8	HCN
10	Trial 5	674.4/ 135.2	0923	6/21/2012	8/10/2012	223.0	54	8/14/2012	241.8	HCN
10	Trial 5	674.4/ 135.2	0925	6/21/2012	8/10/2012	229.8	54	8/14/2012	270.4	HCN
10	Trial 5	674.4/ 135.2	0947	6/21/2012	8/10/2012	230.5	54	8/14/2012	264.1	HCN
10	Trial 5	674.4/ 135.2	1015	6/21/2012	8/10/2012	218.8	54	8/14/2012	256.0	HCN
10	Trial 5	674.4/ 135.2	1025	6/21/2012	8/10/2012	219.4	54	8/14/2012	258.8	HCN
10	Trial 5	674.4/ 135.2	1041	6/21/2012	8/10/2012	236.3	54	8/14/2012	247.3	HCN
10	Trial 5	674.4/ 135.2	1055	6/21/2012	8/10/2012	229.2	54	8/14/2012	259.1	HCN
10	Trial 5	674.4/ 135.2	1063	6/21/2012	8/10/2012	232.9	54	8/14/2012	268.0	HCN
10	Trial 5	674.4/ 135.2	1085	6/21/2012	8/10/2012	227.7	54	8/14/2012	255.5	HCN
10	Trial 5	674.4/ 135.2	1093	6/21/2012	8/10/2012	228.4	54	8/14/2012	251.3	HCN
10	Trial 6	511.3/ 101.8	0929	6/21/2012	8/10/2012	208.1	55	8/15/2012	251.9	Euthanasia
10	Trial 6	511.3/ 101.8	0935	6/21/2012	8/10/2012	213.6	55	8/15/2012	259.9	Euthanasia
10	Trial 6	511.3/ 101.8	1019	6/21/2012	8/10/2012	218.4	55	8/15/2012	257.1	Euthanasia
10	Trial 6	511.3/ 101.8	1105	6/21/2012	8/10/2012	217.8	55	8/15/2012	260.1	Euthanasia
10	Trial 6	511.3/ 101.8	0961	6/21/2012	8/10/2012	210.0	55	8/15/2012	242.0	HCN

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
10	Trial 6	511.3/ 101.8	0999	6/21/2012	8/10/2012	211.6	55	8/15/2012	257.9	HCN
10	Trial 6	511.3/ 101.8	1039	6/21/2012	8/10/2012	205.8	55	8/15/2012	253.9	HCN
10	Trial 6	511.3/ 101.8	1043	6/21/2012	8/10/2012	211.3	55	8/15/2012	253.4	HCN
10	Trial 6	511.3/ 101.8	1091	6/21/2012	8/10/2012	216.1	55	8/15/2012	256.5	HCN
10	Trial 6	511.3/ 101.8	1113	6/21/2012	8/10/2012	204.5	55	8/15/2012	236.2	HCN
10	Trial 7	427.3/ 85.0	0939	6/21/2012	8/10/2012	216.2	62	8/22/2012	298.1	Euthanasia
10	Trial 7	427.3/ 85.0	0969	6/21/2012	8/10/2012	211.8	62	8/22/2012	277.8	Euthanasia
10	Trial 7	427.3/ 85.0	1013	6/21/2012	8/10/2012	208.3	62	8/22/2012	319.1	Euthanasia
10	Trial 7	427.3/ 85.0	1017	6/21/2012	8/10/2012	203.6	62	8/22/2012	298.8	Euthanasia
10	Trial 7	427.3/ 85.0	1037	6/21/2012	8/10/2012	206.4	62	8/22/2012	264.4	Euthanasia
10	Trial 7	427.3/ 85.0	1075	6/21/2012	8/10/2012	211.4	62	8/22/2012	300.5	Euthanasia
10	Trial 7	427.3/ 85.0	1077	6/21/2012	8/10/2012	214.7	62	8/22/2012	275.8	Euthanasia
10	Trial 7	427.3/ 85.0	1083	6/21/2012	8/10/2012	205.0	62	8/22/2012	303.7	Euthanasia
10	Trial 7	427.3/ 85.0	1119	6/21/2012	8/10/2012	218.3	62	8/22/2012	294.0	Euthanasia
10	Trial 7	427.3/ 85.0	0979	6/21/2012	8/10/2012	210.5	62	8/22/2012	306.0	HCN
11	Trial 1	198	0007	5/17/2012	7/6/2012	234.3	54	7/10/2012	269.9	Euthanasia
11	Trial 1	198	0017	5/17/2012	7/6/2012	236.0	54	7/10/2012	261.1	Euthanasia
11	Trial 1	198	0021	5/17/2012	7/6/2012	235.0	54	7/10/2012	261.5	Euthanasia
11	Trial 1	198	0025	5/17/2012	7/6/2012	237.2	54	7/10/2012	269.8	Euthanasia
11	Trial 1	198	0039	5/17/2012	7/6/2012	232.4	54	7/10/2012	268.2	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
11	Trial 1	198	0043	5/17/2012	7/6/2012	236.2	54	7/10/2012	271.4	Euthanasia
11	Trial 1	198	0049	5/17/2012	7/6/2012	233.6	54	7/10/2012	270.8	Euthanasia
11	Trial 1	198	0055	5/17/2012	7/6/2012	236.2	54	7/10/2012	268.6	Euthanasia
11	Trial 1	198	0083	5/17/2012	7/6/2012	237.4	54	7/10/2012	277.7	Euthanasia
11	Trial 1	198	0089	5/17/2012	7/6/2012	233.1	54	7/10/2012	268.8	Euthanasia
11	Trial 2	493.5	0035	5/17/2012	7/6/2012	221.0	56	7/12/2012	259.2	Euthanasia
11	Trial 2	493.5	0097	5/17/2012	7/6/2012	212.0	56	7/12/2012	248.9	Euthanasia
11	Trial 2	493.5	0013	5/17/2012	7/6/2012	215.9	56	7/12/2012	242.1	HCN
11	Trial 2	493.5	0023	5/17/2012	7/6/2012	216.3	56	7/12/2012	243.9	HCN
11	Trial 2	493.5	0031	5/17/2012	7/6/2012	220.2	56	7/12/2012	274.7	HCN
11	Trial 2	493.5	0037	5/17/2012	7/6/2012	220.2	56	7/12/2012	271.7	HCN
11	Trial 2	493.5	0041	5/17/2012	7/6/2012	215.4	56	7/12/2012	269.4	HCN
11	Trial 2	493.5	0045	5/17/2012	7/6/2012	214.0	56	7/12/2012	246.2	HCN
11	Trial 2	493.5	0069	5/17/2012	7/6/2012	217.8	56	7/12/2012	257.0	HCN
11	Trial 2	493.5	0099	5/17/2012	7/6/2012	214.5	56	7/12/2012	253.6	HCN
11	Trial 3	407.4	0105	5/23/2012	7/13/2012	279.5	54	7/16/2012	313.3	Euthanasia
11	Trial 3	407.4	0145	5/23/2012	7/13/2012	246.7	54	7/16/2012	274.6	Euthanasia
11	Trial 3	407.4	0155	5/23/2012	7/13/2012	249.2	54	7/16/2012	276.2	Euthanasia
11	Trial 3	407.4	0179	5/23/2012	7/13/2012	245.9	54	7/16/2012	268.3	Euthanasia
11	Trial 3	407.4	0195	5/23/2012	7/13/2012	251.1	54	7/16/2012	277.7	Euthanasia
11	Trial 3	407.4	0157	5/23/2012	7/13/2012	245.3	54	7/16/2012	274.8	HCN
11	Trial 3	407.4	0163	5/23/2012	7/13/2012	245.3	54	7/16/2012	273.9	HCN
11	Trial 3	407.4	0165	5/23/2012	7/13/2012	254.9	54	7/16/2012	285.0	HCN
11	Trial 3	407.4	0173	5/23/2012	7/13/2012	263.1	54	7/16/2012	290.6	HCN
11	Trial 3	407.4	0231	5/23/2012	7/13/2012	248.5	54	7/16/2012	276.5	HCN
11	Trial 4	340.3	0311	5/31/2012	7/20/2012	203.8	56	7/26/2012	246.5	Euthanasia
11	Trial 4	340.3	0343	5/31/2012	7/20/2012	206.1	56	7/26/2012	255.4	Euthanasia
11	Trial 4	340.3	0351	5/31/2012	7/20/2012	204.6	56	7/26/2012	238.7	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
11	Trial 4	340.3	0417	5/31/2012	7/20/2012	200.6	56	7/26/2012	254.6	Euthanasia
11	Trial 4	340.3	0423	5/31/2012	7/20/2012	207.8	56	7/26/2012	256.0	Euthanasia
11	Trial 4	340.3	0425	5/31/2012	7/20/2012	208.6	56	7/26/2012	262.8	Euthanasia
11	Trial 4	340.3	0439	5/31/2012	7/20/2012	203.5	56	7/26/2012	247.2	Euthanasia
11	Trial 4	340.3	0277	5/31/2012	7/20/2012	204.2	56	7/26/2012	246.2	HCN
11	Trial 4	340.3	0337	5/31/2012	7/20/2012	209.1	56	7/26/2012	260.6	HCN
11	Trial 4	340.3	0389	5/31/2012	7/20/2012	205.4	56	7/26/2012	253.6	HCN
11	Trial 5	453.7	0737	6/14/2012	8/3/2012	208.4	54	8/7/2012	243.6	Euthanasia
11	Trial 5	453.7	0749	6/14/2012	8/3/2012	206.8	54	8/7/2012	235.6	Euthanasia
11	Trial 5	453.7	0795	6/14/2012	8/3/2012	215.8	54	8/7/2012	245.3	Euthanasia
11	Trial 5	453.7	0845	6/14/2012	8/3/2012	212.2	54	8/7/2012	241.8	Euthanasia
11	Trial 5	453.7	0891	6/14/2012	8/3/2012	209.8	54	8/7/2012	238.1	Euthanasia
11	Trial 5	453.7	0733	6/14/2012	8/3/2012	211.2	54	8/7/2012	245.5	HCN
11	Trial 5	453.7	0769	6/14/2012	8/3/2012	213.6	54	8/7/2012	250.8	HCN
11	Trial 5	453.7	0877	6/14/2012	8/3/2012	207.7	54	8/7/2012	238.2	HCN
11	Trial 5	453.7	0885	6/14/2012	8/3/2012	210.4	54	8/7/2012	244.8	HCN
11	Trial 5	453.7	0901	6/14/2012	8/3/2012	214.4	54	8/7/2012	245.8	HCN
11	Trial 6	272.3	1131	6/28/2012	8/17/2012	200.1	61	8/28/2012	278.4	Euthanasia
11	Trial 6	272.3	1139	6/28/2012	8/17/2012	202.3	61	8/28/2012	291.1	Euthanasia
11	Trial 6	272.3	1151	6/28/2012	8/17/2012	199.7	61	8/28/2012	282.2	Euthanasia
11	Trial 6	272.3	1155	6/28/2012	8/17/2012	205.1	61	8/28/2012	297.7	Euthanasia
11	Trial 6	272.3	1157	6/28/2012	8/17/2012	199.0	61	8/28/2012	295.5	Euthanasia
11	Trial 6	272.3	1177	6/28/2012	8/17/2012	206.0	61	8/28/2012	304.6	Euthanasia
11	Trial 6	272.3	1179	6/28/2012	8/17/2012	202.2	61	8/28/2012	286.1	Euthanasia
11	Trial 6	272.3	1185	6/28/2012	8/17/2012	204.2	61	8/28/2012	290.3	Euthanasia
11	Trial 6	272.3	1121	6/28/2012	8/17/2012	198.6	61	8/28/2012	267.7	HCN
11	Trial 6	272.3	1135	6/28/2012	8/17/2012	199.7	61	8/28/2012	269.2	HCN
11	Trial 7	450.3	1203	10/4/2012	11/23/2012	207.74	61	12/4/2012	275.73	Euthanasia

Profile (1-11)	Trial Number	Concen-tration (ppm)	Animal Number	Date of Birth	Date Weighed	Randomization Weight (g)	Age at Exposure (days)	Date of Exposure	Weight at Exposure (g)	Mode of Death
11	Trial 7	450.3	1233	10/4/2012	11/23/2012	216.31	61	12/4/2012	316.82	Euthanasia
11	Trial 7	450.3	1263	10/4/2012	11/23/2012	205.30	61	12/4/2012	282.09	Euthanasia
11	Trial 7	450.3	1285	10/4/2012	11/23/2012	208.65	61	12/4/2012	293.25	Euthanasia
11	Trial 7	450.3	1307	10/4/2012	11/23/2012	215.08	61	12/4/2012	325.07	Euthanasia
11	Trial 7	450.3	1323	10/4/2012	11/23/2012	213.19	61	12/4/2012	301.42	Euthanasia
11	Trial 7	450.3	1235	10/4/2012	11/23/2012	210.51	61	12/4/2012	293.71	HCN
11	Trial 7	450.3	1271	10/4/2012	11/23/2012	209.10	61	12/4/2012	313.41	HCN
11	Trial 7	450.3	1293	10/4/2012	11/23/2012	206.79	61	12/4/2012	274.25	HCN
11	Trial 7	450.3	1297	10/4/2012	11/23/2012	217.19	61	12/4/2012	302.11	HCN

List of Symbols, Abbreviations, and Acronyms

AC	Hydrogen cyanide (military designation)
AEGL	Acute Exposure Guideline Level
BMDS	Benchmark Dose Software
C	Concentration
Cavg	Time-weighted average concentration
Ci	Initial concentration
CWA	Chemical warfare agent
DOD	Department of Defense
FT-IR	Fourier Transform Infrared Spectrometer
HCN	Hydrogen cyanide
IACUC	Institutional Animal Care and Use Committee
LC_{50}	Median lethal concentration
LCL	Lower confidence limit
LCt_{50}	Product of concentration and exposure duration producing 50% lethality
MFC	Mass flow controller
NOEU	Nose-only exposure unit
SLM	Standard liters per minute
SRE	Standardized residual error
t	Time duration
TIC	Toxic industrial chemical
TL_{50}	Toxic load for 50 percent lethality
U.S. EPA	U.S. Environmental Protection Agency
WPAFB	Wright-Patterson Air Force Base